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Executive Summary

To provide for the current needs with little to no harm of future needs is the essence of Sustainability. Our Florida Institute of Technology’s campus has and is still undergoing expansion to benefit the campus community, however in this expansion of current needs parking and transportation issues have been a lower priority. These issues can potentially fall under the harm of future needs if nothing is done. This document provides proposals to have “the buck stop here” and these issues addressed. Every part of transportation systems are addressed from cars to people to even segways.

The problem on our Florida Tech campus is, it is a small campus surrounded by residential space. The layout of the campus works when the walking campus is centered by parking lots and the residential space, but there is no room for expansion without harming the parking lots. Also increased numbers of incoming students adds to a strain on the pedestrian transportation structures and increases risks where more pedestrians meet other forms of transportation, like crosswalks and J-walking. Other issues come from linking off campus housing, via a bike path, since laws state that bicycles should be on the road and not on the sidewalk. Even more issues come from the current fleet of the campus, since it would be tough to get onto the Association for the Advancement of Sustainability in Higher Education (AASHE) Sustainability Tracking, Assessment, & Rating System (STARS) Program. STARS credits will be tough to achieve with a primarily gasoline powered fleet.

This document is an all-in-one guide for the recommendations of solutions. What is needed for these solutions is a definitive plan from the campus. The many factors are based on the multiple directions that the campus could go, thus a firm direction is needed. Funding is another huge portion, but will be determined from the direction the campus wants to go. Other costs will be in the research and use of sustainable materials to help better the Florida Tech campus in a sustainable solution. In the twelve major sections, each has recommendations for the development of these ideas.

Why now, is it important to strive for a sustainable campus? Universities have always led the charge in new technologies and ideas. Florida Tech is “High Tech with a Human Touch” thus to continue to be that, the campus should pursue this new idea of Sustainability. The return on investment in sustainable technology is a better campus community and a leading institution in sustainability.
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Introduction
Sustainability has been a topic of interest since the Brundtland Report in 1987. The report states:

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” [1]

This quote means that the needs of the present should not be met by hindering or harming the needs of the next generation. Applying this to a Collegiate Scenario, every four years a graduating class is a generation. There are many needs that students want, and by this model, some will start the change but leave before seeing it complete. Others will enter in the process. More will enter at the end of the progress and move onto a new issue. Thus this cycle is what affects a sustainable movement.

For Sustainable Transportation at Florida Tech, there are many subsystems that make up the campus transportation system. The major systems are motorized vehicle traffic (cars and buses), human powered vehicle traffic (bicycles and skateboards), and pedestrian traffic (walking). These areas need to be addressed in their own ways without affecting the other areas in negative ways.

Overview
This document outlines different ways and ideas to help prepare the major traffic systems for a sustainable outcome. This outcome has development in many different infrastructure areas around the campus. Each of the major traffic systems has subsystems that are the sections. Cars, Motorcycles, Bicycles, Pedestrians, Shuttles, are some examples of the subsystems. This document is designed as an all-in-one plan containing the relevant ideas and designs for sustainable solutions around the Florida tech campus.

Purpose
As an all-in-one document, there are many outlines of plans to develop sustainable transportation on the Florida Institute of Technology's main campus. Many sections have recommendations from the 2014 student research group of Dr. Kenyon Lindeman. These recommendations are areas describing what is to be filled into the section. This document is to be a foundation to be added upon with different revisions to get sustainable transportation on the Florida Tech campus.

Goals, Objectives and Performance Measures
This document is to be the plan for moving the Florida Tech campus onto the Association for the Advancement of Sustainability in Higher Education (AASHE) Sustainability Tracking, Assessment, & Rating System (STARS) Program.
The Fundamentals of Sustainable Transportation

In researching sustainable transportation on many campuses, there was a consistent set of ideas on any sized campus. These ideas are as follows: an Emergency Ride Home, a Ride Sharing Benefit, and a focus on Commuting Safety. These three ideas are considered the Fundamentals of a Sustainable Transportation Plan, and are part of the foundation of Florida Tech’s Sustainable Transportation Plan (referred to as ST Plan for the remainder of the document). The Fundamentals are explained further in the following sections.

Emergency Ride Home

Many people would consider taking public transportation or participate in a car pool, however are afraid of being stranded at work when there’s an emergency at home or they have to work late unexpectedly. These very legitimate concerns are addressed by the Emergency Ride Home (ERH) program, sponsored by FIT and ran by Company X. (For the remainder of this section, Company X is considered a local 3rd party company.)** The ERH program provides eligible employees, who forego commuting alone in a car, with cab service paid by the school in case of personal or family emergencies.

Any FIT employee who uses public transportation, carpools, vanpools, bikes, or walks to work at least three days per week may use the program. Participants in the ERH Program may obtain a ride one time per month up to six times per year.

The program may be used in any of these circumstances:

- Personal illness or emergency
- Family illness or emergency
- Unscheduled or unplanned overtime
- A driver of a Carpool or Vanpool has an emergency

The ERH does NOT apply during these conditions:

- Weather delays or disasters
- Space Coast bus or other transit delays or disruptions
- Construction disruption to normal commuting method

Faculty and staff have to register with Company X prior to using the program. Once Company X has received and processed the completed registration forms, an orientation package will be sent to you with a taxi voucher and program information. (Please note that registration may a couple of weeks.)

** The ERH transit program above is similar to one operated by Massachusetts Institute of Technology (MIT) [*] and their area transit program, Charles River Transportation Management Association (TMA). It would make sense that the Space Coast Area Transit would have a similar program that Florida Tech might be able to join if not find a third party company to handle Company X’s role in monitoring and enforcing the program.
Ride Sharing
Ride Sharing in this case is defined as using one vehicle to transport multiple people to a destination. Carpooling and Vanpooling are common types of Ride Shares. By carpooling and vanpooling, a parking lot is able to minimize the vehicle traffic in it while maintaining the amount of people arriving to it.

Many campuses provide benefits to a ride sharing program. These benefits are to help promote the program and help maintain less vehicles coming to campus. One benefit for faculty is a reduced parking permit for the year. Other benefits for both faculty and students are specific spots for carpools and vanpools only. More details can be found in the Cars Section on page 7.

Commuting Safety
Safety is a huge subject when it comes to faculty, staff, and students. Many people have certain standards and misconceptions about public transportation and commuting outside a car. A car is provides a sense of security, but it is a lot of space to move a person. To overcome this need of security, focus has to be shifted into education of the area transit and where and when to go.

An area transit system can be a huge benefit to a college. The Space Coast Area Transit is the system serving Florida Tech, with four different route stops on the Florida Tech campus. However, many people would rather drive themselves than use the local transit. Education of the system is needed beyond just looking up the area transit on google. For example students can ride the bus for 60 cents or free if they are a student at Eastern Florida State College. Thus it would be possible for a student to ride route 26 to the beach for under $2 round trip, yet Florida Tech freshmen probably do not realize this and will drive. While students would probably use the beach bus on the weekends, the point of education on the Space Coast Area Transit is to make students be aware of everything and be safe. More details are in the Shuttles & Trolleys section on page 41, but Safety is one key thing that needs to be addressed.

Another area of commuting safety is in using crosswalks. Many students are from other countries and thus need education of United States law to be safe. Also Students who bike or long board or walk and text need to be reminded that they are not in their own little bubble. They need to be aware of their surroundings.

Recommendations
These three fundamentals of Emergency Ride Home, Ride Sharing, and Commuting Safety are essential to achieving Sustainable Transportation solutions. While all three should be tackled concurrently, if there was an order to tackle them, the Emergency Ride Home would be the first Program needed. Getting faculty support towards sustainable transportation is needed for a sustainable campus. The second program is Safety Education. Setting up classes, lectures, topics for University Experience Students, etc. is needed as well as the guidelines and knowledge for Ridesharing. Last is Ridesharing, but not by much. Ridesharing programs will require changes to the structure of parking lots, permits, and benefits to get people on board for carpooling.

Current Fleet
This section contains the fleet data for the Florida Tech vehicle fleet. This data is important for STARS credits.
Inventory List
Available data for the fleet vehicles are on next two pages.
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Figure 1: Vehicle Data
### Specifications

Most of the fleet is gasoline powered. There are golf carts that are powered from Solar Cells that charge during the day, but more could be done to move towards a sustainable solution. The data above does not include what carts are on the solar program, so it would be beneficial to know which carts are solar powered and which ones are not. Those that are not solar powered should be considered for moving onto the program. The result may mean that the solar facility would have to be renovated and/or expanded to house more solar carts. The optimal solar cell angle and conditions can be calculated for the Florida Tech Location on the Globe.[9] These are considered in a proposal in Appendix A.2.a Sustainable Capstone Projects.

Focusing on the bigger vehicles of the campus fleet, gasoline is the current structure. For the campus to move onto the STARS rating system, expansion of fuel types is needed. The Diesel Engines and Hybrids are a good starting point. A lot of weight is placed on this in at least 4-18 categories depending on STARS or the Princeton Review.[42] To restructure the current fleet is a tremendous task, but an added bonus is the potential to move diesel vehicles to bio-diesel. A Bio-Diesel plan is mentioned in Appendix A.2.b. This project proposal has scoped out the

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<td>C-120</td>
<td>Food Services</td>
</tr>
<tr>
<td>C-60</td>
<td>Defunct</td>
<td>C-89</td>
<td>Facilities/HARV</td>
<td>C-121</td>
<td>Security #1</td>
</tr>
<tr>
<td>C-61</td>
<td>Facilities/Grounds</td>
<td>C-90</td>
<td>Facilities/Painters</td>
<td>C-122</td>
<td>Security #2</td>
</tr>
<tr>
<td>C-63</td>
<td>Defunct</td>
<td>C-91</td>
<td>Facilities/Painters</td>
<td>C-123</td>
<td>Security #3</td>
</tr>
<tr>
<td>C-64</td>
<td>IT</td>
<td>C-92</td>
<td>Facilities/Carpentry</td>
<td>C-124</td>
<td>Security #4</td>
</tr>
<tr>
<td>C-65</td>
<td>Facilities/Grounds</td>
<td>C-93</td>
<td>Facilities/Carpentry</td>
<td>C-125</td>
<td>Security #5</td>
</tr>
<tr>
<td>C-66</td>
<td>Facilities/Grounds</td>
<td>C-94</td>
<td>Facilities/Painters</td>
<td>C-126</td>
<td>Security #6</td>
</tr>
<tr>
<td>C-67</td>
<td>Facilities/Grounds</td>
<td>C-95</td>
<td>Facilities/Plumbing</td>
<td>C-127</td>
<td>Security #7</td>
</tr>
<tr>
<td>C-68</td>
<td>Facilities/Grounds</td>
<td>C-96</td>
<td>Facilities/Electricians</td>
<td>C-128</td>
<td>Security #8</td>
</tr>
<tr>
<td>C-70</td>
<td>Athletics</td>
<td>C-97</td>
<td>Facilities/HARV</td>
<td>C-129</td>
<td>Mailroom</td>
</tr>
<tr>
<td>C-71</td>
<td>Purchasing</td>
<td>C-98</td>
<td>Facilities/Carpentry</td>
<td>C-130</td>
<td>Athletics</td>
</tr>
<tr>
<td>C-72</td>
<td>Food Services</td>
<td>C-99</td>
<td>Facilities/Electricians</td>
<td>C-131</td>
<td>Athletics</td>
</tr>
<tr>
<td>C-73</td>
<td>Defunct</td>
<td>C-100</td>
<td>Facilities/Electricians</td>
<td>C-132</td>
<td>IT</td>
</tr>
</tbody>
</table>

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Figure 2: Golf Cart Data
potential for this bio-diesel transition if the school wanted to head in that direction in 10 years (Currently being 2014).

