Sill Center Sustainability Assessment:
Creating a Template for Future Use on Campus Buildings

Emily Gaines and Will Swanepoel

University of Utah

Salt Lake City, UT 84112

Table of Contents

Introduction

In the United States, 80% of electricity consumption is by buildings[i]. Nationwide, over 7 billion gallons of water is used each day for landscape irrigation[ii]. The University of Utah main campus contains approximately 300 buildings on 1,500 acres of land. There is currently little data available regarding baseline consumption of water and energy on a per-building basis for campus. As concerns over global warming, energy prices, and water shortages become more prevalent, there is a tremendous need for the campus and the community to determine baseline usages and reduce resource consumption.

An individual building energy audit, when conducted by a professional, would cost approximately $15,000 for a campus building (Cory Higgins, personal communication). A total budget of $4.5 million would be required to complete professional audits for all University of Utah buildings. Given the constraints of a public university budget, the only way in which University of Utah buildings can be evaluated in a timely manner and on a wide scale is through use of an inexpensive audit tool.

An audit tool was created using the Sill Center building as a model. By employing a "trial and error" method at the Sill Center, we were able to determine which aspects of the building most impacted overall resource consumption, and which aspects could be improved in the most cost-effective manner. Based on work at the Sill Center, a "Sustainability Assessment" technique was created to enable groups of interested students, faculty, and staff to conduct audits of various buildings on campus. The Sustainability Assessment enables interested parties to determine a building's resource consumption baseline and to pinpoint areas for potential improvement.

Sill Center Background

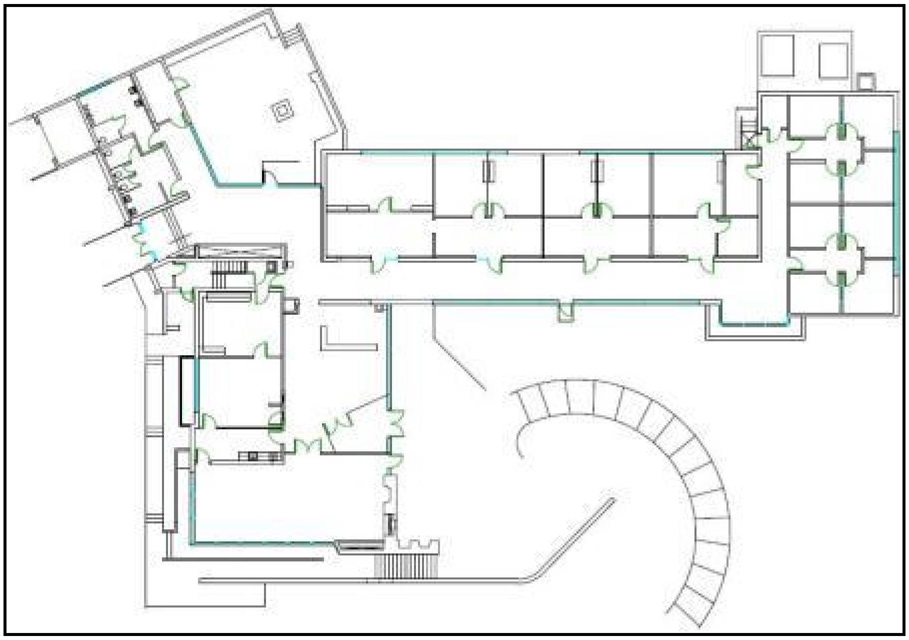
The Sill Center is a rather unique building on campus because it houses a single administrative entity, the Office of Undergraduate Studies. We chose the Sill Center as our model building because of its administrative uniformity and because its residents had expressed interest in participating in an assessment. Additionally, the Sill Center is the focus of a variety of sustainability initiatives conducted by students and faculty of the University of Utah. These initiatives include a thermal modeling project, the potential installation of solar panels, and experimentation with a novel heating system.

The Sill Center was constructed in 1951 and is 13,107 square feet in size. It has two floors with the bottom floor being a walk-out basement on the north side of the building. It houses 29 full-time employees and 6 part-time employees. On average, approximately 30 visitors utilize conference rooms for an hour a day during the academic year. The building is showing its age as its large single-pane windows do little to combat the heat and cold during the seasons and window and door seals are in desperate need of repair. These issues will be addressed later on in this report. Please see the diagrams below for the Sill Center layout.

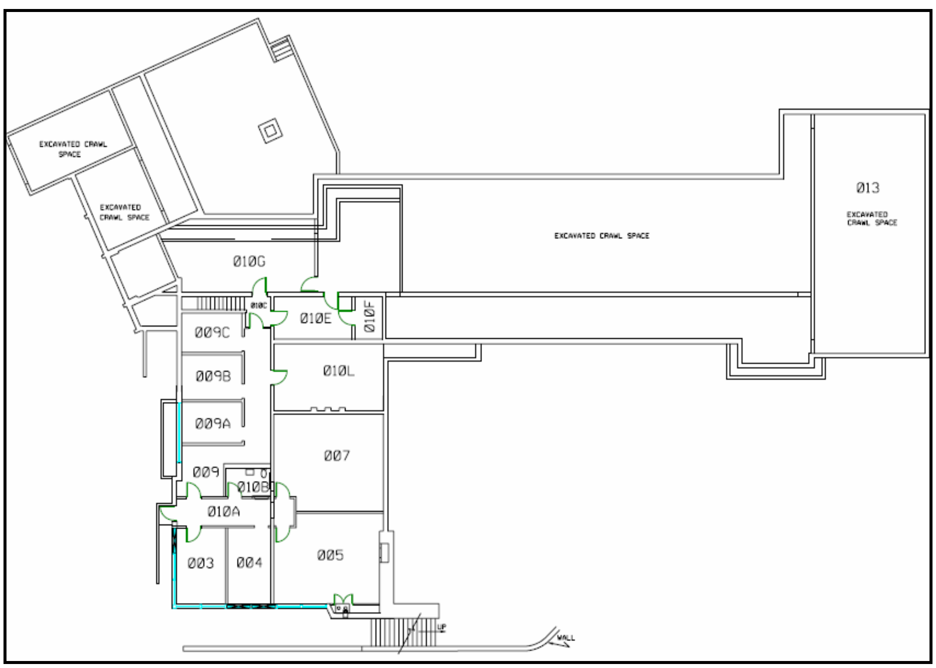
---

[i] http://buildingsdatabook.eere.energy.gov/docs/1.5.1.pdf
[ii] http://www.epa.gov/WaterSense/pubs/outdoor.htm

Sill Center – main floor



Sill Center – basement



General Project Methodology

To obtain baseline information regarding resource use at the Sill Center, we identified the following areas for our assessment:

- Lighting
  - types of lights, frequency of use
- Appliances
  - types of computers/printers, etc., frequency of use
- HVAC
  - type of system, frequency of use, thermostat settings
- Water use
  - indoor plumbing and outdoor irrigation
- Recycling
  - Categories, availability of recycling
- Procurement
  - frequency and source of orders
- Transportation
  - modes, distance traveled

To collect information for each category, we divided the building's interior and exterior into sections. We then conducted an inventory of all sections, recording everything from number of overhead lights to number of waste bins (See SillAssessmentData spreadsheet for complete inventory list). The Facilities Management department was an invaluable resource in helping to develop our inventory plan and providing key pieces of data.

Although the inventory provided a great deal of information, it did not provide much insight into overall behavioral patterns of Sill Center employees. To obtain a full representation of behaviors within the building, we administered a survey to all Sill Center employees (See Appendix 6). Of 35 potential respondents, 15 responded to the survey. The survey assessed the building's overall occupancy patterns. Additionally, it requested behavioral information regarding transportation modes, recycling habits, and energy conservation. Transportation questions were modeled after the recent UTA survey. Building occupants were also asked to indicate any problems they had observed within the building.

The newly formed Sill Center Green Team was consulted at the beginning of the assessment process to determine whether any members would be interested in assisting with the inventory and/or survey. We felt that the Green Team would be an invaluable resource in promoting the survey and spreading the word about the upcoming inventory process.

After the survey and inventory were complete, a baseline calculation was made to estimate the Sill Center's energy and water usage (See SillAssessmentData spreadsheet and Summary section below). A variety of improvement options were considered and were evaluated for cost-effectiveness in terms of payback period. Based on the most feasible options, a set of recommendations was created.

Upon completion of the process for the Sill Center, we were able to determine which features of the building inventory were most relevant for overall resource consumption. We then simplified the inventory process to create a template/tool for future assessments of different buildings on campus (See AssessmentTemplate spreadsheet). This template/tool contains a written protocol for assessments with a checklist for individuals to follow. It also contains a spreadsheet component which can be used to calculate energy and water usage upon completing a building inventory.

Lighting: Indoor

Methods:

This part of the assessment created a benchmark of indoor light use in kWh per year and then made suggestions to improve this number. During our numerous walk-throughs of the Sill Center, we counted the number of lights in the entire building and also recorded the wattage of each bulb. Fortunately, most of the overhead lighting is the same and was generally limited to 32 Watt fluorescent and 60 Watt incandescent bulbs. Lighting included both overhead and task lights (desk and floor lamps). In addition, we measured the brightness in each area using a light meter. This assisted in determining how many lights were actually needed in a specific area and allowed us to suggest a better layout when applicable.

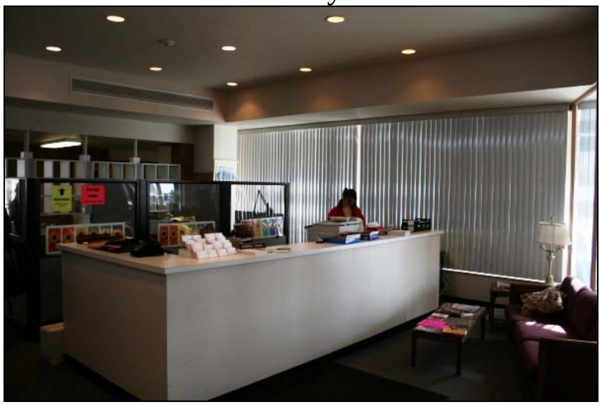
Findings:

Our assessment showed that there were an excessive number of light fixtures in most rooms in the center. Examples of this can be seen in the image below of the recessed incandescent lights in the large conference room. There are currently 40 lights in this room. On our visits to the center we often found the blinds closed in this room and overhead lighting being used instead of natural light.

