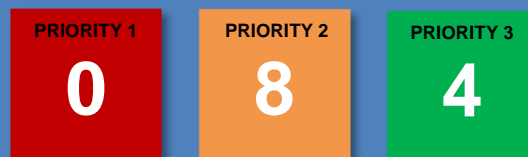


# TRANSFORMER SHOP INVENTORY & CONTROLS AUDIT

## NUMBER OF RECOMMENDATIONS



*City of Glendale  
Internal Audit*

06.29.2018



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**Acknowledgment**

*We would like to thank personnel from the Glendale Water & Power Department for their support and assistance provided to us throughout this project.*

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## A. Overview

### Key Outcomes

The Glendale Water & Power (GWP) electrical transformer physical inventory processes can be improved with the implementation of stronger controls, such as providing oversight over the process, documenting physical inventory results as well as operational policies and procedures.

The transformer inventory operation can be improved by actively utilizing the underlying data available in the transformer inventory database to help inform operational decisions. For instance, the Transformer Shop should consider using a data-driven approach through gap analysis, transformer aging analysis and obsolete inventory reviews to provide useful information for procurement decisions, and to establish optimal transformer stocking levels. However, prior to performing proactive data analytics, the data limitations of the database must be addressed and periodic quality controls established to improve data reliability.

The current process of transformer disposal can also benefit from stronger oversight by engaging the Finance Department and the Purchasing section in the process. GWP should also work with the current transformer disposal contractor to ensure up-to-date metal price listing is consistently provided to the City prior to any transformer shipments.

Internal Audit identified 12 improvement opportunities related to risk reduction, compliance, cost saving and efficiency. The detailed observations are included in the Observations, Recommendations & Management Responses Matrix beginning on page 9.

### Impact Dashboard

This table summarizes the applicable value-added categories (total nineteen) for the twelve recommendations based on their priority rankings and one innovation opportunity.

	Value Added Categories				Innovation Opportunities
	Risk Reduction	Compliance	Cost Saving	Efficiency	
Priority 2 <b>8</b>	4	4	1	4	1
Priority 3 <b>4</b>	1	3	1	1	0

(Definitions of priority rankings and value-added impacts are located in Appendix 1)

## B. Action Plan and Target Completion Dates

The action plan and target completion dates are summarized in the table below. Internal Audit will perform quarterly status follow-up to provide assurance that management is taking appropriate and timely corrective action to address audit recommendations.

Ref.	Management Action Plan	Completion Date <sup>1</sup>
<b>Priority 2</b>		
1.	Document and provide oversight for quarterly inventory counts, and reconcile in stock transformers with a TILM queried report. <i>Value added: <u>Risk Reduction</u>, <u>Compliance</u>, <u>Efficiency</u></i>	06/30/2019
2.	Perform data cleansing procedures on the current TILM dataset and establish periodic data quality control procedures going forward by streamlining data entry, to the extent possible. <i>Value added: <u>Risk Reduction</u>, <u>Efficiency</u></i>	06/30/2019
3.	Establish and document criteria for transformer disposals and perform obsolete inventory reviews. <i>Value added: <u>Cost Saving</u>, <u>Efficiency</u></i>	06/30/2019
4.	Use comparison and aging analyses to inform transformer procurement decisions. <i>Value added: <u>Efficiency</u>, <u>Innovation</u></i>	06/30/2019
5.	Document the PCB spill reporting definitions as provided by the City Attorney's Office in its Policies and Procedures. <i>Value added: <u>Risk Reduction</u></i>	06/30/2019
6.	Deactivate TILM database access upon employee separation, and discontinue the use of generic user ID's. <i>Value added: <u>Risk Reduction</u>, <u>Compliance</u></i>	06/30/2019
7.	Work with the Finance Department to implement relevant controls for transformer disposals. <i>Value added: <u>Compliance</u></i>	06/30/2019
8.	Request up-to-date salvage equipment pricing from vendor prior to shipment, and work with the Purchasing section to determine whether existing City equipment disposal procedures can be used instead of the contractor's procedures. <i>Value added: <u>Compliance</u></i>	06/30/2019

<sup>1</sup> The completion dates were provided by GWP based on a realistic evaluation of the workload.

Ref.	Management Action Plan	Completion Date <sup>1</sup>
<b>Priority 3</b>		
9.	Develop documented policies and procedures for the Transformer Shop inventory operation.  <i>Value added: <u>Risk Reduction</u>, <u>Compliance</u></i>	12/31/2019
10.	Work with the departmental systems analyst to identify whether recommended functionality improvements can be made to the TILM database.  <i>Value added: <u>Efficiency</u></i>	12/31/2019
11.	Ensure that the manufacturer operating guarantee is utilized for transformer failures covered under the said guarantee.  <i>Value added: <u>Compliance</u>, <u>Cost Saving</u></i>	12/31/2019
12.	Implement relevant controls to ensure methodological and reporting accuracy, reliability and soundness for key performance indicators (KPI) related to transformers.  <i>Value added: <u>Compliance</u></i>	12/31/2019

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## C. Background

In accordance with Internal Audit's fiscal year (FY) 2017-18 annual work plan, Internal Audit performed an audit of the GWP Transformer Shop Inventory and Controls.

A transformer is an electrical device that transfers electrical energy between two or more circuits through electromagnetic induction; transformers<sup>2</sup> are essential to the City's transmission, distribution and use of electrical power. GWP is the main City department that is responsible for providing electrical services to its customers. The GWP Transformer Shop staff, within the Electrical Services Division, manages operations including procurement, inventory, testing and servicing of transformers.

