



Office of Audits
Office of Inspector General
U.S. General Services Administration

PBS Southeast Sunbelt Region's Lack of Planning Has Resulted in Chillers That Are Outdated, Inadequately Maintained, and Lack Redundancy

Report Number A210030/P/5/R23004
February 16, 2023

Executive Summary

PBS Southeast Sunbelt Region’s Lack of Planning Has Resulted in Chillers That Are Outdated, Inadequately Maintained, and Lack Redundancy

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Why We Performed This Audit

In May 2022, we issued an audit report on GSA’s approval process for minor repair and alteration projects.¹ During that audit, officials in the GSA Public Buildings Service’s Southeast Sunbelt Region (PBS Region 4) raised concerns over the condition of chillers in their region. As a result, we included this audit in our *Fiscal Year 2021 Audit Plan*.

Our audit objective was to determine if PBS Region 4’s practices for chiller maintenance and repair are effective, being followed, and ensure that the chillers are properly maintained in accordance with government policy and industry standards.

What We Found

PBS Region 4 does not have a plan to identify and prioritize chillers for repair and replacement. As a result, many of PBS Region 4’s chillers are outdated, inadequately maintained, and lack redundancy. We found that 33 percent of the chillers in PBS Region 4’s owned buildings are beyond their useful lives—a figure that will increase to 48 percent by 2025. We also found that PBS Region 4 did not perform the manufacturer-recommended overhauls for chillers at any of the seven buildings we tested. Finally, we found that 33 percent of the chillers in PBS Region 4’s owned buildings lack the required redundancy to ensure continuous operation in the event of equipment failure. Taken together, these deficiencies resulted in actual cooling loss in 27 buildings over the 1-year period ended November 2021, and increased the risk of cooling loss in others.

What We Recommend

We recommend that the PBS Region 4 Commissioner:

1. Assess the condition of all chillers within PBS Region 4 to identify those that:
 - a. Have, or will soon, exceed their useful lives;
 - b. Are due for or behind on manufacturer-recommended overhauls and are not nearing or beyond their useful lives; or
 - c. Lack required redundancy.

¹ *Audit of PBS’s Approval Process for Minor Repair and Alteration Projects* (Report Number A190100/P/5/R22005, May 9, 2022).

2. Develop and implement a plan to:
 - a. Replace the chillers that have exceeded, or will soon exceed, their useful lives;
 - b. Perform the identified manufacturer-recommended overhauls, as well as ensure future overhauls are performed in a timely manner; and
 - c. Prioritize redundancy in accordance with GSA's *Facilities Standards for the Public Buildings Service*.

Additionally, the PBS Commissioner should:

3. Perform a similar assessment of the condition of all chillers across PBS's nationwide portfolio.
4. Develop and implement a plan to address the results of the assessment.

The PBS Commissioner agreed with our finding and recommendations. PBS's written comments are included as ***Appendix C***.

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Introduction

We performed an audit of the practices used by GSA Public Buildings Service’s Southeast Sunbelt Region (PBS Region 4) to maintain and repair its chillers.

Purpose

In May 2022, we issued an audit report on GSA’s approval process for minor repair and alteration projects.² During that audit, officials in PBS Region 4 raised concerns over the condition of the chillers in their region. As a result, we included this audit in our *Fiscal Year 2021 Audit Plan*.

Objective

Our audit objective was to determine if PBS Region 4’s practices for chiller maintenance and repair are effective, being followed, and ensure that the chillers are properly maintained in accordance with government policy and industry standards.

See **Appendix A** – Objective, Scope, and Methodology for additional details.

