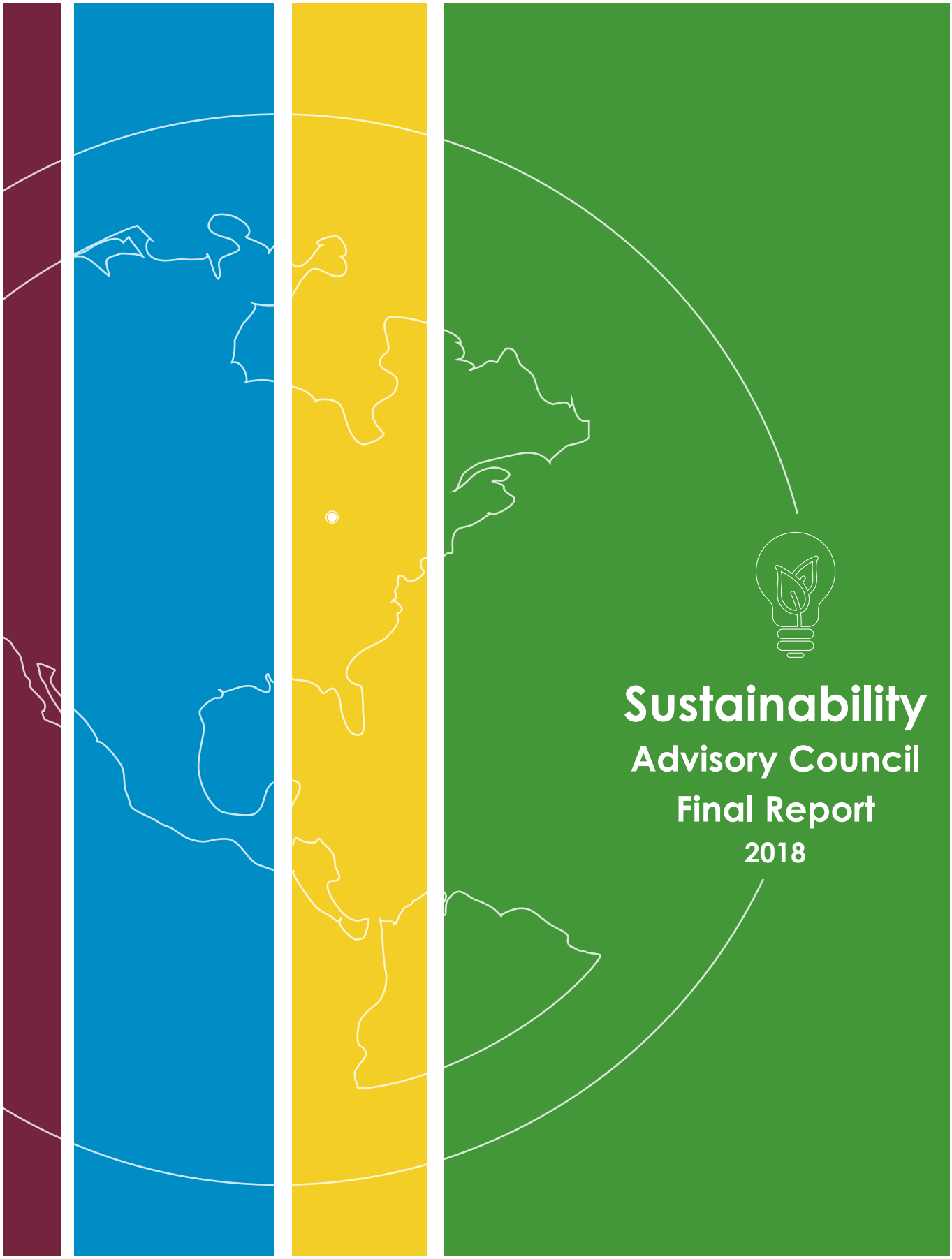

Sustainability
Advisory Council
Final Report
2018

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What sustainability means for Culver

Conserve and protect natural resources and support their sustainable use;

Minimize waste and emissions from our operations to the maximum extent practicable; and

Educate to foster awareness, understanding, and action throughout our community

"Culver educates its students for leadership and responsible citizenship in society by developing and nurturing the whole individual – mind, spirit and body – through an integrated curriculum that emphasizes the cultivation of character."

Leadership an
citizenship.

nd

These words define the animating force behind the Culver Academies. Both words appear in Culver's mission statement and are in the first paragraph of the first chapter of the Culver Handbook. The institution and its students strive continuously for excellence in both leadership and citizenship, and this thread binds today's students with the Academy's very first cadets.

Introduction

Chartered by John Buxton in June 2016, and with the subsequent, strong support of Dr. Jim Power, the Sustainability Advisory Council continues a decades-long practice of reaching out to our alumni, parent and patron base to seek guidance and advice on critical strategic issues facing the Academies. The Advisory Council process is an intentional focused effort to engage the Culver family in an effort of continuous improvement.

The justification for forming a Sustainability Advisory Council is grounded in Culver's mission of **educating students for leadership and responsible citizenship in society.** Sustainability considers effective, equitable utilization of resources in ways that best promote the well-being of all individuals in society today while preserving critical natural resources that enable future generations to flourish in the world of tomorrow. Quite simply, responsible citizens behave sustainably. Culver's leaders believe we have important opportunities to improve our operations and to better advance sustainable behavior through our teaching and learning. These areas include improving our energy footprint, reducing our waste and emissions, and maintaining and improving the stewardship of our grounds and water resources, as well as raising awareness around sustainability within our campus and broader communities where we engage as representatives of Culver. From a broader leadership perspective, Culver should be exploring innovative ways to teach and model sustainability. Sustainability is a critical element for a 21st century leadership institution; activating all members of our community around this value is vital for the Academies.

The term sustainable development was coined in the seminal paper *Our Common Future*, released by the Brundtland Commission over thirty years ago. This definition has been widely adopted by educational institutions, businesses and governmental bodies throughout the world.

> "Sustainable development is the kind of development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

The council's **Charter** is to connect and collaborate with Alumni, parents, and patrons to:

- Enhance and improve sustainability at Culver
- Confirm the sustainability mission and meaningfully contribute to Culver's sustainability planning and actions
- Reconnect with the Academies, graduates and friends
- Have a worthwhile and enjoyable experience

The **Purpose** of the Advisory Council is three-fold.

Directly Connect Culver Academies with its alumni, parent and patron base to leverage their sustainability knowledge, experience and expertise to help guide the Academies' sustainability program.

Imagine a process to understand the current environment and help envision the future.

Craft Recommendations to guide our leaders in urgent strategic decision-making to promote Sustainability in our community.

This report is the work product of the Council's two year effort with the capable assistance and unwavering support of Culver faculty and staff under the leadership of Chris Kline, Culver's Sustainability Director.

Advisory Council Membership

Culver's vast alumni, parent, and patron base includes many individuals whose professional expertise includes key aspects of sustainability. The eighteen members of the Sustainability Advisory Council represent a diverse array of very talented and dedicated individuals who share a common interest in helping Culver become more sustainable. Over the past twenty-two months, this group worked together in a collegial and supportive fashion, seeking first to understand Culver's existing efforts on sustainability, and then leveraging their specific areas of relevant expertise to craft recommendations for sustainability improvement. The Council members are identified below.

Member	Culver Affiliation	Profession	Sustainability Interest Area	Education	Working Group
Hildy Teegen	CGA'83	Professor, Moore School of Business; Consultant	higher education, global business economics, design thinking	PhD, International Business	Social
Brian Reichart	CMA '68	CEO, Red Gold	food, community	BS, Industrial Management	Built
Carlos Ramos Cardenas	CMA '86	Director, Advisory; KPMG	communications	MS, Social Responsibility, PhD Candidate, Social Responsibility	Social
Michael Spensley	CMA '68	Managing Director, Pyxis Global Consulting, LLC	science/ sustainable communities/ social & environmental justice	Doctorate in Veterinary Medicine	Social

Member	Culver Affiliation	Profession	Sustainability Interest Area	Education	Working Group
Ariane Grazian	CGA '08	Program Lead, Project Gigaton; Walmart	international business, procurement	BBA, International Business	Social
John Henderson	CMA '81, WG '76	Business Owner	energy/solar/ financing	BA, Economics	Natural Resources
Becky Stanfield	CGA '87, SG '84	Senior Director, VoteSolar.com	energy/solar/ policy	JD	Built
David Corbin	SG '62	Professor Emeritus, Univ Nebraska	wellness/energy	BS, M.ED, PhD Health	Social
Miles Gordon	SN '83	Principal, Kitchen Table Consulting	food/education	BA Political Science; MA, International Relations	Social
Tom Ruane	CMA '94	Business Owner	natural area conservation/ policy	BA, Political Science	Built, Natural Resources
Kent Blacklidge	SG '56, WG '50	Publishing	educate/raise awareness	BS, Industrial Management, MS, Conservation of Natural Resources, Marine Science, PhD Biology	Natural Resources
Tim Boos	CMA '79, WG '74	CEO, Boos Resource and Technology	energy/waste/ engineering	BS, Geological Engineering	Natural Resources
Markey Culver	CGA '96	Founder, The Women's Bakery, Inc.	community and international development	BA, Communications MBA	Social
Caspar Martin	CMA '68, WG '63	NIBCO Foundation	human behavior	BA, Math, MS, Computer Science, MBA, MFA, Literature	Natural Resources
Dave Janney	Current Parent	Principal, Millies Engineering	energy/building design	BS, Electrical Engineering	Built
Scott Johnson	CMA '94, WG '89	Culver Academies	transportation	BA, Slavic Languages	Built
Sotiria Anagnostou	CGA '04, SG '02	Whirlpool Corporation	human behavior	BA, MA, Energy/ Mineral Resources, PhD. Environmental Science	Social
Beau Barbe	CMA '08	Consultant	finance	BS, Economics, MS, Environmental Affairs	Built

Council Process

Hildy Teegen, CGA'83, was selected by Mr. Buxton to Chair the Advisory Council. She was tapped for this leadership opportunity because, as a current tenured faculty member and former Dean of the University of South Carolina Darla Moore School of Business, Dr. Teegen brings both professional expertise and personal commitment to this effort. Under her deanship, and in technical partnership with the US Department of Energy, the Moore School designed and built the state's only LEED® Platinum rated public sector building—the highest standard for sustainable buildings available. Dr. Teegen's private sector experience as an international business consultant helped ensure the Council remained focused on defined and achievable goals.

The Council's efforts began in July 2016 with a series of conference calls to formulate an agenda for our first meeting and to develop a strategy to deliver on the group's charter. The Council had three goals for its first meeting: 1. to engage with one another and (re)connect with Culver; 2. to learn more about Culver's past and current efforts regarding sustainability and 3. develop a path forward for the Council's work. Agendas from all of the Council's meetings are included as Appendices.

September 2016 Meeting

During its first on campus-meeting, the Council sought to better understand the complex operations of our beloved institution. For several Council members, the September 2016 meeting was the first time in decades they had returned to campus. Background information was developed and shared with Council members prior to their arrival. Once the team arrived, it began a series of tours, briefings and meetings with students, faculty, staff and community members all of whom shared their perspective on various sustainability issues at Culver.

Dr. Power opened the Council's on-campus meeting by encouraging the Council to explore areas where Culver could demonstrate compelling leadership in sustainable behavior, both for secondary schools and in the broader community. The Council is grateful for Dr. Power's leadership, particularly regarding sustainability. He has provided valuable support to our effort throughout this process.

The Council also engaged the professional services of Dr. Paul Chapman, a recognized expert in sustainability at independent secondary schools throughout the United States. Dr. Chapman has written and spoken extensively on this topic, specifically producing several seminal publications for the National Association of Independent Schools. Dr. Chapman's presentation to the Council helped provide the context for best sustainability practices at secondary schools around the country. Further, Dr. Chapman was a valued resource and advisor to Dr. Teegen and Chris Kline, Sustainability Director, as we prepared for our first on campus meeting.

Some members of Advisory Council, Summer Sustainability Interns and Culver staff gathered on Beason patio.

Working Groups

A critical outcome of the first meeting was to organize the Council into three working groups covering the three focal areas for our Council work: Social Environment, chaired by Ari Grazian; Built Environment, chaired by Dave Janney; and Natural Resources Environment, co-chaired by John Henderson and Tim Boos. Council members served on the working group which best aligned with their own interests, experiences and professional expertise. Over the next 18 months, Council members worked together closely within and across their respective working groups. The bulk of this report consists of the research and recommendations of the three working groups.

July 2017 Meeting

The Council's summer meeting in July 2017 had two primary goals. First: to share the interim findings and research of the three working groups and, second, to meet with the CEF Board of Trustees for a briefing and conversation on sustainability. On both counts, our meeting was a success. The active participation of Culver's three summer sustainability interns, Maddie Berman, Regina Padilla, and Julia Smith, assisted in the success of our meeting.

Prior to the summer meeting, a significant contribution to our work came out of the Social Working Group's survey effort. This working group crafted a survey instrument to which more than 550 students, faculty and staff responded. This survey confirmed strong support for sustainability from all of the various campus stakeholders. See the Social Working Group report for a discussion of these survey findings.

Green Life leaders discuss upcoming Green Week activities during the Sustainability All School Assembly while Council Panel looks on.

This meeting also provided the Council with the opportunity to critically engage around a fairly detailed set of sustainability recommendation areas stemming from the survey work and faculty/staff led discussions undertaken in parallel on campus by Chris Kline. A tentative prioritization of these recommendation areas provided clear pathways forward for each of the working groups to launch into the final year of the Council's work and ensured Council-wide engagement and understanding of how the social, built and natural environmental aspects of sustainability must be integrated into a coherent whole in our final recommendations to Culver.
An important accomplishment of our summer meeting was to meet with the full CEF Board. During an hour-long briefing and discussion, we covered many aspects of sustainability. In particular, the Advisory Council emphasized the connection of sustainability to Culver's mission and highlighted several economic opportunities from adopting sustainable policies. We are particularly grateful to Miles White for his Board leadership and for his willingness to embrace this important discussion. The Council was gratified by the warm reception of the Board and the clear interest expressed in advancing Culver through sustainability endeavors.

April 2018 Meeting

Our goals for the final Council meeting on campus were two fold – first to share our report with the community and second to celebrate our Council's nearly two-year effort. We succeeded on both counts, but it is safe to say none on the Council could have predicted how we would surpass these two goals.

Our meeting coincided with the kick-off of Green Week, the student led series of activities celebrating sustainability and the environment. After discussion, our Council joined the rest of the student body, faculty and staff by participating in the first

ever student-led all school assembly celebrating sustainability. A short film discussing the history of ecology at Culver "premiered". Hildy then took the stage describing our council's work and providing an overview of our report and recommendations. A student led panel discussion followed where Becky Stanfield, Sotiria Anagnoustou, Miles Gordon and Dave Janney engaged with three students on a more detailed exploration of the report. Following some announcements the assembly dismissed into a brilliantly sunny spring afternoon.

Following the assembly, the Council met via Skype with Jerry White, Culver's new Chief Operating Officer, and Darrell Garbacik, Facilities Projects Director. We engaged in a full discussion of our report with these two men who will have key roles implementing our recommendations. After the discussion with Mr. White and Mr. Garbacik, we took a break and reconvened at 7 p.m. in the White DeVries Rowing Center for a delicious farm to fork dinner.

One of the key recommendations in this report is to establish a Green Revolving Fund at Culver to help finance sustainability projects which offer cost savings or income streams to replenish the fund over time. A student group has formed and has identified several potential GRF projects, including relighting various buildings and sub-metering. This group has the support of Dr. Power, our Advancement office and our COO. And of course this report itself contains many candidate projects for investment as well. All that was missing was the funding. During our Friday night dinner, that situation changed.

In an act of leadership, Caspar Martin, through his family foundation, announced a gift of $50,000 to establish the GRF. Hildy challenged the Council to match her own donation of $11,500 adding to a seed donation of $2,000 from Dr. Power such that our report's recommendation of a base funding of $25,000 would be met. Most council members present responded to the challenge and as of this writing, we are nearing our matching goal!

Plenary Discussion

Top: Chef Amy Collins explains details of Culver's food recovery efforts.
Bottom: Examples of recovered meals packed during our service project.

Orchard Project Accomplished!

We left the dinner Friday night feeling very positive about this ground-breaking effort, knowing that the recommendations in this report, produced through our collective time and talent, were being supported even further through significant commitments of the Council's treasure. But it didn't end there.

The Martin Brown (CMA '58) family was visiting Culver at the same time our Council was meeting. The Brown family is also interested in sustainability. They attended the All School Assembly on Friday and participated in our food recovery service project on Saturday. Afterwards, Mr. Brown announced his family foundation would be making two gifts to Culver. The first is a gift of $16,000 to get us to 100% of our goal for the solar panel crowdfunding project.

The second gift from the Brown Family, echoing Caspar's leadership, is an additional $50,000 to the GRF for the purpose of sub-metering campus buildings. This sub-meter project, as this report identifies, is a critical one both for the built and social environment at Culver.

Although more common in colleges and universities, we are aware of only one other secondary school in the US which has such a fund. The GRF will be an excellent opportunity for students to become deeply engaged in real world economic, engineering and design challenges. It truly can be transformational.

Our meeting continued on Saturday as we gathered in Legion for working group break out discussions on our report, its recommendations and next steps. Dr. Power, Kathy Clark of the Lake Maxinkuckee Environmental Council, several students and several faculty and staff members of the Sustainability Committee joined us for these discussions. A robust

exchange of ideas, focusing on prioritizing Culver's sustainability efforts ensued. We are very grateful for Dr. Power's participation in these discussions and for his leadership on these issues.

Following yet another fantastic lunch prepared by the Dining Hall staff, we separated into two groups to engage in some service projects. The first project, led by Charles Mahoney (CMA '18), packed "recovered" food in the Dining Hall. As mentioned above, we were joined by members of the Martin Brown family for this worthwhile activity.

We also assisted a group of Culver students in planting an orchard at Fleet Field. This service project, started by two 2017 CGA graduates (Katie Derwin and Linnea Karaholious), continued under the leadership of Gabby Woempner, CGA '18. As one can see from the picture, a wonderful mix of the Culver family joined together to plant 25 apple and peach trees.

Our Council met for its final dinner Saturday evening, well pleased with what we have catalyzed and optimistic about the future of sustainability at Culver.

Acknowledgments

Our Council is grateful for the support and encouragement from many in Culver's family. In particular, we would like to thank Alan Loehr and Amy Davis Johnson in the Alumni Office for their constant support. Chris Kline, Sustainability Director, provided staffing support and guidance throughout this process; we are inspired by Chris' commitment to this endeavor. Leann Weatherby in the Advancement Office contributed her talents to our meetings. Chef Amy Collins, Karin Moreno and the entire Dining Hall staff provided wonderful meals throughout our on-campus meetings. Jeff Kutch's team in the Facilities Department was gracious with their time responding to our many requests for information. We would like to particularly thank Darrell Garbacik, Dave Blalock, Lyn Hanley, Krystyna Hyrczyk, Rene Chapdelaine and Martha Bridegroom. Gerri Quivey ensured we were housed comfortably and conveniently for our on-campus meetings. And Sarah Perschbacher's graphic skills made a significant contribution to this final report.

Next Steps

It is the Council's fervent hope and strong expectation that our work does not end with this report. We are heartened by a number of positive signs indicating this will not be the case. These indicators include:

- Support from Academy Leadership, particularly Dr. Power and his team
- Broad community support for sustainability as evidenced by our survey findings
- Active engagement within a standing faculty/staff committee on sustainability
- Student interest, including an active Green Life club, Sustainability Prefects within CGA, and a number of senior Service Leadership Practicum projects related to sustainability
- Formalization of the role of the Culver Sustainability Director tasked with developing and implementing this program
- Intentional academic focus on sustainability with an Honors in Sustainability Seminar beginning in the upcoming academic year
- Early significant fundraising support geared towards sustainability efforts at Culver

Strategic opportunities remain for improving sustainability at Culver, particularly relating to Culver's built environment and campus master plan. We expect the Faculty/Staff Sustainability Committee, chaired by the Sustainability Director, to take the lead in prioritizing and implementing the recommendations in our report.

We look forward to hearing about future successes and are grateful for the opportunity to have served Culver in such a meaningful way.

Social Environment Working Group Report

Introduction & Process

Sustainability projects, based on the best environmental science and the most compelling financial case, faces risk of failure if human behavior is not appropriately considered and addressed in our initiatives to promote sustainability at Culver. Members of the Social Environment Working Group have seen the importance of behavioral change in action for promoting sustainability in a wide range of settings.

