TORN DOWN FOR WHAT: THE RELATIONSHIP BETWEEN PRESERVATION AND MATERIAL REUSE AT THE UNIVERSITY OF GEORGIA

by

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(Under the Direction of Katherine Melcher)

ABSTRACT

This thesis examines the relationship between the fields of historic preservation and sustainability, specifically within the context of the University of Georgia. It defines the extent of their interaction, while offering a perspective on how the fields can be integrated through the reuse of material. The costs and benefits of material reuse at the institutional level are examined, providing evidence for the value of such a program at an educational institution, particularly when aligned with University priorities and goals for sustainability. Material reuse offers a unique opportunity for the University of Georgia to be a leader in both historic preservation and sustainability, through expansion of the current student and community oriented Material Reuse Program to an institutional level through building policy and practice. An evaluation of this program at the University of Georgia aims to provide evidence for the inclusion of material reuse to bridge the gap between sustainability and historic preservation, particularly at institutions of higher education.

INDEX WORDS: University of Georgia, Material Reuse, Construction, Demolition, Recycling, Waste Management, Green Building, Historic Preservation

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DEDICATION

I would like to dedicate this thesis to my parents, who have each in their own way supported me throughout all of my endeavors. To my mom, who gave me the confidence and encouragement to always stand on my own two feet, who is never hesitant to tell me the truth when I get a crazy idea, but ultimately stands behind me no matter what, unconditionally. To my dad, who always pushed me to be better, to never accept the status quo, and who made a lot of sacrifices to get me where I am today. Last but not least, to Laura Elizabeth, who has given me more love in friendship than I could ever deserve.

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CHAPTER ONE:

INTRODUCTION

As today's world faces growing environmental problems, including climate change and dwindling supplies of natural resources, the concept of sustainability has become increasingly promoted in an effort to solve problems worldwide. While the term has become a buzzword used by corporations and the media to create an impression of good environmental citizenship, a deeper concept of sustainability has existed for several years as nations examined their impacts on the planet. However, the concept of sustainability has existed for quite some time, as we have sought to examine our current and future impacts on the planet. In 1987, the United Nations World Commission on Environment and Development released "Our Common Future" also known as the Brundtland Report, which aimed to examine environmental issues and raise awareness and encourage commitment to action by the world community regarding sustainability. The report provided a definition of sustainability that has become the standard: "to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs."[1]

Even before the Brundtland Report, the concept of sustainability was being discussed within the field of historic preservation. While preservationists seem to be embracing this relationship in recent years, by promoting the green aspects of preservation, the idea is certainly not new. In 1980, the National Trust for Historic Preservation advertised its annual Preservation

[1] World Commission on Environment and Development, Our Common Future (Oxford: Oxford University Press, 1987), 16.

Week with a striking image: a historic brick building depicted as a gas can (Figure 1.1). Closely following the energy crisis in 1979 following a revolution in Iran, this campaign played to current events and national awareness of gas prices. The text under the image begins, "It takes the energy equivalent of one gallon of gasoline to make, deliver and install eight bricks. Preserving eight old bricks instead of throwing them away and making new ones means that the energy of one gallon of gasoline can be used to meet other needs."[2]