Background

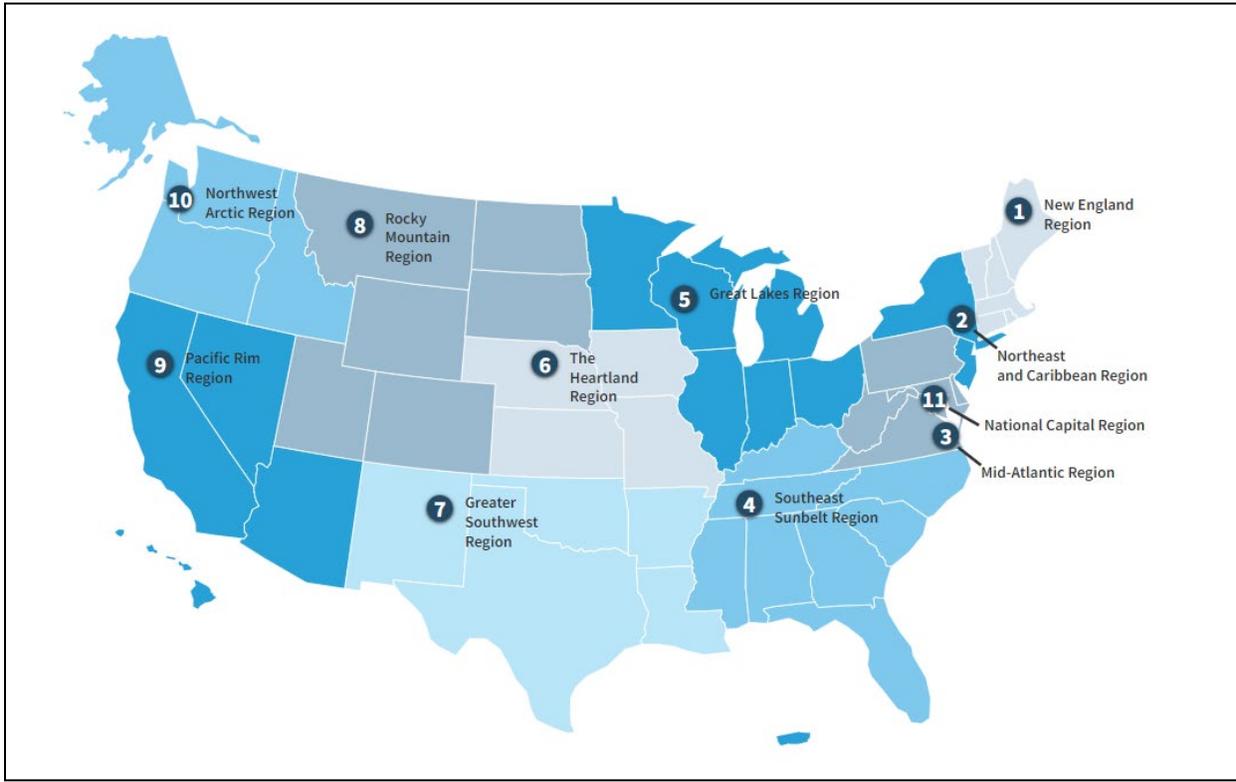
GSA owns or leases over 8,800 facilities nationwide that provide workspace for approximately 1.1 million federal employees. For these facilities, PBS is responsible for ensuring comfortable temperatures and healthy humidity levels for building tenants, contractors, and visitors.

As shown in *Figure 1* on the next page, PBS Region 4 is one of PBS’s 11 regions. It covers the following eight states:

Alabama	Mississippi
Florida	North Carolina
Georgia	South Carolina
Kentucky	Tennessee

² *Audit of PBS’s Approval Process for Minor Repair and Alteration Projects* (Report Number A190100/P/5/R22005, May 9, 2022).

Figure 1 – Map of PBS’s 11 Regions³



PBS Region 4’s Property Management Division is responsible for overseeing operations, maintenance, and minor repairs and alterations for the 136 PBS Region 4 owned buildings within the region. Because of their location in southeastern United States, these buildings operate in a high-temperature, high-humidity environment, with most buildings requiring year-round cooling.

Chillers

Of PBS Region 4’s 136 GSA-owned buildings, 128 (94 percent) rely on chillers for cooling.⁴ Chillers are large pieces of equipment that are generally customized to the buildings they cool and have a useful life span of 20–23 years. Pricing for commercial chillers, such as those within GSA-owned buildings, can range from approximately \$100,000 to over \$1 million, depending on the peak cooling load of the buildings they cool. *Figure 2* on the next page shows an example of two chillers in the George C. Young Federal Building and Courthouse in Orlando, Florida.

³ This map was taken from “GSA Regions” on the GSA website, <https://www.gsa.gov/about-us/gsa-regions?topnav>, on November 9, 2022. GSA and PBS regions are identical.

⁴ The other eight facilities in PBS Region 4 do not have chillers. They include facilities such as parking garages and warehouses.

Figure 2 – Chillers in the George C. Young Federal Building and Courthouse⁵



Chillers cool buildings by removing heat from a liquid coolant to cool and dehumidify the air. A breakdown in a chiller may lead to rising temperatures and humidity within the building and possible building closures.

Redundancy

Chiller redundancy is essential for the continuous cooling of GSA-owned buildings. Redundancy is the duplication of chillers necessary to increase system reliability. If a chiller fails, the redundant (i.e., backup) chiller can take over to prevent cooling loss to the building. Additionally, chiller redundancy allows for easy scheduling of preventive maintenance and recommended overhauls. GSA's *Facilities Standards for the Public Buildings Service* (GSA's P100 standards) require redundancy of key building equipment in GSA-owned buildings and specify the number of chillers a building should have based on its size to ensure sufficient redundancy.

Chiller Maintenance

Proper maintenance of chillers is essential to ensure efficient operations, prevent breakdowns, extend chiller life span, and improve indoor climate quality. There are two main types of chiller maintenance: preventive maintenance and overhauls.

Preventive maintenance. Preventive maintenance is the routine maintenance of building equipment to keep it running, ensure it is working efficiently, and prevent costly breakdowns.

⁵ Photograph taken by the audit team, July 21, 2021.

