UNIVERSITY OF
TEXAS
ARLINGTON

REVIEW OF CHEMICAL SAFETY INVENTORY SYSTEM
FEBRUARY 18, 2014

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UNIVERSITY OF TEXAS ARLINGTON | INTERNAL AUDIT

MEMORANDUM

TO: Dr. Vistasp Karbhari
President

FROM: Ken Schroeder
Director, Office of Internal Audit

DATE: April 10, 2014

SUBJECT: Review of Chemical Safety Inventory System Audit Report Dated February 18, 2014

Executive Summary

We have completed the review of the chemical safety inventory system as included in our FY 2014 annual audit plan.

The University has a system to record and manage chemicals purchased for educational and research purposes known as CEMS, Chemical Environmental Management System, which is managed by the Environmental Health and Safety Office (EH&S). The University was one of the first to undertake implementation of a CEMS which has added to efficiency, effectiveness, and improved safety.

The objective of this engagement was to review the chemical safety inventory system to ensure the accuracy of the CEMS listing as it compares to the actual chemicals in the labs, and verify that there are no outdated chemicals.

Based on our review of CEMS, departments' purchases of chemicals are generally recorded in the system. There were, however, a number of inventory process deficiencies identified, such as missing barcoded chemicals, non-barcoded chemicals, barcoded chemicals not in CEMS, and the overall handling of missing chemicals by EH&S. We also noted deficiencies in the management of user access rights to CEMS. Our review resulted in recommendations that aim to improve timely accounting of chemical inventory. These recommendations are considered significant to the process or department and are summarized as follows:

- Implement a chemical inventory policy that conforms to best practices and satisfies Federal and State regulatory requirements
- Automate detection and reporting of expired chemicals
- Conduct a periodic physical count of the chemical inventory in each laboratory and reconcile to the CEMS inventory listing noting any discrepancies
- Develop a formal process for the reporting and investigation of missing chemicals
- Enforce processes concerning the arrival of new chemicals for barcoding and entry into CEMS, and the classification of chemicals deemed empty

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- Work with the CEMS vendor on the use of valid barcode numbers
- Limit access to CEMS on a need-to-do/need-to-know basis
- Obtain documented authorization for each CEMS user and role assigned

We appreciate the courtesy and cooperation we received from the EH&S and lab staffs throughout this audit. If you have any questions, please contact me at extension 2-2018.

cc: Dr. Ronald L. Elsenbaumer, UT Arlington, Provost and Vice President for Academic Affairs
Ms. Kelly Davis, UT Arlington, Vice President for Business Affairs and Controller
Mr. John Hall, UT Arlington, Vice President for Administration and Campus Operations
Ms. Leah Hoy, UT Arlington, Director of Environmental Health & Safety
Dr. Pedro Reyes, UT System, Executive Vice Chancellor for Academic Affairs
Mr. Alan Marks, UT System, Attorney – General Law Section
Mr. J. Michael Peppers, UT System, Chief Audit Executive
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Mr. Ed Osner, Legislative Budget Board
Mr. Jonathan Hurst, Governor's Office of Budget, Planning and Policy
Internal Audit Coordinator, State Auditor's Office
Mr. Ken Levine, Sunset Advisory Commission
Report File

Background Information

The University uses the Chemical Environmental Management System (CEMS), which is a barcode-based system to record and manage information about the quantity, location and properties of chemical stock and biological agents. It automates record-keeping, requests for hazardous waste removal, allows access to chemical Safety Data Sheets, allows sharing of materials among campus labs, and has a messaging feature that facilitates communication between various CEMS users. New chemicals are bar-coded and added to the system by the Environmental Health and Safety (EH&S) Office CEMS administrator. Empty chemical containers can be removed (coded as empty) from the system by any CEMS user who has been given basic CEMS access and training.

UT Arlington was the first UT academic institution to undertake the implementation of such a system, which was a significant task for the EH&S office, who administers the use of CEMS. This type of system is not required or intended to satisfy Federal and State regulatory requirements – its purpose being to have a system in place that provides a general idea of the chemicals in a given room and/or building for fire and life safety purposes, and to have an effective inventory system in place for efficiency purposes (i.e. sharing to reduce costs and reduce disposal costs).

Objective

The objective of this engagement was to review the chemical safety inventory system to ensure the accuracy of the CEMS listing as it compares to the actual chemicals in the labs, and verify that there are no outdated chemicals.

