



## Chesterfield County, Virginia Internal Audit

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**GREG L. AKERS**  
Director

**DATE:** October 14, 2019

**TO:** Joseph P. Casey, Ph.D.                      Chesterfield County  
County Administrator                      Board of Supervisors

Mervin B. Daugherty, Ed.D.                      Chesterfield County  
Superintendent                      School Board

**FROM:** Greg L. Akers   
Director of Internal Audit

**SUBJECT:** Cooling Tower Maintenance Special Project

### CONCLUSION

Internal Audit performed this special project based on County managements' request to evaluate County and Schools (CCPS) heating, ventilation, and air conditioning (HVAC) cooling tower system (cooling tower) preventative maintenance practices from August 2017 through August 2019. County and Schools have separate departments, staffing and budgets for facility maintenance, which includes building HVAC systems. We found:

- The County had monthly water treatment inspections conducted, regularly performed cooling tower maintenance, and completed recommended repairs from inspections.
- Schools did not consistently have monthly water treatment inspections, regularly perform cooling tower maintenance, or complete recommended repairs from inspections.
- Neither County or Schools:
  - Have documented standard operating procedures for their HVAC water treatment processes based on consensus standards for water management.
  - Document management's evaluation of monthly water treatment inspection recommendations to identify planned response (i.e. identify if there is agreement and the planned repair or other resolution).
  - Use their service request and maintenance workorder systems (i.e. FacilityDude and SchoolDude) to document and monitor cooling tower preventative maintenance tasks completion.
- Schools budget process has not adequately prioritized HVAC system preventative maintenance needs and year end remaining balances have not been applied to maintenance needs.
- Schools did not have benchmark data to illustrate internal staffing requirements for on-going HVAC preventative maintenance.

## **BACKGROUND**

On August 1st, 2019 Chesterfield County management contacted Internal Audit regarding concerns about Schools water cooling towers testing positive for Legionella bacteria. As a result, we were asked to evaluate recent County and Schools cooling tower preventative maintenance practices. Separate evaluations were performed and reported by the Virginia Department of Health - Chesterfield Health District and Chesterfield County's Risk Management.

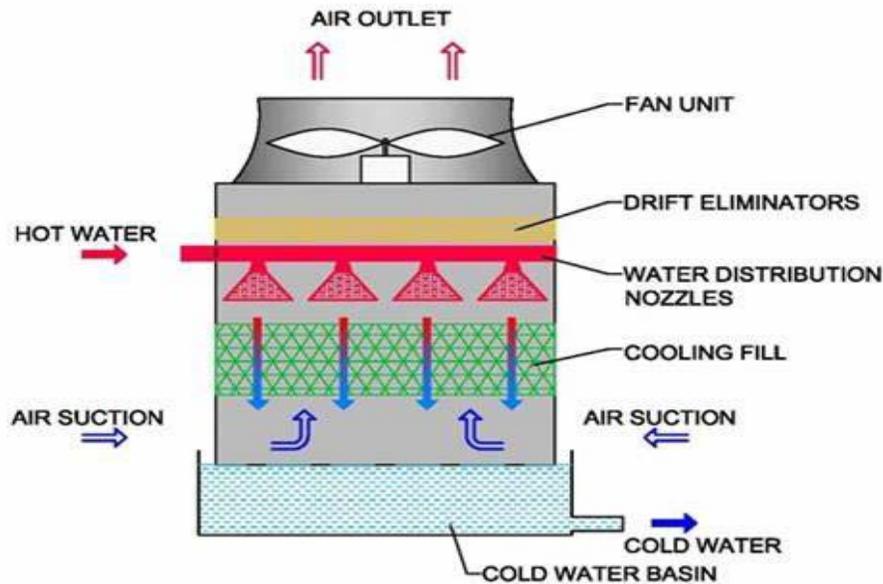
The Health District reported Chesterfield had 11 confirmed Legionellosis cases through June 2019, representing over half the Metro areas' 20 cases (Chesterfield, Henrico, Richmond and Hanover). The Health District also noted Chesterfield calendar 2018 (12) and 2017 (14) cases were the highest among Metro area localities. The Chesterfield Health District has worked with the Centers for Disease Control (CDC) to evaluate the increased occurrences.

The CDC describes that Legionella bacteria can lead to Legionnaires disease, a serious type of pneumonia (lung infection). Legionnaires' outbreaks are often associated with large and complex water systems like cooling towers. CDC's evaluation included testing cooling towers in proximity to reported cases. Cooling towers provide cost-effective and energy efficient air conditioning for large buildings. They contain large amounts of water which is a potential breeding ground for Legionella bacteria if not properly disinfected and maintained on a recurring basis.