Preventive maintenance includes changing filters, lubricating parts, and visually inspecting for leaks. This type of maintenance generally occurs on a weekly, monthly, or annual basis.

PBS delegates preventive maintenance of building equipment, including chillers, to its operations and maintenance (O&M) contractors. PBS’s standard O&M contracts require that contractors “use GSA’s preventive maintenance standards or the manufacturer’s recommended maintenance procedures, or a combination of the two to perform maintenance.” GSA’s preventive maintenance standards are outlined in its *Public Buildings Maintenance Standards*, which is referred to as the Preventive Maintenance Guide. The Preventive Maintenance Guide requires that O&M contractors adhere to the equipment manufacturer’s recommended maintenance procedures.

Overhauls. Overhauls are more comprehensive than preventive maintenance and happen less frequently. Overhauls are significant maintenance events designed to maximize efficiency of chillers, reduce breakdowns, extend the chiller’s life span, and improve indoor climate quality. Additionally, overhauls allow technicians to identify problems before they occur or worsen.

Overhauls generally require the chiller to be taken apart; the components inspected, repaired, and replaced as needed; and the chiller to be reassembled. During overhauls, technicians assess areas of wear; inspect the condition of components; and replace critical components such as gaskets, covers, and seals. Finally, chiller overhauls allow technicians to reach and inspect areas of the chiller that are not usually accessible during preventive maintenance.

Manufacturers recommend performing periodic chiller overhauls. For example, Trane recommends overhauls for its chillers after 10 years or 40,000 hours of run time. Carrier recommends overhauls for its chillers starting at 6,000, 10,000, or 12,000 hours of operation. PBS officials stated that due to their complexity and duration, overhauls can cost between \$50,000–\$200,000, depending on the chiller size, and fall outside the scope of GSA’s standard O&M contracts.

Funding

PBS funds its chiller maintenance, repair, and replacement through the Federal Buildings Fund (FBF). The FBF operates as a revolving fund; however, unlike typical revolving funds, it is subject to annual enactment of new obligational authority by Congress. PBS does not have a single funding source related to its chillers. Chiller-related expenses may be funded using three different budget activities to draw funds from the FBF (see *Figure 3* below).

Figure 3 – GSA’s Budget Activities Used for Chiller-Related Expenses

Budget Activity	Programs	Threshold
61	Day-to-Day Building Operations	Below \$25,000
54	Minor Repairs and Alterations	\$25,000–\$3,375,000
55	Major Repairs and Alterations	Above \$3,375,000

As part of the annual appropriations process, Congress authorizes FBF funding for GSA’s Minor Repairs and Alterations and Day-to-Day Building Operations programs. PBS can use this funding for projects within the respective dollar thresholds shown in *Figure 3* without further congressional approval. In deciding how to use this funding, PBS must consider the needs of its aging portfolio of buildings and mounting maintenance backlog. Accordingly, projects to repair or replace chillers are considered alongside projects to address other critical needs, including projects to prevent water intrusion, improve fire detection systems, and replace key building equipment.

For the Major Repairs and Alterations Program, PBS must submit a prospectus for each proposed project for separate congressional review and approval.⁶ In this case, PBS may replace chillers as part of a larger, congressionally approved building renovation or modernization project.

In recent years, GSA has expressed concern over the gap between requested and authorized spending levels for building repairs and alterations. For example, in its *Fiscal Year 2023 Congressional Justification*, GSA noted that:

Congress must begin to close the gap between the annual revenues and collections deposited into the FBF and [New Obligational Authority] appropriated so that GSA may begin to reverse the cumulative impacts of underinvestment in deferred maintenance and necessary capital improvements among its federally owned facilities. In the absence of such reinvestment, our federally owned assets will deteriorate further and can only offer future liabilities with compounding effects.

Prior Office of Inspector General Reports

Since Fiscal Year (FY) 2021, we have issued two reports related to building deficiencies in PBS’s aging inventory of federally owned buildings. In September 2021, we reported on the need for PBS to improve its strategy for addressing its growing deferred maintenance backlog.⁷ We found that PBS was not effectively managing its aging real property inventory and is vulnerable to rising maintenance and repair costs, increased risk of building system failure, accelerated deterioration of systems and structures, and potential life safety hazards. PBS Region 4’s chillers are an example of deferred maintenance that has resulted in more frequent repairs and presented a risk of building system failure.

⁶ 40 U.S.C. 3307, *Congressional approval of proposed projects*.

⁷ *Audit of the Public Buildings Service’s Effectiveness in Managing Deferred Maintenance* (Report Number A190066/P/2/R21009, September 30, 2021).

In May 2022, we reported on the need to improve PBS’s approval process for minor repair and alteration projects.⁸ GSA uses minor repair and alteration projects, in part, to address its deferred maintenance backlog and include projects to repair and replace chillers in GSA buildings. We found that PBS’s approval process of minor repair and alteration projects had no discernible effect on which projects were actually approved and performed in FY 2019 and FY 2020.