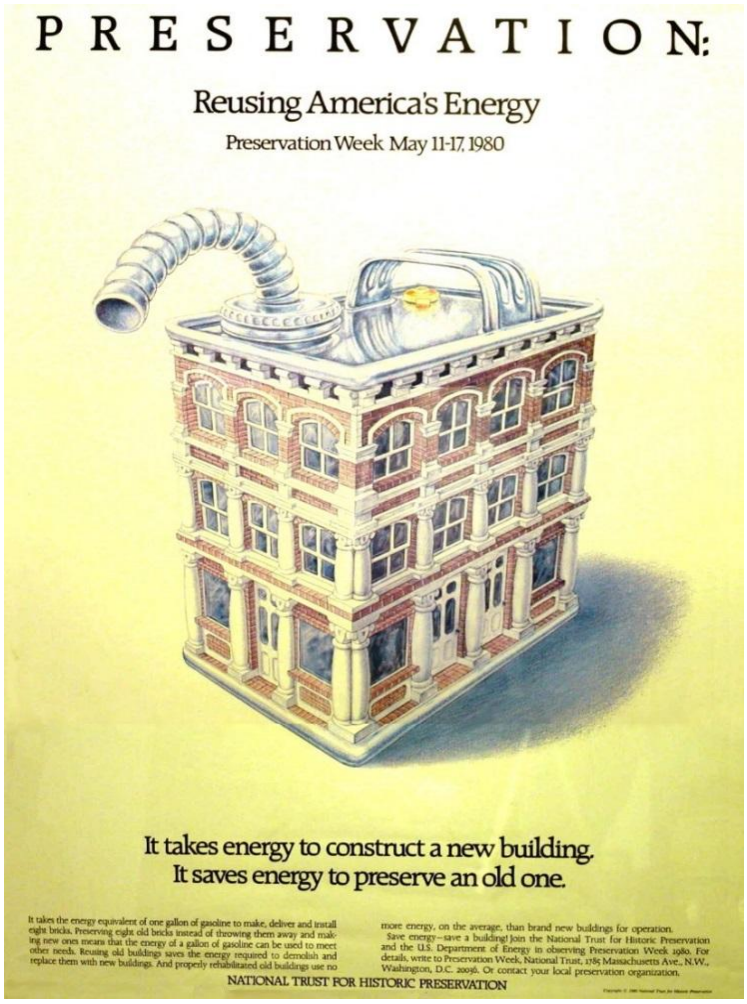

Figure 1.1: Preservation Week 1980 Promotional Campaign[3]

[2] Preservation: Reusing America's Energy, The National Trust for Historic Preservation (Washington, DC, 1980) http://www.historycolorado.org/sites/default/files/images/OAHP/Programs/CLG_Handouts_1980poster.JPG

[3] Ibid.

Even before the idea of sustainability became established, the National Trust was making a bold statement about the inherent value of energy embodied in materials, specifically historic building materials. While preservationists agree that preserving an entire building is a win for both historic preservation and sustainability, what happens when the entire building is not able to be saved? There are a multitude of reasons that in some cases, removal of a structure is necessary. While it is the worst-case scenario, and last option for preservationists, demolition does occur. Usually, this is regarded as a major loss for preservation, and once slated for demolition, buildings lose any attention garnered by preservationists. The argument of "the greenest building is one that already exists" only seems to apply to an entire building for preservationists. But what if a greater responsibility existed and the current relationship between preservation and sustainability was broadened? Preservation should be built on a platform of sustainable development, not separate from it. If, as a last resort, a building must be removed, it should fall into the safety net of sustainable development placed under historic structures. Creative mitigation such as deconstruction and building material reuse and recycling should be the norm in these situations. Additionally, these same principals can apply in situations involving renovations or rehabilitations. The possibility of reusing or recycling materials salvaged during renovations adds another layer of sustainability to historic preservation. A greater responsibility beyond preserving historic structures exists, as it does for all citizens of the world interested in "meeting the needs of the present without compromising the ability of future generations to meet their own needs."[4]

[4] World Commission on Environment and Development, Our Common Future (Oxford: Oxford University Press, 1987), 16.

Thesis: Preservation and Material Reuse at the University of Georgia

Bearing in mind the tenuous relationship between historic preservation and sustainability, and in particular material reuse, it is not surprising that these two entities function separately at a large, public university. The University of Georgia (UGA), the oldest state-supported institution, was chartered in 1785 as a liberal arts college. Over 200 years later, the university has grown to include seventeen colleges and schools, which support the university's mission of teaching, research, and service. The university's motto "to teach, to serve, and to inquire into the nature of things" reflects its commitment as a land and sea-grant university to serve as a leader "in the state's and nation's intellectual, cultural, and environmental heritage."[5]

The university has established programs and dedicated staff managing sustainability and historic preservation on campus, as well as an existing Material Reuse Program. This existing program is the driver of the research presented in this thesis. The program is unique, and offers a creative approach to sustainable development, while also incorporating themes of education and student involvement. The Material Reuse Program is an opportunity for UGA to be a leader in sustainability in the realm of higher education.