Large Conference Room

A similar issue was observed in the lobby. These lights (20 x 60 Watt recessed incandescent bulbs) were always on during business hours, even though the room had large shuttered windows that could let in natural light – see image below. Obvious solutions to this issue would be to remove the recessed lights and replace them with highly efficient T-8 fluorescent fixtures. Only a fraction of the current number of fixtures would be needed to provide light to these areas. Additionally, we will address the heat caused by all south and west facing windows by looking at solar window film options later in this report (see HVAC section).

Lobby



Wiring of light fixtures in the entry area and lobby are also an issue. The light switch for the lobby includes the three lights in the entrance area. The entrance area is therefore always lit and this area does not need any lighting during the day. The accessibility of light switches is an issue elsewhere in the building, as well. For instance, employees within the Sill Center do not have control over the overhead lighting in the upstairs hallway. As a result, the lights are always on, even when they are not necessary. Many survey respondents felt that this lighting was excessive. An additional issue is that in places where light switches do exist, they are not labeled.

A good example of excessive use of lighting fixtures can be seen in the computer area. The facilities department had already detached a number of lights in this area as well as the long corridor that leads to the LEAP Center, but we believe more lights can be removed or at least be put on a light sensor controller (See Recommendations section for further information).

With the exception of a few offices, we observed that task lighting was not being utilized, even when it was built into desk units. These findings were verified by the survey, which found that 33% of respondents did not utilize task lighting (See Appendix 6). The survey also uncovered some dissatisfaction with the level of lighting in the building. Of the respondents, 40% were unhappy with the level of lighting in their workspaces; 2/3 of these people felt that the lighting was too bright. Also noteworthy was the fact that 47%

of respondents use shades to block out unwanted sunlight. Many of the individuals surveyed also felt that the night-time security lighting was excessive.

The survey uncovered a number of behavioral issues, as well. Just 13% of respondents always turn lights off when leaving the room; 27% never do. However, 80% do turn off their lights when leaving for the day. Many of the individuals who do not turn off the lights do not have controls over switches.

Baseline:

Our baseline assessment of indoor lighting totaled to 49,250 kWh per year. At the current electricity rate paid by the University of Utah, this totaled approximately $2,950 per year.

Recommendations and Cost Analysis:

We have suggested changes to the outlay of overhead lights in each room and area – please refer to the SillAssessmentData spreadsheet for specific details. Our new layout suggestions would reduce the total number of overhead lights from approximately 466 down to 262. If all behavior remains the same, this new configuration can save the Sill Center $1,250 per year.

Lighting use and projected savings with new configuration

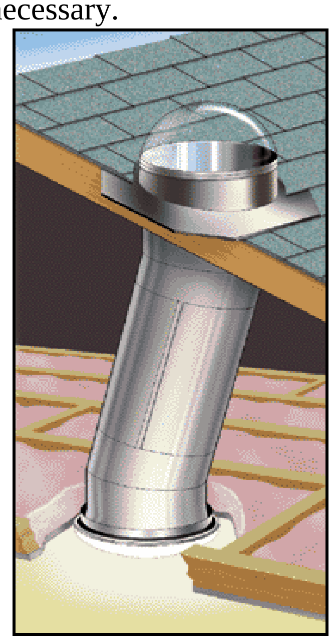
Lighting Use in the Sill Center	Current # Units	Watts	Current kWh a year	Current Cost	New kWh a year	New Cost
Overhead Lighting						
# of T8 (32W)	398	12,736	37,180.42	$2,230.82	26,870.27	1,612.22
# of T12 (40W)	4	160	5,025.28	$301.52	0	0
# of 60W incandescent	64	3,840	4,867.20	$292.03	0	0
Task lighting			1,651.31	$99.08	1,651.31	$99.08
NO light but ballast present (3W)	20	60	525.6	$31.54	0	0
			49,249.81	$2,954.99	28,521.58	$1,711.29
Price per kWh:	**$0.06**					
Annual Savings:	**$1,243.69**					
Estimated labor:	**$2,000.00**					
Payback:	**1.61**	**years**				

These savings could be further increased if behavioral issues mentioned above are improved through education and reminders to turn lights off wherever possible. Adding labels to existing light switches may help promote more selective use. Similarly, efforts to promote use of built-in task lights would help reduce the usage of overheads and would lower total electric draw. The usage of window films may enable more people to utilize natural lighting without grappling with unwanted heat loads (See Appendix 3).

We also suggest using motion detectors in the kitchen and bathrooms. This investment would cost between $320 and $400 in total, but the energy savings are quite dramatic - 3,205 kWh per year and $193. This results in a payback period of 2 years. Additional areas like the copy room, conference rooms and some corridors should be assessed for sensor controls. Photosensors would be especially useful in areas such as the upstairs corridor that receive a great deal of sunlight.

Although the Sill Center does not have control over the security lighting (i.e. the lighting in areas such as the hallway, which is always on and not on a switch), we suggest that they consult with Facilities Management to see about having this lighting reduced. Since survey results indicate that the building is rarely occupied on weekends and is generally occupied only 8am to 5pm on weekdays, it is likely that this security lighting can be reduced without jeopardizing building safety. Perhaps a timer in conjunction with motion sensors could be installed to reduce the waste of electricity.

Other possible solutions that should be considered for the future include solar tube skylights. These skylights are relatively inexpensive ($500 per kit) and can be easily installed. The lobby and certain main-floor offices could be great candidates for solar tubes. With the installation of these skylights, overhead electric lights would become unnecessary.

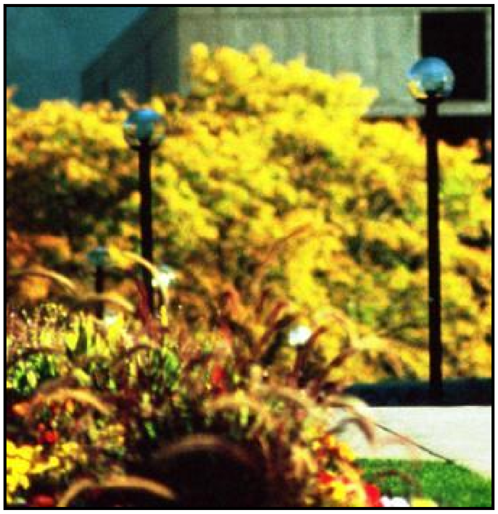


Resources:
http://www.solatube.com/commercial/index.php
http://www.veluxusa.com/solar_tube.htm
http://www.lowes.com/lowes/lkn?action=howTo&p=Improve/InstallTubularSkylight.htm
l

Lighting: Outdoor

Methods and Findings:

We walked the perimeter of the Sill Center to determine its outdoor lighting status. The Sill Center has 7 "lollipop" style outdoor lamps. This style is both inefficient and wasteful. The light from the rounded dome is directed up where it is least needed.



Unfortunately, it does not appear that the Sill Center has any control over whether these lamps are on or off.

Baseline:

We estimate that the outdoor lights consume nearly 4,600 kWh per year.

Recommendations and Cost Analysis:

We suggest removing these lights and replacing them with 7 solar post lamps. Prices for these lights range between $1,000 and $4,995 per unit (uninstalled). Unfortunately, because the University currently pays only $0.06 per kWh, the payback period on this investment (50 years) will make it difficult to convince anyone to make this change.

Lamps	7	
Watts	150	
hours per week	84	
kWh per week	88.2	
kWh per year	4586.4	@ $0.06 per kWh
Cost per year	$275.18	
Cost to replace	$14,000	($2,000 per lamp)
Payback	50.88	years

Without funding sources to purchase and install solar lights, we suggest the Sill Center speak with Facilities Management about halving the number of “lollipops” that are on each night.

Some online resources are:

- http://www.solarilluminations.com/acatalog/The__Superior__Collection_of_Solar_Lamp_Post_Pole_Street_Lights.html
- http://www.solarstreetlights.net/pathway%20lights.html
- http://www.pqicanada.ca/electrical_products/pdf/solar_power/solar_lighting_product_overview.pdf
- http://www.pqicanada.ca/electrical_products/pdf/solar_power/flare_series_solar_light.pdf
- http://www.oksolar.com/n_cart/search.asp?cat=Lighting&subcat=Solar%20Lighting

Appliances

Methods

The use of appliances was assessed by counting the number and type of all printers, computers, and miscellaneous appliances throughout the building. Behavioral aspects of appliance use were determined through our own observations and responses to our survey.

Findings

Appliances ranged from refrigerators and coffee makers to computers and printers. We found a total of 37 computers and 15 printer/copiers. There were 3-small refrigerators and one full-size refrigerator. Many of these appliances were energy-star rated. Although we found a hot water heater in the mechanics room, we decided not to include it in our calculations because the ambient temperature of the room was over 100 degrees and we felt the hot water heater’s energy draw would be rather low.

Based on the survey results, 80% of respondents always turn their computers off when leaving for the day, while 87% either never turn off their printers or do not have control over the printer. From these results, it appears that shared printers are likely left on at all times.

Approximately 33% of respondents possess a personal appliance such as a fan or spaceheater. This is indicative of HVAC problems and will be discussed further (see HVAC section).

Baseline

Our assessment shows the baseline energy use of appliances to be approximately 25,000 kWh or $1,500 per year.