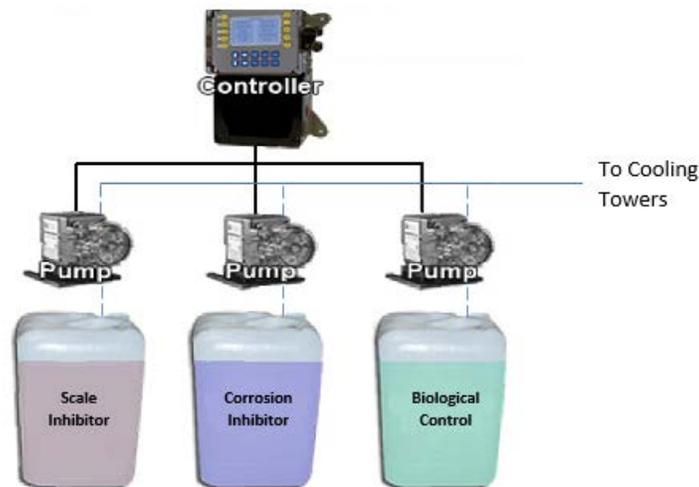
The County's General Services Department has roughly 1.6 million square feet of conditioned space across the County, with multiple HVAC systems that include 4 cooling towers. An additional cooling tower at the Jail is maintained by the Sheriff. General Services contacted Sheriff Leonard about CDC concerns and the Sheriff arranged testing for the Jail's tower. The testing showed no Legionella was present, and the Sheriff intends to adopt the County's testing procedures. Schools Operations and Maintenance Department (O&M) have roughly 8.5 million square feet of conditioned space districtwide with multiple HVAC systems that include 49 cooling towers.

County and School's cooling tower preventative maintenance strategy uses a combination of internal staff and contracted resources. Preventative maintenance (i.e. operating budget) is the ongoing effort to ensure satisfactory operation condition through systematic inspection, detection and correction of equipment failures either before they occur or before they develop into defects requiring major maintenance. Major maintenance (i.e. capital budget) is the repair, partial replacement or complete replacement of systems required to continue use.

Cooling towers, as illustrated below, remove heat from a building or facility using water. Air flows from tower sides and passes through falling water. As air passes through the water, heat is exchanged, and some water evaporates. This heat and evaporated water can rise from the tower as a cloud-like mist. The cooled water is collected at the bottom of the tower and pumped back into the facility for reuse. Cooling towers should be properly disinfected and maintained to reduce risk of bacterial growth including Legionella.



Cooling tower chemical treatment systems include equipment, as illustrated below, to monitor operation and add chemicals to the water supply. Equipment and chemical supplies should be inspected regularly to ensure proper function.



The Centers for Disease Control (CDC) and OSHA best practices recommend a documented water management program that should include:

- Maintaining water temperatures outside the ideal range for Legionella growth.
- Preventing water stagnation.
- Ensuring adequate disinfection.
- Maintaining equipment to prevent scale, corrosion, and biofilm growth.

They also explain that effective water management programs include the following key elements:

- Establish a water management program team.
- Document building water systems using text and flow diagrams, that identify unique requirements for different equipment.
- Identify risk areas where Legionella could grow and spread.
- Decide control measures and how they should be applied and frequency of monitoring.
- Establish ways to intervene when control limits are not met.
- Monitor the program to ensure it is running as designed and is effective.
- Document and communicate all the activities.

OSHA recommends cleaning and disinfecting cooling towers at least twice a year, at cooling season initial start-up and after shut-down in the fall. New systems and those out of service for an extended period should also be cleaned and disinfected. Routine water treatment equipment and chemical supply monitoring is needed to ensure proper operation. Systems with high Legionella levels may require additional cleaning.

## **OBJECTIVES, SCOPE & METHODOLOGY**

### **Objectives:**

Evaluate County and School's cooling tower system (cooling towers) preventative maintenance procedures.

### **Scope:**

County and School's cooling towers related preventative maintenance practices and procedures from August 2017 thru August 2019.

Scope does not include recent remediation activities. Separate evaluations were performed and reported by the Virginia Department of Health - Chesterfield Health District and Chesterfield County's Risk Management.

### **Methodology:**

Our methodology included:

- Inquiry with County and Schools management, Risk Management, and Procurement.
- Review of vendor service contract, invoices, payments, and vendor reporting to County and Schools.
- Testing County and Schools actions based on vendor maintenance recommendations.
- Analytical review of budget, expenditures and HVAC staffing for both County and Schools.
- Review of Schools cooling tower workorders.

We conducted this special project as a performance audit in accordance with generally accepted government auditing standards, except the risk and internal control assessment was more targeted to cooling tower maintenance practices versus a comprehensive evaluation of the preventative maintenance program. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. Khara Durden, Technology Audit Manager, and Greg Akers, Director, performed the audit work. Chesterfield County Internal Audit is a department within the organization of Chesterfield County/Schools.

## FINDINGS

### Policies Assessment:

Internal Audit reviewed current policies to determine if County and Schools had written documentation in place to address preventative maintenance needs for HVAC systems. Both County and Schools have general policies for facility maintenance:

- County Policy 5-7 Facilities Management describes that preventative maintenance programs should be utilized to decrease life-cycle infrastructure costs.
- School Board Policy 7170 requires managing buildings and grounds to maintain them in good condition.