To effectively engage Culver's stakeholders around sustainability, we needed first to understand the beliefs and behaviors of the key stakeholders who can help shape, and are impacted by any recommended initiatives the Council might bring forward. We determined that a broad based Culver stakeholder survey would help to define priorities, highlight gaps in current practice and lend perspective on potential barriers or boundaries that reflect the current situation at Culver. In designing the survey, we drew on pilot survey work with faculty and staff at Culver undertaken by a consultant, Dr. Paul Chapman, who is perhaps the nation's leading expert in sustainability matters for independent schools in the United States. His initial benchmarking of the 'state of play' at Culver vis-à-vis other independent schools was a critical starting place for understanding key domains for establishing baseline understanding of our broader stakeholder communities. We augmented this work by reviewing dozens of stakeholder understanding/engagement surveys in use in leading sustainability efforts on college campuses in the United States. We fielded the survey in two waves in the Fall of 2016 as we began the Council's work. The first wave included students, faculty and staff on the Culver campus and yielded 550 responses. The second wave consisted of parents, alumni and board member stakeholder representatives, yielding over 50 responses. The survey instrument and raw data compilations from both waves is presented in the Resource/Appendices. Both surveys confirmed that there is both strong interest and commitment to sustainability across stakeholder groups at Culver. Many promising opportunities for exploration regarding specific sustainability initiatives were provided by stakeholders which formed a starting point for the Council's work. From this survey, we discovered that the formation of three working groups: this social environment group, along with a built environment group and a natural environment group would allow the Council members to most closely map their respective expertise to application areas for advancing sustainability at Culver.

The Social Environment Working Group engaged in research drawing from experiences within their own organizations and fields, and stemming from our baseline survey work, to identify promising opportunities to engage our stakeholders, educate them further and in so doing, enhance Culver's

reputation for sustainability. Our strategic recommendations span across the key domains:

Behavior—how we can promote behavior among Culver stakeholders consistent with positive sustainability practice through visible, tangible campaigns and activities, through activating opportunities for leadership and competition, and by inspiring members of the Culver community to play a personal role in supporting sustainability.

Curriculum—how we can tightly integrate opportunities for applied learning and academic development with sustainability advancement efforts across the curriculum, and, ideally involve all stakeholders in concert with one another, making sustainability education the purview of many on campus and extending the learning opportunities from sustainability programming ever more broadly.

Communication—how we can use new modalities and media to energize people around sustainability at Culver and beyond, bringing the most exciting new developments in sustainability to our campus through compelling messaging formats and recognizing that Culver's commitment to leadership development and demonstration can be powerfully showcased through richly detailed stories of our sustainability programming.

Community—how we can invoke powerful ideas and ideals around community and society through enhanced understanding and commitment to sustainability. We care about sustainability precisely because we care about our social fabric on campus and beyond as we study, live and work on campus and within our local Culver Indiana home.

Challenge

Overview

To foster commitment to sustainability at Culver, we seek to challenge our students, faculty, staff and other key stakeholders to engage in behaviors and practices that advance our sustainability goals and complement the sustainable advances we can make within our built and natural environments on campus. We will need to measure the results of our actions and build experience/expertise among our community members to perpetuate sustainability gains in the future. As leaders on campus and beyond, the Culver community will promote sustainability on a larger scale through demonstration of successful projects and through our community members' positive behavior.

Illustrative Challenge Pilot Concepts

We recommend initiating pilot projects on campus that relate directly to highlighting the importance of our individual and group actions for sustainability. In the section that follows we highlight high potential pilots that have successful analogs on other campuses and in other organizations and provide direct conduits to propel members of the Culver family to take productive actions in this regard.

The Barracks/Dormitories Sub-metering Project

Without behavioral change, current Culver infrastructure in the built environment limits sustainability gains in terms of energy utilization. This project will leverage new investments in pilot site sub meters of energy usage in Culver barracks and dormitories to challenge students to adopt more sustainable energy usage behavior. Facilities has received a proposal for such metering to cover all residence halls on campus at a cost of just under $80,000 from Siemens. Sub-metering allows Culver to track site specific energy utilization given ***existing*** HVAC and lighting infrastructure in place in residence halls. Once installed, this equipment allows for precise monitoring, trend analysis and benchmarking against site-comparable locations elsewhere.

Measurement of energy usage with demonstrable indicators allows for across-time and across-building comparisons of energy utilization, directly addressing both **Transparency** (via data) and **Tangibility** (via real time reporting on energy utilization that can be posted in each residence hall). **Competition** is advanced by benchmarking energy performance in each building against other buildings, against prior time periods, and against like-kind buildings elsewhere off campus. **Curriculum** can be enhanced by leveraging actual usage data to measure effectiveness of communications in promoting change.

Educational materials around energy utilization and opportunities for savings can be drawn from U.S. Department of Energy and other sources and conveyed to students on campus. Incentives for positive improvements in energy utilization by residence hall will be determined based upon estimated cost savings from reduced energy. Buildings generating greatest energy savings will be rewarded with some percentage of energy savings (recommend 50%). The remaining 50% of demonstrated energy savings can be invested in the Green Revolving Fund (recommend 25% of savings) (see page 18) and in the operating budget for Facilities (recommend 25% of savings) for additional metering projects and/or pro-sustainability infrastructure investments in the built environment.

Recommendation 1

Educate/inform community members about ways to save energy—through Green Life, campus convocations, etc. Draw on inventory of energy savings ideas from U.S. Department of Energy, the U.S. Green Building Council, academic institution residence halls.[1]

Recommendation 2

Communicate clear incentives for community members to benefit from energy savings.

Recommendation 3

Measure current energy utilization by building through micro-metering.

Recommendation 4

Compare energy utilization across buildings.

Recommendation 5

Calculate campus-wide energy savings (denominated in energy units and denominated in dollars).

Recommendation 6

Reward big energy savers (by building) with non-monetary perks (e.g. sleep ins), discretionary use of some of funds associated with energy savings and other leadership recognition.

Recommendation 7

Deploy some energy savings into future investments in Culver sustainability in built, natural, and social environments.

The Green Revolving Fund

Without a stable source of funding, great ideas for enhancing sustainability at Culver will not take off. The stakeholder survey indicates broad support for sustainability at Culver—including among alumni and parents. This support can be validated through philanthropic investments earmarked for sustainability initiatives at Culver. The efficacy of ongoing communication efforts regarding sustainability at Culver can be evaluated by future gifts to the Green Revolving Fund (GRF) spurred by prior successes in sustainability at Culver. Institutional commitment to sustainability will be demonstrated through policies whereby direct cost savings, and/or fee incomes associated with GRF funded projects will also be (at least partially) earmarked to replenish the Fund.

The Green Revolving Fund will be administered by the Culver Sustainability Director, in consultation with the Sustainability Leadership Team. Review of proposals will include participation by student leaders (e.g. Sustainability Honors students; Green Life, etc.). The GRF will serve as the principal source of seed capital to perennially invest in new, innovative projects to advance sustainability at Culver. Awarded projects will prominently display recognition of GRF funding to advance **Tangibility** of sustainability. **Transparency** will be advanced by making available reviewer notes on past proposals (both funded and non-funded) and by requiring post-project reports regarding sustainability goals and financial implications of projects. **Competition** among proposals will be advanced as GRF funds are limited. Projects with **Curriculum** components will be favored in the review process.

Student interest in the GRF is high with a group of students keenly interested in forming a GRF club to help manage and evaluate GRF projects.

Recommendation 8

Challenge Culver supporters to develop a funding stream for sustainability at Culver in communications with alumni and parents.

Recommendation 9

Establish a dedicated philanthropic effort to seed and to grow a Green Revolving Fund (Recommend $25,000 initial launch minimum through lead donor(s) and/or specific crowdfunding opportunity) to augment the initial $2,000 fund allocated by Dr. Power. Fund will be evergreen/self-preserving over time.[2]

Recommendation 10

Circulate annual call for proposals to students, faculty and staff for GRF project grants to advance sustainability at Culver.

10a. Projects that are implementable within a given year.

10b. Projects that can be extended across years for continuity.

10c. Projects that have demonstrated opportunities to recoup initial grant investment through follow-on or matching grants, linked cost savings, fee revenue, etc.

10d. Projects that "touch" the built, natural and/or social environments at Culver are eligible.

10e. Projects that link tangibly to student learning are favored.

10f. Projects that can "lead by example" for other academic institutions are favored.

10g. Projects must be showcased annually during Green Week or other Culver Sustainability Summit/Convocation.

Food Challenge

No sustainability issue resonates more strongly with students than do issues relating to food – food waste, food safety, food economics, nutrition, environmental issues associated with food production, hunger. All of these issues impact students, faculty and staff in real and meaningful ways. Over the course of the working group's tenure, several significant strides have been taken regarding food sustainability at Culver. In particular, a comprehensive food waste and recovery program has been successfully implemented. This program has been well-documented through other media and the Council strongly endorses and supports this effort.

A second major sustainable food initiative has been to intentionally increased the amount of local food sourced to the Dining Hall. Starting on a pilot basis during the summer of 2016, Culver's local food initiative has been growing steadily under the guidance of Food Service Director Lee Willhite and Chef Amy Collins. We encourage Culver to continue these efforts and to develop metrics to effectively define and measure Culver's local food initiative.

Our working group has identified a third area which we believe, if implemented, will strengthen Culver's sustainable food program and make it enduring. This third initiative relates to celebrating and developing the culinary skills of Culver's Dining Hall line staff.

Recommendation 11

Increase the skills and knowledge of culinary staff by providing them with a range of trainings, to include all aspects of increasing the use of fresh local fruits, vegetables, and meats in school meals and their role in improving health, flavor, and sustainability.

Recommendation 12

Integrate definition and purchasing of local food products into Culver's procurement process to increase pro-local purchasing, support the local economy, and reduce transportation miles and Greenhouse Gas Emissions (GHGE).

Recommendation 13

Create educational campaigns for students and staff to limit food waste on the plate.

Recommendation 14

Research the feasibility of a school/community garden and greenhouse on campus as an outdoor classroom for cross curricular training and a way to educate and highlight the importance of locally produced food.

Curricular Challenge

A recent Wall Street Journal[3] article underscored the value of experiential learning for 21st century education. In this context, teaching and learning about sustainability at Culver is ripe with opportunities. By embedding sustainability within the formal curriculum at Culver, students can use sustainability application as a tangible means of applying relevant understanding of conceptual and analytical knowledge in various domains.

Recommendation 15

Culver should intentionally develop sustainability learning opportunities across our campus operations – facilities, dining, business management. Such an effort recognizes that all staff have a role to play in educating our students and one another. Analyzing our campus energy or water use; operating the food recovery program; operating a green revolving fund… these are examples of experiential-based learning opportunities which should be incorporated into the curriculum.

Recommendation 16

Building on the EcoForester's report, Culver will establish an outdoor ecology curriculum with a focus on restoration ecology, biodiversity and taxonomy. Over time, this curriculum will expand to include the pollinator prairie, lake, streams and wetlands on and around our campus.

Recommendation 17

Building on the Honors in Sustainability Seminar slated to begin in the Fall of 2018, Culver will develop a prerequisite "Principles of Sustainability" course for Fall of 2019.

Recommendation 18

Culver will cultivate and develop academic relations with sustainability programs in area colleges and universities (Notre Dame, Purdue, Goshen, Ancilla). This program will include hosting university students on our campus and cooperative curriculum development.

Recommendation 19

Culver will evaluate developing sustainable, entrepreneurial food and curriculum projects, along the lines of the Rubin Café – for example, orchard products, honey, maple sugar, farm/garden produce.

Communication

Consistently focused, timely, accurate, responsible, and credible are among the characteristics of effective communications by which we propose to share information relevant to plans, progress, achievements and challenges of Culver's Sustainability Program. Open communication to and with the campus and community populations is intended to compel engagement and collaboration within and across the respective communities. Similarly, by effectively sharing Culver's work with the field, an introducing leaders in sustainability to Culver, we will amplify and accelerate Culver's sustainability work.

Media

Recommendation 20

A Sustainability Newsletter, consisting of timely and relevant content should be used to communicate "Sustainability News" to program stakeholders and prospective stakeholders.

Recommendation 21

Social media and websites, by virtue of interactive user-contributed content and significantly greater reach to many more users than newsletters, would afford 'best practice' methods to enhance awareness and understanding of Culver's program and foster relationship building in the field. Social media and sustainability are very compatible; they share values like community and collaboration.

Culver students, faculty, and neighbors in the community recognize and appreciate living in a "green environment", i.e., a natural environment of fields, trees, wild flowers, wildlife, insects, flowing waters and the lake; and a built environment of buildings, parks, solar panels, and agriculture. Elements of both – built and natural environments – are terrific content for newsletters, social media, and websites.

Recently, a crowdfunding site was launched for Culver's first solar project. The site features a student-made video demonstrates the technology that will be used in the project.[4]

Speaker Series

Recommendation 22

Create an endowment to support bringing or support hosting, at Culver Academies, experts in the field of sustainability. In turn, invited speakers will create increased awareness and knowledge among our 'sustainability community' of innovative domestic and global sustainability practices. The series' goal is to host local/regional, domestic, and global leaders on a range of sustainability issues, e.g., sustainability entrepreneurs, innovative sustainability technologies, innovative energy and water conservation, policy makers and policies, democratization of environmentalism and sustainable communities development.

Culver's Global Studies Institute has an established endowment and speaker series upon which the Sustainability Program can learn, partner and, likely model an initiative.

Film & Visual Arts

Recommendation 23

Institutionalize/formalize and fund a Sustainability Film & Visual Arts Program at Culver. Film, video, and visual arts are increasingly popular and being used to effectively communicate–to make more people aware and facilitate understanding of sustainability issues. In addition to the aforementioned student-made video in support of Culver's first solar project, Culver students have produced videos on water sustainability and, recently, the food recovery program.

Recommendation 24

A means by which to further communicate Culver's Sustainability Program, engage with like-minded sustainability advocates, practitioners, entrepreneurs, filmmakers, and more is by participation in sustainability, environmental, and conservation film festivals. While there are many such festivals, not all of them dedicate some or all of an annual festival to 'next gen film makers'. Currently, by virtue of Chris Kline's relationship-building with leadership of the American Conservation Film Festival (ACFF)[5], Culver students and staff are considering participation in ACFF's project/competition, Next Generation Capture Conservation. Through occasional participation at ACFF and/or similar film festivals, Culver students will engage with filmmakers and experts from a variety of sustainability sectors, participate in discussions and workshops, and have their films screened on website(s) and at the festivals.

Community

Building a sense of community through involvement

Developing Culver's relationship with the local community and with peer institutions is an important way to share our sustainability efforts. Engaging with Culver's local community to share knowledge and collaborate on sustainability initiatives will provide benefits to both the town of Culver and to the Culver Academies. This work will also provide learning experiences and help to build responsible leadership skills in our students.

Connect with Local Community

Recommendation 25

Continue and grow our support of the Lake Maxinkuckee Environmental Fund and Council with staff and financial resources. Invite students to attend LMEC meetings to engage with local residents regarding environmental issues.

Recommendation 26

Invite local community, alumni, and parents to tour and participate with Culver's sustainability initiatives, recycling initiatives, orchard, Cardinal Creek projects, etc. Encourage student led tours/ discussions/presentations.

Connect with Peer Institutions

Recommendation 27

Develop a more complete understanding of how Culver's resource consumption (e.g. water) compares to peer institutions including tracking resource by function and location.

Recommendation 28

Green Life members to look for institutional leadership from other school sustainability clubs to benchmark and share successful projects. Recent Culver alumni are looking for ways to give back to the Culver community without providing financial support (as they're still students themselves)–Club members can reach out to recent graduates who participate in sustainability clubs at colleges and universities to build alumni connections back to campus. Club members to present/attend at the Smart and Sustainable Campuses Conference.

Built Environment Working Group Report

Overview

Sustainability today is core to the notion of leadership and responsible citizenship and is embraced as a distinguishing characteristic by Fortune 500 companies, cities, small businesses, universities and other institutions across the country and around the globe. Responsible citizenship benefits of sustainability convey other tangible and valuable benefits including:

Significant cost savings;

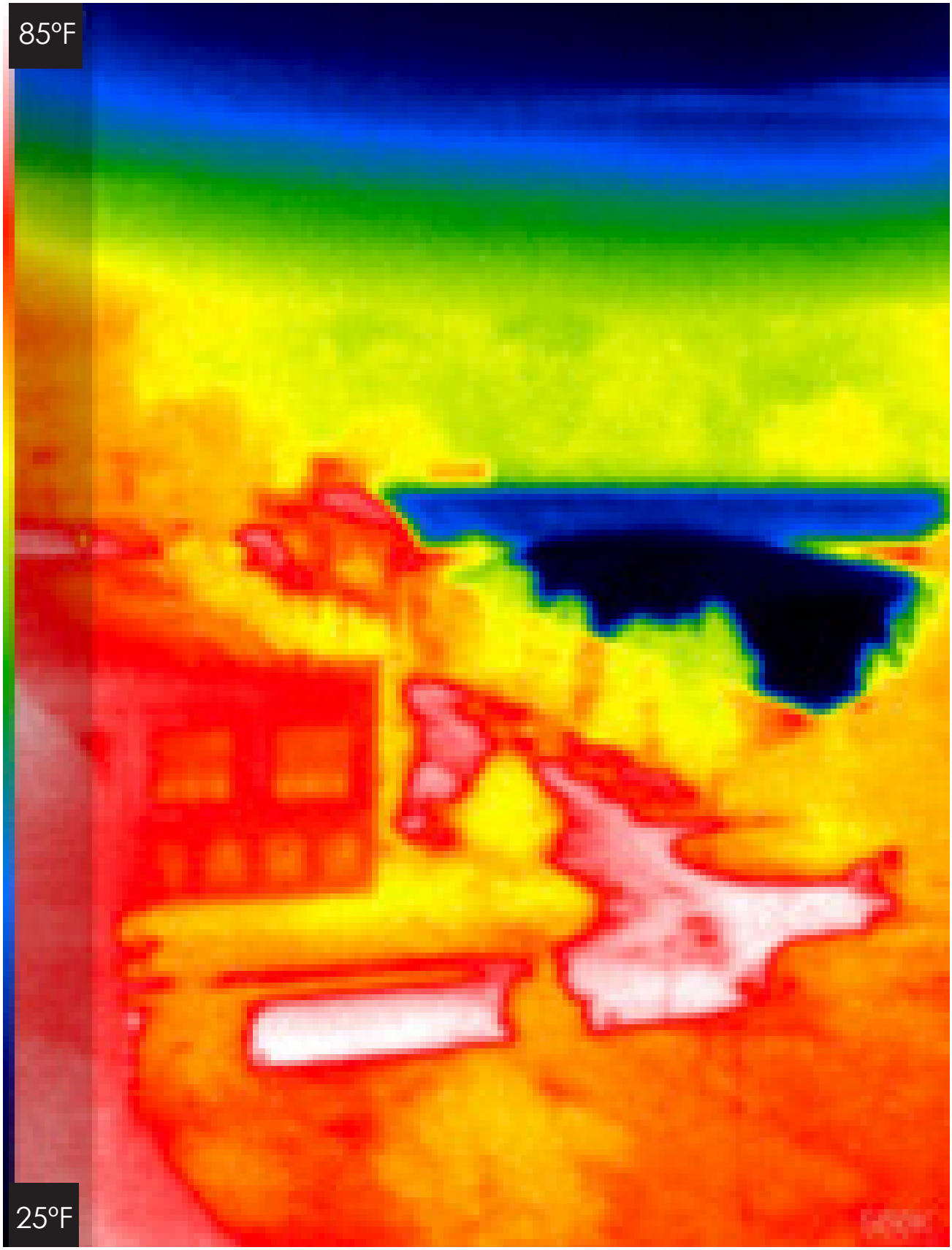
Economic development benefits through job creation in the architecture, construction, engineering, and renewable energy industries;

Improved local health outcomes through the reduction of exposure to harmful pollutants; and

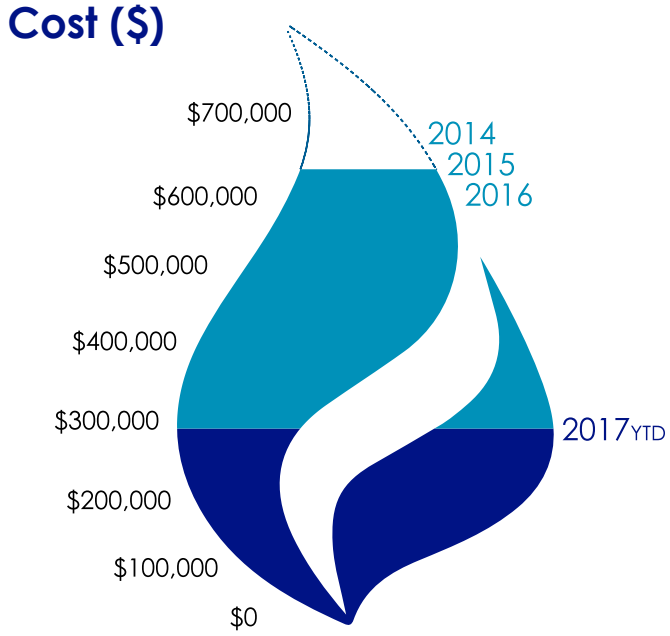
Environmental benefits through reduction in greenhouse gas emissions.