The current relationship between preservation and sustainability at UGA is unclear. These programs are established and have dedicated staff, but are dispersed throughout the University. In looking at the focus of current projects, policies, and efforts on campus, it appears that both preservation and sustainability are priorities of the university. As such, it is important to assess the current functioning of both programs, examining their correlation and potentially overlapping goals. In examining these entities, it is important to also consider the existing

[5] The University of Georgia, The Mission of the University of Georgia, accessed February 24, 2016. http://www.uga.edu/profile/mission/

Material Reuse Program, as it relates to both, and offers an opportunity for more sustainable development.

Research Questions

This thesis aims to answer the following questions: What is the extent of the connection between sustainability and preservation at the University of Georgia? What are the costs and benefits of institutionalized material reuse and recycling for building projects at the University of Georgia? These questions lead to a greater question: How can sustainability and historic preservation be well integrated within a university?

Methodology and Organization

Firstly, to offer the reader a greater context and background of the relationship between sustainability and historic preservation, specifically related to material reuse, Chapter Two provides definitions of material reuse, as well as environmental and economic evidence of the benefits of material reuse from previous research. It also explores the historic precedent for material reuse, and the current opportunities for reuse within preservation processes such as Section 106 requirements. This chapter creates context and a baseline of knowledge surrounding sustainability and preservation, providing a foundation for further chapters. Chapter Three builds on the context information and examines the current state of sustainability and preservation at other universities, including two case study institutions. Institutions of higher education are interesting case studies of these planning practices because of their unique setup. Universities are somewhat insular, with independent planning, construction and design efforts. This creates a

living laboratory for planning practices, including sustainable development and historic preservation.

After looking at the larger context, Chapter Four seeks to explore the current state of preservation and sustainability efforts at the University of Georgia. The University of Georgia has already initiated a rare program on campus related to both sustainability and preservation: the Material Reuse Program. At the same time, the University is currently making strides towards increased sustainability and sensitive preservation efforts of the campus. An overview of the Office of Sustainability is given, as well as an overview of current campus preservation efforts, focused on the currently developing Campus Preservation Plan. This Chapter provides in depth information about the University's current practices and policies to be referred to in later analysis. Chapter Five provides an overview of the Material Reuse Program, including its operations and challenges of expanding the program. This program is instrumental in the University's sustainability efforts and recommendations will be made on expanding its role.

Chapter Six provides an analysis of the interchange of preservation on sustainability on campus, as well as the value an expanded Material Reuse Program could offer the campus. Recommendations are made, drawing on research presented in favor of material reuse as a sustainable building practice, and organized based on the University's goals set in the Strategic Plan. This chapter aims to highlight how the University's current goals can be accomplished through an expansion of existing programs. Finally, Chapter Six synthesizes information from the previous chapters and analyses, offering a conclusion on the research presented, and offering insight into how the University of Georgia can set a precedent for others attempting to increase their sustainability while also preserve the resources of their past. Ultimately, this thesis aims to

offer evidence that the University of Georgia can be a leader as an institution of higher education in the intersection of sustainability and preservation.

CHAPTER TWO:

SUSTAINABILITY AND PRESERVATION

This chapter aims to define the existing relationship between sustainability and historic preservation, specifically in relation to material reuse. First, it defines material reuse to give the reader an understanding of the topic as it pertains to building practices as a whole. It proceeds to give evidence in support of material reuse, including environmental and economic evidence. It then offers an overview of the historic precedent for material reuse, including information on material reuse throughout history. Additionally, the mitigation process in historic preservation is discussed, offering examples of material reuse as a creative mitigation strategy.

