2014-2015 SANTA CLARA COUNTY CIVIL GRAND JURY REPORT

SANTA CLARA COUNTY CRIME LAB LEGIONELLA BACTERIA – STILL CANNOT DRINK THE WATER

Summary

In November 2013, the San Jose Mercury News published an article titled “Bacteria that causes Legionnaire’s disease found in Santa Clara County Crime lab”. The article stated:

> At least one water pipe in Santa Clara County's $75 million crime lab is infected with bacteria that can cause Legionnaires' disease, according to preliminary tests, county officials confirmed Wednesday. None of the building's 65 employees has come down with any symptoms since November 2013 when the Legionella Bacteria were discovered. In its most virulent form, Legionella Bacteria can cause potentially fatal pneumonia, as it did in 1976 at the American Legion convention in Philadelphia. It is usually contracted from breathing mist from water that contains the bacteria. [1]

It should be noted that although the news report mentions Legionnaire’s disease, it is not the disease that is present within the Santa Clara County Office of the District Attorney’s Crime Laboratory (Crime Lab) water but the Legionella Bacteria, which can cause the disease.

Last year, the 2013-2014 Santa Clara County Civil Grand Jury (2013-2014 Grand Jury) attended a presentation at the Crime Lab where the presence of Legionella Bacteria was discussed.

Subsequently, the 2014-2015 Santa Clara County Civil Grand Jury (Grand Jury), on the recommendation of the 2013-2014 Grand Jury, chose to investigate whether the statements in the Mercury News article were accurate and if the problem still exists. If so, what actions is Santa Clara County (County) taking to correct the problem and ensure that adequate testing, immediate remedial actions, and future mitigation programs are implemented for the safety of the employees, contractors, and the public

[1] San Jose Mercury News, Local Section, 11/14/13

who might have contact with potable[2] water in the building.

The Grand Jury was told during the investigation that the Legionella Bacteria were still present in the water. Management of the Crime Lab is commended for taking the first step to protect employees and others who work in or visit the Crime Lab by posting warning signs and notifying staff of the problem.

The County Facilities and Fleet Department (FAF) manages construction, modification, and maintenance of all County owned and leased buildings. It is the responsibility of FAF to respond to and make repairs in those buildings affecting employees and the public. The Grand Jury was told that initial suspicion about the possibility of bacterial growth in the water systems of the Crime Lab occurred during the summer of 2012. A system to chlorinate the waters within the Crime Lab to control bacterial growth in those waters was designed and a permit from the State of California was issued to treat the waters of the Crime Lab. A chlorine injection system has been installed and was activated on March 25, 2015. This system is expected to control bacterial growth in Crime Lab water systems. Proper management to ensure control of water borne bacterial growth will require ongoing and periodic testing of the water.

It is imperative that all employees, contractors, and the public who visit or work in the Crime Lab are informed, educated, and updated regarding the water contamination. This is accomplished by the use of warning signs on the water drinking fountains, sinks and faucets and by verbally informing all public visitors and workers about the water contamination. The Grand Jury observed that the existing warning signs were only in English. Furthermore, the signs were not present at all locations where they should be posted. The policies regarding continued presence of such signs and other notification steps should be reviewed and revised as needed.

The Grand Jury was told about the steps taken to mitigate the presence of Legionella Bacteria in the water of the Crime Lab. These steps have been taken sequentially starting with the warning signs until the recent installation of a chlorine injection system for treatment of the water. A Water Management Team is in place to monitor and manage the situation.

[2] Potable water is commonly referred to as tap water.

Background

The Crime Lab

The Crime Lab provides services to all criminal justice agencies within Santa Clara County (County) and at times may assist District Attorney's offices in other counties. Crime Lab Criminalists evaluate and analyze evidence, interpret results, provide expert testimony in court related to the full spectrum of physical evidence recovered at crime scenes and offer technical assistance and training to other agencies. The Crime Lab employs over 65 criminalists, technicians, and support staff.

The mission of the Crime Lab reads:

1. Provide the Santa Clara County criminal justice system with quality laboratory services through accurate and valid testing in a timely manner,
2. Promote a working relationship with the agencies of the Santa Clara County criminal justice system through communication and training, and
3. Establish a state-of-the-art full service laboratory through quality assurance programs, modern instrumentation and automated analysis procedures.

The Building

On September 3, 2008, the Crime Lab moved from three separate locations to the new, modern, state of the art criminal laboratory, bringing its employees and units together into one location. The facility consists of 90,072 square feet, has four floors, a basement, and is designed specifically for forensic collection and analysis. It was built to the latest conservation requirements to meet Leadership in Energy and Environmental Design (LEED)[3] Gold certification. The building was designed to house additional forensic needs for the County and to enable the laboratory to service other jurisdictions in the future.

FAF is responsible for construction and maintenance of all County owned and leased buildings. As such, they were responsible for managing the construction of the new Crime Lab.

[3] For additional information on LEED Certification, see Appendix B
LEED Certification

Methodology

The Grand Jury toured the Crime Lab on two occasions and engaged in question and answer discussions. The Grand Jury also conducted interviews with Crime Lab management and non-management personnel; the FAF management and non-management personnel; and a specialist in the detection and removal of the Legionella Bacteria. Additionally, the Grand Jury reviewed numerous relevant documents. See Appendix A
Bibliography for a list of documents reviewed.

Discussion

Legionella Bacteria

Legionella is a bacterium that causes the infection Legionella Pneumophila,[4] commonly known, when people become sick, as "Legionnaire's Disease." The Legionella Bacterium was first identified in 1976, as the cause of an outbreak of pneumonia among a group of American Legion members attending their annual convention held at the Philadelphia Bellevue-Stratford Hotel[5]. It is most commonly found in natural waterways such as rivers and ponds but has also been found in buildings that have areas of stagnant water within their plumbing, air conditioning ducts, or cooling tower systems. There are over 40 different species of Legionella Bacteria.[6] Legionella infection occurs after inhaling droplets that originated from a water source that is contaminated by Legionella Bacteria. The Bacteria must be inhaled through a fine mist of tiny water droplets that contain the bacteria.