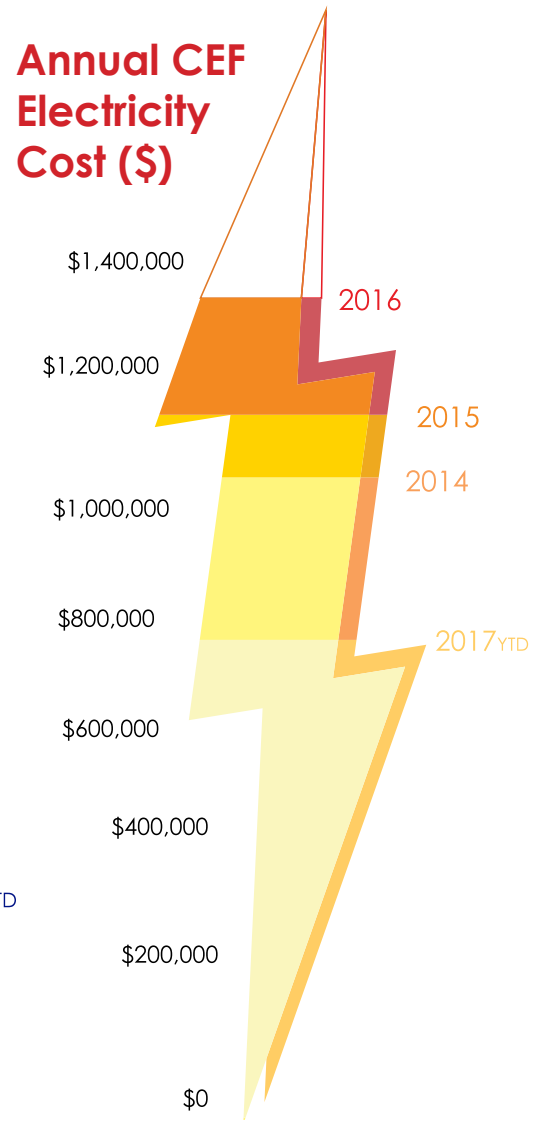
Moreover, the Culver Academies are a place of unexpected physical beauty. Lake Maxinkuckee, the lake front sycamores, the mysterious Bird Sanctuary, as well as stately structures like Gignilliat Hall, Legion Memorial, and the Riding Hall form deep and lasting impressions on students, campers, parents and visitors alike. Surrounded by the subtle beauty of rolling farmland and nearby rivers like the Tippecanoe to the South and the Yellow to the North, the Academies and its property are truly special amongst the locales of Northern Indiana. The Academies have a vested interest and a fiduciary responsibility in maintaining and enhancing this beauty in both the natural and built environments, to continue to attract students and campers from all over our nation and the world. Conducting operations in a sustainable way, therefore, can enhance Culver's value proposition to our customers and promote Culver's position as a leading secondary school.

With over one million square feet of building space on the main campus, and significant additional square feet at Woodcraft Camp, Culver has a major opportunity to demonstrate leadership, engage and educate students and the broader Culver community, improve the quality of life on campus, and enhance the bottom line economics of its operations (See Appendix 8 for the inventory of Culver Academies buildings). Culver's facilities are a tremendous source of pride for our community of students, alumni, parents, faculty and staff. However, the need for careful and respectful modernization is abundantly evident. We all remember opening our windows in the winter while the heat was cranked. We remember the challenge of getting a hot shower. These same challenges still exist, along with observed instances of heating and cooling a building simultaneously, and significant energy losses in particular buildings associated with poor insulation and inadequate sensors and controls according to modern standards. And users of our buildings often behave in ways that exacerbate energy waste.



A thermal camera image taken June 30, 2017. Looking west from the Memorial Chapel Steeple. Outside temperature was 85°F. Thermal image of Henderson Ice Rink shows the exterior at 25°F.





Given the size of Culver's utility bill, and our assessment that 10%-20% utility savings are readily achievable, the financial benefits to Culver are significant.

In addition to operating our buildings efficiently, an efficient, clean, modern, and well-maintained vehicle fleet is a key component and extension of the campus' beauty, representing the Culver brand, communicating Culver's leadership to prospective students and parents, as well as nearby communities members.

Our baseline survey from 2016 described in the social environment section demonstrates that our stakeholders care about sustainability. A 2015 Nielsen study states that Gen Z and Millennials are increasingly willing to pay extra for sustainable offerings. In addition, a 2017 demographic survey by CarMax and CleanTechnica of the 100,000 customers who had purchased an electric or hybrid vehicle from CarMax revealed that 65% were Gen X or Baby Boomers. The trend is clear: not only do the students in our prospect pool believe sustainability is an important parameter of value, but family members and scholarship donors who underwrite their education do too.

Our Process

To develop our recommendations, the Built Environment worked closely with Culver Facilities staff led by Facilities Director Jeff Kutch. Mr. Kutch and his team provided our working group with data including utility information, building designs and blueprints. Further Mr. Kutch and his team were quite gracious with their time, meeting with us, answering our questions and providing tours of various buildings. In general, we reviewed the utility and building design information and compared this information to recognized national design standards. Our group also reviewed Culver's vehicle fleet, examining fleet make up, fuel costs, maintenance procedures and vehicle mileage.

Our case studies for the Rowing Center (see Appendix 6), Ice Rink (Appendix 3) Memorial Chapel (Appendix 4) and campus exterior lighting (Appendix 5) represent additional in-depth analysis of elements of our built environment. The Rowing Center is the newest, most energy efficient structure on campus. We scored the building according to federal Energy Star guidelines. For the Ice Rink, we conducted an initial (preliminary) engineering analysis utilizing modeling software which allows us to simulate the operation of the facility on an hourly basis throughout the year. This analysis takes into account the ice sheet characteristics, usage, conditioning cycles, etc. in order to ascertain possible savings from various options (such as supplemental insulation, temperature adjustments, timing of when the ice sheet is started, and so forth.) Of note was the difficulty in accurately modeling the space without metering equipment on the steam system – assumptions were necessary. For Memorial Chapel, we reviewed utility data and interviewed building occupants and maintenance personnel. Our lighting case study (Appendix 5) examines successes other similar campuses have had converting from conventional to LED lighting.

Our recommendations fall into the following three general categories.

Building Recommendations

Capturing the Opportunity for Energy Performance in New Construction

Addressing Energy Waste in **Existing** Buildings

Minimizing Water Waste and Toxic Chemical Exposure

Capturing the Opportunity for Energy Performance in New Construction

The most important time to address energy performance of a building is when it is undergoing construction or major modifications. Once the initial construction or modification is complete, correcting deficiencies in the building envelope or equipment can be far costlier than incorporating thoughtful energy saving measures into the initial design. Once built, a poorly designed building will cost Culver money in wasted energy for decades. Fortunately, today, many tools exist to allow building owners and their contractors to capture these energy savings and healthy building design opportunities before they are lost.

Recommendation 29

Establish a near-term policy that each new building or major modification undertaken will achieve an Energy Star score of at least **80**, and to evaluate whether a score of **90** is achievable. (See Appendix 6 for an example of Energy Star scoring of White – DeVries Rowing Center).

Recommendation 30

Evaluate other existing rating systems for new buildings including the LEED® rating system developed by the U.S. Green Building Council (USGBC), the New Building Institute's Zero Energy Building certification, and the Living Buildings Challenge. LEED®, Green Building Initiative, and the Living Buildings Challenge incorporate healthy and sustainable design going beyond just energy waste minimization including the sourcing of building materials, while the Zero Energy Building certification is limited in its focus to energy use.[a]

Recommendation 31

CEF will require its design firms to meet a base minimum design standard developed by the Culver Academies. These "Owner's Project Requirements" (OPRs) will include aesthetic considerations, minimum construction standards, as well as specific sustainability requirements and options. The policy will mandate that the OPR be annually reviewed and regularly updated to reflect technology improvements and best industry practices (see Appendix 7 for recommended OPR template).

Addressing Energy Waste in ***Existing*** Buildings

Benchmark and Track Building Energy Performance

Measuring and tracking energy use is a prerequisite to identifying opportunities for savings and successfully eliminating energy waste. If one's household does not have a budget, one cannot assess whether one is spending too much, and if one does not weigh oneself it is difficult to know how much weight one needs to lose. Over the past decade, the U.S. government has developed a wealth of tools to give cities, institutions and building owners insight into how they measure up, and to allow for the ongoing tracking of that data. See example from the Department of Energy Summary.[6]

Accordingly, the committee strongly recommends metering, benchmarking and tracking energy performance data for all campus facilities.

Specifically,

Recommendation 32

Sub-meter each building so that each building's energy performance can be measured and tracked.

Recommendation 33

Use the Energy Star benchmarking and reporting system to gain an understanding about how each building is performing relative to a vast database of similar buildings, identify problems that are causing energy waste and incorporate elimination of those problems into an annual planning cycle.

In addition to the obvious operational benefits, both recommendations 32 and 33 directly tie into student learning opportunities. The data generated through sub-metering buildings can be analyzed and manipulated by students to illustrate statistical, economic and physics principles. Now that we have established an Energy Star account and protocol for Culver, it will be possible for students to evaluate other campus buildings.

a. While not all of the current buildings have individual metering equipment, any new construction should be required to not only have the metering but also to be provided with fully integrated direct digital controls for the systems within the buildings (lighting, mechanical, plumbing, etc).

Undertake All Cost-effective Opportunities for Retrofitting Existing Buildings

The benchmarking exercise combined with targeted auditing can give Culver a firm understanding of where improvements in the building envelope (insulation, windows), lighting, equipment, appliances or control automation can result in cost-effective energy savings. Armed with that information, our recommendations for retrofits are:

Recommendation 34

Adopt a policy that Culver will pursue energy savings building upgrades wherever analysis indicates that the value of the energy savings will outweigh the up-front cost of the measure, over the full lifetime of the measure. For example, if replacing a refrigerating unit will cost $1500, but will save $1,600 (adjusted for the time-value of money) over its lifetime, that replacement should be undertaken.

Recommendation 35

To the extent that the number of cost-effective measures are too numerous to undertake within current budgets, Culver should either.

35a. Explore *performance contracting* through which an energy services company would provide the up-front costs of a campus-wide retrofit program, and the institution would pay for the projects over a number of years as the savings is being realized.[b]

35b. Culver should create a plan to sequence the measures over a number of years as internal financing and budgets allow, prioritizing the buildings with the greatest potential for energy savings and greatest net present value of investments.

b. See, for example, the University of North Carolina, Wilmington performance contract for campus-wide retrofit with 18-year payback and 42% overall reduction in energy use.[5]

Operating Buildings to Achieve Continuous Improvement

Building energy use is a function both of the "hardware" (e.g., the building envelope and equipment) and the human factor or, in other words, the way the building is managed and used. Study after study confirms that enormous savings (or waste) result from building users' behavior. In turn, we also know that good management depends upon institutional leaders prioritizing energy management and rewarding good performance. Over the past decade, the science of building energy management has been honed and a recognition of the benefits of managing for "continuous improvement" has been developed, from which Culver can greatly benefit.[7]

Consistent with this approach, we make the following recommendations:

Recommendation 36

Set an achievable but ambitious goal for annual energy intensity reduction. Specifically, we recommend that Culver aims to cut energy waste sufficient to reduce energy use by a minimum of 3% each year.

Recommendation 37

Orient staff, faculty and student resources toward this goal. Develop educational outreach so that all members of the Culver community can play a role in achieving the goals.

Recommendation 38

Reward achievement by aligning bonus earnings or other valuable compensation such as extra paid leave or specialized continuing education opportunities for building managers with attaining or surpassing the annual energy use reduction targets. Additional non-monetary benefits should be developed for faculty, staff, and student contribution to the goals.

Minimizing Water Waste and Toxic Chemical Exposure

While this committee focused intensely on energy performance, we note the need to develop equally detailed recommendations for water conservation and reduction of toxic chemical exposure through the full range of exposure pathways including the use of non-toxic building materials, and the use of safe cleaning products during building maintenance. Our recommendations are:

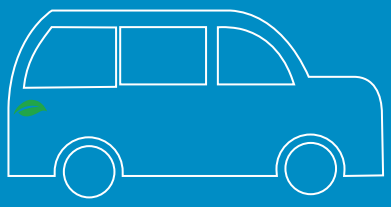
Recommendation 39

Maintain a team of students, alumni and staff to explore sustainable building rating systems that include benchmarking, tracking and continuous improvement on both water conservation and toxic exposure reduction. That team should make more detailed recommendations within 18 months of initiating its research

Conclusion

The Built Environment team thanks the CEF board for the opportunity to provide feedback relating to the Culver Academies and the future of sustainability on the campus. We hope the information we have provided is useful. Further, we have a passion for Culver and the campus and look forward to its continued prosperity. The CSAC would be delighted to help in the future, whether to be a sounding board for ideas, to share our knowledge as it relates to current trends, etc. Please feel free to ask for assistance at any time.

CEF Transportation Assessment



As sustainability becomes more of an everyday expectation in the marketplace, improving the efficiency of the vehicle fleet is a relatively easy way to:

- Maintain and enhance the campus's physical beauty
- Reduce operating costs
- Project a sustainable image wherever Culver vehicles operate

The focus of our review of Culver's transportation program was on Culver's on-road vehicle fleet. This fleet includes service vehicles like pickup trucks and catering vans, student transportation including mini-buses and coach buses, and passenger vehicles like sedans and minivans.

Culver's Vehicle Landscape

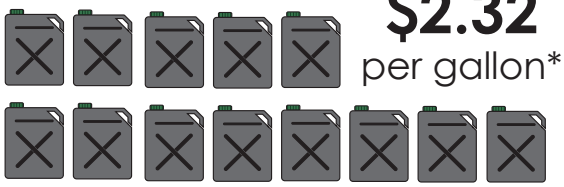
Gasoline

$2.22 per gallon*

Annual Consumption 23,000 Gallons

\+

Diesel



$2.32 per gallon*

14,000 Gallons

= $83,500

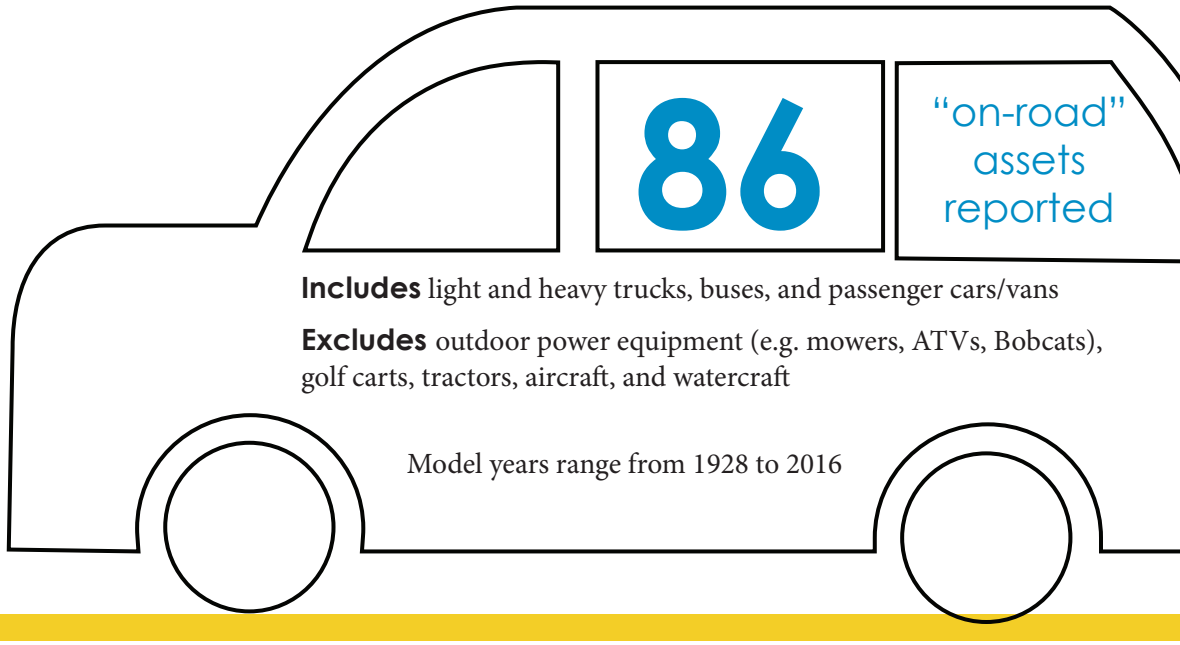
Average annual costs for motor fuel

* Campus-wide, including all vehicles. Data does not exist yet to separate out on-road vehicles.

95%
powered by conventional power-train with internal combustion engine (ICE) and stepped ratio transmission

1%
utilize gasoline/electric hybrid propulsion

3.4%
use full electric propulsion



Includes light and heavy trucks, buses, and passenger cars/vans

Excludes outdoor power equipment (e.g. mowers, ATVs, Bobcats), golf carts, tractors, aircraft, and watercraft

Model years range from 1928 to 2016

Greenhouse Gas Calculations

Gasoline

414,000 pounds
(187 metric tons)

Diesel

308,000 pounds
(140 metric tons)

= 541,500
pounds CO^2 emissions annually from motor fuel

Transportation Recommendations

Recommendation 40

Culver should target a strategic goal of 5% decrease in motor fuel consumption for fiscal year 2018-2019 compared to FY 2017-2018, and 3% per year reduction after that using the following tactics:

40a. Driver behavioral changes

- Minimize idling.
- Minimize aggressive accelerations.

40b. Vehicle modifications

- Replace tires with low rolling resistance instead of conventional tires.
- Where possible, install power-train calibrations focused on improving fuel economy.

40c. Vehicle attrition

- As conventional ICE-powered vehicles are retired, replace them with full electric equivalents where appropriate, assuming they meet the criteria described in recommendation 41. *Note: A charging infrastructure on campus will be required.*
- If a full-electric equivalent cannot meet the criteria described in recommendation 41, a gasoline-electric hybrid or conventional ICE-powered vehicle that achieves a minimum of 5% better EPA estimated miles per gallon ratings should be procured.

Recommendation 41

When considering vehicle purchases, Culver should integrate sustainability into its decision making process, ensuring the following criteria are met:

41a. Maximize efficiency

- The vehicle performs its duty cycle with minimum fuel consumption and greenhouse gas (GHG) emissions.

41b. Maximize safety and dependability

- The vehicle make no compromises on safety and dependability.

41c. Minimize cost of ownership

- Does the vehicle's acquisition cost fit within budget constraints, and the longer-term cost profile including depreciation, maintenance, disposal, and training of personnel makes economic sense.

Recommendation 42

Adopt long term vision of full-electric on-road fleet by 2030

- Managing the over-cost compared to conventional ICE-powered vehicles is an open question until price parity occurs. *Note: a charging infrastructure on campus will be required.*

Natural Resources Working Group Report

Culver's Summer Sustainability Interns and biology instructor, Dr. Rebecca Sam, discuss research protocols in Culver's pollinator prairie.

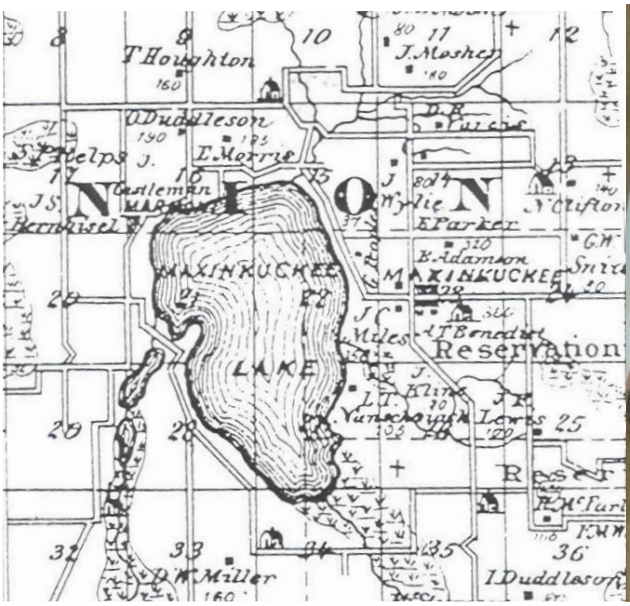
Overview

Perhaps the most common bond we who love Culver share is our interaction with and appreciation for Lake Maxinkuckee and our beautiful campus. We share that bond with Henry Harrison Culver who in an interview in 1893 described some of his earliest memories with the area.

I spent the whole summer (of 1883) by the side of the lake. I fished nearly all day, and lived in a tent. When fall came, I was a different man, it had such a glorious effect on my health that I determined to acquire property here.[8]

The Academies, of course, sprung from Mr. Culver's energy and vision which in no small measure was inspired by his love of the lake and its environs. Mr. Culver certainly is not the only one who loved this area. The Potawatomi who lived here for scores of generations prior to European settlers' arrival certainly had a deep and abiding respect for the lake and the land.

In the context of our impact on our environment, sustainability implies we should take a cue from the native peoples and leave our place – campus, community, country, planet – better than when we found it. As sustainability adherents, we believe



Left: 1876 Plat Map of Lake Maxinkuckee. Right: Three Potawatomi chiefs, 1837.

conservation and stewardship are admirable traits that should be promoted and valued. Culver's Mission Statement captures this concept succinctly, when it states we educate students to be leaders and responsible citizens in society. Responsible people take care of their home.

As with maintaining any home, the ecological stewardship of Culver's property inevitably requires balancing economic and social interests with doing the "right" thing for the environment.

Culver's "natural" home is predominated by two distinct ecosystems, the lake and the forests. Additional ecosystems, including wetlands, prairies and streams, are scattered across the campus, but the lake and the forest were the main focus of our working group.

The purpose of this report is not to restate all that is known about these two main ecosystems; however, it is important to make the following observations.

Above: Summer scene. Right: The environmental, social, and economic circles intersect that create sustainable principles. Opposite page: Summer camp utilizes Lake Maxinkuckee as a learning platform.