### Procedures Assessment:

Internal Audit reviewed County and Schools' approach for cooling tower preventative maintenance. Both County and Schools have dedicated HVAC teams responsible for system maintenance and use vendors for water management system inspections, treatment chemicals and certain repairs. The County has processes in place to monitor and perform cooling tower preventative maintenance. Schools did not adequately monitor and perform cooling tower preventative maintenance. Our observations of vendor contract management and cooling tower preventative maintenance from August 2017 thru August 2019 are described below.

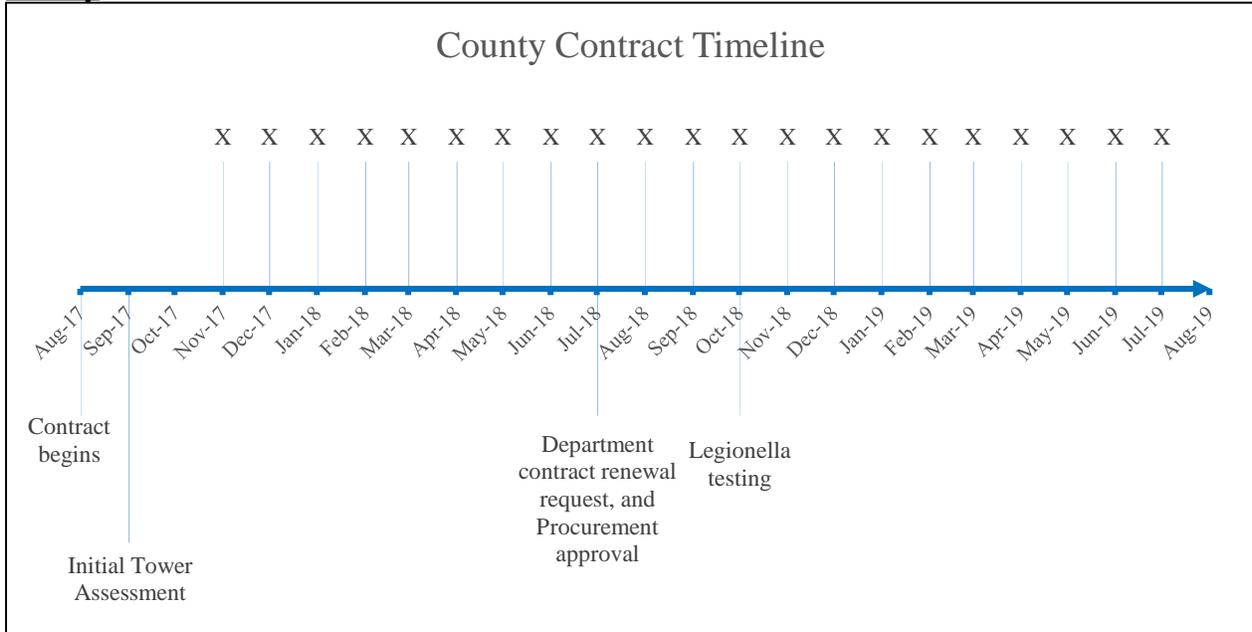
In August of 2017, after a formal Invitation for Bid (IFB) process, both County and Schools contracted with the same third-party vendor to perform water treatment services for HVAC systems which included monthly cooling tower inspections. The initial contract was thru July 31, 2018 with the option for four one-year renewals. The contract included initial evaluations of each system, monthly inspections and recommendation reporting. In addition, the vendor sells parts and can make repairs at hourly rates.

After the contractually required initial evaluation was performed, the vendor provided a "system report" which was sent to the departments responsible for HVAC systems; General Services Department for the County and O&M Department for Schools. Each report included an initial review of system equipment and Phosphate and pH readings. The vendor recommended periodic testing for Legionnaires disease and using OSHA guidelines for sampling, tower disinfections/cleaning/maintenance procedures, and chemical programs for all cooling towers.

Vendor monthly inspections include a "service report". Routine service visits include inspection of equipment, analysis of system readings compared to contract-mandated standards, and refilling dosing tanks. Vendor comments are included for each location. Observations and recommendations are made at the conclusion of each report. County and Schools HVAC employees evaluate vendor service report recommendations to determine if internal staff will remediate or if a quote will be requested from vendor.

County and Schools' activity under the contract is summarized below.

**County:**



X = Monthly inspection completed

The County consistently completed monthly vendor cooling tower inspections and made recommended repairs.

