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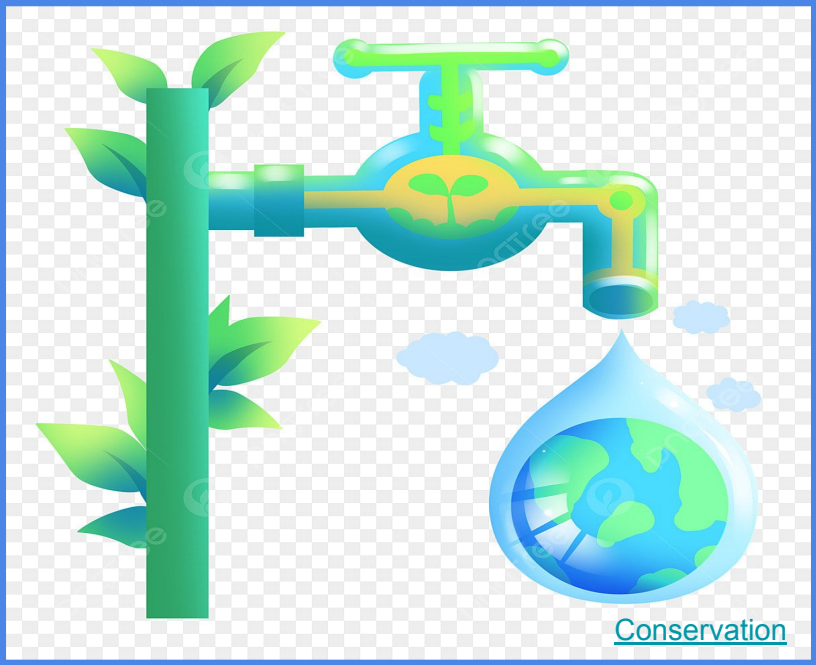
# NJARNG Sustainability Newsletter

*In collaboration with Rowan University*

## Clean Cut Quarterly



Conservation

Learn about sustainability initiatives to reduce water consumption on page 3.


Ballast

The role of ballasts in facilities today. Details on page 6.

Sustainable

Read how to design a sustainable building on page 1.

# How to Make a Sustainable Building

*By: Katlynn Hewitt-Ezekiel & Tyler Ortzman*

Sustainability is the idea that through using resources carefully and responsibly, they can be preserved for present and future generations [1]. Many natural resources are limited and do not replenish, so when they are depleted they are gone for good. Therefore, it is important to be sustainable whenever possible, as well as utilize the renewable resources that the earth provides. There are ways to build and operate buildings sustainably, from the construction to the daily activities [2].

The placement of the building is the first step to achieving sustainability. Placing buildings near public transportation reduces fuel demand, and thus reduces emissions from commuting. Therefore, having a building near train or bus stations is a more sustainable option than having a building isolated from the public. The types of materials used in a building's construction also impacts its sustainability. If possible, start with a building that is already built because it reduces the emissions caused from construction. If it is not possible to use an already existing building, opt for using recycled materials instead of new materials.

Green Earth

Next, it is important to consider lighting. Lighting is responsible for 17% of the total energy used in commercial buildings [3]. Sustainability efforts in lighting can be achieved using natural lighting or low-energy consuming bulbs. Instead of constantly using artificial lighting, windows and skylights can be implemented to provide natural light. This has an added benefit of providing natural heating, to reduce heating costs in the winter. When natural lighting is unavailable, low-power lights, such as LEDs, can be used to reduce electricity consumption.

Heating and cooling systems should also be considered in sustainability efforts, as they account for 35% of a building's total energy use [4]. Some ways to reduce usage in these systems are to use a programmable thermostat and separate the building into zones. A programmable thermostat is an automated system that can be used to control temperature set points, reducing HVAC usage during unoccupied hours. Separating a building into zones involves analyzing what areas are used for and determining a set temperature for it. A room that is not used often does not need to be heated or cooled as much as a room that is frequently used [6]. Sustainability can also be improved by reducing heat loss through the building envelope. Using weather stripping on doors and windows reduces air leakages in the building exterior, which decreases the need for running HVAC systems. Double pane windows are more effective than single pane windows in preventing heat loss. Adaptation of the heating and cooling system can vastly increase the sustainability of the building. The sources of energy also impact a building's sustainability. Renewable energy technologies use replenishing sources, such as the sun and the wind, and reduce the use of nonrenewable fossil fuels while providing a benefit of generating no carbon emissions. Solar panels are a common way buildings create energy [5].