Lake Maxinkuckee

We know much about the ecology of Lake Maxinkuckee. The breadth and quality of scientific study of the lake is practically unrivaled, certainly compared to other similar lakes in the upper Midwest. Between 1899 and 1985 many scientific investigations were conducted on Lake Maxinkuckee. The most extensive survey of the lake was that of the United States Bureau of Fisheries, which maintained a field station on the lake between 1899 and 1914. Known as the Evermann & Clark survey, this two-volume set was published in 1920 by the Indiana Department of Conservation. Except for one 1921 sampling by the Indiana State Board of Health; no other scientific data has been found about the lake between 1921 and 1965. From 1965 to today, however, Lake Maxinkuckee has had over 60 individual research studies done by various organizations including the United States Environmental Protection Agency, the Indiana Department of Natural Resources, Indiana University, Purdue University as well as many studies commissioned by the Lake Maxinkuckee Environmental Council.

Armed with this wealth of research and testing, the Lake Maxinkuckee Environmental Council (LMEC) of which the Academies is a founding member and key supporter, has been instrumental in protecting and preserving the lake and its watershed for more than thirty years. Today, due to these efforts, Lake Maxinkuckee is judged to be in an almost pristine state by the Indiana Department of Environmental Management and the United States Environmental Protection Agency.

1931 Photo of the Bird Sanctuary

Forest Lands

(Note: This section is adapted from the soon-to-be-released study of Culver's woods by Ecoforesters.)

Surrounded by land primarily managed for agricultural use, Culver's forest has high ecological significance. Though the entire state of Indiana was once dominated by large areas of old growth forests such as those found in parts of The Bird Sanctuary, Culver's forest is now a rare relic of this past, providing high quality habitat for wildlife that depends on forest. Additionally, Culver's forest provides significant ecological services to protect water quality in Lake Maxinkuckee, provide clean air, and store forest carbon, offsetting carbon emissions from the rest of campus. Culver's forest also provides abundant recreation and educational opportunities for the community, staff, students, and campers. In a walk through the towering old growth trees of The Bird, one could imagine oneself in the pre-settlement forest of Indiana 250 years ago. It is worth noting that in 1800, the state of Indiana was 90% forested and 10% prairie. The vast forests that surrounded what is now Culver were host to wolves, cougars, black bears, bison, and elk. As recovered mastadon bones attest, even large mega-fauna roamed this area many thousands of years ago.

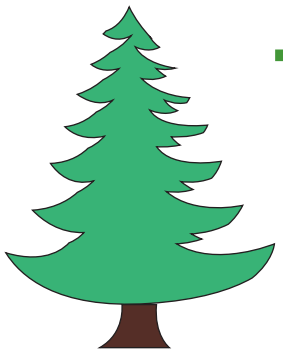
Unfortunately, Culver's forest is under a suite of threats from an overpopulation of deer, invasive plants and insects, most significantly the emerald ash borer, bush honeysuckle, and oriental bittersweet vine. These species threaten the future existence of the forest itself. While roughly one quarter of the forest contains high quality old-growth habitat with limited invasive plants, almost half of the forests consists of abandoned fields that have grown up with a dominance of invasive species and scattered unhealthy trees. Compounded with the loss of ash trees, overpopulation of deer, and inevitable

Area of Each Cover Type

Forest

141
Old-Growth
Forest Acres

+



142
Mid-Successional
Forest Acres

+

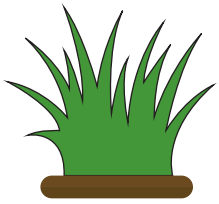
260
Invasive
Infested
Forest Acres

= 543
Total Forest Acreage

Campus

371 Acres

+



Pasture

314 Acres

= 1,228 Total Acreage

Courtesy EcoForesters

Basal Area by Cover Type & Diameter Class

Natural Community Type	4-8"	8-12"	12-16"	16-20"	20-24"	24-28"	28-32"	34-36"	<34"	Total
Old-Growth	8	14	15	11	23	22	26	26	0	**145**
Mid-Successional	10	13	21	23	14	11	0	5	7	**104**
Invasive Infested	11	20	27	17	10	4	2	6	5	**102**

Average Percent Cover of Non-Native Invasive Species by Cover Type

Natural Community Type	Bush Honeysuckle	Oriental Bittersweet	Buckthorn	Garlic Mustard	Multiflora Rose	Japanese Barberry	Other Invasive*
Old-Growth	4%	4%	3%	9%	1%	<1%	6%
Mid-Successional	9%	3%	1%	9%	4%	5%	2%
Invasive Infested	51%	30%	27%	14%	8%	1%	12%

** Other species include: Autumn olive, privet, vine honeysuckle, Japanese stilt grass, burning bush, phragmites, and tree-of-heaven.*

Courtesy of EcoForesters

continued natural disturbance, these invasive plants will continue inward from the forest edges to the interior, establishing dominance and interrupting natural succession.

Without significant intervention using positive impact forestry, over time Culver's high-quality forests will be diminished. A soon-to-be released report by EcoForesters establishes some excellent specific recommendations to manager Culver's forests for the long term. These recommendations are **First** to control and monitor invasive plants, prioritizing high quality core forest areas first and secondarily doing more intensive forest restoration and invasives control in invasives infested forest.

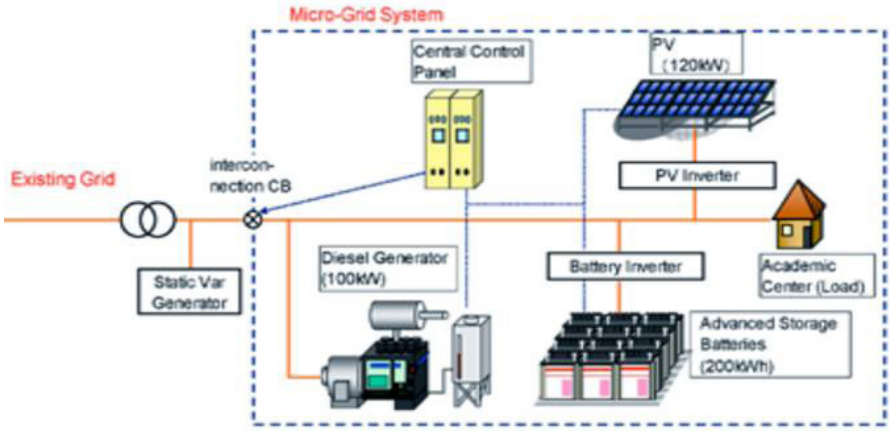
Second, EcoForesters recommends a sustained effort to control deer populations such that browse is reduced and native tree regeneration can occur.

Third, EcoForesters recommends tree planting, protected from deer browse, for forest restoration in invasives infested forests and areas that have recently seen significant ash mortality due to the emerald ash borer.

Fourth, restoring Culver's forest not only sustains and enhances its benefits now and for future generations, it could provide a great educational opportunity for Culver's students on the lessons of environmental stewardship in the 21st century. We strongly endorse EcoForester's final recommendation to advance learning opportunities for students as well as to adopt a system for long-term forest monitoring and adaptive stewardship.

Bush Honeysuckle, an invasive plant, at edge of Culver forest.

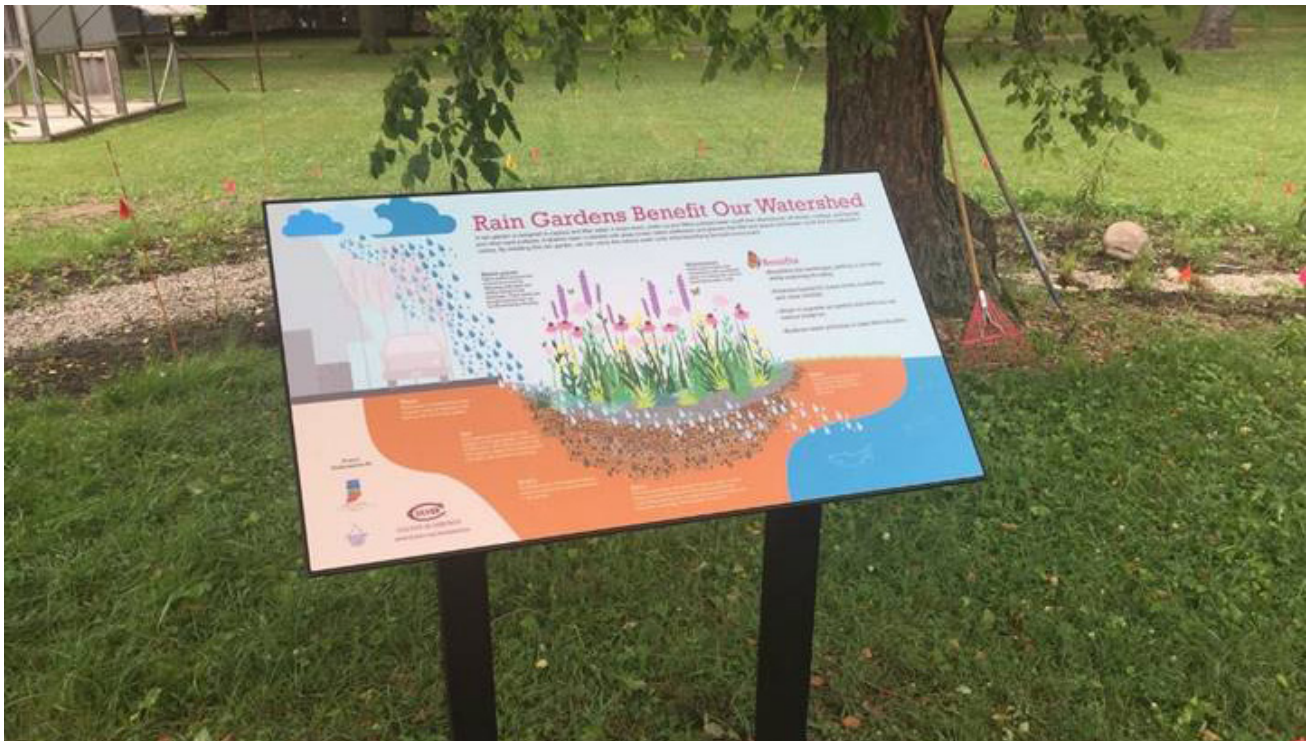
Microgrids



Notwithstanding the discussion above concerning the primacy of the lake and the forests for our subgroup's focus, a key recommendation below regarding Culver's electric grid requires some context and explanation. One might observe that it is not immediately apparent how the electric grid and the natural areas are directly related. However, we believe that a particular domain of our campus – the Woodcraft camp, is one where the natural environment, the built environment and the social environment combine uniquely to present an important and distinctive opportunity to advance sustainability at Culver. Furthermore, due to our working group's particular experience and expertise, we undertook deep exploration of a microgrid concept for Woodcraft.

A microgrid is a localized grouping of distributed energy sources, like solar, wind, in-stream hydro, and biomass, together with energy storage or backup generation and load management tools. This system can operate as a stand-alone entity or its users can plug into the larger grid as needed. Microgrids are nimble, efficient microcosms of the big grid, designed for smaller, diverse energy sources. The use of local supply to serve local demand makes them more resilient and reduces energy lost in transmission and distribution.[9]

The potential efficiency and resiliency benefits of a microgrid alone merit further investigation. When one considers the learning opportunities such a system presents for students, we believe further exploration of this concept certainly justified. Animating our exploration were these questions: "What if we could take a part of campus, say the Woodcraft Camp, off the grid? How might we do that and would it make sense?" To aid in this exploration, we facilitated several conversations and one on-campus meeting with microgrid experts from NIPSCO, Cummins, Ag Technologies (solar company), and Design Collaborative (an energy engineering firm). The result of this initial exploration is a baseline model for a microgrid at Woodcraft that can be considered for a future pilot at Culver.



Right: Sediment plume at Cardinal Creek following 1" rain, June 2016.
Left: Educational sign with rain garden in background, Woodcraft Camp.

Our Process

To develop our recommendations, our working group drew on several sources of information. First and foremost, the Facilities team led by Jeff Kutch was extremely gracious with their time and support. Dave Blalock, who leads the grounds department was particularly helpful. Two other key resources were Kathy Clark of the Lake Maxinkuckee Environmental Council and Rob Lamb and his team at EcoForesters. In addition, the teams from NiSource/NIPSCO, Cummins, Ag Technologies, and Design Collaborative were very generous with their time and advice.

Lake/Watercourses

The lake is obviously vital to Culver and the surrounding community and Culver Academies, for the most part, has been a proactive steward of the lake. Nonetheless, there are a number of "Best Practices" regarding lake and watershed stewardship which Culver could adopt to further improve the quality of our water resources well into the future. Additionally, adopting best management practices provides Culver students and campers with hands on learning opportunities which they may take back to their home communities and/or pursue academically. Our recommendations are based on our own experience and training, conversations with stakeholders and the excellent work of the Lake Maxinkuckee Environmental Council.

Recommendation 43

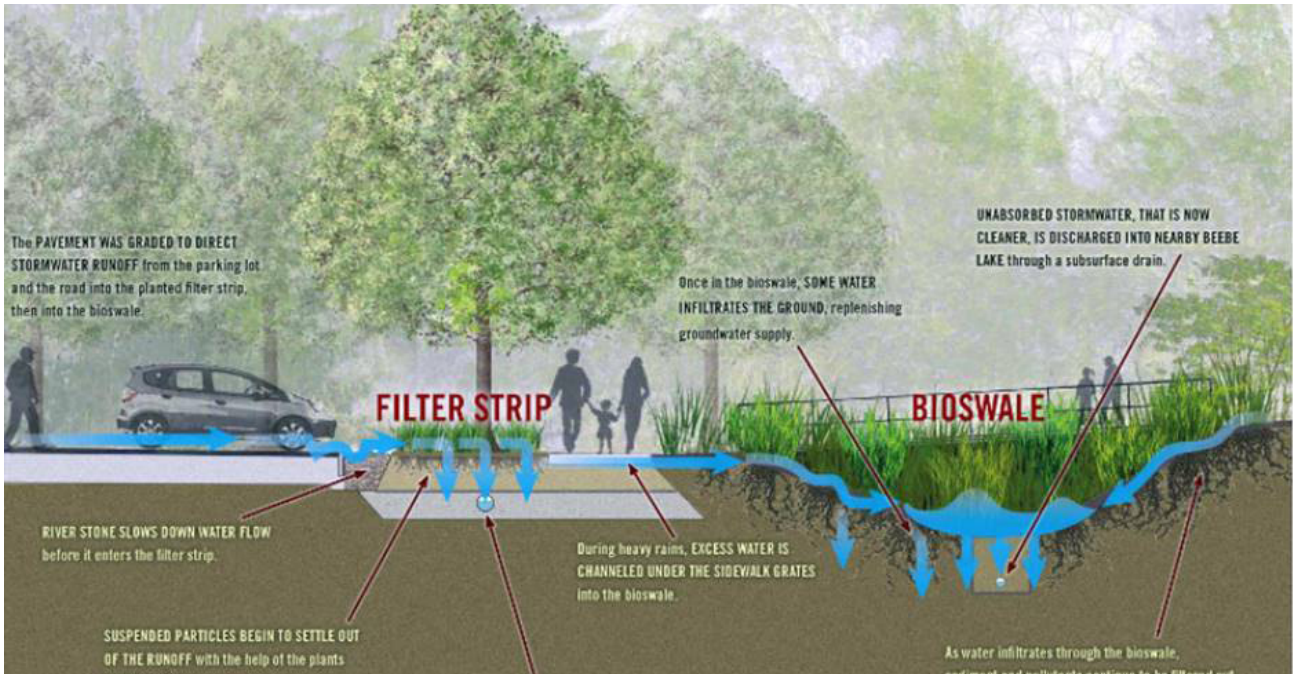
Remove more seawalls and restore beaches on lake shore (for habitat restoration and reduction of wave action and turbidity). This effort is underway and partially complete. Results of current "softening" are promising. Wildlife in restored areas from the crew shed to the naval building are full of life. The Academies have heavy equipment to accomplish this internally. Several sections from Naval building to Indian trail still could be restored.

Recommendation 44

"Daylight" culvert at "Hatchery Creek," the small creek on east side of old motel location. Removing this culvert would provide habitat and create a natural drainage into the lake.

Recommendation 45

Restore Cardinal Creek–Restoring the section of stream along State Road 117 would involve revegetating with trees and native wetland plants, restoring the natural meander to stop sedimentation in lake by trapping soils. Further restoration could include daylighting sections of the creek



This image illustrates green infrastructure technologies which could be applied at Culver.

Recommendation 46

Evaluate and restore various ditches to creeks where possible. The focus of this recommendation are the agriculture ditches draining into the Bird Sanctuary area on the north and east side of campus.

Recommendation 47

Create more campus rain gardens, bioswales and other natural storm water remediation systems.

Recommendation 48

Install lake data monitoring equipment – Real time and on-line lake data monitoring system on or near campus (water height, temp, temp at depths, meteorology etc. would be valuable for student learning as well as supporting the efforts of other entities (specifically Lake Maxinkuckee Environmental Council) stewardship of the lake.

Recommendation 49

An appropriate next step for the Academies would be to develop a "green infrastructure plan" which would apply biological and engineering analysis to areas around our campus to identify green projects to implement. Such a plan would help address storm water and waste water, a particularly urgent task given plans to continue expanding the Academies' built infrastructure.

Forest and Natural Areas

The forthcoming report from EcoForesters contains a number of thoughtful natural area management recommendations which we endorse.

Recommendation 50
Implement invasive control plan. EcoForester report contains detailed recommendations on areas and approaches for this vital stewardship mission.

Recommendation 51
Digitally map trails and make available to students, faculty and staff.

Recommendation 52
Restore controlled deer hunting or some effective method of deer control. Evidence is overwhelming that deer browsing is negatively impacting the health of Culver forests.

Recommendation 53
Creation of a Big Tree List from forestry work, and possible listing of trees with National Arbor Day Foundation or Indiana DNR. Great way to get students outside. Where's the biggest oak tree? What about the biggest sycamore?

Recommendation 54
Adopt land acquisition plan for improved natural areas and campus privacy buffers

Recommendation 55
Evaluate establishing a sugar business on campus. Best candidate would be heavy maple areas between golf course and old airport, perhaps in concert with Rubin Café, soon to be installed Culver orchard, and existing apiary

Recommendation 56
Evaluate and implement curricular tie ins from EcoForester Report

Recommendation 57
Implement reforestation plan as outlined in EcoForester Report

Campus

While the above recommendations focused on the "natural" areas on campus, a significant opportunity exists to create more "naturalized" areas on the main campus. Doing so provides functional benefits, the most important of which include storm-water treatment, reduced erosion and habitat creation.

Recommendation 58
Adopt native plant policy[10]

Recommendation 59
Remove invasive plants from campus and housing areas. As an example, prior decorative plantings of bush honeysuckle on campus has provoked an invasive threat to Culver forests in subsequent years

Recommendation 60
Establish goal limiting amount of impervious surface; require RFPs for pervious surface solutions wherever possible on campus.

Recommendation 61
Evaluate biomass use and disposal, including organic waste material from landscaping on campus

Recommendation 62
Internship to advance built and natural environment pilots on campus.

Electric Grid

Recommendation 63
Culver should continue to evaluate the feasibility of establishing a microgrid energy system for a significant portion of campus. The Woodcraft energy load and location make it an ideal candidate for a pilot study. The Appendix contains a spreadsheet model suitable for exploring various parameters from the desktop.

Resources/ Appendices

Summary of Sustainability Advisory Council Recommendations

SOCIAL ENVIRONMENT WORKING GROUP

Building and Behavior

1. Educate/inform community members about ways to save energy—through Green Life, campus convocations, etc. Draw on inventory of energy savings ideas from U.S. Department of Energy, the U.S. Green Building Council, and academic institution residence halls

2. Communicate clear incentives for community members to benefit from energy savings

3. Measure current energy utilization per building through sub-metering

4. Compare energy utilization across buildings

5. Calculate campus-wide energy savings (denominated in energy units and denominated in dollars)

6. Reward big energy savers (by building) with non-monetary perks (e.g. sleep ins), discretionary use of some of funds associated with energy savings and other leadership recognition

7. Deploy some energy savings into future investments in Culver sustainability in built, natural, and social environments

Green Revolving Fund

8. Challenge Culver supporters to develop and grow a funding stream for sustainability at Culver in communications with alumni and parents

9. Establish a dedicated philanthropic effort to seed and to grow a Green Revolving Fund (GRF) (Recommend $25,000 initial launch minimum through lead donor(s) and/or specific crowdfunding opportunity) beyond the initial $2,000 fund allocated by Dr. Power. Fund will be evergreen/self-preserving over time

10. Circulate annual call for proposals to students, faculty and staff for GRF project grants to advance sustainability at Culver. Recommended project proposal preferences:

    10a. Projects that are implementable within a given year

    10b. Projects that can be extended across years for continuity

    10c. Projects that have demonstrated opportunities to recoup initial grant investment through follow-on or matching grants, linked cost savings, fee revenue, etc.