According to the FY 2017-18 budget, Electrical Services Division is one of the key components of GWP operations with a mission to provide safe, reliable and efficient electric service by making and maintaining continuous improvements in the power delivery system. The general mission of GWP is to cost effectively provide its customers with safe, efficient, reliable and sustainable water and power services at reasonable costs.

GWP is currently in the process of moving the transformer inventory function from the Transformer Shop to the GWP warehouse in order to improve inventory controls over transformers. According to Finance, transformers have been accounted for, either, by being expensed (to Fund 582 or 552 previously), or capitalized (to Fund 583 or 553 previously) as they are procured. The migration of the inventory function to the warehouse will help streamline accounting practices by adding transformers to inventory (using Surplus Fund 581) upon procurement, and charging to appropriate capital, or operation funds, when they are put in service.

### **Inventory Management Software**

GWP uses a proprietary inventory database called Transformer Inventory Load Management (TILM) to manage the transformer inventory; it was created by a former City employee in the mid-1990s using a software language that is no longer widely-used. A GWP systems analyst and a consultant provide *limited* technical support for the custom database; consequently, the functionality of the database can be improved in a few areas that are detailed in audit findings that follow. Any functionality changes made to TILM must be made by the consultant on an hourly basis.

TILM provides basic inventory management functionality such as viewing and editing transformer records, searching for transformers based on a variable such as PCB content or voltage. GWP staff also use TILM to reserve transformers that are to be installed, as well as search for transformer failures and overload data among other features. The database contains rich data, both historical and current, on transformers such as status, cost, make, type, size, service history including installation and removal dates and any

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<sup>2</sup> There are 3 main types of transformers that the City use: overhead (mounted on electrical poles), underground residential distribution transformers and pad-mounted transformers, which are ground mounted electric power distribution transformers in a locked steel cabinet mounted on a concrete pad.

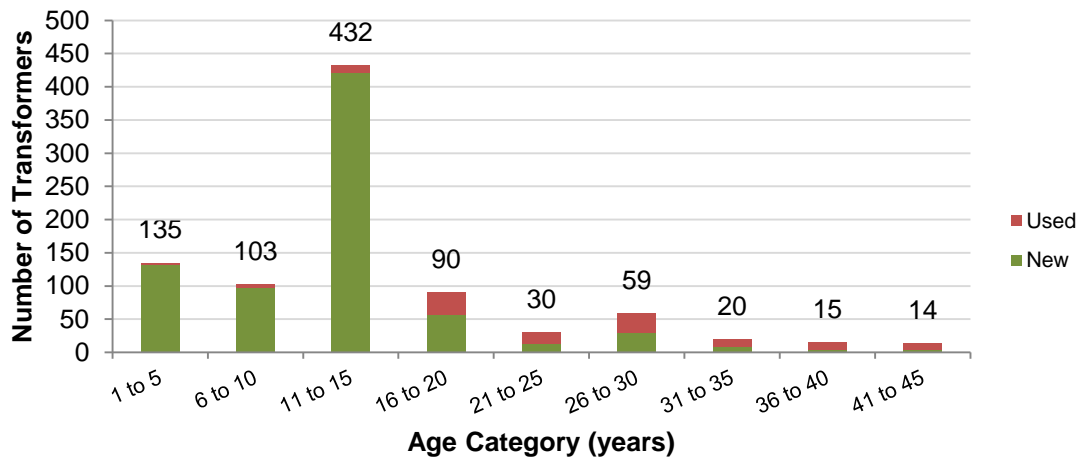
applicable PCB test information. This data can be effectively used to inform inventory and operational decisions.

As noted in this report, the data has some quality issues due to the fact that a few of its data entry inputs are manual and prone to human error; nonetheless, the magnitude of the error still allows for meaningful data analysis.<sup>3</sup>

**In Stock Transformers**

As of March 2018, there were 898 transformers in stock at the GWP warehouse, of which 676 (or 75%) are of the overhead variety. The transformers are typically dual voltage with the most common type being 120/240V. There are 766 brand new transformers in stock and 132 that have been serviced at least once. The total cost to purchase the in stock transformers was about \$2.6 million.