Defining Material Reuse and Recycling

The United States Environmental Protection Agency (U.S. EPA) has established a waste management hierarchy ranking the strategies for managing waste according to environmental impact. Source reduction and reuse are listed at the top of the hierarchy, followed by recycling. Disposal is listed at the bottom of the hierarchy, as it is the least desirable option. (Figure 2.1) The principles of waste management established by the hierarchy can apply to both solid waste and material waste. Material waste, or construction and demolition debris, is defined by the EPA as waste material produced in the process of construction, renovation, or demolition of

structures.[6] Reduction of material waste can occur through the avoidance of demolition, minimization of packaging of new materials, and by design of new construction. Reuse of materials can be achieved through salvage or deconstruction projects, sourcing previously used materials and applying them in their original state to a new project. Building materials commonly reused are wood, masonry units including brick and stone, metal, and architectural elements such as decorative moldings, mantels, and metalwork. Materials can also be recycled through the processing of the used material into new products. This method is usually less preferable as it requires additional energy and resources to process the material and can often result in a product that is less desirable than the original material. Common materials that are recycled include wood, metal, and aggregates such as concrete, asphalt, asphalt shingles, and gypsum wallboard.[7]

Figure 2.1: Waste Management Hierarchy[8]

[6] "Construction and Demolition (C&D) Debris," U.S. Environmental Protection Agency, accessed January 15, 2015, http://www.epa.gov/reg3wcmd/solidwastecd.html.
[7] "Construction and Demolition Recycling Association," accessed January 15, 2015, http://www.cdrecycling.org/.
[8] "Waste Management Hierarchy," U.S. EPA, last modified August 12, 2013, http://www.epa.gov/osw/homeland/hierarchy.htm

Construction and demolition debris is generated in any type of building project, whether it is new construction, renovation, or demolition. The amounts of waste generated depend on the project, and material recovered from these projects can vary greatly. A summary of the projects is seen in Figure 2.2, a table comparing the aspects of construction, renovation, and demolition, as well as a viable alternative to demolition: deconstruction. Demolition is considered the dismantling of a structure, typically by mechanical methods. It requires the least amount of labor and time when taking down a structure. However, this method generates a large amount of waste, and makes it difficult to reuse or recycle the materials. Demolition using a wrecking ball or crane is time and labor effective, but reduces the building or structure to rubble, mixing and crushing materials all together. This makes processing of materials for reuse or recycling extremely difficult and typically leads to waste being disposed of in a landfill. Deconstruction, an alternative to demolition, offers a method that creates a high amount of reusable or recyclable material. Deconstruction is the methodical disassembly of buildings with the purpose of recovering materials. According to Kibert and Languell of the Powell Center for Construction and Environment at the University of Florida, using deconstruction, 80% of a building's materials can be diverted from the landfill through either reuse or recycling.[9] This percentage is notably higher than the average rate of recovery during demolition, estimated by the EPA at only 20-30%.[10] Deconstruction allows for a high percentage of recovery due to the methods used to dismantle the structure.

[9] Charles Kibert and Jennifer Languell, *Implementing Deconstruction in Florida: Materials Reuse Issues, Disassembly Techniques, Economics and Policy* (Gainesville, FL: Powell Center for Construction and Environment, 2000).
[10] U.S. Environmental Protection Agency, *Characterization of Building-related Construction and Demolition Debris in the United States*, by Franklin Associates. EPA530-R-98-010 (Washington, D.C.: United States Government Printing Office, 1998) 3-9.

