**Campus-Community Project Ideas (Fall 2021) – CEE190**

**TRANSPORTATION**

**Electric Vehicle charging stations**

*Develop the location and Facilities Standard for EV charging stations and a protocol for approving EV charging station locations on campus property. Contact people include Stacey DeLorenzo (F&S Transportation Demand Management Coordinator), Marty Paulins (Parking Department Director), and CEE Professors Kontou and Ouyang.*

**Wireless Power Transfer for Electric Vehicles**

*Feasibility study of wireless power transfer for vehicles in university parking lots or buses using campus routes. This can be static charging stations or dynamic charging. Contact is Prof. Roesler.*

**Traffic Demand***Does the university have any intersections with conflicts between the modes of transportation? Is there enough room for pedestrians, bicycles, and vehicles? Do their paths cross significantly? Do people behave in accordance with the design?*Particular places of interest: Armory and Sixth, Krannert Center and Spurlock Museum; Gregory to Lincoln

**Bicycle Plan - Lanes**
*Are the bicycle paths adequate to service demand? Are there any places where they should be added? Are there any places where they should be taken away, either due to demand or conflicts with other modes of transport? How can the C-U area encourage more people to use bikes?*
Particular places of interest: Lincoln Ave from FAR/PAR to Vet Med

**Bicycle Plan – Parking**
*Is new parking needed? Or would adding more bike parking encourage more people to use bikes rather than cars or buses? Where should parking be placed to meet demand and/or increase demand? How successful is the new bike shelter, and is it worth the cost?* Contact is Sarthak Prasad, F&S Transportation Demand Management department.

**Campus Bike Lane study**

The connection for bicyclists from Goodwin Avenue to Mathews Avenue, between Green Street and Nevada Street, is marked as a “study area” in the Campus Bike Plan. We need help identifying preferred bikeways, and potential spaces for installing safe bikeway connections through this area. The contact people include Stacey DeLorenzo (F&S Transportation Demand Management Coordinator) and Sarthak Prasad (F&S Sustainable Transportation Specialist).

**Intersection Safety**

The intersection of Virginia Dr. and Pennsylvania (PAR) has modal conflicts that need to be resolved to improve campus safety. How can this intersection be upgraded to reduce the risks to travelers? The contact people include Stacey DeLorenzo (F&S Transportation Demand Management Coordinator) and Sarthak Prasad (F&S Sustainable Transportation Specialist).

**Closing Mathews Avenue to cars**

The University does not own Mathews Avenue, but the long-term goal is for the campus to buy it and close it to cars from Oregon to Green. What should the design be to support walking, biking, service vehicles, and fire truck access?

**Safety***Are there any no-visibility parking garages on campus or in the C-U area? Where are they located and how can they be made safer?*

**Active Transportation**
*What is the demand for active transportation (bicycling, walking, busing)? How can the design of sidewalks, bicycle lanes, and roads be altered to encourage people to use active transportation more often? How can campus encourage people to use active transportation, even during the winter?*

**Active Transportation and Covid-19**

How has the pandemic changed students' perception of public transport and other active modes of transportation? What are new solutions post-Covid for active transportation on campus?

**Carpooling / Ridesharing***Should public transportation be provided for university employees? What are the economic, social, and environmental advantages and disadvantages of providing this service? Is there demand for such a service? How can public transportation, more common in urban areas, be tailored to meet the needs of rural areas?*
Particular places of interest: vanpool from Mahomet for 900 employees (Contact Kelly Pfeifer, CRIS Rural Mass Transit District)

**Parallel Pedestrian/Bicyclist Bridge**
*The I-57 bridge that crosses Kirby Avenue was just constructed but is too narrow to accommodate pedestrians and bicyclists safely. Would reconstructing a wider bridge or building a parallel active transportation bridge be more cost-effective? How would each option affect the natural environment, such as increased run-off or emissions? Are there any opportunities for sustainability that could help keep costs down such as recycling materials?*

**Pedestrian Bridge No. 2**
*Pedestrian traffic over Green Street and Springfield Avenue is very heavy due to the location of the Main Quad, the Engineering Quad, and the engineering buildings in between. Would constructing a pedestrian bridge benefit the pedestrian, bicycle, and vehicle traffic by significantly decreasing waiting times? Would it increase demand for active transportation? Is there a more cost-effective alternative?*

**Traffic Flow Mathews/Springfield/Stoughton**

*Mathews Ave. between Springfield and Main is one-way to north; Stoughton between Mathews and Goodwin is one-way to east. Stoughton provides access for trucks to the loading docks for Newmark and Siebel. Challenge is large trucks have difficulty making turn from Springfield to Mathews to Stoughton. Additional challenge is Uni High school has significant traffic for drop-off/pick up twice a day. Could traffic flow be altered to improve access to loading docks while maintaining safe access for high-school students?*