**Exhibit 1: In Stock Transformers by Age Category**

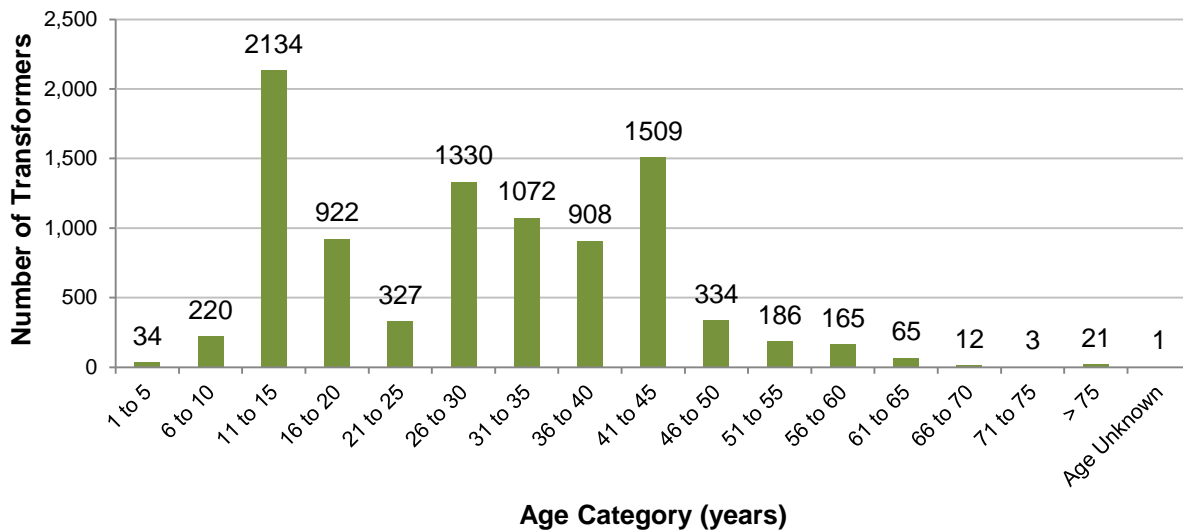


**Active Transformers**

As of March 2018, there were 9,243 active transformers in the City with more than half being of the overhead variety. Per Exhibit 2, 25% of the active transformers are more than 40 years old. The transformers cost about \$16 million to purchase.

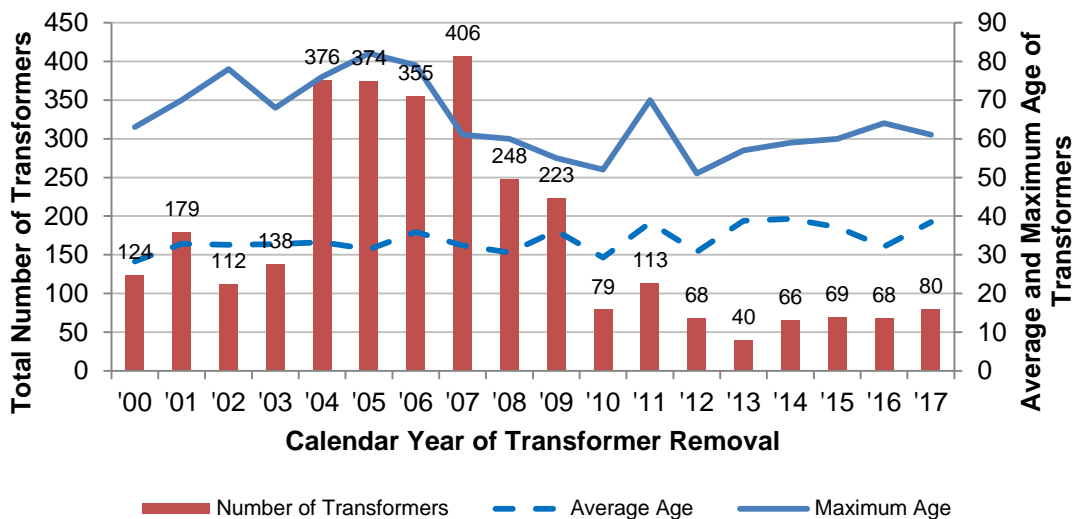
<sup>3</sup> All statistical information presented in this audit report is from the TILM database, as of March 2018.

**Exhibit 2: Active Transformers by Age Category**



Per Exhibit 3 below, for the past 18 calendar years, the average age at which transformers were permanently removed from service, fluctuated between 28 and 39 years of age. The maximum age at which transformers were removed fell between 51 and 82 years of age.

**Exhibit 3: Transformer Removals from Service by Calendar Year, Average and Maximum Age**



There is currently no maintenance program for the transformers, as per GWP staff, it is more costly to repair a transformer than to procure a new one. The Transformer Shop performs diagnostic testing on all transformers prior to use.

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## D. Objective, Scope and Methodology

The objective of the GWP Transformer Shop Inventory and Controls Audit was to determine whether adequate controls are in place for the inventory management of the GWP electrical transformers.

The scope of this audit covers GWP transformer inventory for FY 2017-18, including data analysis that covers other periods.

In order to achieve the audit objective, Internal Audit performed the following:

- Interviewed staff in GWP's Electrical Section, Environmental Compliance, Business System Support, as well as in the Finance department regarding transformer inventory procedures, the transformer management database, disposal procedures, environmental compliance regulations, information system user access controls as well as key performance metrics.
- Conducted a walk-through of the in stock transformers at the GWP yard to review existing inventory controls pertaining to authorized access, transformer warranties and periodic physical inventory procedures.
- Sampled 102 transformers (out of the 898 in stock transformers per TILM) at the GWP yard for completeness and existence by considering the age, cost, type and PCB content.
- Analyzed the transformer installations in 2017 to determine whether the "first-in, first-out" inventory best practice has been applied.
- Obtained and analyzed electrical transformer historical data by reviewing statistical information for in stock, active and disposed transformers. Reviewed data limitations within the TILM database.
- Performed an appropriateness test on the active TILM user access list to identify any employees that have access to the database but have separated from the City.
- Reviewed KPIs from FY 2012-13 to FY 2016-17 related to electrical transformers for accuracy and appropriateness.
- Evaluated whether transformers containing PCBs are being handled according to regulations.
- Reviewed transformer disposal procedures.

As a result of these audit procedures performed, twelve observations were identified and are detailed in the Observations, Recommendations & Management Responses Matrix in the pages that follow.