⁸ Report Number A190100/P/5/R22005, May 9, 2022.

Results

Finding – PBS Region 4’s lack of planning has resulted in chillers that are outdated, inadequately maintained, and lack redundancy.

PBS Region 4 does not have a plan to identify and prioritize chillers for repair and replacement. As a result, many of PBS Region 4’s chillers are outdated, inadequately maintained, and lack redundancy. We found that 33 percent of the chillers in PBS Region 4’s owned buildings are beyond their useful lives—a figure that will increase to 48 percent by 2025. We also found that PBS Region 4 did not perform the manufacturer-recommended overhauls for chillers at any of the seven buildings we tested. Finally, we found that 33 percent of the chillers in PBS Region 4’s owned buildings lack the required redundancy to ensure continuous operation in the event of equipment failure. Taken together, these deficiencies resulted in actual cooling loss in 27 buildings over the 1-year period ended November 2021, and increased the risk of cooling loss at others.

We describe these deficiencies below.

Outdated Chillers

The American Society of Heating, Refrigerating, and Air-Conditioning Engineers estimates that chillers have a useful life span of 20–23 years, depending on chiller type. We found that 75 of the 229 chillers (33 percent) in PBS Region 4’s owned buildings are beyond their useful lives. These chillers have an average age of 30 years, including one chiller that is 62 years old.

Specific examples of outdated chillers identified in our audit testing include the following:

- The Sam M. Gibbons U.S. Courthouse in Tampa, Florida, operates on two 26-year-old chillers that reached the end of their 23-year useful lives in 2019. As of June 2022, these chillers remain in use; therefore, they have exceeded their useful lives by 3 years.
- The Prince H. Preston Federal Building in Statesboro, Georgia, operates on two chillers that have exceeded their 20-year useful lives. PBS estimates that these chillers were installed in 1962. As of June 2022, the chillers remain in use; therefore, they have exceeded their 20-year useful lives by 40 years.

We also found that an additional 35 chillers in PBS Region 4 will exceed their useful lives by 2025. As a result of this increase, 110 of the 229 chillers (48 percent) in PBS Region 4 buildings will be beyond their useful lives by 2025.

A complete listing of chillers that are near or beyond their useful lives in PBS Region 4 is included in **Appendix B**.

Outdated chillers pose an increased risk of failure that could result in cooling loss, temporary building closures, and additional expenses for PBS Region 4. These chillers can also suffer from reduced efficiency, preventing them from producing the chilled air necessary to meet demand. Additionally, it is difficult to obtain replacement parts for these chillers as the chillers and their parts grow obsolete.

Lack of Overhauls

Chiller manufacturers recommend overhauls be performed to ensure chillers' long-term performance and efficiency. For example, we found that:

- The R.L. Timberlake Jr. Federal Building in Tampa, Florida, is designed to operate on two chillers. These two chillers were installed in 2000 and 2004, respectively; however, according to PBS staff, neither chiller has been overhauled in accordance with manufacturer recommendations. One of the chillers is no longer functioning. As a result, PBS Region 4 is dependent on the sole operating chiller, which is nearing the end of its useful life, to cool the building. Due to a broken part in the sole operating chiller, the building experienced a few hours of cooling loss in July and August 2021.
- The George C. Young Federal Building and Courthouse in Orlando, Florida, operates on two chillers that are 19 years old. PBS Region 4 has not performed the recommended overhauls on these chillers since they were installed. Despite more than \$115,000 in repairs since 2017, one of the chillers has only been available for short durations, requiring PBS Region 4 to keep the other chiller in constant operation.

Without overhauls, chillers are more likely to have shorter useful lives, reduced operational efficiency, and higher operating costs.

Lack of Redundancy

GSA's P100 standards require redundancy of key building equipment in GSA buildings and specify the number of chillers a building should have for sufficient redundancy based on its size. GSA's P100 standards further state that "failure of one piece of equipment should not shut down large portions of the building." However, we found that 42 of the 128 chillers (33 percent) in PBS Region 4's owned buildings lack redundancy. For example:

- The J.C. Watts Federal Building in Frankfort, Kentucky, operated on a single 13-year-old chiller, despite GSA's P100 standards requiring a minimum of three chillers for redundancy. The chiller broke down in March 2021. PBS officials had to rent a temporary chiller at a total cost of \$38,000 for 5 months before they were able to replace the broken chiller.

- The U.S. Courthouse Annex in Orlando, Florida, has three chillers, requiring two main chillers operating during the day with a third as a standby. However, since 2017, one chiller has been operable for only 1 month due to repeated leaks.
- The Federal Building and U.S. Courthouse in Columbia, Tennessee, operates on a single 28-year-old chiller, despite GSA's P100 standards requiring a minimum of three chillers for redundancy.