**Housing Locations**
This section is for listing the locations of where every vehicle is stored. It is a good idea to understand where the garages, parking lots, sheds, etc. are for the campus fleet. This way those areas could be increased to be more sustainable, and also help protect the vehicles from the elements to reduce the amount of servicing needed.

**Recommendations**
Adding to the vehicle ID numbers, the vehicle type (car, van, bus, trolley, etc.) to the data will be helpful. It is also important to document where the vehicles are stored and the fuel types each vehicle uses. Not only is this helpful for STARS, but for the general knowledge of what is what. As an example, if Vehicle FIT#020 breaks and needs fuel. Based on the data the 2014 student team received, it would be a guess to someone with no knowledge of the gas fleet to buy gas or diesel. It would also be tough for someone to know where the vehicle is supposed to be stored. Point is, if the data is to be passed around as is, then it needed to be as clear as possible.

Also the campus should look over the STARS credits and decide if a movement to better fuel types is worth the effort. Gas fleets do not normally fair well with achieving STARS Credit.

Based on the data, it is roughly 50/50 of small and medium lots to large lots. However the capacity during peak times shows that the ratio needs to change. There are many ways to change this, and many ways to extrapolate the data to suit the needs of the campus. It would be best if the campus evaluates this data and develop the conclusions they need to move forward on the parking lots. (From May 2, 2014, more spaces are being added officially to lots 4 and 21 on the parking data chart, so recounting those in the fall will be needed.)

**Cars**
The Florida Tech Campus has nearly 3100 parking spots located in the Melbourne area where students are present the most. However there is, as of Spring 2014, a student body of 4100 students[2] attending classes at the campus. Factoring in the Faculty[3] and Staff numbers, the amount of people coming to campus exceeds the total amount of spaces by at least 1500 spaces. Granted that not everyone is coming to campus at one time, but still parking is tight. Looking at times that the campus holds special events like Southern Sprints and Career Fairs, certain parking lots are closed to normal traffic, and stresses the already low number of spaces. This section outlines and reviews different vehicles and ways to affect Sustainable Transportation.

**Commuters**
Of the 3100 parking spaces on campus, roughly 1000 are for the resident halls, although ~200 spaces are from Panther Bay. With 800 spaces on the main campus for student residents, and factoring out the 200 from Panther Bay and 155 from FIT Aviation, there are roughly 2850 parking spaces on campus available to commuting students, faculty, and staff. This number of 2580 is half of the 4100 student body and supporting faculty and staff (2014 numbers). Outlined below are the various ways to make transportation of vehicle commuters sustainable.
Parking Available on Campus
As previously mentioned, there are roughly 3100 parking spaces for Florida Tech Facilities, and 2850 spaces on the main campus. These numbers are taken from parking space data that was collected on March 5, 2014. The results are on the following page:
<table>
<thead>
<tr>
<th>Lot #</th>
<th>Lot type</th>
<th>Decal Color</th>
<th>Amt of Parking Cars</th>
<th># of Special Spots Low Emission/Electric Handicap/Visitor/etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Main Entrance</td>
<td>Silver/Visitors</td>
<td>37</td>
<td>2 Handicap; 7 Visitor; 5 Cart</td>
</tr>
<tr>
<td>2</td>
<td>West Keuper</td>
<td>Reserved Only</td>
<td>4</td>
<td>1 Handicap</td>
</tr>
<tr>
<td>3</td>
<td>Behind Sub</td>
<td>Reserved Only</td>
<td>7</td>
<td>2 Mailroom, 1 cart</td>
</tr>
<tr>
<td>4</td>
<td>Rear Shaw</td>
<td>Reserved Only, Security</td>
<td>25</td>
<td>10 Jump Curb, Park on Grass; 4 Cart; 2 Handicap</td>
</tr>
<tr>
<td>5</td>
<td>Res Hall/ Dorm Circle</td>
<td>Reserved Only/15 min Parking</td>
<td>8</td>
<td>1 Handicap</td>
</tr>
<tr>
<td>6</td>
<td>CV Garage</td>
<td>Yellow</td>
<td>170</td>
<td>1 Handicap in Garage; 8 in Village</td>
</tr>
<tr>
<td>7</td>
<td>Across from Roberts</td>
<td>Yellow/Blue/Green/Black</td>
<td>220</td>
<td>1 Handicap</td>
</tr>
<tr>
<td>8</td>
<td>Behind Lot 7</td>
<td>Yellow/Blue/Green/Black</td>
<td>X</td>
<td>Dirt Lot w/ Mulch Pile</td>
</tr>
<tr>
<td>9</td>
<td>Brownlie</td>
<td>Yellow</td>
<td>29</td>
<td>1 Handicap</td>
</tr>
<tr>
<td>10</td>
<td>Across from Main</td>
<td>Blue/Green/Black</td>
<td>282</td>
<td>31 Panther Plate, Red Stripes</td>
</tr>
<tr>
<td>11</td>
<td>Health center</td>
<td>Health Center Patrons</td>
<td>8</td>
<td>1 Handicap</td>
</tr>
<tr>
<td>12</td>
<td>CAPS</td>
<td>Reserved Only</td>
<td>13</td>
<td>2 Handicap</td>
</tr>
<tr>
<td>13</td>
<td>Crawford</td>
<td>Green/Black</td>
<td>25</td>
<td>2 Handicap</td>
</tr>
<tr>
<td>14</td>
<td>Gleason</td>
<td>Green/Black</td>
<td>44</td>
<td>3 WFIT Visitor; 3 Handicap</td>
</tr>
<tr>
<td>15</td>
<td>Corner of Univeristy and Babcock</td>
<td>Blue/Green/Black</td>
<td>54</td>
<td>3 Handicap</td>
</tr>
<tr>
<td>16</td>
<td>Infront of Frueauff</td>
<td>Blue/Green/Black</td>
<td>4</td>
<td>1 Handicap</td>
</tr>
<tr>
<td>17</td>
<td>Clemente/Olin</td>
<td>Blue/Green/Black</td>
<td>244</td>
<td>20 Handicap; 1 Wheelchair Specific</td>
</tr>
<tr>
<td>18</td>
<td>Henry lot to Machine Shop</td>
<td>Blue/Green/Black</td>
<td>60</td>
<td>5 Visitor; 5 Handicap</td>
</tr>
<tr>
<td>19</td>
<td>Business/Scot Center</td>
<td>Blue/Green/Black</td>
<td>66</td>
<td>11 Visitor; 1 Carpool; 5 Handicap</td>
</tr>
<tr>
<td>20</td>
<td>Harris Building Lot</td>
<td>Blue/Green/Black</td>
<td>128</td>
<td>4 Athletic Van; 11 Handicap</td>
</tr>
<tr>
<td>21</td>
<td>Behind ROTC</td>
<td>Blue/Green/Black</td>
<td>18</td>
<td>X Grass Field</td>
</tr>
<tr>
<td>22</td>
<td>Harris Village</td>
<td>Magenta</td>
<td>240</td>
<td>22 Service; 1 Mail; 1 Visitor; 12 Handicap</td>
</tr>
<tr>
<td>23</td>
<td>Southgate</td>
<td>Orange</td>
<td>264</td>
<td>29 Spaces Facing Field</td>
</tr>
<tr>
<td>24</td>
<td>Parking Garage</td>
<td>Blue/Green/Black(All on Top)</td>
<td>255</td>
<td>2 Electric Vehicle; 2 Trolley; 19 Visitor; 6 Handicap</td>
</tr>
<tr>
<td>25</td>
<td>U plaza</td>
<td>Reserved</td>
<td>X</td>
<td>Patrons only, can't park there for classes</td>
</tr>
<tr>
<td>26</td>
<td>Commons</td>
<td>Blue/Green/Black</td>
<td>236</td>
<td>14 Guest; 1 Cart; 8 Handicap</td>
</tr>
<tr>
<td>27</td>
<td>Mary Star of the Sea</td>
<td>White</td>
<td>72</td>
<td>5 Handicap</td>
</tr>
<tr>
<td>O.1</td>
<td>Airport</td>
<td>All</td>
<td>155</td>
<td>4 Handicap</td>
</tr>
<tr>
<td>O.2</td>
<td>Greek village/Panther Bay</td>
<td>All</td>
<td>203</td>
<td>13 Handicap</td>
</tr>
<tr>
<td>O.3</td>
<td>Facilities &amp; Football Corner</td>
<td>?</td>
<td>75</td>
<td>2 Handicap</td>
</tr>
<tr>
<td>O.4</td>
<td>By All Faith</td>
<td>All</td>
<td>25</td>
<td>2 Handicap</td>
</tr>
<tr>
<td>O.5</td>
<td>Alumni House</td>
<td>Green/Black</td>
<td>X</td>
<td>Grass Lot</td>
</tr>
<tr>
<td>O.6</td>
<td>Work Building</td>
<td>Green/Black</td>
<td>2</td>
<td>2 Cart</td>
</tr>
<tr>
<td>O.7</td>
<td>Evans Building/Kat Spots</td>
<td>All</td>
<td>4</td>
<td>Temp Parking</td>
</tr>
<tr>
<td>O.8</td>
<td>Behind OLS</td>
<td></td>
<td>3</td>
<td>Service Vehicles Only</td>
</tr>
<tr>
<td>Total</td>
<td>Sum of all spaces</td>
<td></td>
<td>Σ= 3102</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3: Data of FIT Parking Spaces
The parking data shows the number of spaces in each lot around campus. Lot 15.5 was not clearly defined on the parking map[4] and could be part of either lot 15 or 16. Other areas have the notation of “O.# (_)” where O.# stands for unaccounted lot that is unnumbered. The numbers in parenthesis are suggestions for lot numbers. Also there might be error in the data by ±1 parking space or ±2 spaces from the method used to count spaces, an app called Tally Counter,[7] and some lines defining the spaces were worn out. Small lots like 2, 15.5, and O.8 have no error, medium lots under 100 spaces have ±1 space error, and large lots with over 100 spaces may have ±2 spaces error.

