



Internal Audit Report

Deferred Maintenance Review

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I. EXECUTIVE SUMMARY

Internal Audit & Advisory Services (IAS) has completed an audit of the campus deferred maintenance program to determine the reliability of information used to establish the deferred maintenance shortfall, and the impacts and needs associated with deferred maintenance in the most critical campus areas.

Overall, the campus deferred maintenance program provides reasonable assurance that deferred maintenance projects are identified, quantified, prioritized and reported for funding when available. Physical Plant inspection of facilities and equipment, which is the basis for identifying deferred maintenance, is effective and efficient. There is a good working relationship with Planning & Budget to identify high priority deferred maintenance projects for selection by senior management as funds permit.

However, the quality of information leading to decisions on planned and preventive maintenance, and ultimately deferred maintenance project lists has been impacted by budget cuts to Physical Plant. Inspection frequencies for planned and preventative maintenance have been scaled back due to these cuts. When these inspections do not occur in a timely manner there is the increased risk of breakdowns and emergency responses, with increased costs associated with expedited freight costs for replacement parts and down time that has a negative impact on the campus community, its mission and a deterioration of the campus environment.

UCOP's Facility Infrastructure Renewal Model (FIRM) records our campus capital renewal and deferred maintenance backlog, which currently stands at \$150 million. Physical Plant maintains a deferred maintenance projects list that is compiled through physical inspection. For FY12, the Physical Plant deferred maintenance list included 42 projects with an estimated cost of \$7.295 million, not including grounds. Of these projects, three were fully funded in the estimated cost of \$1.375 million, and six were partially funded for the estimated cost of \$315K in FY12. (Refer to Appendix A – Deferred Maintenance List 2012)

During this review, we did not observe issues that required management corrective action. Refer to section III. Results of Work Performed and Results, for a more detailed account of work performed and conclusions reach for this limited scope audit engagement.

II. INTRODUCTION

Purpose

We conducted a review to determine the reliability of information used to establish the deferred maintenance shortfall, and the impacts and needs associated with deferred maintenance in the most critical campus areas.

Background

Physical Plant is the unit of the Division of Business & Administrative Services that is responsible for providing services for the safe and efficient operation, maintenance and repair of the campus infrastructure and physical assets.

There are various types of maintenance:

- **Planned maintenance:** this is characterized by its routine or recurring nature; its purpose is to keep facilities functional.
- **Preventive maintenance:** the periodic inspection, adjusting, minor repairs, lubricating, reporting and data recording necessary to minimize breakdowns and maximize system and equipment efficiency.
- **Emergency maintenance:** the repair or replacement of facility components or equipment requiring immediate attention because the functioning of a critical system is impaired or because health, safety, or security of life is endangered. This type supersedes all other categories of maintenance.
- **Deferred maintenance:** this is maintenance that was not performed when it should have been or was scheduled to be and which is put off or delayed for a future period due to budget restrictions.

Physical Plant generates deferred maintenance (DM) lists both for internal tracking of DM and to respond to Planning & Budget requests for DM projects for which funding is available. These DM lists are based on physical inspections of facilities and equipment, and are prioritized. There are two departments within Physical Plant that have DM: Building Utilities and Fleet Services, and Grounds Services. Each of these departments has similar procedures for physical inspections within their planned and preventative maintenance programs. These programs include documented levels and frequency of inspections, with levels defined in terms of inspection tasks and lists of equipment ordered for preventative maintenance. This documentation provides assurance that management is adequately informed of the condition of facilities and equipment within the scope of Physical Plant's operations.

Budget cuts affect the quality of those inspections. Due to a series of budget cuts, Physical Plant has had to lay off staff. Most of the layoffs were to Custodial Services, but Building Utilities and Fleet Services, and Grounds Services also had layoffs and unfilled or lost positions, resulting in approximately 16% and 15% reduction of their work forces respectively since 2009.