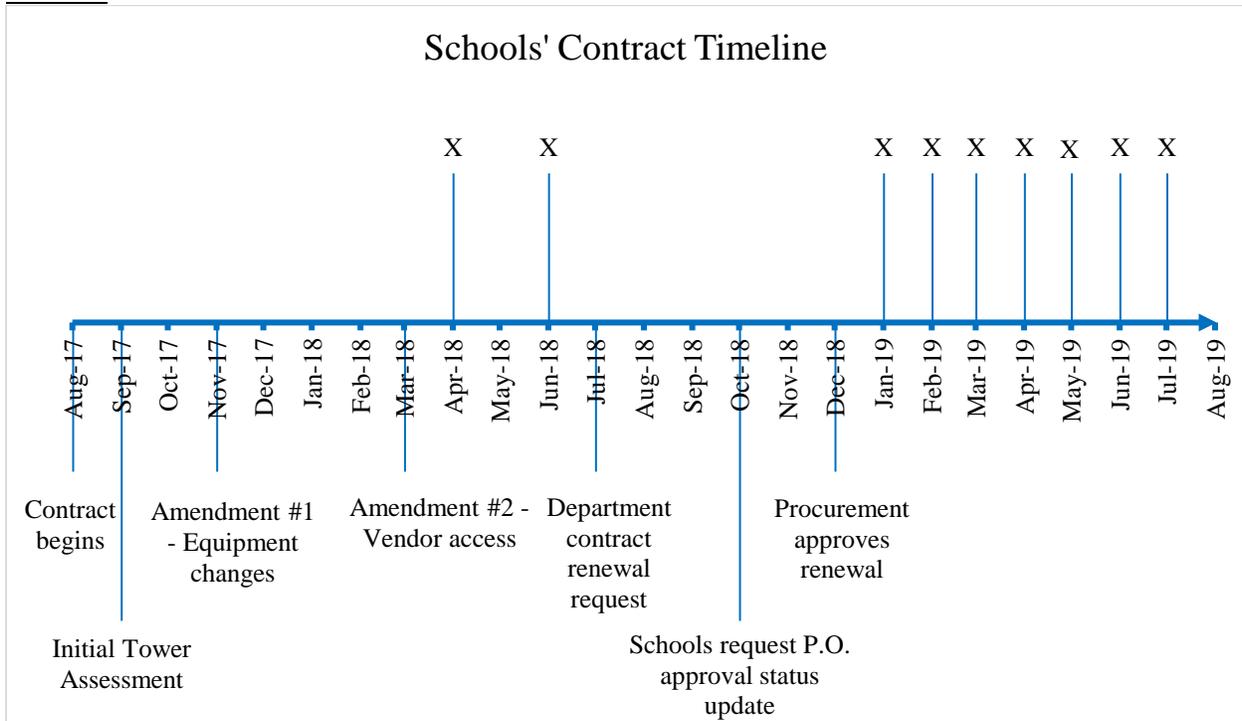
The vendor performed initial assessments of the four cooling towers maintained by the County in September 2017 (the Sheriff’s Office Jail cooling tower is maintained under a separate contract for HVAC preventative maintenance). Internal Audit requested and reviewed all initial inspection reports. There were no immediate tower cleaning or repair recommendations from the vendor.

Starting in November 2017, the vendor completed County’s monthly inspections per the contract through August 2019. Internal Audit requested and reviewed all service reporting from the vendor. Monthly reports included recommendations for cleaning, disinfection and repairs. We noted all four cooling towers maintained by the County were tested for Legionella in October 2018 and no Legionella was found. However, the County does not have a documented water management procedure (*see recommendation #1*).

County HVAC employees accompany the water management vendor during monthly inspections, and discuss inspection recommendations, planned repairs or other resolutions. General Service Department does not have a formal procedure to document this process (*see recommendation #2*). We were able to trace certain vendor recommendations to subsequent repairs and maintenance performed by the vendor. Per inquiry with County HVAC employees, other vendor recommendations were addressed by internal HVAC staff within two months.

The County uses FacilityDude, a workorder management system, to track service requests. Per inquiry with General Services management, HVAC water management vendor recommendations are not currently entered as a unique task in the workorder system (*see recommendation #3*).

Schools:



X = Monthly inspection completed

Schools did not consistently complete monthly vendor cooling towers inspections. Although inspections have been performed since January 2019, as of August 2019 vendor recommended repairs remained unfinished. Also, Schools did not test for Legionella during the period of review or sanitize the cooling towers with chemicals on the recommended vendor schedule.

The vendor performed initial assessments of the Schools’ 49 cooling towers in September 2017. Internal Audit requested and reviewed all initial inspection reports from Schools. 18 of 39 sites (46%) had tower cleaning or repair recommendations from the vendor. The cooling tower inventory used for the procurement required adjustment due to the vendor identifying nine locations where the number of cooling towers were different than listed in the contract. The contract was subsequently amended for these differences in November 2017. This first amendment also established pricing for chemicals and Legionella testing.

After the first contract amendment, Schools attempted to schedule a monthly inspection for December 2017 but required vendor follow school entry procedures that were different than the contract terms (*see recommendation #8*). The original contract required vendor reporting “to the CCPS Facilities Department” to obtain access keys to Schools. Subsequent negotiation led to a second contract amendment in March 2018 which redefined vendor entry procedures to require vendor sign-in at the “individual school locations” main office and be accompanied by a designated School employee. During FY18, the vendor only performed monthly inspections in April and June. While monthly vendor inspections were delayed, we did not see workorder system documentation of cooling tower inspections performed by the internal HVAC team.

Both the initial inspection (September 2017) and the first monthly service report seven months later (April 2018) identified significant concerns regarding cooling tower maintenance.