Scope and Methodology

Our examination was conducted in accordance with guidelines set forth in the Institute of Internal Auditors' *International Standards for the Professional Practice of Internal Auditing.* These *Standards* set criteria for internal audit departments in the areas of independence, professional proficiency, scope and performance of audit work, and management of the internal auditing department. UT System policy UTS 129 titled "Internal Audit Activities" requires that we adhere to the *Standards.*

To achieve the audit objective, we physically verified the chemicals inventory of sampled laboratories and stockrooms against the CEMS listing as of November 15, 2013, and interviewed key personnel. The audit findings and recommendations were discussed with the clients, and management responses were obtained and have been incorporated in this audit report.

Audit Results

Preliminary Survey

During the planning phase of the audit, we performed a risk assessment that identified the existing controls and weaknesses in the chemical inventory process. We informed EH&S that we would make recommendations to correct the weaknesses noted during this preliminary gathering of information.

Observation #1 – Absence of Chemical Inventory Policy
The University does not have a policy governing chemical inventory. There are, however, standard operating procedures to guide users on how to update CEMS. EH&S is in the process of drafting a policy for chemical inventory.

Recommendation:
The EH&S management should implement a chemical inventory policy that conforms to best practices and satisfies Federal and State regulatory requirements. The policy should also be supported with documented procedures and added to the University's procedures associated with Environmental Health & Safety - Procedures 8-01 through 8-10. These procedures should include best practices in periodic physical inventories, reconciliation and the corrections of discrepancies noted, if any, during inventory counts.

Management Response:
UT Arlington was the first UT System institution to implement a large scale barcode-based chemical management system. Since the inception of the Chemical Environmental Management System (CEMS), the Environmental Health & Safety Office (EH&S) has continuously made improvements to CEMS to better serve our researchers. To assist the research laboratories, the initial focus of EH&S was to barcode chemical containers, input the chemical information into CEMS, dispose of unwanted chemicals, assist with organization of chemical storage, and conduct CEMS user training. Currently, the University has 49,346 inventoried chemicals in 693 chemical storage locations. During FY13, there were 7,473 chemical containers received and added into CEMS. EH&S has uploaded over 25,000 Safety Data Sheets into CEMS. Additionally, EH&S has trained the UT Arlington Police Dispatch and City of Arlington Fire Department to access CEMS during emergency response to incidents in research laboratories and for emergency pre-planning purposes.

Recently, EH&S has been focused on developing a Chemical Safety Procedure 8-11 to be added to the University's Environmental Health & Safety - Procedures 8-01 through 8-10. This Chemical Safety Procedure is currently near final draft stage and EH&S will ensure that the recommendations requested above (best practices in periodic physical inventories, reconciliation, and the corrections of discrepancies noted) are addressed in this policy.

Target Implementation Date: *June 1, 2014*

Responsible Party: *Director of Environmental Health & Safety*

Observation #2 – Lack of Auto-detection of Expired Chemicals
The CEMS does not automatically detect outdated chemicals. The expiration date, if indicated by the manufacturer on the container label, is added to CEMS during the barcoding and recording process. The CEMS does not generate automatic notifications when a chemical has expired.

Recommendation:
The EH&S management should consult with the CEMS vendor to determine the feasibility of implementing an automated detection and reporting of expired chemicals. CEMS should generate automatic notifications when a chemical has expired. If the cost to modify CEMS to implement this feature is prohibitive, EH&S should consult with the Office of Information Technology (OIT) to see how the CEMS database can be analyzed to generate the expired chemicals report.

Management Response:
EH&S has contacted the vendor, University of New Hampshire, to inquire about the feasibility of implementing automated detection and reporting of expired chemicals. The CEMS vendor has indicated that they are currently working on an upgrade of the software that includes building a tool into CEMS that will allow the CEMS Administrator to auto send email notifications/alerts for expired chemicals. The new version is currently in the testing phase and a release date is pending, but the vendor expects it to be released by June 2014. It should be noted that the implementation date listed below will be driven by the vendor's release of this software upgrade.