Discovery of Legionella Bacteria in the Crime Lab

In the summer of 2012, Crime Lab management started to be concerned about the condition of the potable water (tap water) that flowed through the pipes in the Crime Lab. The suspicion was that some sections of the pipe might contain stagnant (standing) water that could become a breeding ground for dangerous levels of bacteria. The Crime Lab management requested, in May of 2013, that water designated as potable be tested for various bacteria to ensure that the water was safe to use.

The tests found Legionella Bacteria were present in potable water at the Crime Lab.

Water

The Crime Lab uses the following types of water:

[4] http://en.wikipedia.org/wiki/Legionella_pneumophila
[5] http://www.philadelphia.bellevue.hyatt.com/en/hotel/home.html
[6] For additional information on the varieties of Legionella Bacteria, please see Appendix C Legionella Bacteria strains

Potable: Potable water is safe enough to be consumed by humans. It contains chlorine or chloramine (for protection against bacteria) and is, usually, delivered through municipal pipes.
Potable water is used in the following areas of the Crime Lab: sinks (restrooms, labs and kitchens), employee showers, emergency showers, eyewash stations, and water drinking fountains. The public also uses selected restroom sinks and water drinking fountains. Potable water is stored in a holding tank until needed and pumped for use throughout the building. Only potable water was of concern to Crime Lab management.

Reclaimed: Reclaimed water or recycled water, is former wastewater (sewage) that is treated to remove solids and impurities, and used in sustainable landscaping irrigation, to recharge groundwater, to meet commercial and industrial water needs, and for drinking.

The Crime Lab uses reclaimed water for outdoor landscaping and all interior toilets. This is done for energy efficiency and to save water, and meet LEED Gold Certified standards. Reclaimed water was not a concern of Crime Lab management. However, the use of reclaimed water, as opposed to potable water, for flushing toilets may be a contributing factor to the problem. If more potable water is used, within the building, more water will flush through the pipes. This would maintain an appropriate level of chlorine within the water.

Deionized: Deionized water is highly purified water. Deionization means the removal of ions. Ions are electrically charged atoms or molecules found in waters that have either a net negative or positive charge. For many applications that use water as a rinse or ingredient, these ions are considered impurities and must be removed from the water. Deionized water is used in laboratories to conduct testing because of its purity.

Deionized water is created within the laboratory and then distributed through a separate plumbing system for use when conducting lab tests. Therefore, tests are not compromised by the contaminated water containing Legionella Bacteria.

Crime Lab management suspected that the potable water may have developed potentially dangerous levels of bacteria because of several factors:

- Standing water in piping leading to unused emergency showers and eyewash stations,
- Standing water in “dead legs” (pipe sections that go nowhere),
- Pipe sections where there is very little or no flow allowing the chlorine to dissipate and become ineffective, and
- Mixing valves that combine hot and cold water permit migration of bacteria from the hot water system (an environment preferential to their growth) to the cold (where they grow slowly).

Causes of Stagnant Water at the Crime Lab

Stagnant water is water that sits undisturbed for a long time. Even though the water

has been chlorinated, the chlorine effect will diminish over time. Bacteria breeds in stagnant water.

The following factors are of significance in the development of stagnant water in the Crime Lab:

Building Size: The Crime Lab is located in a large building (90,072 sq. ft.). Currently there are only 65 employees. The building is designed for workload expansion and to accommodate a larger number of employees. The proportion of people to space is a problem because with more people, the water use would be greater thus, possibly, avoiding stagnation. Water stagnation provides the opportunity for bacteria to grow.

Emergency shower and eyewash stations: The Crime Lab contains nine labs with 82 workstations. There are 37 emergency showers and 108 emergency eyewash stations located in the labs. These showers and eyewash stations are only used in chemical emergencies when an employee has become contaminated with a dangerous chemical. If that happens, the employee stands under the emergency showers or will flush their eyes at the eyewash stations. Because they are only used in emergencies, water that feeds these outlets can sit in the pipes for long periods without being flushed. This sets up a condition where bacteria can flourish. Since occupying the building in 2008 (and as of this writing), there have been no instances where the emergency showers were used and only one instance where an eyewash station had to be used.
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Dead Legs: Dead legs are pipes that have no outlet. This is where the water can sit and become stagnant, allowing bacteria to grow.

Two Other Factors Leading to Potential Water Contamination

Although stagnant water is the primary contributor to bacterial breeding in the building water supply, two other factors contribute to the possibility of bacterial contamination. First, the Crime Lab potable water holding tank is open to the air and there was a concern that chlorine (or chloramine) in the water might be evaporating and becoming less effective over time. In fact, some faucets which had been tested showed very low chlorine levels. Second, the mixing valves serve to blend hot and cold waters to deliver warm water through the emergency showers. The valves had been removed because, during routine inspections, some were observed to be sticking. Also, because they combine waters from an environment favorable to bacterial growth (hot water) with one where bacterial growth is naturally slow (cold water), migration from hot to cold could occur. The emergency showers now deliver only cold water.

Because of these concerns, Crime Lab management contacted FAF to request testing of the water on May 13, 2013. FAF is responsible for Facilities Management, performs all maintenance services for County facilities including Crime Lab, for plumbing, heating, ventilating and air conditioning (HVAC) systems, electrical, custodial, other general maintenance, and grounds services. Phigenics, a company that tests water (etc.), was contacted and water samples were sent to their Lab on October 17, 2013.

Phigenics

The Phigenics Analytical Services Laboratory (Phigenics), a nationally recognized firm that specializes in water treatment and hazards, was selected to determine if Legionella Bacteria was present in the water system of the new Crime Lab building. The presence of Legionella Bacteria was confirmed. Upon finding this positive result, an Informal Competitive Procurement (ICP) was initiated for a contractor to test and consult on a treatment and eradication plan for the water system within the Crime Lab building and to develop a system to monitor for the presence of future bacterial infection. A 5-year contract was awarded to Phigenics on September 23, 2014 for ongoing consultation and testing. See Appendix D
Water Testing for additional information.