**INFRASTRUCTURE**

**Wayfinding Signage**

*Feasibility and suggestions for design, placement, and content of campus way-finding signage. This includes signage for bikeways, walkways, and general wayfinding, as well as connections to the broader local community. The contact people include Stacey DeLorenzo (F&S Transportation Demand Management Coordinator) and Sarthak Prasad (F&S Sustainable Transportation Specialist).*

**ENERGY CONSERVATION**

**LED Lights**
*Which locations on campus don’t use LED lights? Would switching to LED lights be beneficial economically and environmentally? By how much?*
Particular places of interest: parking lots; emergency lighting on exteriors

**Rooftop Solar**
*How many solar panels can campus buildings support structurally? How much energy could be generated by these panels? How much would implementing solar panels cost, both in the short-term and the long-term? How many emissions would they save?*Particular places of interest: F&S building (S9)

**Solar Roof vs Green Roof LCA**
*What are the advantages and disadvantages of each type of roof? How much do they vary between buildings? Which type of roof is more beneficial, economically, environmentally, and socially? Could they be built together?*
Particular place of interest: future new expansion of RAL at northeast corner of Mathews and Oregon.

**Newmark Conservation Plan**
*Which locations in Newmark use the most energy? Which use the least? Why does this occur? How can energy be used more efficiently in the building? How can total energy use be decreased, and by how much?*

**Electricity vs. Natural Gas vs. Bio-gas Fueled Automobiles**
Vehicles contribute significantly to campus greenhouse gas emissions. Several alternatives to conventional petroleum-based fuels exist for campus vehicles, with each one having different costs and environmental impacts. Bio-gas generated from organic wastes is one attractive alternative because it addresses waste reduction and energy simultaneously. *Based upon the information on the potential to produce bio-gas on campus as proposed in past Anaerobic Digester (AD) reports for campus and research into other AD projects, what is the best financial and environmental option for use of alternative vehicle fuels for campus vehicles?*
Stakeholders: Jim Sims and Pete Varney

**Wind Turbines**
*Are rooftop wind turbines feasible for campus? How much energy would they contribute? Would there be an economic benefit? How does this vary between buildings? How can their effectiveness be measured prior to installation? Could they increase the understanding of clean energy on campus?*

**Solar Energy Generation**
*Currently Allerton Park’s operation buildings is equipped with a 11,000W solar array that is projected to reduce the park’s dependence on fossil fuel power by as much as 12 percent annually. Analyze the park’s smart meter data to determine the efficiency in the system. How could the system be improved? Would an expanded solar array be feasible for the park? Where should it be placed if so?*
Stakeholders: Derek Peterson, Director of Allerton Park

**Life Cycle Cost of Hybrid and Electric Cars**
*Are electric cars better for the environment than hybrid cars? What are the benefits and drawbacks to using each compared to a conventional car in terms of economics, environment, and convenience? What stages of the life cycle play the largest role in determining these benefits and drawbacks?*

**Geothermal Energy**

What locations could use geothermal energy on campus? How can existing geothermal projects be brought to light, so people know they are here? Contacts include CEE professors Baser, Makhnenko, and Stark, and Morgan White, F&S Associate Director for Sustainability.

**WATER MANAGEMENT**

**Grey Water**
*Would switching to grey water be feasible for campus buildings? How much would it cost? How much grey water is available? How much money and emissions would it save? How could it integrate with BIF and the Design Center?*
Particular place of interest: new construction being planned next to BIF

**Permeable Pavement**
*What would be a good measurement tool and system to compare effectiveness of the porous pavement parking lot at the corner of Fifth and Chalmers to conventional pavement? Quantify the improvements between the two types of pavement and delineate the cost difference. Based upon the results, what would you recommend about using permeable pavements for all future campus parking lot and/or roadways?*
Stakeholders: Marty Paulins, Kelly Jo Hoffmann, Stacey DeLorenzo, and Brent Lewis

**Stormwater Runoff Quality**
*It is assumed that most of the contaminants are contained in the initial surface run off. Is this assumption validated? How should we manage the first inch in order to improve water quality in our Stormwater runoff? What is the quality of the parking lot runoff after 1” and 3” rains? Is it different for porous asphalt than for conventional asphalt?*
Stakeholders: Brent Lewis, Betsy Liggett, and Dr. Schmidt

**DESIGN A PERMEABLE AREA FOR CAMPUS**

Between the Architectural Annex and Ag Engineering Sciences Building, there is a major flooding issue where the bike path and sidewalk run north-south. Design an infiltration trench and/or permeable pavers for the area to remove flooding, with connections to the existing storm drain manholes. Which solution is more cost effective? Which solution is better for campus beauty and sustainability? Contacts include Brent Lewis.