A consequence of staff reductions and cuts in operating funds is that inspection frequencies for planned and preventative maintenance have been scaled back. When these inspections do not occur in a timely manner there is the increased risk of breakdowns and emergency responses, with increased costs associated with expedited freight costs for replacement parts and down time that has a negative impact on the campus mission and deterioration of the campus environment.

UCOP keeps a database that tracks facility renewal and deferred maintenance for state-funded facilities systemwide, called Facilities Infrastructure Renewal Model (FIRM). Facility or capital renewal is based upon the fact that over time buildings and infrastructure typically use up their intended design life and through that deterioration lose a portion of their functionality to the university's mission. Normally these are larger projects and involve whole system replacement or renewal, rather than deferred maintenance. As a model, FIRM collects data from the university's official space inventory database (Corporate Equipment, Facilities and Assets System) and assigns these with industry standard lifecycles, repair and replacement costs, etc. to arrive at a capital renewal and deferred maintenance backlog. Currently, UCSC has a backlog of \$150 million.

Scope

To accomplish the purpose of this review we performed the following procedures:

- Interviewed management of Physical Plant and Planning & Budget.
- Reviewed the UC Facilities Manual pertaining to the operation and maintenance of plant.
- Obtained and reviewed documented procedures for the scheduling and conducting of inspections by Building Utilities & Fleet Services and Grounds Services crews.
- Obtained and reviewed prioritized lists of deferred maintenance projects compiled for internal use and to respond to request by Planning & Budget.
- Obtained current UCSC backlog of capital renewal and deferred maintenance in dollars from FIRM.
- Reviewed UC budget proposals related to deferred maintenance.
- Reviewed Physical Plant staffing lists from 2008 to 2014.

We did not evaluate the decisions made in prioritizing and ultimately funding those projects included on the Physical Plant Deferred Maintenance List 2012.

III. SUMMARY OF WORK PERFORMED AND RESULTS

UC Facilities Manual	
Work Performed	Results
<p>Reviewed the UC Facilities Manual Volume 6 Plant Operations & Maintenance</p>	<p>Chapter 2 of Vol.6 was titled “Deferred Maintenance Program” and described that program in four parts:</p> <ol style="list-style-type: none"> 1. Facility Audit and Inspection Program 2. Deferred Maintenance Funding Sources 3. Deferred maintenance Funding Guidelines 4. Required Deferred Maintenance Lists. <p>The purpose of the Facility Audit and Inspection Program is to identify, quantify and prioritized deferred maintenance projects and capital renewal and replacement projects. The inspection is a physical inspection.</p> <p>Management informed us that physical inspection of facilities and equipment takes place within the planned and preventative maintenance programs of the only two departments that have deferred maintenance, viz. Building Utilities & Fleet Services, and Grounds Services. We reviewed their programs (see below).</p> <p>We confirmed with Planning & Budget that the state no longer provides funding for deferred maintenance, although UC includes it in its annual budget proposal to the state.</p> <p>The campus is the source of funding for deferred maintenance, such as through contract and grant indirect cost recovery and loans.</p> <p>Campus changes in facility space are reported to OP to include in the university's official space inventory database (Corporate Equipment, Facilities and Assets System), which informs FIRM.</p>