Target Implementation Date: *August 31, 2014*

Responsible Party: *Director of Environmental Health & Safety*

Accuracy of Inventory
As of November 2013, the University had a total of 312 locations (labs and stockrooms) with approximately 44,000 barcoded chemicals, and 716 CEMS users who have either view only or update capabilities. The EH&S personnel are responsible for barcoding and recording into the CEMS chemicals purchased by various departments on campus. This is accomplished when a department informs EH&S that a new chemical has been purchased. EH&S staff will then update CEMS with this new chemical by assigning a barcode. The only other personnel that has the capability to barcode chemicals and record them into CEMS is the Department of Chemistry and Biochemistry (Chemistry) Stores Supervisor. Empty chemical containers are taken out of the inventory by the authorized CEMS users in each of the labs. These users also update CEMS when chemicals are moved from one lab to another.

To determine the accuracy of chemical inventory, we judgmentally selected five of the 312 locations on campus and performed the following procedures at each location:

- Judgmentally selected a sample of the lesser of 10% or 20 items from the chemicals listed in CEMS inventory and physically verified their existence
- Using the same sample size indicated above, we judgmentally selected chemicals from the locations and verified that they were recorded in CEMS
- As a general validation, we used IDEA (a data analytics tool) software to analyze the inventory listing to look for duplicate barcode and chemicals with no barcode

Our testing resulted in the following recommendations to improve process deficiencies over the timely and accurate inventory of chemicals.

Observation #3 – Missing Chemicals/No Periodic Inventory

During our physical verification of sampled departments, we identified two labs and a stockroom with missing chemicals. Five of 20 sampled chemicals selected from the CEMS listing for room 276 in the Engineering and Research Building were not physically located. One of 20 sampled chemicals selected from the CEMS listing for room 216 in the Life Sciences Building was missing, and one of the sampled 20 chemicals in Room 110, Chemistry and Biochemistry Building was missing. Missing chemical inventory requires replacement, which causes an additional expense to the University and – more significantly – poses a hazard to the University and community at-large given the chemicals were stolen and/or disposed of improperly. The Principal Investigators (PI) and Chemistry Stores Supervisor in charge of these locations were not able to locate the missing chemicals. We also learned that the PIs are not conducting their own periodic count of inventory to ensure accuracy as they are relying on the biennial review by the EH&S staff. The Chemistry Stores Supervisor, however, is conducting a semi-annual partial physical count to determine what items will be reordered for the coming semester. The Chemistry Stores Supervisor also conducts an annual physical count of all items, barcoded and non-barcoded, inside the Chemistry stockroom as required by Accounting Services to reflect the financial value of all items in the Chemistry stockroom. This physical count, however, is not reconciled with the CEMS inventory listing.

a. **Recommendation:**
   We recommend that CEMS users/Principal Investigators (PIs), with oversight from EH&S staff, conduct a periodic physical count of the chemical inventory in their respective labs and stockrooms. These reviews should be reconciled to the CEMS inventory listing in order to determine the extent of inventory shrinkage. They should also determine the reasons for the shrinkage and develop plans to eliminate them in the future.

   Management Response:
   - Principal Investigator, Room 276, Engineering Research Building

We have updated our physical inventory as of this week. We have notified the EH&S personnel for the five items that were found missing so that they are deleted from their inventory. To minimize the risk of making such mistakes in the future, we will conduct semi-annual physical inventories.

An inventory was conducted on Feb 18, 2014 and found no additional chemicals missing other than the five of a total of 276 noted by the auditor.

We identified the main reason of chemical missing. Some members in our lab did not know that they needed to take the barcode from empty containers, to be deleted from the EH&S inventory. This explanation has now been added to our onsite training, and all current members were notified of this important step in chemical inventory control.

- Principal Investigator, Room 216, Life Science Building
  One chemical was missing during the audit on December 11, 2013. The missing chemical was ethanol (Barcode-71327, 200 Proof, 1 pint). The PI investigated and discovered that the ethanol had been used and the empty, barcoded bottle was thrown out. The PI thinks that there was a delay in updating the system. In order to solve this problem, the PI will update chemical inventory frequently whenever a barcode from an empty bottle is placed on the whiteboard in room 216. The PI will also conduct a physical inventory at least twice (but preferentially quarterly) per year with oversight from EH&S staff.

- Chemistry Stores Supervisor, Room 110, Chemistry and Biochemistry Building
  We will comply with the inventory policy and procedures that EH&S publishes and implement as part of its management response.