## E. Observations, Recommendations & Management Responses

Ref	Observation	Recommendation	Management Response
<b>1.</b>	<b>Inventory Process Improvements</b>		
Priority 2	<p>The quarterly inventory of transformers is not documented, or reviewed by a supervisor. The same position that is responsible for inventory can also modify transformer records in the TILM database, which per the APM should be separated.<sup>4</sup></p> <p>The transformer list that is used for inventory is generated from the TILM's end-user interface, which is not an efficient way to comprehensively inventory the transformers at the GWP yard, as it does not show detailed information, such as serial number, voltage, status, etc.</p> <p>8 of the 102 sampled transformers at the yard had eroded labels related to transformer numbers. 1 transformer needs to be tested for PCB content and be labeled accordingly.</p> <p>Currently, transformers can only be located by going through entire sets of transformers that are placed at the yard by size, which can be time consuming.</p>	<p>GWP perform the following:</p> <ol style="list-style-type: none"> <li>Document the quarterly inventory counts, archive them for a minimum of 1 year and include the total count of all transformers. It should also include an accuracy rate and the date the inventory was performed.</li> <li>Supervisory oversight should be provided for the inventory count, as well as for any changes to transformer records in TILM.</li> <li>Create a queried TILM report of all in stock transformers to be used for quarterly inventory.</li> <li>Replace eroded labels.</li> <li>Create layout maps of transformers to easily locate them.</li> </ol>	<p>Agrees and will implement by June 30, 2019.</p> <p>GWP staff/management will perform the following:</p> <ol style="list-style-type: none"> <li>Document quarterly inventories and archive them.</li> <li>Provide supervisory oversight for the quarterly inventory counts as well approve changes to TILM records. Separation of duties will be addressed when transformers are moved under Warehouse supervision.</li> <li>Create a queried TILM report, quarterly, listing in stock transformers.</li> <li>Staff is currently in the process of replacing aged labels.</li> <li>Staff has already created layout maps of transformers to provide efficient location information.</li> </ol>

<sup>4</sup> APM (Administrative Policy Manual) 3-13 Inventory Management states that, "An employee should not be in a position where he or she has access to records and at the same time has control of material".

Ref	Observation	Recommendation	Management Response
<b>2. TILM Data Quality Limitations and Controls</b>			
<b>Priority 2</b>	<p>The TILM database has data reliability issues due to the fact that some of its fields have manual data entry. About 900 (or 6%) of the total transformers<sup>5</sup> have data quality issues<sup>6</sup> in the following categories:</p> <ul style="list-style-type: none"> <li>• <u>Data Consistency and Accuracy</u> <ul style="list-style-type: none"> <li>○ This category contains transcription and transposition errors that have affected PCB test result, PCB test type, serial numbers, transformer cost and purchase order numbers. The PCB test result field contained the most number of inconsistent data entries, for example, about 1/3 of entries contain just values while about 2/3 contain values with letters and symbols such as 2 PPM, 2 PCB, 2 PM, 2 PPPM or &lt; 2 PPM.</li> </ul> </li> <li>• <u>Transformer Status Not Updated</u> <ul style="list-style-type: none"> <li>○ 22 (or 0.15%) of total records</li> </ul> </li> <li>• <u>Default or Out of Range Date</u> <ul style="list-style-type: none"> <li>○ 521 (or 3.50%) of total records</li> <li>○ This category can affect aging analyses.</li> </ul> </li> <li>• <u>Data Not Available</u> <ul style="list-style-type: none"> <li>○ 495 (or 3.32%) of total records</li> <li>○ This category has affected PCB transformers without test results, manufactured prior to 1979, although the general PCB category indicates that these do not contain PCBs.</li> <li>○ This category also shows around 200 transformers that have been disposed with no apparent service dates.</li> </ul> </li> </ul>	<p>GWP perform the following:</p> <ol style="list-style-type: none"> <li>a. Streamline data entry where possible, and provide training to staff on entering data in a standardized manner.</li> <li>b. Perform data cleansing procedures and ensure that physical transformer data matches the TILM database.</li> <li>c. Establish periodic data quality control procedures.</li> </ol>	<p>Agrees and will implement by June 30, 2019.</p> <p>GWP staff will perform the following:</p> <ol style="list-style-type: none"> <li>a. Streamline data entry where possible and will provide training to staff on entering data in a standardized manner.</li> <li>b. Staff has already started to perform appropriate data cleansing procedures to the TILM database.</li> <li>c. Establish periodic data quality control procedures.</li> </ol>

<sup>5</sup> Transformer records totaled 14,891 in the TILM database, as of March 2018.

<sup>6</sup> Note: the data quality issues provided above were identified through analysis of TILM data as well as by physically sampling transformers at the GWP yard. The total numbers do not represent unique transformers; the same transformer may have issues across different data quality categories. The data quality issues represent transformers that are active, in stock or reserved in TILM; the category of "Data Not Available" includes transformers in the Junk and Sold/Exchange statuses.