**Water Audits***How do building occupants use water? How much water is used for which activities? How can water usage be reduced while changing occupant behaviors minimally?*

**Rainwater utility fee**

*Both cities have instituted a Stormwater Utility Fee that supports the maintenance costs of storm sewers in the community. We would like suggestions on how to implement a similar utility rate system for managing rainwater on university property. The campus pays a fee to both cities and pays the costs for maintenance and improvements for the campus-owned storm sewer system. The contacts for this project include Brent Lewis (University Landscape Architect at F&S) and Morgan White (F&S Associate Director for Sustainability).*

**Bio-infiltration basin, Mathews Av. Between Stoughton and Main**

Many pedestrians walk on the parkway (between street and sidewalk) on east side of Newmark along Mathews Ave., which often results in a muddy, messy, unappealing landscape. Could this parkway be re-designed as a bio-infiltration basin (rain garden) with pervious walkways at convenient locations?

**Building water audits**

*New buildings have efficient plumbing fixtures installed, per the Facilities Standards. We need to inventory the older buildings and identify if they have upgraded the plumbing fixtures (primarily in bathrooms and kitchen areas). This will involve visiting existing buildings and looking at the plumbing fixtures. It can also include using a flow rate bag, if the plumbing fixtures cannot be read. See* [*https://icap.sustainability.illinois.edu/project/water-audit-inventory*](https://icap.sustainability.illinois.edu/project/water-audit-inventory)*. The contact for this project is Morgan White (F&S Associate Director for Sustainability).*

**WASTE MANAGEMENT**

**Methane Capture**
*How much methane is actually collected at a local landfill? How could it be used to benefit the environment? How could it be used to benefit the economy? How much overlap is there between these two areas?* Contact is Lance Schideman.

**Waste Collection***What are the logistics behind the collection schedules of the university? Is there a way to operate regular collections more efficiently? Is there a way to incorporate more recycling or composting in the process? How would any changes affect the costs of the service and to the environment?*
Contact: Prof. Ouyang

**Bio-Modified Asphalt Binder**
*Is bio-modified binder a more economical and/or environmental choice over virgin binder? How does its service compare to that of virgin binders? What pavements is it most appropriate for, based on its quality?*

**Abbott Coal Ash**
*Can the coal ash produced by the Abbott Power Plant be used elsewhere? Can it be sold? If so, what are some possible markets? How much would the plant gain from selling the ash and how much would the community benefit from the reuse of the ash?*

**Household Hazardous Waste**
*What is a good site for a household hazardous waste facility? How does the location affect the quality of the site? How does the location affect the community’s economy, health, and environment?*

**Effluent Diversion**
*What, if any, impact do we expect of the diversion of the effluent water from the Copper Slough for the Tuscola Urea plant? What will be the changes in flows, seasonally adjusted? Are there better solutions?*Stakeholders: Dave Thomas or Clark Bullard and Prof. Lance Schideman

**Community Glass Recycling**
*At present, we are not recycling glass on campus, except through Catering Services in University Housing’s Dining Services. What is the expected volume of waste glass generated by campus? Should the waste be separated into appropriate categories, such as lab glass, clear glass, colored glass? Is there sufficient volume of waste glass to make a practical product? If so, what product?*
Stakeholders: Pete Varney, Stacey DeLorenzo

**GREEN BUILDING**

**Pollinatarium Improvements**
*Can a building addition be attached to the west side of the pollinatarium building using sustainable/recycled materials? What innovative technology should be included? The addition will function as a learning center, tool storage unit, and potting station for children. How does this affect the design?*
Stakeholder: Leslie Deem

**Net-Zero Energy Buildings**

*Compare the process for getting a building certified as Net-Zero Energy from the Living Future Institute and from the US Green Building Council. What are the pros and cons of the two options, and are there other options for campus to consider pursuing?* Contacts: Morgan White, Catherine Somers, and Qu Kim.