    10d. Projects that "touch" the built, natural and/or social environments at Culver are eligible

    10e. Projects that link tangibly to student learning are favored

    10f. Projects that can "lead by example" for other academic institutions are favored

    10g. Projects must be showcased annually during Green Week or other Culver Sustainability Summit/Convocation

Food

11. Increase the skills and knowledge of culinary staff by providing them with a range of trainings, to include all aspects of increasing the use of fresh local fruits, vegetables, and meats in school meals and highlighting their role in improving health, flavor, and sustainability

12. Integrate definition and purchasing of local food products into Culver's procurement process to increase pro-local purchasing, support the local economy, and reduce transportation miles and GHGE

13. Create educational campaigns for students and staff to limit food waste on the plate

14. Research the feasibility of a school/community garden and greenhouse on campus as an outdoor classroom for cross curricular training and a way to educate and highlight the importance of locally produced food

Curriculum

15. Culver should intentionally develop sustainability learning opportunities within our campus operations–facilities, dining, business management. Such an effort recognizes that all staff have a role to play in educating our students and one another. Analyzing our campus energy or water use; operating the food recovery program; operating a green revolving fund… each of these are examples of experiential-based learning opportunities which could be incorporated into the curriculum

16. Building on the EcoForester's report, Culver will establish an outdoor ecology curriculum with a focus on restoration ecology, biodiversity and taxonomy. Over time, this curriculum will expand to include the pollinator prairie, lake, streams and wetlands on and around our campus

17. Building on the Honors in Sustainability Seminar slated to begin in the Fall of 2018, Culver should develop a prerequisite "Principles of Sustainability" course for Fall of 2019

18. Culver should cultivate and develop academic relations with sustainability programs in area colleges and Universities (Notre Dame, Purdue, Goshen, Ancilla). This program could include hosting university students on our campus and cooperative curriculum development

19. Culver should evaluate developing sustainable, entrepreneurial food and curriculum projects, along the lines of the Rubin Café – for example, orchard products, honey, maple sugar, farm/garden produce

Communication

Media

20. A Sustainability Newsletter, consisting of timely and relevant content could be used to communicate 'Sustainability News' to program stakeholders and prospective stakeholders

21. Social media and websites, by virtue of interactive user-contributed content and significantly greater reach to many more users than newsletters, could afford 'best practice' methods to enhance awareness and understanding of Culver's programs and foster relationship building in the field

Speaker Series

22. Create an endowment to support bringing experts in the field of sustainability to Culver. Invited speakers will create increased awareness and knowledge regarding innovative domestic and global sustainability practices. The series' goal is to host local/regional, domestic, and global leaders on a range of sustainability issues, e.g., sustainability entrepreneurs, innovative sustainability technologies, innovative energy and water conservation, policy makers and policies, democratization of environmentalism and sustainable community development

Film & Visual Arts

23. Institutionalize/formalize and fund a Sustainability Film & Visual Arts Program at Culver. Film, video, and visual arts are increasingly popular and being used to effectively communicate–to make more people aware and facilitate understanding of sustainability issues. In addition to the student-made video in support of Culver's first solar project, Culver students have produced videos on water sustainability and, recently, the food recovery program

24. Leverage ways to further communicate Culver's Sustainability Program by engaging with like-minded sustainability advocates, practitioners, entrepreneurs, and more by participating in sustainability, environmental, and conservation film festivals

Connect with Local Community

25. Continue and grow our support of the Lake Maxinkuckee Environmental Fund and Council with staff and financial resources. Invite students to attend LMEC meetings to engage with local residents regarding environmental issues

26. Invite local community, alumni, parents to tour and participate with Culver's sustainability initiatives, recycling initiatives, orchard, Cardinal Creek projects, etc. Encourage student led tours/ discussions/presentations.

Connect with Peer Institutions

27. Culver's resource utilization (e.g. water consumption) compares to peer institutions, including tracking resource use by function and location

28. Culver Green Life and Faculty Sustainability members to look for institutional leadership from other school sustainability clubs to from other schools' sustainability clubs to benchmark and share successful projects

BUILT ENVIRONMENT WORKING GROUP

Building Recommendations

Capturing the Opportunity for Energy Performance in New Construction

29. Establish a near-term policy that each new building or major modification undertaken will achieve an Energy Star score of at least 80, and to evaluate whether a score of 90 is achievable

30. Evaluate other existing rating systems for new buildings including the LEED® rating system developed by the U.S. Green Building Council (USGBC), the New Building Institute's Zero Energy Building certification, and the Living Buildings Challenge

31. CEF should require its design firms to meet a base minimum design standard developed by the Culver Academies. These "Owner's Project Requirements" (OPRs) will include aesthetic considerations, minimum construction standards, as well as specific sustainability requirements and options (See Appendix 7).

Energy Waste in Existing Buildings

32. Sub-meter each building to measure and track its energy performance can be measured and tracked

33. Use the Energy Star benchmarking and reporting system to gain an understanding about how each building is performing relative to a vast database of similar buildings, identify problems that are causing energy waste and incorporate elimination of those problems into an annual planning cycle

34. Adopt a policy that Culver will pursue energy savings building upgrades wherever analysis indicates that the value of the energy savings will outweigh the up-front cost of the measure, over the full lifetime of the measure

35. To the extent that the number of cost-effective measures are too numerous to undertake within current budgets, Culver should explore performance contracting through which an energy services company would provide the up-front costs of a campus-wide retrofit program, and the institution would pay for the projects over a number of years as the savings is being realized

36. Set an achievable but ambitious goal for annual energy intensity reduction. Specifically, we recommend that Culver aims to cut energy waste sufficient to reduce energy use by 3% each year

37. Orient staff, faculty and student resources toward this goal. Develop educational outreach so that all members of the Culver community can play a role in achieving the goals

38. Reward achievement by aligning bonus earnings and other valuable non-financial incentives like extra paid leave or specialized continuing education opportunities for building managers with attaining or surpassing the annual energy use reduction target. Additional non-monetary benefits should be developed for faculty and student contribution to the goals

Minimizing Water Waste And Toxic Chemical Exposure

39. Maintain a team of students, alumni and staff to explore sustainable building rating systems that include benchmarking, tracking and continuous improvement on both water conservation and toxic exposure reduction. That team should make more detailed recommendations within 18 months of initiating its research

Transportation

40. Culver should target a strategic goal of 5% decrease in motor fuel consumption for fiscal year 2018-2019 compared to FY 2017-2018, and 3% per year reduction after that using the following tactics:

40a. Driver behavioral changes

- Minimize idling
- Minimize aggressive accelerations

40b. Vehicle modifications

- Replace tires with low rolling resistance instead of conventional tires
- Where possible, install power-train calibrations focused on improving fuel economy

40c. Vehicle attrition

- As conventional ICE-powered vehicles are retired, replace them with full electric equivalents where appropriate, assuming they meet the criteria described in recommendation 41.
- If a full-electric equivalent cannot meet the criteria described in recommendation 41, a gasoline-electric hybrid or conventional ICE-powered vehicle that achieves a minimum of 5% or better EPA estimated MPG

41. When considering vehicle purchases, Culver should integrate/continue to integrate sustainability into its decision making process, ensuring the following criteria are met:

41a. Maximize efficiency

- The vehicle performs its duty cycle with minimum fuel consumption and greenhouse gas (GHG) emissions

41b. Maximize safety and dependability

- The vehicle make no compromises on safety and dependability

41c. Minimize cost of ownership

- Does the vehicle's acquisition cost fit within budget constraints, and the longer-term cost profile including depreciation, maintenance, disposal, and training of personnel makes economic sense

42. Adopt long term vision of full-electric on-road fleet by 2030

NATURAL AREA WORKING GROUP

Lakes and Water Courses

43. Remove more seawalls and restore beaches on lake shore

44. "Daylight" culvert at "Hatchery Creek"

45. Restore Cardinal Creek

46. Evaluate and restore various ditches to creeks where possible

47. Create more campus rain gardens, bioswales and other natural storm water remediation systems

48. Install lake data monitoring equipment

49. Create Green Infrastructure Plan

Forest and Natural Areas

50. Implement invasive plant control plan

51. Digitally map trails and make available to students, faculty, and staff

52. Restore controlled deer hunting or some effective method of deer control

53. Creation of a Big Tree List from forestry work, and possible listing of trees with National Arbor Day Foundation or Indiana DNR

54. Adopt land acquisition plan for improved natural areas and campus privacy buffers

55. Evaluate establishing a sugar bush business on campus

56. Evaluate and implement curricular tie-ins from EcoForester Report

57. Implement reforestation plan as outlined in EcoForester Report

Campus

58. Adopt native plant policy

59. Remove invasive plants from campus and housing

60. Establish goal limiting amount of impervious surface

61. Evaluate opportunities for productive biomass utilization

62. Create Engineering Internship

Electric Grid

63. Evaluate the feasibility of establishing a microgrid energy system for a significant portion of campus with a recommended first pilot at Woodcraft Camp

1. Sustainability Advisory Council Meetings
2. Community Survey Data
3. Case Study – Henderson Ice Rink
4. Case Study – Memorial Chapel
5. Case Study – Campus Lighting
6. White-DeVries Rowing Center Energy Star Score Sheet
7. New Construction Owner's Project Requirement Template
8. Campus Building Square Footage
9. Transportation
10. Reference Links
11. Sustainability Rubric

Appendix 1
Meeting Agenda

Sustainability Advisory Council Meetings
Schedule of Events

First Meeting:
September 25–27, 2016

September 25

3:00 p.m.
Council members arrive on campus and get settled – Check in at Main Guard for your house key

4:00 – 5:00 p.m.
Introduction using Pairings, White DeVries Rowing Center

5:00 – 6:30 p.m.
Campus Sustainability Tour – Accomplishments, Opportunities and Challenges – Mini bus depart from Rowing Center parking lot.

6:30 – 8:00 p.m.
Reception and Dinner, White DeVries Rowing Center

Monday, September 26

7:30 – 8:15 a.m.
Breakfast , Roberts Hall of Science, Roberts Auditorium

8:30 a.m.
Sustainability Council Convenes
Roberts Hall of Science, Roberts Auditorium

8:30 – 9:00 a.m.
Welcome and Introduction of Dr. Jim Power – Hildy Teegen, "Why Sustainability?" – Dr. Jim Power

9:00 – 9:30 a.m.
Sustainability Overview at Culver – Chris Kline

9:30 – 10:00 a.m.
The Environmental Sustainability Movement in Independent Schools – Dr. Paul Chapman

10:00 – 10:15 a.m.
Break

10:20 – 10:40 a.m.
Culver Master Plan – Susan Thews and Darrell Garbacik

10:40 – 11:00 a.m.
Sustainability in the Culver Summer Schools and Camps – Don Fox

11:00 – 11:20 a.m.
Sustainability in the Culver Curriculum – Kevin MacNeil

11:20 – 11:40 a.m.
Sustainability and Dining Services – Carol Buchanan

Noon – 1:00 p.m.
Lunch Round Table Discussion " Sustainability in the Community" – Jonathan Leist, Ginny Munroe, Sr. Mary Baird, PHJC, Beason Hall

1:10 – 1:45 p.m.
Student Perspectives, Roberts Auditorium

- Green Life – Tori Styers
- Service Learning – Justin Matei
- Honors in Leadership – Nate Cripe

1:45 – 2:30 p.m.
Culver Academies: Sustainability Looking Forward – Paul and Chris

2:30 – 2:45 p.m.
Break

2:45 – 3:15 p.m.
CSAC Organization – Hildy

- Member interests/expertise
- Working Group Structure
- Select Working Group Chairs
- Recording Secretary

3:15 – 4:30 p.m.
Initial Working Group Meeting

- Review key questions
- Determine data needs/request

4:30 – 5:15 p.m.
Working Group Report Out and Wrap Up, Hildy

6:00 – 7:30 p.m.
Boat tour of Lake Maxinkuckee

7:30 – 9:00 p.m.
Dinner, Naval Building

Tuesday, September 27

7:30 – 8:15 a.m.
Breakfast, Lay Dining Hall

8:30 – 9:30 a.m.
Continue Working Group Meetings, Roberts Auditorium

9:30 – 9:45 a.m.
Break

9:45 – 11:00 a.m.
Determine Focus Areas and Prioritization for Working Groups – Hildy

11:00 – 11:30 a.m.
Determine Meeting/Call Schedule for Working Groups – Hildy

11:30 a.m.
Box lunch for Council departure

Noon
Sustainability Leadership Team lunch debrief
Lay Dining Hall

Second Meeting: July 6–8, 2017

Thursday, July 6

Before 4:00 p.m.
Council members arrive on campus and get settled – Check in at Culver Cove, 319 W. Jefferson St, Culver, (3p.m. check–in time)

4:30 – 5:00 p.m.
Introduction and Charge for the Weekend – Beason Hall

5:00 – 6:00 p.m.
Campus Sustainability Tour –Rain Garden, Solar Site, Prairie Biodiversity Project – Mini bus

6:30 – 8:00 p.m.
Reception and Dinner
Beason Hall – We will be joined by SLT members, Dean Lynn Rasch and Holly Johnson. Also joining will be Andy Dorrel and Jen Cerny, economics and humanities instructors with an interest in integrating sustainability into the curriculum.

Friday, July 7
7:30 – 8:15 a.m.
Breakfast, Beason Hall

8:30 – 9:00 a.m.
Welcome and Update – Hildy Teegen and Chris Kline, Beason Hall – Throughout our meetings on Friday and Saturday we will be joined by sustainability interns Julia Smith (CGA ’17), Madi Berman, (CGA ’15), and Regina Padilla, (CGA ’15)

9:00 – 10:00 a.m.
Working Group Breakout to fine tune Board Presentation Modules, Beason Hall

10:00 – 10:30 a.m.
Break

10:30 – 11:30 a.m.
Full Council Discussion of Proposed Next Steps by Working Group Area

11:30 – 11:50 a.m.
Sustainability in Higher Ed – Sustainability Intern Presentation

Noon –1 :30 p.m.
Lunch Round Table Discussion "Sustainability in the Community – Stellar Program and Marshall County Food Council" Jonathan Leist, Culver Town Manager and Angela Rupchek Shaffer, Marshall County Community Foundation – Beason Hall

2:00 – 3:00 p.m.
Working Group Meetings with Campus Stakeholders

3:00 – 4:00 p.m.
Final Prep for Board Meeting (Dry Run) with Full Council, Beason Hall

4:30 – 5:30 p.m.
Board Presentation and Related Discussion with Full Council, Roberts Auditorium

5:30 – 6 :00 p.m.
Board meeting debrief, Beason Hall

6:00 – 7:00 p.m.
Free Time

7:30 – 9:30 p.m.
Dinner, Lakehouse Grille

Saturday, July 8

7:30 – 8:15 a.m.,
Breakfast, Lay Dining Hall

8:30 – 9:00 a.m.
Full Council Convenes to discuss Working Group deliverables, Beason Hall, Holly Johnson, Director of Advancement, to join these meetings.

9:00 –10:30 a.m.
Working Group Meetings to Develop Deliverables Plans

10:30 – Noon
Full Council Reconvenes and meets jointly with SLT members; confirm schedule for balance of charter and discuss deliverables (box lunch provided)

Third Meeting: April 20-22, 2018

Friday, April 20

11:00 a.m.
Arrive and check-in, Roberts Hall of Science, Roberts Auditorium

Noon – 1:00 p.m.
Sustainability Council Convenes, Roberts Hall of Science, Roberts Auditorium

a. Working Lunch and Agenda Overview
b. Prep for All School Meeting – Alumni Lounge (1:00 – 2:30 pm)

2:30 – 3:30 p.m.
All School Sustainability Meeting, Eppley Auditorium

3:30 – 4:30 p.m.
Sustainability Council Reconvenes, Roberts Hall of Science, Roberts Auditorium

a. Follow up from ASM/Break
b. Debrief from ASM; Short Staff Meeting (4:30 – 5:30 p.m.)

7:00 – 9:00 p.m.
Dinner for Council and Guests, White-DeVries Rowing Center

Saturday, April 21

9:00 a.m.
Breakfast, Legion Memorial Building, Heritage Room

9:30 a.m. – Noon
Working Group Meetings with Students (Sustainability Prefects, Green Life, Honors in Sustainability),
Facilities, Student Life, Advancement to discuss recommendations and next steps
Built Environment Working Group – Toots Henderson Auditorium
Natural Environment Working Group – Legion Memorial Building, Dicke Conference Room
Social Environment Working Group – Sally Port, Great Hall Conference Room

Noon – 1:00 p.m.
Lunch, Legion Memorial Building, Heritage Room

1:00 – 3:00 p.m.
Service Opportunity – Pack recovered meals or plant orchard

3:00 – 6:00 p.m.
Break

6:00 – 9:00 p.m.
Dinner, Final Gathering and Thank You, Lakehouse Grille, downtown Culver

Sunday, April 22

Breakfast Available, Lay Dining Hall

Religious Services

Friday, April 20

6:30 p.m.
Jewish Service, Crisp Visual Arts Center, Toots Henderson Auditorium

Sunday, April 22

9:00 a.m.
Roman Catholic Mass, Memorial Chapel

10:30 a.m.
Protestant Service, Memorial Chapel

Appendix 2
Survey Results

Student/Faculty and Staff Survey Respondents

Answer Choices	Responses	
CGA Student	**38.20%**	212
CMA Student	**31.17%**	173
Faculty or Staff Member	**30.81%**	171
Alumni	**2.70%**	15
Parent of CGA student(s)	**3.96%**	22
Parent of CMA student(s)	**3.06%**	17
Parent of Summer student(s)	**1.62%**	9
Donor	**3.06%**	17
Corporate Partner	**0.18%**	1
Culver Academies Board Member	**0.18%**	1
Total Respondents: 555		

Perception of Culver's Commitment to Sustainability

	Demonstrably very committed	Somewhat committed	Indifferent	Not at all Committed	Total
Extracurricular Activities	**31.54%** 158	**46.91%** 235	**16.37%** 82	**5.19%** 26	501
Curricular (Classroom) Activities	**32.26%** 161	**46.09%** 230	**17.23%** 86	**4.41%** 22	499
Buildings and grounds	**24.15%** 121	**53.49%** 268	**16.77%** 84	**5.59%** 28	501
local community and surrounding areas	**19.56%** 98	**51.30%** 257	**23.75%** 119	**5.39%** 27	501

My Commitment to Sustainability…

	Demonstrably very committed	Somewhat committed	Indifferent	Not at all committed	Total	Weighted Average
(no label)	**32.14%** 162	**60.12%** 303	**6.35%** 32	**1.39%** 7	504	1.77

If Culver were to offer formalized sustainability learning opportunities (academic courses, speaker series, enduring projects such as a community garden/orchard, etc) I would be

	Demonstrably very committed	Somewhat committed	Indifferent	Not at all committed	Total	Weighted Average
(no label)	**33.26%** 149	**46.65%** 209	**16.52%** 74	**3.57%** 16	448	1.90

Board Survey Raw Data

I am

Answer Choices	Responses	
Parent Board	**40.74%**	22
Legion Board	**31.48%**	17
Summer Board	**27.78%**	15
Total Respondents: 54		

My perception of Culver's commitment to sustainability

	Demonstrably very committed	Somewhat committed	Indifferent	Not at all Committed	Total
Extracurricular Activities	**40.00%** 20	**44.00%** 22	**16.00%** 8	**0.00%** 0	50
Curricular (Classroom) Activities	**47.92%** 23	**43.75%** 21	**8.33%** 4	**0.00%** 0	48
Buildings and grounds	**38.78%** 19	**51.02%** 25	**6.12%** 3	**4.08%** 2	49
local community and surrounding areas	**30.61%** 15	**57.14%** 28	**10.20%** 5	**2.04%** 1	49

My commitment to Culver's sustainability effort

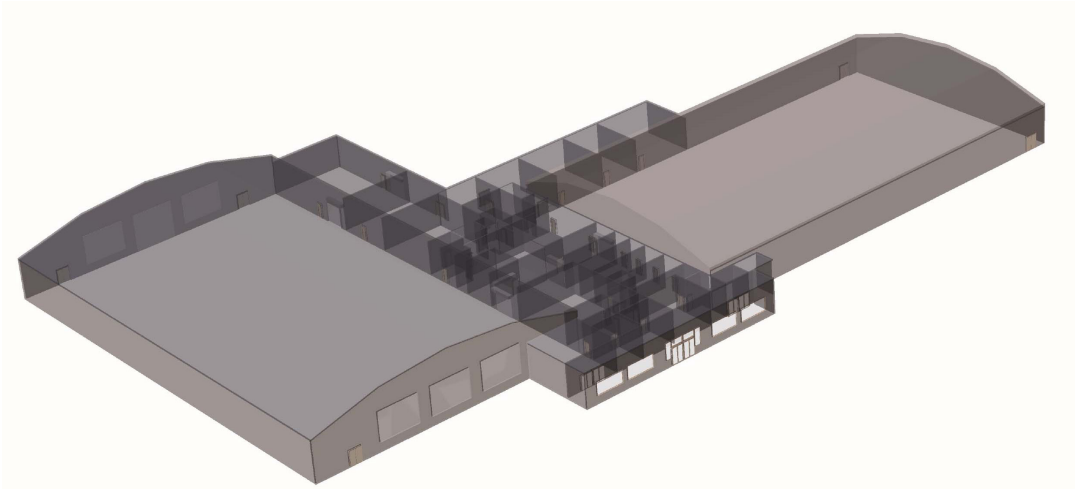
	Demonstrably very committed	Somewhat committed	Indifferent	Not at all committed	Total	Weighted Average
(no label)	**36.00%** 18	**64.00%** 32	**0.00%** 0	**0.00%** 0	50	1.64

: If Culver were to offer formalized sustainability learning opportunities (academic courses, speaker series, enduring projects such as a community garden/orchard, etc) I would be

	Demonstrably very committed	Somewhat committed	Indifferent	Not at all committed	Total	Weighted Average
(no label)	**54.76%** 23	**33.33%** 14	**9.52%** 4	**2.38%** 1	42	1.60

Appendix 3
Case Study – Henderson Ice Rink

The existing Ice Arena was constructed in multiple phases and has undergone several renovations as well. The facility houses two (2) ice sheets although the schedules are dissimilar. The building and the typical annual schedule (such as thickness of ice, conditioning ice schedules, maintained temperatures, frequency of use, etc) was brought into an hourly analysis simulation to better understand the costs associated with the facility and the opportunities for savings. Numerous assumptions were necessary as data exists for the electric consumption, but no data exists for the steam consumed, etc.