**'Building' continued on page 2**

In conclusion, there are many ways to create a sustainable building. The main features to consider are the location, construction materials, lighting, HVAC systems, and energy sources. Being sustainable is important because there is only one Earth and many of the sources that are being depleted cannot be replaced anytime soon. This leaves less for future generations, so it is important to try to be sustainable when we can.

# Operation Conservation

*By: Walter Foard, Allison Garfield, Braden Garth, Moira Smith, & Andrew Wilson*

According to the American Water Works Association, the daily domestic water use in the United States is 82 gallons per person. The distribution of domestic water use by function is shown in Figure 1. Combined, 322 billion gallons of water are used everyday in the US. To put this value into perspective, there are already forty states in the U.S. that foresee water shortages by 2024. According to the EPA, less than 1% of the water on earth is available for human use, with the other 99% located in the oceans and polar ice caps. It is imperative for the future of our planet that humans become more environmentally conscious and aware of appropriate water conservation practices.

The Environmental Protection Agency (EPA) uses measures such as the Water Accounting System or an evaluation of the effects of water rate changes to assess the effectiveness of water conservation strategies. New Jersey Water Savers, a partnership with NJDEP, refers to New Jersey as “water-rich” due to the average rainfall of 45 inches per year. New Jersey needs to strengthen our water conservation efforts to take advantage of our “water-rich” qualities while we still can. The EPA partnered with various regional companies encouraging consumers to seek WaterSense-labeled products which are certified to use at least 20% less water than competitors, allowing households to take an active role in water conservation.

