Sustainability Action Plan

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Executive Summary

Along with its own institutional values and priorities, interest in a Sustainability Action Plan (SAP) at Texas A&M University Galveston (TAMUG) came from a greenhouse gas (GHG) emissions inventory and reduction plan that was provided to the university in 2019. Many of the recommendations from that GHG emissions inventory reduction plan, along with an expanded scope of recommendations, are provided in this Sustainability Action Plan (SAP). This SAP was developed over a period of several months in cooperation with the project sponsor, Captain Allan Post, Executive Director of Marine Education Support and Safety Operations and Deputy Superintendent of the Texas A&M Maritime Academy. The development process included interviews, Zoom meetings, research, a campus-wide survey of students, faculty, and staff, a site visit, and the findings of the GHG emissions inventory and reduction plan. Development of the plan was guided by two requirements identified by the client: first, all recommendations should be revenue-neutral or provide a short-term positive return on investment; and second, that the plan can be used as a "menu of options" that the university can refer to and implement as opportunities present themselves. The recommendations fall into three categories, with multiple recommendations in each category: Improving campus engagement in sustainability; reinforcing behavioral changes to improve sustainability; and reducing energy consumption and GHG emissions.

Background

According to its mission statement, TAMUG is a "special-purpose institution of higher education for undergraduate and graduate instruction in marine and maritime studies in science, engineering, and business and for research and public service related to the general field of marine resources" (Texas A&M University Galveston, 2020). The university currently has 2,300 students and 350 faculty and staff members and has a campus that occupies 150 acres with 23 buildings encompassing 902,441 square feet. TAMUG is under the management of the Board of Regents of the Texas A&M University System, which has university campuses in several locations throughout Texas, including the main campus in College Station.

As stated in its 2018 Master Sustainability Plan, the vision of the Texas A&M University Office of Sustainability is "…to be recognized as a national campus leader in sustainability, to develop long-term programs around environmental, social, and financial stewardship for our earth that have measurable results, and for every member of the Aggie family to incorporate sustainable practices into their daily lives." (Texas A&M University, 2018) As part of the Texas A&M University System, the TAMUG campus shares this vision and the 16 goals and 47 targets defined in the master plan to achieve this vision.

Other reasons the TAMUG campus is undertaking this project are to maintain and enhance its reputation and thereby attract quality students, to address the risks related to climate change and sea level rise since the campus is located on a barrier island in the Gulf of Mexico, and to act as a responsible corporate citizen both in the surrounding community as well as globally.

Client Requirements

To support the TAMUG campus in helping to realize the overall sustainability vision and goals of the Texas A&M University system as articulated in the Sustainability Master Plan (Texas A&M University, 2018), the leadership of the TAMUG campus has requested an SAP that addresses the particular requirements, opportunities, and limitations of the TAMUG campus in contributing to the university system's overall sustainability goals. This includes identifying:

- Initiatives for GHG emissions reductions (both direct emissions reductions and reductions tied to reduced energy consumption)
- Recommendations for improving engagement among students, faculty, and staff in sustainable behaviors
- Targeted sustainable behaviors to foster on campus
- Performance metrics to track GHG emissions reductions and assess engagement in sustainable behaviors
- An implementation plan
- A set of future recommendations

Underpinning the SAP is the requirement that all recommendations are revenue-neutral or have a short-term return on investment, meaning that the recommended initiatives are free,

pay for themselves in some fashion, or provide a source of positive cash flow within a few years, such as through money saved due to reduced consumption of energy or other resources.

The client sponsor also requested that the SAP present the recommendations as a "menu of options" that the school can pick from as revenue and resources permit and as priorities dictate. Unlike the main campus of Texas A&M University, the Galveston campus has no financial or personnel resources dedicated to sustainability and therefore must incorporate its sustainability priorities and activities into its existing budgets, plans, and organizational structure.

Campus Survey

To help determine the most relevant recommendations of the SAP, a survey of all students, faculty, and staff was conducted.

The survey was designed to establish general knowledge regarding sustainability, the importance of sustainability both personally and for the university, any sustainable behaviors respondents are currently engaged in, and perceived blocks to engaging in sustainable behavior. The survey was based on a survey instrument used by the main Texas A&M University campus in College Station as part of that campus' participation in the STARS program (The Sustainability Tracking, Assessment and Rating System), which is developed and run by AASHE (The Association for the Advancement of Sustainability in Higher Education). The TAMUG survey used the 2019 STARS sustainability literacy assessment submitted by the College Station campus (Texas A&M University, 2019), with modifications made to customize the survey based on the unique circumstances of the TAMUG campus and the needs of the SAP. The survey questions and complete results are available as a separate document.

The survey received 97 responses out of a total population of 2650 students, faculty, and staff, which yields a 95% confidence level in the results with a confidence interval (or margin of error) of 10. For example, 54% (+/- 10%) of respondents said that incorporating sustainability into their everyday lives was very important. 48 students (50% of respondents), 9 faculty (9% of respondents), and 40 staff (41% of respondents) completed the survey. Among student respondents, 47% live on campus and 53% live off-campus.

Sustainability literacy was high among all respondents, with results indicating a good grasp of basic sustainability concepts. The personal importance of sustainability to respondents

is fairly consistent regardless of age or role (student, faculty, or staff). The majority of respondents indicate that incorporating sustainability in their lives is either very important (54%) or somewhat important (37%). When asked about the importance of sustainability generally, 85% indicated that it was very important and 13% indicated it was somewhat important, and this is true across age groups and roles as well. A noteworthy result is that all faculty respondents indicated that sustainability was very important generally even though two indicated that it was very unimportant for them personally. The differences in results between the two questions (personal vs. general importance) are consistent with the common disconnection between believing sustainability to be important in general but not as important personally, even within a population that is favorably inclined toward sustainability overall.

Survey respondents also indicated a high level of personal engagement in sustainable activities, which is an encouraging result since it indicates a favorable disposition toward supporting similar behaviors on behalf of TAMUG. The highest reported levels of participation relate to items such as turning off lights, double-sided printing (a policy already in place on campus), using re-usable bottles and cups, washing in cold water, and recycling. However, the disparity between questions of the personal or general importance of sustainability may be indicative of some degree of over-reporting on sustainable behaviors.

The lowest levels or participation are for items like bicycling, ride sharing, carpooling, eating less meat, and participating in civic engagement. Low engagement related to carpooling and ride sharing is of particular significance since 53% of students report living off campus and Scope 3 emissions related to commuter vehicle emissions represent 56% of total 2018 CO2e emissions for the university. See Figure 1 for more detail.
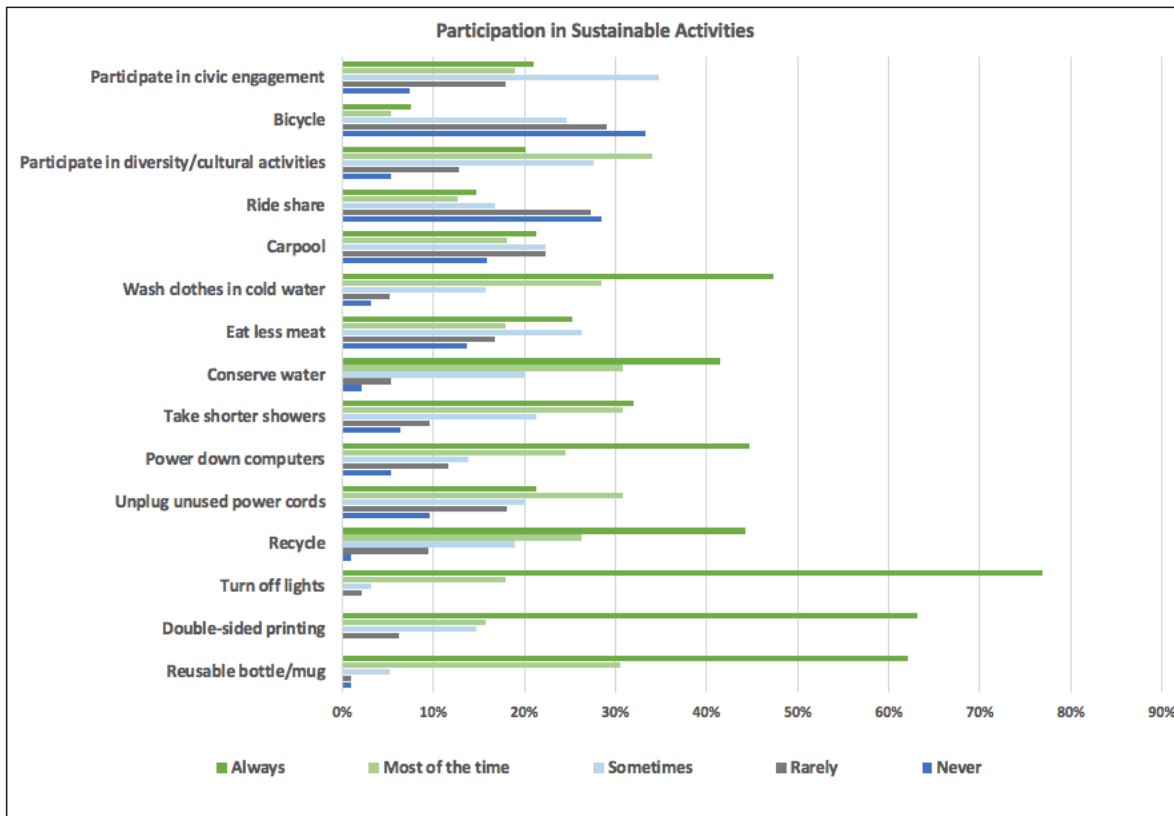
Figure 1: Participation in Sustainable Activities

Consistent with the results for personal engagement, the survey results indicate a high degree of alignment with the actions perceived to be effective in reducing energy and resource consumption on the campus. This includes items like turning off lights, unplugging devices, using LED bulbs, and standardizing building temperature set points. See Figure 2 and Figure 3 for more details.
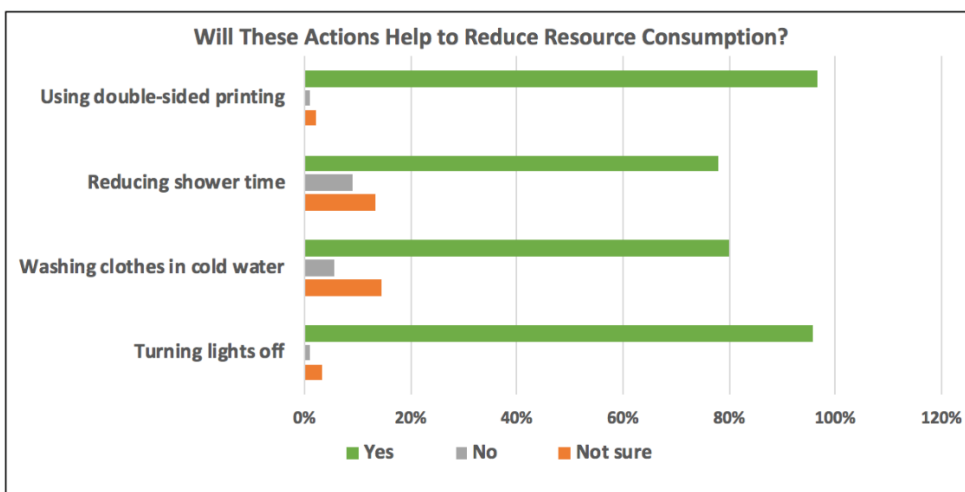
Figure 2: Actions To Reduce Resource Consumption
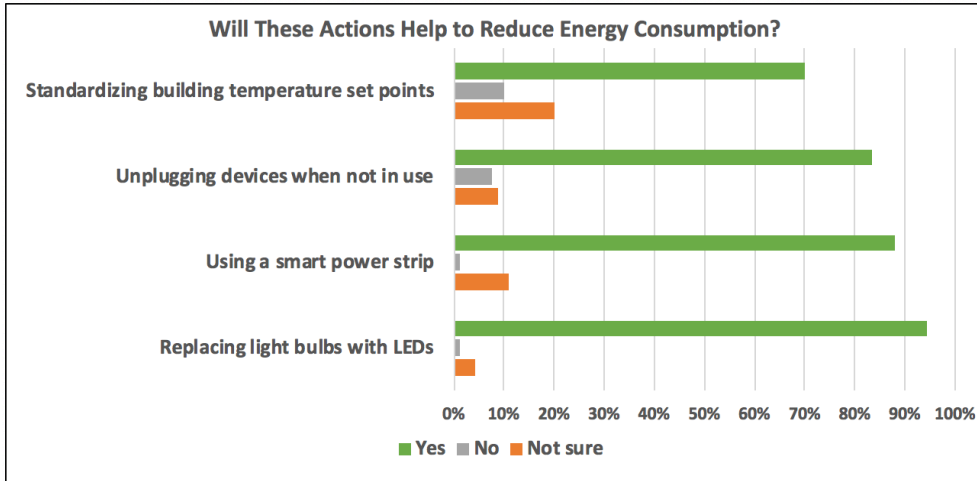
Figure 3: Actions To Reduce Energy Consumption