The lack of redundancy limits PBS Region 4's ability to perform critical preventive maintenance because the chillers cannot be turned off for the extended period of time needed to perform the maintenance. As a result, preventive maintenance is not performed or is only performed at night or on weekends, often at additional expense.

Loss of Cooling

The deficiencies noted above resulted in actual cooling loss in 27 buildings across PBS Region 4 over the 1-year period ended November 2021. For example:

- The Post Office and U.S. Courthouse in Lexington, Kentucky, is equipped with two chillers. PBS Region 4 has not performed the manufacturer-recommended overhauls on either chiller. One chiller is 26 years old, exceeded its useful life in 2019, and is no longer operable. The other chiller is 28 years old and exceeded its useful life in 2017. This chiller was the building's sole operating chiller until it broke down in June 2021. As a result, the building lost cooling for 3 days, forcing court cases to move and tenant agency employees to telework. PBS Region 4 is planning to replace the chillers in March 2023, at a cost of \$1.5 million. In the interim, PBS Region 4 has rented temporary chillers to cool the building and keep it in operation. Between June and November 2021 alone, the rental costs for these chillers totaled \$90,000.
- The U.S. Courthouse in Natchez, Mississippi, operates on one 16-year-old chiller that will exceed its useful life in 2026. PBS Region 4 has not performed the manufacturer-recommended overhauls on the chiller. In November 2021, the chiller failed due to pressure and flow switch failures. Because of the lack of redundancy, the building experienced a 2-hour cooling loss while the chiller was repaired.
- The Federal Building-Post Office-Courthouse in Greenville, Mississippi, runs on two 28-year-old chillers that exceeded their useful lives in 2014. PBS Region 4 has not performed the manufacturer-recommended overhauls on either chiller. In October 2021, the building experienced a 4-hour cooling loss when both chillers broke down due to a combination of motor, contactor, and pump failures.

The cooling loss events described above clearly demonstrate the effects of chillers that are outdated, inadequately maintained, and lack redundancy. Because of the poor condition of its

chillers, PBS Region 4 faces an increased risk of future chiller breakdowns that could lead to cooling loss and possible building shutdowns.

PBS Region 4 Does Not Have a Plan to Repair and Replace Chillers

Although chillers are critical for many of its owned buildings, PBS Region 4 does not have a comprehensive plan to address the deficiencies described above. In fact, PBS Region 4 did not have a complete listing of its chillers and their respective ages and conditions until we requested this information for our audit.

As described below, we found that PBS Region 4 does not have a systematic approach for identifying or prioritizing chillers for repair and replacement. In addition:

- PBS Region 4 has no plans to replace chillers that are well beyond their useful lives. For example, the chillers at the Federal Building and U.S. Courthouse in Paducah, Kentucky, are 40 years old and exceeded their useful lives in 2002. Additionally, the chillers at the John J. Duncan Federal Building in Knoxville, Tennessee, are 35 years old and exceeded their useful lives in 2010. Despite those facts, there are no current projects to replace these chillers.
- PBS Region 4 does not plan for chiller overhauls, which could be critical in maximizing chiller useful life. For example, the Ed Jones Federal Building and U.S. Courthouse in Jackson, Tennessee, and the Federal Building and Courthouse in Tuscaloosa, Alabama, each operate on two chillers that were installed in 2010. According to the manufacturer's recommendations, these chillers were due to be overhauled in 2020. Nonetheless, PBS officials have no plans to perform the overhauls.
- Additionally, PBS Region 4 has not planned to address the need for redundant chillers. If a chiller fails, the redundant chiller can take over to prevent cooling loss to the building. PBS Region 4 officials stated that they are aware of the lack of chiller redundancy in PBS Region 4's owned buildings; however, due to budget constraints, PBS has no current or planned projects to address the chiller redundancy issues.

PBS Region 4 officials told us that the region lacks sufficient funding to repair and replace these chillers. PBS Region 4 officials also expressed concerns that the gap between requested and authorized spending levels has limited their ability to fund the necessary maintenance, repair, and replacement of chillers beyond their useful lives. We recognize PBS Region 4's concerns. Nonetheless, PBS Region 4 has opportunities to improve its chiller inventory by taking a more targeted approach to strategic planning.

For example, PBS Region 4 could assess the current condition of all its chillers. In doing so, PBS could develop and implement a plan to replace chillers that are, or soon will be, beyond their useful lives. This would ensure that when funding is available, immediate liabilities are prioritized.

PBS Region 4 could also develop and implement a plan to perform manufacturer-recommended overhauls for chillers that are not nearing or beyond their useful lives. This ensures the chillers' long-term performance and efficiency.

Finally, PBS Region 4 should develop and implement a plan to prioritize chiller redundancy according to GSA's P100 standards. This ensures that if a chiller fails, the redundant chiller can take over to prevent cooling loss. Since many chillers in PBS Region 4 are past their useful lives, inadequately maintained, and therefore, at a higher risk of failure, redundancy is even more critical.