Criteria for comparing the four types of building projects

	New construction	*Renovation*	*Demolition*	*Deconstruction*
Definition	Assembly of buildings	Removal of certain parts of buildings for the purpose of construction	Complete removal of buildings	Organised dismantling of buildings
Waste reduction goals	Insignificant	Insignificant	Insignificant	Significant
Amount of waste generated	Small (about 4 pounds/sf)	Large (>4 pounds/sf)	Very large (about 70 pounds/sf)	Very large (about 70 pounds/sf)
Type of waste	Packaging and debris from cut materials	Packaging and debris from cut materials; old building materials mainly wood, metal scrap, and granule	Old building materials mainly wood, metal scrap, and granule	Old building materials mainly wood, metal scrap, and granule
Waste separation	Easy	Average difficulty	Difficult	Easier than demolition due to its orderly manner
Reusability	Good possibility; mainly for packaging materials	Good possibility; mainly for packaging materials and other scrap being demolished	Less likely due to the mix up of debris	Very likely due to the organised fashion in stripping materials and careful dismantling of systems
Re-cyclability	Good possibility; mainly because the debris are not mixed up	Good possibility; mainly for packaging materials and other scrap being demolished	Possible, but further processing is needed	Very likely due to the organised fashion in stripping materials and careful dismantling of systems
Type of materials	Mainly packaging materials and cardboard, scrap metal and concrete	Mainly packaging materials and cardboard, scrap metal, piping, tiles, concrete, *etc.*	Metals, lumber, asphalt, concrete, roofing materials, *etc.*	Appliances, pipes, fixtures, tiles, metals, lumber, asphalt, concrete, roofing materials, cardboard, *etc.*

Figure 2.2: Building Projects Summary Table[11]

[11] "Construction and Demolition (C&D) Waste," US EPA and Peaks to Prairies Pollution Prevention Information Center, accessed April 2004, http://peakstoprairies.org, cited in Manar Shami, "A Comprensive Review of Building Deconstruction and Salvage: Deconstruction Benefits and Hurdles," *International Journal of Environmental Technology and Management*, Vol. 6, nos. 3/4 (2006): 242.

Environmental Evidence for Material Reuse

Building materials inherently require energy to manufacture or process from their natural form, referred to as embodied energy. The Dictionary of Energy defines embodied energy as "the sum of the energy requirements associated, directly or indirectly, with the delivery of a good or service."[12] In reference to used building materials, embodied energy is the amount of energy to extract natural resources, process and manufacture the resources, transport the finished product to a site, and install the material. Upon demolition and disposal of a building, this embodied energy is retained in the materials, and deposited in a landfill. This cycle is seen in Figure 2.3, which shows the life cycle stages of a building, developed in the Life Cycle Assessment (LCA) approach.

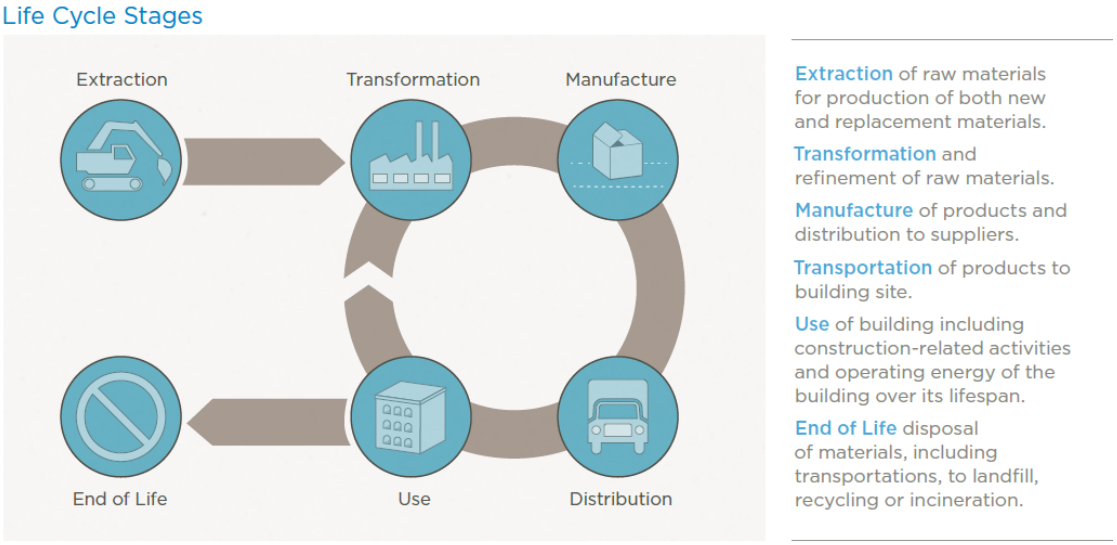

Figure 2.3: Life-Cycle Assessment Stages[13]