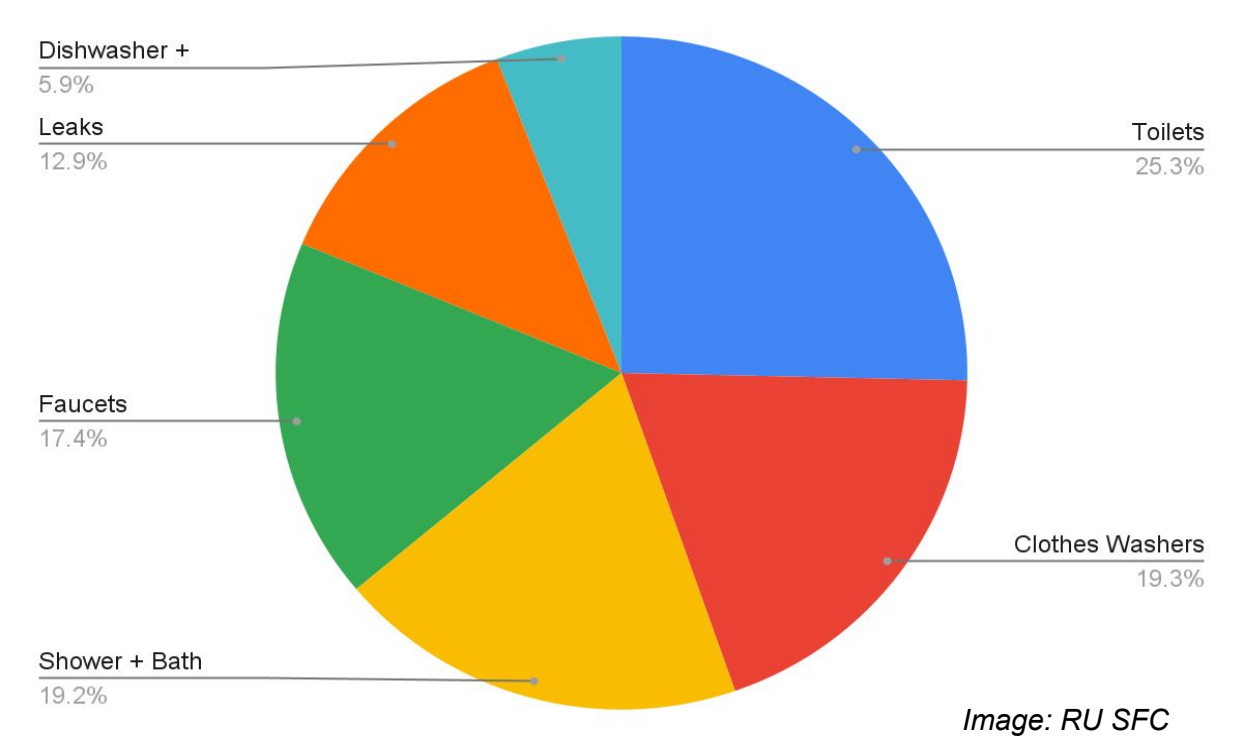



**Figure 1: Average % Household Indoor Water Usage (EPA 2008 and WRF 2016)**

**‘Conservation’ continued on page 3**

In 2009, *Sustainable Jersey* was organized as a collaboration between the NJ DEP, the NJ Board of Public Utilities, the NJ League of Municipalities, and the Sustainable Communities Leadership Network. These two departments, grassroots collaboration, and the College of NJ initiative (respectively) had taken action on their own, and this partnership developed into a 501(c)(3) non profit in the winter of 2011-2012. Today, this organization offers a certificate program for New Jersey communities to earn sustainability and conservation points in exchange for aligning efforts. 82% of New Jersey's 564 municipalities actively participate in *Sustainable Jersey*, with over 15,000 approved actions related to energy conservation, water conservation, or other sustainability initiatives. A critical aspect of *Sustainable Jersey*'s Natural Resource Certification program is the implementation of a Water Conservation Ordinance, striving to minimize unnecessary water waste. Additionally, the program requires a Water Conservation Education Program to support water-use reduction in local communities, to achieve sustainability recognition. *Sustainable Jersey* also requires each municipality to define and prioritize their local water challenges by collecting information on drinking water, wastewater, and stormwater, stimulating municipal action among the community. This sets a strong foundation for municipalities' water conservation development measures, along with providing opportunities for local individuals to get involved in real-world community issues.

The New Jersey Department of Environmental Protection released a ten-step guide on reducing water consumption, with an emphasis on conservation during the summer when NJ is at the highest risk for drought. NJDEP suggests the use of collected rain to irrigate lawns, as well as micro-sprayers instead of sprinkler systems to allow longer watering times with less runoff. Furthermore, raising the lawnmower blade height to 3 inches from the ground promotes deeper grassroots that hold water more efficiently. Pool owners can purchase a water-saving cartridge filter, and cover the pool while it is not in use to minimize evaporation. NJDEP also recommends against toys that require a constant stream of water. Overall, there are many recommendations to reduce daily water usage and the best time to implement them is now.

# Four Main Functions of Facilities Management

*By: Ryan Bailey & Richard Rivera*

Facilities Management (FM) has the main goal of ensuring that a facility is operated in the most efficient and effective manner. This has a very broad scope, as it is important for the facility itself, systems within the facility, and the people using the facilities to be in coordination. As such, a facility manager has a wide range of responsibilities which evolve as a facility is used. To better understand these responsibilities, they are broken down into four main categories.


*Image courtesy of the RU-SFC*

**'Functions' continued on page 5**

## Maintaining and Optimizing

Perhaps the most obvious responsibility of FM is to ensure the facility is properly maintained and operated. This includes all levels of building operations, from the structure itself, to individual pieces of equipment such as fire extinguishers or HVAC systems. Primarily, the facility manager is responsible for keeping the building operations up to any applicable codes and regulations. Beyond this, ensuring properly maintained equipment is important to managing costs, as it prevents unnecessary downtime and additional repair costs when equipment fails unexpectedly. Facility Managers often take advantage of a Computerized Maintenance Management System (CMMS) to keep track of required maintenance and to assign jobs to the maintenance staff. NJDMAVA makes use of a CMMS known as FacilityDude, which allows staff to create work orders which the armorers can use to track the progress of maintenance and/or repairs.

## Establishing Procedures

According to Facilities Management Advisor, “Many FM’s can relate to the struggle of getting their team members to execute procedures as intended [4].” There can be different ways maintenance procedures can be executed:

1. The manufacturer’s way of how maintenance should be completed.

2. The armorer’s way of how maintenance should be completed.

3. The final compromise between the manufacturer’s guidelines and what the armorer feels like doing.

There can be a standoff between how the armorer feels and how much effort they want to put into maintaining equipment and what NJDMAVA is looking to establish in order to increase the sustainability of their equipment in their facilities. With NJDMAVA working to implement the Facility Dude work order management system into their facilities across the state, this is a step in the right direction in being a useful resource to improving the establishment and standardization of procedures.