Target Implementation Date:

- Principal Investigator, Room 276, Engineering Research Building
  February 18, 2014

- Principal Investigator, Room 216, Life Science Building
  March 3, 2014

- Chemistry Stores Supervisor, Room 110, Chemistry and Biochemistry Building
  Beginning immediately

Responsible Party:

- *Principal Investigator, Room 276, Engineering Research Building*

- *Principal Investigator, Room 216, Life Science Building*

- *Chemistry Stores Supervisor, Room 110, Chemistry and Biochemistry Building*

b. Recommendation:

The EH&S management should develop and implement a process that requires CEMS users, Principal Investigators (PIs), or his/her designee to conduct a periodic physical count of the chemical inventory in their respective locations and reconcile to the CEMS inventory listing noting any discrepancies. A quarterly review would provide more assurance for accuracy, but, if such a review is not feasible, a semi-annual review should be the minimum conducted. The process should also provide guidance to assist CEMS users in determining reasons for shrinkage and to properly document missing chemicals. The guidance should also include steps CEMS users can take to eliminate inventory shrinkage.

Management Response:

Prior to the purchase of a chemical inventory system, EH&S reviewed the CEMS program with the Provost, departmental chairs/directors, and affected faculty. The CEMS purchase and implementation was made with the understanding that EH&S would endeavor to ensure that CEMS would have minimal impact on their research. EH&S has researched best management practices at other higher education institutions. Most institutions do not require the PI to perform a periodic inventory and the majority of those that do, require the PI to conduct only an annual inventory/reconciliation. The number of inventoried chemical containers belonging to each PI at UT Arlington varies greatly from the teens to over seven thousand for one researcher. For most laboratories performing a required semi-annual inventory of their chemicals will be manageable. However, EH&S has a concern that a semi-annual review by the larger research laboratories may have an impact on their time and funding devoted to research. Despite these concerns, EH&S agrees with this recommendation in principle.

Based on the minimum recommendation above, EH&S will develop a procedure requiring PIs to conduct a semi-annual physical count of the chemical inventory in their respective locations, reconcile to the CEMS inventory listing noting any discrepancies and reporting noted discrepancies. This procedure will include determining reasons for discrepancies and guidance to eliminate them. To address concerns regarding the larger research laboratories, EH&S will include an avenue for a researcher to justify and request an alternative inventory schedule provided they receive approval from EH&S, the Vice President for Administration and Campus Operations, and the Provost.

Target Implementation Date: *August 31, 2014*

Responsible Party: *Director of Environmental Health & Safety*

While testing the chemicals in room 110 of the Chemistry and Biochemistry Building, the Chemistry Stores Supervisor expressed concern that there are several people working in different Chemistry and Biochemistry labs who have authorized access to the stockroom after office hours and during weekends. They are not consistently recording on a logbook the materials taken from the stockroom after office hours and weekends. The Chemistry Stores Supervisor explained further that if he notes a missing item, he tracks it down by requesting an activity report from Mav Express that shows who entered the stockroom outside regular office hours. He then emails the PI to let him/her know that one or more of the PI's personnel entered the stockroom and failed to record the barcode number of the missing chemical. This affects the CEMS inventory listing and adds workload to the Chemistry Stores Supervisor for investigating and correcting the CEMS inventory record. The Chemistry Stores Supervisor confirmed that this is happening two to three times a month.

c. Recommendation:

The Chemistry Stores Supervisor should develop and implement a process so that all personnel allowed to access room 110 of the Chemistry and Biochemistry building outside of office hours are given clear instructions on how to properly record items taken from the stockroom. There should be an escalation process in place for frequent violators.

Management Response:

I have already contacted Elisabeth Rowlett, Chemical Specialists with EHS, and verified that each user requesting access to the CEMS system, and is granted a 'users role,' is trained on the proper procedure for looking up items, updating items, and properly marking empty containers in the CEMS system.

Also, we cover the basic procedures with each person that comes to the Stockroom to take a barcoded item from our inventory. There are instructions for documenting items taken from the Stockroom in strategic areas of the Stockroom. These notices also state that if there are any questions or doubt as how to properly record these items, to seek help from a Stockroom worker. I have also obtained a complete listing of all persons that have access to any of the four doors leading into the Stockroom. If I find any missing item(s), another access report will be requested to see which person entered the Stockroom after hours. I will then look at the sign-out books of the PI this person works under to see if proper sign out procedures were followed, and if a deficiency is noted, I will call a meeting with the appropriate person to discuss the issue, and remind the proper sign out procedure. Students will be required to meet before their faculty member, staff will meet with their immediate supervisor, and faculty will meet with the department chair.