Recommendations

Overall, the Sill Center would be wise to invest in energy star[iii] appliances and to consolidate appliances when possible. We counted three mini-refrigerators used in the center and these could be consolidated into one for each floor.

Since it appears that shared appliances (printers, refrigerators, etc) are rarely turned off, behavioral improvements would go a long way in saving energy. We would advise setting up a schedule for Green Team members to turn off computers and appliances at the end of the work day and week. We also suggest putting some appliances like copiers and printers on a basic timer.

[iii] http://www.energystar.gov/

Water: Indoor

Methods and Findings

Within the Sill Center inventory, the number of toilets, sinks, and urinals were assessed. The flush volumes for the bathroom fixtures were determined to be 3.5 gallons per toilet and 1.6 gallons per urinal. Using a stopwatch, we estimated sink flow rate to be 0.1 liters per second in the kitchen and 0.03 liters per second in the bathrooms. Given estimates for the number and gender of employees and visitors, we made some simple assumptions to calculate the frequency of use of these water-consuming fixtures (See Appendix 4 for assumptions and calculation specifics).

Baseline

With current building fixtures, annual indoor water usage was estimated at 98,000 gallons (See Appendix 4).

Recommendations

Indoor water use is directly related to the type of fixtures installed in the Sill Center, and the number of people using them. It is not feasible to significantly improve indoor water usage via behavioral changes. The only possible changes at the Sill Center would be installation of water-saving fixtures such as dual-flush toilets (which use 0.8 gallons for a low-volume flush and 1.6 gallons for a high-volume flush). Waterless urinals are another option. Sinks could also be retrofitted with low water-pressure faucets. However, we did not explore the sink option in great detail because the volume of water used for hand washing is quite low.

Cost Analysis

We estimate start-up costs for replacing the bathroom fixtures to be approximately $2,200. With these low-flow water fixtures in place, water savings would be approximately 69,000 gallons per year. At current water prices of $1/750 gallons, annual savings in water would be $93. Assuming sewage treatment fees would also be lowered because of the reduction in volume, total savings due to these fixtures is estimated at $180 per year. Payback time would be approximately 12 years.

Costs for Improvements	
2 urinals @ $300 ea.	$600
4 toilets @ $200 ea.	$800
labor, 10 hours @ $80/hr	$800
total	$2,200
Annual water savings	69,000 gallons
Annual Savings in water and sewage fees	$180
Payback period	12 years

Water: Outdoor

Methods and Findings

Since the Sill Center's grounds run continuously into the grounds of neighboring buildings, it is difficult to distinguish its particular outdoor areas. We walked the perimeter of the building and paced out the approximate area of lawn that we felt was directly associated with the Sill Center (See Appendix 1).

The total lawn area directly associated with the Sill Center is about 7,890 square feet. The entire area is planted with Kentucky bluegrass and a few large conifers. According to the buildings and grounds crew, it is irrigated heavily in the warm months using spray head and rotor sprinklers. The irrigation foreman for the area was not able to give us estimates of water volume. We were told that a sensor would be installed within the coming year. Once the sensor information is available, it will be much easier to quantify irrigation water at the Sill and across campus.

Without a sensor in place, and without direct information from the buildings and grounds crew, we consulted with the Utah Division of Water Resources website[iv] to determine the recommended watering schedule for Kentucky bluegrass in the area. We were then able to extrapolate the total volume of water that would be applied to the 7,890 square feet of lawn under ideal circumstances and on an annual basis (See appendix 4 for assumptions/calculations).

The Sill Center is also home to approximately 2,000 square feet of student gardens. The gardens produce a variety of fruits and vegetables that are largely donated to local food pantries. These gardens are watered by hand during early morning or evening hours. We spoke with the program coordinators to determine the watering schedule.

Student Gardens at Sill Center

Baseline

The student gardens receive 25,000 gallons of water a year. We estimate that the 7,890 square foot turf area receives a minimum of 103,500 gallons of water per year. Total annual outdoor water usage affiliated with the Sill Center is 128,500 gallons.

[iv] http://www.conservewater.utah.gov/OutdoorUse/Lawn

Recommendations and Cost Analysis

Since the student gardens at the Sill Center represent a powerful teaching tool and are an asset to the University and community, we recommend that they remain in their current state. The greatest impact to outdoor water usage can be made through addressing the issues of turf irrigation. We recommend replacing the 7,890 square feet of lawn with xeriscaping.

We conducted an initial cost analysis assuming replacement of the Kentucky Bluegrass with Blue Grama Grass. Blue Grama Grass is a drought and heat tolerant plant utilized at Utah State University's Utah House[v]. Blue Grama Grass is an attractive warm-season grass that is drought and heat-tolerant. Utah House estimates that its xeriscaping reduces irrigation by 75%, and so we have assumed the same savings. Since there is so much student interest in the grounds at the Sill Center, we assumed that student teams would be able to assist with the installation of the Grama Grass to eliminate start-up labor expenses.

Cost for Improvements	
28 pounds of seed at $12 per pound	$336
Quantity of water saved annually	77,700 gallons
Water savings	$104
Payback Period	3.25 years

Based on payback period and water savings, Grama Grass appears to be a viable option. However, dormant Grama Grass can be seen as a fire hazard. It is likely that the University of Utah would be too concerned with liability issues to allow large plantings of Grama Grass even though the length of the grass could be shaved at the end of the season. Possible alternatives include Buffalograss, which responds well to mowing and would more closely mimic Kentucky bluegrass in appearance. At a short, mowed length, it would present less of a fire hazard in its dormancy. Buffalograss requires half of the irrigation of Kentucky bluegrass and requires mowing half as often. If Buffalograss were planted, water savings would be about 51,800 gallons per year[vi]. With start-up costs of approximately $700 for Buffalograss seed, the payback period would be 10 years[vii].

Unfortunately, xeriscaping in a more landscaped fashion by mulching planting beds and carefully placing and selecting different plants would likely cost thousands of dollars for initial installation. We estimate that this type of xeriscaping would cost between $1.25 and $2 per square foot, not including labor. It would also be likely to require more regular up-keep than would a dense lawn of Grama Grass or Buffalograss. As a result, carefully landscaped xeriscaping would likely have too long of a payback period to be viable in the eyes of University administration.

[v] http://theutahhouse.org/htm/landscape
[vi] http://www.hort.usu.edu/PlantGuide/html/turf/buffalograss.htm
[vii] http://www.outsidepride.com/catalog/Buffalo-Supreme-p-17711.html?gclid=CJXO0Ye99pICFQijPAodYHVSyw

The Sill Center could make a powerful statement by xeriscaping its grounds. However, if planting drought-tolerant grasses will create too much of a fire hazard, it appears that the Sill Center's only option is to install landscaped, water-wise plantings and seek out alternative funding sources.

Recycling

Methods

Recycling success at the Sill Center was evaluated by inventorying the number, type, and location of all recycling bins. Waste bins were checked for recyclables. Similarly, recycle bins were checked for waste contaminants. Questions from the survey sought to determine whether Sill employees are utilizing recycling opportunities and are satisfied with them.

Findings

Overall, Sill Center employees make an excellent effort to recycle. All respondents to the survey felt that recycling opportunities at the Sill were either above-average or excellent. Respondents indicated that they were able to recycle printer cartridges, glass, paper, plastic, aluminum, and cardboard. Of the respondents, 73% indicated that they always recycle when they can.

Despite these clear recycling successes, there appears to be an overall shortage of recycling bins and some confusion regarding recyclables. When recycling bins were not in central locations, such as in the kitchen, we noted that recyclables were being discarded as waste. All offices contained a paper recycling bin, but not a mixed paper recycling bin. We therefore found much mixed paper present in trash bins. Since the Sill Center does possess a large collection bin for mixed paper, it appears that many building employees are either confused on the recycling rules, or are unmotivated to follow them. One survey respondent indicated that the distinction between various paper types and recycling locations was unclear. Despite these difficulties, paper recycling is quite popular in some locations. For instance, all paper recycling bins in the copy room were filled to the brim.

Copy room recycling

In the entire building, we found just three aluminum recycling bins and two cardboard recycling bins. These bins were clustered within a small area of the second floor. Also noted was the presence of an impromptu plastic and glass recycling area where Sill employees were collecting and recycling these items for private disposal. There was no official location for recycling plastic or glass. On the survey, one-third of respondents indicated that they would like to see an increase in the number of types of recycling accepted at the Sill Center. In particular, survey respondents reported that they would like to see glass and plastic recycling opportunities.

There was a large amount of electronic waste (computers, printers, etc) being sorted in the Sill Center. We learned that electronic waste and decommissioned computer equipment is shipped off to the University Surplus and Salvage department where it is appraised and offered for sale.

We were unable to quantify total waste and recycling within the Sill Center, so we were unable to obtain a baseline of recycling success.

Recommendations

Although the University does not presently recycle plastic and glass, it appears that Sill Center employees are interested in adding these items to the building's recycling plan. If there is enough interest, we recommend that the Green Team initiate a formal recycling program and alternate recycling duties amongst its members. Collected items can be brought to the nearest recycling station, for instance Hogle Zoo. We explored the possibility of obtaining a large outdoor collection bin for these miscellaneous items (plastic, glass) at or near the Sill Center, but it appears to be cost-prohibitive on a departmental scale. An annual contract would be required and a weekly fee for pick-up.

In total, we recommend adding 24 recycle bins to the Sill Center. Wherever possible, it would be preferable to locate these recycling bins adjacent to trash bins. These 24 bins would include 3 large mixed paper bins to be spread around the building (preferably 1 in the copy room and 1 near each of the basement printers), 3 large cardboard bins (1 in kitchen, 1 in upstairs hall, and 1 in basement), 2 additional aluminum bins (1 in upstairs hall, 1 in basement), and 12 small mixed paper bins (one in each major office area). A glass and plastic recycling program could be initiated with a total of 4 large collector bins (1 glass and 1 plastic on each floor). We estimate that these additions could be made for $500 or less, depending on the source of the bins. Presumably, some of these bins could be requested through the University and would be free of charge.