Also in alignment with personal engagement levels, the survey indicates a high degree of interest in having the TAMUG campus participate in sustainable activities. Foremost among these are the use of renewable energy, reducing waste, recycling, indoor air quality, social justice and equity, diversity and inclusion, and conserving energy. Similarly, the average rating for the importance of TAMUG incorporating sustainability into its planning and initiatives is 8.62 on a scale of 1 – 10. See Figure 4 and Figure 5 for more detail.
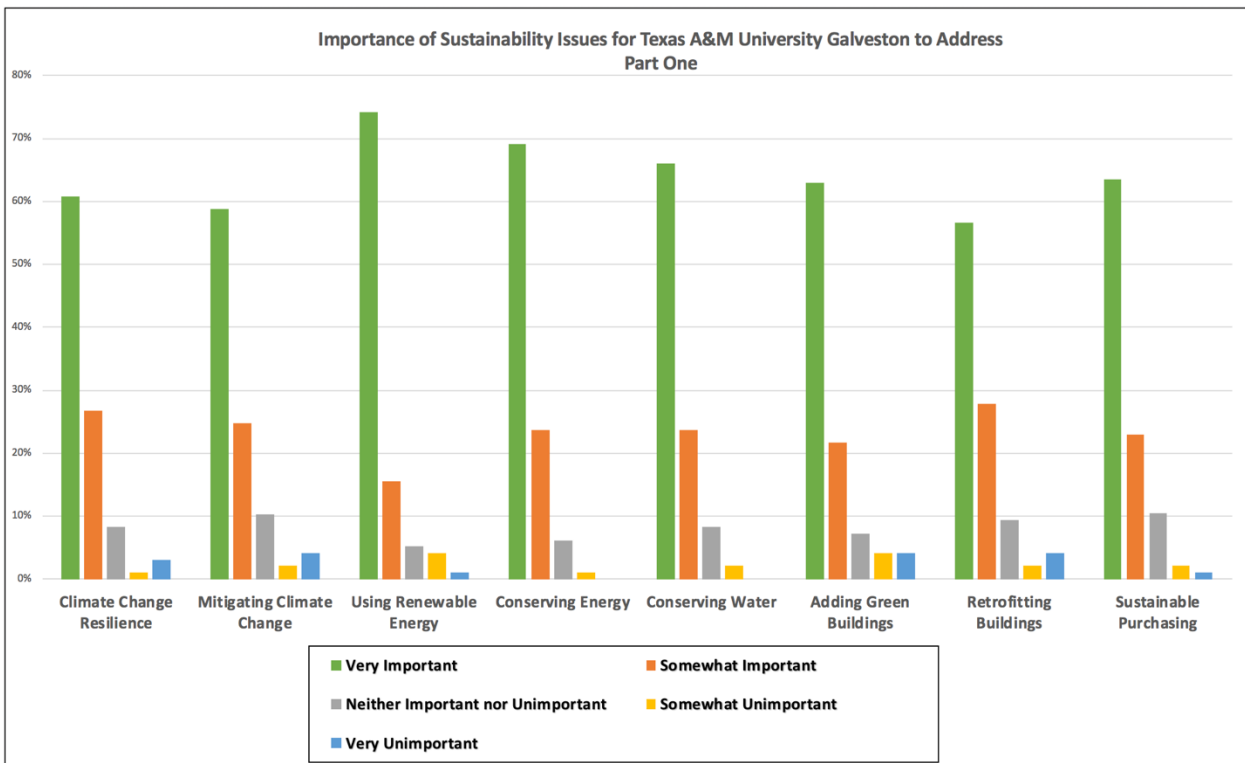
Figure 4: Sustainability Activities for TAMUG to Address (Part One)

Texas A&M University Galveston Sustainability Action Plan
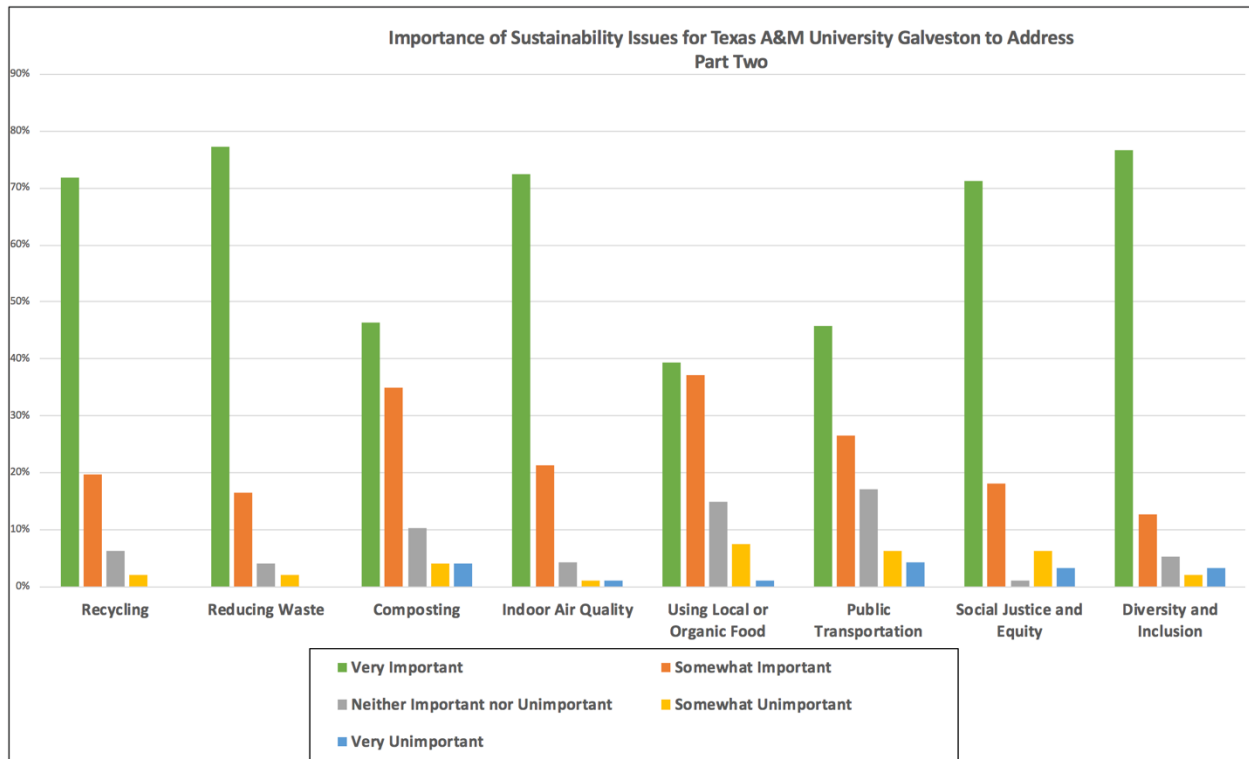
Figure 5: Sustainability Activities for TAMUG to Address (Part Two)

The survey also indicated a significant amount of interest in adding more sustainability related course to the curriculum, with 57% of respondents rating this as very important and 31% rating it as somewhat important. 38% think it is very important to add a sustainability major and/or minor, and 41% rated this as somewhat important.

Despite the levels of interest in having TAMUG engage in sustainable actions, there is a comparatively low level of awareness of the sustainability programs currently available on campus and of the efforts already underway to reduce the university's environmental footprint. Only 7% strongly agree that they are aware of efforts to reduce the footprint, whereas 30% disagree and 12% strongly disagree. That leaves the remaining 51% split more or less evenly between somewhat agreeing and neither agreeing nor disagreeing. When it comes to specific sustainability-related programs, the results are more mixed, with the lowest levels of awareness tied to the Sustainable Office Certification program and Earth Day celebrations. The highest levels of awareness are for The Big Event, which is a campus-wide community volunteering event held every year. The results for recycling are noteworthy since awareness

appears to be mixed while at the same time there are numerous comments in the survey results about the recycling program and the need to improve it. See Figure 6 for more details.
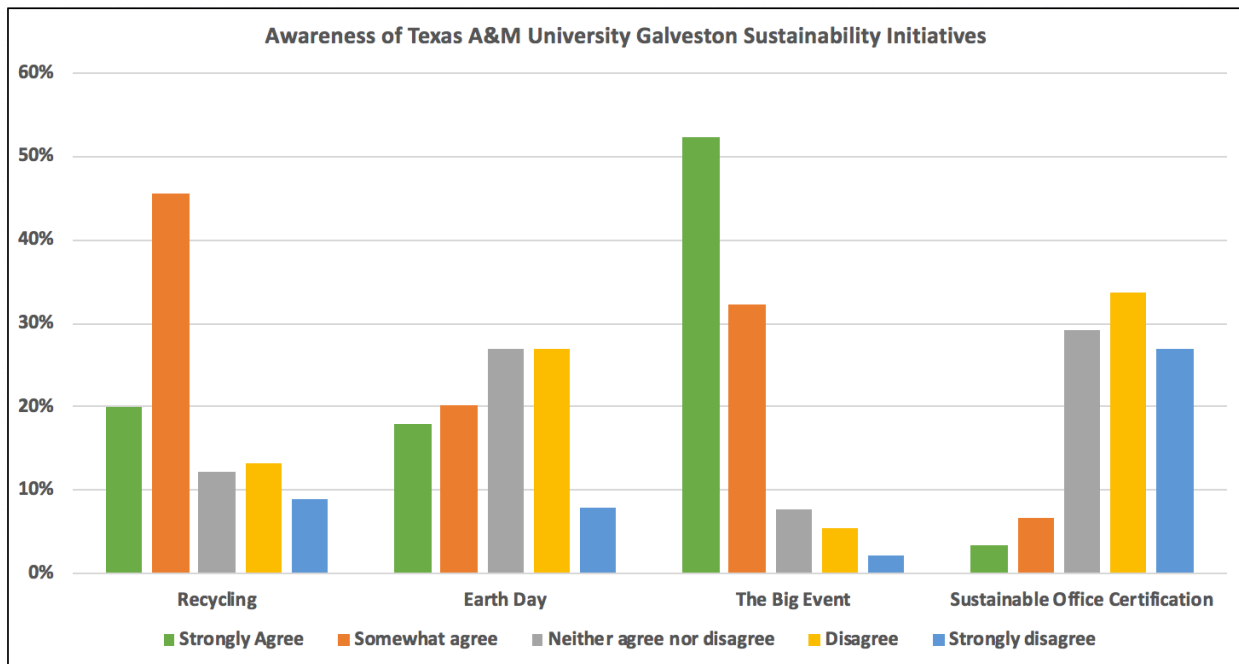
Figure 6: Awareness of Texas A&M University Galveston Sustainability Initiatives

When it comes to the reasons given for not acting sustainably, the top five answers are personal habit, forgetfulness, lack of time, inconvenience, and personal comfort.

The last question of the survey was open-ended and asked the question, "What, if any, sustainable features/actions would you like TAMUG to pursue in the future?" Suggestions ran the gamut, from the small scale like reducing single-use plastics or the amount of printing required by professors, to the highly ambitious, like building a small-scale nuclear reactor or tidal power generator. Some common themes include the use of renewable energy like solar panels, composting, regularly communicating what the university is doing to be sustainable, and the use of locally sourced goods. Recycling was mentioned the most frequently, with 29 separate comments, though for reasons that are explained later (see the section Behavioral Changes), recycling is not emphasized as a recommendation in this SAP.

Complete survey results are available in a separate document, though here are a few of the comments made in response to this question. They are provided here to give a sense of the kinds of comments offered by respondents.

"To commit to pursuing all of them. We can't be an island campus that houses the Disaster Resilience Institute and degree programs like MARB/MARF [Marine Biology/Marine Fisheries], OCRE [Ocean and Coastal Resources], MARM [Master of Marine Resources Management], etc., and still only provide paper towels in the bathrooms and have rampant rumors around campus that the recycling doesn't actually get recycled."

"I feel like TAMUG needs to inform students more of what actions they are taking for the schools [sic] sustainability. I constantly see signs in the caf[eteria], coffee shops etc. saying how the school is sustainable, however, I feel like the majority of students want to see actual statistics."

"It doesn't make sense to get lectured about plastic ruining oceans in class with that being the only option in the cafeteria (utensils and food packaging)."

Opportunities and Risks

This section explains the opportunities and potential risks associated with this SAP.