In April 2018, the vendor service report included the following recommendation for cooling towers: “We recommend all cooling towers undergo disinfection procedures and physical cleaning per OSHA recommendations twice yearly. Most, if not all cooling towers have not been physically cleaned in 2+ years. Inspection of equipment show excessive debris, sediment and biological growths. Systems have gone an extended period without routine monitoring and treatment. System conditions prevalent throughout CCPS may result in hazardous biological activity.” In June, we noted vendor invoices for cleaning chemicals and pump repairs at certain locations. The vendor report for June confirms that “disinfection products were delivered/slug dosed to all tower systems during service”. While schools had certain repairs completed, the vendor continued to “recommend physical cleaning of equipment and additional disinfection procedures per OSHA operational recommendations. Select tower systems may be recommended to continue purchase of disinfectant until cleanings and other maintenance responsibilities are fulfilled by CCPS”.

Water treatment services purchase order expired at fiscal year-end (June 30<sup>th</sup>) and the first-year contract term expired July 31, 2018. Schools submitted a purchase order renewal request to County Procurement during August 2018. Minor contract adjustments with vendor were not completed and approved by the Procurement Department until December 2018. Monthly inspections were resumed in January 2019. We observed where O&M management reported 19 pending purchase requests August 22, 2018 to Procurement management, which included this contract renewal. Three items O&M management specifically referenced in their contact to Procurement management were prioritized and approved August 23 and September 6. Schools also inquired about contract renewal approval status in mid-October 2018. However, the cooling tower maintenance request was not approved until contract renewal was completed in December 2018. We do not see where alternative procurement solutions were specifically offered or requested (*see recommendation #10*) during the approval delay.

Internal Audit reviewed all monthly vendor “service reports” from January thru June 2019. Monthly reports included recommendations for cleaning, disinfection and repairs. Schools does not have a documented water management procedure and no towers were tested for Legionella during this time (*see recommendation #4*).

We have summarized the number of times vendor recommendations and observations appeared for the 6 months reviewed:

Service Report recommendations and observations	Months reported
Recommend Legionella testing.	6 of 6
Recommend all towers use degas dosing equipment to minimize biological activity.	6 of 6
All systems have seen minimal service performed over the last 2+years. Majority of systems were found deficient in corrosion inhibitor and treatment levels which may result in negative equipment impacts.	5 of 6
Select chemical feed stations for cooling towers need repairs (controls, pumps, switches, bleed valves, etc.).	5 of 6
Recommend disinfection for all cooling towers.	3 of 6
Recommend physical cleaning of equipment.	3 of 6

Schools have designated the Building Operations Supervisors at each facility to accompany the water management vendor during monthly inspections. Monthly inspection reports are provided to the HVAC Supervisor for review. Schools do not have formal procedure to document management's evaluation of monthly water treatment inspection recommendations to verify agreement, planned repair or other resolution (*see recommendation #5*). In February 2019, the vendor issued a "deficiency report" in addition to the service report. This report lists recommendations for repairs, chemicals and cleaning for 88% of the inspected towers. In June 2019, the vendor repeated recommendations for chemicals, cleaning or repairs for 88% of the cooling towers inspected. Vendor invoices indicate that disinfection chemicals were purchased in May 2019. After reviewing workorders, Internal Audit was unable to determine if vendor recommended repairs were completed by vendor or CCPS staff.

CCPS uses SchoolDude, a workorder management system, to track service requests. Per inquiry with the O&M Department, HVAC water management vendor recommendations are not recorded in the workorder system (*see recommendation #6*).

We understand CCPS planned to use the vendor for inspections and certain cooling tower repairs, while Schools HVAC employees would perform cooling tower cleaning and disinfection. We reviewed SchoolDude for these preventative maintenance tasks. Schools provided a SchoolDude report listing 52 cooling tower preventative maintenance workorders from FY15 thru FY19 completed by Schools HVAC employees. Workorder volume indicates inadequate cooling tower preventative maintenance on all cooling towers, averaging less than one cooling tower service item system-wide per month. This lack of documented maintenance since FY15 is consistent with the initial inspection observations noted by the vendor. We focused our workorder analysis to the period August 2017 thru August 2019 and noted only nine workorders (eight locations) were completed from August 2017 thru August 2019. 2 of the 9 opened in early 2019 (January 7<sup>th</sup> and February 26<sup>th</sup>) were not closed until late August 2019.

### **Budget Assessment:**

County budgeted amounts appear reasonable to perform HVAC preventative maintenance. However, Schools operating budgets did not prioritize preventative maintenance. Schools O&M Department FY18 and FY19 additional funding requests (i.e. unfunded requirements) for HVAC preventative funding, recommended by Schools Chief Operating Officer, were not included in the Superintendent's proposed budgets (*see recommendation #7*).

Internal Audit analyzed HVAC preventative maintenance budget requests, approvals and expenditures for County and Schools from August 2017 thru August 2019 to determine if preventative maintenance budgeted amounts and expenditures are reasonable. County and Schools' budget activity is summarized below.

### **County:**

During annual budget development, the General Services Department estimates needs which are evaluated by the County Budget department. When finalized, the budget is approved and adopted by the County Board of Supervisors. HVAC maintenance and repairs' budgets are in line with expenditures and have been relatively consistent.