Physical Inspections	
Work Performed	Results
<ul style="list-style-type: none"> • We interviewed and corresponded with management of Building Utilities & Fleet Services (BUFS) and Grounds Services (GS) about their planned and preventive maintenance programs. • We obtained and reviewed samples of documentation used for these programs. 	<p>Each of these departments has similar procedures for physical inspections within their planned and preventative maintenance programs. These programs include documented levels and frequency of inspections, with levels defined in terms of inspection tasks and lists of equipment to replace for preventative maintenance.</p> <p>BUFS lists its skilled crafts (e.g. Cogen plant, electricians, HVAC, plumbing, carpenters, etc.) and inspection schedules on its Web site. BUFS uses a customized FileMaker Pro application to document its inspection tasks. These documents include parts lists ordered for replacing worn out parts for preventative maintenance, as well as other key elements of the program, including contacts, notifications, supervisor approval, check list of tests, etc.</p> <p>GS provides Excel checklists for inspections by its work crews, including campus irrigation system, roads, parking lots, gardens and storm drains. GS road maintenance is an active program based on a 2006 consultant’s report. Annual prioritization for road work involves visual verification of actual condition of roads. Regular inspection of roads is not possible due to insufficient staff. GS also has detailed maps of campus paths that were drawn over ten years ago; no inspection of paths is done due to insufficient staff.</p> <p>These documents together with supervisory review and approval provide assurance that management is adequately informed of the condition of assets under their control.</p> <p>There is an opportunity for increased efficiency, such as when BUFS work crews record inspections by hand and later this data is entered into the database. If crews carried mobile devices and used these to record inspection information additional effort and</p>

	<p>time could be reduced. Management is aware of this opportunity and is studying the possibility of a mobile device data inspection upload functionality.</p> <p>Due to budget cuts/layoffs, both departments have had to reduce the frequency of their inspections. When these inspections do not occur in a timely manner there is the increased risk of breakdowns and emergency responses, with increased costs associated with expedited freight costs for replacement parts and down time that has a negative impact on the campus mission and deterioration of the campus environment.</p>
Deferred Maintenance Lists	
Work Performed	Results
<ul style="list-style-type: none"> • Interviewed Physical Plant management on how deferred maintenance is tracked and obtained lists of deferred maintenance projects. • Interviewed Planning & Budget management to learn its role in the development of these lists. 	<p>Physical Plant has a practice of each shop/trade maintaining its own deferred maintenance list that would feed into an overall list. Such lists are better than the FIRM list as they identify what actually needs to be replaced as well as prioritization. We obtained a copy of BUFS’s list.</p> <p>Physical Plant also has departmental directors submit deferred maintenance projects on a standard template that describes these projects and prioritizes them. These projects are then evaluated by Physical Plant management to determine the most important projects to fund according to information provided by Planning & Budget on potential funding available. A working list for this purpose in FY2013 identified 20 BUFS projects totaling \$3,870,000 and eight GS projects totaling \$3,048,000; altogether \$6,918,000. Three of the BUFS projects were chosen for funding. This list was not inclusive of all deferred maintenance on campus, but only those projects that could qualify for available funds. FIRM records our facility renewal and deferred maintenance at a backlog of \$150 million.</p> <p>Depending on the budget situation, Planning & Budget informs Physical Plant of funding that is available for deferred maintenance and requests a list of projects within the amount of funding available.</p>

	<p>Some years there is no funding available. Planning & Budget does not have a specific or quantifiable goal for appropriating funds for deferred maintenance, as funding availability is unpredictable. It does try to keep it from increasing much and reduce it as possible.</p>
<p>Physical Plant Staffing Lists</p>	
<p>Work Performed</p>	<p>Results</p>
<p>We obtained copies of Physical Plant staffing lists from FMW from FY2008 to FY2014, and analyzed them to identify staffing reductions to understand how those reductions affected the work crews that perform planned and preventive maintenance.</p>	<p>Of the years reviewed, 2009 had the highest staffing. Since 2009, Physical Plant lost 81.78 FTE (23%); BUFS lost 11 budgeted FTE (16%); GS lost 7 budgeted FTE (15%). Custodial Services suffered the highest loss of budgeted FTS at 25.5.</p> <p>When we viewed the FMW report for FY2014, Physical Plant had 20.81 open provisions (recruitment underway); BUFS had four open provisions and GS had 1.8 open provisions. Provisions were also lost. At the end of FY2013, 15 Physical Plant employees retired; this was described by management as over 400 years of experience of Physical Plant lost.</p>