Opportunities

The TAMUG campus has a number of opportunities available to it to advance its sustainability practices. Perhaps most important, the Texas A&M University system, of which the TAMUG campus is a part, has defined a sustainability vision, action plan, and a set of goals and targets for itself and the TAMUG campus needs to participate in achieving them. Commitment to the plan comes from the highest levels of the university and TAMUG campus administration, which is a critical element for success, and several initiatives are either already underway (LED lighting) or funding is being discussed (for example, submetering of electricity for buildings).

As a campus with an aging set of buildings, another sustainability opportunity lies in building recommissioning. Based on research done for the TAMUG campus in 2019 regarding a GHG emissions reduction plan, building recommissioning is a viable means of reducing both significant amounts of GHG emissions and also decreasing overall energy and maintenance expenses while improving quality of life. It appears that the Vice President of Administration has undertaken a separate initiative with Ameresco (www.ameresco.com) to begin recommissioning, though nothing has been approved as of the completion of this SAP.

As an institution of higher learning, TAMUG has the opportunity to make its students and the surrounding community aware of the need for the full spectrum of sustainability (social, environmental, and financial) both personally and institutionally and to inculcate these values into its graduates. While not directly measurable, instilling the values of sustainability

and environmental stewardship into its students is perhaps where TAMUG can have the most meaningful long-term impact.

Making the adjustments needed to offer a quality education during the COVID-19 pandemic has provided an opportunity to reduce power consumption and associated GHG emissions for the TAMUG campus through factors like lower building occupancy and reduced commuter traffic to and from campus, along with the reduced consumption of resources such as food, water, and paper. While the university has stipulated that its goal is to resume a traditional, in-class model for education when it is possible to do so, a long-term move towards some component of remote learning could help the school maintain some of these reductions in emissions and the consumption of resources.

Risks

TAMUG faces a number of risks if it fails to move forward with its sustainability efforts. One of these risks is reputational harm, which could affect its ability to recruit quality students as well as its ability to obtain grants and other forms of funding for its academic mission. As a coastal campus situated on a barrier island, TAMUG is quite vulnerable to environmental factors such as sea level rise and extreme weather events such as severe hurricanes, and the risk of harm due to these factors only increases if TAMUG and the rest of the world fail to act more sustainably. Climate change and its impact on the ocean environment also directly affects the university's educational mission, from ocean sciences and maritime business to the maritime academy.

TAMUG also faces the ongoing consequences of operational inefficiencies, such as costs for heating, cooling, and maintenance and repair. These same operational inefficiencies also represent a reduced quality of life for both faculty, staff, and students. As one example, one of the primary administrative buildings is so poorly heated in the winter that employees use small space heaters in their cubicles to keep warm. This is not only terribly inefficient and costly, it presents a possible fire hazard and is an unpleasant working environment for employees.

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Key Stakeholders

A key stakeholder is the project sponsor, Allan Post. Allan is Deputy Superintendent of the Texas A&M Maritime Academy and Director of Marine Education Support and Safety Operations. Other key stakeholders include the members of the Environmental Management Council (EMC), which has members representing many of the key constituencies on the TAMUG campus, including faculty, staff, and Chartwells food services. (Texas A&M University Galveston, 2018). The other key stakeholder group is the student body, though it is does not currently have representation on the EMC. The EMC is the group that is responsible for evaluating, adopting, and implementing the SAP.

Name/Title/Department	Role on Committee	Faculty/Student/Staff
Vernon Camus Assistant Director Marine Education, Safety, and Operations	Staff Member	Staff
Dee Haney Occupational Safety and Health Inspector	Co-Chair	Staff
Mona Hochman Lecturer Marine Biology	Faculty member	Faculty
Tina Pennington Senior Human Resources Representative Personnel Office	Staff member	Staff
Michael Phillips Occupational Safety and Health Inspector Waterfront Operations	Staff member	Staff
Allan Post Executive Director Marine Education, Safety, and Operations	Staff member	Staff
Antonietta Quigg Associate Vice President Marine Biology	Faculty Member	Faculty
Doug Sivyer Staff, Manager – Chartwells Food Services	External Member	Staff
Bob Mosely Director, SSC/Facility Services	External Member	Staff

Methodology

This SAP was created using a combination of the following methods:
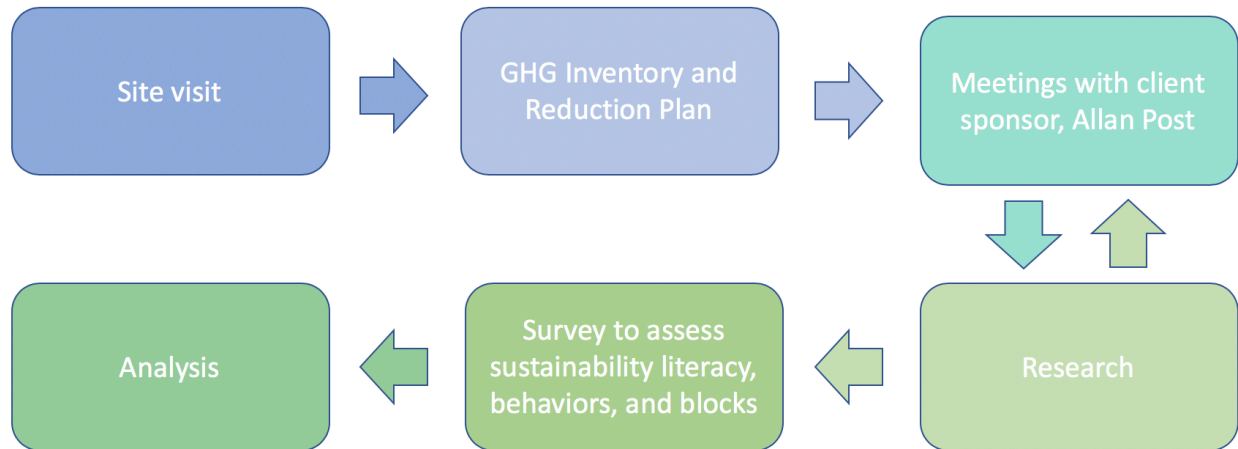
Figure 7: SAP Methodology

The GHG Inventory and Reduction Plan was prepared by this author and provided to TAMUG in 2019. The aforementioned sustainability survey was designed in cooperation with the client and was administered by the client.

Recommended Initiatives

The recommendations in this SAP are a combination of recommendations from the GHG Inventory and Reduction Plan along with a set of recommendations designed to enhance the engagement of students, faculty, and staff in sustainability and to develop specific sustainable behaviors on the campus. The selection of recommendations was also informed by the campus-wide sustainability survey. There is of course a certain degree of overlap between these categories of recommendations since many sustainable behaviors inherently result in reduced GHG emissions.

The results of a 2019 evaluation of the major sources of carbon emissions at the TAMUG campus are summarized in the table below:

Scope	Source	2018 MTCO2e	Total Percentage
2	Purchased Electricity	10,285.70	66%
3	Commuter Vehicles	3,509.28	22%
1	Stationary combustion of natural gas	1,334.56	9%
1	Fleet vehicles and vessels, fugitive refrigerant	341.33	3%

Table 1 - Summary of TAMUG GHG Emissions Sources

Scope 2 emissions are the single largest contributor to GHG emissions for TAMUG and account for 66% of total emissions in 2018. This consists of 10,285.70 MTCO$_2$e from 22,357.68 MWh of power consumed (up from 60% in 2015). Scope 3 emissions from commuter travel are the next largest contributor at 3,509.28 MTCO$_2$e from 8,761,600 miles driven and 398,255 gallons consumed. This accounts for 22% of total GHG emissions. This is followed by Scope 1 emissions from the on-site combustion of natural gas at 1,334.56 MTCO2e from 25,149.25 MMbtu consumed. This amounts to 9% of total GHG emissions for the university. Combined, these items comprise 97% of all university emissions. The remaining 3% is contributed by Scope 1 emissions from university-owned vessels and vehicles and fugitive refrigerant.

The following recommendations are based on these GHG emissions results, the requirement to increase engagement in sustainability, and the results of the campus-wide survey. These recommendations are prioritized based on a number of factors, including ease of implementation, impact, and cost. As a guiding principle, those that are easiest to implement and lowest in cost are listed first, even if they may not have the biggest overall impact, simply because they can be done quickly and inexpensively. The remaining recommendations represent low to high-cost options with payback periods ranging from one to four years or more.

Summary of Recommendations

This section provides an outline of current as well as future recommendations. The remaining sections provide more details for each recommendation.

Free and Low-Cost Strategies

1. Campus engagement

    a) Personal Footprint Challenge

    b) Inter-Residence Hall Energy Challenge

    c) En-ROADS Climate Action Simulation

    d) Sustainability Champion Awards

    e) Sustainability Lunch & Learns

    f) Sustainability Moments

2. Behavior changes

    a) Turning off lights and equipment

       b) Unplug before you unplug

       c) Adjusting thermostats

       d) Sustainable Office Certification

3. PC power management

4. LED Lighting

5. Reduced commuter travel

Medium and Potentially High-Cost Strategies

1. Director of Sustainability

2. Sub-metering

3. Retro-commissioning of buildings

4. Continue measuring Scope 1 – 3 GHG emissions

5. Food waste

Future Recommendations

1. Sustainability in the curriculum

2. Social justice/diversity and inclusion

3. Rooftop solar

4. Study/relaxation lounges

5. Formalized GHG emissions reporting with science-based targets

6. Car charging stations

7. Water conservation

8. Supply chain sustainability

Campus Engagement

The following recommendations address how to increase the engagement of students, faculty, and staff with issues of sustainability. There is a brief description of theory to provide a context for the recommendations.

Theoretical Background

Getting people to care about and act related to sustainability is notoriously difficult. Daniel Kahneman, famous for his book *Thinking, Fast and Slow*, which examines how humans assess risk and why we are not very good at it, is far from optimistic on the topic. In an article in Forbes magazine, Kahneman declares "I really see no path to success on climate change" and

he offers three reasons: 1.) It lacks salience, meaning it is too "abstract, distant, invisible, and disputed" to capture our attention; 2.) it requires short-term sacrifices to avoid greater but uncertain future losses, and this is not in our nature; 3.) it is still perceived by many as uncertain and disputed even if the reality is quite different (Mui, 2019).

Despite his pessimism, Kahneman does point to a possible way forward: "To mobilize people, this has to become an emotional issue. It has to have immediacy and salience." His opinion is borne out by his and others' contemporary research. One effort to determine what can help establish enduring change in people's attitudes towards and engagement with sustainability determined that a number of factors are involved, including a deep engagement with the subject, changing mental models, and breaking bubbles of homogeneous group discussion (Goldberg, Gustafson, & van der Linden, 2020).

A thoughtful evaluation of the merits of a message (deep engagement) leads to "attitudes higher in certainty, accessibility, and importance" and these attitudes are more consistently organized around core principles in one's belief system. An aspect of this deep evaluation that is important to note is that active thinking about the issue is generated by the target of persuasion, rather than by persuasive appeal, by asking the target to connect *themselves* to the topic.

Breaking bubbles of homogenous discussion is exactly what it sounds like: finding ways to expose individuals to other perspectives and ideas outside of their normal social sphere, whether that is friends, family, or preferred news sources. Changing mental models approaches the problem of engagement from the perspective of how people perceive sustainability and shifting that frame or model to one that is more conducive to pro-environmental attitudes and actions. Possible models include perceiving sustainability and climate change as political drama, as a distant threat, a natural process, or esoteric science. Shifting models like this to ones that position sustainability as a solution to a threat from climate change that is imminent and personal seem to produce a lasting favorable shift in attitude toward sustainability.

Other research related to climate change risk perception seems to support and integrate with these conclusions, and points out – like Kahneman - that an effective approach to conveying a perception of risk, and thus modifying one's response to that risk, needs to

make an emotional as well as an intellectual appeal. According to one paper, the research results indicate that risk perception "is greatly influenced by affective and emotional factors, including connotative meaning, and provides convergent evidence that public risk assessments are strongly influenced by experiential processes." (Leiserowitz, 2006).

Gamification

An approach that has gained momentum in both the business and academic worlds in response to the challenges of sustainability is gamification. This approach addresses the challenges of deep engagement, shifting mental models, breaking social bubbles, and engaging people emotionally and experientially (Kamal, 2013) (Owen, 2013). Games can turn mundane tasks into adventures and they are good at involving people intellectually and emotionally through challenges, competitions, and problem solving. And games can be an opportunity to interact with others who may have different beliefs and opinions within a context of solving a common challenge.