The major consumption of energy is related to the ice and ice quality. While a number of savings opportunities were reviewed, the following few are presented for discussion purposes. It is recommended that the facilities department pursue hard bid numbers to more accurately identify the simple paybacks listed below, as these savings are estimates based on the industry standard Means Cost Data.

Option 1
Emissivity panels with reflective paint.
The cost for this installation would likely run in the $100,000 range, with a savings of $15-20,000 per year, with a simple payback ranging from 5-6.5 years.

Option 2
Increasing the insulation at the perimeter walls to reduce skin losses

Option 3
Increasing the insulation at the roof to reduce skin losses

Option 4
Upgrade refrigerant system for the ice sheets
The single largest savings opportunity resides in the upgrade to more efficient refrigeration systems for the ice sheets. Due to the modifications from diesel to electric with the existing machines, it is inappropriate to estimate the savings in a tight band, as the exact parameters of this equipment in combination with the steam system are not

Henderson Ice Rink
Case Study Continued

able to be simulated closely enough. At the same time, it is apparent this is the single largest electric consumption and savings with new equipment is typically 10-20% of the building's utility cost. Although the savings is significant, the costs will be as well, likely with a payback of over 10 years.

Annual Cost Summary

Table 1. Annual Costs

Component	[B] Henderson Ice Arena ($)	[R] Henderson Ice Arena ($)
Air System Fans	85,793	77,233
Cooling	39,436	33,792
Heating	0	0
Pumps	30,438	27,945
Heat Rejection Fans	10,438	9,173
HVAC Sub-Total	**166,104**	**148,143**
Lights	57,170	57,170
Electric Equipment	0	0
Misc. Electric	0	0
Misc. Fuel Use	0	0
Non-HVAC Sub-Total	**57,170**	**57,170**
Grand Total	**223,274**	**205,313**

Table 2. Annual Cost per Unit Floor Area

Component	[B] Henderson Ice Arena ($/ft²)	[R] Henderson Ice Arena ($/ft²)
Air System Fans	0.671	0.604
Cooling	0.308	0.264
Heating	0.000	0.000
Pumps	0.238	0.219
Heat Rejection Fans	0.082	0.072
HVAC Sub-Total	**1.299**	**1.158**
Lights	0.447	0.447
Electric Equipment	0.000	0.000
Misc. Electric	0.000	0.000
Misc. Fuel Use	0.000	0.000
Non-HVAC Sub-Total	**0.447**	**0.447**
Grand Total	**1.745**	**1.605**
Gross Floor Area (ft²)	127920.0	127920.0
Conditioned Floor Area (ft²)	127920.0	127920.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 3. Component Cost as a Percentage of Total Cost

Component	[B] Henderson Ice Arena (%)	[R] Henderson Ice Arena (%)
Air System Fans	38.4	37.6
Cooling	17.7	16.5
Heating	0.0	0.0
Pumps	13.6	13.6
Heat Rejection Fans	4.7	4.5
HVAC Sub-Total	**74.4**	**72.2**
Lights	25.6	27.8
Electric Equipment	0.0	0.0
Misc. Electric	0.0	0.0
Misc. Fuel Use	0.0	0.0
Non-HVAC Sub-Total	**25.6**	**27.8**
Grand Total	**100.0**	**100.0**

Hourly Analysis Program 5.11

Annual Energy and Emissions Summary

Table 1. Annual Costs

Component	[B] Henderson Ice Arena ($)	[R] Henderson Ice Arena ($)
HVAC Components		
Electric	166,105	148,136
Natural Gas	0	0
Fuel Oil	0	0
Propane	0	0
Remote HW	0	0
Remote Steam	0	0
Remote CW	0	0
HVAC Sub-Total	**166,105**	**148,136**
Non-HVAC Components		
Electric	57,170	57,170
Natural Gas	0	0
Fuel Oil	0	0
Propane	0	0
Remote HW	0	0
Remote Steam	0	0
Non-HVAC Sub-Total	**57,170**	**57,170**
Grand Total	**223,275**	**205,306**

Table 2. Annual Energy Consumption

Component	[B] Henderson Ice Arena	[R] Henderson Ice Arena
HVAC Components		
Electric (kWh)	1,407,670	1,255,390
Natural Gas (na)	0	0
Fuel Oil (na)	0	0
Propane (na)	0	0
Remote HW (na)	0	0
Remote Steam (Therm)	32,593	21,553
Remote CW (na)	0	0
Non-HVAC Components		
Electric (kWh)	484,491	484,491
Natural Gas (na)	0	0
Fuel Oil (na)	0	0
Propane (na)	0	0
Remote HW (na)	0	0
Remote Steam (Therm)	0	0
Totals		
Electric (kWh)	1,892,161	1,739,881
Natural Gas (na)	0	0
Fuel Oil (na)	0	0
Propane (na)	0	0
Remote HW (na)	0	0
Remote Steam (Therm)	32,593	21,553
Remote CW (na)	0	0

Table 3. Annual Emissions

Component	[B] Henderson Ice Arena	[R] Henderson Ice Arena
CO2 Equivalent (lb)	0	0

Table 4. Annual Cost per Unit Floor Area

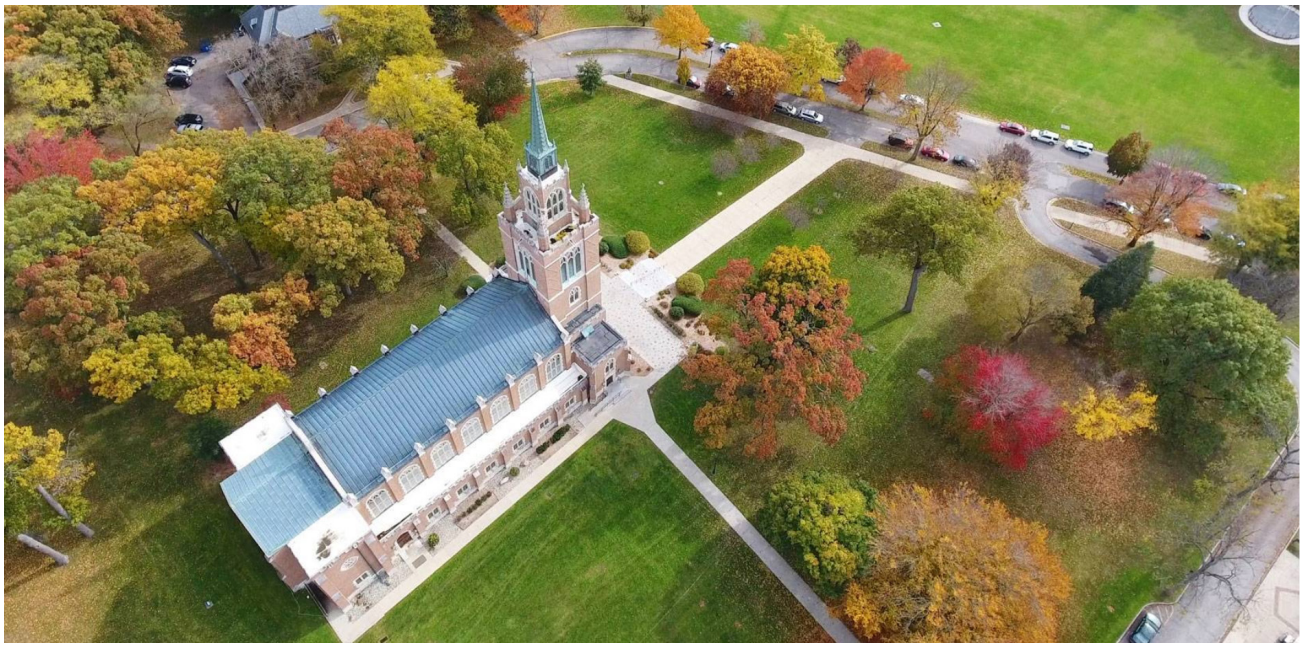
Component	[B] Henderson Ice Arena ($/ft²)	[R] Henderson Ice Arena ($/ft²)
HVAC Components		
Electric	1.299	1.158
Natural Gas	0.000	0.000
Fuel Oil	0.000	0.000
Propane	0.000	0.000
Remote HW	0.000	0.000
Remote Steam	0.000	0.000
Remote CW	0.000	0.000
HVAC Sub-Total	**1.299**	**1.158**
Non-HVAC Components		
Electric	0.447	0.447
Natural Gas	0.000	0.000
Fuel Oil	0.000	0.000
Propane	0.000	0.000
Remote HW	0.000	0.000
Remote Steam	0.000	0.000
Non-HVAC Sub-Total	**0.447**	**0.447**
Grand Total	**1.745**	**1.605**
Gross Floor Area (ft²)	127920.0	127920.0
Conditioned Floor Area (ft²)	127920.0	127920.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 5. Component Cost as a Percentage of Total Cost

Component	[B] Henderson Ice Arena (%)	[R] Henderson Ice Arena (%)
HVAC Components		
Electric	74.4	72.2
Natural Gas	0.0	0.0
Fuel Oil	0.0	0.0
Propane	0.0	0.0
Remote HW	0.0	0.0
Remote Steam	0.0	0.0
Remote CW	0.0	0.0
HVAC Sub-Total	**74.4**	**72.2**
Non-HVAC Components		
Electric	25.6	27.8
Natural Gas	0.0	0.0
Fuel Oil	0.0	0.0
Propane	0.0	0.0
Remote HW	0.0	0.0
Remote Steam	0.0	0.0
Non-HVAC Sub-Total	**25.6**	**27.8**
Grand Total	**100.0**	**100.0**

Appendix 4
Case Study – Memorial Chapel



Culver Academies Memorial Chapel Reflection and Case Study

By Tom Ruane, Council Member

The Culver Academies Chapel, completed in 1951, is a memorial to the 6,500 Culver Men who served in WWII, as well as the 400-plus who gave their lives in that cause. The Chapel is also dedicated to Culver Cadets and CGA students who served in the Korean, Vietnam, and Global War on Terror conflicts, and the nearly 100 who gave their lives in those struggles. The building is lovely and treasured both for its purpose and for its aesthetic refinement.

As the son of a WWII veteran, I grew up on first hand stories of that conflict, despite having been born well after the war. My father's WWII experience had such a profound effect on him, that pretty much everything else in life paled in comparison.

For this reason, among others, this building means something personal to me, despite the passage of time. Although I took very little as a cadet seriously, I still could never shake the profundity of what this building represented, particularly to the many Culver faculty and staff I knew and had grown to love like uncles. I think everyone who ever passes through its doors is moved in some way. A cadet or co-ed having a religious experience or contemplation, enjoying an enforced sanctuary from the day to day demands of life on campus, to just a visitor, or wedding attendee, shares a profound experience in a place of such impressive structure.

While any Culver loving person, especially one who has seen the view from the tower or experienced any of the emotions expressed above, would be hard pressed to want to find anything wrong with the Chapel, the building has its challenges. The Chapel significantly under performs from a square footage standpoint in terms of energy efficiency. Currently

only the uninsulated Henderson Hockey Rink seems to demand more of the Academy's natural gas, steam, and electricity, per square foot, making the Chapel the second worst energy performer of 80+ buildings on campus.

One reason might be a simple factor of geometry; the building has a huge volume for its square footage, the sanctuary is some 50 plus feet high and capable of housing the entire student body, plus faculty and guests. While our campus energy data is admittedly a bit rough, (we address the importance of metering buildings elsewhere in this report) our initial investigation found that the Chapel is a significant energy consumer and, compared to other large buildings on campus (like the Rec Center and Auditorium) appears to be under performing.

We set out to determine whether this under performance was indeed the case and what might be done about it.

Who are we?

The Culver Academies Sustainability Advisory Council was created in 2016 to bring the Culver Academies 19th century charm into the 21st century in terms of energy efficiency and responsible environmental citizenship to its neighbors, students, staff and faculty and the world beyond. Its 18 members represent diverse expertise in Social, Natural, and Built (constructed) Sustainability and Environmental areas and therefore the committee divided its efforts into three sub-committees along those lines. The Built Environment Committee picked up the challenge of making recommendations to make buildings like the Memorial Chapel as green as possible while maintaining human comfort/conveniences. Even if one has no sympathies in the current raging debates over anthropomorphic global climate change (man-caused), one idea that appeals to everyone is the idea of securing the Academy's future by saving money on operational costs. If nonprofits similar to the Culver Educational Foundation were to be required to spend 5% of their endowment every year, this would amount to approximately $20,000,000 for the academy, realizing that $1,000,000 in endowment funds is considered to be worth $50,000 in annual operating expenses. Given the enormous effort it takes to raise that money for The Culver Fund (the annual supplement to the operating budget) or Culver Academies Endowment Fund (now worth close to $400,000,000) why not spend less on things like utilities and more on things people tend to love like programming and the campus. To be explicit, saving $50k a year in utility bills is like adding one million to the endowment. If our current electric bill of almost $1,300,000 were $0, it would save the institution $26 million raised by this way of thinking.

With this in mind, that a penny saved is 20 earned, the task of this council is an important one, even if one doesn't factor in the deep impacts of pollution releases and other environmental impacts of running a village of as many as 2,000 people on any given day. If our recommendations are successfully implemented, it could potentially put Culver Academies years, or even decades ahead of where it might have been without these improvements.

While it would be satisfying to the egos of this committee to think the ideas they brought to campus were entirely new, that was thankfully not the case. In a pleasing turn of events, our working group's investigation over the winter of 2017/18 determined that despite some struggles and areas for improvement, the Chapel's recent upgrades over the past eight years have made great headway in terms of energy efficiency. Funded primarily by Mr. Colin Brown CMA '67, the restoration project ran

from 2009-2017 at a cost of $ 2.4 million. While the masonry restoration is also an 'efficiency upgrade', the value of the double glazing and HVAC work done appears to be $1 million USD, about half the project cost. Among the positive steps:

Geothermal Heating/Cooling, as well as a fresh air intake, were installed and functional as of May 2014, not only to improve comfort in the increasingly hot days of summer, but to even out the humidity that was contributing to the lime buildup on the interior walls.

Double panes were quite tastefully and lovingly installed on the beautiful impressive large windows all over the building. One would be hard pressed to notice them if you didn't look for them intentionally, but there they are saving energy, money. This work was completed May 2017. It appears that installing gas between these panes to further lower U value (heat loss factor) would be highly impractical in this setting, and preventing leaks in a retrofit system like this would be near impossible.

Modern controls were installed along with the geothermal system, about May 2014, although more advanced versions are now being requested. Chapel and Facilities staff have learned to maximize the savings of the existing control system and would like to implement even better energy/ humidity/ temperature control strategies.

There is at least one functional air return at the highest point in the chapel, along the wall that separates the sanctuary from the choir and altar. This return improves air circulation without the installation of visible fans or additional ductwork. The Sanctuary lighting was upgraded to rheostatic

LEDs with a traditional look about four years ago. While the bulbs are just achieving payback now, there are even more pleasing and effectively shaped bulbs now on the market with LED filament. Given how much better things are now, swapping these bulbs when much of the campus is still incandescent or CFL is of relatively low priority.

The project's original goals of restoring the brick tuck-pointing, roof, and removing unsightly lime buildup on the interior walls also resulted in improving the building's "envelope" and making it more efficient.

Even John Gouwens, the famous academy carillonneur who is known for an insightful capacity to be particular, considered this project a success, and says his instruments, both the organ and the carillon, seem to like the more temperate conditions.

Interested readers are pointed to a short video on the on the 2009-17 Memorial Chapel Renovation: Giving Back — Colin Brown '67 - *Leading By Example*[11]

There is certainly room for improvement (any Toyota driver can vouch for the concept of constant improvement), but this project and the generosity of Mr. Brown has reduced a monumental task down to some recommended tweaks and relatively inexpensive upgrades. This project was a success.

The Building

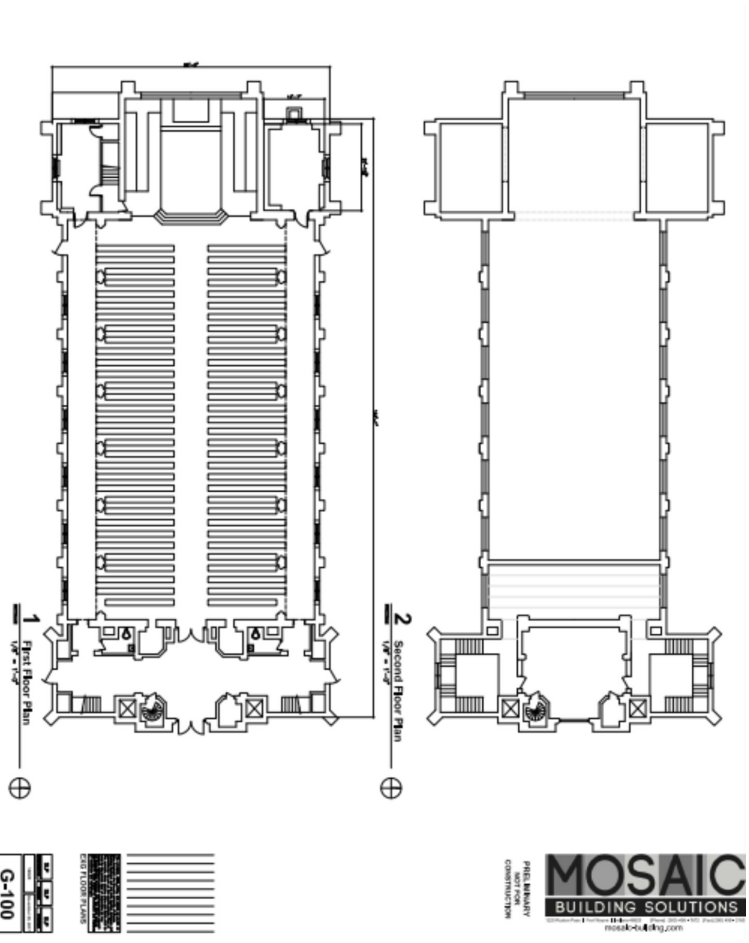
Culver sits astride the line for heating degree and cooling degree days being fairly even, with many great spring and fall days not requiring conditioning for the building. It's brick, cement and limestone construction and slate roof gives it great heat and cool retaining properties and it receives a lot of direct sunlight to keep it warm on cool winter days. Despite these attractive passive solar features, there are challenges. The building wasn't designed with space for wall or roof insulation. It's all masonry, cement or limestone.

Data

Square Footage of Chapel:

First Level	9,430
Lower Level	4,520
Balcony & Conf. Room	1,850
TOTAL:	15,800

Cu ft rough estimate at 480,000 sq ft vs same space with 8 ft ceilings: 126,400 sq ft



Ratio of actual estimated volume of chapel to a standard ceiling height version with the same footprint: 3.8

Therefore all else held constant, one could expect the utility costs of the chapel to be almost 4 times that of a regular building based on volume of air mass to condition alone.

Wall insulation masonry brick, cement, steel and limestone.

Roof insulation: just the vales of the materials used. There is no specific insulation.

Window U (heat loss) value: Single pane can be assumed to be 1.22 U (heat loss factor)the new double panes take it down to .7, so an estimated 40% improvement for those portions of the wall in insulation, and if you take the whole envelope of the Chapel, that might lead to a 5-10% savings. This brings the windows much closer to be in line with the heat loss of the thick masonry walls.

Annual Electric Costs: Initially we assumed electric costs are somewhere north of $2 per sq ft which is the campus average, so over $30,000 per year. Some of this might be due to running the large pumps for geothermal now installed. Geothermal is generally more efficient at cooling than heating, though better than most conventional systems at both.