Access reports have been acquired, so I know every person that has access, and it will be an ongoing process of training new personnel that comes to the Stockroom on proper procedure. Discrepancies will be researched immediately upon discovery, and inventory will be adjusted according to the results of my findings.

Target Implementation Date: *Immediately*

Responsible Party: *Chemistry Stores Supervisor*

Observation #4 - Handling of Missing Chemicals by EH&S

During the audit we determined that EH&S staff would normally classify chemicals that were not found during their inventory reviews as "Container is Empty" in CEMS. According to EH&S management, there is no functionality or code in CEMS to document a chemical as "missing." The assumption made by EH&S staff is that the missing chemical container was probably empty and discarded without properly updating CEMS. Furthermore, EH&S does not have a formal "missing" chemical reporting process in place for PIs to report missing chemicals.

Recommendation:

EH&S should develop and implement a formal process for reporting and investigating missing chemicals, and to not automatically classify missing chemicals as “Container is empty” in CEMS. EH&S should also quantify labs' chemical inventory shrinkage identified during the biennial chemical inventory reviews. Labs with high inventory shrinkage rates may require more training for staff and/or further investigation and oversight.

Management Response:

EH&S will develop and implement a formal process for reporting and investigating missing chemicals. Additionally, this process will include provisions for retraining as deemed necessary. As indicated in the response to recommendation #1, EH&S is currently working on a Chemical Safety Procedure. This newly developed process for reporting and investigating missing chemicals will be referenced in this procedure.

Target Implementation Date: *June 1, 2014*

Responsible Party: *Director of Environmental Health & Safety*

Observation #5 - Non-Barcoded Chemicals

Based on our physical verification of chemicals as identified previously, we identified two labs with chemicals that were not barcoded at the time of the review. There were five containers with chemical contents in Room 276 of the Engineering and Research Building, and four containers with chemical contents in Room 124 of the Geology Sciences Building that were not barcoded. Management was not able to provide sufficient explanation as to why these items were not barcoded. The chemicals in Room 124 of the Geology Sciences Building were eventually barcoded and entered into CEMS by EH&S staff during the audit. Non-barcoded chemicals will cause the CEMS inventory listing to be inaccurate.

a. Recommendation:
The PI in charge of the lab in room 276 of the Engineering Research Building should contact EH&S immediately to barcode new chemicals and record them in CEMS.

Management Response:
We contacted EH&S this week and got instructions to place the missing barcodes. We have barcoded the missing chemicals as of February 25, 2014.

Target Implementation Date:
February 25, 2014

Responsible Party:
Principal Investigator, Room 276, Engineering Research Building

b. Recommendation:
The EH&S management should periodically remind all PIs that CEMS must be used and to promptly report to EH&S the arrival of new chemicals for barcoding and entry into CEMS. Subsequently, PIs need to reinforce this among their staff.

Management Response:
EH&S has the following existing Standard Operating Procedures (SOP) for CEMS users:

- *Request a New CEMS Account*
- *Update Inventory on CEMS*
- *Add Inner Location on CEMS*
- *Request to Inventory New Chemicals on CEMS*
- *Request for Chemical Waste Removal on CEMS*
- *Search SDS/MSDS Archive on CEMS*

The "Request to Inventory New Chemicals on CEMS" SOP was developed in 2011. The procedure instructs a CEMS user to send a message via CEMS requesting EH&S to barcode new chemicals.

Based on the above recommendation, EH&S will also implement a periodic reminder to PIs that CEMS must be used to promptly report to EH&S the arrival of new chemicals for barcoding and entry into CEMS, and to reinforce this among their staff.

Target Implementation Date: *June 1, 2014*

Responsible Party: *Director of Environmental Health & Safety*

Observation #6 - Barcoded Chemicals not in CEMS
During the review of the lab in room 124 of the Geology Science Building, we identified seven barcoded chemical containers with contents in a box on the lab floor that were not on the CEMS inventory list. Upon further investigation, we found that these chemicals were noted in CEMS as "Container is Empty." EH&S staff explained that the chemical containers were mistakenly coded as empty during an inventory review they had conducted. The barcodes were subsequently re-activated in CEMS by EH&S.