Personal Footprint Challenge

In the Personal Footprint Challenge, students, faculty, and staff can challenge each other to reduce their carbon footprints over the course of a semester. Using a common footprint assessment tool (a number of websites provide carbon footprint tools), each participant establishes a baseline footprint, which is published to the entire campus. Over the course of the semester, each participant acts to reduce his or her footprint and re-assesses using the same tool at the end of the semester. The person with the greatest reduction wins a prize and public recognition. Variations on this challenge could be between students and faculty, faculty and staff, and between grade levels.

This challenge addresses the goals of campus engagement as well as helping to reduce GHG emissions and the consumption of resources. It also allows room for creativity as it is up to each participant to determine how to reduce their own footprint.

Inter-Residence Hall Energy Challenge

This challenge is similar to the Personal Footprint Challenge and would be administered in a similar way, though measurement would be done through metered electricity consumption for each residence hall. This challenge adds the dimension of making it a cooperative effort among all the residents in a given residence hall. A possible variation on this challenge would be

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to establish a competition between the regular residence halls and the housing for the Maritime Academy. Responsibility for coordinating, running, and recording the results of this competition could be assigned to Community Leaders (community leaders are like Resident Assistants) in each residence hall. The Community Leaders would act as champions for the competition and encourage participation by as many residents as possible in each residence hall.

En-ROADS Climate Action Simulation

The En-ROADS Climate Action Simulation is an interactive role-playing game developed by Climate Interactive, a not-for-profit think tank with origins in the MIT Sloan School of Management (Climate Interactive, n.d.). It is available for free and provides over 10 hours of video-based training to learn how to facilitate and play the game. The game is designed for 20-50 players and usually involves 2-4 hours of gameplay. Players are divided into teams that represent different global stakeholders of business, government, and society with a goal of achieving a scenario of not exceeding the 2-degree Celsius limit on global warming.

The game has proven to be effective at increasing people's knowledge about the actions needed to address climate change, enhancing emotional and intellectual engagement with climate issues, and leaving people feeling empowered to address climate change (Rooney-Varga, et al., 2020). The game could be incorporated into class curricula, included in orientation activities, or conducted on an extra-curricular basis. Implementation of this game may need to wait until social distancing measures due to COVID-19 are no longer in place.

Sustainability Champion Awards

In 2017 the College Station campus of Texas A&M University began the Sustainability Champions Awards program (Texas A&M University Sustainability Champion Award), which each year honors an undergraduate, a graduate, a faculty member, and a staff member who have "demonstrated excellence and commitment to making Aggieland more environmentally, economically, and/or socially sustainable." Implementing a sister program at the Galveston campus would be a productive step in supporting engagement in sustainability. The program sends a clear message that sustainability is valued and rewarded at Texas A&M University and encourages individuals at all levels of the organization to participate. The College Station

program has a clearly defined nomination and selection process that can be used as a model for the Galveston campus, making the implementation of the program straightforward.

Sustainability Lunch and Learns

Although lectures and presentations about sustainability and climate change may not be effective in and of themselves, if they are presented by TAMUG professors or reputable guest speakers on topics that directly affect students' fields of study, they are more likely to meet some of the criteria for long-term effectiveness mentioned earlier such as emotional impact, immediacy, and personal relevance. For example, students studying coral reefs are likely to be engaged by a lecture on coral bleaching due to the rise in seawater temperatures from climate change. With social distancing measures in place on the TAMUG campus, these lectures could be provided via Zoom or some other remote learning tool and conducted over the lunch hour so they do not interfere with class schedules. These lectures could also foster closer ties between faculty and students who have an interest in sustainability to help students determine the course of their studies as well as future career plans related to sustainability.

Sustainability Moments

A common practice in the oil and gas industry, which places a heavy emphasis on safety as a cultural value both in the field and in office buildings, is to conduct what is called a "safety moment" at the beginning of each meeting. At every meeting, an employee is tasked with the responsibility of providing a brief presentation and discussion on a wide range of safety topics – they are not limited to just the oil and gas industry. The purpose of these safety moments is of course to share information about how to be safe, but just as importantly they are meant to reinforce a mindset and attitude and to promote a culture of safety.

A very similar approach can be taken regarding the topic of sustainability. At the beginning of class or staff meetings, for example, a student, faculty, or staff member could present a sustainability-related topic. The goal of each sustainability discussion would be to communicate a specific sustainable behavior and the benefit that this behavior has, such as reduced energy consumption, reduced waste or pollution, or a positive effect like planting a tree or restoring habitat. Responsibility for presenting the topic would change for every class or meeting to ensure every person is given an opportunity to participate.

The following table summarizes each of the engagement initiatives and indicates the key elements of effective engagement that each one addresses:

Sustainability Engagement Initiatives	Salience	Deep Engagement	Changing Mental Models	Breaking Homogenous Bubbles	Emotional & Intellectual Appeal
Gamification					
Personal Footprint Challenge	X	X	X	X	X
Inter-Residence Hall Energy Challenge	X		X	X	X
En-ROADS Climate Action Simulation	X	X	X	X	X
Sustainability Champion Awards	X	X	X	X	
Sustainability Lunch and Learns	X	X	X	X	X
Sustainability Moments	X	X	X	X	

Table 2: Summary of Sustainability Engagement Initiatives

Behavioral Changes

Over time, small changes can lead to big differences, and there are a number of behavioral changes that students and faculty of the university can undertake to help reduce energy consumption, emissions, and waste. Results from the sustainability survey indicate that engagement in some sustainable activities is fairly high, such as turning off lights (78% report doing this all the time) or using double-sided printing (66% report doing this all the time and 15% most of the time). Other activities see much lower engagement numbers, such as carpooling (23% say they carpool all the time and 19% carpool some of the time), taking shorter showers (36% report doing this all the time), and unplugging used appliances (23% report doing this all the time).

The survey results also indicate that the primary barriers to engaging in sustainable behavior are, in order: forgetfulness, personal habits, lack of time, inconvenience, and personal control. Using the community-based social marketing model developed by Doug McKenzie-Mohr (McKenzie-Mohr, 2011), the remaining items in this section (other than the section on the Sustainable Office Certification) use that model to identify a number of strategies to overcoming these barriers for a specific set of sustainable behaviors. The selection of behaviors

was determined by a combination of relative impact in supporting the goals of the SAP and low engagement rates as indicated by the survey. The social marketing model is presented in tabular form since this is an efficient way to summarize the various strategies used to overcome barriers to engaging in sustainable behavior.

Many of the proposed initiatives rely on the ability to communicate with all faculty and staff and the entire student body. The two primary means of accomplishing this on the TAMUG campus are email and the Campus phone app, which is an iOS and Android app for smart phones that is used extensively for school communications.

It is important to note that while there is frequent mention of recycling in the survey results, there is little interest from the client in promoting or revamping recycling behaviors and opportunities on campus and therefore it is left out of this SAP. Recycling is perceived to provide a false sense of meaningful engagement in sustainability that distracts from the much more impactful behaviors of reducing consumption through reduced demand and reuse of materials. Furthermore, while the campus does provide single-stream recycling, it is no longer clear that the recycling stream is actually being recycled after collection. It may instead be taken directly to landfill along with all other solid waste streams (this seems to be a matter of how Galveston County has elected to address recycling given increased costs). Consequently, the client wants to emphasize the promotion of behaviors that lead to a reduction in the consumption of resources and GHG emissions.

Turn off lights and equipment

This is a straightforward approach of turning off equipment and lighting that is not currently in use. A longer-term solution is to install occupancy sensors to turn lights on and off automatically based on rooms being occupied or empty. The strategies described here, other than signage and stickers, are applicable to students, faculty, and staff studying and working from home during social distancing in response to the COVID-19 pandemic as well as when everyone returns to campus on a full-time basis.

The Texas A&M University Office of Sustainability, located on the College Station campus, provides some valuable resources to support this initiative, including signage that can be posted to remind people to turn off their lights: (Texas A&M University Office of Sustainability).

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Turning off lights and equipment in meeting rooms and classrooms	
Barrier	**Strategy**
Personal Habits	**Commitments**
	Teachers and meeting leaders ask for volunteers.
	Volunteer names are included in minutes/agendas, course materials and/or syllabi.
	After small commitments, teachers and meeeting leaders ask for people to sign a pledge to turn off lights/equipment at every meeting.
	Social Norms
	Teachers, meeting leaders, and volunteers model the behavior.
	Others see teachers, meeting leaders, and volunteers demonstrating the behaviors.
	Social Diffusion
	Behavior is simple, observable, trialable without risk, and has a relative advantage of positive social recognition and fulfilling a public commitment.
Forgetfulness	**Prompts**
	Stickers on light switches, exit doors, and equipment.
	Reminders at the end of meetings and classes.
	Reminders in meeting agendas and minutes, perhaps in course syllabi.
	Reminders can be verbal, written, or graphical.
Lack of Time	**Social Norms**
	Teachers and meeting leaders can establish time at the end of every meeting or class to address shutting off the lights and equipment.
Inconvenience	**Social Diffusion**
	Behavior is simple, observable, and trialable without risk.
	Social Norms
	Teachers and meeting leaders can establish time at the end of every meeting or class to address shutting off the lights and equipment.
Personal Comfort	**Social Diffusion**
	Behavior is simple, observable, and trialable without risk. It is also purely voluntary, so it is not perceived as an imposition on personal comfort.
	Social Norms
	Teachers, meeting leaders, and volunteers model the behavior, thereby establishing a social norm. People tend to comply with social norms since they see them as norms, not as exceptional demands for behavioral change that interfere with personal comfort. Behavior is also not likely to interfere in any meaningful way with personal comfort.

Table 3: Turning Off Lights and Equipment in Meeting Rooms and Classrooms

Unplug before you unplug

The focus of this initiative is to encourage students, faculty, and staff to turn off and unplug any unnecessary electronic devices, including appliances, lab equipment, computers, monitors, and laptops during prolonged absences, such as weekends and holidays. According to the social marketing model, a targeted behavior should be both indivisible (meaning it cannot be broken down into further behaviors) and an end state, meaning it accomplishes the desired outcome. Since the initiative is focused on one type of event, a prolonged absence, and the behaviors are all comparatively simple and focused on the same end state, this initiative

combines several end state behaviors rather than limiting itself to just one. The Texas A&M University Office of Sustainability provides some valuable resources to support this initiative, including signage that can be posted to remind people to turn off their lights, computer equipment, monitors, power strips, and appliances (Texas A&M University Office of Sustainability). As is the case with the initiative to turn off lights and equipment, this initiative is applicable both for a full-time campus presence and also while students, faculty, and staff are operating from home due to the COVID-19 pandemic.

Turning off lights and equipment, unplug devices, adjust thermostat, and close windows and blinds during long absences.	
Barrier	**Strategy**
Personal Habits	**Commitments**
	Department heads/deans, Student Coordinators, Community Leaders, and office managers ask for volunteers.
	Volunteer names are published in the Campus App.
	Could be gamified as a competition between dorms for greatest number of participants and greatest energy reductions as measured by consumption of electricity.
	Social Norms
	Department heads/deans, Student Coordinators, Community Leaders, and office managers participate in the behaviors. What is perceived as a norm or standard is less of an inconvenience than something perceived as an extra step.
	Social Diffusion
	Behavior is simple, observable, trialable, without risk, and has a relative advantage of positive social recognition and fulfilling a public commitment.
	Communication
	Month-to-month reductions in energy bills (and associated CO2e) can be communicated via email and the Campus App.
Forgetfulness	**Prompts**
	Posters in hallways, common areas (deployed before major holidays like Spring Break, Thanksgiving, and Christmas).
	Email reminders before school holidays and semester breaks.
	Reminders from faculty, student coordinators, and resident assistants.
	Reminders can be verbal, written, or graphical.
Lack of Time	**Communication**
	Communication (posters, email, personal reminders) can emphasize how little time is required.
	Communication should emphasize what is lost if no action taken in vivid, relatable terms. For example, amount of CO2e that could have been avoided using tools like the EPA's greenhouse gas equivalencies calculator.
Inconvenience	**Social Diffusion**
	Behavior is simple, observable, and trialable without risk.
	Social Norms
	Department heads/deans, Student Coordinator, Community Leaders, and office managers participate in the behaviors. What is perceived as a norm or standard is less of an inconvenience than something perceived as an extra step.
Personal Comfort	**Social Diffusion**
	Behavior is simple, observable, and trialable without risk. It is also purely voluntary.
	Social Norms
	Department heads/deans, Student Coordinators, Community Leaders, office managers, and volunteers model the behavior, thereby establishing a social norm. People tend to comply with social norms since they see them as norms, not as exceptional demands for behavioral change that interfere with personal comfort. Behavior is also not likely to interfere in any meaningful way with personal comfort.