Technology

**‘Functions’ continued on page 5**

### Integrating Technology

As facilities management has evolved into the 21st century, so have the integration of technologies to improve these tasks. According to TalbotFORCE, "Technology has also served its benefits in developing automation systems, paperless onboarding, HR solutions, workforce, building management, and security services offered by facility management providers. Ergo, it will be right to conclude that technology lies at the core of excellent facility services [5]." Comparing previous standards of facilities management to now the use of the FacilityDude work order system, the efficiency and compatibility of facilities management has increased with scheduling corrective and preventative maintenance to building systems in an accessible environment where armorers can access these functions conveniently on their smartphones as opposed to conventional paper and pencil work orders.

### Supporting People

Creating a streamlined, comfortable, and well-maintained environment serves the greater purpose of supporting the people using the facility in doing their work. Good Facility Management will allow the staff inhabiting the building each day to be comfortable and safe, which will increase their overall productivity. To ensure the facility meets the staff's needs, it is important that the facility manager and the staff maintain open communication. Be sure to report issues and suggestions to the armorer at your facility so they can be addressed. As time goes on, facility managers can continue to tune daily operations based on staff feedback.

# Do You Still Need a Light Ballast?

*By: Stephanie DeMattheis & Thomas Torney*

A light fixture ballast is the heart of a fluorescent light. It interacts with the lighting mechanism to control, regulate, and stabilize the light output of the fixture. They accomplish this by generating the voltage that is required to start the light and then regulating the current once the light is on. Without them, light bulbs would quickly be destroyed [1]. LEDs and incandescent light bulbs do not require a ballast as they are designed with a different type of technology. Modern ballasts incorporate many different features that can help save costs and even have environmental benefits as they reduce energy consumption [2].

**Ballast Types**

There are two main types of light ballasts: magnetic ballasts and electronic ballasts. A light that is buzzing or flickering can most likely be attributed to a magnetic ballast as it is a result of the direction of flow of current changing [5]. It is less advanced than other kinds of ballasts and often requires a starter, which is a small cylindrical component that resides behind the light fixture and is filled with gas to allow the light to start [3].

The electronic ballast is more commonly used today, being 12% more efficient [4]. They control the supply power with greater precision and at a much higher frequency, which is why they do not buzz or flicker [5]. They do not need a starter and can give themselves a high-voltage boost to turn on, meaning they need a high amount of voltage to start up. The high-voltage boost makes them more energy efficient, but shortens their life as they erode over time. This is why they are used in areas where lights are left on for extended periods [3].