Previously, on October 17, 2013, samples were taken by FAF from various sources in the Crime Lab. The Phigenics Validation Test® (PVT)[7] was used employing the TimeZero method for detection of Legionella Bacteria. The report on October 28, 2013, was positive for Legionella Bacteria in some of the samples. A second test sample was drawn by Phigenics on December 13, 2013. The report on December 19, 2013 showed the presence of Heterotrophic Aerobic Bacteria[8] in eight of the ten samples. Legionella Bacteria is a Heterotrophic Aerobic Bacteria. Both of these test results are presented in Appendix G
Test Results.

An ICP was issued by FAF on May 1, 2014 for water testing and related issues. There were five responses to this ICP. One requirement in the Scope of Work (see below) was to provide Hazard Analysis Critical Control Point (HACCP) based Facility Water Management Programs. This was a required condition of the ICP. The proposal deadline for the ICP was June 2, 2014 at 3 PM PDT with a schedule to evaluate all proposals during June 3-6, 2014 and to select a contractor on July 11, 2014. Phigenics submitted their proposal by the due date and a contract for not more than $300,000 (and less than $100,000 annually) was awarded to them September 23, 2014 and to conclude five years later on August 15, 2019.

The contract scope of work is:

1. Evaluation of Potable Water Safety System …
    - Water collection and testing …
    - Inspection of existing potable water systems …
2. Develop a County-wide Water Management Plan (WMP) utilizing HACCP methodology
    - Hazard Analysis Summary
    - Process Flow Diagrams
    - Validation and Verification Documentation
    - Cost to Benefit Recommendations

[7] Phigenics PVT test instructions: https://www.phigenics.com/files/Instructions/PVT_Test_Instructions.pdf
[8] http://en.wikipedia.org/wiki/Bacteria

3. Establish a Reporting Mechanism
   - Facility specific reports, based on (not less than) monthly specimen collections
   - Automatic alerts for out of parameter test results
4. Facilitate implementation of WMP
   - Train County personnel on best practices
   - Provide recommendations for equipment or services
   - Set critical control guidelines and test parameters …
5. Verify and Validate
   - Manage laboratory test result documentation
   - Provide monthly documentation of system efficacy …

Testing

Many outside laboratories are capable of determining whether bacteria are present within a water sample. The complexity arises when one wishes to determine which bacterium is present and then how much of it is present. The presence of a disease causing bacterium contamination in the water is of concern. A small amount of some contaminants is acceptable to the Federal Safe Water standards and the County Health Department pursuant to the Federal Clean Water Act. If the quantity of that contaminant in a given sample exceeds the safe threshold[9], action must be taken to preserve a healthy water supply.

Only a Centers for Disease Control and Prevention (CDC) Environmental Legionella Isolation Techniques Evaluation (ELITE) certified lab is qualified to perform all of the steps and tests necessary to isolate, identify, and quantify the Legionella Bacterium. Though many commercial laboratories are competent to test for water contaminations, only an ELITE laboratory, such as Phigenics, is certified in identification of Legionella contamination. A discussion of the Phigenics' collection and test process as contrasted with other testing protocols is contained in Appendix D
Water Testing.

Crime Lab Mitigating Activities

At the first confirmation that the Legionella Bacteria was present in the new Crime Lab building, steps were implemented to provide for the safety of the employees working in the building and the public entering the premises. Warning signs were made by Crime Lab personnel and placed at some, but not all, of the water drinking fountains, within the building, warning people not to drink the water from those water drinking fountains. Bottled drinking water was brought in for employees and the public. Employees were

[9] Water quality standards are set by the Federal Clean Water Act. Water quality standards are "provisions of State or Federal law which consist of a designated use or uses for the waters of the United States and water quality criteria for such waters based upon such uses. Water quality standards are to protect the public health or welfare, enhance the quality of water and serve the purposes of the Act." http://en.wikipedia.org/wiki/Clean_Water_Act

told not to use the employee bathroom showers. These signs were only in the English language.

Hazard Analysis Critical Control Process (HACCP)

The Crime Lab and FAF are using HACCP to organize the activities of the WMP COMMITTEE. HACCP is the mitigation program recommended by Phigenics. The HACCP process is a standard approach to identifying and correcting hazardous elements in a system or systems.

The HACCP Process is based on seven principles and twelve steps.

The principles are: [10]

1. Hazard analysis
2. Critical control points
3. Critical limits
4. Monitoring procedures
5. Corrective actions
6. Record keeping and documentation
7. Verification and validation

The recommended steps are:[11]

1. The establishment of an HACCP team
2. Analysis and description of the building water systems
3. Identify intended use
4. Confirm Process flow diagram that determines key steps in the water supply process
5. Ensure that all process steps have been included
6. Conduct a hazard analysis
7. Determine Critical Control Points
8. Establish critical limits
9. Establish a system to monitor critical control points
10. Establish corrective actions
11. Validate/verify HACCP plan
12. Establish documentation and record keeping

The application of HACCP to public water supplies was first proposed in 1994 and has been successfully implemented by many countries including Australia, New Zealand, Belgium, Finland, Italy, South Africa, and the United Kingdom. Safety programs, based on the seven principals of HACCP, were developed by the World Health Organization and have been proven effective in preventing waterborne disease associated with

[10] Additional detail on these principles can be found in Appendix E HACCP Process.
[11] Additional detail on these principles can be found in Appendix E HACCP Process.

contaminated building water systems. The CDC has recommended HACCP-based practices for facilities that have had outbreaks of Legionnaire's disease or where Legionella Bacteria is present. Phigenics has developed and recommends a mitigation program based on HACCP, a structured systemic, cost-effective paradigm best known for its successful use in the food industry. There have been no subsequent outbreaks in buildings that follow Phigenics' recommended protocols.

Mitigation Stages Employed for the Crime Lab

The County adopted mitigation processes and sequentially implemented steps from the simple and low cost measures to the more complex, time consuming, and expensive measures as recommended by Phigenics and others.

The WMP Committee was formed to facilitate discussion and communication among the two County departments (Crime Lab and FAF) and Phigenics. The purpose of these meetings is to discuss plans and schedules for mitigation activities and to ensure that the validation and verification schedules are met. The Grand Jury was told that FAF was the organization arranging or performing the actual work involved.