Conclusion

PBS Region 4 does not have a plan to identify and prioritize chillers for repair and replacement. As a result, many of PBS Region 4's chillers are outdated, inadequately maintained, and lack redundancy. We found that 33 percent of the chillers in PBS Region 4's owned buildings are beyond their useful lives—a figure which will increase to 48 percent by 2025. We also found that PBS Region 4 did not perform the manufacturer-recommended overhauls for chillers at any of the seven buildings we tested. Finally, we found that 33 percent of the chillers in PBS Region 4's owned buildings lack required redundancy to ensure continuous operation in the event of equipment failure. Taken together, these deficiencies resulted in actual cooling loss in 27 buildings over the 1-year period ended November 2021, and increased the risk of cooling loss at others.

PBS Region 4's buildings operate in a high-temperature, high-humidity environment, with most buildings requiring year-round operations of their chillers. Accordingly, PBS Region 4 should take appropriate measures to address the deficiencies identified during our audit to ensure effective building operations, and prevent building shutdowns that could prevent tenant agencies from carrying out their missions. Finally, to the extent that these deficiencies are not unique to PBS Region 4, PBS should address these issues across its nationwide portfolio.

Recommendations

We recommend that the PBS Region 4 Commissioner:

1. Assess the condition of all chillers within PBS Region 4 to identify those that:
 - a. Have, or will soon, exceed their useful lives;
 - b. Are due for or behind on manufacturer-recommended overhauls and are not nearing or beyond their useful lives; or
 - c. Lack required redundancy.
2. Develop and implement a plan to:
 - a. Replace the chillers that have exceeded, or will soon exceed, their useful lives;
 - b. Perform the identified manufacturer-recommended overhauls, as well as ensure future overhauls are performed in a timely manner; and
 - c. Prioritize redundancy in accordance with GSA's *Facilities Standards for the Public Buildings Services*.

Additionally, the PBS Commissioner should:

3. Perform a similar assessment of the condition of all chillers across PBS's nationwide portfolio.
4. Develop and implement a plan to address the results of the assessment.

GSA Comments

The PBS Commissioner agreed with our finding and recommendations. PBS's written comments are included as ***Appendix C***.

Audit Team

This audit was managed out of the Great Lakes Region Audit Office and conducted by the individuals listed below:

Michael Lamonica
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Regional Inspector General for Auditing
Auditor-In-Charge

Appendix A – Objective, Scope, and Methodology

Objective

Our audit objective was to determine if PBS Region 4’s practices for chiller maintenance and repair are effective, being followed, and ensure that the chillers are properly maintained in accordance with government policy and industry standards.

Scope and Methodology

We evaluated PBS Region 4’s policies and procedures related to its chiller maintenance and repair.

To accomplish our objective, we:

- Reviewed GSA policies and industry standards related to the maintenance and repair of chillers;
- Met with industrial hygienists, quality assurance specialists, and other PBS officials to gain an understanding of chillers and chiller components;
- Analyzed PBS Region 4’s chiller and chiller component inventory as of FY 2021;
- Evaluated how PBS Region 4 officials prioritize chiller replacement and repairs;
- Selected a judgmental sample of seven PBS Region 4 owned buildings in Florida for detailed testing. For the seven sampled buildings, we:
 - Conducted site visits to observe the chillers and related components,
 - Interviewed PBS Region 4 officials and O&M contractors regarding the history and current status of chillers and chiller components, and
 - Reviewed documentation relating to repair history; and
- Held meetings with PBS Region 4 officials regarding chillers, chiller components, and loss of cooling events at a judgmental sample of 15 additional PBS Region 4 owned buildings.

Data Reliability

At our request, PBS Region 4 officials created two spreadsheets with information about: (1) chiller inventory and (2) chiller and chiller component redundancy for each PBS Region 4 owned building. The chiller inventory spreadsheet contained information either taken from the GSA’s National Computerized Maintenance Management System or manually entered by the building services specialist for each building. The information included the number of chillers, as well as the chillers’ ages, useful lives, and condition. The redundancy spreadsheet information was entered manually by the building services specialists, detailing redundancy for the chillers and chiller components, including cooling towers, chilled water pumps, and condenser pumps at each building. It also included whether the building experienced cooling loss in the last year. We used the chiller inventory spreadsheet to select a judgmental sample of seven buildings for our site visits.

We assessed the reliability of data by: (1) comparing the data between the two spreadsheets and (2) interviewing quality assurance specialists and O&M contractors. We determined that the data was sufficiently reliable for the purposes of this audit.

Sampling

We selected a judgmental sample of seven buildings in PBS Region 4 for chiller inspection during our site visits. Based on the site visits, we selected an additional judgmental sample of 15 buildings in PBS Region 4 to discuss with PBS Region 4 officials. We considered the following factors when selecting our samples: redundancy, useful life, and whether buildings experienced cooling loss. The total sample represents 17 percent of PBS Region 4 owned buildings that contain at least one chiller. The sample design did not include sample sizes that would allow for projection to the population; however, they allowed us to sufficiently address our audit objective.