Actual Data shows:

Culver Memorial Chapel Electric Utility Evaluation

year/month	kwh	cost	avg temp	notes
15/5	43,392		56.4	geothermal system completed may 2014
15/6	47,904		65.3	
fiscal 2014/15	***91,296***		***60.9***	avg temp
15/7	45,312		70.2	
15/8	40,992		73.1	
15/9	48,864		69.7	
15/10	48,480		66.2	
15/11	57,600		51.3	
15/12	65,952		42.3	
2015	***489,792***		***61.7***	avg temp
16/1	48,960		33.4	
16/2	58,752		27.6	
16/3	57,696		39.5	
16/4	36,616	$ 3,771	44.1	
16/5	35,616	$ 3,771	56.4	curious repetition
16/6	40,800	$ 4,089	66.7	
fiscal 2015/16	***585,640***	***$11,632***	***53.4***	
16/7	36,960	$ 3,718	72.6	
16/8	37,152	$ 3,829	82.3	

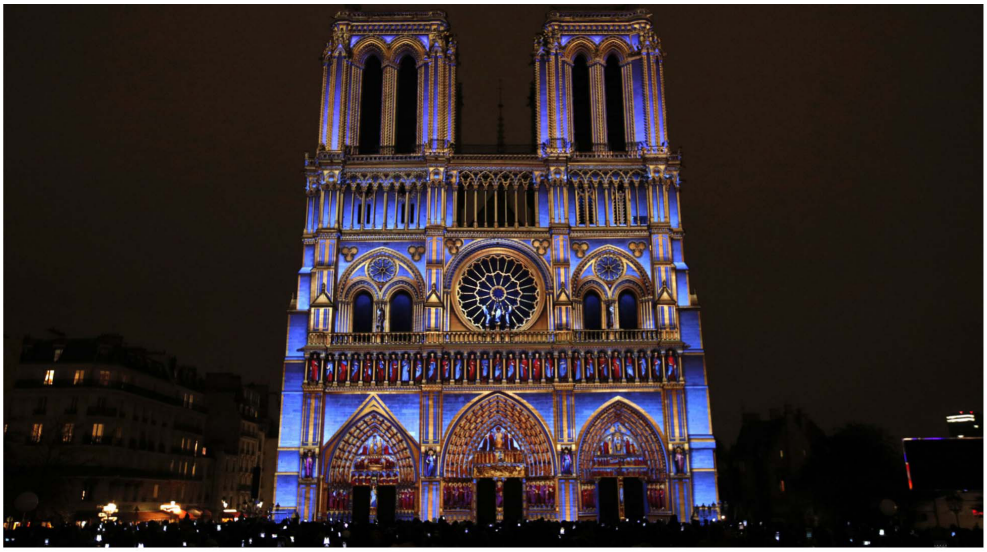
16/9	37,152	$ 3,820	71.3	curious repetition
16/10	25,056	$ 3,003	63.4	
16/11	22,944	$ 2,979	53	
16/12	39,264	$ 4,962	35.5	
2016	***1,062,608***	***$45,574***	***53.8***	avg temp
17/1	52,608	$ 6,245	21.2	
17/2	39,744	$ 4,925	28.8	
17/3	35,232	$ 4,421	37.9	
17/4	35,808	$ 4,435	48.5	
17/5	32,832	$ 4,036	55.5	double glazing of windows completed
17/6	32,160	$ 3,764	68.5	
fiscal 2016/17	***426,912***	***$50,137***	***53.2***	
17/7	27,744	$ 3,382	71.7	
17/8	24,960	$ 3,022	71.3	
17/9	31,584	$ 3,573	64.6	
17/10	32,448	$ 3,692	66.7	
17/11	28,896	$ 3,642	45.9	
17/12	31,296	$ 3,915	36.7	avg temp
2017	832,224	$ 99,190	51.6	
18/1	51,360	$ 6,051	21.2	
18/2	44,448	$ 5,136	28.8	
18/3	36,192	$ 4,313	37.9	

Natural Gas Consumption: Prior to the geothermal upgrade it was assumed that the Chapel was well above the average use per square foot of 160K BTU per square foot. Since the system is almost natural gas free (except in energy production to run the geothermal, along with coal and the other mix of inputs to NIPSCO's power supply) it's assumed this value is now 0.

Here are a few of our assumptions when we began this investigation:

As the building is well maintained, the issue of efficiency doesn't seem to be an issue of sealing. Most of the losses both in heat and cooling seem to be from a poor distribution of heat and a lack of adequate insulation, especially given the massive windows in the building.

Aesthetics are a priority equal with energy savings, and that any efforts to upgrade the Chapel must be done with an impeccable eye towards preserving it's romantic inspired almost 70 year old character.



Possible Solutions, in order of assumed payback

Air Circulation

1. Install a ducted system that retrieves hot air from the peak of the sanctuary and returns it to the floor level

2. Tastefully selected quiet historically appropriate fans

Geothermal System

1. Upgrades

2. Improvements to its distribution

3. Upgrade to closed loop from open loop

Windows

30+ sets in all, many divided by limestone.
Double-Paned for insulation

1. Outside with large clear almost imperceptible panels

2. Inside with large clear almost imperceptible panels

It would seem that the north window is the first priority. Its staining makes it the easiest to remedy with an outside extra pane, and by ordinality (the way it faces north) it's the coldest window for heat loss, therefore likely the window that costs the most in winter from a heat transfer standpoint.

Heat Distribution

It's a great tradition of the Chapel to leave the windows and doors open whenever possible. All who attended with regularity have great memories of fresh spring days with air alive all around. Is there a way to preserve this tradition through creative ducting, automation, zoning, or manual control to reduce the loss of energy?

Lighting

The age of LEDs has arrived, and they are sophisticated now. Whereas five years ago, I would not have trusted LEDs to create the required ambiance in a sacred building like this which implies a world lit only by fire, with it's historic Romanesque design, they have the capacity now to give hues and lumens not only in line with candlelight but perhaps exceeding the ability of incandescent bulbs. They also can be rheostatically controlled (dimmable) and even under certain circumstances display almost infinite hues of light. They also likely require much less maintenance.

1. Upgrading of interior light bulbs.
2. Upgrading of exterior light fixtures, for aesthetic, safety, and security needs. It might seem tacky

but there would be an opportunity with multi-color lights to mimic the activities of the empire state building where holidays are celebrated with colors, EG red and green lights for Christmas etc. if nothing else, the old white glass fixtures could be removed and replaced with much more discrete lighting that would also be much more efficient, almost pay for itself, and could be turned into an asset for ceremonies and recognitions.

Note: while incandescent lights do provide heat to a room, it's highly inefficient compared to the gas/ geothermal system that exists currently. Plus that's heat you don't want in the summer if you are running the lights. So half the time it's inefficient, and half the time it's actually working against you, compounding its inefficiency by taking up energy dedicated to cooling.

Now understanding that the majority of this work speculated upon in the last section was done, we would like to make some minor recommendations:

- The Control unit on the HVAC system should be improved to a more versatile one. The current Johnson Controls unit is not achieving all that a newer competitors unit could achieve. Siemens products were mentioned as an ideal.

- The outside lighting of the Chapel should be upgraded to reflect its significance to the campus and its iconic status. This has become a common step in Cathedral improvements in European and now American cities when a religious building is a centerpiece of a community (for instance, dominates a major civic square)–that it be equipped with low energy demand lighting that is dimmable, versatile, perhaps multi color, and reflects the mood of the place and people and accentuates the architecture of the building. It's usually done by lighting designers and just a few fixtures can make a major difference. Note the beautiful lighting on the Notre Dame Chapel in South Bend, whose glowing golden dome lit at night creates a rich centerpiece of the campus, and as an eponymous comparison from Europe, Notre Dame Cathedral in Paris during a light display is seen on the prior page.

- The Inside of the Chapel's lighting is LED so achieves the energy savings demanded, but has been accused of being shadowy and inadequate. The bulbs are of a previous generation of rheostatic candle shaped bulbs that don't take advantage of the new LED filament design that would look significantly more of the period and not have white plastic electronic housing bases. Some of the shadows are the result of the old candelabra chandeliers as well, which are beloved and not likely to be removed but for perhaps $2000 the 200 fixtures could be upgraded to a more modern technology that satisfyingly gives a more traditionally effective look than what is currently installed.

- While the campus obviously struggles with landscaping given the deer population, and does not like trees too close to any buildings, would more trees planted, especially on the north end of the building, shelter it and save heating and cooling costs naturally? insert question mark after naturally? The very manicured set of trees might be allowed to go a bit wild with bushes underneath to give the altar area a form of wild sanctuary to separate it from the upper parade ground/ playing field.

- Could the planters along the walk to the chapel be planted with deer resistant native wildflowers?

Appendix 5
Case Study – Campus Lighting

Lighting retrofits are the classic "low-hanging fruit" among energy efficiency measures. Combining new LED technology for both indoor and outdoor lighting, coupled with outdoor lighting with modern controls that allow for motion sensing automation provides for a large amount of waste reduction with extremely attractive pay-back periods. Because LED technology is long-lasting (25,000 hours compared to 1,200 hours for an incandescent or 8,000 hours for a CFL), the retrofit also reduces maintenance costs substantially, and enhances worker safety with far fewer trips up a ladder to change bulbs. In addition, LEDs reduce not just the number of kWh used each month but the number of watts of demand, reducing the demand charge on the electricity bill as well as the volumetric per-kWh charge. Finally, LEDs improve the livability of the space, enhancing both function and aesthetics.

Lighting retrofits are therefore core to most energy efficiency efforts in commercial, industrial, residential, municipal and institutional settings.

Campuses are no exception. Dozens of campuses across the nation have scored near-term energy efficiency gains and carbon emission reductions by prioritizing lighting. According to the Energy Information Administration (EIA), lighting comprises 17% of electricity use on a typical college campus, and can be as much as 30% of electricity use in a typical classroom building, so the potential for impact are great, and success stories are not difficult to find –

- Northwestern University: Since 2009 the University has invested more than $1.5 million in existing building lighting upgrades which will **save over $400,000 a year,** a 3.5 year payback.

- Boston University: Since 2008, 14 lighting retrofit projects have been done across 12 locations resulting in a **savings of 5,794,883 kWh/year** and 2,706 metric tons of CO2e/year, which equals 497 cars or 69,385 trees.

- In 2016, Bucknell University in Pennsylvania installed LEDs at a total cost of $266,400, with an **expected savings of $2.1 million** and a payback period of 3.75 years.

Another benefit to prioritizing lighting retrofits is that most utility energy efficiency programs offer incentives for LED lamps and fixtures, as is the case with NIPSCO's prescriptive energy efficiency program.[12] This program can buy down the total retrofit cost by as much as $10,000. For larger projects, NIPSCO has a custom energy efficiency programs for institutions and non-profit customers, which pays $0.07 for every kWh of savings for lighting projects.

Appendix 6

White DeVries Rowing Center Energy Star Assessment

What is Energy Star?

- Energy Star is an online tool you can use to measure and track energy, water consumption and green house gas emissions.
- You can benchmark the performance of one building or a whole portfolio of buildings.
- You receive a score based on a percentile ranking from 1 to 100
- Portfolio Manager Login
  - https://portfoliomanager.energystar.gov/pm/login.html

What you need:

- Building Information
- Energy Bills - 12 months
  - Gas
  - Electric
  - Water
- Space Attributes
  - Weekly Operating Hours
  - Number of Workers
  - Number of Computers
  - Percent that can be heated
  - Percent that can be cooled

What you can do in Energy Star

4 Portfolio level tabs

- View and Enter Data in Building Portfolio
- Share Your Project
- Generate Reports of Your Project
- Apply For Recognition

7 Property level tabs

- Summary
- Details
- Energy
- Water
- Waste and Materials
- Goals
- Design

See link for video in note section

Appendix 7
New Construction Template

Culver Educational Foundation

NEW CONSTRUCTION TEMPLATE – September 1, 2017

[Note to Project Director: Documentation of Owner's Project Requirements (OPR) is a step required for compliance with LEED but is also a useful tool in designing High Performing Sustainable Facilities. This template should be used as a guide to collect information needed to meet the Owner's Baseline Sustainability Program. The information should be developed by the project team in collaboration with the Owner.

1. Owner and User Requirements

A. *[Typically already covered in Project Scope & Narrative along with the Construction Budget. Includes primary purpose, program and use of project. May also describe future expansion needs, flexibility, quality of materials, construction and operation costs.]*

Environmental and Sustainability Goals

A. In Consultation with the Owner, determine which of the following goals shall apply to this project:
   - LEED v4 Certified, Silver, Gold or Platinum Designation and/or
   - Energy Star Building Rating and/or
   - Design per High Performance Building Standard (ASHRAE 189.1) and/or
   - Comply with International Green Construction Code
   - Reduce Water Consumption by 20% beyond the baseline recognized through EPACT 2005, ANSI UPC-1 (2006), and International Plumbing Code
   - Zero Net Energy Building

B. Other Owner requirements: *[e.g. Owner priorities among various green/sustainability options]*
   - *Enhanced Building Commissioning*
   - *Onsite Renewable Energy shall be included for a minimum of 3% of the building's energy consumption (or 5%, 7%) If solar is provided, it shall be integrated with battery storage, and shall provide reporting and control data to be used in the sustainability curriculum*
   - *Low Flow Urinals and Dual Flush Toilets*
   - *Natural Ventilation*
   - *Metered Faucets*
   - *Regional or Recycled Materials*
   - *Energy Star Appliances*
   - *Sustainable Building Materials including items such as:*
     - *eco-friendly concrete such as Ashcrete,*
     - *Accoya Acetylated Wood, bamboo, or other FSC woods,*
     - *Green Batteries*
     - *Smart Windows (dynamically changing tints)*
   - *Grey Water Plumbing System*
   - *Metering Equipment for Gas, Electric and Water in order to integrate Leadership in Sustainability with the curriculum*
   - *Native Vegetation (no Sprinkler)*

- *Passive Building Design (Possible green roof?)*
- *Restoring/Protecting Habitat*
- *Light Pollution shall be minimized*
- *A complete Energy Management System shall be included (and interfaced to the Campus Energy Management System (a campus system may not exist today, but it is going to be mandatory in the future and should be started now)*
- *Heat Island Effect (Roof, NonRoof, Both)*
- *Etc.*

2. Energy Efficiency Goals

A. Project shall comply with Title 24 building energy efficiency standards as well as control requirements. –OR- Project shall EXCEED Title 24 building energy efficiency standards by X %

B. Lighting systems offer cost effective energy savings potential, and lighting fixtures and/or controls shall be selected to exceed Title 24 minimum efficiency requirements by 10% or greater. ALL LIGHTING SHALL BE LED.

C. High efficiency HVAC equipment offers cost effective energy savings, and HVAC equipment shall be selected that exceeds Title 24 minimum efficiency requirements by 10% or greater.

D. Additional energy efficiency measures that provide cost effective energy savings shall be included wherever feasible.

E. Other Owner requirements: *[e.g. orientation, siting, daylighting, cool roof, natural ventilation, landscaping]*

3. Indoor Environmental Quality Requirements

A. Indoor lighting requirements: *[List any specific non-standard requirements. E.g. pendant-mounted lighting, illumination requirements such as 35 fc in classrooms, special applications, etc.]*

B. Occupant lighting control requirements: *[List any non-standard requirements. E.g. multi-mode controls for assembly spaces]*

C. Thermal comfort requirements: *[List any non-standard temperature or humidity requirements]*

D. Ventilation and filtration requirements: *[List any non-standard requirements]*

E. Occupancy HVAC control requirements: *[List any non-standard requirements. E.g. integration with existing control systems]*

F. Acoustic environment requirements: *[List any non-standard requirements. E.g. local noise sources requiring mitigation, spaces such as classrooms that require low background noise and short reverberation times]*

G. Other Owner requirements: *[E.g. natural ventilation, operable windows, daylight, views]*

4. Equipment and Systems Expectations

A. Special HVAC equipment requirements: *[E.g. equipment type, quality, reliability, efficiency, control system type, preferred manufacturers, maintenance requirements]*

B. Unacceptable HVAC system types or equipment: *[List if applicable]*

C. Special lighting equipment requirements: *[E.g. list preferred lamp and ballast types that comply with Owner standards if applicable]*

D. Other system requirements:

5. Building Occupant and O&M Personnel Expectations

A. Day-to-day HVAC operation by: *[occupants, operating staff]*

B. Periodic HVAC maintenance performed by: *[building occupants, operating staff, service company, Owner staff, other]*

C. Lighting system maintenance will be performed by: *[building occupants, operating staff, service company, Owner staff, other]*

D. Training required for building occupants: *[e.g. demonstration, instruction documents]*

E. Training required for operating and maintenance staff: *[e.g. demonstration, classroom training, instruction documents]*

F. Other Owner requirements:

Appendix 8
Culver Academies Main Campus Building Square Footage

Culver Building List	Sq Footage
Accounting Office	4,500
Argonne/Chateau Thierry Dorms w/Hegeler Addition	62,890
Armory	12,080
Beason Hall	4,937
Beason Park - Bunkhouse	4,000
Beason Park - Dining Hall	4,000
Benson Dorm	12,956
Boat Shed	16,000
Bus Garage	6,400
Dicke Theatre, Eppley Aud., Steinbrenner Perf. Arts, McMillen Ctr.	63,061
Dicke/Roberts Math & Science	64,000
East Barracks	17,004
Eppley Hall of Humanities	27,066
Crisp (Eppley)	21,273
Facilities - Service/Storage	5,824
Facilities/Security	22,366
Fleet Gym/Steinbrenner Rec. Ctr./Siegfried Fitness Ctr.	147,077
Gignilliat Hall	11,824
Golf House	5,048
Golf Shop	3,360
Grounds	1,280
Guest House - Bays/Whitney	3,484
Guest House - Founder's Home	2,000
Guest House - Guest House	4,000
Guest House - Homestead	3,432
Health Center	15,120
Henderson House - Head of Schools	3,200
Henderson Rink/Multipurpose Building	63,452
Huffington Library	47,572
Human Resources	3,600
Ithaka & Linden Dorms	12,628
Laundry/Uniform	19,402
Lay Dining Center/Student Ctr./Bookstore	49,330
Legion Memorial Bld./Dicke Administration Bld.	24,471

Main Barracks	38,320
Memorial Chapel	15,601
Motorpool	3,899
Music & Arts	12,265
Naval Building	15,764
North Barracks	24,724
Post Office	6,272
Powehouse	8,166
Pump House - Sewer	800
Rowing Center	23,957
South Barracks	12,820
Vaughn Equestrian Center	86,591
Washroom - Concessions Stand	225
Washroom - Pressbox/Dugouts	900
West Barracks	17,700
Total Square Footage	**1,036,641**

Appendix 9
Transportation

Large vehicle fleets that accumulate many miles annually see massive benefits from small percentage increases in fuel economy, saving tens of thousands of dollars per year and several tons of GHG emissions as a result. Culver is different. Vehicles at Culver don't accumulate many miles, and the fleet size is small with a wide variety of vehicles for various applications. Incremental efficiency increases may seem like they don't even move the needle. However, small improvements add up over time and can result in meaningful benefits for the school.

A 5% reduction in total motor fuel consumption in year 1 would result in a monetary savings of $4,175. Reducing by 3% thereafter for years 2 through 10 would result in a total savings of $25,000 and 93 metric tons of GHG over the period, assuming fuel prices are constant.

Calculating the monetary savings for an entirely electric on-road fleet at Culver is much more difficult. What is certain is that the cost to fuel two similar vehicles, like a small conventional sedan/hatchback and its closest full electric equivalent (closest in price, size, and range), the Chevrolet Bolt, favors the electric. Filling an empty 12 gallon gasoline tank at $2.22 per gallon to get 240 miles of range costs $27. Charging a fully depleted 60 kWh battery in the Bolt to get an industry best 238 mile range will cost $6.00 (assuming $.10 per kWh that Culver pays). Plus, there are no GHGs emitted from the Bolt.

There are cases where an electric vehicle will not make sense. For example, we doubt our alumni will appreciate the Artillery Battalion riding around the parade field on silent, electric trucks. However, the duty cycles of most of Culver's on-road vehicles favor full electric: short trips in Culver or surrounding areas and sitting unused at night. Not only will going electric make sense for the reasons stated in the introduction, it will make economic sense as electric vehicles continue to move down-market in price.

Data

541,500 pounds CO_2
emissions annually

**CO_2 emissions per gallon of fuel
- 20 pounds / 100% gasoline
- 22 pounds / 100% diesel
- 18 pounds / E10 (10% ethanol & 90% gasoline)

20 pounds / B20 (20% biodiesel & 80% diesel)

Assume that on-road vehicles account for at least 75% of total emissions
Therefore, Culver's on-road vehicles produce 541,500 pounds
(245 metric tons) of CO_2 annually which produce greenhouse gas emissions
Equal to 268,000 pounds of coal burned or 600,000 miles driven by an average passenger car.

Appendix 10
Reference Links

Social Environment Working Group Report

1. www.energystar.gov/buildings/tools-and-resources/energy-star-score-residence-halls-dormitories
   www.usgbc.org/projects/deep-green-residence-hall
   https://wmich.edu/sites/default/files/attachments/u159/2013/SupGreenResHall%281%29.pdf
   www.sc.edu/green/doc/GreenDormRoomProgramManual.pdf
   https://gustavus.edu/reslife/residences/begreen.php; https://sustainability.unc.edu/resources/green-residence-hall-room/

2. http://greenbillion.org/resources/
   http://www.ase.org/blog/green-revolving-funds-support-campus-efficiency-upgrades
   http://secondnature.org/wp-content/uploads/SEI_Greening-the-Bottom-Line-20121.pdf
   https://www.stjacademy.org/theacademy/news/sja-news/~news-id/2492

3. https://www.wsj.com/articles/how-to-prepare-college-graduates-for-an-ai-world-1519095901

4. https://fundbycell.com/rcy5no

5. www.conservationfilm.org

Built Environment Working Group Report

6. https://energy.gov/eere/slsc/building-energy-use-benchmarking

7. https://energy.gov/eere/slsc/energy-savings-performance-contracting

Natural Environment Working Group Report

8. www.maxinkuckee.history.pasttracker.com/culver_family/h_h_culver.htm

9. www.drawdown.org/solutions/electricity-generation/microgrids

10. www.cardnonativeplantnursery.com/home

Resoruces/ Appendices

11. www.vimeo.com/251708830

12. www.nipsco.com/save-energy/schools-institutions/prescriptive-gas-electric-incentives

Appendix 11
Sustainability Rubric

Sustainability Rubric

For annual self-assessment of Sustainability Progress at Culver

Grayed boxes are from 2015-16 Assessment; Tan boxes are 2018 Assessment.
If only one box is shaded, assessment is unchanged from 2016.