A number of actions were taken at the Crime Lab, by both Crime Lab and FAF personnel, after the discovery of the Legionella bacteria contamination, including (in no particular order):

- Warning signs in English (only) placed at potable water outlets
- Removal of some "dead legs"
- Replacement/removal of mixing valves (temper valves[12])
- Regular flushing of pipes and fixtures
- Chlorine shock treatment for the entire system

Following failure of the above steps to control the Legionella Bacteria, the next step suggested by Phigenics was to install a Chlorine Gas Injection system into the building potable water supply. Installation of a custom chlorination system, in effect, makes the building equivalent to a city water treatment system. A California State Permit to inject chlorine is required and the permit application was submitted September 23, 2014. The permit title is: "Permit for Chlorine Injection System Installation."

The system was installed in February 2015 by FAF and Culligan. It was activated on March 25, 2015.

For a more detailed discussion of the above topics, see Appendix F
Mitigation Steps.

[12] **thermostatic mixing valve** (TMV) is a valve that blends hot water with cold water to ensure constant, safe shower and bath outlet temperatures, preventing scalding.
http://en.wikipedia.org/wiki/Thermostatic_mixing_valve

Warning signs

While on the tour of the Crime Lab, the Grand Jury saw evidence of mitigation through observing signs above some of the water drinking fountains and sinks internal to the lab that stated "Caution Do Not Drink Water." These signs were in English only. Bottled water was observed, and the Grand Jury was informed that the staff was told to use these (the bottled water) for drinking purposes and hand washing. There were no signs on some of the water drinking fountains and sinks in the lab testing areas.

However, while on a subsequent tour, the Grand Jury noted that the signs were not as evident for the public occupying the common areas (a non-restricted part of the Lab). The Crime Lab's 1st floor large conference room is frequently used by outside agencies for meetings and training classes. The Grand Jury members noticed that the public drinking fountain and sink directly outside the auditorium did not have a sign warning about the water. When asked, the Grand Jury was informed that the people in the auditorium had been told that the water was not safe to drink. The Grand Jury does not know how and when the Crime Lab visitors and the public are informed that the water is not safe to drink and this is a concern.

Education and Training

The Grand Jury learned that Crime Lab employees have been updated on the status of the Legionella Bacteria in ongoing meetings and emails. Training to address the potential presence of Legionella Bacteria is suggested by the Grand Jury for all employees at the Crime Lab who have not already received such training. The Grand Jury also learned that FAF is responsible for the physical maintenance of the Crime Lab. Therefore, FAF employees and contractors (janitors, plumbers, maintenance workers, etc.,) should also be given ongoing training regarding Legionella Bacteria in the Crime Lab. In fact, the Grand Jury learned that some FAF employees who regularly perform work at the Crime Lab were not informed about the Legionella Bacteria present in the water at the Crime Lab.

Training and/or information on Legionella should be provided to anyone working at the Crime Lab and should include these topics:

a. Periodically informing employees about the disease and methods of prevention,
b. Outlining the procedures for controlling or eradicating the bacteria, and
c. Implementing a follow-up plan to address possible future contamination.

Phigenics has indicated that, upon request, they can provide training or additional training, beyond what has already been provided, for employees.[13]

[13] See contract

Conclusion

The Grand Jury commends the management of the Crime Lab for requesting the initial testing of the water, the placement of warning signs and in providing bottled water for personal use. To date, no one has become ill because of the contaminated water. This may be due to Crime Lab management's response in informing employees and the public about the Legionella Bacteria, and taking those initial steps toward managing Legionella Bacteria levels in potable water within the Crime Lab. The control of the Legionella Bacteria is underway, and a plan is in place to do follow-up testing that ensures that any bacterium is detected before reaching unsafe levels and that the water continues to be treated to keep the bacterium at a safe level. As of late May, the Grand Jury has not been told whether the chlorine injection system has controlled the presence of Legionella Bacteria at the Crime Lab.

Upon Crime Lab management's request, it was FAF's responsibility to detect and eliminate the bacteria. Crime Lab personnel drew the initial confirmation samples in October 2013 which were tested by Phigenics showing positive for the presence of Legionella Bacteria. FAF then arranged for and contracted with Phigenics for advice and testing regarding the problem and it was Phigenics' recommendation to install a chlorine injection system. The system has been installed and a periodic testing plan established. FAF needs to maintain the injection system and draw additional water samples at planned intervals. Both steps are necessary to ensure potable water at the Crime Lab is safe for all to use. The Grand Jury has no confirmation that the schedule for and actual follow-up testing has commenced.

Once the need for a Chlorine Injection System was identified, an application was submitted to the State of California in September 2014. The permit process was not completed until March 2015, in time to activate the chlorine injection system on March 25, 2015. The Grand Jury was told that collection of supporting documentation contributed to this delay. The Grand Jury was also told that approval by the State of California for such permit applications could be a lengthy process.

The Grand Jury is concerned that not everyone working in some capacity at the Crime Lab is receiving adequate training or information. FAF, as managers of the building, have the responsibility to ensure that all parties occupying or entering the building are informed of any dangers and any steps which must be taken to avoid personal danger. Upon touring the Crime Lab, the Grand Jury observed that warning signs were missing at some water drinking fountains. The signs that were present were observed to be only in English. These warning signs should also have the warning stated in additional languages that are prevalent within Santa Clara County such as English, Spanish, Chinese, and Vietnamese.

FAF is charged with performing all maintenance on buildings owned or leased by the County. Therefore, it is responsible for management of the mitigation efforts to remove the threat of disease caused by the presence of Legionella Bacteria in the waters of the Crime Lab.

In the opinion of the Grand Jury it is essential to the health and safety of all occupants of the Crime Lab that information about the presence of Legionella Bacteria is readily available to all. This applies equally to visitors to the building. People must be informed that mitigation efforts are underway and the current status of those efforts.

Findings and Recommendations

Finding 1

The Crime Lab management took proactive action to protect their employees and the public. The initial step of placing warning signs at water drinking fountains and sinks, while also providing bottled water for personal use, has been instrumental in avoiding anyone contracting Legionnaire's Disease.

Recommendation 1

No recommendation

Finding 2

The Legionella Pneumophila Bacterium in the plumbing system of the Crime Lab can be controlled within acceptable levels.