**OTHER CAMPUS IDEAS**

**Pollinator Pockets**

*A pollinator pocket map, showing existing campus pollinator pockets, was developed in spring 2019. We need to identify good locations for increasing pollinator pockets, within the F&S Grounds department maintenance areas. The contact people for this include Ryan Welch (F&S Superintendent of Grounds) and Brent Lewis (University Landscape Architect at F&S).*

**PARKLAND COLLEGE PROJECTS**
Stakeholders: Hilary Valentine, Director of Creative Services 351-2399 room X126B and Jim Bustard, Director of Physical Plant 351-221 room108

**Onsite Gray Water Reuse***Determine the amount of water usage, identify sources of grey water (chilling plant, greenhouse, etc.). Could grey water be recycled, used for toilets, irrigation, water feature recirculation, etc? Study the feasibility of reusing grey water for these issues.*

**Parking Lot Lighting***Is it feasible to install solar panels in parking lot pavement? Could solar pavement (IngieGogo) or another technology be used to light pedestrian walkways?*

**Parking Lot Heat Island Mitigation**
*Analyze the current heat island effect from Parkland’s multiple parking lots. Propose ways to reduce summer heating. Explore the use of expanded tree cover, pavement materials, etc.*

**Storm Water Retention**
*Develop a Stormwater retention/detention/infiltration strategy for Parkland’s entire campus or consider just the landscape surrounding the newly constructed student services building. Analyze aerial images to determine pervious and impervious surfaces and estimate the annual amount of runoff, slope and soil conditions. Develop a strategy to reduce runoff and estimate cost savings in city fees. What locations on Parkland’s campus would interventions such as raingardens, bioswales, or pervious pavement best be sited?*

**Environmental Services**
*Develop a proposal for replacing mown areas with pollinator strips (e.g., milkweed for monarchs) and analyze cost savings and carbon sequestration. Determine which trees are best for carbon sequestration and analyze the offsets. Recommend where the new trees should be planted. Analyze Parkland’s pond for siltation and recommend how to dredge and use the silt.*

**Transportation Efficiency**
*Look at transportation survey data and make recommendations for alternatives to single-passenger cars. Develop a bicycle lane network to connect Parkland’s campus with the surrounding neighborhoods. Review current bus service and recommend improvements such as streetcar service, micro bus routes, etc. Make a recommendation for the perimeter walking/biking trail. Maybe include connections to Champaign Park District paths.*

**Applied Technology Center**
*Review the LEED gold construction goals and analyze energy usage and compare the findings with the LEED goals. Suggest strategies to maintain or strengthen their goals. Use data collected from Parkland’s data monitoring system to compare utility usage.*

**Chilled Water Plant**
*Research geothermal technologies and/or alternate air conditioning systems. Conduct a cost analysis of replacing chilled water plants with newer technology.*

**OTHER EXTERNAL PROJECTS (**Stakeholders: Professors Jeff Roesler and Art Schmidt)

**Yard Waste Disposal in Champaign Township** (Prof Jeff Roesler)
*Determine ideas to recycle yard waste at Champaign Township to avoid burning or extra hauling fees.*

“*I am a member of the Champaign Township Board, and we have taken several complaints over the years about our burning of the yard debris that we routinely collect. The trustees are all concerned about the health issues of our new neighbors, and we take these complaints very seriously. The problem becomes: What can we do as an alternative? Currently, we burn the detritus. That is the most cost-effective alternative. If you do the math from the article, it would have cost about $10,000 to take it to the recycling center. In contrast, by burning, the township will incur only about $1,000 at the landfill. We have presented the problem to some departments at the University of Illinois, thinking they would help come up with a solution. No such luck. In fact, one department's answer was not only "no," but was borderline insulting. The people involved in waste management gave it to their students, but no one wanted to tackle this issue, even though it is a nationwide problem. I guess the UI isn't interested in solving this kind of dilemma. Members of the Champaign Township Board would welcome suggestions that would be both cost-effective and sustainable. Anyone with such suggestions can email me at norman.davis@champaigntownship.com or come to a board meeting at 3900 Kearns Road in Champaign.” Norman Davis June 27, 2018 (News-Gazette)*

**Hospital Cooling without Air Conditioning** (Prof Jeff Roesler)
*Determine the feasibility and solution of cooling the second floor of a two story hospital in a hot tropical climate without reliable power and air conditioning. The second floor is currently not usable because of how hot it becomes each day.*

**Champaign County Forest Preserve District** (CCFPD)

*A sustainability data analysis to calculate annual greenhouse gas emissions for years 2017 – 2019.  This will entail writing a script (preferably in R or Python) that does the following:*

* *Extracts data from excel spreadsheet invoices and converts them to a standardized format -such as a csv or data frame.*
* *Converts kWh to BTUs to CO2 using net energy ratios and conversion factors specific to fossil fuel types.*
* *Calculates and plots tons of CO2 emitted in years 2017 – 2019 for entire district, each preserve, each department, each building.*
* *Synthesize the results for CCFPD*