Internal Controls

We determined internal controls were not significant within the context of our audit objective. Therefore, we did not assess the design, implementation, or operating effectiveness of internal controls. The results of our audit are not intended to provide assurance on GSA's internal control structure. GSA management is responsible for establishing and maintaining internal controls.

Compliance Statement

We conducted the audit between January 2021 and March 2022 in accordance with generally accepted government auditing standards. 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 finding and conclusions based on our audit objective.

Appendix B – List of Chillers That Are Near or Beyond Their Useful Lives

This appendix lists chillers in PBS Region 4 owned buildings that are beyond their useful lives, or will be beyond their useful lives in 2025, as of July 2, 2021.

Building Name	Building Location	Number of Chillers	Chiller Age (Years)	End of Useful Life⁹
Bryan Simpson U.S. Courthouse	Jacksonville, FL	3	22	2023
C. B. King U.S. Courthouse	Albany, GA	1	22	2020
C. B. King U.S. Courthouse	Albany, GA	1	22	2023
C. F. Haynsworth Federal Building and U.S. Courthouse	Greenville, SC	2	38	2004
C. F. Haynsworth Federal Building and U.S. Courthouse	Greenville, SC	1	30	2012
Carl D. Perkins Federal Building and U.S. Courthouse	Ashland, KY	1	42	2000
Carl D. Perkins Federal Building and U.S. Courthouse	Ashland, KY	1	29	2016
Charles E. Bennett Federal Building	Jacksonville, FL	1	18	2024
Charles E. Simon U.S. Courthouse	Aiken, SC	1	27	2015
Claude Pepper Federal Building	Miami, FL	2	22	2023
Clifford Davis - Odell Horton Federal Building	Memphis, TN	2	21	2024
Dan M. Russell Jr. U.S. Courthouse	Gulfport, MS	2	20	2025
Donald Stuart Russell U.S. Courthouse	Spartanburg, SC	2	20	2022
Estes Kefauver Federal Building	Nashville, TN	1	28	2014
Estes Kefauver Federal Building	Nashville, TN	2	21	2021
Federal Building	Mobile, AL	2	21	2024
Federal Building	Owensboro, KY	2	20	2025
Federal Building and Courthouse	Fort Lauderdale, FL	2	23	2019
Federal Building and U.S. Courthouse	Paducah, KY	2	40	2002
Federal Building and U.S. Courthouse	Columbia, TN	1	28	2017
Federal Building and U.S. Courthouse	Anniston, AL	1	27	2018
Federal Building and Post Office Century Station	Raleigh, NC	1	31	2014
Federal Building-Post Office-Courthouse	Valdosta, GA	1	29	2016
Federal Building-Post Office-Courthouse	Greenville, MS	2	28	2014
Federal Building-Post Office-Courthouse	Winchester, TN	1	26	2019

⁹ Chiller useful life varies between 20–23 years, depending on chiller type.

Building Name	Building Location	Number of Chillers	Chiller Age (Years)	End of Useful Life ⁹
Federal Building-Post Office-Courthouse	Rome, GA	1	18	2024
FEMA Federal Regional Center	Thomasville, GA	1	32	2010
Frank M. Johnson Jr. Federal Building and U.S. Courthouse	Montgomery, AL	3	25	2017
G. W. Andrews Federal Building and U.S. Courthouse	Opelika, AL	2	26	2016
Gene Snyder U.S. Courthouse and Custom House	Louisville, KY	1	25	2020
Howard H. Baker, Jr. U.S. Courthouse	Knoxville, TN	2	25	2017
Internal Revenue Service Annex	Chamblee, GA	3	25	2020
J. Roy Rowland Federal Courthouse	Dublin, GA	2	18	2024
James H. Quillen U.S. Courthouse	Greeneville, TN	2	23	2022
Joel W. Solomon Federal Building and U.S. Courthouse	Chattanooga, TN	1	38	2004
Joel W. Solomon Federal Building and U.S. Courthouse	Chattanooga, TN	1	21	2024
John J. Duncan Federal Building	Knoxville, TN	2	35	2010
L. Clure Morton United States Post Office and U.S. Courthouse	Cookeville, TN	1	62	1980
L.R. Preyer Federal Building-Post Office-Courthouse	Greensboro, NC	1	56	1989
L.R. Preyer Federal Building-Post Office-Courthouse	Greensboro, NC	1	25	2020
Martin Luther King Jr., Federal Building	Atlanta, GA	1	26	2019
Paul G. Rogers Federal Building and Courthouse	West Palm Beach, FL	2	30	2015
Peachtree Summit Federal Building	Atlanta, GA	3	22	2023
Post Office and Courthouse	Columbus, GA	1	32	2010
Post Office and Courthouse	Athens, GA	2	19	2023
Post Office and U.S. Courthouse	Lexington, KY	1	28	2017
Post Office and U.S. Courthouse	Lexington, KY	1	26	2019
Prince H. Preston Federal Building	Statesboro, GA	2	60	1982
R. G. Stephens Jr. Federal Building	Athens, GA	1	27	2015
R. L. Timberlake Jr. Federal Building	Tampa, FL	1	23	2022
R. L. Timberlake Jr. Federal Building	Tampa, FL	1	18	2024
Richard B. Russell Federal Building and U.S. Courthouse	Atlanta, GA	3	23	2022