Table 4: Saving Power During Long Absences

Adjust thermostats

While there is some overlap with the previous initiative for prolonged absences, this initiative is also relevant since it addresses achieving reductions in ongoing energy consumption throughout the year. As with the preceding initiatives, it is applicable for a full-time campus presence as well as when students, faculty, and staff are studying and working remotely.

Setting the thermostat: 74-76 deg. in summer, 68-71 deg. in winter	
Barrier	**Strategy**
Personal Habits	**Commitments**
	Community Leaders and faculty ask for volunteers.
	Volunteer names are posted in the Campus App, also in dormitory lobbies.
	Social Norms
	Community Leaders, volunteers, and faculty participate in the behavior. What is perceived as a norm or standard is less of an inconvenience than something perceived as an extra step.
	Social Diffusion
	Behavior is simple, observable, trialable, without risk, and has a relative advantage of positive social recognition and fulfilling a public commitment.
	Communication
	Initiative provides an opportunity to communicate creative solutions to temperature discomfort that participants have employed, from fans for cooling to extra layers for warmth. This is also an opportunity to identify and discourage maladaptive approaches, like personal space heaters. Email and Campus App are good media for the communication. Regular communication can also help reinforce social norms.
Forgetfulness	**Prompts**
	Stickers next to thermostats in dorm rooms and anywhere else programmable thermostats are located.
	Periodic reminders via email and Campus App, especially around the hottest and coldest months of the year.
	Reminders from Community Leaders and faculty.
	Reminders can be verbal, written, or graphical.
Lack of Time	**Communication**
	Communicate that setting the thermostat requires almost no time at all (Set it and forget it).
	Communication should emphasize what is gained if action is taken in vivid, relatable terms. For example, amount of CO2e that can be (or has been) avoided using tools like the EPA's greenhouse gas equivalency calculator.
Inconvenience	**Social Diffusion**
	Behavior is simple, observable, and trialable without risk.
	Social Norms
	Community Leaders, faculty, and volunteers participate in the behavior. What is perceived as a norm or standard is less of an inconvenience than something perceived as an extra step.
Personal Comfort	**Social Diffusion**
	Behavior is simple, observable, and trialable without risk. It is also purely voluntary.
	Social Norms
	Community Leaders, faculty, and volunteers model the behavior, thereby establishing a social norm. People tend to comply with social norms since they see them as norms, not as exceptional demands for behavioral change that interfere with personal comfort.

Table 5: Setting The Thermostat in Summer and Winter

Sustainable Office Certification

The Texas A&M University Office of Sustainability sponsors the Aggie Sustainability Alliance (Texas A&M University Office of Sustainability, 2020), which is comprised of a two-tier program to engage faculty and staff in being more sustainable. The first tier is the individual certification, and the second is the office certification. For an office to participate, a minimum of 35% of the office staff needs to participate in the individual certification (offices are self-defined and often share a common kitchen or break room). A successful implementation of this initiative will need to wait until faculty and staff return to campus full-time for work and teaching.

According to the campus survey results, awareness of this program on the Galveston campus is minimal, though it is a well-developed program that can make a meaningful contribution to increasing sustainability at TAMUG. At the individual level, a participant can certify at one of three levels: Supporter, Advocate, or Champion. The level depends on whether individuals commit to a minimum of one, two, or three actions in each of five areas: energy and water, transportation, food and purchasing, waste minimization, and social sustainability. The office certification program follows the same tiered participation levels, but it is based on completion of an extensive checklist of sustainable activities. The Supporter level requires a commitment to 30% of the checklist, the Advocate level requires a commitment to 55%, and the Champion level requires a commitment to a minimum of 80% of the checklist. The office checklist covers food and purchasing, social sustainability and engagement, energy and transportation, recycling, reduction and reuse, and innovation (independent office initiatives).

The Aggie Sustainability Alliance can contribute not only to reductions in energy and resource consumption and help reduce waste, active participation in the program can also serve to promote and establish a culture of sustainability on the TAMUG campus. The EMC needs to encourage participation in this program, and support this effort with regular follow ups to measure levels of engagement over time. Though salary and compensation are outside the purview of the EMC, as an added measure it could also help foster the idea of tying performance reviews and compensation to program participation.

Computer Power Management

There are an estimated 1,625 desktop computers and monitors on campus, and according to IT department policy the computers must remain on 24 hours a day for the distribution of software updates. However, there are no power management policies or procedures in place, which presents a free or inexpensive way to achieve both cost savings and reduced energy consumption. Today's computer operating systems have native power management features that can be configured and used at no cost, and third-party power management utilities are available at a comparatively low cost. An energy savings calculator available from The U.S. government's Energy Star program (Energy Star) indicates a possible energy savings of as much as 952,236 kWh per year, or 4% of total electricity consumption at the university. That represents approximately $37,709 in savings for the university. While this initiative is primarily targeted toward computer hardware located on campus, the same power management strategies can be recommended by the campus IT department for computer equipment that students, faculty, and staff are using at home.

LED Lighting

Buildings built on the campus in the last few years use LED lighting, but the large majority of buildings still use fluorescent lighting. The significant improvement in efficiency of LED lights will reduce electricity consumption and help reduce GHG emissions. Replacing fluorescent lighting with LEDs is a straightforward process and the long life of LED bulbs, plus their energy efficiency, will help recover the costs of replacement. While the specifics for TAMUG will vary, it is not unusual for a simple payback period on LED bulbs to be around two years or less. The scope of the LED lighting change could also be extended to include all outdoor lighting, such as parking lots, exterior lighting on buildings, and any other facilities requiring night-time illumination like tennis courts and playing fields.

Reduced Commuter Travel

Scope 3 emissions are the second largest contributor to TAMUGs total GHG emissions, contributing 22% of total emissions. They are also some of the most challenging to reduce. While the sustainability plan for the College Station campus identifies a number of ways to reduce commuter miles driven by campus users, those recommendations (like a campus shuttle bus) are better suited to the much larger College Station campus and do not adapt well to the

unique circumstances of the Galveston campus. With a large percentage of students and all faculty living off campus, a significant opportunity to reduce commuter travel lies in carpooling or some other form of high occupancy commuting. Public transportation infrastructure in Galveston and Harris counties, where the majority of faculty and students live, is inadequate and does not offer a viable alternative to driving, and bicycling is not a safe option since the bridge to Pelican Island does not have a bike lane. Nevertheless, reducing single-occupancy vehicles driving to and from campus can be a meaningful way to reduce GHG emissions and the consumption of non-renewable resources.

Perhaps one of the reasons public transportation infrastructure around TAMUG is so poor is there is a strong cultural influence of car ownership and the independence that a car can provide. Overcoming this attachment to vehicles will not be easy. Some strategies to accomplish this include offering preferred parking to vehicles that carpool, and getting individuals to make a written "Carpool Pledge" that gets visibly displayed or communicated across campus. Periodic reporting to the campus of passenger miles saved can provide visibility of the effort and offer some encouragement both to the participants and others who might be interested to join. Communicating this information in vivid and relatable terms, such as using the EPA's greenhouse gas equivalencies calculator (Environmental Protection Agency, n.d.), can help make the message more impactful. For example, if 20 vehicles are taken off the road for campus commuting purposes due to carpooling, and it is assumed that those vehicles are used 50% of the time for campus commuting, that translates to the following equivalent CO_2 emissions:

5,208	4,547	51,002	0.613	5.3	7.8
gallons of gasoline consumed	gallons of diesel consumed	Pounds of coal burned	tanker trucks' worth of gasoline	homes' energy use for one year	homes' electricity use for one year

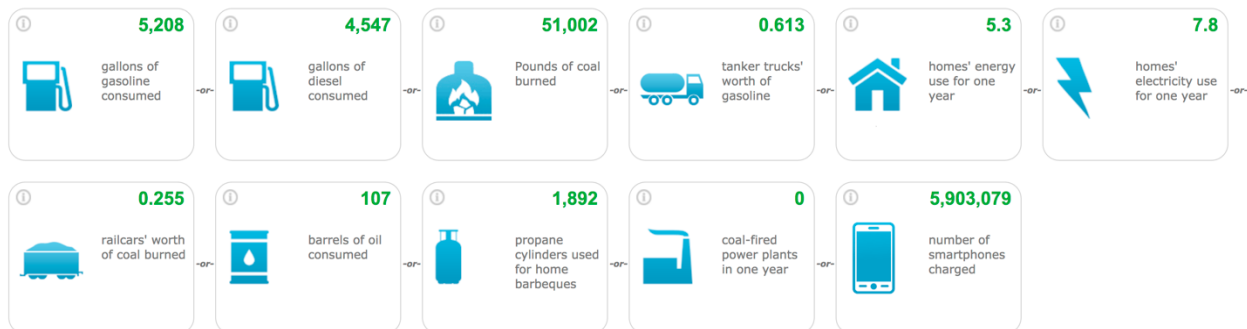| 0.255	107	1,892	0	5,903,079
railcars' worth of coal burned	barrels of oil consumed	propane cylinders used for home barbeques	coal-fired power plants in one year	number of smartphones charged

Figure 8: Example of GHG Emissions Equivalencies

Implementation of the carpool program, though easy and free to do, will need to wait until social distancing measures are no longer necessary to prevent the spread of COVID-19.

Director of Sustainability

Improving engagement with sustainability on a lasting basis, which this SAP is tasked with helping to bring about, requires making sustainability a permanent part of institutional culture. Like any cultural change, this requires a vision that is implemented with long-term focus, commitment at all levels of the organization, and consistent follow-up. The EMC can certainly do this, and as the stewards of sustainability initiatives on the TAMUG campus they are the logical choice to help bring about this kind of institutional change. The EMC also has other responsibilities, as do its individual members, a circumstance which represents a meaningful risk to the EMC's ability to bring about the needed cultural change. To help mitigate this risk and ensure the success of the action plan, the recommendation of this SAP is to hire a dedicated, full-time resource that is responsible for directing sustainability initiatives on the TAMUG campus. Sustainability professionals fulfill their roles at various levels of an organization, such as Director of Sustainability, Chief Sustainability Officer, Sustainability Manager, or Sustainability Coordinator, and the position often reflects the relative importance and impact of the role to the organization. Given the need to work with and have influence across the entire organization, it is optimal for the position to report at a senior level. At whatever level the position is implemented, it is imperative that the position has the influence and guidance needed to succeed.

TAMUG, like many educational institutions, must operate within tight budget constraints, and therefore may not have funds available to pay for a new, full-time position. However, the money saved from the coordinated implementation of sustainability efforts on campus could contribute in part or in whole to covering the costs of this position. As one example of this, the main Texas A&M University campus in College Station, in the latest available sustainability biennial report, indicates saving $162 million in energy costs over an 11-year period due to improved efficiency and reduced consumption (Texas A&M University Office of Sustainability, 2014).

Whether this action plan is implemented by a dedicated resource or by the EMC, the set of core responsibilities and skills remains the same. The following lists of responsibilities and qualifications are compiled from several different sources: The Conference Board of Canada (Conference Board of Canada, 2017), EnvironmentalScience.org (Environmental

Science), and The Society for Human Resource Management (Society for Human Resources Management).

Responsibilities

- Engage with students, faculty, and staff on a regular basis to facilitate the development of sustainability policy and projects and help ensure their success
- Support existing sustainability projects and programs and encourage new initiatives
- Communicate regularly on the progress and impact of ongoing projects to all stakeholders through a variety of means, including email, the Campus phone app, and signage
- Manage a sustainability budget as appropriate
- In collaboration with internal and external stakeholders, proactively develop and implement a long-term roadmap to continuously improve the sustainability practices and policies of the TAMUG campus, including the establishment of science- and context-based goals and targets
- Propose and implement strategies to address a variety of environmental requirements, including energy use, pollution, building and facility design (in collaboration with facilities and maintenance staff), conservation, food waste, value chain improvement, and materials reuse and recycling
- Identify and develop creative ways to provide good environmental stewardship and advance innovation to address sustainability barriers while also achieving operational goals and obligations
- Act as a change agent to help instill a culture of sustainability among students, faculty, and staff on the TAMUG campus
- Maintain currency in the field of sustainability, including the latest developments and best practices
- Collaborate with faculty to support the integration of sustainability topics into the curriculum
- Communicate the relevance and importance of sustainability to the TAMUG community through a variety of means, including seminars, guest speakers, presentations, events, and other means
- Coordinate and collaborate with the Texas A&M University Office of Sustainability in College Station

Qualifications

- Bachelor's or master's degree in sustainability, environmental science, or change management; master's preferred
- 3-5 years' experience in sustainability strategy development, implementation, and performance reporting

- 3-5 years' experience proposing, initiating, and managing cross-functional collaborations
- Strong understanding of the social and human elements of sustainability, including community development and human/environmental health
- Demonstrated ability to grasp systems thinking
- Excellent written and verbal communication skills
- Demonstrated analytical and research skills
- Current knowledge of sustainability practices and applicable laws and regulation
- Strong project management, organizational, and collaboration skills
- Ability to initiate and establish organizational change

Sub-Metering

While TAMUG has begun the process of sub-metering gas and electricity usage in its buildings, at the moment there is no way to identify all the buildings, equipment, or processes that consume the largest amounts of energy. With a large inventory of older buildings (See Table 6), there are certainly inefficiencies in heating, cooling, and other forms of power usage such as labs and equipment that can and should be identified by implementing sub-metering.