Ref	Observation	Recommendation	Management Response
<b>3. Establish and Document Criteria for Transformer Disposals</b>			
<b>Priority 2</b>	<p>Criteria for transformer disposals are currently not documented in policies and procedures, and also the reason for transformer disposals is not noted in TILM. Based on review of TILM database fields and sample testing, we noted the following:</p> <ul style="list-style-type: none"> <li>• TILM records show close to 200 transformers that have been disposed with no apparent service dates. These transformers cost around \$300,000 and were purchased between 1971 and 2007. It is unclear whether these transformers were actually in service and do not have service history entered into TILM, or whether, they have never been used.</li> <li>• Sample testing of the calendar year 2017 transformer disposals showed one transformer that had been disposed without use. It had been in stock for 38 years prior to disposal. Two transformers were disposed due to visible signs of inoperativeness, such as leaking or rusting, and a determination could not be made whether the lack of service dates means that they had never been used. 5 used transformers had been in stock for 10 years or more, but due to long periods of inactivity had become visibly damaged.</li> <li>• TILM data analysis has also identified 14 transformers in stock that are 40 years and older (see Background Exhibit 1). These transformers were also physically located in stock at the GWP yard. It is unclear whether these transformers can still be used.</li> </ul>	<p>GWP perform the following:</p> <ol style="list-style-type: none"> <li>a. Document in Policies and Procedures how transformer disposal determinations are made, especially, in case of disposal without servicing.</li> <li>b. Going forward, the cause of disposal for unused transformers should be entered into TILM as “Disposed without Use” under the category recommended in Item 10.</li> <li>c. Prior to transformer disposal, ensure that the transformer records in TILM are up-to-date in all categories including service history.</li> <li>d. Review the current in stock transformers beyond 40 years of age and determine whether they should be disposed of, and establish periodic obsolete inventory reviews.</li> </ol>	<p>Agrees and will implement by June 30, 2019.</p> <p>GWP staff will perform the following:</p> <ol style="list-style-type: none"> <li>a. Document how existing transformer disposal determinations are made.</li> <li>b. Document transformers that may be disposed without use in TILM under the category called “Disposed without Use”.</li> <li>c. Ensure that, prior to disposal, transformer records are up-to-date in TILM for all categories including service history.</li> <li>d. Review the current aging in stock transformers, and going forward, perform periodic obsolete transformer inventory reviews.</li> </ol>

Ref	Observation	Recommendation	Management Response
<p style="color: #A52A2A; font-weight: bold;">Priority 2</p>	<p><b>4. Optimal Stocking Levels and Aging Transformers</b></p> <p>TILM data is not used to identify aging transformers and determine optimal stocking levels. Based on TILM data review, the following analyses can be used to guide procurement decisions:</p> <ul style="list-style-type: none"> <li>• A comparative analysis of in stock and active transformers by size, voltage, impedance as well as the average age and quantity of transformers can help identify stocking gaps, see sample analysis in Appendix 2.</li> <li>• A trend analysis of active transformers that are nearing 40 years of age.</li> </ul> <p>These analyses can be used to make more informed decisions about the most optimal spare transformer stocking levels to maintain the service reliability of the power distribution network, and avoid overstocking and potential waste. As Background Exhibit 3 shows, transformers are removed from service, on average, at around 40 years of age per TILM. Tracking the age of active transformers can aid in providing useful information to more effectively guide procurement decisions.</p>	<p>GWP use data analytics to increase operational efficiency, and specifically consider the following analytical perspectives:</p> <p>Perform comparative analysis between in stock and active transformers, and track the percentage of active transformers nearing age 40 to better inform transformer procurement decisions.</p>	<p>Agrees and will implement by June 30, 2019.</p> <p>GWP management will use comparative analysis in conjunction with tracking the total number of active transformers nearing the end of useful life to inform transformer procurement decisions.</p> <p>In addition, GWP has proactively evaluated establishing a purchase order to reduce the procurement time for transformers and to optimize stocking levels.</p>

Ref	Observation	Recommendation	Management Response
<b>5. Detailed Policies and Procedures for Potential PCB Transformer Spills</b>			
<b>Priority 2</b>	<p>TILM data shows 303 active transformers that are above the state PCB threshold of 5 ppm. Electrical transformers can contain PCBs and still be in-use, permitting that they are adequately labeled and contained. According to TILM records, 6 of the active transformers contain PCB content that meets the federal threshold of 50 ppm.</p> <p>Although PCB transformers may pose a spill risk in case of significant spills, according to GWP staff, <i>none of the active transformers are at risk due to the low concentrations of PCBs</i>. The average age of the active PCB (&gt;5ppm) transformers is 52 years; see Exhibit 1 in Appendix 3 for more details.</p> <p>The City Attorney’s Office has provided a legal interpretation of applicable state and federal PCB spill-related regulations and has recommended that it be GWP policy to report PCB spills that meet the following criteria:</p> <ul style="list-style-type: none"> <li>• Any spills involving more than 10 lbs. of material that potentially contain &gt; 5 ppm PCB; or</li> <li>• Any spills of potentially PBC-containing material that is &lt;= 5ppm that, either, “directly contaminates surface water, sewers, or drinking water supplies”, or “directly contaminates grazing lands or vegetable gardens”; or</li> <li>• Any spills, regardless of size or specific impact, that GWP staff reasonably believe to be “significant”, or that would pose a “significant present or potential hazard to human health, safety, property, or the environment”.</li> </ul>	<p>GWP should document the management of PCB transformers including PCB spill reporting protocol as provided by the City Attorney’s Office in its Policies and Procedures (cross-referencing any other applicable City policies).</p>	<p>Agrees and will implement by June 30, 2019.</p> <p>GWP will document the PCB spill reporting definitions as provided by the City Attorney’s Office in its Policies and Procedures.</p> <p>GWP will initiate an active transformer replacement program that prioritizes replacement based on PCB content. Once all transformers with PCB content &gt;5 ppm are replaced, prioritization of replacement will be based upon age. This program will be implemented by June 30, 2019.</p>