**'Ballast' continued on page 7**

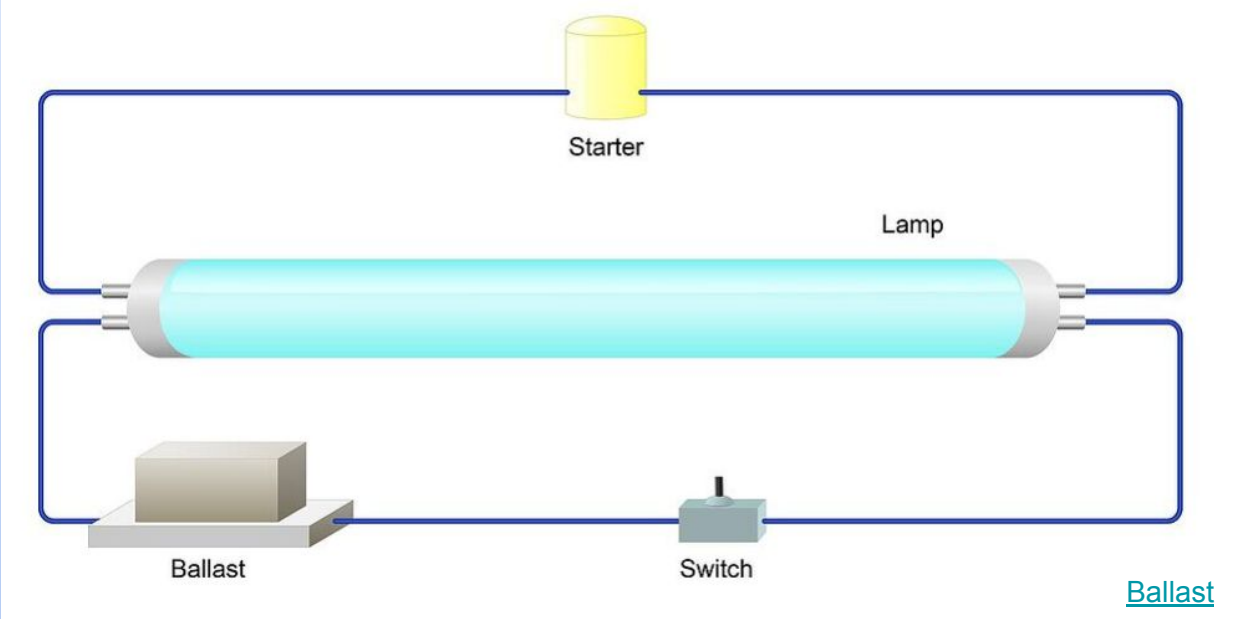



**Figure 2: How a fluorescent light ballast operates**

## What To Do?

The type of ballast required for a light fixture depends on the type of light bulb being used. Older types of bulbs such as incandescent, halogen, fluorescent, and HID light bulbs require a magnetic or electronic ballast to operate [2]. As previously described, electronic ballasts are the superior ballast when compared to magnetic ballasts as they are about 12% more efficient and eliminate the flickering and buzzing associated with magnetic ballasts [4]. However, magnetic ballasts have a lower upfront cost than their electronic counterpart, but the energy savings in the long-run help counteract this difference. Making the transition from a magnetic to electronic ballast does not require an electrician and can be done with the aid of a number of online resources.

This leaves LED bulbs as the only type of lamp to not require a ballast. Most building managers and homeowners have started transitioning towards LED bulbs as they are 80-85% more efficient and have a longer lifespan. While LED bulbs do not require a ballast, there are certain LEDs which can be used in a fixture which has a ballast. These LED bulbs which can operate with a ballast are considered “plug-and-play” LEDs. It is important to note that magnetic ballasts are typically less compatible with LEDs than electronic ballasts, reducing lifespan and effectiveness. While using plug-and-play LED bulbs may be the simple solution, bypassing the ballast altogether has some long-term benefits. According to some experts, LED bulbs are more efficient and provide better light when the ballast is bypassed. Additionally, if the ballast is kept, it will eventually wear out and need removal or replacement [7].

Overall, if older light bulb technologies are continuing to be used, then an electronic ballast will increase efficiency and eliminate lights flickering and buzzing. But, if lights are switched to LED bulbs, these ballasts can be bypassed to increase the efficiency and quality of lighting while reducing the need for future repair and replacement of ballasts. Switching or bypassing ballasts does not require an electrician but can be facilitated with videos and other online resources. In order to reduce future costs and maintenance, bypassing ballasts with LEDs is an optimal solution.

# John Foster: Achievements and Aspirations in Engineering Sustainability

*By: Kieran Breen & Jason Muermann*

John Foster is a young professional who has already made impressive strides in the field of civil and environmental engineering. He holds a Bachelor of Science in Civil & Environmental Engineering from Rowan University, which he earned in 2020. John also recently received his Master of Science in the same field in 2023. But it's not just his academic credentials that set John apart – he has also gained valuable work experience through his involvement with the Sustainable Facilities Center (SFC).

During his time at the SFC, John worked on various projects related to building energy and water audits, as well as building information modeling (BIM). As an undergraduate student at Rowan University John participated in a building energy and water audit for the Woodbridge Armory in the fall of 2018. The following spring he conducted a similar audit for the Fort Dix Joint Force Headquarters (JFHQ). In the summer of 2019, he was a BUILDER student intern for the C10 Interior Construction systems. In the spring of 2020, he worked on a BIM project for the Cherry Hill Armory. This helped build his interest in Rowan's Sustainable Facilities Program. Perhaps most impressively, from fall 2020 to spring 2022, John served as a graduate research fellow at the SFC. In this role, he managed a team of undergraduate engineering students who completed BIM models and created several standard operating procedures related to the BIM process, quality control of Autodesk Revit models, and AutoCAD drawings, which are still in use today by the SFC and its engineering students.

Given his extensive experience in engineering sustainability, it is no surprise that John's personal goals and aspirations align with this area of focus. John is confident that his work for the SFC has played a significant role in this development. He is currently seeking employment opportunities that will allow him to continue working in this field and hopes to use his skills and knowledge to contribute to a more sustainable future. The work John has done at and for Rowan University's SFC does not go unnoticed. Thank you, John Foster, and we wish you well in your future endeavors.