A 2006 study issued by the General Services Administration (GSA) indicates that the data gained from sub-metering can result in energy savings ranging from 5 – 15% (General Services Administration). The savings result from building tune-up and load management, such as the identification of maintenance and operations improvements and managing demand load for electric rate schedules. This could result in GHG emissions reductions ranging from 581.01 – 1,743.04 $MTCO_2e$ based on 2018 Scope 2 electricity and natural gas Scope 1 emissions. To be most effective, the university should consider sub-metering electricity, natural gas, water consumption, and hot and cold water used for HVAC heating and cooling.

Retro-Commissioning

The data that submetering provides is also valuable because it contributes to the process of building retro-commissioning. Retro-commissioning applies to existing buildings and is defined as a commissioning process that seeks to improve how building equipment and systems work together (Mills, 2009). Retro-commissioning helps to resolve issues that developed during design or construction or that have developed throughout a building's lifecycle. Submetering helps identify where retro-commissioning needs to be performed

The results from an extensive study by Evan Mills of the Lawrence Berkeley National Laboratory that looks at commissioning data for 643 commercial buildings in the U.S indicates that commissioning projects result in a median whole-building energy savings of 16% in existing buildings and 13% in new buildings, with payback times ranging from 1.1 to 4.2 years. This analysis also found that all studied projects for existing buildings were cost-effective, as were the majority of new buildings (Mills, 2009).

Sub-metering not only identifies where retro-commissioning is needed, it plays a role in its continued implementation through a process known as ongoing commissioning (General Services Administration). This is the process by which the energy and cost-saving benefits of retro-commissioning are maintained and realized over time, which bolsters the argument for the value of sub-metering. According to the GSA paper, items such as the ongoing identification of improvements and continued management attention can bring energy use reductions on the order of 15 – 45%. This translates to GHG emissions reductions on the order of 1,743.04 – 5,229.12 MTCO$_2$e, or 11 – 33% of all university GHG emissions.

Without the sub-metering data, it is not possible to estimate commissioning-related savings for any particular building on the TAMUG campus, or even to detail specific retro-commissioning steps that should be taken. However, the available research data indicate not only is retro-commissioning cost-effective, it has a comparatively short payback period. Table 6 below provides an average estimate of retro-commissioning costs on all but the newest buildings on the TAMUG campus based solely on their square footage. While actual costs will vary, this is a useful preview of the up-front commissioning costs.

Using the estimated median energy savings of 16% from retro-commissioning, the current price that TAMUG is paying for electricity ($ .0396), and the consumption of 22,357,680.28 kWh of electricity in 2018, the university could potentially save $141,658 in electricity costs alone, which could pay for the costs of retro-commissioning in just two years.

Retro-commissioning also provides other, intangible benefits, such as improved worker comfort and indoor air quality and the competence of maintenance staff. Retro-commissioning also acts as a risk management strategy by detecting and correcting problems that could become far more costly maintenance or safety issues if left unaddressed.

No.	Name	Year Built	Floors	Sq. Ft.	Retro-Commissioning Cost Estimate
3001	Kirkham Hall	1971	03	19,448	$ 5,834.40
3002	Engineering Lab Building	1971	02	13,290	$ 3,987.00
3003	Oceanography Building	1971	02	5,635	$ 1,690.50
3004	Mary Moody Northern Student Cent	1976	01	18,321	$ 5,496.30
3005	Residence Hall A/B	1976	03	54,287	$ 16,286.10
3006	Central Service Building	1976	02	15,603	$ 4,680.90
3007	Classroom-Laboratory Bldg	1979	03	40,628	$ 12,188.40
3010	Williams Library	1986	01	26,825	$ 8,047.50
3011	Electric Switch Gear Bldg	1991	01	558	$ 167.40
3018	PE Facility	1994	01	29,500	$ 8,850.00
3021	Pool Mechanical Building	1977	02	600	$ 180.00
3025	Student Support Building	1995	01	5,992	$ 1,797.60
3026	Sea Aggie Center	2002	01	74,212	$ 22,263.60
3027	Powell Marine Engineering Complex	2004	02	58,515	$ 17,554.50
3028	Residence Life Center	2006	01	3,858	$ 1,157.40
3029	Oceans and Coastal Studies Building	2010	04	113,195	$ 33,958.50
3030	Seibel Student Services Building	2011	01	9,171	$ 2,751.30
3031	Pacific Hall	2012	03	87,338	$ 26,201.40
3032	Atlantic Hall	2012	03	87,338	$ 26,201.40
3033	Texas A&M Maritime Hall	2015	06	201,825	$ 60,547.50
3034	Academic Bdg. Complex - Phase I	2017	04	85,335	$ 25,600.50
3035	Aggie Special Events Center	2018	03	62,036	$ -
3104	Wetlands Pavilion	2003	01	1,731	$ 519.30
					$ 285,961.50

Table 6 - Estimated Retro-commissioning Costs for TAMUG Buildings

This analysis is supported by the fact that the Vice President for Administration, in an effort undertaken independently of the EMC, has arranged for a company called Ameresco (Ameresco.com) to submit a proposal for building retro-commissioning that involves upgrading HVAC and boiler systems, thermal studies, and installing LED lighting and room occupancy sensors. Ameresco offers several options for financing its projects that are revenue neutral, meaning there are no upfront costs for TAMUG. These options include DBOOM (Design, Build, Own, Operate, and Maintain), performance contracting, and Power Purchase Agreements (PPAs) (Ameresco, n.d.). Final approval for the work has not yet been given (the notice to proceed), and some details are unknown, but it is most likely set up as a performance contracting arrangement. In this arrangement, Ameresco pays all installation costs and is paid back out of a portion of the savings from the retro-commissioning over a set term at the end of which TAMUG retains all ownership and receives all future savings.

Continue Measuring Scope 1-3 GHG Emissions and Retain Reduction Goals

Having established a GHG emissions baseline for the Galveston campus starting in 2015, the university should continue dedicating time and resources to measure these emissions on a year to year basis. This data is vital to knowing where the university stands in regards to its emissions, the efficacy of any emissions reductions programs it undertakes, and where to focus its efforts for optimal results. The Galveston campus is also expected to comply with university-wide GHG emissions reduction goals as set forth in the 2018 Sustainability Master Plan (Texas A&M University, 2018), and emissions measurements are required to establish whether these goals have been reached.

In keeping with these overall goals, the Galveston campus should retain the comparatively conservative goal of reducing its overall GHG emissions by 25% by the year 2030 as set forth in its GHG Inventory and Reduction Plan.

Food waste

Minimizing food waste helps to reduce GHG emissions both downstream from the landfill where the food is thrown away and also upstream from emissions associated with growing and distributing the food that in effect are also wasted along with the food. Fortunately, Chartwells Food Service, which provides food on campus at a dining hall and several snack and coffee bar locations, has instituted a number of measures to minimize food waste. This includes the use of Waste Not, a software that tracks the weight of pre- and post-production kitchen waste to minimize over-trimming, with bonuses and compensation tied to compliance with its use. Chartwells uses trayless dining, which helps avoid taking too much food that is then thrown away, and works with local waste management to recycle and compost if those options are available (Chartwells does not do its own composting due to cost concerns). They sponsor Stop Food Waste Day, which is actually a month-long effort in April to inform diners about food waste, and once per semester they conduct Project Clean Plate, which involves measuring food waste from dine-in guests for a week and then posting the results. Chartwells also offers the Green To Go program, which provides students with reusable plastic containers that they can return in exchange for clean containers to take food back to their residence halls or homes. They also offer vegetarian and/or vegan options every day, which can help reduce the consumption of red meat (which is GHG-intensive).

There were several mentions in the campus survey about reducing single-use plastics in the dining facilities. While health measures related to COVID-19 have necessitated an increased use of plastics, perhaps there is a longer-term opportunity to reduce the impact of single-use plastics with biodegradable and/or reusable cutlery, straws, and cups. Another possible opportunity is to combine the Green To Go program with something similar to Snap Kitchen (www.snapkitchen.com), where students place food orders in advance (possibly using a phone app), pick them up in the Green To Go containers, and return containers from any previous orders for reuse. Such an approach may help minimize overproduction of food due to the unpredictability of demand. It could also help avoid the frustration associated with running out of popular dishes. There is also an opportunity to overcome what appears to be a somewhat negative perception of Chartwells due to single-use plastic by increasing student awareness of the measures that Chartwells already has in place to minimize waste.

Fostering Sustainable Behavior

This section addresses how to put the necessary organizational structure, leadership, and plan in place to establish a culture of sustainability on the TAMUG campus. These steps represent the foundation that needs to exist to implement the engagement and behavioral change initiatives described previously.

Sustainability Vision

The Texas A&M University system, of which the Galveston campus is a part, has already articulated a sustainability vision in its *2018 Master Sustainability Plan* (Texas A&M University, 2018):

> *Our vision is to be recognized as a national campus leader in sustainability, to develop long-term programs around environmental, social, and financial stewardship for our earth that have measurable results, and for every member of the Aggie family to incorporate sustainable practices into their daily lives."*

This vision is supported by a detailed plan with specific goals, targets, and actions defined through the year 2050. Although the Galveston campus does not receive any of its own funding specifically for sustainability, it is committed to the same vision and is already undertaking its own actions towards sustainability, such as the commissioning of this SAP and a GHG Inventory and Reduction plan, the formation of the EMC, and the pursuit of building recommissioning.

Organizational Structure In Support of Sustainability

The level of organizational change required to implement this SAP and bring about a lasting sustainability shift in the university's culture requires long-term, organized leadership from the highest levels of the organization. The EMC and possibly a Director of Sustainability are well-suited to this task, and they will need consistent backing from senior staff to fulfill their mission. The EMC has broad stakeholder representation, but in its current form lacks representation from the student body. Adding student representation to the EMC, or ensuring regular communication and collaboration between the EMC, student government, Student Coordinators, and Community Leaders will help remedy this gap.

Leadership's Role and Recommended Actions to Engage Community

It is important that leadership set the tone for sustainability on the campus. It can do this through its verbal and written communication, through the development, implementation, and promotion of sustainability initiatives, by giving time and resources as needed, and leading by example. Another important role that leadership plays is enlisting others in a shared vision and enabling them to act on that vision. A Sustainability Action Plan written for the Walnut Hill School for the Arts provides a series of steps that offer an effective way to accomplish this. The steps include creating a sense of urgency and awareness, appealing to a shared set of values, developing an engagement plan, removing barriers and empowering action, and creating short-term wins (Gupta, Kurtzhals, Lawrence, & Woodside, 2015).

Create a Sense of Urgency and Awareness

The actions taken so far by leadership at TAMUG demonstrate a sense of urgency about sustainability. This urgency is particularly acute for TAMUG, since its geographic location, as well as its primary academic focus, make it uniquely vulnerable to the impacts of climate change. While the results of the sustainability survey indicate a high degree of awareness about sustainability and its importance among students, faculty, and staff, it also indicates that there is a lack of awareness about the sustainability actions being taken on campus. The recommendations provided earlier related to engagement and behavior change serve to close this gap in awareness, as do the suggestions provided in the section on communication below.

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Appeal to Shared Values

Along with information, another important way to enlist people in a common effort is to appeal to a shared set of values. Texas A&M University has a world-renowned reputation for strong values and traditions, including what are known as the Core Values (The Assocation of Former Students, Texas A&M University, n.d.). There is an opportunity to appeal to these Core Values in communications with the campus about sustainability by making a connection between the Core Values and the values of sustainability.

Aggie Core Value	Connection to Sustainability
Excellence – Set the bar	Excellence is about doing the best that one can possibly do and setting the highest standards. A broader perspective of excellence recognizes the context in which one acts and ensures that standards are not compromised due to harm to others or the environment.
Integrity – Character is destiny	Part of being in integrity is making sure words and actions are congruent, and that actions do not betray one's values, including the Core Values and their intrinsic connection to sustainability.
Leadership – Follow me	Leadership has a positive, long-term vision for the future. Powerful leadership is also inclusive, not exclusive – it rises to meet the needs of many, not just a few.
Loyalty – Acceptance forever	Loyalty involves honoring one's belonging to a larger community and finding strength through unity. This applies to the Aggie family as well as to the larger family of life on earth to which we all belong.
Respect – We are the Aggies, the Aggies are We	Respect for one's community is critical to the wellbeing of the community and every community member. As with loyalty, this means respecting not just the Aggie family but also the community of life to

	which Aggies belong and upon which all lives ultimately depend.
Selfless Service – How can I be of service?	Selfless service requires putting aside one's personal needs to look after the needs of others. Selflessness underpins the values of leadership, loyalty, and respect and it requires a perspective that transcends individual needs in support of a greater whole.