Ref	Observation	Recommendation	Management Response
<b>6. TILM Database User Access Controls</b>			
<b>Priority 2</b>	<p>A reconciliation between the current active employees and the TILM active users, as of April 2018, found that 134 employees have access to TILM that no longer work for the City. We confirmed with GWP that these terminated employees have had their general access to the City’s network removed, however, the TILM access has not been removed.</p> <p>Internal Audit also found 14 generic/group accounts (e.g., Emergency Center, AGM) in the user access list, although the GWP Security Policy<sup>7</sup> states that, “Generic/Group user names and password will not be authorized”.</p>	<p>GWP implement the following controls:</p> <ol style="list-style-type: none"> <li>a. Deactivate TILM database access upon employee termination, or when employee no longer has responsibilities that require access to TILM.</li> <li>b. Discontinue or document the business needs of providing access through generic user ID’s and establish compensating controls to ensure appropriate access.</li> <li>c. Assign TILM database user access monitoring responsibilities, and perform periodic ongoing reviews to ensure appropriate access to TILM.</li> </ol>	<p>Agrees and will implement by June 30, 2019.</p> <p>GWP will implement the following:</p> <ol style="list-style-type: none"> <li>a. GWP will implement alternative solutions (e.g., Citrix) to enhance access controls to TILM.</li> <li>b. Discontinue or validate the business needs of providing access through generic user ID’s and establish compensating controls to ensure appropriate access.</li> <li>c. Perform ongoing reviews of the TILM user listing to ensure that access to the database is granted to authorized employees only.</li> </ol>

<sup>7</sup> Version 1.0 Security Policy for Access to GWP Systems II. Procedures Section A (5)

Ref	Observation	Recommendation	Management Response
<b>7. Transformer Disposal Process</b>			
<b>Priority 2</b>	<p>Based on review of 93 transformers that were disposed through four shipments in calendar year 2017, we noted the following:</p> <ul style="list-style-type: none"> <li>a. Per APM 3-11 Purchasing Policy, Form O-25 Property Transfer/Disposal Request must be used for any equipment disposal. GWP currently does not use this form to dispose transformers.</li> <li>b. Per federal regulation<sup>8</sup>, the manifest used for disposed PCB transformers must list the earliest date of removal from service for disposal. None of the 2017 transformer disposal manifests contain PCB transformer removal dates.</li> <li>c. The status for 8 transformers was not updated to the disposed category from the “Junk” category, although they had been disposed in 2017.</li> </ul>	<p>GWP implement the following controls:</p> <ul style="list-style-type: none"> <li>a. Work with the Purchasing section to properly dispose of transformers through the use of Form O-25.</li> <li>b. Ensure the earliest removal date of PCB transformers is included in the manifest in Item 14 and reference the applicable federal regulation in Policies and Procedures.</li> <li>c. Periodically reconcile disposed transformers with the TILM database to ensure that transformers are in the correct status category.</li> </ul>	<p>Agrees and will implement by June 30, 2019.</p> <p>GWP will review policies and regulations for applicability and implement the following:</p> <ul style="list-style-type: none"> <li>a. Work with the Purchasing section to implement relevant controls for the transformer disposal.</li> <li>b. Ensure that the earliest date of PCB transformers is provided in the manifest in Item 14. In addition, GWP will add a separate column of removal dates on the disposed transformer list.</li> <li>c. Periodically reconcile disposed transformers with the TILM database to ensure that transformers have appropriate status categories and to provide safeguards against theft.</li> </ul>

<sup>8</sup> Title 40 CFR 761.207 (a) (2) states that, “For each PCB article Container, or PCB Container, the unique identifying number, type of PCB waste (e.g., soil, debris, small capacitors), earliest date of removal from service for disposal” shall be provided on the disposal manifest in Item 14 – Special Handling Instruction box.





Ref	Observation	Recommendation	Management Response
<b>10. TILM Database Functionality Improvements – Continued on Next Page</b>			
<b>Priority 3</b>	<p>Upon review of TILM data and its functionality, we noted the following improvements:</p> <ul style="list-style-type: none"> <li>• The transformer status category of “Sold/Exchange” is currently used to denote primarily disposed transformers, but is also used to track transformers that are part of the Mutual Aid program. The transformer status category of “Junk” is used to denote both historically junked transformers and those pending disposal. In order to efficiently review current transformer junk, the “Junk” category should be replaced with “Pending Disposal”. Additionally, tracking the date and reason for transformer disposal would improve operational transparency.</li> <li>• We found 3 instances where the same transformer had 2 different transformer numbers, yet the status of the obsolete transformers numbers still showed as “In Stock”, in effect inflating the total number of transformers that are actually in stock.</li> <li>• Currently, the removal cause of a given transformer is not gathered comprehensively in TILM, with only about 25% of permanent transformer removals having associated removal causes listed. The category of “Failed Cause” is used to capture any removal causes noted by field crew staff as they remove transformers from service. The removal causes started being tracked in TILM in 2009, and currently include the following categories: “Animal”, “Overload”, “Defective”, “Connection”, and “Oil Leak”.</li> </ul>	<p>GWP consider updating the following features in TILM for more effective data analytics:</p> <ol style="list-style-type: none"> <li>a. Replace Transformer Status categories of “Sold/Exchange” and “Junk” with separate categories called “Disposed” – to capture permanently disposed transformers and “Pending Disposal” – to capture transformers pending disposal.</li> <li>b. A separate category called “Mutual Aid” – to capture transformers involved with the program.</li> <li>c. Separate categories of “Date of Disposal” and “Reason for Disposal” should be added to the TILM database.</li> </ol>	<p>Agrees and will implement by December 31, 2019.</p> <p>GWP will work with the departmental systems analyst to identify whether the recommended functionality improvements can be made to the TILM database.</p> <p>GWP will proactively perform assessments on all failed transformers and document the causes of failure in TILM. Any trends that may result from the assessment will be used to improve inspections.</p>