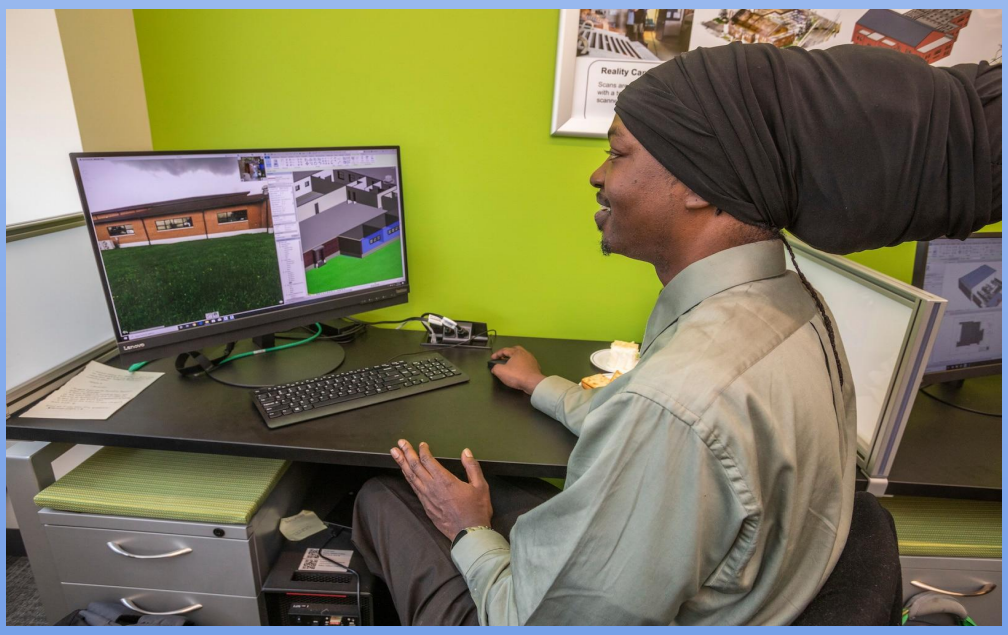


*Image courtesy of the RU-SFC*

# Meet the Authors

## Katlynn Hewitt-Ezekiel & Tyler Ortzman

*Building Energy and Water Audit Clinic Team*


Katlynn is a junior Civil & Environmental Engineering major. She likes traveling, being outdoors, and sports. She is currently interested in either transportation or environmental. Her goal is to get a career where she has the ability to travel and work with different people.

Jose is a junior in the Electrical & Computer engineering program, who likes to work on cars and plans to work on weapon defense system


## Ryan Bailey & Richard Rivera

*Facilities Management Clinic Team*

Ryan is a senior majoring in Electrical & Computer Engineering. He enjoys sound engineering and recording music. Ryan hopes to build a career in public transit.

Richard is a senior Electrical & Computer Engineering. While enjoying working and learning modern technology practices, he enjoys putting his knowledge to use by working in technical production. Richard's career goal is to find a job in electrical and computer engineering and technical production.

## Stephanie DeMattheis & Thomas Torney

*Building Energy and Water Audit Clinic Team*

Stephanie is a junior majoring in Electrical & Computer Engineering. Her hobbies include hiking and backpacking. Stephanie plans to pursue a career working on electric vehicles.

Thomas is a junior studying Electrical & Computer Engineering. Thomas loves watching football and is a huge Eagles fan. Thomas is excited to pursue a career as an electrical engineer.

**'Meet The Authors' continued on page 9**

# Meet the Authors

**Allison Garfield, Moira Smith, Andrew Wilson, Walter Foard, & Braden Garth**

*Ground Source Heat Pump Clinic Team*

Allison is a junior in the Mechanical Engineering program. She is currently supporting the integrated product team at Lockheed Martin and serves on the Tutoring Advisory Committee.

Moira is a junior in the Civil & Environmental Engineering program. She likes running and going to the beach. Moira would like to be a coastal engineer focusing on shore protection.

Andrew is in his junior year majoring in Civil & Environmental Engineering. Andrew likes to work out and intends to be his own boss.

Walter is in his senior year and finishing a Civil & Environmental Engineering degree. Walter is an avid archer.


Braden is in his junior year pursuing a Civil & Environmental Engineering degree. Braden loves to golf and going to the beach.

**Kieran Breen**

*Building Information Modeling (BIM) Clinic*

Kieran is a junior studying Civil & Environmental Engineering. He is passionate about soccer.

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For more information, please contact:
Bill Johnson
*Clean Cut Quarterly Managing Editor*
*Rowan SFC Advisor*
johnson@rowan.edu

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HENRY M. ROWAN
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