Based on the data, it is roughly 50/50 of small and medium lots to large lots. However the capacity during peak times shows that the ratio needs to change. There are many ways to change this, and many ways to extrapolate the data to suit the needs of the campus. It would be best if the campus evaluates this data and develop the conclusions they need to move forward on the parking lots. (From May 2, 2014, more spaces are being added officially to lots 4 and 21 on the parking data chart, so recounting those in the fall will be needed.)

**Low Emission & Fuel Efficient Vehicles**

In the Clemente/Olin lot, Lot 17, there are four spaces that are reserved 24 hours a day for low emission, fuel efficient vehicles.

The sign marking these spots are somewhat plain.

**Electric Vehicles**

There are currently two spaces in the parking garage, Lot 24, that are only for electric vehicles. These spots have a charging station in-between them and have green stripes.
However these spots are in a location that is somewhat hidden from the view of traffic.

**Hybrid Vehicles**
There is one spot by the Scot Center, which can be easily missed.

**Recommendations**
Based on the parking data, some improvements can be made. Of the many possibilities, the campus should re-evaluate the parking lot data and draw conclusions to determine the course of action the campus should take. Applying Florida Tech’s Motto: “High Tech with a Human Touch,” to Sustainable Actions, consolidation of the different types of parking spaces for special vehicles is recommended. Applying this to Sustainable Actions, the different types of parking
spaces for special vehicles should be consolidated. A floor of the parking garage, if not a section of a lot, should be for the Low Emission, Fuel Efficient, Electric, and Hybrid Vehicle. A floor in the parking garage would provide an incentive for people to drive those types of vehicles for the cover of the floor above providing them shelter. Another benefit for an “Eco-Lot” or “Sustainable Car Lot” is the marketability of the lot. The school could benefit from showcasing its commitment towards sustainable transportation.

Another way to denote the different “green” car spaces is using the green paint that the electric spaces uses. There are a couple of colors already used on campus, and differentiating these spaces would bring attention to them. Panther Plate spots in Lot 10 are marked with red paint, and most people know that a Handicap space is denoted by blue paint stripes and a handicap sign (Figure 7), so the same principle could be used over a specific “Eco-Lot.”

The Low Emission, Fuel Efficient spaces are plain. White paint stripes and a sign that looks similar to others denote the current spaces. Changing the paint stripes to a bold color, green or yellow, and changing the sign style would draw attention to the space type.

For more on signage, see the different types pictured below:
For the most part the signs around campus are plain. If one factors in a car-length and potentially other conditions, the above signs roughly look the same. More contrast and adding logos to the designs would help differentiate which spot is what. Reading the text on each of the various types of white signs with red text can be difficult as well. The other option is to reduce the amount of sign types so fewer types are around the campus. As an example:
Figure 9 above could be the contrast type used (with no text) to mean that Deans, ROTC, and National Academy members can park there. Adding text to the sign in the white area would differentiate what permit number is allowed there or if the spot is carpool, service, or other type only. More research on sign colors and types should be done before deciding on a standard.

Another good source of data, would be to know what Security allows as the of special vehicle types. What kind of car is an electric, or low emission, or hybrid vehicle? This data would help promote faculty and staff to consider buying these vehicles is they knew they are guaranteed a parking spot. This data could not be attained in the Spring of 2014, but should be added here.

On the topic of Faculty spots, Faculty lots should be created if not a few select spots in each parking lot be reserved. This would allow for faculty to have parking without competing with students. These spaces could be reserved for a short time, as example from 7am-1:30pm, to allow faculty the ability to get a space, and students to park in the afternoon if needed.

From the idea of redesigning some lots for only faculty, the parking permits should also be looked into. From the Florida Tech website, there is a custom parking option of “Executive Parking Pass” that should be removed for students. The Executive Pass, allows a space to be reserved 24/7 for a student or faculty. For a student to buy a space that will be vacant when not on campus, wastes the space and removes a vital space that could go to a commuter. There are only 2850 spots on campus, if X are reserved (data from Security would have the exact number), then that defeats the purpose of a parking space if a car is not in it.
However, if the program cannot be phased out, then students should have to wait one month into a semester to buy a spot. September or February depending on the semester. This delay for students allows faculty and staff the chance to buy spots that are right next to or close to an academic building. These spaces are the prime locations for Faculty and should be given to them first if they want the space for the year. Students do not necessarily know where their classes will be, and thus having a space near a door to the Olin Engineering Center is not useful if the student has classes in the Academic Quad, Link Building, and P133.

Another limitation for students would be, to only allow commuting students to buy spots. There have been some yellow and magenta tags (Lots 8 and 22 respectively) seen in reserved spots in Lot 17 during the day. Whether or not these vehicles are supposed to be there for owning the space permit, on campus students should not be allowed to buy a spot in front of Clemente, or the Olin buildings. Again it removes from the 2850 parking spots available to commuters, and these students have parking in their resident areas.

The other Custom option is the Freedom Pass, which should be kept. The Freedom Pass allows for a student to park in any color lot without fear of a ticket. Some students use this option to park in the Southgate Lot, Lot 23, because it is vacant most of the time. The $500 spent guarantees them a space for the year, and is still cheap compared to big schools.

Increasing parking by developing grass fields into parking lots is another possibility. The field behind the ROTC building is used as parking, and the field does show wear. Instead of replacing the grass sod every now and then for it to be ripped by vehicles parking on it, placing gravel or developing the lot is a better use of the field. In the sustainable sense, a gravel parking bed over grass means less resources are used to maintain the worn out grass. Other areas around campus where the trolleys stop have also been worn down to dirt. Development
of gravel or actual concrete (perhaps using materials in Appendix B.1) lots and areas would help reach a sustainable solution over re-sodding an area every month. *Note: In the preparation of the final document for Spring 2014, an email was sent on May 2, 2014 stating that these areas are going to be developed. The preceding paragraph can be omitted in the future documents, yet the information reference in the Appendices should be kept. (This also means that more spaces need to be added to the parking data.)

Another way to increase the amount of parking on campus would be to ban cars for on campus students or students who are not junior level. This would open up the 3100 total spots on campus, however there should be programs set up to allow students to leave campus. See the Zipcar section on pg. 17 for more details.

A different program would be to set up a carpooling program with dedicated spaces. If 5 people carpool, that is 4 less individual vehicles coming to campus. More on this program is discussed in the Carpool Section on pg. 18.

The final way that parking could be increased on campus is to raise the price of a parking pass. Florida Tech parking is very cheap compared to larger schools, and mentioned before some students easily pay $500 for a spot in Southgate. Increasing the price would make students really decide if driving to campus alone is the best option for them.

**Satellite Parking**

A college campus can be considered different types of cities. Large state schools like the University of Florida can appear to be half of the city of Gainesville. The University of Central Florida is a tiny part of Orlando, but from a map of the school, it is contained enough to pass as a small city. Florida Tech is different by placing most of the automotive traffic on the outside of the campus, and having pedestrian traffic inside the campus. Everything inside the boundaries of the Main Campus is scaled to a pedestrian view. As good as this is, the expansion of campus has put a strain on placing parking on the outside of the boundaries. The options are either expand the existing parking lots up into garages, or look at satellite parking.

Satellite parking would be the use of a parking lot a little distance away from campus, and shuttling people from the lot to campus. There are already shuttles in use (described more in Shuttles on pg. 42) and a building with a lot that Florida Tech owns not far beyond one of the routes. This building is the donated building from Intersil. The parking lot is huge, and from a satellite map, has plenty of spaces. To use this lot would be beneficial to reduce the traffic on the Main Campus.

What the lot needs is some security measures and could use an automated toll booth like the University of Minnesota uses. This toll booth is automated and allows for a relatively small number of security tenants in the lot. There is the potential to have a Florida Tech machine fitted with the technology to allow for payment by the Panther Card over other credit cards. Like the vending machines the Panther Card payers could receive a small discount from the pay per day idea or the setup of various plans to always park in the lot. This option is worth looking into with the mentioned technology as a starting point.

**Potential Nearby Parking**

Space around the Florida Tech Campus is tight, however there are lots nearby that are mostly vacant during the week days. These lots are owned by the different churches on Babcock and Country Club. It may be beneficial to work out an agreement for week day parking at these
sites. These sites would be a cheaper parking pass as an incentive for students to park there. The distance of these lots are not that much farther than Roberts Hall and Columbia Village. The church off of Babcock is located by the Cross Walk for Southgate. These parking lots would only be used during the week days, and should not conflict with that many events at the churches. It is a possibility that the school should look into.

Another possibility is the Southgate lot. There are 29 spaces that face the Southgate field. These spaces could be used for the Carpool lot. The maximum occupancy of Southgate is 221 and is 40 people under the total amount of spaces. This lot is near the cross walk on Babcock, so no additional development is needed. This section of the lot should be used if not for a Carpool program, but as faculty parking.

**Zipcar or equivalent companies**

It is important to note that Zipcar is used as a term here. Zipcar as a term has become like Kleenex and Coke, where not all facial tissues are Kleenex and not all colas are Coke, but nonetheless people will use a brand to mean what they want.

For sustainable efforts on the Florida Tech Campus, a company like Zipcar would be a good benefit. A “Zipcar” company is a rental car company that rents cars to students for a special rate. This allows for students to use a car when needed and not have to worry about the maintenance of personal vehicles.

**Plan**

In the past, there has been some efforts to get a Zipcar similar company on campus. Currently, in 2014, Business and Retail Operations in conjunction with SGA is working on finding a company that best fits the interests of the school and it is also affordable for students. Based on this knowledge, the major Zipcar like companies other major AASHE schools use are:

- Zipcar
- Hertz
- Enterprise
- U-Haul
- Vox

Depending on which company the school wants to pursue and work with, the actual plan should be inserted here.

**Recommendations**

From the Zipcar website, the ratio of cars a Zipcar replaces is 1:15, where 1 Zipcar replaces 15 normal cars. This would mean that most of the spaces in Lot 6 and Lot 21 could be used for commuters or other parking needs, as long as a few spaces were Zipcar only. For example ~12 Zipcars at minimum would be enough to supply the Freshmen in Columbia Village with a car if needed. Approximately 150 parking spaces would become available if a Zipcar System was put in place.