Ref	Observation	Recommendation	Management Response
<b>10. TILM Database Functionality Improvements - Continued</b>			
<b>Priority 3</b>	<p><b>-Continued from previous page-</b></p> <ul style="list-style-type: none"> <li>• The current transformer inventory module, “Search”, allows customization of transformer lists by voltage, PCB content and impedance among other categories. The addition of age to the search criteria would help staff to quickly review aging in stock and active transformers.</li> </ul>	<ul style="list-style-type: none"> <li>d. Create a separate transformer status category called “Not Active” to track transformer numbers that are no longer in use due to transformer number or any other changes.</li> <li>e. Replace “Failed Cause” field with “Removal Cause”, to denote the exact cause of permanent removal. The list of possible causes of permanent transformer removal should be reviewed for exhaustiveness.</li> <li>f. Add “age” to the sorting criteria in the “Search” module to review aging in stock and active transformers.</li> </ul>	

Ref	Observation	Recommendation	Management Response
<b>Priority 3</b>	<b>11. Use of Manufacturer Operating Guarantee</b>		
	<p>Bid specifications to a 2018 transformer purchase order provide for an Operating Guarantee such that, "The Contractor shall guarantee for a period of one years after delivery, that all equipment and appurtenances furnished by the Contractor shall be free from defects of material, workmanship, design, or construction. The Contractor shall replace any defective material or equipment which shall develop faults during said period of one year." According to GWP staff, Operating Guarantee has not been used to replace any applicable transformers.</p> <p>Although very few transformers meet the criterion of being serviced and developing faults within the same year, audit testwork found that there were 2 transformers that were disposed within the same year of purchase.</p>	<p>GWP should ensure that the Operating Guarantee is utilized for transformers that default within the warranty's specified time period.</p>	<p>Agrees and will implement by December 31, 2019.</p> <p>GWP staff will ensure and document that the manufacturer operating guarantee is utilized in the event of a transformer mechanical breakdown within the warranty period.</p>

Ref	Observation	Recommendation	Management Response
<b>Priority 3</b>	<p><b>12. Key Performance Metrics</b></p> <p>The 2 KPI metrics for the GWP transformer operation were reported incorrectly.</p> <p>The first metric, "Percentage of Overloaded Transformers", tracks the number of transformers that are overloaded (120% or more) compared to the total number of active transformers for that period. Although the methodology used to arrive at the metrics is reasonable, it was not carried out accurately and was reported incorrectly.</p> <ul style="list-style-type: none"> <li>The "Percentage of Overloaded Transformers" metric was reported as 46% for FY 2016-17 and 17% for FY 2015-16 in the City's KPI report, annual report and budget document. Upon review of supporting documentation, we noted that the reason behind the inflated values for the 2 fiscal years was due to the methodology not being carried out accurately.</li> </ul> <p>The second metric, "Number of Transformer Failures", tracks the total number of failed transformers in a fiscal year. The "Number of Transformer Failures" metric was reported incorrectly for 3 of the past 5 fiscal years:</p> <ul style="list-style-type: none"> <li>In FY 2012-13 and FY 2013-14, GWP reported 10 failures while the reviewed data yielded only 9 failures. It appeared that one duplicate was included.</li> <li>In FY 2015-16, GWP reported 19 failures while the reviewed data yielded only 14. The reason of the discrepancy cannot be determined.</li> </ul>	<p>GWP performing the following:</p> <ol style="list-style-type: none"> <li>Review the data collected for the transformer related metrics for reliability and accuracy and ensure that the methodology is sound and documented. To ensure reporting accuracy, the KPIs should also be reviewed by a supervisor.</li> <li>Ensure that the next cycle of the KPI report, annual report and the budget document contain, if possible, corrected values and/or notes indicating the corrected values for a given fiscal year.</li> <li>Report the "Number of Transformer Failures" as well as a "Rate of Transformer Failures" in order to provide context for the metric.</li> </ol>	<p>Agrees and will implement by December 31, 2019.</p> <p>GWP staff will implement the relevant controls to ensure accuracy, reliability and soundness of KPI reporting. GWP staff will report the "Rate of Transformer Failures", in addition to the "Number of Transformer Failures", in order to provide contextual background.</p>

## Appendix 1: Definitions of Priority Rankings and Value-Added Categories

### Definitions of Priority Rankings

The priority rankings are assigned by internal auditors based on their professional judgment. They are also agreed upon by management based on their evaluation of the alignment with the strategic goals, priorities and available resources. A timeline has been established based on each priority ranking:

- a. **PRIORITY 1** - Critical control weakness that exposes the City to a high degree of combined risks. Priority 1 recommendations should be implemented within **3 months** from the first day of the month following report issuance or sooner if so directed.
- b. **PRIORITY 2** - Less than critical control weakness that exposes the City to a moderate degree of combined risks. Priority 2 recommendations should be implemented within **6 months** from the first day of the month following the report issuance or sooner if so directed.
- c. **PRIORITY 3** - Opportunity for good or better practice for improved efficiency or reduce exposure to combined risks. Priority 3 recommendations should be implemented within **9 months** from the first day of the month following the report issuance or sooner if so directed.