We noted for FY19, one HVAC position was requested and approved as part of the 5-year budget plan (1 additional trades position per year for fiscal years 2020-2024). We are not aware of any General Services unfunded HVAC preventative maintenance budget requests for FY18 and FY19.

The County records HVAC maintenance and repairs activities (non-payroll) in four budget accounts (Chemicals, HVAC repair, Maintenance contracts, Other equipment repair) in one department. The repair account also includes non-HVAC items.

The following chart shows FY18 and FY19 County budget to actual expenditures for these accounts. There were no budget adjustments other than routine year end carry forward for pending purchases. The FY19 budget overage is offset by remaining balances in other department operating accounts.

Budget to Actual, County HVAC maintenance and repairs expenditures

	Adopted Budget	Original Appropriation	Revised Budget	YTD Actuals	Encumbrance	Remaining at year end	Remaining Budget %
FY19	\$360,500	\$363,241	\$363,241	\$392,311 <sup>a</sup>	\$170	\$(29,239)	-8.0%
FY18	346,800	349,955	349,955	322,636 <sup>b</sup>	2,741	24,579	7.0%

<sup>a</sup> – FY19 YTD actual expenditures include \$391,378 for HVAC

<sup>b</sup> – FY18 YTD actual expenditures include \$321,816 for HVAC

Schools:

Internal Audit reviewed the School Board’s approved FY18 and FY19 budgets and the subsequent approval by the Board of Supervisors. During these years, the Board of Supervisors adopted the School Board’s preventative maintenance expenditure requests without change. We noted the School Superintendent’s FY19 and FY20 Proposed Financial Plans recommended to the School Board did not identify unfunded priorities for preventative maintenance (i.e. operations).

During annual budget development, Schools O&M Department estimates needs which are evaluated by the Schools Budget department. When finalized, the Superintendent presents the proposed budget to the School Board. Once the School Board approves, the budget is adopted by the County Board of Supervisors. Schools does not have separate HVAC budget accounts like the County. Schools record all HVAC related maintenance and repairs in the Other Service Maintenance Contracts account in the O&M Department (*recommendation #9*). This account also includes non-HVAC items.

The O&M Department wanted to apply FY18 division \$1.3 million position reorganization savings to increase contracted services by \$750,000 for preventative maintenance. These additional contracted services were intended to offset HVAC staffing vacancy challenges. Instead, the savings were allocated to other priorities, including debt repayment, and additional HVAC preventative maintenance funding was not included in the Superintendent’s proposed FY18 budget. Department budget analysis did not include benchmarking information using recognized standards to support preventative maintenance budget prioritization (*recommendation #7*).

In preparation for the FY19 budget, CCPS O&M Department budget worksheet indicated a request for \$1,450,000 (\$454,923 for HVAC repairs) and an additional \$600K was requested but remained an unfunded initiative. When the budget was presented to the School Board by the Superintendent the \$1,450,000 had been reduced to \$445,007 which was the amount approved by the School Board and subsequently, the Board of Supervisors. Subsequently, a budget adjustment for additional State funding increased available FY19 funding approximately \$897,000 for operational needs in the facilities area. The O&M Department prioritized this available funding to address a portion of required HVAC preventive maintenance.

In addition, the Superintendent’s Budget Advisory Committee noted that additional operations and maintenance funding was not included in the FY19 (November 26, 2018) budget and recommended increasing day to day maintenance priority for the FY20 budget (January 9, 2019). The Superintendent’s proposed FY20 budget, subsequently approved by School Board and the Board of Supervisors includes \$900,000 base budget increase for preventative maintenance. The FY20 “other service contracts” adopted budget (i.e. line item reviewed below that includes HVAC preventative maintenance) increased \$564,258 to \$1,059,335. However, that is a reduction for this line item compared to the revised FY19 budget and actual FY19 expenditures.

The following chart shows FY19 and FY18 Schools’ budget to actual expenditures for building maintenance category. Both years showed significant remaining balances at year end.

Budget to Actual expenditures for Schools O&M – Building Maintenance

	Adopted Budget	Original Appropriation	Revised Budget	YTD Actuals	Encumbrance	Remaining Budget at year end	Remaining Budget %
FY19	\$6,780,583	\$7,102,492	\$9,026,243	\$7,084,429	\$1,291,400	\$650,413 <sup>c</sup>	7.20%
FY18	6,939,938	7,602,363	7,692,918	6,563,106	322,687	797,124 <sup>d</sup>	10.40%

<sup>c</sup> – FY19 Remaining budget includes \$205,000 for salary savings

<sup>d</sup> – FY18 Remaining budget includes \$104,000 for salary savings

The following chart shows FY18 and FY19 Schools’ budget to actual expenditures for the “other service contract” account (a single account within the building maintenance category where preventative maintenance expenditures are recorded). Schools HVAC preventative maintenance budgets varied between years and included significant budget adjustments (increases) during FY18 and FY19 to cover actual expenditures. The adopted FY19 budget decreased 50% from prior year and was approximately one-third of actual FY18 expenditures.