Recommendation 2A

The County should ensure that FAF continues with the use of the installed chlorine Injection System to control the growth of water borne bacteria at the Crime Lab.

Recommendation 2B

The County should ensure that FAF maintains a schedule of testing as specified in the "Permit for chlorine Injection System Installation" permit plan and as documented within the HACCP plan to ensure that the residual bacterial levels in the potable water do not exceed safety standards.

Finding 3

The County did not provide timely notification, information, education, and training regarding Legionella Bacteria found in the water of the Crime Lab to their employees and contractors who regularly or occasionally perform work in the Crime Lab building.

Recommendation 3

The County should ensure that all Crime Lab and Facilities and Fleet employees, contractors and others who frequent or visit the Crime Lab are given timely notification, updates, and training regarding the status of the Legionella Bacteria in the water.

Finding 4

The Crime Lab warning signs regarding Legionella Bacteria posted at water drinking fountains, sinks, and faucets used by employees and the public are only in English.

Recommendation 4

The County should ensure that the Crime Lab's Legionella Bacteria warning signs on the water drinking fountains, sinks, and faucets used by employees and the public are provided in languages which are prevalent in Santa Clara County such as, Spanish, Chinese, and Vietnamese.

Finding 5

The Crime Lab does not have warning signs regarding the presence of Legionella Bacteria posted at all of the water drinking fountains, sinks, and faucets.

Recommendation 5

The County should ensure that the Crime Lab's Legionella Bacteria warning signs are posted and remain posted in all appropriate locations until such time that the employees and public may be assured the danger posed by Legionella Bacteria in the potable water system of the Crime Lab is controlled.

Appendix A
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Documents reviewed included:

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Appendix B
LEED Certification

Leadership in Energy and Environmental Design (LEED)
LEED Certification is a set of rating systems for the design, construction, operation, and maintenance of green buildings, homes, and neighborhoods.[14]

Developed by the U.S. Green Building Council (USGBC), LEED is intended to help building owners and operators be environmentally responsible and use resources efficiently. Proposals to modify the LEED standards are offered and publicly reviewed by USGBC's member organizations, which number almost 20,000.

Unlike Model Building Codes, such as the International Building Code, only members of the USGBC and specific "in-house" committees may add, subtract, or edit the standard, based on an internal review process. Model Building Codes are voted on by members and "in-house" committees, but allow for comments and testimony from the public during each and every code development cycle at Public Review hearings, generally held multiple times a year.[15]

[14] http://en.wikipedia.org/wiki/Leadership_in_Energy_and_Environmental_Design
[15] "Code Development". International Code Council. Retrieved May 2, 2014.

Appendix C
Legionella Bacteria strains

The three main illnesses associated with the Legionella Bacteria are Legionnaire's Disease, Pontiac Fever and Lochgoilhead Fever found in a village in Scotland. Pontiac Fever, a self-limited non-pneumonic influenza like illness, and Lochgoilhead Fever are milder forms of Legionella Bacteria infections with symptoms resembling influenza. Both usually go unreported. Legionnaires' disease is a severe form of pneumonia and lung inflammation caused by the infection and may be fatal.

Appendix D
Water Testing

Testing water for contaminants

Buried pipes usually deliver water from local sources. This is especially true in cities, towns, and villages of any size. The "city water" typically has been filtered to remove particulate matter and treated with chlorine or chloramine to kill or otherwise control bacteria and other biologicals present in the local supply sources such as rivers and local wells. The water company, also, may be required or choose to add a fluoride compound as a measure to assist in improved dental health. The supplier is also careful to use sources free of chemical contaminants and other dissolved matter. They typically have their own or contract with a commercial laboratory to ensure that the water they deliver to their customers is free of known or suspected contaminants or that those which remain after treatment occur below established thresholds which are usually set by a local health department or related agency. However, all of these precautions fail under certain circumstances. To discover these failures requires that the consumer test the water for one or more suspected contaminants.

Testing for the presence of particulate matter is a simple procedure that usually involves allowing a sample to sit undisturbed for a period. This allows any large amount of particles otherwise unnoticed in the water to settle out forming a coating at the bottom of the test vessel. Particulate matter may also be detected and measured using a filtration method. For this test, a very fine mesh filter is placed in a stream of sample water until a specified volume has passed through it. Then the filter is examined and measured to determine the nature and quantity of unwanted matter that it has captured.

Testing for dissolved matter and compounds is much more complicated and involves examination of a water sample in a sophisticated laboratory. Such things as dissolved gases, acids, and bases can be detected with simple processes, but determining the amount of any of these that exceed established safety standards is a bit more complicated. Qualitative[16] measures are usually easy, quantitative[17] measures are more difficult.

The third category concerns biologicals. These range from fecal matter, to live organisms to the detritus of once living beings and everything in-between. Bacteria such as the Legionella Bacterium fall in this category.

Testing for many of these biologicals is not simple, but not overly complex either. Many laboratories are capable of informing a client whether bacteria are present within a water sample. The complexity arises when one wishes to determine which bacterium is present and then how much of it there is. The latter is to observe whether the contamination is of concern or not. A small amount of some contaminants is often acceptable to the guardians of our health, whereas if the quantity of that contaminant in

[16] Qualitative measures determine If something is present in the sample.
[17] Quantitative measures examine a sample not only for which contaminant is present, but how much of it there is.

a given sample exceeds a pre-determined threshold for the specific contaminant, action must be taken to remove (most) of it to preserve a healthy water supply.

Testing for the Legionella bacterium involves detection, identification, and quantification.

Detection is relatively simple and will not differentiate between types of bacteria present.

Identification is necessary to determine the nature of the bacteria present and which of the 40+ strains of Legionella or anything else that may be there. This is necessary, because some of the Legionella strains can cause disease and others do not. The difference determines whether one needs to be concerned about the infestation or to just be aware of it.

Quantification is necessary to determine whether the identified strain of the bacterium is present in sufficient quantities to cause concern, disease or exceed established health standards. Testing to quantify the bacterium requires that it be performed in a CDC Elite Certified laboratory[18] conforming to very strict testing methods and controls.