Building Name	Building Location	Number of Chillers	Chiller Age (Years)	End of Useful Life ⁹
Romano Mazzoli Federal Building	Louisville, KY	1	58	1987
Romano Mazzoli Federal Building	Louisville, KY	1	20	2025
Sam M. Gibbons U.S. Courthouse	Tampa, FL	2	26	2019
Sam Nunn Atlanta Federal Center	Atlanta, GA	4	27	2018
T. G. Abernethy Federal Building	Aberdeen, MS	2	52	1993
T. G. Abernethy Federal Building	Aberdeen, MS	1	28	2014
U.S. Courthouse	Augusta, GA	2	29	2016
U.S. Courthouse	Covington, KY	2	24	2021
U.S. Courthouse	Statesville, NC	1	18	2024
U.S. Courthouse	Oxford, MS	2	17	2025
U.S. Courthouse Annex	London, KY	2	22	2023
U.S. Custom House	Charleston, SC	1	20	2022
U.S. Post Office and Courthouse	Pikeville, KY	2	19	2023
Veach-Baley Federal Complex	Asheville, NC	2	28	2017
Wilkie D. Ferguson, Jr. U.S. Courthouse	Miami, FL	1	19	2023
William Augustus Bootle Federal Building and Courthouse	Macon, GA	1	31	2014
William Augustus Bootle Federal Building and Courthouse	Macon, GA	1	20	2022
William H. Natcher Federal Building	Bowling Green, KY	1	20	2025
Total Chillers		110		

Appendix C – GSA Comments

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Public Buildings Service

January 27, 2023

MEMORANDUM FOR: MICHAEL LAMONICA
REGIONAL INSPECTOR GENERAL FOR
AUDITING
GREAT LAKES REGION AUDIT OFFICE (JA-5)

THROUGH: NINA ALBERT
COMMISSIONER 
PUBLIC BUILDINGS SERVICE (P)

FROM: KEVIN KERNS Rob L. Miller, Jr. /for/
REGIONAL COMMISSIONER
PUBLIC BUILDINGS SERVICE
SOUTHEAST SUNBELT REGION (4P)

SUBJECT: Response to the Office of Inspector General Draft Audit Report,
*PBS Southeast Sunbelt Region's Lack of Planning Has Resulted in
Chillers That Are Outdated, Inadequately Maintained, and Lack
Redundancy* (Audit Number A210030).

The Public Buildings Service (PBS) thanks the Office of the Inspector General (OIG) for the opportunity to review and comment on the subject audit report. PBS offers the following responses to the OIG's findings and recommendations.

PBS agrees with the OIG's recommendation that PBS perform a similar assessment of the condition of all chillers across PBS's nationwide portfolio. PBS also agrees to develop and implement a plan to address the results of the assessment.

The PBS Southeast Sunbelt Region (Region 4) reviewed the report, agrees with the findings and recommendations, and will develop an action plan to implement them. The following information is provided as additional context in relation to the draft audit report's findings.

Region 4 has a very robust and methodical planning approach to addressing necessary repairs that considers the needs of building systems in all of the buildings that we manage. We begin planning for projects 18-24 months in advance of requesting funding; reviewing all proposed projects with client agencies and through a formal GSA committee. We then prioritize these and execute once funds are received.

We also wish to clarify the redundancy requirement in the *P100, Facilities Standards for the Public Buildings Service*, (5.3.2.1 CHILLER PLANT). Older P100 versions had

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different requirements; recent versions have not allowed for redundancy due to financial limitations and efficiency requirements. The 2022 P100 states: "Peak cooling loads must be met using three equally sized chillers. The three chillers must be sized to meet the peak cooling load. Increasing chiller size for spare or backup capacity is not permissible."

For more than a decade, GSA's major repair and alterations budget request has been underfunded by approximately \$1 billion annually, or half of the annual amounts requested, which is now increasing deferred maintenance across GSA's real estate portfolio. Gaining full access to the annual revenues and collections in the FBF will allow us to more properly maintain the public assets we steward.

If you have any questions, please contact Kendra Turner, Director, Region 4 PBS Office of Strategy and Engagement at kendra.turner@gsa.gov.

Appendix D – Report Distribution

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Director, Audit Planning, Policy, and Operations Staff (JAO)