Budget to Actual expenditures for Schools “other service contracts” (includes HVAC preventative maintenance)

	Adopted Budget	Original Appropriation	Revised Budget	YTD Actuals	Encumbrance	Remaining Budget at year end	Remaining Budget %
FY19	\$445,077	\$445,477	\$1,648,111	\$1,252,098 <sup>e</sup>	\$294,854	\$101,159	6.1%
FY18	900,000	922,994	1,223,332	1,168,124 <sup>f</sup>	400	54,808	4.5%

<sup>e</sup> – FY19 YTD actual expenditures include \$502,766 for HVAC

<sup>f</sup> – FY18 YTD actual expenditures include \$135,064 for HVAC. An additional \$196,085 was spent in other accounts.

**Staffing Assessment:**

Internal Audit analyzed HVAC staffing in County and Schools from August 2017 through August 2019 to determine if the number of current staffing is adequate to meet the HVAC maintenance needs of the entity. Pay ranges for comparable positions were similar when comparing County and Schools, however Schools has had significant staff vacancies for the years reviewed and current staffing levels results in each HVAC team member providing service for more than 2.5 times (3.2 times with position vacancies) the square footage compared to County employees (*see recommendation #7*).

**County:**

The County has a dedicated HVAC team consisting of nine positions. The County uses benchmark data to illustrate staffing and funding requirements for ongoing facility preventative maintenance and repairs to include HVAC systems. There were no vacancies at the end of FY18 or FY19. In addition, General Services and their Buildings and Grounds program management team have been stable. The County maintains roughly 1,600,000 square feet of air-conditioned space which makes each employee responsible for approximately 178,000 square feet. Approved salary ranges for HVAC employees at the County for FY19 are shown below.

Number of Positions	Title	FY19 Pay
1	Supervisor	\$48,651 - \$83,076
4	Mechanics	37,272 - 63,647
4	Technicians	32,621 - 55,705

**Schools:**

Schools did not have benchmark data to illustrate in-house staffing and funding requirements for ongoing facility preventative maintenance, including HVAC systems (*see recommendations #7 and #9*). For FY18 and FY19, Schools dedicated HVAC team had 19 positions. While salary ranges are similar with County, there have been vacancy challenges (33% at June 30, 2018 and 21% at June 30, 2019). Vacancies impacting operations include the Director of Facilities and Maintenance (over a year). To broaden recruitment, certain HVAC positions were reclassified in FY19 adding two new position titles (Helpers and Chiller Preventative Maintenance Mechanics). While number of positions remain the same, the current Director has proposed the Advanced Maintenance and Prevention Program (AMPP) to change how staff are deployed in the future.

Schools have approximately 8.5 million square feet of air-conditioned space to maintain. That results in each HVAC employee covering more than twice the square footage of County HVAC staff (approximately 447,500 square feet, 567,000 square feet when considering vacancies). Approved salary ranges for School HVAC employees for FY19 are shown below.

Number of Positions	Title	FY19 Pay
1	Supervisor	\$48,640-\$83,059
1	Lead	42,570-72,696
2	Chiller Preventative Maintenance Mechanics	39,127-66,815
13	Mechanics	34,244-58,478
2	Helpers	28,547-48,748

**RECOMMENDATION(S):**

We recommend County General Services Department:

1. § Coordinate with Risk Management to develop a preventative maintenance procedure for HVAC systems that include consensus standards for water management and frequency for Legionella testing.
2. § Document vendor recommendations review from monthly service reports to identify planned response.
3. § Use workorder system to document and monitor cooling tower preventative maintenance tasks completion.

**MANAGEMENT'S RESPONSE(S):**

1. *Concur. Buildings and Grounds Division Chief, Earl Kirby is responsible for implementing:
  - a. 12/1/19, develop and implement cooling tower maintenance SOP and overall water management program based on best practices and industry standards (one procedure covering both County and CCPS).
  - b. 3/31/20, existing HVAC PM procedures and tasks. Preventative maintenance (PM) work orders with specific process tasks are already part of the FacilityDude system (since initial implementation). Staff will review existing procedures vs. industry standards and best practices and complete any necessary updates. NOTE: upload of Facility Condition Assessment results caused data linking issues with HVAC PM work orders. General Services is currently working with vendor to update records. HVAC Technicians utilizing legacy data to complete PM's until issue resolved. Adjustments will be made once final Risk Management recommendations are available.*
2. *Concur. Buildings and Grounds Division Chief, Earl Kirby, implemented 8/12/19. A recurring work order was created in the FacilityDude work order system for monthly vendor site inspections. If follow-up issues are found during monthly inspections, a new, unique work order is created for the required repair. Adjustments will be made once final Risk Management recommendations are available.*
3. *Concur. Buildings and Grounds Division Chief, Early Kirby implemented 8/12/19. Recurring PM work orders were created in the FacilityDude system for the following: 1) Semi-annual Legionella and Heterotrophic plate count (HPC) sampling (April and July); 2) Bi-weekly visual inspections of chemical induction systems to ensure proper function and no operational alarms; 3) Semi-annual preventative maintenance and cleaning; and 4) Semi-annual PM associated with start-up and shutdown. Adjustments will be made once final Risk Management recommendations are available.*

**RECOMMENDATION(S):**

We recommend Schools O&M Department:

4. § Coordinate with Risk Management to develop a preventative maintenance procedure for HVAC systems that includes consensus standards for water management and frequency for Legionella testing.
5. § Document vendor recommendations review from monthly service reports to identify planned response.
6. § Use workorder system to document and monitor cooling tower preventative maintenance tasks completion.