As a final note, we did observe that individuals are very good at recycling regular office paper. However, the bulk of paper could be reduced by promoting more double-sided printing and font-size reductions. Purchasing recycled paper would also help with this issue (see Procurement for further discussion).

Procurement

Methods

We requested procurement information from the administrative assistants of the Sill Center. We sought lists of standard purchases, frequency of purchase, and sources. To complement this information, we also looked through the copy room of the Sill Center to investigate the nature of their paper products.

Findings

We were not able to obtain detailed purchasing records. However, we did learn that the vast majority of office supplies, in terms of consumables such as pens, staplers, etc., are purchased 1-2 times per week through the Campus General Store and once per week from Office Depot. Approximately six times per year, orders are made from newegg.com, micron.com, apple.com, meritline.com, and circuitcity.com.

Approximately 50% of the copy paper in the copy room did not have any recycled post-consumer waste in it. Some of the color paper stock did carry 30% recycled materials. In the absence of concrete purchasing records, we assume that a typical full-time office worker uses 10,000 sheets of paper per year[viii], for a total of 290,000 sheets of paper used at the Sill Center. With such a large volume of paper being consumed, it is clear that the Sill Center could make a large impact by improving its paper procurement practices.

Without specific purchasing information, we were not able to determine a relevant baseline finding for procurement.

Recommendations

Given the large number of purchases made through the Campus General Store, it appears that the General Store would be a good target for future studies. If the Campus General Store can employ eco-friendly and sustainable purchasing practices, it will in turn improve the purchasing practices of all departments at the University of Utah.

We would suggest that the Sill Center request copy paper with a higher amount of recycled content. These products are typically not much more expensive than the alternative. As an example, a box of OfficeMax copy paper is $4.29. A box of Aspen 100 Recycled Copy Paper is $5.99 while also demonstrating the following characteristics[ix]:

- 100% post-consumer content
- Offers the same characteristics and brightness as a non-recycled sheet
- Made without the use of chlorine or chlorine compounds (PCF)
- Laser guaranteed
- Acid-free

---

viii http://www.printgreener.com/earthday.html
ix http://www.officemax.com

Using recycled paper keeps waste paper out of landfills and incinerators. Compared to virgin paper manufacturing, making paper from recycled material creates less air pollution and uses less energy and water. Additionally, buying chlorine-free paper reduces pollution[x].

Based on OfficeMax pricing, we estimate that the Sill Center could switch entirely to recycled paper with an annual cost increase of less than $600. If 100% recycled papers were made available via the Campus General Store, pricing would likely be greatly reduced.

Transportation

Methods

During the Sill Center inventory, any apparent transportation-related issues were noted. The vast majority of transportation issues were addressed via administration of the Sill Center survey (for results, see Appendix 6). Based on observed trends regarding commute distances and modes of travel, we made rough estimates of energy usage for transportation (for calculations and assumptions, See Appendix 5).

Findings

Inventory notes

There is an apparent lack of adequate bicycle storage facilities, as was evidenced by the presence of a bicycle in a major hallway.

Survey results

Working from home

There appears to be some potential for employees to work from home/telecommute. Of the individuals who responded to the survey, 53% indicated that 20% or more of their work could be completed from home. Similarly, 86% of respondents were willing to telecommute. If this is correct, it may be possible for these individuals to commute to work just 4 days a week, instead of 5.

Shifting work times

From the survey, 60% of respondents were willing to alter their work schedules to avoid a rush hour commute. Additional respondents felt that if work times could be shifted, they would be more likely to carpool.

Transportation Modes

Two-thirds of survey respondents commute to the Sill Center via single-passenger vehicle. Carpooling was used by 13% of respondents, with the remainder divided evenly among UTA TRAX, UTA bus, and campus shuttle. Although 86% of respondents have a UTA-Ed pass, only 31% reported using it regularly for all or part of their work commute.

[x] http://www.greenguardian.com/EPPG/4_1.asp

From the short answer responses, it appears that carpooling and mass transit are not favored alternatives for most people because of issues with timing and flexibility. However, there is some interest in bicycling. A total of 6 respondents (40%) would bike to work if locker room and shower facilities were available to them. This would reduce the number of single passenger vehicles affiliated with Sill Center employees by three.

Parking

Most individuals (90%) possess "A" parking permits and are given access to "prime" parking lots. All respondents who drive regularly park within a 10 minute walk of the Sill Center. Satisfaction with parking varies greatly; 50% felt that parking availability was above average or excellent.

Distance Travelled

In terms of the amount of time required for the work commute, 13% of respondents spend 10 minutes or less. A total of 73% travel for 30 minutes or less. For actual miles traveled, 53% of respondents live within 10 miles of the Sill Center. Individuals who commute via single passenger vehicle commute an average distance of 10 miles each way.

Baseline

Assuming the trends outlined in the survey apply to all Sill Center employees, we estimate that total annual energy expenditures for individuals commuting to the Sill Center is approximately 610 MBTU's (See Appendix 5 for calculations and assumptions).

Recommendations

Based on the survey results, we recommend that the Sill Center consider promoting flexible/shifted work hours and telecommuting where possible. The majority of employees who responded to the survey expressed interest in these options. This change could reduce the overall amount of travel that occurs and cut down on rush-hour commuting. Our survey indicates that if more flexible work hours were established, more individuals would be likely to utilize carpooling and mass transit options.

In addition to offering alternative work arrangements, there appears to be some demand for facilities for bicyclists. The Sill Center may want to consider establishing a protected bike storage area, perhaps on the front patio. Similarly, employees could be encouraged to utilize shower facilities at the nearby HPER complex.

Although there did not appear to be much interest in carpooling, the Sill Center may want to promote eco-friendly commuting habits by establishing a central ride board for its employees. It may also be possible for the Sill Center to grant some priority parking to those who carpool. Educational signs posted around the building could also be useful in promoting change. For instance, the average employee may be shocked to know how much pollution their single-passenger car is emitting.

Assuming there is no loss in productivity due to shifts in work schedule, all of these changes could be implemented without cost.

Heating, Ventilation, and Air Conditioning (HVAC)

Methods

The efficiency of the heating and air conditioning systems was assessed through building walk-throughs and calculations of energy usage. Survey responses were also considered to determine overall building comfort and how Sill Center employees felt about the thermostat settings.

Heating

Collecting data on heating costs for the Sill Center was extremely difficult as it is heated from the lower campus steam generation plant that heats numerous other buildings on campus. There is no metering specific to the Sill Center. We had to make a number of assumptions from the limited amount of data we were able to obtain for two buildings on campus of similar age to the Sill Center. Below is a table with the annual costs and BTU per square foot for buildings of a similar age as the Sill Center.

Data Subjects	**Annual cost per sq. ft.**	**Annual BTU per Sq. Ft.**
78,158 Sq. Ft. building:	$0.49	47,170.09
32,128 Sq. Ft. building:	$0.73	71,932.58
SILL - 13,107 Sq. Ft building	*$0.85*	*82,000.00*

Air Conditioning

Unlike many buildings on campus, the Sill Center possesses its own electrical meter. We used monthly usage data from 2007 to estimate the amount of electricity being used by the air conditioner chillers. See Appendix 2 for calculations and assumptions.

Findings

Heating

Unfortunately, both the example buildings were considerably larger than the Sill, so we decided to make an educated assumption on numbers and came to $0.85 annual cost per square foot and 82,000 annual BTUs per square foot. According to our survey, 60% of respondents felt that the building temperature was “just right” during the winter months; 33% reported feeling cold. Despite this indication of discomfort, two-thirds of all respondents indicated that they would be willing to have the building thermostat lowered by a degree or two in winter. Most rooms are set at 72F or 73F. Hallways are currently set at 68F.

Air Conditioning
The willingness of Sill Center employees to increase building temperature (and thus decrease air conditioning loads) was evaluated in the survey (Appendix 6). It appears that building residents are not comfortable with increasing building temperature because it is already too warm. From the survey, 60% of respondents indicated that their workspace was too hot in the summer months. This finding matches well with our observation that there are over 15 personal fans located within a building occupied by just 35 people. Clearly, the building staff is uncomfortable in the warmer months. Unfortunately the trend is not consistent across the entire building because 7% of respondents felt that the summer building temperatures were too cold. In total, 53% of respondents indicated that they would be willing to have the summer building temperature warmed up a degree or two in summer.

Much of the heat load in the Sill Center is attributable to the large amount of window area. There is a total of 1,513 square feet of south and west facing windows on the building. During the hottest months, the air conditioning and ventilation systems cannot keep up with the demand.

Ventilation System
During walk-throughs, we found several vents which were dirty or partially obscured by furniture.

Building Seal
We also found that few, if any, of the windows in the Sill Center close properly. There is a visible gap of approximately 1 centimeter in the closure of the front door - see pictures below. These issues would obviously contribute to overall HVAC costs.

Front Door

Window Seals

Baseline

Heating

The Sill's heating costs were calculated to be $11,050 per year using 1.066 MM BTUs of natural gas.

Air Conditioning

On an annual basis, air conditioning draws 67,700 kWh of electricity for a total cost of $4,060.

Recommendations and Cost-Analysis

The survey indicates that on the rare occasion when employees are at the Sill Center on a weekend day, it is only a handful of individuals staying for a limited period of time. Survey respondents indicated that the building is generally occupied just 8am-5pm on weekdays. We recommend that the thermostat settings be modified to reflect these occupancy patterns. It also appears that many employees would be willing to have the thermostat temperature lowered during winter months. We recommend that the Sill Center Green Team meet with Facilities Management to discuss these potential modifications to the thermostat. By reducing heating temperatures and times, a great deal of energy can be saved.