Although the current landfill burden in the United States is unknown due to inadequate data, it is estimated to be substantial, around 143 million tons in total.[14] In the United States, the

[12] Cutler J. Cleveland and Christopher Morris, Dictionary of Energy (Oxford, England: Elsevier, 2009).
[13] Preservation Green Lab, *The Greenest Building: Quantifying the Environmental Value of Building Reuse* (Washington, DC: National Trust for Historic Preservation, 2011) 22.

disposal of waste is separated into two categories: municipal solid waste (MSW) and construction and demolition (C&D) waste. While MSW landfills will accept C&D materials, C&D landfills are dedicated solely to the disposal of this particular waste. Municipal solid waste landfills are federally regulated through the Resource Conservation and Recovery Act (RCRA) passed in 1976 as an amendment to the Solid Waste Disposal Act. This legislation sought to address the issue of the increasing volume of waste and plan for the future. However, the RCRA does not apply to construction and demolition landfills, only MSW landfills. C&D landfills are not subject to federal regulation, and are managed at the state or local level. This is a barrier to accurate data regarding the C&D debris landfill burden in the United States.

The United States Environmental Protection Agency (EPA) released a report in 2009 regarding an estimation of C&D waste in 2003. This report is the most recent estimation of C&D waste. Prior to this report, the EPA estimated the C&D waste burden at 136 million tons per year in the United States. The updated report placed the C&D waste estimate at 170 million tons, showing a notable increase from the previous estimate in 1998. As seen in Figure 2.4, the amount of waste produced by demolition comprises the largest portion of C&D waste, followed closely by renovation. Construction produces the smallest percentage, totaling only 9%. Based on limited state-reported data, the same report estimated that 52% of this waste was disposed of in landfills, including both MSW and C&D landfills. In contrast to the amount of waste disposed of in a landfill, the report estimated that 48% of C&D debris was recovered. Recovery of C&D waste includes both reuse and recycling of the material. As previously discussed,

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[14] A.R. Chini and S.F. Bruening, *Deconstruction and Materials Reuse in the United States*, CIB Report no. 300 (2005), quoted in Hongping Yuan, Abdol R. Chini, Yujie Lu, and Liyin Shen, "A Dynamic Model for Assessing the Effects of Management Strategies on the Reduction of Construction and Demolition Waste," *Waste Management* 32 (2012): 521-31.

alternatives to demolition provide an opportunity for greater recovery of C&D material due to the ease of sorting and processing this material.

Estimated Amount of Building-Related C&D Materials Generated in the U.S. During 2003.

Source	Residential		Nonresidential		Totals	
	Million tons	Percent	Million tons	Percent	Million tons	Percent
Construction	10	15%	5	5%	15	9%
Renovation	38	57%	33	32%	71	42%
Demolition	19	28%	65	63%	84	49%
Totals	67	100%	103	100%	170	100%
Percent	39%		61%		100%	

*C&D managed on-site should, in theory, be deducted from generation. Quantities managed on-site are unknown.

Note: Data are rounded to the appropriate significant digits. Data may not add to totals shown.

Figure 2.4: Estimated C&D Waste Generated in 2003[15]

Economic Evidence for Material Reuse

While environmental factors point heavily towards an increased need for material reuse as an alternative for waste management, economic evidence might not be as straightforward. At a base level, research has shown that traditional demolition is less costly than deconstruction or salvage. Many factors contribute to this, including but not limited to labor, time, disposal, recycling and abatement of hazardous materials. However, while costs are higher initially for deconstruction and salvage, research has shown that the net cost when compared with demolition is actually lower.

[15] U.S. Environmental Protection Agency, *Estimating 2003 Building-Related Construction and Demolition Materials Amounts*, EPA 530-R-09-002 (Washington, D.C.: United States Government Printing Office, 2009) 17.