A test sample (or several) is required to initiate the testing process. Typically, the sample is drawn by the client into sterile containers of from 250ml to 1000ml (1 liter) in size. The size is determined by the nature of the source water. Potable water requires a larger container and sample than waters from a cooling tower. The relatively large sample is necessary because the quantities present in flowing water tend to be extremely small. An air space must remain in the container used, because Legionella Bacterium requires oxygen to survive. It is an aerobic bacterium. The sample can be concentrated in the laboratory to improve chances of detecting and measuring the bacterium.

Note that the natural home and growth location for the Legionella bacterium is within the biofilm present in virtually all water piping. The various algae, amoeba and protozoans (single cell organisms) which make up this biofilm play host to and assist in the propagation of bacterial organisms (not just the Legionella Bacterium).

Phigenics (the contractor) uses their own certified procedure; The Phigenics Validation Test® (PVT)[19]. Phigenics is a CDC ELITE[20] certified laboratory. This test protocol uses a patented TimeZero test method for quantitative measurement of viable Legionella and for heterotrophic[21] aerobic bacteria. The swab collection procedure used for the PVT is simple enough for the client to perform. Each sample consists of two Dipslides with vials and a 100ml[22] Sterile EPA vial containing water from the source as used for each pair of Dip slides. Each Dipslide is coated with compounds, which provide a growth medium for any organisms present in the water. During transit from the client to the lab,

[18] See following discussion of ELITE labs.
[19] Phigenics PVT test instructions: https://www.phigenics.com/files/Instructions/PVT_Test_Instructions.pdf
[20] See discussion below for an overview of the CDC ELITE program.
[21] A **heterotroph** is an organism that cannot fix carbon and uses organic carbon for growth
[22] The Phigenics procedure uses less water than other methods of testing for Legionella Bacterium.

these slides culture[23] the organisms so that the laboratory can measure results shortly after arrival with no need to delay processing because of insufficient growth time. The collected sample(s) are sent overnight to the Phigenics laboratory for completion of the test process and recording of the results.

For contrast, other laboratories collect water samples, transport them to their labs and then apply the possibly infected waters to a growth medium in preparation for observing the presence of either specific or multiple species of bacteria. The delay between collection of a sample and its application to the growth medium can result in inaccurate test results because the sample concentrations can change (increase or decrease) during and because of environmental changes during transit as well as wait times.

ELITE Overview[24]

"ELITE" is an acronym for the "Environmental Legionella Isolation Techniques Evaluation" Program.

Although Legionella live in a wide variety of freshwater habitats, they can be difficult to isolate. Culture and enumeration of Legionella from environmental sources involves several steps including concentration of the bacteria, re-suspension, selective pre-treatments, and the use of complex media. Use of a suitable isolation protocol is critical for determining whether Legionella are present in a sample and at what concentration. The ELITE Program was created as a way for laboratories to test their Legionella isolation techniques against standardized samples. There is no charge for participating in the ELITE Program. Registration, results entry, and access to reports are available online. Participating labs receive a panel of lyophilized test samples biannually. The test samples are divided between Legionella positive or negative and may be mixed with other organisms commonly found in water. After reconstituting the test samples, participants process them according to their protocols and report their results. Labs that correctly identify Legionella from the test samples in two consecutive panels receive a certificate of proficiency and are listed among our ELITE Members. ELITE Program Members also have access to individualized performance reports, the latest CDC policies and guidelines, and CDC staff scientists to help optimize isolation procedures.

[23] A **microbiological culture**, or **microbial culture**, is a method of multiplying microbial organisms by letting them reproduce in predetermined culture media under controlled laboratory conditions.

Appendix E
HACCP Process

The HACCP Process is based on seven principles and twelve steps.

The principles are:
Hazard analysis is a structured systemic evaluation of the processes in building water systems to identify conditions that contribute to hazards from identified chemical, physical and microbial agents of concern.

Critical control points are the specific locations in the building water system where controls are applied to prevent, eliminate, or reduce hazardous conditions to an acceptable level.

Critical limits are the prescribed quantitative parameters for the chemical or physical control measure applied at each critical point.

Monitoring procedures are the means, methods, and frequency used to measure and document parameters at the critical control points.

Corrective actions are the procedures that must be implemented within a specific time period when monitoring indicates that the parameter at a critical control point is not within critical control limits.

Record keeping and documentation include creating and maintaining complete, accurate, written description of all aspects of the HACCP program.

Verification and validation. *Verification*, a quality-assurance function, is the confirmation that the HACCP plan is being implemented as designed. *Validation*, a quality-control function, provides confirmation that the implementation of the HACCP plan is maintaining conditions throughout the system at the intended levels and that the hazards are under control.

The recommended steps are:
The establishment of an HACCP team. This was completed by appointing a team of staff members to monitor the progress and implementation of the HACCP program. The team is comprised of managers and representatives from FAF, the Crime Lab, and Phigenics.

Analysis and description of the building water systems. This has been completed and the HACCP Team determined that the source of the contamination was due to the under use of the water piping system because of the building not being used to its full capacity. The pipes were not being flushed frequently enough to adequately prevent the creation of stagnant pools of water, which encourage the breeding of bacteria and specifically, Legionella Bacteria.

Identify intended use. The use here is clearly identified that the building was constructed and designed to house criminal forensic laboratories where forensic testing could be done. The building size was designed to allow for increased future use and performing testing for other jurisdictions.

Confirm Process flow diagram that determines key steps in the water supply process. A process flow diagram was created by the HACCP team that depicts and has been verified by Phigenics as an accurate description of the built in operational conditions within the Criminal Laboratory building.

Ensure that all process steps have been included. Confirm that all steps in the water delivery system within the building have been designated and completed.

Conduct a hazard analysis. From the Grand Jury's interviews of County staff and the contractor, it has been determined that a hazard analysis was conducted using the process flow diagrams of the water system within the building to perform a systematic hazard analysis to identify control points.

Determine Critical Control Points. Process steps, at which the hazard (Legionella Bacteria) can be mitigated, eliminated or prevented.

Establish critical limits. Establish hazard control limits for each critical control point. From interviews conducted by the Grand Jury, parameters have been established; testing has occurred and is scheduled to be repeated at regular intervals to determine the level of Legionella within the system and to verify its eradication or lowering it to an acceptable level.