Overall air conditioning and heating performance could be improved by checking the ventilation system more frequently to look for signs of filter problems. Dirty vents can indicate blocked filters and reduced system capacity. We recommend that the Green Team check the vents on a bi-monthly basis to detect filter problems early.

As mentioned earlier, the building seal needs to be addressed. Basic weather stripping (approx. $1 per linear foot) and seals for windows and weather stripping sweeps (approx. $3 per linear foot) for doors would go a long way in saving on HVAC energy usage and costs.

We further recommend that the Sill Center take a closer look at installing new double-pane glass or install solar window film on their south and west facing buildings. Please see Appendix 5 for an in-depth description of window film results from a recent case study. The average cost for installing window film on a commercial building is between $3 and $6 dollars a square foot. Solar control window film can immediately reduce A/C energy consumption by 40 to 50% (Stanford study). It would cost approximately $7,200 to install film on all south and west facing windows (approx. 1,513 sq. ft.) and should conservatively save the Sill Center $1,400 in A/C use per year. This translates into a 5 year payback for this solution. Window film also filters the harsh light and will enable the occupants to begin using more natural lighting and reduce use of electric overhead lights. Additionally, some utility companies and several municipal utility districts are already offering rebate programs for the installation of solar window film on commercial buildings, both small and large. The life of window film depends on factors that include the application of the film, orientation of the window and geographic location. When properly installed, it is not uncommon for window film to remain attractive and effective for as long as 30 years or more[xi]. Some online resources are:

- http://www.az-solarcontrol.com/getwindowfilm.html
- http://www.advancedwindowfilms.com/Huper%20Optik%20page.htm

Additional options for improving heat load on the Sill Center include planting trees to help shield the building. These trees would have the added benefit of improving the shading of the outdoor areas. Many survey respondents (46%) indicated that increased shade in the patio areas would enhance their usage and enjoyment of these locations.

[xi] http://www.globalwindowfilms.com/about-faq.htm#5

Summary of Sill Center Assessment

Baseline

ENERGY

Electrical usage	Annual MBTU	Annual kWh	Annual Cost to Sill Center
Overhead lighting:	168,040	49,250	$2,954.99
Outdoor lighting (if metered):	15,649	4,586	$275.18
A/C:	230,992	67,700	$4,062.00
Appliances:	84,354	24,723	$1,483.37
Total Electrical Usage	499,036	146,259	$8,775.54
Total Heating	1,075		$11,140.95
Total Transportation *	610		$0.00
Total Annual Energy Expenditures	**500,721**		**$19,916.49**

*** employees largely fund this themselves**

WATER

Water Usage	Annual Gallons	Annual Cost to Sill Center
Indoor	98,067	$130.76
Outdoor (turf)	103,533	$138.04
Outdoor (student gardens)	24,935	$33.25
Total Annual Water Expenditures	**226,535**	**$302**

Key Recommendations

Lighting:

- Reduce number of overheads
- Utilize task lighting
- Consider motion detectors/light sensors for certain areas/rooms
- Work for reduction in security lighting (perhaps through timers)
- Encourage individuals to turn off lights when leaving the room

Appliances:

- Continue purchase of energy-star appliances
- Assign a Green Team member to ensure that shared printers, etc. are turned off
- Consider consolidating appliances where possible (i.e. refrigerators)

HVAC:

- Consider solar window film to reduce heat loads
- Thermostat could be made slightly cooler in winter
- Given building occupancy patterns, a set-back thermostat could work well
- Improve overall building seal (weatherstripping, etc)

- Regularly check vents for filter issues

Water:

- Consider installation of dual-flush toilets and waterless urinals
- Xeriscaping could be an attractive option for the building's perimeter

Transportation:

- Promote carpooling
- Consider allowing more flexible work schedules and/or work from home
- Encourage bicycling and use of HPER locker room facilities

Procurement:

- Strive to increase recycled content within consumables

Recycling:

- Increase number of bins, building-wide
- Clarify mixed and office paper distinctions
- With assistance of Green Team, create glass and plastic recycling program

Conclusion

Notes on Methods Development

This project was an exploratory assignment to investigate a breadth of sustainability-based areas of building assessment in order to identify the most important (shortest payback and greatest effect) areas for change. Our project was both a success and a failure. We succeeded in creating an approximate energy and water baseline for the building, but we failed at being able to adequately examine all of the factors contained within our initial project proposal. For instance, we were not able to obtain baselines for procurement nor waste and recycling. We believe the scope of this project was a bit too wide for a single-semester project. Limiting focus to just the most important elements would have improved our overall efficiency and effectiveness. For future assessment efforts, we suggest either larger assessment teams or smaller teams with a more limited focus.

Some of our failures are attributable to the countless delays we experienced due to communication difficulties and scheduling conflicts. We believe that earlier deployment and better promotion of the survey, combined with increased Green Team involvement, would have helped our cause and delivered a more effective and broader response. Additionally, increased motivation for cross-departmental collaboration (i.e. Facilities Management, Building and Grounds, etc.) would have been helpful. Although we made many requests for data for our project, we found, not surprisingly, that the needs of our small student project did not always receive priority attention. If these types of assessment tools are going to be effective, perhaps the Office of Sustainability could be more directly involved in seeking out these collaborative relationships to obtain the necessary data in a more timely fashion.

Overall, we feel that both the survey and the inventory were useful tools for obtaining a well-rounded picture of the Sill Center. The survey succeeded in providing behavioral insights that helped us interpret the data collected in the inventory. The survey was also a powerful tool because it promoted awareness among Sill employees of the on-going assessment and encouraged them to think about their individual habits. The inventory was relatively straight-forward and successfully led to calculation of a building baseline.

Creation of an Assessment Template

Since inventory taking was the most time consuming part of this project, our assessment template has been streamlined to focus on only the most important areas of the assessment – lighting, appliances, windows, recycling etc. We have consolidated all aspects of the project into a single, user-friendly spreadsheet that can be applied to future assessments of different campus buildings. Upon completing an inventory and survey, interested parties can enter the required data into the spreadsheet to obtain baseline water and energy estimates for their building of interest (see AssessmentTemplate.xls for complete information). The spreadsheet also includes cost analysis information for potential improvements such as reducing overhead lighting, water use, and solar heat load. Green Teams can easily modify the Excel tool to include improvement options they find most relevant and interesting. Green Teams can also elect to consider only a limited set of parameters depending on their interests and expertise. For instance, if they wish to consider just electrical usage due to computers, they can easily use the spreadsheet tool for these calculations. Our intention is that the template tool can continue to be modified as more information becomes available, and as future teams build upon our work to create improved assessment techniques.

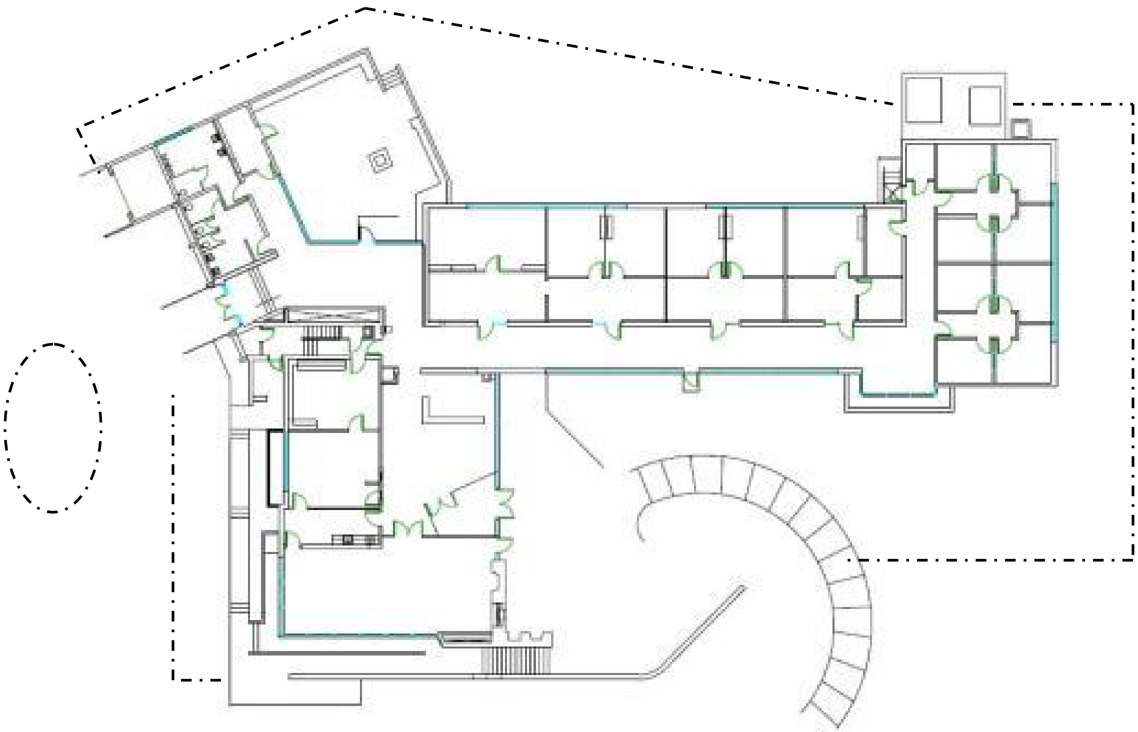
Collaborators

Many thanks to all of the individuals who assisted with this project:

Office of Sustainability: Craig Forster, Jen Colby
Sill Center: Mark St. Andre and Green Team
Sustainability Practicum Course Instructors: Steve Burian, Bill Johnson
Faculty Assistance: Melinda Krahenbuhl
Facilities Management: Chris Atkins, Bianca Shama

Appendices

Appendix 1: Grounds area where Xeriscaping was considered, excluding student gardens.