In 2000, the University of Florida Center for Construction and Environment released a detailed report illuminating the findings of a research project focused on implementing deconstruction in Florida. Funded by the Florida Center for Solid and Hazardous Waste Management, the study aimed to give an overview of the costs and benefits of deconstruction, and analyze the feasibility of replacing demolition and disposal with deconstruction and reuse. The report first gives a comprehensive overview of current waste management practices, providing compelling facts for the need to reduce the current landfill burden. The report then goes on to examine the costs of deconstruction in comparison with demolition through case studies of actual projects. Two nonresidential deconstruction projects were examined, comparing costs of deconstruction with estimates from demolition bids. The two buildings examined were located in the Bay Area of California and were federally owned. The first building was a single story, wooden structure of 9180 square feet. The second building was a wood construction 3 acre warehouse.[16] While initial costs for deconstruction were higher than demolition for both projects, net costs of deconstruction were lower than demolition in both cases (Figure 2.5). After taking into consideration the value added of salvaged material, costs were lower using deconstruction in both cases, saving 45% and 66% respectively on the two projects.

[16] Center for Economic Conversion, Green Base Conversion Strategies: Techniques for Creating Environmentally Sustainable Development on Closing Military Bases (1997) 3.

Case Study: Deconstruction Cost
Location: Presidio, Building #901

Expense	Deconstruction Cost	Demolition Cost
Labor	-$33,000	$0
Logistics	-$12,000	$0
Administration	-$ 8,000	$0
TOTAL EXPENSES	-$53,000	-$16,800
Income	**Deconstruction**	**Demolition**
Sale of Salvaged Materials	$43,660	$0
NET COST	**$ 9,340**	-$16,800

Case Study: Deconstruction Cost
Location: Port of Oakland, Building #733

Expense	Deconstruction Cost	Demolition Cost
Labor	-$240,000	$0
Logistics	-$47,000	$0
Administration	-$43,000	$0
TOTAL EXPENSES	-$330,000	-$150,000
Income	**Deconstruction**	**Demolition**
Sale of Salvaged Materials	$280,000	$0
NET COST	**$50,000**	-$150,000

Figure 2.5: Deconstruction Costs, Bay Area Case Studies[17]

One difficulty in assessing the economic feasibility of deconstruction is the number of factors that play into the net cost. Many factors are dependent on the location and the individual structure itself. Costs associated with labor and disposal vary greatly depending on location, as well as salvage value of materials. In addition, building factors including condition, age, size, and materials greatly affect deconstruction feasibility. Ultimately, projects need to be assessed on an

[17] Ibid.

individual basis, taking into account variables pointing towards either deconstruction or demolition, when deconstruction is not a viable option.

Historic Precedent for Material Reuse

Reuse throughout History

In the field of historic preservation, material reuse has been limited and often discouraged due to the cause and effect argument of building demolition and deconstruction. Many preservationists feel that promoting the benefits of building deconstruction and salvage will cause historic buildings to disappear at a growing rate. If deconstruction and salvage are seen as a viable option, it might encourage demolition rather than reuse of historic structures. Preservationists mostly agree that once a building has been dismantled, the pieces of the structure no longer retain any historic significance or integrity. However, building material reuse has a long history, dating back to classical times. The use of *spolia*, the academic term for architectural elements reused from earlier monuments, has been widely documented in the classical world.

An early example of the use of *spolia* is seen in the construction of the Arch of Constantine in 315 AD, constructed almost entirely with pieces from earlier monuments. Everything from the capitals, columns, architraves, and reliefs were taken from existing structures and appropriated by Constantine to form a new monument. While the intentions behind this design decision are not entirely known, Philip Jacks proposes: “on the one hand, Constantine was projecting his victory over Maxentius by co-opting the memory of these beneficent rulers. On the other hand, he was physically appropriating the forms of an earlier

epoch to forge a new aesthetic." [18] While the arch could have been an attempt at making a political statement, it could have also been an attempt to reuse valuable resources. Additionally, the arch serves as a record of the city's past. Joseph Alchermes, in an article regarding the use of *spolia* in the Roman Empire, states: "Such architectural recycling furnished a means of maintaining the luster of the later imperial city's heritage in the physical record of its dismantled and recomposed monuments."[19] Alchermes implies that the *spolia*, while no longer forming an entire monument, inherently carry some degree of heritage as reused materials.