Recommendation:
The EH&S management should remind its staff and those who have access to modify the status of a chemical, to ensure that chemical containers are empty prior to classifying them as empty in CEMS.

Management Response:
As indicated in the response to recommendation #4, EH&S is currently working on finalizing a Chemical Safety Procedure that will address reporting and investigating missing chemicals. EH&S staff will be trained on the new procedure once established.

Target Implementation Date: *June 1, 2014*

Responsible Party: *Director of Environmental Health & Safety*

Observation #7 – Invalid Barcode in CEMS
Based on the data analysis performed on the CEMS listing of inventory, there was one chemical without a valid barcode. We noted that the value of the barcode field for this chemical was zero. The CEMS administrator explained that this might be a mistake when this chemical was recorded in CEMS. The system accepted the input because zero is a number. This resulted in inaccurate information in the CEMS because zero is not a valid barcode.

a. **Recommendation:**
The EH&S management should investigate the cause of the barcode error and correct this record in CEMS to reflect the actual barcode of the chemical in question.

Management Response:
EH&S has determined that this bar code was added as a means to create a laboratory door sign for the entrance of the Animal Care Facility. At the request of the Director of the Shimadzu Institute for Research Technologies, EH&S created a laboratory door sign for the main entrance to this facility. Laboratory door signs include information regarding the hazards contained in that laboratory as well as contact information for the PI, or in this case, the Facility Manager. In order for a door sign to be created in CEMS, a "mock" barcoded chemical had to be added to create a location (Animal Care Facility). The barcode of "0" was used purposefully as a means to distinguish it from the other actual chemicals in the database. This "mock" chemical has been removed from the inventory.

Target Implementation Date: *Immediately*

Responsible Party: *Director of Environmental Health & Safety*

b. Recommendation:
The EH&S management should contact the CEMS vendor support and request correction of this validation error so that CEMS will only accept valid barcode numbers.

Management Response:
EH&S will contact the CEMS vendor to request the addition of a business rule so that CEMS will only accept valid barcode numbers. It should be noted that the implementation date listed below will be driven by the CEMS vendor's capability to make this change, as well as their schedule.

Target Implementation Date: *August 31, 2014*

Responsible Party: *Director of Environmental Health & Safety*

User Access to CEMS

To determine if there are no excessive access rights given to CEMS users that could potentially impact the accuracy of chemicals inventory, we obtained a list of all CEMS users along with their access rights from EH&S management. Using IDEA data analysis software, we performed an initial analysis of the users' access rights and noted that there are 16 users with database administration roles in CEMS. This means that these 16 users have full access to make changes to all CEMS data. We selected this group of users as our sample because the database administration has the most privileged access to CEMS. Based on this review, we identified the following observations:

Observation #8 – Excessive Access to CEMS

Several of the 16 users noted above only need access privileges to update the chemical inventory and not necessarily the database administration role that can update all of CEMS data. EH&S management explained that the database administration role was granted to these users for purposes of updating the chemical inventory.

Recommendation:
As required by the University Acceptable Use policy, EH&S management should limit access to CEMS data on a need-to-do, need-to-know basis. The capability to modify all CEMS data through the Database Administration role should be limited to the CEMS systems administrators or those creating and maintaining CEMS user IDs. Employees with responsibility to update the chemical inventory should be given the Update Inventory role instead of the Database Administration role.

Management Response:
EH&S has limited the Database Administrator role to essential personnel only as recommended above. EH&S has reduced the Database Administrator role to nine EH&S staff and two Chemistry Stockroom personnel. These remaining individuals must have this access to perform certain vital job functions.

Target Implementation Date: *Immediately*

Responsible Party: *Director of Environmental Health & Safety*

Observation #9 – Undocumented Authorization to Access to CEMS
There is no documented authorization for the16 CEMS users with database administration role. This role can add and edit all CEMS data. The CEMS administrator explained that these users were verbally authorized by the EH&S management during the implementation of CEMS.

Recommendation:
As a best practice for user account management, the CEMS administrator should secure documented authorization for each CEMS user created and role assigned.