Appendix 2: Assumptions/Calculations for Air Conditioning

- Sill Center air conditioning runs full-time when the air temperature in Salt Lake City is at or above 70 degrees Fahrenheit.
- Based on 30-year temperature averages for Salt Lake City, the temperature is at or above 70 degrees for all of June, July, August, and September. It is at or above 70 degrees for 20 days in May and 5 days in October.
- Monthly electrical usage for normal building operations (excluding air conditioning) was calculated as an average of usage amounts for November, December, January, February, March, and April.
- Monthly electrical usage for all building operations (including air conditioning) was calculated as the average of June, July, August, and September – the months when the air conditioning is running full-time.
- Monthly draw for full-time air conditioning was calculated as the difference between the two averages.
- Monthly air conditioning draw was converted to annual air conditioning draw by adding the cumulative draw among all months when the air conditioning was running.

Without further information, we had to ignore any potential impacts that changing length of day would have on electricity usage for lighting. This does not appear to be an unreasonable assumption since in the summertime many lights are still on because most windows are fully covered[xii].

Appendix 3: Solar Window Film Information

The following is an excerpt from Marty Watts' article on this subject entitled, "Window film isn't just for heat control anymore"[xiii]:

"Unlike solid walls, windows and fixed glass allow the relatively easy transmission of both heat and light into a building's interior. Acknowledge the fact that the existence of glass in built and yet-to-be constructed buildings will continue to account for a significant percentage of a building's envelope. That being the case, architects and designers must understand how glass performs in terms of heat and light transmission when developing and implementing a comprehensive strategy for managing a building's environment and indoor air quality. Why must they? Because to not understand how light and heat through existing glass can impact a building's environment and air quality will inevitably reduce the efficacy of both existing and prospective environmental management plans. And knowing how glass performs will make clear the role of window film in mitigating the ability of glass to negatively impact the indoor environment.

Take the issue of heat. According to the California Energy Commission, 30 percent of a building's cooling requirements is from heat entering through existing windows. Whether this fact is known or not, reducing heat in a building is usually considered to be a legitimate and exclusive HVAC function. As a supplement to HVAC, stopping heat at the window using heat-blocking window film, can not only reduce air conditioning operating frequency and cost, but can also placate many building occupants who rightly or wrongly believe "conditioned" air is less desirable to work or live in than non-conditioned air.

A recent window film installation at Stanford University at Encina Hall, originally constructed as a dorm in 1891 and completely renovated as an administration building in 1998. Some 6,212 square feet of spectrally selective window film was applied in June 2003. Spectrally selective film blocks solar heat while simultaneously transmitting high levels of natural light. Daily air conditioning (A/C) requirements to remove heat at Encina Hall prior to the film's installation amounted to 665.57 A/C tons at an A/C cost of $66.56 per day. Daily air conditioning requirements to remove heat with the film installed are 339.44 A/C tons at an A/C cost of $33.94 per day. As a result of the film's installation, Encina Hall now enjoys an annual savings in A/C cost of $4,891.95."

Appendix 4: Water Assumptions

[xii] http://www.utahefficiencyguide.com/measures/commercial/hvac.htm; http://www.utahefficiencyguide.com /measures/rates.htm

[xiii] http://www.edcmag.com/CDA/Archives/6ce4abe75d697010VgnVCM100000f932a8c0____

Indoor Use

- Given the sink flow rates and our own trials, we estimate that an individual uses 0.1 gallons of water each time he/she washes his/her hands.
- Individuals wash their hands every time they visit the restroom.
- The kitchen sink is used only negligibly, for limited dish-washing. Total water usage is 1 gallon per day.
- All full-time employees visit the restroom four times a day; part-time employees visit it once.
- Without knowing gender specifics, we have assumed that there are 19 full-time women at the Sill Center, 10 full-time men, 3 part-time women, and 3 part-time men.
- Most individuals at Sill appear to drink canned beverages. We've assumed that just a quarter of full-time Sill Center employees utilize drinking fountains for their daily water consumption. Daily water consumption is assumed to be approximately 2 liters, with 1 liter consumed while at work. Total water consumption for drinking purposes at Sill is thus assumed to be approximately 2 gallons per day.

Outdoor use

- On a monthly basis, ideal/recommended watering schedule for turf (Utah Division of Water Resources) is 3.9 inches of water in May, 4.9 inches in June, July, August, and 2.5 inches in September
- Calculation assumes ideal soil and exposure and minimum water losses due to poor sprinkler placement.
- Intended watering schedule for Sill Student Gardens is 4 inches a month in May, June, July, August, and September.

Appendix 5: Calculations/Assumptions for Transportation

- We have assumed that of all employees, 20 full-time and 3 part-time employees commute by single-passenger vehicle each day. This assumption is supported by the survey, where 2/3 of all respondents commuted by single-passenger car. If we assume this trend would hold among individuals who did not take the survey, then we can estimate that 23 total Sill Center employees commute via single-passenger car. We designated the 20/3 split because it most closely matched the survey results when taking into consideration the responses of the part-time workers and the fact that they are not all present every work day.
- Of the individuals responding to the survey, 13% carpool and the remaining 20% were split evenly among campus shuttle, UTA bus, and UTA TRAX. We have assumed that these trends hold among all Sill Center employees. However, this assumption likely overestimates the number of individuals utilizing alternative transportation, since the group responding to the survey was self-selected.
- We have assumed that all carpoolers are full-time employees, since many part-timers indicated that their schedules were too complex for alternative travel arrangements.

- In keeping with survey findings, we assumed that of the full-time employees, 20 take single-passenger vehicles, 4 carpool, 3 utilize bus or shuttle, and 2 utilize TRAX. Of the part-time employees, 3 take single-passenger vehicles, 2 utilize bus or shuttle, and 1 utilizes TRAX.
- On a daily basis, full-time employees travel 12.67 miles and part-time employees travel 31.5 miles. These values are calculated averages from all survey responses and all modes. We have assumed that they hold true for all employees.
- We have assumed that the Sill Center is staffed 248 days a year.
- Annual mileages for all modes of transportation (car, carpooling, bus/shuttle, TRAX) were calculated based on total number of employees and average distance traveled.
- These mileages were then converted to MJ's assuming the following:
    - bus/shuttle: 4.1 MJ per passenger mile
    - TRAX: 1.3 MJ per passenger mile
    - Carpooling: 3 MJ per passenger mile (assuming a 2-person carpool)
    - Single-passenger car: 6 MJ per passenger mile
    - (Energy expenditures by mode were adopted from pp 76-79 of Sustainability and Cities by P. Newman and J Kenworthy (1999).)

Appendix 6: Survey results

Q1. What is your employment status at the Sill Center?

Count	Percent	
8	53.33%	Full time (35 hours a week or more)
7	46.67%	Part time (less than 35 hours a week)
15	Respondents	

Q2. Please provide a sample of your typical schedule in the Sill Center for each day of the week:

(*Example: Monday 8am-5pm*)

Count	Respondent %	Response %	
14	93.33%	19.72%	Monday:

Count	Percent	
1	7.14%	10:45AM-4:15PM
1	7.14%	11:30-2pm
1	7.14%	11am - 4 pm
1	7.14%	8 am -3:15 pm (in class for three hours)
2	14.29%	8am-3pm
3	21.43%	8am-5pm
1	7.14%	9:00am -4:45pm
1	7.14%	9-4
2	14.29%	9-5
1	7.14%	9am-1pm

Count	Respondent %	Response %	
14	93.33%	19.72%	Tuesday:

Count	Percent	
1	7.14%	10am-4pm
1	7.14%	12:00-2pm
1	7.14%	8:45am -5:00pm

Q2. Please provide a sample of your typical schedule in the Sill Center for each day of the week:

(*Example: Monday 8am-5pm*)

Count	Respondent %	Response %	
	1	7.14%	8am-3pm
	2	14.29%	8am-5pm
	1	7.14%	8am-9am, noon-5pm
	1	7.14%	9 am - 4 pm
	1	7.14%	9:30am-2:30pm
	3	21.43%	9-5
	1	7.14%	9am-1pm
	1	7.14%	variable
13	86.67%	18.31%	Wednesday:
	Count	**Percent**	
	1	7.69%	10:45AM-4:15PM
	1	7.69%	11am - 5 pm
	1	7.69%	8 am-3:15 pm (in class for three hours)
	1	7.69%	8:30am - 4:30pm
	1	7.69%	8-5
	2	15.38%	8am-3pm
	3	23.08%	8am-5pm
	2	15.38%	9-5
	1	7.69%	9am-1pm
13	86.67%	18.31%	Thursday:
	Count	**Percent**	
	1	7.69%	10am-4pm
	1	7.69%	12-1pm
	1	7.69%	8:30am -4:30pm
	1	7.69%	8am-3pm
	2	15.38%	8am-5pm
	1	7.69%	9 am - 4 pm
	1	7.69%	9:30am-2:30pm
	2	15.38%	9-5
	1	7.69%	9am-1pm
	1	7.69%	noon-2pm
	1	7.69%	variable
13	86.67%	18.31%	Friday:
	Count	**Percent**	
	1	7.69%	10 am - 4 pm
	1	7.69%	10:45AM-2:45PM
	1	7.69%	8 am - 1:30 pm (in class for three hours)
	1	7.69%	8:30am -4:30pm
	2	15.38%	8am-3pm
	3	23.08%	8am-5pm
	1	7.69%	9:30am-2:30pm
	2	15.38%	9-5
	1	7.69%	9am-1pm
2	13.33%	2.82%	Saturday:
	Count	**Percent**	
	1	50.00%	infrequent - sometimes I stop by to make copies, or work for not more than 3 - 4 hours
	1	50.00%	not present
2	13.33%	2.82%	Sunday:
	Count	**Percent**	
	1	50.00%	none
	1	50.00%	not present

Q2. Please provide a sample of your typical schedule in the Sill Center for each day of the week:

(*Example: Monday 8am-5pm*)

Count	Respondent %	Response %	
15	Respondents		
71	Responses		

Q3. If your job permits it, approximately what percentage of your work hours could be conducted remotely (i.e., through videoconferencing, Internet)?