7. Benchmark funding and in-house staffing requirements to comply with recognized standards for HVAC preventative maintenance including water management to support future budget prioritization.
8. Develop standard vendor Schools access process language and consistently coordinate with Procurement Department to include in future procurements (i.e. to avoid future service delays to amend initial contracts).
9. Develop detailed preventative maintenance requirements by facility and system, for workorder system tracking and support future budget requests.
10. Monitor critical pending purchase approval request and continue to coordinate with Procurement on how to best ensure pending purchase approval requests receive appropriate priority.

<sup>8</sup> Certain County (1 to 3) and Schools (4 to 6) recommendations are the same. These recommendations are separately listed for each organization to allow for separate management responses, and subsequent implementation monitoring and follow-up.

**MANAGEMENT'S RESPONSE(S):**

4. *Concur. Director of Facilities and Maintenance, John Thumma, III, P.E. is responsible for implementing:*
  - a. *By 12/1/19 develop and implement Cooling Tower Management/Water Management Program and Standard Operating Procedures (SOP) with Risk Management (RM) recommendations and develop HVAC Preventative Maintenance (PM) program that incorporates EPA/OSHA guideline and industry standards to include legionella testing for all systems requiring water treatment.*
  - b. *By 2/1/20 incorporate all PM work orders and schedules into SchoolDude Maintenance Management System by the PM Program Manager; and finalize draft SOP for management of PM contracts and work orders.*
5. *Concur. Director of Facilities and Maintenance, John Thumma, III, P.E. is responsible for implementing 11/15/19. 1) Finalize draft SOP that outlines the process for managing contracted PM.; 2) Complete interviews and hiring process for PM Program Manager; and 3) Until PM program manager is hired, Director will review and ensure work orders are submitted for all identified deficiencies.*
6. *Concur. Director of Facilities and Maintenance, John Thumma, III, P.E. is responsible for implementing 11/15/19. 1) Incorporate all PM work orders and schedules into SchoolDude Maintenance Management System by the PM Program Manager; 2) Finalize draft SOP for management of PM contracts and work orders; and 3) Until PM program manager is hired, Director will review and ensure work orders are submitted for all identified deficiencies.*
7. *Concur. Director of Facilities and Maintenance, John Thumma, III, P.E. is responsible for implementing 7/1/20. Operations and Maintenance has completed benchmarking to present internally during the FY21 budget process. CCPS will continue to pursue contracted services until on-going vacancies can be filled and approval for optimal staffing levels are funded. Benchmarking was performed using Association of Physical Plant Administration (APPA) standards for maintenance staff required for HVAC preventive maintenance. APPA provides most school standards used by CCPS budget.*

8. *Concur. Director of Facilities and Maintenance, John Thumma, III, P.E. implemented 8/19/19. Vendor access process language has been standardized and is included in all requirement contracts.*
9. *Concur. Director of Facilities and Maintenance, John Thumma, III, P.E. is responsible for implementing 7/1/20. 1) All systems have been identified through the EMG Facility Condition Assessment report from December 22, 2017 and input into SchoolDude (COMPLETE); 2) Detailed HVAC PMs will be developed as mentioned in previous action items; and 3) Once PM Program Manager is in place PMs for Plumbing, Electrical and structural will be developed and implemented.*
10. *Concur. Director of Facilities and Maintenance, John Thumma, III, P.E. implemented 7/1/19. CCPS has a Financial Analyst tracking all purchase orders (PO's) to ensure they are processed in a timely manner as of July 1, 2019. CCPS recommendation for Procurement: Provide a standard protocol for transitioning projects between buyers to achieve consistency in execution and prioritization of contract negotiations and / or renewal.  
*Auditor Comment: We understand O&M Department routinely meet with Procurement to manage project status which provides an opportunity for them to consider process changes.**

### CLOSING

We appreciate the cooperation and assistance received from County and Schools management and staff across multiple departments throughout this audit.

Copy: Scott Zaremba, Deputy County Administrator for Community Operations  
Clay Bowles, General Services Director  
David Johnson, Director Risk Management  
Matt Harris, Deputy County Administrator for Finance and Administration  
Keith Gagnon, Procurement Director  
Meghan Coates, Director of Budget and Management  
Karl Leonard, Sheriff  
Nita Mensia-Joseph, Chief Operating Officer (CCPS)  
John Thumma III, P.E., Director of Facilities and Maintenance (CCPS)  
Dr. Thomas Taylor, Chief of Staff (CCPS)  
Vacant, Chief Finance Officer (CCPS)  
Denise Sandlin, Director of Management and Budget (CCPS)