The added benefit of adopting a Zipcar plan is to compare prices to other major Florida Colleges. The University of Florida, University of Central Florida, Florida State and others have prices figured out. From UCF’s data, for a student to spend 2 hours at the supermarket would cost ~$15-$17 after the set up fees.
More data should be collected on how often a student living on campus uses his/her car and what types of errands they run, to better determine the types of cars that should be rented as well as the total amount the school would need.

**Rideshares**

Ridesharing like carpooling can be a great asset to a small community. Letting 4-5 people go to a single place allows for the best use of a car space.

**Carpool**

The term carpool refers to a vehicle with up to 6 seats that carries more than 1 person to an area. The vehicle types in this category can range from a small 2 seat car up to a 6 seat minivan/van or SUV. Vehicles in this category are owned individually and can vary between individuals.

On a campus community level, this option is best for faculty, staff, and students.

**Vanpool**

The term vanpool refers to a vehicle that is like a box van that is owned by a third party company. These vans are uniform and standardized in the company. Programs can vary from rental of a van to a group of commuters to a “park and ride” situation. Park and ride is where a commuter will park at the Vanpool parking lot, and will be shuttled to work with others heading in the same direction. It is essentially a small bus, but it will take a person directly to work instead of a nearby bus stop.

On a campus community level, this option is best for faculty and staff that share the same work hours. The Space Coast Area Transit offers vanpooling options for the area.

**Recommendations**

To promote carpooling and vanpooling incentives are needed. Relating this to parking, many schools offer a variety of options that promote car sharing. Other than monetary incentives of reduced parking permits, the other big incentive for parking is a guaranteed space. Some schools will define a time for carpoolers, thus allowing for the spaces to be used outside that time frame and not waste the space. The normal hours that are reserved are the morning hours of 7am-11am.

Other third party programs mimic social media to create an environment for commuters who want to carpool. Websites like Nuride, Zimride, exist to provide the rewards and the social media space to communicate. Nuride is smaller and has nothing nearby, but shows how there are programs that allow members to earn rewards for commuting in packs. Zimride is a bigger company that works with many universities, like University of Florida, Florida State University, and University of Central Florida. From the UCF page, there are Zimride users in the Melbourne area, and thus it may be possible to set up a Zimride community for Florida Tech.

**Motorcycles and Scooters**

As some people will prefer personal motorized transportation, motorcycles and scooters will be the mode of transportation they take. The Florida Tech Campus needs to be prepared for those choosing to come to campus by motorcycle.
Parking Available on Campus

There is ample space on the Florida Tech campus for motorcyclists, however not all space is an actual space for motorcycle parking. The current laws make it tough to discern if a motorcycle parking space is its own space or just a redefined car space. For the purposes of this study the data on where space is in parking lots are on the following page.
<table>
<thead>
<tr>
<th>Lot #</th>
<th>Lot type</th>
<th>Amt of Parking mbikes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Main Entrance</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>West Keuper</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Behind Sub</td>
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</tr>
<tr>
<td>4</td>
<td>Rear Shaw</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Res Hall/ Dorm Circle</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>CV Garage</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Across from Roberts</td>
<td>13</td>
</tr>
<tr>
<td>8</td>
<td>Behind Lot 7</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Brownlie</td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td>Across from Main</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>Health center</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>CAPS</td>
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</tr>
<tr>
<td>13</td>
<td>Crawford</td>
<td>8-11+</td>
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<tr>
<td>14</td>
<td>Gleason</td>
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</tr>
<tr>
<td>15</td>
<td>Corner of Univeristy and Babcock</td>
<td>3</td>
</tr>
<tr>
<td>15.5</td>
<td>Infront of Frueauff</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Frueauf North</td>
<td>4</td>
</tr>
<tr>
<td>17</td>
<td>Clemente/Olin</td>
<td>7</td>
</tr>
<tr>
<td>18</td>
<td>Henry lot to Machine Shop</td>
<td>5</td>
</tr>
<tr>
<td>19</td>
<td>Business/Scot Center</td>
<td>2</td>
</tr>
<tr>
<td>20</td>
<td>Harrris Building Lot</td>
<td>1</td>
</tr>
<tr>
<td>21</td>
<td>Behind ROTC</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Harris Village</td>
<td>2</td>
</tr>
<tr>
<td>23</td>
<td>Southgate</td>
<td>3</td>
</tr>
<tr>
<td>24</td>
<td>Parking Garage</td>
<td>13</td>
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<tr>
<td>25</td>
<td>U plaza</td>
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</tr>
<tr>
<td>26</td>
<td>Commons</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Mary Star of the Sea</td>
<td>4</td>
</tr>
<tr>
<td>O.1 (28)</td>
<td>Airport</td>
<td></td>
</tr>
<tr>
<td>O.2 (29)</td>
<td>Greek village/Panther Bay</td>
<td>1</td>
</tr>
<tr>
<td>O.3 (30)</td>
<td>Facilities &amp; Football Corner</td>
<td></td>
</tr>
<tr>
<td>O.4 (31)</td>
<td>By All Faith</td>
<td></td>
</tr>
<tr>
<td>O.5 (32)</td>
<td>Alumni House</td>
<td></td>
</tr>
<tr>
<td>O.6 (33)</td>
<td>Work Building</td>
<td></td>
</tr>
<tr>
<td>O.7 (34)</td>
<td>Evans Building/Kat Spots</td>
<td></td>
</tr>
<tr>
<td>O.8 (35)</td>
<td>Behind OLS</td>
<td></td>
</tr>
</tbody>
</table>

Total Sum of all spaces 70

Figure 11: Motorcycle Space
This data would need to be expanded on for every lot on the Florida Tech campus for more accurate numbers. Also in Lot 13, the Crawford building, actual spaces are marked within one car parking space. A better understanding of what the law defines as a parking space would help attain better data.

For the future, this definition and a plan for space expansion would go here.

**Satellite Parking**
Unlike car users, motorcyclists would probably not park in a satellite lot if it is far from campus. However this is based on the assumption cars are secure. More data, like surveys through the campus list servers, would help plan expansion on or off campus.

**Potential Nearby Parking**
Like for the cars, the parking lots owned by the nearby churches offer more space. Including this option in a data survey would be a good idea.

**Recommendations**
The accumulation of more data from the motorcyclist perspective is needed before any formal plans can be added to this document.

**Bikes**
Many colleges utilize the resources in helping the demographic that uses bicycles. These resources do not just go to on campus traffic, but the construction and maintenance of paths to the main academic buildings. There are many factors to consider when designing the paths for bicyclists as well as the needs of a bicyclist when the cyclist is commuting and at the destination.

As in any planning effort, it is necessary to understand the existing conditions before developing any recommendations or policy changes. This section presents the baseline conditions assessment of bicycle infrastructure, facilities and supporting programs, bicycle use, bicycle theft, and other bicycling related activities on the Florida Tech campus. To help plan for expansion of a bicycle plan on the Florida Tech campus, two viewpoints are in each section. One is the plans for expansion and the other is the existing conditions on the campus.

**Existing Conditions**
For the plans of expansion, the Florida Tech campus is centered in a suburban area. From a satellite view of the campus, there are many neighborhoods surrounding the campus as well as Downtown Melbourne to the north and Shopping Centers to the south. These boundaries have to be considered when designing the paths. Safety will be a big factor along with minimal disruption of neighborhood areas.

From the on campus view, there are many bike racks around campus (data in Land Use section, pg. 22) and a rental program ran through the Student Government Association (SGA). The SGA program has 16 bikes, 3 of which are broken, and the other 13 are rented regularly. This is a positive start, but a bigger program will help promote a cyclist community on campus and in the area. STARS credits are associated with the bike system.
Regional Framework
This section is for the discussion of demographics, population density, and any and all pertinent laws surrounding the Campus.

This is a section that the student group (spring 2014) could not get to, but in many other plans this section is needed.

By Florida law, bicyclists are considered vehicles and thus should be in a bike lane on a road way. There any many helpful websites that educate the general public and cyclists on the rules of the road. See References 18-20.

Bike Planning History at FIT
The concept of a Bike Program is fairly new (from the 2014 perspective). Official paths and trails were not considered before Spring 2014, but has since become an area of focus to bring students to campus.

While paths and bicycles have not been high priority for bringing students to campus, there is a high activity of cyclists on the campus. One program, through Campus Security allows students to register their bikes with the office, where students place an identification tag on their bike. Other programs are through clubs like the Cycling Club or the SGA.

SGA’s Rental Program came from an idea in 2009 with the help of the Sustainability initiative that Dr. Catanese started. SGA started its new bike program at the end of the 2010-2011 Academic year with the current amount of bikes for the rental program. Other initiatives have been considered, but have not been successful.

Bicycle Safety and Education Programs
Even with a high activity of cyclists on the Florida Tech Campus, there is a need for Safety and Education Programs. In 2013, SGA tried to start a bike safety initiative with the Cycling Club without success. However, SGA has worked on communicating educational information for upcoming and returning students through The Crimson newspaper and the student planner as well as a small section in the University Experience syllabus.

Helpful websites, like those that list the laws and updates the laws will be a good resource.

Local Land Use Patterns
Like the Regional Framework Section, this section covers the demographics of the surrounding area and what lies nearby from the Existing Conditions section. To plan for expansion, an understanding of what the main campus holds and what lies around the campus is needed.

The Main Campus has roughly 75 buildings on the campus for uses of academics, research, support functions, recreation, and housing. It is roughly 130 acres and is located in the southeast part of Melbourne Florida. It is approximately 2 miles from the Historic Downtown Area, 5 miles west of the Indialantic Beach, and 4 miles from the Melbourne Airport.

The 130 acre campus is approximately bounded by Babcock Street to the east, Florida Avenue to the south, Country Club Boulevard to the west and Vida Way/Edgewood Drive to the north. There are neighborhood areas that border these streets as well and fall within the error bounds of the campus. In order to improve the conditions and promote greater bicycle use among
students, understanding the variety of land uses surrounding the Florida Tech campus is needed. Immediate land uses surrounding the campus are as follows:

- North – Hickory Hill Estates
- South – Meadow Ridge
- East – Southgate, Lakewood Village
- West – Golf Club Estates, Golf View Estates, University Park

**Names from Google Earth Labels**

Need what types of homes i.e. single family, apartments, etc. in addition to the division names give here.

From Figure 12 above and the boundary conditions, the Florida Tech campus is surrounded by what can be deemed “suburbia.” For bicycle paths to come into existence, there will be limited opportunity unless the paths can also benefit the surrounding areas. The way to provide the best opportunity for bicycle paths to succeed is to link them to residential areas where students live. With students living in Panther Bay south and a little east of campus, a test path between the two areas could be the best option. See Paths in the Recommendation section (pg. 29) for more details.

**Figure 12: Surrounding Area from Google Maps with terrain on right**
Public Transportation
The Space Coast Area Transit serves the Florida Tech campus, and their buses are equipped with bicycle racks. Two bikes can fit per bus.