Count	Percent	
1	6.67%	0%
1	6.67%	Less than 10%
5	33.33%	10-20%
1	6.67%	21-30%
3	20.00%	31-40%
2	13.33%	41-50%
2	13.33%	51-60%
0	0.00%	61-70%
0	0.00%	Greater than 70%
15	Respondents	

Q4. If the option was available to you and appropriate for your job type, which, if any, of the following would you be willing to do at least one da all that apply)

Count	Respondent %	Response %	
9	60.00%	33.33%	Non-standard work hours (i.e., 7am-3pm) to avoid a rush hour commute
4	26.67%	14.81%	Longer work days to avoid rush hour commute and/or work fewer days (i.e., working four 10-hour days per we
13	86.67%	48.15%	Telecommuting/videoconferencing and working from home
1	6.67%	3.70%	Other (please specify)

Count	Percent	
1	100.00%	I already do that - I grade at home and prepare lecture notes at home

Count	Respondent %	Response %	
0	0.00%	0.00%	None of the above
15	Respondents		
27	Responses		

Q5. What is your *primary* means of transportation to the Sill Center?

Count	Percent	
10	66.67%	Single-passenger vehicle
1	6.67%	UTA TRAX
1	6.67%	UTA bus
1	6.67%	Campus shuttle
0	0.00%	Walking
2	13.33%	Carpool
0	0.00%	Bicycle
0	0.00%	Other (please specify)

Count	Percent

Count	Percent
15	Respondents

Q6. In which lot do you typically park?

Count	Percent	
9	90.00%	North of Alumni House

Q6. In which lot do you typically park?

Count	Percent	
0	0.00%	North of Union
1	10.00%	HPER lot
0	0.00%	Other (please specify)

Count	Percent

10	Respondents

Q7. Which U of U parking permit do you have?

Count	Percent	
8	80.00%	A
0	0.00%	D
0	0.00%	E
0	0.00%	M
0	0.00%	R
0	0.00%	T
2	20.00%	U
0	0.00%	No permit
10	Respondents	

Q8. If you do not have a permit or do not always use one when working at the Sill Center, approximately how much do you pay weekly for parking at the U?

Count	Percent	
0	0.00%	Less than $1
0	0.00%	$1-5
0	0.00%	$6-10
0	0.00%	$11-15
0	0.00%	$16-20
0	0.00%	More than $20
10	100.00%	Not applicable
10	Respondents	

Q9. How would you rate parking availability on campus?

Count	Percent	
3	30.00%	Excellent
2	20.00%	Above average
3	30.00%	Average
1	10.00%	Below average
1	10.00%	Poor
10	Respondents	

Q10. What would make carpooling a more feasible option for you?

Count	Percent
12	100.00%

Count	Percent	
1	8.33%	flex time
1	8.33%	Having more people who work at the Sill Center nearby. One lives very nearby, but TRAX still seems like a better way to go than a car pool. In the spring and fall, I ride my bike most of the time in any case. I would ride during the heat of the summer if lockers and showers were available.
1	8.33%	Having someone in my area that also worked 8-3
1	8.33%	I could change my work schedule to car pool in the morning with a friend, then ride the bus home.

Q10. What would make carpooling a more feasible option for you?

Count	Percent	
1	8.33%	I don't like the idea of carpooling with anyone from work. I think it's awkward.
1	8.33%	I live on campus and don't use my car during the week. Carpooling isn't really an option for me since it is easier for me to walk, ride my bike, or take a campus shuttle to work.
1	8.33%	If I knew other people around me who were driving to the U...but I am a very faithful bus rider, so I don't think it's a problem.
1	8.33%	Knowing the person I was car-pooling with had some flexibility.
1	8.33%	Likely not feasible due to variable work hours.
1	8.33%	not an option for me
1	8.33%	nothing -- I have kids to drop off at multiple locations
1	8.33%	nothing at the moment.. i have a complex schedule with two kids under 5 years old..
12	Respondents	

Q11. What would make mass transit a more feasible option for you?

Count	Percent
12	100.00%

Count	Percent	
1	8.33%	availability
1	8.33%	Building a rail line closer to east bench.
1	8.33%	I have a baby so it would be difficult to drop her off and then make it to work on tie
1	8.33%	I used to ride the bus, but the routes changed last August. There are now few buses that go to my neighborhood. The flexibility in scheduling is gone.
1	8.33%	If the 313 or 354 had a bus that left the University at 3 pm; I do take the bus twice a week on days when I can get a ride home with my mom from Holladay.
1	8.33%	It is a great option- I just need to wake up earlier.
1	8.33%	Mass transit takes me more than twice as long to commute and does not allow me to run errands on my way home. It is also not fun in bad weather to walk six blocks to the bus stop. So I would say I would need closer and more timely availability.
1	8.33%	not an option for me
1	8.33%	Not having to drop my daughter off at preschool every morning.
1	8.33%	nothing
1	8.33%	see Question 10 above
1	8.33%	There isn't a bus stop that is close to my apartment. I would have to make at least one transfer and it would take a lot of extra time.

Count	
12	Respondents

Q12. If, hypothetically, locker-room facilities were available at the Sill Center, would you be willing and able to commute by bike?

Count	Percent	
6	40.00%	Yes
9	60.00%	No
15	Respondents	

Q13. Do you have a UTA-Ed Pass?

Count	Percent	
13	86.67%	Yes
2	13.33%	No
15	Respondents	

Q14. Do you use your UTA-Ed pass for your commute?

Count	Percent

Q14. Do you use your UTA-Ed pass for your commute?

Count	Percent	
4	30.77%	Yes
9	69.23%	No
13	Respondents	

Q15. What are the key reasons behind your transportation mode choice?

Count	Percent
15	100.00%

Count	Percent	
1	6.67%	convenience and lack of flexibility of my hours
1	6.67%	Convenience and the necessity of dropping my daughter or son off at child care.
1	6.67%	Convince. It is quick and easy to get to work on time.
1	6.67%	dropping of and picking up children
1	6.67%	I don't think it's necessary for me to waste gas driving to Salt Lake every day by myself when I could just as easily take the bus. I could probably afford a car payment, but I don't want one and I definitely don't want to pay for gas.
1	6.67%	I have used my pass on rare occasions, but my key reasons for carpooling are that it is more time-saving and convenient.
1	6.67%	I live 30 miles away from campus, and have to drop kids off at childcare.
1	6.67%	It is the easiest option because I have trouble getting up early, and I sometimes commute from my boyfriend's apartment, stop at my apartment, then go in to work.
1	6.67%	Location; variable hours; need for flexibility; drive fuel efficient car.
1	6.67%	My work hours; there are no buses running to Sandy when I get off at 3 pm. TRAX is no longer an option because I've had my car broken into in their parking lots and significant damage done, and UTA got rid of the neighborhood bus that ran from the TRAX station to my house.
1	6.67%	See question 10
1	6.67%	There isn't a convenient bus route where I live.
1	6.67%	time and flexibility
1	6.67%	Timing
1	6.67%	We only have one car, and I'm close enough to TRAX and the U that the commute by TRAX is easy when I'm not riding my bike.

15 Respondents

Q16. How long does it take you to commute *one way* to or from work on a typical day?

Count	Percent	
0	0.00%	Less than 5 minutes
2	13.33%	5-10 minutes
4	26.67%	11-15 minutes
1	6.67%	16-20 minutes
1	6.67%	21-25 minutes
3	20.00%	26-30 minutes
2	13.33%	31-35 minutes
0	0.00%	36-40 minutes
1	6.67%	41-50 minutes
1	6.67%	51-60 minutes
0	0.00%	More than 60 minutes
15	Respondents	

Q17. What is the zip code of your present residence?

Count	Percent
15	100.00%

Count	Percent

Q17. What is the zip code of your present residence?

Count	Percent			
	1	6.67%	84037	
	1	6.67%	84065	
	1	6.67%	84093	
	1	6.67%	84094	
	3	20.00%	84102	
	1	6.67%	84105	
	1	6.67%	84106	
	1	6.67%	84108	
	1	6.67%	84109	
	1	6.67%	84112	
	1	6.67%	84119	
	2	13.33%	84121	
15	Respondents			

Q18. What is the approximate distance from your residence to the Sill Center, in miles?

Count	Percent	
0	0.00%	Less than 1 mile
5	33.33%	1-5 miles
3	20.00%	6-10 miles
2	13.33%	11-15 miles
3	20.00%	16-20 miles
1	6.67%	21-30 miles
1	6.67%	31-40 miles
0	0.00%	41-50 miles
0	0.00%	51-60 miles
0	0.00%	More than 60 miles
15	Respondents	

Q19. On poor air-quality days, how are your commuting habits affected?