Table 7: The Core Values and Sustainability

Create an Engagement Plan

The EMC and perhaps a Director of Sustainability have the primary responsibility for promoting sustainable action and developing a sustainability culture on the TAMUG campus. This group must have a shared set of objectives and appropriate levels of trust and commitment to help realize the sustainability vision. They must also have an organized approach to implementing the recommendations of the SAP. There are any number of change management approaches to follow to accomplish this, though the Environmental Protection Agency's (EPA's) Energy Star Program offers a basic template that is suitable in this context called the Energy Star Guidelines for Energy Management (Energy Star #2, n.d.). It is comprised of seven high-level steps with added sub-steps specific to TAMUG:

1. Make a Commitment
   a. Commit to implement the SAP
   b. Define roles and responsibilities for the EMC and Director of Sustainability
2. Assess Performance
   a. Update the 2018 GHG emissions data (identified in the GHG emissions reduction plan) with 2019 data
   b. Identify any initiatives already underway
3. Set Goals
   a. Define energy and waste reduction goals based on the 2019 baseline
   b. Define engagement and behavior goals
   c. Adjust as needed due to impact of COVID-19
4. Create an Action Plan
   a. Select recommendations to implement
   b. Define roadmap and assign responsibilities
5. Implement the Action Plan

6. Evaluate Progress
    a. Measure results and communicate progress
    b. Re-assess performance and adjust as needed
7. Recognize Achievements

Step 3 (setting goals) presents a unique set of challenges due to the disruption of regular campus activities from COVID-19. The reduced number of students, faculty, and staff on campus makes it impossible to compare 2020 energy consumption and waste production directly to 2019. However, it is still possible to define a relative percentage of reduction after adjusting for the reduced number of people living and working on campus in 2020. For example, if buildings are at 50% occupancy, a goal of reducing Scope 2 emissions by 20% is still meaningful, though it applies to the emissions from 50% occupancy rather than full occupancy.

A more detailed change management process is available from the University of California, Berkeley in their Change Management Toolkit (University of California, Berkeley). This toolkit is broader in scope than the Energy Star guidelines and is a good reference for possible future sustainability initiatives, such as those addressing social justice and equity, which can represent an even more fundamental change in organizational culture and norms (https://hr.berkeley.edu/sites/default/files/change_management_toolkit.pdf).

Remove Barriers and Empower Action

Any change initiative, regardless of the nature of the change, is likely to encounter some form of resistance. Whether structural, such as a lack of capital, or cultural, such as a lack of interest or willingness, resistance can kill a change initiative if left unaddressed. While the sustainability survey indicated broad support for sustainability on campus across students, faculty, and staff, there are still likely to be roadblocks on the way to becoming more sustainable. The table below addresses some of the more fundamental obstacles and what can be done to overcome them:

Potential Obstacle	Mitigating Strategy
Lack of priority	• Have the EMC and Director of Sustainability make a public commitment to the campus, including a commitment to follow up with progress reports. • Start with short term wins to build momentum (see Create Short Term Wins below)
Lack of interest	• Pursue to the recommendation in the section on Campus Engagement.
Lack of funds	• Build momentum with free initiatives • Assess the return on investment (ROI) • Utilize a Sustainability Capital Reserve (see below)
Lack of time/staff	• Have the EMC and Director of Sustainability make a public commitment to the campus, including a commitment to follow up with progress reports • Look for help from those already engaged • Prioritize

Table 8: Overcoming Obstacles

Create Short Term Wins

Early successes help create momentum for anyone involved in the sustainability effort and help win over skeptics who might otherwise oppose or be indifferent to participating. They also help establish the legitimacy of the effort and can provide early feedback so adjustments can be made to improve the effectiveness of later efforts. There are several initiatives discussed in this SAP that can be used to establish some early victories in the sustainability plan, and any combination of some or all of them can be implemented:

• Promote the Sustainable Office Certification program – With the full complement of staff on campus during the COVID-19 pandemic, this gets groups involved early on and helps foster community spirit and friendly competition.

• Promote the Sustainability Champion Awards – This gets individuals involved early on and signals that sustainability is valued. It can also be conducted whether and individual is on or off campus.

• Start Sustainability Moments in classes and meetings (both virtual and online) – This makes sustainability a highly visible social norm early on and enlists people to participate, again whether on campus or online.

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- Start the lights out and thermostat campaigns – With a full staff and 1,100 of 1,650 students living on campus, this program helps establish sustainability as a social norm and provides reportable results, at least for the residence halls, where submetering is available.
- Implement a computer power management protocol – Though less visible, this is an easy win that makes a meaningful difference. It is more difficult to measure results, however, since office space is not yet sub-metered.

Communication

Clear and consistent communication about sustainability initiatives on the campus is an essential element of increasing engagement and ensuring a long-term shift toward sustainable behavior. A first step would be to announce the commitment to the SAP and perhaps distribute a copy of the plan to the relevant stakeholders. The existing email system and the Campus phone app are both good vehicles for this communication. Letting the campus community see the implementation roadmap and providing regular progress reports will help establish sustainability as a social norm and also demonstrate both efficacy and relevance, all of which will help overcome any resistance to the initiative and build momentum for those who support it already. A sense of efficacy also helps moderate any fear-based resistance to sustainable action and can help to reinforce group identity and the support of group values (Tauber, van Zomeren, & Kutlaca, 2014). Research also indicates that a strong sense of group identity or community reinforces a sense of control or efficacy, thus creating a virtuous feedback loop (McKenzie-Mohr, 2011). In a community that already has a strong sense of community and a focus on shared values, this should be an effective approach. The information provided in the section on appealing to shared values can provide guidance on how to describe the different sustainability initiatives to the campus community in these regular updates.

A research article on using human psychology to better engage people on the issue of climate change offers a quick reference table about guidelines for effective policy decisions. The guidelines serve equally well for formulating communications about sustainability (van der Linden, Maibach, & Leiserowitz, 2015) and the following table is an adaptation from the original article content that is designed to assist with sustainability communication strategies:

Psychological Lesson	Policy Guideline	Example Communication Recommendation
The human brain privileges experience over analysis	Highlight relevant personal experiences through affective recall, stories, and metaphor	- Have competitors share their sustainability stories (e.g., Sustainability Champion challenge, Personal Footprint and Thermostat Challenges) - Solicit personal stories (Yale Program On Climate Change Communication, 2020) - Seek support from Community Leaders, Student Coordinators, senior faculty and staff – they know their audience and can craft effective messages
People are social beings who respond to group norms	Activate and leverage relevant social group norms to promote and increase collective action	Be consistent in emphasizing prescriptive norms (e.g., turn off lights and equipment) and descriptive norms (e.g., the number of people participating in a given initiative).
Out of sight, out of mind: reduce psychological distance	Emphasize the present and make climate change impacts and solutions locally relevant	Share information about climate change and other sustainability impacts to the local community and environment as well as to current research and fields of study at the university.
Nobody likes losing, but everyone likes gaining	Frame communication decisions in terms of what can be gained (not in terms of what is lost)	Describe progress toward goals and how that helps led to things like cleaner air and water, healthier oceans, and achieving sustainability goals.
Tapping the potential of human motivation	Leverage intrinsic motivation to support long-term environmental goals	Connect with the Aggie Core Values.

Table 9: Psychological Lessons to Guide Communication Decisions

Sustainability Capital Reserve

The College Station or main campus of Texas A&M University provides something called the Aggie Green Fund. According to the university, the Aggie Green Fund is a grant-making organization specifically for sustainability projects whose purpose is "to empower students, faculty, and staff to take action and bring creative environmental improvements to our campus." (Texas A&M University College Station, 2020) While this organization and its funds are unfortunately not available to the Galveston campus, it can create a similar organization or capacity to serve the same purpose. Availability of such a fund sends a clear message that the administration is committed to sustainability and offers everyone at the university an opportunity to become more fully engaged in sustainable action.

Funding for the sustainability capital reserve can come from a number of sources, such as savings from reduced energy consumption or state or federal grants to promote energy efficiency and the use of renewable energy. Money for the program should be treated as a separate budget to be used exclusively for sustainability-related projects.

Performance Metrics and Reporting

Measuring the outcome of sustainability initiatives is an essential element of determining whether a given initiative is achieving the results it was intended to achieve. Key Performance Indicators (KPIs), if well chosen, are an effective way to make this determination. It is important that KPIs measure key outcomes, not just activity. Since many of the initiatives in this plan are focused on reducing resource consumption and associated emissions, quantifying reductions by initiative is a good KPI. Using a common measurement, such as MT CO2e, will help determine relative effectiveness between programs. However, attributing reductions to a particular initiative may not always be feasible, particularly if more than one initiative is undertaken at the same time. In such instances a proxy measurement, such as degree of participation, will need to suffice. The following table lists some possible KPIs for the initiatives recommended in this plan:

Initiative	KPIs
Personal Footprint Challenge	• Estimated overall footprint reduction • Number of participants year to year
Inter-Residence Hall Energy Challenge	Reduction in residence hall energy consumption [1]
En-ROADS Climate Action Simulation	• Number of participants • Follow-up surveys can establish long-term impacts on behavior and perceptions related to sustainability
Sustainability Champion Awards	• Estimated project impacts on resource and emissions reductions • Number of participants year to year
Sustainability Lunch and Learns	• Number of participants year to year • Follow-up surveys can establish long-term impacts on behavior and perceptions related to sustainability
Sustainability Moments	• Level of participation (number of classes and meetings that use them consistently)
Turning off lights and equipment	• Level of participation
Unplug Before You Unplug	• Level of participation
Adjust thermostats	• Level of participation
Sustainable Office Certification	• Level of participation

Computer Power Management	• Number of computers and servers using power management
LED lighting	• Percentage of total campus lighting converted (interior and exterior)
Reduced commuter travel	• Estimated reductions in Scope 3 emissions from 2015 baseline and year to year
Directory of Sustainability	• Hired (Yes/No)
Sub-metering	• Percentage of campus buildings with electrical submetering
Commissioning and retro-commissioning	• Estimated Scope 2 emissions reductions from 2015 baseline and year to year.

[1] Needs to be measured against some baseline, whether per academic year or month-to-month. Seasonal variation in temperature, while a factor, affects all residence halls equally and therefore should not be a factor since the comparison is between buildings during the same year or month. Some residence halls may have an advantage, such as newer buildings that are more energy efficient. This can perhaps be adjusted for by consulting with facilities management to establish a handicap system.

Reporting on the progress of initiatives should be regular and predictable, though frequency may vary depending on the initiative. Communications intervals should be every semester at most, and possibly monthly. As mentioned previously, regular progress reporting helps establish credibility and a sense of efficacy, keeps sustainability in the foreground, and ensures visibility of efforts for all stakeholders. Existing email distribution mechanisms, along with the Campus phone app, are useful communication vehicles, and others may be appropriate at different times as well, such as posters and flyers (through from a resource consumption point of view, electronic media are preferred).

Future Recommendations/Initiatives

The sustainability survey provides a good roadmap for possible future initiatives. For example, the two areas respondents felt were most important for TAMUG to address are reducing waste (77% said this is very important) and diversity and inclusion (also 77%). Renewable energy is second, with 74% of respondents indicating it is very important. Recycling and indoor air quality are tied for third (72% indicate they are very important), and social justice an equity comes in fourth (71% indicate it is very important). There are also other opportunities for sustainable action in the longer term, and the following section provides a summary of each one. Though listed as important, recycling is not included here for the reasons stated previously. Neither is indoor air quality, since there was insufficient time to determine what the

concerns related to air quality actually are and the likelihood that many of them will be addressed by building recommissioning, which already being evaluated.

Diversity and Inclusion/Social Justice and Equity

Diversity and inclusion and social justice and equity are not included in this action plan since they are not part of the client's current set of requirements. However, the university has undertaken social justice training in the recent past and, given the level of interest, may be well-served to do so again. To keep pace with the changing demographics of the United States and the continued cultural shift toward greater diversity and social justice, addressing these areas will be necessary if the university wants to remain relevant and truly "fearless on every front." There is also readily available evidence indicating that organizations that have well developed diversity and inclusion and ESG (environmental, social, and governance) programs are higher performing.