Bicycle Facilities

Intra-Campus Bikeways
The campus does have some regulations for bicyclists. These rules help guide cyclists in some do’s and don’ts, however do not limit certain paths from use. With the exception of cross walks, bikes can be ridden all around the campus. There are narrow spots that should be added to a list of potential hazards. Also noting the peak times of travel for each weekday will be helpful.

The speed limit is 25mph on both Country Club and University. This speed is fine for cars, but for a bike to share the road is tough for inexperienced riders. Only a few Cycling Club members will ride on the side of these roads. Development of the Path Classifications (in Path section, pg. 29) would create a better chance of usage.

Shower & Changing Facilities
Currently the Florida Tech campus has none that are solely for Bicyclists. There is the Gym, but for STARS credit a deeper understanding of the layout is needed. Portland State has a helpful report on this.

Indoor Storage Facilities
Again for STARS, indoor facilities is a helpful thing. While there is not any facilities for everyday use there is one for the SGA bike program. The SGA bikes are stored in the storage locker in Evans during the summer.

Again, Portland State is a good example.

Bicycle Parking
The current amount of bicycle racks on the Florida Tech campus approximately total 120 rack with a carrying capacity of approximately 970 bikes. These numbers are based on the assumptions that the racks are the same size in each class and bikes are only chained to those racks. There are 5 classes of bike racks on the Florida Tech campus. These classes are what will be called: ladder (comb), wave, upside-down (inverted) “u,” hanger, and triangle (toast).

Note after taking the data, a FDOT website was found that listed all the types under the FDOT names. These names are in parentheses. The shape of these racks are pictured below.
Figure 13: Bike Rack Types in Order of List
*Note: The hanger pictured is similar to the ones in Harris Village
These types of racks are found at the following locations around campus.
On the side of the Locations page, there is a Capacity Key. This is the standard used in many plans on bike density.

The data yields a capacity of approximately 970 bikes assuming occupancy numbers from the baseline of where the racks are located. Better data during peak times of day (class times and lunch hour) would yield a better demographic of which racks are over capacity and those that are under used. At this time the data has proved to be complex and tough to put into an image editor that does not use layers. Using a program like Photoshop would probably be best to help layer the FIT image to have the locations marked (better than the red symbols used here) and include the population density circles that are standard.

It is important to note when the semester ends, students who leave a bike locked on campus can lose their bike after a small period of time. Security notifies the campus community that they will cut locks on a certain day and donate the bike to charity.

Figure 15: Example of Bike Density from Portland State[23]
**Off Campus Bike Ways**

There are none at this time (2014) but this section is for when bike ways and paths are added.

**Bicycle Use**

Unlike a car that requires a license and registration, a bicycle is free to be used by anyone. This section is for the survey and data collection of the bicyclist.

Surveys that are recommended to be done are:

- Rack usage
- Student polls
  - Activity
  - Commuters
    - Zip codes of the commuters

The data from these surveys will generate the demographic and where the efforts for paths and infrastructure should be spent. The UCLA bike plan has some sample surveys in Appendix D that will be a useful guide.[24]

**Bicycle Thefts**

Always an issue, bicycle theft is a problem surrounding the campus. Fortunately there does not seem to be that many thefts, yet data from security would be helpful to confirm or disprove this thought.

A statement from an SGA representative about theft and their bike program is, “We have not had to deal with any thefts this year (2014), but since the bikes are registered with security we would report it to security like any other student. If the bike is stolen when it is the responsibility of a student, then it is their duty to either find the bike or to pay to have it replaced. The few thefts we have had in the past have been consequence of improper lock from the student who has rented the bike. We always request students to lock the bikes to a bike rack rather than the bike itself.”

The common factors when a bike is stolen is forgetfulness to lock it to the rack (or something solid), forgetfulness to lock it, carelessness among new students, and many other human factors. The way to prevent theft as best as possible is to educate and remind students to lock their bikes.

**Bicycle Impounds**

It is unknown if security does impound bicycles and for what causes, but this section would cover this. It is possible for security to impound bicycles, but again data is needed.

**Recommendations**

The recommendations for this chapter on bikes are broken down into different sections.

**Improve Bicycle Accessibility to FIT**

To create a bicycle path and a network of paths is the end goal. Along with the paths, the infrastructure for this network is needed. The design of a hub or central location is ideal for designing a network. The hub would be a point or area that all the paths lead to. This could be the campus itself for where paths become campus sidewalks, but still a certain spot is better.
This spot should be a building, not a spot like the Panther Plaza. Also the need to work with local municipalities will help designate and construct the bikeways.

**Improve On-Campus Bicycle Accessibility**

The infrastructure needed here is the programs and planning that can be done. Developing a plan for the land usage and where the hub (mentioned in the previous section) will be will determine the structure of what kinds of path classes are needed. The classification structure of the paths is discussed in the next section.

Other types of programs to improve accessibility lie in SGA’s rental program. Being able to increase the number of bicycles that are able to be rented. Other equipment to be rented would be a standard helmet, lights, and lock.[25]

On the safety side of things, it should be known that all the restrictions and rules for bikes and skateboards are in the Security Manual (Parking and Traffic Regulations)[41], not actually in the student handbook since bikes are considered vehicles according to the state of Florida.

**Paths**

In order to facilitate the transportation for all students there are almost no restrictions on campus on where to or not to ride bikes or skateboards. Including the sidewalks throughout campus is important.

The FDOT does consider bikes as road worthy vehicles, thus finding data on what makes a bikeway different than a sidewalk had to be based on other schools. There are three classifications that are used[26]

Class 1 is a path separate from the road and sidewalk providing the most safety. It is an exclusive right of way for cyclists. This one requires the most land, but recreational cyclists will use it.

Class 2 is a bike lane adjacent to the roadway or the sidewalk. When adjacent to a roadway, the lane is defined by stripes and will be placed in direct corridors. These routes are for connections to point A and point B.
Class 3 is a bike route that is smaller than a bike lane in the road. This route is only designated by signs and will be used in high demand corridors.

The classification system is not a hierarchy. Each bikeway has pros and cons and is to be used in the best application. To alternate between each class in one route is not recommended.

At the crosswalks or grade crossings, signage should be added to address two concerns at crosswalks. The first would be to warn bicyclists to slow down when approaching crosswalks. The second would be aimed at drivers to be especially careful of bicyclists, who may come across the crosswalk faster than they can react. Both of these signs would work in unison to create a safer atmosphere for bicyclists.[39]

Lighting of the routes is also an important factor. This consideration has to be researched further for the best options.
Bike Hub and Services
As mentioned in previous sections, the bike hub is to be a central location that all of the bike routes funnel into. Ideally it is a building that would either be an indoor storage facility with showers to help satisfy STARS credits, or a building housing a bike store to help with maintenance and other things.

The current Florida Tech Machine Shop is not considered as the ideal hub location. While the machine shop can help with repair of simple tasks, shop is already used heavily by students for various research and design projects on the campus. An independent space for bicycle needs would be better.

SGA provided a statement (in 2014), “There is an initiative coming from Business and Retail Operations in conjunction with SGA to bring a Bike Shop (to University Plaza) available for Students in a near future. It is, however, a work in progress.”

The ideal type of bike shop would not only do retail operations, but be able to do the amount of maintenance on student bikes and provide classes to help promote ridership. Safety education, basic service, and maintenance classes are taught at the Portland State Hub, which helps students become better cyclists.[27]

As a temporary solution, an interesting and unique way to have a bike facility is to bring in one by trailer.[28] Temple University has a contract with one of the bike shops to allow for a mobile shop (trailer) to be parked on campus. The trailer serves as the shop and is run by the bike company. If the Florida Tech campus wants a certain company, but is waiting on retail space, the trailer option may be a good temporary fix (as of 2014). The trailer also allows a little mobility on days when parking may be tight, like Senior Design Showcase. Space in Parking Lot 20 (Harris Center) should be considered. As a final note, the trailer spot on campus would help provide an idea of where the bike paths should migrate to.

Improve Bicycle Parking at FIT
From the data in the Bicycle Parking section, there are currently 5 types of racks used around campus. Not all of the racks are maintained that well, some of the ladder (comb) types are beaten and old. Other types like the upside-down “u” are unable to carry the amount of traffic parked by them. The hangers in Harris Village are too few and bikes are locked in the pathway around the hanger potentially causing a hazard. They are probably locked inside for shelter as opposed to using the wave racks outside.

A standard type or two types of racks is needed. Older racks need to be removed, phased out, and replaced with the standard chosen. The Wave type seems to be the best type for the simple design and unlikelihood of breaking. Enforcement of the rules if not the removal of the hangers in Harris Village will fix the overflow issues indoors. Replacing the “U’s” with waves will help the traffic at the Olin Complex.

The priority areas will be based on the data of density at peak times, or areas that SGA asks for. In 2013, new bike racks were placed throughout campus. All of these new bike racks locations were suggested and requested by SGA in the year prior. Data is needed for where the obsolete racks are and which ones are in dire need of replacement.
Offer Incentives to Bicycle to Campus
Once a program is established, this section is for ideas on how to promote the program. Many of the ideas researched, require infrastructure that is not available in 2014 or financial programs that do not exist on the Florida Tech Campus.

Assuming an Emergency Ride Home Program is setup, one possible incentive for students is admittance into the ERH program at a temporary discount.

Campus Bicycle Regulations
As mentioned before, the regulations can be found online in the Parking and Traffic Regulation Site online. Everything related to bikes is under security since they are considered vehicles. For convenience the URL is: http://www.fit.edu/security/parking_regulations.php#Bike%20Skate

Bicycle Safety and Education
The development of a program to be taught is needed. Utilizing the University Experience Course will be a good start for incoming freshmen, but a seminar like lecture every semester will help keep safety in everyone’s minds. To present a safety lecture will help everyone stay current with different procedures and laws. Online resources and website will be useful tools and aids.

Bicycle Marketing
Marketing bicycling goes on two fronts. The first is the incoming student level, and the second is the community level. Depending on which direction the campus takes to promote bicycle usage, marketing needs to be focused on the supply or the demand side of the curve.

On the supply side, incoming students may bring or buy a bicycle within the welcome week of college. The Florida Tech Campus is small enough to walk from one end of Columbia Village to the other in Harris Village in around 40 minutes. Until a bikeway system is put in place, to limit the supply of incoming bicycles, promoting a walking campus and the SGA rental program is better to alleviate pressure on the current bicycle system and bicycle racks.

On the demand side, improving the parking racks and the infrastructure will help. Looking at certification programs like the League of American Bicyclists will help promote cycling around Florida Tech.