Establish a system to monitor critical control points. From interviews conducted by the Grand Jury, past testing and the requirements outlined in the contract with Phigenics, it was determined that a system of monitoring by FAF with scheduled testing has been implemented and continues.

Establish corrective actions: Corrective actions were implemented by the County to determine if Legionella Bacteria was present and to eradicate its presence or limit it to acceptable and harmless levels. Signs were posted warning those in the building not to drink water from the water fountains. Bottled water was brought in for drinking. Pipes have been flushed and treated with chlorine to destroy any bacteria present.

Validate/verify HACCP plan. "Verification is the process of confirming that the HACCP system has been accurately implemented and is working as designed." Phigenics, the contractor hired by the County defines validation as "evidence (data) that hazards have been eliminated or controlled to the extent that prevents disease under actual operating conditions." The HACCP team has contracted with Phigenics to continue periodic testing of the water to continually monitor that the levels of contamination have been eliminated or are within the guidelines established by local and federal statutes and ordinances.

Establish documentation and record keeping. Providing accurate documentation and record keeping is essential to the HACCP system in order to provide retrospective proof of compliance with the HACCP process. The County has signed a five-year contract with Phigenics to implement a water safety plan, which will test the water system in the Crime Lab Building and establish a record of validation and verification evidence.

Appendix F
Mitigation Steps

Signage - It was noted that signs saying, "Do not drink the water" were posted. These signs were only in English. The Grand Jury was told that the signs would be modified to include other languages.

Dead Legs - A dead leg is a length of pipe that is capped at the end. Therefore, the water contained within that length of pipe is never refreshed or flushed and becomes a breeding ground for bacteria. All kinds of bacteria can grow in that closed environment, not just Legionella.

Another form of dead leg is a length of pipe with a faucet, shower or other valve on it where that valve is either never or very infrequently opened. Thus, water sitting in that pipe is not refreshed or flushed and, again, becomes a stagnant breeding ground for bacteria.

Of additional concern might be lengths of pipe leading to faucets or other outlets where the use is both infrequent and of insufficient volume to consistently remove all standing waters. For example, this might be a pipe containing 3 liters of water, but usage never exceeds, 0.5 liter. Though the inlet end of the pipe periodically receives a fresh shot of treated water, the further end (toward the user) does not. Again, this can lead to bacterial growth. The users generally do not know the topology of the pipes they are using.

Mixing Valves - Mixing valves come in a bewildering variety of types, styles, sizes, and applications. Most are made of various metals, but plastic is used in some. Some are automatic, or manually set. The California Plumbing Code[25] specifies the general features of a mixing valve and other portions of a water use environment. Local Plumbing Codes require that in showers and other locations where hot and cold water needs to be mixed producing lukewarm water, a mixing style valve, with a single handle, shall be installed[26]. Individual valves to hot and cold cannot be used in shower installations, for example, but are O.K. for bathroom and kitchen sinks. The requirement mitigates situations where scalding hot water might injure someone.

Some internal surfaces of mixing valve mechanisms tend to retain stagnant water even though they are used regularly. Infrequently used mixing valves are orders of magnitude worse in this regard.

Regular Flushing - Regular use of water in the pipes is one of the best ways to prevent or at least stall the growth of unwanted organisms. Each use will introduce fresher water to the system than that which has been standing overnight or longer. That fresh

[25] http://www.iapmo.org/California%20Plumbing%20Code/Chapter%2004.pdf
[26] An example is from the City of Santa Clara (Pg.2, Item 4)
http://santaclaraca.gov/modules/ShowDocument.aspx?documentid=2111

potable water (city water) will contain some of the infused chlorine and will cleanse the pipe of growing bacteria or at least retard or slow its growth.

Chlorine Shock Treatment - Shock treatment of a potable water system[27] involves dumping massive quantities of chlorination into the system and then flushing it through every pipe and faucet. This process is frequently used for private wells and water systems serving a small number of homes.

The amount used is usually several times the amount nominally present in a typical city water system and can usually be smelled as the waters are sent to the drain. Enough flushing needs to be done to observe and the remove that smell everywhere, thus ensuring a complete treatment of the system. The larger the pipe network (and building), the more complicated this process becomes.

Typically, the water remains usable during a shock treatment, but would have a detectable and offensive odor of chlorine.

Other substances (such as chloramine[28]) can be used for this cleansing.

Chlorine Gas Injection[29] - A system to infuse chlorine gas into potable water as it enters the building makes the facility a "city water system" as defined by the State of California. A permitting process is in place for all such facilities.

The infusion of chlorine to the building potable water system would help ensure that waters within the building have enough chlorine content to keep the bacteria at bay, even when parts of the system are quite infrequently flushed. It does not preclude the need to flush known and unused portions of the system at some interval.

Reduce the Number of Emergency Showers - This was mentioned as a way to decrease the number of sites within the building requiring flushing, such as the emergency showers. Significant plumbing and cosmetic skills would be required to do this and only after a thorough analysis of the need for showers in proximity to need at work stations and associated safety requirements.

This would only be considered if the analysis determines it to be a feasible approach and the funding is available to do the work. It is unlikely that this method will be employed.

Closed Loop Circulation[30] - Closed loop recirculation systems are frequently used in water-cooled refrigeration systems and air conditioning systems.

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[27] http://www.water-research.net/index.php/shock-well-disinfection

[28] Monochloramine is preferentially used for domestic water systems. Dichloramine or trichloramine is used for swimming pools and other non-drinking water system. Some water systems use chlorine dioxide. See: http://www.cdc.gov/healthywater/drinking/public/water_disinfection.html

[29] http://water.me.vccs.edu/concepts/chlorequipment.html

[30] http://www.redytemp.com/hot-water-recirculator-how-it-works.htm

A small pump and additional return piping would be installed running between the source and furthest usage point individually in both the hot and cold water systems. The intent is to move water through the system without actually using it. This would refresh the waters of the main pipes without sending any of it to the drain. Most hotels and some other buildings use such a system to ensure delivery of hot water to distant locations within the building while retaining an efficient large water heater in a central location. Homeowners, generally, do not have such a system, which explains why one must run the faucet a while to obtain hot water and wasting the water that is “used” during the wait. A system of this type is why, in a hotel, hot water is quickly available in any room shortly after you activate a faucet.