Section I. School Sustainability, Energy and Resource Management

(Adapted from CEE National Green Schools Guidelines Place-Based Rubric Draft, 2002 and Besant Hill School)

Assumptions/Intentions	Assessment Level 1	Assessment Level 2	Assessment Level 3	Assessment Level 4
Energy Heating and electricity use are relatively easy to measure and reduce. Commitment to efficient use of energy has an enormous impact on the environment and community. *Energy efficiency represents a significant opportunity for savings and return on investment*	Existing heating and lighting systems are out-dated and little urgency exists to upgrade Information about energy use and cost is not readily accessible to either students or faculty	Energy use and associated cost has been measured to establish a baseline and is reported by students to some parts of school Some attempt is made to raise community awareness of energy use in the classrooms and residentially	Savings through energy conservation behavior is documented, celebrated and passed on in community interaction Student, faculty/staff generated energy saving ideas are increasingly offered and implemented	Student skills are sufficient to convey energy savings techniques to larger local community Most students, faculty/staff can articulate the ecological and political impact of renewable and non-renewable energy use and practices
Alternative Energy *Increasing implementation of available alternative energy technology within the infrastructure of the school will both demonstrate a commitment to sustainable energy resources and reduce dependency on fossil fuels in the long term.*	Conventional non-renewable energy resources are utilized without consideration for available renewable energy alternatives General lack of awareness for the sources of energy being consumed	Some demonstration projects are made utilizing alternative energy technologies Awareness for renewable energy approaches explored in some classroom environs and compared with conventional energy uses	Student and staff awareness for renewable energy potential and practices are generally understood and discussed knowledgeably Renewable energy approaches are included in strategic planning and budget reviews	Specific commitments and timelines are included in strategic planning for timely transition to renewable energy resources Increasing use of renewable energy resources are widely known and celebrated

Assumptions/Intentions	Assessment Level 1	Assessment Level 2	Assessment Level 3	Assessment Level 4
Water Clean and unpolluted water is an increasingly scarce resource. *Understanding the origins of our sources of water and methods to conserve water resources is both responsible and cost effective*	Plentiful water is provided for use in the school, but not examined for quality, sustainability, or the environmental impacts related to its transportation, use, and final discharge back into the natural environment	The source and end use of water resources are studied, measured, and reported by students to some parts of the school Initial efforts are made toward establishing water conservation goals at a community wide level	Students are aware of, and work with faculty and facilities staff to research, propose, and implement school wide water conservation practices and policies Storm water treatment/reuse plans and goals are in place and are being implemented.	Student awareness levels are sufficient to lead concerted efforts to connect water school conservation efforts to water quality issues in the larger local community with an emphasis on health and environmental quality
Waste Stream There is no "waste" in nature, and there is no "away" when we speak of our waste as being "thrown away" *Creating a school-wide ethic of understanding for the relationship between product consumption and product end-use is critical.*	Most materials come into the school are used once without consideration for excessive packaging or end-use Efforts to implement recycling awareness and low waste procurement policies are explored in some classroom environs	Efforts are made by student groups to quantify and report amounts of landfill waste compared to recyclable waste to some members of the community Tentative projects are organized to recycle and reuse unwanted products used at the school	Paper, plastic, aluminum, and approaches are widely used Community wide efforts made to identify consumer products used that can be recycled Student recycling ideas achieve common purpose with facilities and food services commitments	Students collaborate with faculty, school administrators, facilities managers, food service managers, and outside service providers to develop creative and cost -effective approaches to waste stream reduction and material reuse

Assumptions/Intentions	Assessment Level 1	Assessment Level 2	Assessment Level 3	Assessment Level 4
Food Service The creation, transportation, preparation, and disposal of food is one of the single largest ecologically significant activities for humans. “ The average food item now travels over 1500 miles to get to our table. 17% of fossil fuel use is used to grow or transport our food, and 17% of landfill waste is discarded food. *Efforts to compost food waste, minimize prepackaged food products, reduce food transportation, and provide nutritious and freshly prepared meals should be a core objective*	Food services procurement policies and budget constraints prevent consideration of local food resources and energy and waste stream assessment training Significant food and packaging waste is incorporated into waste destined for landfill Food service management is typically not included in discussions of proposed sustainable approaches	Food services procurement begins to explore outside suppliers who can provide fresh local foods within budgetary framework Efforts are made to explore waste stream recycling and efficient energy use with students and faculty Some effort is made to equate basic nutrition information to healthy food choices and procurement policies	Increasing efforts are made to provide consistent quantities of locally grown food choices Increasing efforts are made to inform and equate food services to best informed practices for healthy nutrition Food waste composting and food packaging recycling are integrated into efforts to reduce waste stream of school Energy use assessments are implemented by informed food services staff Cooking oil repurposed for fuel use	Informed food services staff provides a leadership role for modeling sustainable practices and measures that minimize the “ecological footprint” of the school’s food intake, preparation, and end use utilizing direct student involvement and education

Assumptions/Intentions	Assessment Level 1	Assessment Level 2	Assessment Level 3	Assessment Level 4
Chemical Use Products designed for cleaning and landscape maintenance that are considered toxic in their production and in their use are increasingly being found to have long-term environmental impacts including upon the human food chain. New chemicals with higher toxicity are now known to form when chemicals combine in their use and at the time of their disposal *Efforts to research and implement the use of new generation green chemistry products for house keeping and landscaping should be a core objective*	Cleaning, art, science, landscaping, construction, and other chemicals and materials used on campus are used without a thorough understanding for their potential health and environmental risks Facilities procurement practices do not encourage research and comparison of green housekeeping products	Some effort is made in classes or areas of the school facilities departments to research the school uses of toxic materials including their uses, storage, and disposal Some attempt is made to increase community awareness for the uses of toxics at the class and/or school level	Students and faculty network with facilities management and staff to address issues of toxic substance use at the school including potential impacts and alternative approaches Students and staff initiate community wide planning to eliminate the use of dangerous and toxic substances in the school environment Policy planning is initiated for the accounting and safe disposal of existing toxic chemicals stored at the school	School community understanding for the practical uses and impacts of toxic chemicals is sufficient to translate into active understanding for the toxic materials used in the greater community Student awareness of the social/economic/ environmental issues related to toxic material use motivates interest in political issues surrounding health and safety in the household, workplace, and natural environment

Assumptions/Intentions	Assessment Level 1	Assessment Level 2	Assessment Level 3	Assessment Level 4
Transportation The way that we get students and staff to and from school and to school functions, as well as use vehicles on campus has a significant environmental impact: fully 30% of greenhouse gases emitted each year in the U.S. come from fossil fuels used for transportation *Active development of options for faculty carpooling, alternative fuel options for school vehicles, and budgetary planning for new energy efficient vehicles is a core objective.*	Transportation decisions are made without knowledge or consideration for environmental impact of excessive use of fossil fuels Vehicles used for student transportation are not evaluated or maintained for fuel efficiency Options for carpooling are not discussed or considered as reasonable options for the purposes of minimizing carbon footprint	Some classroom curriculum and interest groups are studying contemporary transportation approaches and practical alternatives School vehicle use is supervised to moderate use of fossil fuels Environmental impact of school transportation approaches are considered in planning and cost benefit analysis of procurement policies	Informed students and interest groups collaborate with facilities staff and administration to develop and propose efficiency improvements in school transportation approaches This is a general school-wide understanding of the environmental impacts of school transportation approaches in terms of use of non renewable fossil fuels and atmospheric CO2 contribution, and an awareness for practical alternative approaches	Students and staff have created mechanisms to calculate CO2 footprint of school transportation systems and ways to document pollution reduction and financial savings associated with implementing practical alternatives Students, staff and parents actively seek to reduce impact of school related transportation by carpooling and minimizing inefficient on campus and off campus use of fossil fuels

Section 2. Integrating Sustainability Into School Curriculum

Assumptions/Intentions	Assessment Level 1	Assessment Level 2	Assessment Level 3	Assessment Level 4
Interdisciplinary Connections *Environmental intelligence can be cultivated through a curriculum that integrates diverse disciplines to achieve a "big picture" understanding of environmental sustainability.*	Sustainability principles have a presence in the science curriculum. Science teachers in core courses can explain how the educational principles of sustainability are integrated into one or two lessons in their courses. Sustainability principles are included in the WC CHANT and Basic Nature courses.	Sustainability principles are purposefully integrated into the core science curriculum. Some teachers outside science and all science teachers can explicitly explain how sustainability principles are integrated into their courses. Sustainability principles are included in the WC CHANT and Basic Nature courses, and opportunities to integrate sustainability principles into other curricula are actively explored.	Sustainability principles are integrated into non-science curricula and purposefully integrated into the core science curriculum. A diverse array of teachers outside science and all science teachers can explicitly explain how sustainability principles are integrated into their courses. Sustainability principles are included in the WC CHANT and Basic Nature courses, and other appropriate WC courses and UC science-related courses.	Sustainability principles are purposefully integrated into the entire educational experience through cross-disciplinary connections. Vast majority of teachers can explicitly explain how sustainability principles are integrated into their courses. Sustainability principles are integrated across the WC and UC curricula.

Assumptions/Intentions	Assessment Level 1	Assessment Level 2	Assessment Level 3	Assessment Level 4
Environmental Literacy *Environmental literacy is essential for informed decision-making and the development of sustainable responses to environmental challenges.*	Few students/campers can discuss global, regional, and local environmental issues. Few students/campers can formulate solutions to global, regional, and local environmental problems. Few students/campers can communicate global, regional, and local environmental realities.	Some students/campers can discuss global, regional, and local environmental issues. Some students/campers can formulate solutions to global, regional, and local environmental problems. Some students/campers can communicate global, regional, and local environmental realities.	Many students/campers can discuss global, regional, and local environmental issues. Many students/campers can formulate solutions to global, regional, and local environmental problems. Many students/campers can communicate global, regional, and local environmental realities.	Most students/campers can discuss global, regional, and local environmental issues. Most students/campers can formulate solutions to global, regional, and local environmental problems. Most students/campers can communicate global, regional, and local environmental realities.

Assumptions/Intentions	Assessment Level 1	Assessment Level 2	Assessment Level 3	Assessment Level 4
Experiential Education *Students effectively taught environmental awareness understand that real learning is participatory and experiential.*	Environmental learning tends to take place primarily in the classrooms.	Some learning opportunities are developed utilizing local environmental resources or local environmental issues Use of local outdoor environments and field trips are special events WC CHAT, Basic Nature, Aquatic Biology and UC Lake Max Ecosystem courses spend most instructional time out of doors. (2015)	Students and staff participate in community supported sustainability projects (i.e. recycling, composting, tree planting, energy audits) Classroom lesson plans regularly incorporate "outdoor classroom" Green spaces are strategically developed for integration into curriculum In addition to Level 2 activities, CSSC student are actively involved in tending native planting areas on campus	School environment is developed and regularly used as an outdoor learning laboratory/classroom. Lesson plans regularly include hands-on experience and observations Nearly all students have experienced and can identify major ecological features of school and surrounding community In addition to Level 3 activities, native planting areas are expanded, and WC and UC participate in an ongoing environmental inventory of the main campus, WC, and bird sanctuary.

Section 3. Enhancing The Natural Environment of the School

Assumptions/ Intentions	Assessment Level 1	Assessment Level 2	Assessment Level 3	Assessment Level 4
Outdoor Environments and Green Spaces Natural outdoor environments are the perfect laboratories for coming to understand the natural world and the interrelationship between healthy environment and healthy humanity Educating our students on the long term value of preserving existing green space as a resource is integral to the development of environmental ethics	Healthy maintenance, support, and preservation of existing outdoor environments and green space are a low priority Community use of outdoor environments is minimal and sporadic Outdoor natural environments are not used by science courses for field observations	A few outdoor green space areas are cultivated and utilized for community functions and recreation Students are involved at some minimal level in the care of outdoor environments Green space is occasionally integrated into curriculum for the observation of plants and animals in natural habitat The campus and bird sanctuary are open to students, staff, and the local community for walking and other outdoor activities in all 4 seasons. WC CHANT, Basic Nature, and other courses regularly use the campus, Cardinal Creek and the Lake as their classroom.	Green space is actively cultivated and maintained to promote the habitats of plants and animals Aesthetic areas are designed into outdoor environments for relaxation, reflection, and observation Students and staff value and are familiar with most outdoor environments and green spaces First consideration is given to pollinators and native plants in any decisions to update campus landscape. Additional benches and picnic areas are added to campus – potential development and naming opportunities for donors willing to contribute $500 to $1,000. Indian Trail area and paths are improved to promote access for all. Winter students are allowed to participate in supervised recreational activities involving the lake to include kayaking, stand-up paddle boarding, and swimming. Are allowed to participate in supervised recreational activities involving the lake to include kayaking, stand-up paddle boarding, and swimming.	Outdoor environments are vibrant and healthy, and are integrated into the life of community for active and reflective uses. Sustainable principles and designs are integrated into outdoor spaces to promote wildlife, food production, and water conservation. Students and staff actively assist landscape staff in the development and maintenance of outdoor environments In addition to Level 3 activities Facilities Dept has suspended use of herbicides. Dining halls and Shack source some produce from community garden. Outdoor dining areas are established. Green life club and others are directly involved in planning and taking care of natural areas.

Assumptions/ Intentions	Assessment Level 1	Assessment Level 2	Assessment Level 3	Assessment Level 4
Habitat Improvement/ Restoration Natural habitats in Indiana, particularly wetlands and streams have been severely degraded in the last 150 years. Less than 5 % of interior wetland habitats remain and every stream and lake in the state has a fish consumption advisory due to mercury. Indiana's forests are a bright spot, with nearly triple the amount of forest land in 2015 compared to 1900. *Giving students first hand experience in restoring natural habitats is an essential skill for a sustainable future*	Constructed and developed school environment is primary landscape focus Health of existing natural habitats are not considered, or are endangered by developmental planning and land use practices Comprehensive baseline survey of existing natural habitats and their ecological contributions is not a priority	Natural habitats are removed from developmental planning but not included in strategic land use planning discussions Some habitats are informally inventoried for species composition, ecological history, and resource value Some members of the community are aware of the location of natural habitats on school property	School natural habitats are identified and acknowledged as valuable resources for preservation Local professionals who are engaged in the preservation of natural habitat are utilized as consultants and resources Effort is made to create a comprehensive plan for the preservation and improvement of existing natural habitats Students engage in documented species inventories of habitats	School actively monitors condition of natural habitats and integrates restoration efforts with other similar conservation efforts in the larger community School natural habitats and their condition are well known and understood by most students and staff Uninformed visitors are readily aware of natural habitats and the school commitment and efforts for their preservation and restoration
Landscaping and Green Waste Landscaping practices can have a significant impact on water use, CO2 contribution, exposure to toxic chemicals, and landfill waste. Green waste accounts for over 15% of material sent to landfills	No policies in place to mulch/compost green waste Alternative approaches to herbicide and pesticide use are not encouraged Water conservation irrigation or drought tolerant plants not used	Efforts are made to explore alternatives to land filling green waste Landscape designs integrate some water conservation approaches Alternatives to petro-chemical use explored	Green waste mulching practices are in place and used to supplement landscaping materials Water conserving irrigation systems and drought resist plants are integrated into landscape plantings Permaculture practices partially integrated into landscaping program	Students and faculty are mostly aware of green landscaping approaches being used and collaborate with landscape staff on planting projects Permaculture practices fully integrated into landscaping program.

SECTION IV Community Partnerships

Assumptions/Intentions	Assessment Level 1	Assessment Level 2	Assessment Level 3	Assessment Level 4
Partnership with School Support Staff School support staff is a core influence in the development of a community wide sustainability ethic. Integrating their critical application skills, organizational framework, and knowledge of school operating systems provides an invaluable resource in the implementation of school sustainable practices	School support staff operate independently from the rest of school and interaction with students and other staff is not encouraged Experienced school support staff are not incorporated in sustainability strategic planning or consulted prior to implementation School support staff are not included in community dialogues to convey the importance of adopting ecological principles	School support staff are encouraged to interact and work with students and staff in certain directed areas Some opportunities are created for support staff to provide feedback on sustainable practices and planning In some areas the physical plant of the school is used as an information resource and learning environment	Support staff are introduced and valued in the community as skilled professionals Support staff/student/faculty interactions trend toward partnerships vs transactional relationships in some areas Support staff are provided professional development opportunities to cultivate emerging sustainable practices in their fields Support staff are involved in conveying info on physical plant of school	Support staff are appreciated as informed and knowledgeable in sustainable practice and applications Support staff/student/faculty have frequent opportunities to collaborate in partnership toward the implementation of sustainable school practices Support staff frequently convey their knowledge and practical experience in the application of sustainable approaches to the physical plant of the school
Partnerships with Local Organizations Community organizations like habitat conservation groups, green coalitions, environmental learning centers, and sustainability clubs in other schools provide important service learning opportunities to collaboratively apply the principles of sustainability while strengthening community relationships	A few students are engaged independently in voluntary community service projects School and greater community sustainable practices operate independently even when goals and concerns overlap Opportunities for students and staff to participate in collaborative community projects are inadequately advertised and/or not provided adequate scheduling opportunities	Local organizations and school organizations collaborate to utilize students on occasional projects Students and staff explore possibilities for establishing formal partnerships with local organizations Advocates for community partnerships may exist at school and community levels Some classrooms require students to include service learning opportunities to their knowledge and experience	A service learning component is integrated into the school's educational strategy and curriculum Students and staff participate in community projects that reflect the application of environmental principles benefiting the greater community Local environmental organizations are aware of the shared goals and projects of the school	Students and staff regularly work together with local community organizations on service learning projects On-going collaborative projects and agreements exist between the school and local environmental action organizations Working with local environmental interest groups in integrated into classroom curriculum and lesson plans

SECTION V Administrative Support

Assumptions/Intentions	Assessment Level 1	Assessment Level 2	Assessment Level 3	Assessment Level 4
School and Culture The development of a sustainability ethic in any population hinges on the ability for that ethic to neatly integrate into the philosophy, mission, and culture of the community. Administrative agreement and support for the sustainability ethic is at the core of the comprehensive development of school sustainable practices	Sustainability ethic is not well voiced or understood by entire community Educational approaches that integrate environmental principles and the principles of sustainability across academic disciplines are not well understood or supported	Some administrative support exists to stimulate a dialogue surrounding the ethics of sustainability education and awareness for the trend toward using environmental education as an integrating context (EIC) Developing an EIC approach and curriculum is neither administratively supported nor discouraged, but left to teacher's individual discretion	An ethic of relationship and responsibility to the natural environment and commitment to sustainable practices is actively embraced by the head of school and most school administrators Most teachers and students are aware of the school commitment to sustainable practices and the educational integration of environmental principles into academic life	The school philosophy and commitment to environmental principles is well known by the school community, new applicants, and the greater local community The school philosophy integrating the commitment to environmental principals is clearly supported by policy, budget, planning, and curriculum decisions made by school board and admin
Professional Development Sustainability education crosses disciplinary lines and is a relatively new field of study. Opportunities for professionally developing an informed knowledge and understanding of sustainable practices, and the effective application of sustainable approaches is absolutely essential for informed decision making	Professional development is largely a matter of individual choice and not closely integrated into a larger strategic plan Facilities and support staff are not philosophically integrated in professional development planning	Sustainability conferences and courses in the development of ecological literacy are supported in professional development planning Some efforts are made to create in-service opportunities to be trained or learn about environmental issues and the development of ecological literacy	Active school participation and support for sustainability education and professional development results in noticeable increase in interactions with other schools and educational organizations with reciprocal interests Facilities and support staff are actively encouraged to pursue professional development in sustainable practices	Awareness for training opportunities in sustainability and curriculum development integrating the principles of sustainability are well understood by faculty and staff Active participation in professional development by Facilities and support staff results in noticeable positive engagement in their informed planning and implementation of green practices
Strategic Planning Like any implementation effort, sustainability vision, practice and education benefit from their integration into the long term and short term planning of the school budget, physical plant and curriculum	Integrating sustainability planning is marginally and incompletely integrated into yearly budget and curriculum planning	Green School guidelines are explored for active integration into yearly reports and long term strategic planning Operational funding for sustainable practices are explored for integration into budget Sustainable policies and practices are discussed for integration into facilities and land use strategies	School strategic plans identifies strengths and weaknesses of sustainable practices and strategies Sustainable land use is included in planning School plan includes measuring and assessing school plant and curriculum to identify realistic Green School objectives	School strategic plan is understood by the school community to actively include commitment to sustainable practices and measurable objectives to achieve Green School status Budget, physical plant, and curriculum planning include support for the measured implementation of sustainable practices