To illustrate these concepts see the following figure:

Figure 19: Example Bike Stock Flow Diagram
In Figure 19, a stock flow of the amount of bicycles around campus is shown. The number brought or bought is the supply that increases every term, and the number used is amount that the demand theoretically has to meet. The dashed lines are feedback loops.

Starting with the top left loop, the “A” means there is an Amplifying Feedback Loop. If potential students see a lot of bicycles around campus when visiting Florida Tech on a tour, or if the Freshmen “bring to college” list includes a bicycle, most likely a bicycle will be brought and parked on campus. Based on this example, if a touring student sees the bicycle racks in the residential areas filled with bikes, they may decide they need to bring a bike before determining the usefulness of it. Waiting a couple weeks into the semester would help them determine if they need a bike, and thus they could then go get one with friends, or use the SGA rental program.

The top right loop has “B,” where “B” means a Balancing Feedback Loop. Knowing the carrying capacity of which bicycle racks are in need of more space helps balances where bicycles are stored on campus. The number of commuters and those who choose to ride around campus, will help show which racks need the additions. If a rack in a residential area is only used to gather “yard art” where the bicycles are never used. Then efforts should be spent in making sure the racks are used for the people who actually need the space. This relates to the supply amplification loop. If a bike is never used, it wastes the space and messes with the raw data of bikes chained to racks.

The bottom loop has an “S,” where “S” means Stabilizing Feedback Loop. Mentioned briefly above, if the number of bikes that are actually used by on campus students is known, then the preparations of marketing to the incoming freshmen is better spend. If a bike is a ~$70 piece of “yard art,” then marketing that a student should bring a bicycle is not needed.

To best market to the campus, the school needs to decide which side of supply or demand it wants to take on. The figure does show that the simple system is connected, but each side can be tackled individually before moving onto the other side.

**Recommendations**

For the community level, the proper tools are needed. These tools are logos/brand, promotional phrase, media, etc. Partnerships with the local community, outreach programs, and community events will help promote the plan.

Also promotion through media outlets like the newspaper and web will help make a community impression. Harvard is an example. [http://news.harvard.edu/gazette/story/2013/01/green-incentive-for-being-green/](http://news.harvard.edu/gazette/story/2013/01/green-incentive-for-being-green/)

**Pedestrians**

As the Florida Tech campus moves towards sustainable transportation solutions, the infrastructure for pedestrians is important. These are the many people who will decide to walk the 130 acre campus and not deal with the other modes of intra-campus transportation like bicycles and longboards.

**Current Conditions**

The Florida Tech campus has many paved paths and maintains these paths with care. Very few are cracked, uneven, or suddenly change grade. Some paths show more wear due to
interfacing with brick or arched bridges. There are a few “desired line” paths that have been formed over campus, but most of campus is paved for the best route. A desired line is defined as a trail worn into the dirt that is more direct than the pavement.

There are very few “bottleneck” spots around campus, but these will become more prevalent with increased foot traffic. A bottleneck spot is a path that suddenly diminishes in width and then expands again. Examples are the path near WFIT, and the sidewalks beside the buildings in the Academic Quad.

Crosswalks Surrounding Campus
There are roughly 70 crosswalks that are at a grade crossing. A grade crossing is where the paved pedestrian path and the road meet at the same level. These grade crossing ramps are paved together to remove the curb and thus allow for traffic to flow smoothly. Where the 70 crosswalks are around campus are on the following page.
Lighting
Most of the major crosswalks have lights near them. To understand how well the lights show
the cross walk at night, a test was conducted at night to see which cross walks could be seen.

Using the same map of where the cross walks are, the results are added to the map. A scale of
1 (poor visibility) to 5 (great visibility) was used. This map is on the following page and the
results are discussed in the Visibility Section.
Figure 22: Florida Tech Cross Walks

Legend:
- No Marks
- Women Paint
- Black/Gray
- Stripes
- Side Bars

Luminosity:
- Poor 12345 Great
Visibility
From the two maps of campus, there is a general understanding of where the cross walks are. The term general is used because of the number of grade crossing that are not marked. There are types of crossing on the Florida Tech campus that include painted stripes on the side (side bars), stripes that look like railroad ties (stripes), inlaid crosswalks where brick or gravel is used (brick/gravel), worn areas where remnants of paint remain (worn paint) and the grade crossings with no marks (no marks). Many of the no marks are along the side streets of the campus where little traffic occurs, while the painted options are in the busier areas. These areas are maintained well, but the lighting of these areas is poor.

The map with that measures the luminosity, the measure of how bright/visible something is, shows that the crosswalks are not well lit around campus. The main areas that are problematic are along Country Club Road and University Boulevard, especially at the corner. There are other places around the campus interior that are low visibility, but these parking lots require low speeds anyway.

Future Plan
This section is for expansion of cross walks and grade crossings, painting and marking some of the crossings with no marks, where additional crosswalks will be places. Etc.

As a starting point, some areas of the campus may not be as well-lit as others, and this may present a safety or security issue. An audit of the current campus paths should be done to analyze the distribution of light during the nighttime hours. This could be done by viewing satellite data of the campus at night. A walkthrough of the campus would be used to verify campus lighting from a terrestrial point of view.

Recommendations
For bottleneck spots, it is important to just know where they occur. It would be helpful to try to make these spots more noticeable or not waste space. Like the area near WFIT, adding benches or tables would make use of the space that barely anyone walks on since they have to pass the tree. Also with the outdoor speakers, seating may increase people listening to them.

As for Crosswalks, restriping the campus with Reflectorized Traffic Paint will help make the crosswalks visible to drivers. This type of paint is used in the Daytona Beach area.
The secret to the reflectivity of this paint is using ceramic beads instead of the traditional glass beads. There are many companies besides 3M that produces these beads to be mixed into the paint, so it will be figuring out which company is best.

**Skates, Boards, & Scooters**
This section is for pedestrians using rollerblades (skates), skateboards and longboards, and scooters to get around campus. As more people come to campus to get around, the need for a look at the sub-system of inter-campus transportation may be needed.

**Current Conditions**
The paths and sidewalks around the Florida Tech Campus are shared by pedestrians, cyclists, and those on roller skates, skate boards, and scooters. By Florida Law, those on skates, boards, and scooters are considered pedestrians. As the campus grows and expands, considerations of the types of pedestrians are needed.

**High traffic Routes**
The focal areas of the main campus are the Panther Plaza, Academic Quad, and the Olin Complex. These areas are either areas for promoting organizations or have narrow paths that make pedestrians bunch together to stay on the path. These high traffic routes can become strained at certain times of day like lunch and between classes.

**Future Plan**
Depending on the direction the campus wants to take, this section will develop with those plans, which could be expansion, regulations, or something else entirely.
Recommendations
Mentioned in the Pedestrian Section, be prepared to deal with bottleneck points. These high focus areas of traffic density will need to be addressed.

Collecting data at the mentioned times of lunch and between classes will allow for an understanding of when the paths become overcrowded. This data can also help determine if the paths need to be expanded, like in the Olin Complex, since there are signs deterring golf carts from driving on the grass. These paths are barely a cart’s width and thus makes it tough for carts and pedestrians to share the pathway.

Segways
While the Segway did not become the huge hit the inventor wanted, there are efforts to use Segways in a Sustainable plans. Colorado State uses Segways in their Facilities Department to run errands on campus.[11] The Segway model they use is one of the cargo types that can carry up to 50lbs with the rider.[12]

Current Conditions
It is unknown if Florida Tech has any regulations for Segways, but the use of the vehicles could be beneficial in some departments. Mainly those moving small parcels under 50lbs. This will reduce the usage of golf carts and can potentially save money and resources in the golf carts.

More Data is needed before proceeding with implementing this concept.

Recommendations
Generate more Data for a better understanding of the usefulness of a Segway fleet. Also develop with security the rules for Segway operations. Whether or not students will be able to
use them to head to class? As an example students did own and use a private golf cart in 2009 to go to classes. Security eventually booted the cart. There was nothing stating students couldn’t have a private cart, but there was too much risk. Thus it would be needed to determine the rules, routes, and operations of a Segway.

**Shuttles & Trolleys**

The Florida Tech Campus utilizes shuttle buses, some resembling street car trolleys, to move students around the main campus and to the extremities of the school. This section outlines the trolleys usage and the potential on how to increase ridership.

**Campus**

The current number of shuttles is unknown. It was not incorporated in the data received about the fleet in a discernable manner. The data says an ID number, not the type of vehicle like van, bus, truck, etc. It will be beneficial to know what types of vehicles are what ID numbers for applications to STARS credit.

Insert the data here

**Trolleys**

There are four trolleys in the Florida Tech Fleet – two large trolleys and two small trolleys. However only one large and the two small trolleys operate a daily route. Ridership on these trolleys have been low and some ways to increase ridership are mentioned below.

**Routes**

From the Trolley Webpage:[13]

<table>
<thead>
<tr>
<th>Monday thru Friday</th>
<th>8am-5pm &quot;6 minute express loop&quot; 5-9:45 pm runs every 25 min. to include Southgate/Harris Village</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friday Downtown Melbourne</td>
<td>6-10:30 pm - Pickup/Drop off at Clemente Center Stop and Depot Drive parking lot in downtown Melbourne, every 30 minutes</td>
</tr>
</tbody>
</table>

The trolley operates during the week on the time table in Figure 25, but the exact times of arriving at a stop are not clearly defined. There is a downloadable Excel spreadsheet on the times when the stops are made, but the spreadsheet is not in a table on the website. This downloadable spreadsheet does not have any labels of what columns are what. While the stops are obvious, the times are not defined as pick up or drop off.

<table>
<thead>
<tr>
<th>Trolley Schedule 8-5PM M-F</th>
<th>Trolley Schedule 5-10PM M-F</th>
</tr>
</thead>
<tbody>
<tr>
<td>:54 :00 Panther Dining Hall</td>
<td>:00 Panther Dining Hall</td>
</tr>
<tr>
<td>:58 :04 Commons</td>
<td>:04 Commons</td>
</tr>
<tr>
<td>:02 :08 WFIT</td>
<td>:06 South Gate</td>
</tr>
</tbody>
</table>

Figure 25: Trolley Schedule

Figure 26: Sample Amount of Data from the Downloadable Schedule
Updating and clarifying this data will be beneficial to helping promote ridership.

**Weekend Routes**
The Florida Tech Trolleys currently do not operate on the weekends. Other institutions like Boston College, operate a weekend shuttle to practical destinations.[14] A market and grocery shuttle operate is one of these practical destinations. Their operation times being on the top of the hour to the grocery store and at the bottom of the hour for return trips.[15]

For the Florida Tech Trolleys to head to major stops like Downtown Melbourne, Melbourne Shopping Center, Palm Bay Shopping Center, the Melbourne Square Mall, and/or Walmart on the weekends would help students who do not have a means to get off campus get off campus. The Melbourne and Palm Bay shopping centers house a Publix, and should be ran every other week. The mall and Walmart are potentially once a month trips. Downtown should be like the Friday evening plan. Art Festival weekends could have potential for taking students to the Arts District or Downtown. Also running a trolley to the Foosaner Museum might be useful. The beach however should be left to the Space Coast Area Transit system, discussed more in the section on page 43.