### Definitions of Value-Added Categories

The four value-added impact categories are defined based on their impact from the audit recommendations:

- a. **COMPLIANCE** - adherence to laws, regulations, policies, procedures, contracts, or other requirements.
- b. **COST SAVING** - lower the costs related to conducting City business.
- c. **EFFICIENCY** - ability to avoid wasting resources (money or time) in achieving goals.
- d. **RISK REDUCTION** - lower the risks related to strategic, financial, operations and compliance.

In addition, the **INNOVATION OPPORTUNITY** tag indicates the assistance and consulting services that may be provided by the Innovation and Performance Team.

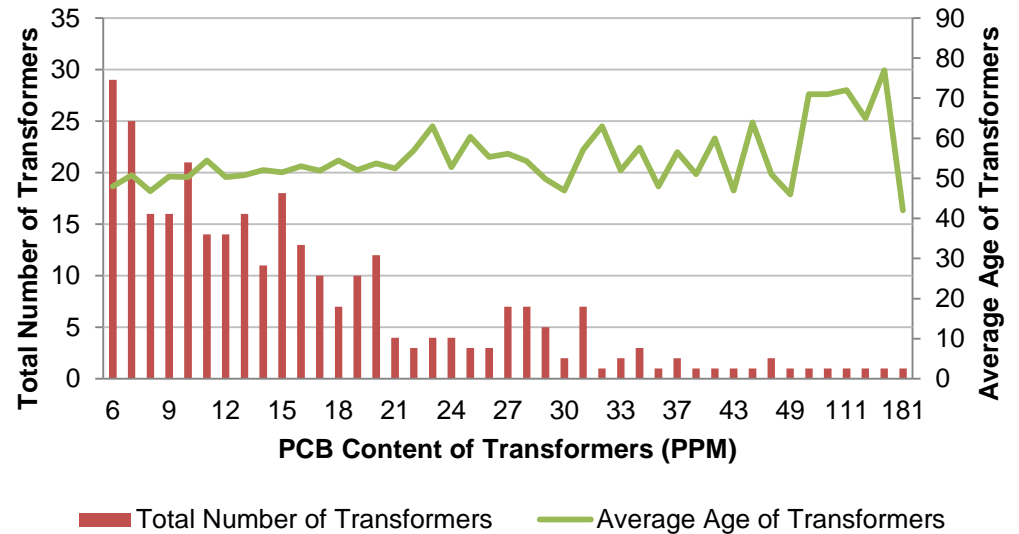
## Appendix 2: Comparative Analysis of Active and In Stock Overhead Type (2.4 to 7.2 kVA) Transformers as of March 2018

Transformer Size	Transformer Secondary Voltage	In Stock		In Use	
		Total Number of Transformers	Average Age	Total Number of Transformers	Average Age
25	120/240	228	11	965	27
	240/480	9	17	26	42
38	120/240	None Available		14	45
50	120/208	None Available		3	12
	120/240	149	4	1701	22
	240/480	13	18	19	43
	277/480	6	11	None in Use	
75	120/240	35	4	687	22
	240/480	20	22	9	23
100	120/240	53	11	88	21
	240/480	31	15	None in Use	
167	120/208	None Available		5	46
	120/240	3	44	21	45
	240/480	5	42	15	44
	277/480	2	42	15	43
250	277	26	18	9	13
	120/208	None Available		3	28
	120/240	4	29	83	23
	240/480	11	21	12	34
	277/480	None Available		73	32
333	120/208	None Available		2	30
	120/240	11	29	22	28
	240/480	18	27	12	26
	277/480	6	39	92	32
500	277	7	10	13	21
	120/208	1	10	None in Use	
	120/240	4	13	3	29
	240/480	8	32	4	40
	277/480	1	42	75	32

## Appendix 3: Active Transformers with PCB Content

Transformers manufactured prior to 1979<sup>11</sup> can be assumed to contain polychlorinated biphenyls (PCBs), which are synthetic chemicals that are no longer produced in the United States; however, they were previously used in transformer coolants and lubricants. The manufacturing of PCBs was stopped in the U.S. in 1979 because of evidence that they build up in the environment and cause harmful health effects. The State of California also regulates the threshold at which an equipment can be said to contain PCBs at a more stringent level than its federal counterpart.<sup>12</sup> It is important to note that even though PCB content is regulated at a threshold level, *active* equipment containing PCBs can be used, permitting that it is adequately labeled, properly cleaned-up in case of exposure and disposed according to regulations.

**Exhibit 1: Active Transformers with PCB Content > 5 PPM**



Per TILM and physical verification of sampled transformers, none of the in stock transformers contain PCBs. Per the exhibit above, there are 303 active transformers that contain PCB content > 5 ppm.

<sup>11</sup> Code of Federal Regulations (CFR) Title 40 Section 761.2 (a) (2) states that, "Any person must assume that mineral oil-filled electrical equipment that was manufactured before July 2, 1979, and whose PCB concentration is not established is PCB-Contaminated Electrical Equipment (i.e., contains ≥ 50 ppm [parts per million] PCB, but <500 ppm PCB).

<sup>12</sup> California Code of Regulations Title 22 Section 66261.24 Characteristic of Toxicity lists PCBs as organic persistent and bio accumulative toxic substance and its threshold limit concentration at 5 ppm.