Use potable water for toilets and landscaping - Any method that ensures a larger water flow through the pipes, bringing freshly chlorinated water, would help reduce bacterial growth within the pipes. Using potable water for toilets may help. Using it for landscaping may not and this is determined based on where in the piping system this occurs.

Phigenics
Validation Test®

PHIGENICS ANALYTICAL SERVICES LABORATORY
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A CDC ELITE Certified Laboratory

Facility Tested: Santa Clara County Crime Lab
Date of Testing: 2013/10/17
Contact Email: rod.hillman@faf.sccgov.org

Validation Criteria:
Potable Water - typically in well managed systems, the total viable heterotrophic aerobic bacterial concentration should be less than or equal to 10^3 CFU/ml. Per the OSHA *Legionella* Technical Manual, the viable *Legionella* concentration should be less than 10 CFU/ml unless the water system serves immunocompromised or higher risk users which require a more stringent level of *Legionella* control (less than 1 CFU/ml).
Utility Water (such as cooling water) - typically in well managed systems, the total viable heterotrophic aerobic bacterial concentration should be less than or equal to 10^4 CFU/ml. For closed recirculating utility water, the total viable heterotrophic aerobic bacterial concentration should be less than or equal to 10^3 CFU/ml. Per the OSHA *Legionella* Technical Manual, the viable *Legionella* concentration should be less than 10 CFU/ml.
- The facility **Water Management Team** should review all options for Validation Criteria and choose its specific criteria based on the specific systems and users.

Phigenics Validation Test (PVT) Report Summary

Method Used: TimeZero Method

Legionella Caution		Indicates *Legionella* was detected.
THAB Caution		Indicates total heterotrophic bacteria count exceeds the validation criteria (10^3 for potable, 10^4 for utility, 10^3 for closed recirculating utility).
NO Concern	No Shading	Indicates results are better than the validation criteria.
	ND	Indicates *Legionella* was not detected.

PASL Number	Date Inoculated	Date Analyzed	Collector	Location Identification	Category (Potable/Utility)	Category Detail	Total Bacteria	Lpn S1	Lpn S2-14	Legionella Spp
							CFU/mL			
45758	2013/10/17	2013/10/28	R. Hillman	1014.1	Potable		10^5	ND	ND	ND
45759	2013/10/17	2013/10/28	R. Hillman	5000.44	Potable		10^6	ND	ND	ND
45760	2013/10/17	2013/10/28	R. Hillman	3006	Potable		10^2	ND	ND	ND
45761	2013/10/17	2013/10/28	R. Hillman	3021	Potable		10^4	ND	ND	ND
45762	2013/10/17	2013/10/28	R. Hillman	2050.17	Potable		10^4	ND	ND	ND
45763	2013/10/17	2013/10/28	R. Hillman	4013	Potable		10^5	ND	10	ND
45764	2013/10/17	2013/10/28	R. Hillman	4016	Potable		10^6	ND	ND	ND
45765	2013/10/17	2013/10/28	R. Hillman	4027	Potable		10^2	50	ND	ND
45766	2013/10/17	2013/10/28	R. Hillman	4085	Potable		10^3	ND	ND	ND
45767	2013/10/17	2013/10/28	R. Hillman	4080.41	Potable		10^3	ND	ND	ND

phigenics
Smart Water Management

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A CDC ELITE Certified Laboratory

Facility Tested: Santa Clara County Crime Lab
Date of Testing: 2013/12/13
Contact Email: mcain@phigenics.com

Validation Criteria:
Potable Water - typically in well managed systems, the total viable heterotrophic aerobic bacterial concentration should be less than or equal to 10^3 CFU/ml.
Utility Water (such as cooling water) - typically in well managed systems, the total viable heterotrophic aerobic bacterial concentration should be less than or equal to 10^4 CFU/ml. For closed recirculating utility water, the total viable heterotrophic aerobic bacterial concentration should be less than or equal to 10^3 CFU/ml.
- The facility **Water Management Team** should review all options for Validation Criteria and choose its specific criteria based on the specific systems and users.

Phigenics Validation Test (THAB) Analytical Report Summary

Method Used: Total Heterotrophic Aerobic Bacteria

THAB Caution: Indicates total heterotrophic bacteria count exceeds the validation criteria (10^3 for potable, 10^4 for utility, 10^3 for closed recirculating utility)
NO Concern: No Shading — Indicates results are better than the validation criteria.

PASL Number	Date Inoculated	Date Analyzed	Collector	Location Identification	Category (Potable/Utility)	Category Detail	Total Bacteria CFU/mL
47371	2013/12/13	2013/12/19	M. Cochran	1055 Shower Hot	Potable		10^3
47372	2013/12/13	2013/12/19	M. Cochran	City Main	Potable		10^2
47373	2013/12/13	2013/12/19	M. Cochran	2018 Men's RR Middle A/S Cold	Potable		10^6
47374	2013/12/13	2013/12/19	M. Cochran	2012 Coffee Hub Sink Hot	Potable		10^4
47375	2013/12/13	2013/12/19	M. Cochran	3030 Sink Hot	Potable		10^6
47376	2013/12/13	2013/12/19	M. Cochran	2030 Firearms Vestibule Sink Hot	Potable		10^4
47377	2013/12/13	2013/12/19	M. Cochran	Water Heater	Potable		10^6
47378	2013/12/13	2013/12/19	M. Cochran	3053 Sink Hot	Potable		10^5
47379	2013/12/13	2013/12/19	M. Cochran	4027 Sink Hot	Potable		10^4
47380	2013/12/13	2013/12/19	M. Cochran	4048 Sink Cold	Potable		10^5

This report was PASSED and ADOPTED with a concurrence of at least 12 grand jurors on this 11th day of June, 2015.

Elaine K. Larson
Foreperson

Wilma Faye Underwood
Foreperson pro tem

Joe A. Lopez
Secretary

James L. Cunningham, Jr.
Secretary pro tem