Polling the student body for data on favorite weekend destinations is needed.

**Recommendations**
Like above, the addition of major shopping centers for groceries and shopping would be helpful for students that do not have the ability to leave campus easily. Also from talking to SGA representatives, better promotion is needed. “The plan is to increase the amount of students that use the trolley and spread the word about the trips and we [SGA] expect that next semester it can become a success and have these types of [weekend] trips in a more organized manner.” Promoting the weekend routes should be done in ways that students will see the alerts. Social media, emails on list servers, and fliers work for interest.

**Shuttles**
Just like the trolleys, Florida Tech operates shuttle buses and vans to take students north to the Airport Aviation Center, or south to the Panther Bay Apartments.

**Airport**
The airport shuttle takes student pilots to and from the Main Campus and the Aviation Center. These shuttles operate on a time table easily found on the aviation website.[16]

More data is needed on how many aviation students take the shuttle.

**Panther Bay Apartments**
The Panther Bay Apartments house a majority of the Greek Fraternities and Sororities in the complex. Students in Greek Life are allowed their own car to commute to campus, but are encouraged to take the shuttle over driving themselves. The shuttles run on roughly 10min after and 40min after the hour. The schedule is in the same file as the airport timetable.[16]

Again data of ridership will be helpful.

**Recommendations**
For the Airport Section, collect more data on ridership.
For the Panther Bay Section, more data will be helpful and modifying the layout of the timetable will be helpful. The data online was originally thought to be just the airport timetable, not both the airport and Panther Bay.

**Space Coast Area Transit**
The Space Coast Area Transit provides the bus service for Brevard County. There are 8 bus stop locations around the Florida Tech campus. They are located: by Clemente on University, by Brownlie Hall on Country Club, North of Southgate Apartments on both the Southgate and Botanical Garden sides, at the corners of Babcock and University, on Babcock by the Parking Garage Entrance, and By Mary Star of the Sea. The routes that they serve are: 1, 25, 26, and 27.

**Bus Routes**
As mentioned before, Routes 1, 25, 26, and 27 run through or near campus. Route 1 can take passengers up and down the Space Coast from Titusville to Malabar. Route 25 takes passengers around the Melbourne, West Melbourne, and Palm Bay area. Route 26 takes passengers to the beach and can run from Indialantic to Just beyond Patrick’s Air Force Base. Route 27 takes passengers around the Palm Bay area.[36]

**Bus Fares**
As of 2014, the fares are as follows:

<table>
<thead>
<tr>
<th>Type</th>
<th>Quantity / Cost Per Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Fare, 1 Ride</td>
<td>$1.25</td>
</tr>
<tr>
<td>Reduced Fare*, 1 Ride</td>
<td>$0.60</td>
</tr>
<tr>
<td>Full Fare, 10 Ride Pass</td>
<td>$10.00</td>
</tr>
<tr>
<td>Reduced Fare*, 10 Ride Pass</td>
<td>$5.00</td>
</tr>
<tr>
<td>Full Fare, Unlimited Monthly Pass</td>
<td>$35.00</td>
</tr>
<tr>
<td>Reduced Fare*, Unlimited Monthly Pass</td>
<td>$17.00</td>
</tr>
</tbody>
</table>

Those eligible for Reduced Fare include: Seniors (60+), Disabled, Veterans, and Students; BCC Students ride for free with a valid BCC Student ID. Medicare cards are accepted as proof for reduced fare. There is no charge for children under the age of five (5), or for transfers.[37]

Taken from the Space Coast Area Transit website[37] before a potential raise in fares.

**Recommendations**
Promotion of the bus and the routes to where they lead may help increase ridership among the student community. As for getting students to ride the bus to campus, education is needed to help students feel safe. After all, a student can get to the beach and back for $1.20 if the
promotion of the system was better. Also it allows for the removal of freshmen cars, since the bus heads to a beach hot spot.

**Implementation Plan**
This section is being thought about and worked on. There are two sections. The first is for the campus officials to determine what should be tackled first and what level of difficulty different tasks are. The second is for the students who will take over and may be asked to help in the future work on the vast number of projects.

**Implementation for Campus**
This is the section for projects and tasks mentioned in the many recommendation sections (as of 2014) in relative scale of when things should be done. The list is topic – explanation.

The Fundamentals of Sustainable Transportation – From across many plans researched from the AASHE website[38], all of the schools have the 3 “fundamentals” in one format or another. Based on this, for Florida Tech to compete with major schools on the AASHE STARS level, the three Fundamentals are needed. If it is impossible to work on all three concurrently, the ideal pecking order would be the Emergency Ride Home, Ride Sharing, then Commuting Safety Programs. Each one in that order gets a little broader and has less specified goals, thus requiring more thought about the direction where the end goal has to be.

Parking Development – As mentioned, on May 2, an email stated that more spaces are being added officially to lots 4 and 21. This is a helpful step to reduce the damage to the grassy lots that were being used as parking areas.

Church Parking Lots – As a short term solution, negotiating with the nearby churches on Babcock and Country Club could help increase the amount of parking spaces. As recommended, only allow parking during Monday-Friday to allow minimal conflict with events the Churches may hold.

Others – To be added as seen fit by Facilities

**The Next Steps for Students**
This section is for students who may or will be asked to take over. For the following academic year of 2014-2015, these topics will be a good starting point. As for Project Management, see Appendix B.1 for assistance in how to develop a strategy for running a project. (As a side note, this section would be updated every May for the next academic year’s projects based on the progress from the previous academic year.)

**Recommendations**
Students should use the resources of their department, faculty, and other students to generate data. From the 2014 team, a brief conversation with a professor between classes provided a contact for a graduate professor who had data on one of the areas in this document. By that example, one never knows where a helpful lead will turn up.

**Financial Plan**
The 2014 Spring team could not get to this section. The final conclusion of the team is that there are too many potential ways that the campus can go. Therefore this section is better left to be filled in with each plan and direction that the campus wants to go.
As an EXAMPLE of Justification:

The ERH plan would take $3500 to start it in the next 5 years

An explanation justification would go here... as for the example, the $3500 would be the minimum needed to start a program without any major changes to the campus. Company Home Bound that provides the service is preferred for their outstanding record with local companies like DRS and their corporate has expressed interest in the FIT Community. They are going to give the college a discount membership of $1500 in setup fees and a $200/year registration fee for the website and Internet management portal...
The remaining $1800 is for the school to promote the program and have IT link code into Access a link to Home Bound for the Faculty.

Cost breakdown:
$1500 startup
$1800 promotion over the next year
$200 starting and recurring to keep the service

Recommendations
The above example is short, but expresses a format that may be useful for this section. Other formats can be considered, but a standard should be determined for official use in every version of this document. Also a student standard should be added for student teams working on future projects that streamlines the faculty standard if needed.
Appendices
Appendix A.1 Sustainable Transportation Map

This diagram maps out the three domains of sustainable transportation. At the overlaps of the domains, the fundamentals of sustainable transportation can be found. Ideally there would be a letter point (ex A¤) corresponds to a potential project that is sustainable and can be featured in a capstone design in appendix A.2.b., and number point (ex 1*) corresponds to an idea for a project in appendix A.2.c. This map is to illustrate where certain projects would fall in Sustainable Transportation.
Appendix A.2.a Sustainable Capstone Project Criteria

This section is to be the metrics for future projects in Sustainability. After a couple months of research (in 2014), there are many ideas for various projects that can affect many areas of the campus for sustainable actions. However as open some professors are to sustainable capstone project ideas, there is not a set rubric that dictates what is considered sustainable. Thus in this section a rubric, or set of goals a sustainable project should/must meet will be placed.

As a starting concept, the efforts of Keep Brevard Beautiful (KBB) Sustainability Award Criteria are a good model for the Project Criteria. The modified KBB Sustainability Award Criteria for the Sustainable Capstone Project Criteria are as follows:

## Sustainable Capstone Project Criteria

There are many definitions of sustainability and various criteria for measuring best practices. Definitions for utility of the criteria are given below:

- “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” (Brundtland Report, 1987)

- “Sustainable development is a dynamic process of adaptation, learning, and action that recognizes and understands the need to act on interconnections between the economy, society, and natural environment.” (Australian Government, 2012)

- “Sustainability develops best practices to ensure system resilience in economic, social, and environmental aspects.” (FIT Sustainability Program working definition.)

### Project Eligibility:

For projects to be deemed eligible of being called Sustainable, there has to be a quantifiable and/or measurable change(s) in best practices. Changes should address past projects or the current project within the standard spheres of sustainability: economic, social, and environmental performance.

### Evaluation:

The projects will be evaluated on the following categories:

- Description of Sustainable Activities/Efforts
- Environmental Benefits
- Economic Benefits
- Social Benefits
- Relevance to Others
Categories:

Description of Sustainable Activities  (Minimum 2 paragraphs)

1. How does the project measurably address social, economic, and environmental performance?
2. Does the project demonstrate the use of practices that exemplify outstanding creativity or introduce new approaches?
3. Explain the project scope:
   o Project goals and objectives
   o Project accomplishments
4. Who was involved in what aspects of the project? (i.e. members involved in planning or execution, professors, advisors, etc.)

Environmental Benefits:

1. How will the Project reduce waste and/or conserve materials?
2. Does the project improve, protect, or make a significant contribution to the sustainable use of natural resources or measurably improve quality of life? For example: does a project protect water, land, or air quality; reduce greenhouse gases; create high-quality recreational opportunities; protect or enhance scenic, historic, or cultural resources; protect sensitive habitats; or help to measurably green supply chains.
3. Quantify the results of the reduction/conservation efforts.
4. Does the project adhere to or go beyond environmental regulations for their industry?

Economic Benefits:

1. What were the significant and quantifiable economic benefits from the activity? (i.e. water savings, labor savings, other)
2. Could efforts result in permanent systemic changes?
3. Provide a cost analysis of the sustainable solution to other solutions... Is the Sustainable Solution close in price of other solutions?

Social Benefits:

1. What could the other benefits for the community and/or the environment through the sustainable project and its activities? (i.e. outreach, safety improvements, other)
2. Does the project increase capacity to develop and deliver educational programs that advance sustainability and innovation?
3. If Applicable: Could the project have a diverse amount of support? (Social Equity)

Relevance to Others: (Minimum 50 words per question)

1. Is the sustainable activity/project part of a larger movement?
2. Does/can the project involve unique or creative partnerships?
3. How can it be disseminated and shared with other organizations?
4. Does it promote environmental, economic, or social equity ideals and provide a useful service?