Management Response:
Currently there are a total of 759 CEMS users. The 16 CEMS users noted that were identified as having no documented authorization were either EH&S staff, EH&S student workers, or Chemical Stockroom personnel. Upon initial implementation of the program these positions were identified as requiring CEMS Database Administrator access. Due to this audit, we have reviewed further and determined that the student workers assisting with the inventory are able to perform their primary job functions without full administrator access. They have subsequently been changed to an Update Inventory Role. In the future, the CEMS Administrator will request and document permission from the Director of EH&S before assigning users such as EH&S and Chemical Stockroom personnel to the CEMS Database Administrator role.

As indicated in the recommendation above, PIs have responsibility over their respective chemicals and their documented request to access CEMS will be considered an authorization.

In 2012, EH&S began requesting permission from the laboratory PI before granting user access to the PI's inventory. This process is described in the EH&S CEMS SOP, "Request a New CEMS Account." Based on the above recommendation, EH&S will take additional steps to ensure that this permission is consistently documented for each laboratory CEMS user.

Target Implementation Date: *Immediately*

Responsible Party: *Director of Environmental Health & Safety*

Review of Chemicals of Interest

The CEMS generates a report of chemicals of interest (COI) based on the Chemical Facility Anti-Terrorism Standard. The list of COIs, upon reaching a level beyond the screening threshold quantities set by the standard, are to be reported to the Department of Homeland Security. To determine if the CEMS administrator performs the monthly review of these COIs, we verified two CEMS-generated reports on COI without exception.

Laboratories Using CEMS

To determine if all labs and stockrooms with chemicals are using CEMS to account for their chemicals, we requested from Mav Express a listing of all rooms to identify all labs and stockrooms. Mav Express manages all the physical access to campus rooms through a Mav Express card. The Mav Express management, however, noted that its listing of rooms does not distinguish which ones are labs. As an alternate procedure, we noted that EH&S performs an annual walkthrough of the campus buildings to look for labs or rooms with chemicals that have not been barcoded. This exercise is considered sufficient to ensure that all labs which use chemicals are accounted for. No exception was noted.

Disposition of Outdated Chemicals

In order to determine how expired chemicals are detected and disposed of at the sampled labs, for each of the sampled chemicals examined during the physical verification, if there was an expiration date indicated on the container label, we checked if the date had not yet expired. We also inquired of the PI how they manage outdated chemicals at their labs. We did not identify any expired chemicals during the review. According to the PIs of the sampled labs, normally chemicals are used up prior to expiration, but if a chemical should expire and no longer had a use, they would contact EH&S via the CEMS messaging system. An EH&S representative would come to the lab and collect the chemical for proper disposal. No exceptions were noted.

Procurement Card Purchases

To determine if chemicals purchased with ProCards were recorded in CEMS, we reviewed Purchasing Card Transaction Logs of the PIs for the sampled labs. From the logs, we judgmentally selected five chemical purchases and matched them with the CEMS records. Additionally, the transactions were reviewed in DEFINE (the University's accounting system) using the VP7 function (ProCard Payment Voucher) to ensure they were properly recorded. We did not identify any exceptions during this testing.

CEMS Users Training

During discussions with EH&S management, we determined that there are no specific CEMS training materials distributed to employees, though CEMS features are explained during periodic CEMS training seminars held by EH&S. Employees may refer to the CEMS standard operating procedures on the EH&S website or contact EH&S directly for answers to CEMS-related questions. For each of the sampled labs/stockroom, we interviewed key CEMS users to determine if they had taken CEMS training and their opinion of the training. The sampled CEMS users confirmed that they had received the formal EH&S CEMS training and that it

provided them with adequate working knowledge of the system; therefore, we noted no exceptions.

Conclusion

The University has a system to record and manage chemicals purchased for educational and research purposes known as CEMS, Chemical Environmental Management System, which is managed by the Environmental Health and Safety Office (EH&S). Based on our review of CEMS, departments' purchases of chemicals are generally recorded in the system. There were, however, a number of inventory process deficiencies identified, such as missing barcoded chemicals, non-barcoded chemicals, barcoded chemicals not in CEMS, and the overall handling of missing chemicals by EH&S. We also noted deficiencies in the management of user access rights to CEMS. Our review resulted in recommendations that aim to improve timely accounting of chemical inventory. These recommendations are considered significant to the process or department.

We appreciate the courtesy and cooperation we received from the EH&S Office and lab staffs throughout this audit.