Waste Reduction

Waste reduction is addressed in this action plan primarily through increased energy efficiency and the elimination of wasteful energy consumption. Other elements are not included directly in this action plan given the late date for the survey results and the time available to do meaningful research. For example, there is some degree of ambiguity about what is meant by waste reduction that needs further investigation. With the low awareness rates for the recycling that is available on campus (only 20% of respondents said they strongly agreed with being aware of current recycling options), along with a high degree of belief that it is important, there may be a conflation of wanting access to recycling and wanting to reduce waste. There were also a number of comments in the survey about the use of single-use plastics by Chartwells, the food services company, that may tie to the issue of waste reduction. While single-use plastics are a valid concern, COVID-19 hygiene protocols have also meant an increase in their use by Chartwells, a factor which may over-emphasize the importance of waste reduction overall. Nevertheless, waste reduction is an important element of sustainability that is worth further investigation and action. It also has ties to other possible initiatives like composting.

Renewable Energy

The sustainability survey indicated broad-based interest in renewable energy, but the late arrival of survey results left insufficient time to do an extensive evaluation of the use of renewable energy on the Galveston campus. However, a preliminary investigation provided some noteworthy results. Should Ameresco win the contract to conduct building re-commissioning as was mentioned earlier, renewables are a logical follow-on or addition to that effort since Ameresco also does renewable energy projects (wind and solar), and they can be financed using the same no up-front cost options that TAMUG is considering for the re-commissioning effort.

An initial study for deploying rooftop solar panels on the campus was conducted using an installation software called Helioscope (helioscope.com) and an estimate of installation costs based on data from the National Renewable Energy Laboratory (US Solar Photovoltaic System Cost Benchmark: Q1 2018). Using two different sets of default settings available in Helioscope for things like panel spacing and angle and equipment used (types of panels and inverters), selecting nine buildings with largely unobstructed rooftops, and using a highly localized weather profile, it appears that TAMUG can generate anywhere between 1,509,000 and 1,868,300 KWh of electricity, which amounts to 7% - 8% of total electricity consumed on the campus based on 2018 usage of 22,357,680.28 KWh. This represents a significant potential reduction in overall Scope 2 GHG emissions. A more thorough study is in order, however, not only to optimize the solar configuration but also to better assess the return on investment timeframe. Given the low rate that the Galveston campus pays for electricity of $0.0396 per KWh (the wholesale rate in Texas is $0.038 per KWh), it appears the ROI period for this solar installation is 19 years, which is twice the industry average and twice the ROI using a typical Texas retail electricity rate. A more detailed breakdown of these numbers is available in the appendix.

Campus Study/Relaxation Lounges

Another way to support reduced commuter travel to and from the university campus is to provide more places on campus where students and faculty can remain to work, study, and relax without needing to return home. Costs associated with the work/study lounges are difficult to determine since this depends on how many lounges are established and where they are located. The current need for social distancing due to the COVID-19 pandemic makes such

lounges more difficult to implement, and perhaps less effective while restrictions are in place due to lower occupancy levels. However, the lower occupancy is likely offset by the reduced in-class schedule that the schools is currently following, which provides a 50/50 mix of in-class and distance learning.

Sustainability in the Curriculum

The sustainability survey of the TAMUG campus indicated a strong interest in adding sustainability to the curriculum at the university, whether in the form of individual courses or potentially as a field of study offering a major or minor. While curriculum development and degree designations are outside the purview of the ECM, it could begin discussions with academic staff to encourage the addition of sustainability to the courses offered at the university. Given the budget constraints that the university faces, this modification to the curriculum would most likely need to be done without the addition of any teaching staff. Sustainability has broad application across the areas of study offered by the university, including areas like the impact of climate change on marine biology, marine fisheries, marine transportation, and maritime business.

Formalized GHG emissions reporting and science-based reduction targets

Reporting GHG emissions on a regular basis using an accepted standard such as the Greenhouse Gas Protocol (ghgprotocol.org) ensures the credibility, reliability, and consistency of data over time and provides a common standard for comparison with other organizations (the existing GHG Inventory and Reduction Plan uses the Greenhouse Gas Protocol). The university could also extend this effort by using science-based goals, meaning that any emissions reduction goals are based on what is required to achieve the goals of the Paris Agreement (Science Based Targets Initiative, n.d.). As a science- and research-based institute of higher learning, utilizing science-based goals is a logical step.

Water Conservation and Landscaping

Opportunities exist to reduce water consumption through basic measures like installing high efficiency shower heads, toilets, and urinals, and instituting water-conservation programs like reduced shower times. Transitioning to more drought-tolerant and native plant species could reduce water consumption as well, as would watering at night or in the early morning to

reduce water loss due to evaporation. Water conservation can also help reduce GHG emissions due to a reduced need to heat water.

Car Charging Stations

To promote the use of electric vehicles and further reduce Scope 3 commuter emissions, the campus could install a small number of electric vehicle charging stations and provide free charging. Depending on the number of electric vehicles and charging stations, a schedule can be coordinated to ensure everyone has equal access for charging.

Supply Chain

As an institution comprised of 2,650 faculty, students, and staff, TAMUG has a sizeable supply chain that has its own environmental impact. While some steps have been taken, such as using partially recycled content for copier paper, the university can take further steps to improve the environmental footprint of its supply chain. This includes purchasing quality used or responsibly sourced items such as furniture, lab equipment and supplies, and office equipment and supplies. Other options include permitting the use of electronic books rather than hardcopy and establishing a market for book loans and the purchase of used textbooks rather than requiring the use of new books.

Roadmap

Along with energy conservation measures, the first-year roadmap is designed to achieve some quick wins and begin the work of establishing a sustainability culture on campus.

January 2021	•Hire a Director of Sustainability •Alternatively, prep the EMC for the SAP rollout •Announce SAP to campus •Prepare for Sustainability Moments •Prepare for Personal Footprint Challenge •Prepare for Inter-Residence Hall Energy Challenge •Liase with College Station Office of Sustainability •Coordinate with Facilities regarding Ameresco work
February 2021	•Implement Personal Footprint Challenge •Implement Inter-Residence Hall Energy Challenge •Implement Sustainability Moments •Prepare for Lights and Equipment Off campaign •Prepare for Thermostat campaign •Arrange preferred parking for carpools •Promote Sustainable Office Certification
March 2021	•Implement Light & Equipment Off campaign •Implement Thermostat Campaign •Implement and promote preferred parking for carpools •Prepare for Lunch and Learns •Coordinate with IT on computer power management •Coordinate with Facilities on sub-metering and re-commissioning •Provide sustainability updates
April 2021	•Implement Lunch and Learns •Prepare for En-ROADS Climate Action Simulation •Prepare for Unplug Before You Unplug campaign •Provide sustainability updates
May 2021	•Pilot En-ROADS Climate Action Simulation for summer school students •Implement Unplug Before You Unplug campaign •Announce winners of the Personal Footprint Challenge and Inter-Residence Hall Energy Challenge •Provide sustainability updates
June 2021	•Assess En-ROADs program and prepare for fall semester •Prepare Sustainability Champions program •Prepare 2019 GHG Emissions report •Provide sustainability updates

July 2021	• Assess performance and set goals for fall semester • Prepare programs for fall semester (Personal Footprint Challenge etc.) • Provide sustainability updates
August 2021	• Conduct En-ROADS Climate Action Simulation for incoming first year class • Announce Personal Footprint Challenge, Inter-Residence Hall Energy Challenge • Announce Sustainability Champions program • Promote Sustainable Office Certification • Provide sustainability updates
September 2021	• Begin coordination/ discussion with faculty about sustainability curriculum • Provide sustainability updates
October - November 2021	• Continue all programs • Prep for Unplug Before You Unplgug (for fall break) • Provide sustainability updates
December 2021	• Implement Unplug Before You Unplug • Announce Personal Footprint Challenge and Inter-Residence Hall Energy Challenge winners • Assess performance and prepare for spring semester • Provide sustainability updates

The roadmap for years 2-5 involves the future initiatives described in the section Future Recommendations/Initiatives. The order of implementation will depend on future conditions and priorities, but a suggested order is as follows:

1. Incorporate Sustainability into the curriculum
2. Reintroduce social justice/diversity and inclusion training
3. Coordinate with Ameresco regarding rooftop solar
4. Build out study/relaxation lounges
5. Formalized reporting of GHG emissions with science-based reduction targets
6. Car charging stations
7. Water conservation
8. Address sustainability in the supply chain

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persuade/

Appendix

Evaluation of Rooftop Solar

Scenario One: Software Defaults with Two-Foot Spacing

Building	Software Defaults Nameplate		Cost/W		Annual Output		TAMUG Cents/KWh	Wholesale Cents/KWh
	KWh	W	Utility 1.06	Commercial 1.83	MWh	KWh	0.0396	0.038
Williams Library	187.5	187,500	$ 198,750	$ 343,125	268.6	268,600	$ 10,636.56	$ 10,206.80
Academic Bldg. Complex Phase 1	46.7	46,700	$ 49,502	$ 85,461	67	67,000	$ 2,653.20	$ 2,546.00
Aggie Special Events Center	117.1	117,100	$ 124,126	$ 214,293	168.7	168,700	$ 6,680.52	$ 6,410.60
Classroom & Lab Bldg. (3007)	122.9	122,900	$ 130,274	$ 224,907	176.4	176,400	$ 6,985.44	$ 6,703.20
Engineering Lab	72	72,000	$ 76,320	$ 131,760	103.4	103,400	$ 4,094.64	$ 3,929.20
Moody Student Center	232.3	232,300	$ 246,238	$ 425,109	333.6	333,600	$ 13,210.56	$ 12,676.80
PE Facility	153.6	153,600	$ 162,816	$ 281,088	222.8	222,800	$ 8,822.88	$ 8,466.40
Residence Hall A	59.2	59,200	$ 62,752	$ 108,336	84.6	84,600	$ 3,350.16	$ 3,214.80
Residence Hall B	58.9	58,900	$ 62,434	$ 107,787	83.9	83,900	$ 3,322.44	$ 3,188.20
Totals:	1,050.2	1,050,200	$ 1,113,212	$ 1,921,866	1,509.0	1,509,000	$ 59,756.40	$ 57,342.00

2018 Electricity Usage (KWh)	22,357,680.28	TAMUG ROI (Years)	19	32
% Reduction from Solar	7%	Wholesale ROI (Years)	19	34

Scenario Two: Software Defaults plus Auto-Spacing

Building	Software Defaults + Auto-Spacing Nameplate		Cost/W		Annual Output		TAMUG Cents/KWh	Wholesale Cents/KWh
	KWh	W	Utility 1.06	Commercial 1.83	MWh	KWh	0.0396	0.038
Williams Library	239.4	239,400	$ 253,764	$ 438,102	334.2	334,200	$ 13,234	$ 12,700
Academic Bldg. Complex Phase 1	59.2	59,200	$ 62,752	$ 108,336	84.5	84,500	$ 3,346	$ 3,211
Aggie Special Events Center	142.7	142,700	$ 151,262	$ 261,141	203.8	203,800	$ 8,070	$ 7,744
Classroom & Lab Bldg. (3007)	160.6	160,600	$ 170,236	$ 293,898	228.4	228,400	$ 9,045	$ 8,679
Engineering Lab	85.8	85,800	$ 90,948	$ 157,014	122.5	122,500	$ 4,851	$ 4,655
Moody Student Center	289.3	289,300	$ 306,658	$ 529,419	412.3	412,300	$ 16,327	$ 15,667
PE Facility	193.3	193,300	$ 204,898	$ 353,739	278.3	278,300	$ 11,021	$ 10,575
Residence Hall A	71.7	71,700	$ 76,002	$ 131,211	101.4	101,400	$ 4,015	$ 3,853
Residence Hall B	72.6	72,600	$ 76,956	$ 132,858	102.9	102,900	$ 4,075	$ 3,910
Totals:	1,314.6	1,314,600	$ 1,393,476.00	$ 2,405,718.00	1,868.3	1,868,300.0	$ 73,984.68	$ 70,995.40

2018 Electricity Usage (KWh)	22,357,680.28	Retail ROI	19	33
% Reduction from Solar	8%	Wholesale ROI	20	34

Scenario One provides two-feet of spacing between rows of solar panels to ensure adequate roof access. Scenario two used the auto-spacing feature of the Helioscope software, which resulted in a slight increase in power output due to an increase in the number of panels. The costs remain linear, however, so the ROI period is effectively the same for both scenarios. There are two different ROI estimates for each scenario, the Utility estimate using the average estimated cost for solar installations producing over 2 MW ($1.06) and the Commercial estimate for those producing between 10 kW – 2 MW (Fu, Feldman, & Margolis, 2018).