Additional Information: (Minimum 1 paragraph per topic)
**Literature Cited**

- Keep Brevard Beautiful Sustainable Award Criteria
- Association for the Advancement of Sustainability in Higher Education
- National Environmental Health Association. Excellence in Sustainability Award Program.
- Sustainable San Mateo County. Sustainability Award Criteria and Selection Process.
- Illinois Sustainable Technology Center - University of Illinois. Illinois Governor’s Sustainability Award Criteria.
Appendix A.2.b Potential Projects

This section is for the list of project synopses that could be presented to students in a Capstone Project class. This list is to be updated as often as possible.

CivE new Solar Charging Facility for Golf Carts

**Solar Plan**

Problem: As Florida Tech expands there will become a need for more utility vehicles around campus. Considering the STARS Credits for non-gas based vehicles the current solar plant may not be able to handle the demand of more vehicles.

Proposal: Have a team of capstone students (potentially civil and others) access the solar charging station. Are the panels placed in the optimal position(s) and can they be adjusted? Is there enough output for the demand? Is there enough accessibility for the carts? Is/can the building be LEED Certified?

The students would design a better facility addressing the previous concerns for a larger solar fleet. The student team is encouraged to make the build either LEED Certified, or incorporate Sustainable Materials (from Appendix C.1, and research) to make the building a “living” test center for some of the materials.

Conclusion: The research into the solar charging plant would provide plans to renovate the facility or provide a newer and better facility for the Florida Tech Campus. These plans would help plan for an expansion of the Facilities Fleet.
Sustainable Parking Lot

Problem: Campus parking space is limited. More parking permits are sold than there are spaces available. Students, faculty, and staff waste time and fuel while searching for a parking space, often travelling through multiple parking lots. This in turn increases pollution and the overall carbon footprint.

Proposal
This proposal comes in two parts. The first is meant to track the availability of parking. This can be done by means of a series of sensors, possibly infrared, which monitor whether or not a parking space is filled. This is processed by a central computer, which feeds into a digital sign at the entrance to each parking lot. The sign could have several messages to denote parking availability. One such proposal would be:

<table>
<thead>
<tr>
<th>PARKING LOT STATUS:</th>
<th>FULL - PARKING UNAVAILABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PARKING LOT STATUS:</td>
<td>NEARLY FULL</td>
</tr>
<tr>
<td>PARKING LOT STATUS:</td>
<td>HALF FULL</td>
</tr>
<tr>
<td>PARKING LOT STATUS:</td>
<td>MOSTLY OPEN</td>
</tr>
<tr>
<td>PARKING LOT STATUS:</td>
<td>EMPTY</td>
</tr>
</tbody>
</table>

Reporting
The second part of this proposal comes in the form of an application meant for smartphones. The app connects to the controlling computer, allowing a user to view all parking lots, and make a parking decision based on what is available. In addition, the app can provide a report down to the individual parking space, allowing drivers to know precisely where to go to park.

A website could also be made available with the same information, though based on travel times from home and the potentially swift nature of changes, it is expected that mainly smartphone users would utilize the service.

Conclusion
Though this will not solve the parking problem at Florida Tech, it will help to mitigate some of the frustration and dissatisfaction regarding campus parking. This may in itself provide some relief until a more comprehensive solution can be found.

Efficiency of a Bio-Fuel plant

It was mentioned to the Sustainable Transportation 2014 Team, that there was a bio-diesel plant plan developed in a previous year. This plan included costs for the installment of a plant behind Clemente and Panther Dining. While this section would be where this plan would go, the student team could not find the document for reference. Even if the plant is never built, it would be beneficial to cross compare the plans for future ideas.
Appendix A.2.c List of ideas

This section consists of ideas that may or may not be sustainable, but have been mentioned, researched, suggested, etc. during research. These ideas, are not capstone projects, but with focused research, they could become viable capstone projects. This idea section should be updated as often as possible with the capstone section for students to think about the ideas listed.

Solar Charging station, Umbrella shape, see Dr. Arrasmith (Would benefit pedestrians, and commuting safety)

Projects from: The Good Life Lab, by Wendy Jehanara Tremayne

Solar Cooling Parking Lots

Composite posts for Road Signs, see Dr. Reichard

tinyhouseblog.com and relaxshacks.blogspot.com are helpful starting points for small living and sustainable projects, some projects can be scaled up to a college campus.
Appendix B.1 Project Management
Section for management and future project teams

While there are many software based resources, like those featured here: [http://online-project-management-review.toptenreviews.com/](http://online-project-management-review.toptenreviews.com/)

Student teams should figure out the type of management style that is best for the project. The style is for who has power and who is responsible for different tasks. Consulting the Senior Design Professors for different departments will be a good start as well as asking friends and peers who have taken Capstone Courses about their work.

Any additional advice should be included here.

**POWER STYLE**

![Power Style Diagram](image)

**EMPHASIS**

Figure A2: Power Style Diagram
Appendix C.1 Sustainable Building Materials and Products

From the Brundtland Report in 1987, Sustainability has been defined as:

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”[1]

This definition means that each generation needs to try not to affect the next with their actions. Thus while working towards a sustainable transportation solution, the entire infrastructure of the Florida Tech campus has been considered.

In an effort to promote Sustainable actions, this appendix lists out different building materials that are considered sustainable. The criteria for these sustainable materials are:
- Made from recycled material
- Other stuff, etc.

These materials should be considered when expanding the maintenance buildings and garages for the campus fleet.

List of Materials:
- Papercrete (http://www.papercrete.com/papercrete.html)
- Styrofoam as insulation (See Dr. Lorcucio)
- Permeable pavement
- Gravel
- Reflecterized Traffic Paint[35]
- Tuftex
- Good Life Lab, tinyhouseblog.com, & relaxshacks.blogspot.com also have ideas on different materials that can be used
Appendix D.1 Potential STARS Credits

STARS Stats

As Florida Tech moves towards becoming an Institution that offers programs in the field of Sustainability, the Campus should reflect what it teaches. The school has just been able to become part of the Association for the Advancement of Sustainability in Higher Education (AASHE) and along with the recognition of being associated with AASHE, the Sustainability Tracking, Assessment & Rating System (STARS) will help the campus achieve more recognition.

The STARS program has many fields and areas where Sustainability can be assessed in many different categories. A big focus of Sustainability on a Campus is in the Transportation areas, especially when there is an entire category focused on Transportation. However, Transportation is just a small sub-system of a sustainable campus, thus looking outside the Transportation category will help Florida Tech prepare to earn the total STARS credit value in other fields. Specifically for a Sustainable Transportation Plan, the main credit in Transportation is Support based, and the other credits are Sustainability Planning and Wellness program in the respective categories of “Coordination, Planning and Governance” and “Health, Well-Being and Work.”

**OP 21:**
Starting with Transportation, mainly the Support for Sustainable Transportation (OP 21), this credit is worth 2 points. The credit background is for the recognition of active transportation, commuting alternatives, and programs to reduce air pollution and greenhouse gases. The requirements of this credit seem to be feasible and well within our reach. In particular, the first part of the criteria, under Option “A”, for this credit requires the institution to have any one of a number of options.

The first of these is secure bicycle storage, which can be met by bicycle storage sheds. It could also require the provision of short-term bicycle storage (bike racks) with 50ft (15m) of all occupied, non-residential buildings, and within 330ft (110m) of all residential halls. This criterion is almost already, if not completely met. It also calls for a bicycle accommodation policy and/or a network of continuous dedicated bicycle and pedestrian paths. Paths do exist around campus, and these can be expanded and enhanced. Finally, the credit requests a bicycle-sharing program, which is already in place on campus, with future expansion being considered. Option “B”, requires only that the Institution be certified as a Bicycle Friendly University by the League of American Bicyclists. This membership is free for the first year, and could be pursued by the Cycling Team already active on campus.

**PA 2:**
Looking at the Sustainability Planning credit (PA 2) in the Coordination, Planning and Governance category, the STARS Credit value is 4 points. With that much weight on one credit, it is good to understand what the credit requires. In short, the credit requires a plan for the future outlining where the school’s vision is for a sustainable campus. Transportation is included in the criteria, and thus the Sustainable Transportation Alan will help acquire points in this category. However to contribute the 2/6 of a point that a plan under the criteria can contribute, two things are needed. The plan has to be formally adopted by the school, and have some metrics, or measurable outcomes, for the time frames of the plan. Both are reasonable requirements of a Sustainability Transportation Plan.
Moving to Health, Well-Being and Work, the Wellness Program Credit (PA 11); this credit is for counseling, referral, and wellbeing services that are available to faculty, staff and students. Taking the Transportation Plan into consideration for this credit would help achieve the maximum gain of 1 point. Partial points are awarded for plans covering only one or two of the three groups on campus. For example, having a bicycle sharing plan has the added advantage of promoting wellness amongst students, faculty, and staff. This can be tracked through an overall health and wellness plan that includes an exercise program.

A wellness plan can even encompass individuals who prefer walking as their preferred method of exercise. One such program is through the Virgin Group, famous for its founder Richard Branson. Their Virgin HealthMiles program encourages healthy lifestyle changes, and even supplies a free pedometer. Participants are rewarded at “milestone” intervals, often in the form of gifts cards or gifts, such as a Polar Heart Monitor. This could be adapted for Florida Tech employees, perhaps even including work/study and college roll positions. Participants can share their accomplishments, and even create their own challenges amongst themselves. This is in addition to the regular challenges offered by the program, which may be in such categories as “miles per day”, or “most points earned”. Competition generally creates an atmosphere where people want to strive for success, so this would contribute to the overall success of the program.

Health Miles Program - [http://www.virginpulse.com/](http://www.virginpulse.com/)

Other Credits

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<th>Campus Fleet</th>
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See next page
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<td>Facilities for Bicyclists</td>
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<tr>
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<td>Transportation</td>
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References

1) http://www.iisd.org/sd/ Brundtland Report Quote
3) http://www.fit.edu/oir/documents/fac_deg/Faculty_Degree_Report_2009-2010.pdf faculty total 2010
4) http://www.fit.edu/security/documents/parking-map.pdf parking map
5) http://www1.umn.edu/pts/park/apmfaq.html automation project, exit payment station
6) http://www.fit.edu/security/parking_regulations.php fit parking passes
8) http://www.zipcar.com/is-it ratio of cars 15reg:1zip
9) Solar Cell Information http://www.solarpaneltilt.com/
10) http://www.zipcar.com/ucf/learn-more?plan_key=odp prices
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