Appendix A – Deferred Maintenance List 2012

Deferred Maintenance List 2012				
Project Name	Building	Dicipline/System	Estimated Costs	Funded
Replace failed R.O. tank	Thimann Labs	HVAC	\$ 60,000	
Replace in lab fume hood cabinets	Thimann Labs	HVAC	\$ 350,000	
Replace FE-211	Kerr Hall	HVAC	\$ 75,000	
Replace lab pressure controls	JBEB	HVAC	\$ 200,000	
Replace 14 furnaces	Baskin Visual Arts	HVAC	\$ 75,000	
Replace machine shop and center fume exhaust fans	JBEB	HVAC	\$ 100,000	
Replace VAV lab pressure controls	Sinsheimer Labs	HVAC	\$ 175,000	
Replace failing HVAC dampers	Marine Lab MDC & COH	HVAC	\$ 75,000	
Replace pre-heat coils	Nat Sci 2	HVAC	\$ 85,000	
Replace pre-heat coils	Thimann Labs	HVAC	\$ 75,000	
Replace steam boilers	Sinsheimer Labs	HVAC	\$ 150,000	
Replace multi-zone and boiler	Cowell Admin	HVAC	\$ 200,000	
Replace AHU's for 1st and 2nd floors	Hahn Student Services	HVAC	\$ 250,000	
Replace failing fumehood ductwork	E&MS	HVAC	\$ 400,000	
Replace failing windows	LML Doyle Building	Structural	\$ 75,000	
Replacement of roof and skylight	Stevenson Hahn Art	Structural	\$ 100,000	Funded #
Replacement of roof	Merrill Admin	Structural	\$ 50,000	
Replacement of 309A Pomona A/C	E&MS	HVAC	\$ 200,000	
Replace 22 windows that have failed	Porter Faculty Office	Structural	\$ 25,000	
South window wall has failed	LML La Feltz	Structural	\$ 100,000	
Replace roof (center where fumehoods are located)	Nat Sci 2	Structural	\$ 200,000	
Replacement of roof and windows	Fire House	Structural	\$ 75,000	
Replacement of ISIS 2 elevators	Humanities H-1	Elevator	\$ 175,000	
Replacement of ISIS 2 elevators	Humanities H-2	Elevator	\$ 175,000	
Replacement/modernization of passenger elevator	JBEB	Elevator	\$ 300,000	Funded #
Repair exterior wall moisture barrier, classroom	Music Facility	Structural	\$ 100,000	
Upgrade of fire alarm system in OMP areas	Kresge College OMP	Fire Alarm	\$ 50,000	25% Funded
Upgrade of fire alarm system	E&MS	Fire Alarm	\$ 250,000	
Upgrade of fire alarm system	Sinsheimer Labs	Fire Alarm	\$ 500,000	
Penthouse roof - fumehood roofs	Thimann Labs	Structural	\$ 400,000	
Replacement of heating system	Stevenson Admin/Academic	HVAC	\$ 850,000	Funded #
Replace/repair failed tank coating	LML Dolphin Tank	Seawater	\$ 175,000	
Building roof davit arms	Various	Structural	\$ 55,000	50% Funded
Replacement/repair of CT-1 & CT-3 piping	Central Heat Plant	Condensing Water	\$ 140,000	75% Funded
Replace fumehood fan shaft bearings for (6) fans	Thimann Labs	HVAC	\$ 100,000	
Replacement of roof	Carriage House	Structural	\$ 150,000	
Replacement of fuel pumps	Fleet Services	Fuel Station	\$ 275,000	
Repair of sinking classroom wall	E&MS	Structural	\$ 5,000	
Elevators fire alarm recall rekeying (OMP elevators)	Various	Elevator	\$ 40,000	50% Funded
Modernization of passenger and freight elevators	2300 Delaware	Elevator	\$ 300,000	50% Funded
Elevators 34 & 35 Replace Emergency Return Units	Earth & Marine	Elevator	\$ 35,000	
Leaking Heating System Replacement	Media & BlackBox	HVAC	\$125,000	Funded
		Total Estimated	\$ 7,295,000	

Source: Campus Physical Plant