Count	Percent			
12	100.00%			
	Count	Percent		
	1	8.33%	I drive almost all the time, so they are not affected.	
	1	8.33%	I try to take the bus; again, this depends on if I can find an alternate way home from work because I can't get from the U to Sandy at 3 pm.	
	1	8.33%	I will walk to my daughter's daycare instead of driving over to visit her at lunch.	
	1	8.33%	N/A	
	1	8.33%	No effect	
	1	8.33%	No.	
	2	16.67%	Not affected.	
	1	8.33%	not much	
	1	8.33%	Not much. I do try to restrict my home and non-essential driving, though.	
	1	8.33%	They aren't.	
	1	8.33%	Usually riding TRAX.	
12	Respondents			

Q20. On a typical day, which lighting sources do you use in your workspace? (Check all that apply)

Count	Respondent %	Response %	
8	53.33%	33.33%	Natural daylighting (from windows)
11	73.33%	45.83%	Overhead lighting (lights mounted on the ceiling)

Q20. On a typical day, which lighting sources do you use in your workspace? (Check all that apply)			
Count	**Respondent %**	**Response %**	
5	33.33%	20.83%	Task lighting (smaller lights located on or near your desk)
15	Respondents		
24	Responses		

Q21. How would you describe the level of lighting in your work space?		
Count	**Percent**	
0	0.00%	Far too bright
4	26.67%	A little too bright
9	60.00%	Just right
2	13.33%	A little too dim
0	0.00%	Far too dim
15	Respondents	

Q22. How often do you do each of the following? - Turn off the lights in your work space when you temporarily leave the room		
Count	**Percent**	
2	13.33%	Always
8	53.33%	Sometimes
1	6.67%	Rarely
4	26.67%	Never
0	0.00%	Not applicable (I do not have control over this equipment)
15	Respondents	

Q23. How often do you do each of the following? - Turn off the lights in your work space when you leave for the day		
Count	**Percent**	
12	80.00%	Always
2	13.33%	Sometimes
0	0.00%	Rarely
0	0.00%	Never
1	6.67%	Not applicable (I do not have control over this equipment)
15	Respondents	

Q24. How often do you do each of the following? - Turn off your computer when you leave for the day		
Count	**Percent**	
12	80.00%	Always
1	6.67%	Sometimes
1	6.67%	Rarely
0	0.00%	Never
1	6.67%	Not applicable (I do not have control over this equipment)
15	Respondents	

Q25. How often do you do each of the following? - Turn off your printer when you leave for the day		
Count	**Percent**	
2	13.33%	Always
0	0.00%	Sometimes
0	0.00%	Rarely
4	26.67%	Never

Q25. How often do you do each of the following? - Turn off your printer when you leave for the day

Count	Percent	
9	60.00%	Not applicable (I do not have control over this equipment)
15	Respondents	

Q26. Do you have any personal appliances in your workspace (i.e., mini-fridge, microwave, spaceheater, personal fan, coffeemaker)?

Count	Percent	
5	33.33%	Yes (please specify what personal appliances)

Count	Percent	
1	20.00%	Mini-fridge
1	20.00%	personal fan
1	20.00%	Space heater and mini fridge
1	20.00%	There are shared appliances in my work space- a fridge, and a microwave.
1	20.00%	There is a space heater that I used about a dozen times during the winter.

Count	Percent	
10	66.67%	No
15	Respondents	

Q27. Approximately how many days a year do you run these appliances?

Count	Percent
5	100.00%

Count	Percent	
3	60.00%	365
1	20.00%	30
1	20.00%	13

Count	Percent
5	Respondents

Q28. Do you use window shades/curtains/blinds to block out unwanted sunlight?

Count	Percent	
7	46.67%	Yes
8	53.33%	No
15	Respondents	

Q29. Please rate the adequacy of your window coverings:

Count	Percent	
1	14.29%	Excellent
4	57.14%	Above average
2	28.57%	Average
0	0.00%	Below average
0	0.00%	Poor
7	Respondents	

Q30. Are there any locations in the building or times of day where you feel lighting is either inadequate or excessive?

Count	Percent	
10	66.67%	Yes (please specify the locations and/or times of day)

Count	Percent	
1	10.00%	Hallway is always lit up and this is not necessary
1	10.00%	I have an office without any windows.. I HAVE to use some form of lights. Your question 26 does not give me that option
1	10.00%	I would be okay with only one of the overhead lights on in room 130; the office next door and the hallway bring in enough light.

Q30. Are there any locations in the building or times of day where you feel lighting is either inadequate or excessive?

Count	Percent	
1	10.00%	If it is dark outside then the lamps in my space aren't sufficient lighting
1	10.00%	In the spring through fall the main conference room upstairs is an incredible heat/light source.
1	10.00%	The front lobby area is hard to control because of all the windows. The idea of having the window open for lighting purposes is nice, but it heats up the area way too much.
1	10.00%	The front office is normally pretty well lit with natural light, but during some hours of the day, I have to close the blinds because the sun is in my eyes at my desk.
1	10.00%	The hallway at the bottom of the stairs which leads to room 009 is too brightly lit.
1	10.00%	too much sunlight in the mornings in summer
1	10.00%	When I have returned to the Sill Center after working hours to pick up something from my office, I have found that the building is a blaze of light for what seems like no apparent reason.

Count	Percent	
5	33.33%	No
15	Respondents	

Q31. How would you describe the temperature in your work space in the summer?

Count	Percent	
0	0.00%	Far too hot
9	60.00%	A little too hot
5	33.33%	Just right
1	6.67%	A little too cold
0	0.00%	Far too cold
15	Respondents	

Q32. Would you be willing to have it warmed up a degree or two in the summer?

Count	Percent	
8	53.33%	Yes
7	46.67%	No
15	Respondents	

Q33. How would you describe the temperature in your work space in the winter?

Count	Percent	
0	0.00%	Far too hot
1	6.67%	A little too hot
9	60.00%	Just right
3	20.00%	A little too cold
2	13.33%	Far too cold
15	Respondents	

Q34. Would you be willing to have it cooled down a degree or two in the winter?

Count	Percent	
10	66.67%	Yes
5	33.33%	No
15	Respondents	

Q35. Are there any areas in the building which you feel have improper heating/cooling/ventilation?

Count	Percent	
9	60.00%	Yes (please specify the areas)

Count	Percent	
1	11.11%	Area next to the bathroom always gets hot from the windows

Q35. Are there any areas in the building which you feel have improper heating/cooling/ventilation?

Count	Percent			
	1	11.11%	East windows by James' cubicle.	
	1	11.11%	font desk	
	1	11.11%	Hallway is always wrong. We frequently have maintenance over to reset (re-pressurize) the thermostats.	
	1	11.11%	I am not sure that the thermostat downstairs actually does anything.	
	1	11.11%	Offices on the east side are too hot in the summer and too cold in the winter. The large conference room is very warm.	
	1	11.11%	Room 130 is always cold.	
	1	11.11%	Some of our rooms have either too much heat or none at all.. heat and air need to be better regulated be it summer or winter	
	1	11.11%	The front lobby area heats up too much when it's warm outside because of all the windows.	
6	40.00%	No		
15	Respondents			

Q36. Please rate the current availability of recycling opportunities within the building:

Count	Percent	
7	46.67%	Excellent
8	53.33%	Above average
0	0.00%	Average
0	0.00%	Below average
0	0.00%	Poor
15	Respondents	

Q37. How often do you recycle when at work?

Count	Percent	
11	73.33%	Always
4	26.67%	Sometimes
0	0.00%	Rarely
0	0.00%	Never
15	Respondents	

Q38. Which of the following materials do you *personally* recycle at the Sill Center? (Check all that apply)

Count	Respondent %	Response %	
0	0.00%	0.00%	Electronics
3	20.00%	5.66%	Printer cartridges
1	6.67%	1.89%	Glass
15	100.00%	28.30%	Paper
11	73.33%	20.75%	Plastic
11	73.33%	20.75%	Aluminum
12	80.00%	22.64%	Cardboard
0	0.00%	0.00%	Food waste
0	0.00%	0.00%	Other (please specify)
	Count	**Percent**	
15	Respondents		
53	Responses		

Q39. Would you like to see recycling opportunities for additional materials?

Count	Percent	
5	33.33%	Yes (please specify the materials)

Q39. Would you like to see recycling opportunities for additional materials?

Count	Percent	

Count	Percent	
1	20.00%	glass
1	20.00%	I believe our office would be willing to help recycle any material, we just need an easy way to have it picked up.
1	20.00%	I would like to see the University collect more recyclables like plastic and aluminum. Currently, as I understand it, some dedicated recyclers at the Sill Center are personally disposing of these items for the whole building.
1	20.00%	It would be nice if the U had a plastic recycling program and one for glass.
1	20.00%	Plastic and all kinds of paper, clearly marked. I'm not always sure what is ok to recycle where. In my home, we recycle everything possible.

Count	Percent	
10	66.67%	No
15	Respondents	

Q40. How often do you utilize the Sill Center's outdoor areas?

Count	Percent	
0	0.00%	Always
6	40.00%	Sometimes
6	40.00%	Rarely
3	20.00%	Never
15	Respondents	

Q41. For which of the following purposes do you use the outdoor areas? (Check all that apply)

Count	Respondent %	Response %	
4	33.33%	26.67%	Eating lunch
5	41.67%	33.33%	Breaks
2	16.67%	13.33%	Meetings
4	33.33%	26.67%	Other (please specify)

Count	Percent	
1	25.00%	LEAP Picnics (2 a year)
1	25.00%	special events
1	25.00%	Walking
1	25.00%	When students have activities

Count	
12	Respondents
15	Responses

Q42. How could the outdoor areas be improved to enhance your enjoyment of them?

Count	Percent
13	100.00%

Count	Percent	
1	7.69%	A bench where I could lie down at lunchtime to read
1	7.69%	accessibility and availability of time
1	7.69%	better seating/tables
1	7.69%	don't know.
1	7.69%	I haven't yet had a chance to use them (relatively new employee who started in winter)--have not experience to make judgement.
1	7.69%	I just never think about it, but maybe they could be scheduled for meetings or lunches, just like the other conference areas?
1	7.69%	I think seating areas so we could enjoy lunch/breaks during the summer would be great.

Q42. How could the outdoor areas be improved to enhance your enjoyment of them?			
Count	**Percent**		
	1	7.69%	It would be nice to have a bench on the North side of the building- maybe on the little island in the parking circle.
	1	7.69%	More shade on front and back patios.
	1	7.69%	Put a shade/awning over the patio to keep it from being so incredibly hot in the 5 months when it is blazingly hot out there. the awning could also shade the windows and keep them from cooking James to a crisp.
	1	7.69%	There needs to be more covered areas, ex. umbrella, awning, etc.
	1	7.69%	They're fine--the weather is mostly what precludes their use.
13	Respondents		