While the practice of disassembling monuments and public structures may have been acceptable in the Roman Empire, eventually this practice reached a dangerous level, a situation many preservationists are concerned with in present time if deconstruction of historic structures is promoted. The Roman Empire corrected this situation through legislation regulating the salvage of materials from existing structures. Similarly, the National Trust for Historic Preservation issued a position regarding deconstruction in 2009. While this position is in no way regulatory, it offers a strong stance on deconstruction that both supports of the practice as a way to reduce landfilling but only as a last resort. The National Trust states that before deconstruction is considered as an option, building reuse and repair in its original location should be considered. Secondly, moving the building to a new location should be considered. Finally, "deconstruct and carefully salvage materials only after all avenues for the continued or adaptive

[18] Philip Jacks, "Restauratio and Reuse: The Afterlife of Roman Ruins," Places- A Forum of Environmental Design 20, no. 1 (2008): 10-20.
[19] Joseph Alchermes, "Spolia in Roman Cities of the Late Empire: Legislative Rationales and Architectural Reuse," *Dumbarton Oaks Papers*, vol. 48 (1994): 170.

reuse of a building have been exhausted." [20] The National Trust continues with several points to further emphasize its stance:

- Deconstruction is an appropriate and positive solution if there is no other prudent or feasible alternative.
- Deconstruction should not be used as a rationalization or incentive for ending the life of a building, especially a building listed in or eligible for listing in the National Register of Historic Places, either individually or as part of a district or has local or state designation as historic.
- We do not support deconstruction of older and historic homes when they are removed from a neighborhood and replaced by out-of-scale houses that infringe upon their neighbors and harm the integrity and stability of the neighborhood.[21]

While the National Trust makes it clear that deconstruction is a last resort, it begins the paper summarizing the use of deconstruction as a green practice, and mentions the credits available for the use of recycled materials in the LEED[22] program. The Trust states,

> We recognize the environmental benefits of reducing impacts to landfills and we support the reuse of older and historic building materials and architectural detail. We also recognize that deconstruction can provide a source of materials for rehabilitating other buildings in a historic neighborhood, and this may serve to help protect community character.

[20] The National Trust for Historic Preservation, *Position on Deconstruction* (Washington, D.C.: National Trust for Historic Preservation, 2009).
[21] Ibid.
[22] "What is LEED?" U.S. Green Building Council, accessed April 9, 2016, http://leed.usgbc.org/leed.html. LEED is a green building rating system which provides certification of a building's green features. The U.S. Green Building Council maintains the certification program, which considers nine different aspects in giving ratings to buildings: integrative process, location and transportation, sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, innovation, and regional priority.

The position paper make it clear that while there are recognized benefits to deconstruction, its practice should be limited to buildings that are unable to be saved.

Reuse as a Mitigation Tool

The only legislation relating to demolition of historic structures is Section 106 of the National Historic Preservation Act (NHPA) of 1966. This legislation requires Federal agencies to consider the effects of undertakings on historic structures. An addendum to the NHPA in 1994 defines an undertaking as "a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of the agency; those carried out with Federal financial assistance; those requiring a Federal permit, license, or approval; and those subject to State or local regulation administered pursuant to a delegation or approval by a Federal agency."[23] The legislation requires a review process that is enforced by regulations set by the Advisory Council on Historic Preservation in 36 CFR 800 (Protection of Historic Properties). This process only applies to Federal undertakings and to properties that are either listed on the National Register of Historic Places or eligible for the National Register of Historic Places. A summary of the legislation can be seen in Figure 2.6, with graphic representation of the process. As seen in the figure, in the event that historic properties are adversely affected, these effects must be mitigated.

[23] 16 U.S.C. § 470w(7) (1994).

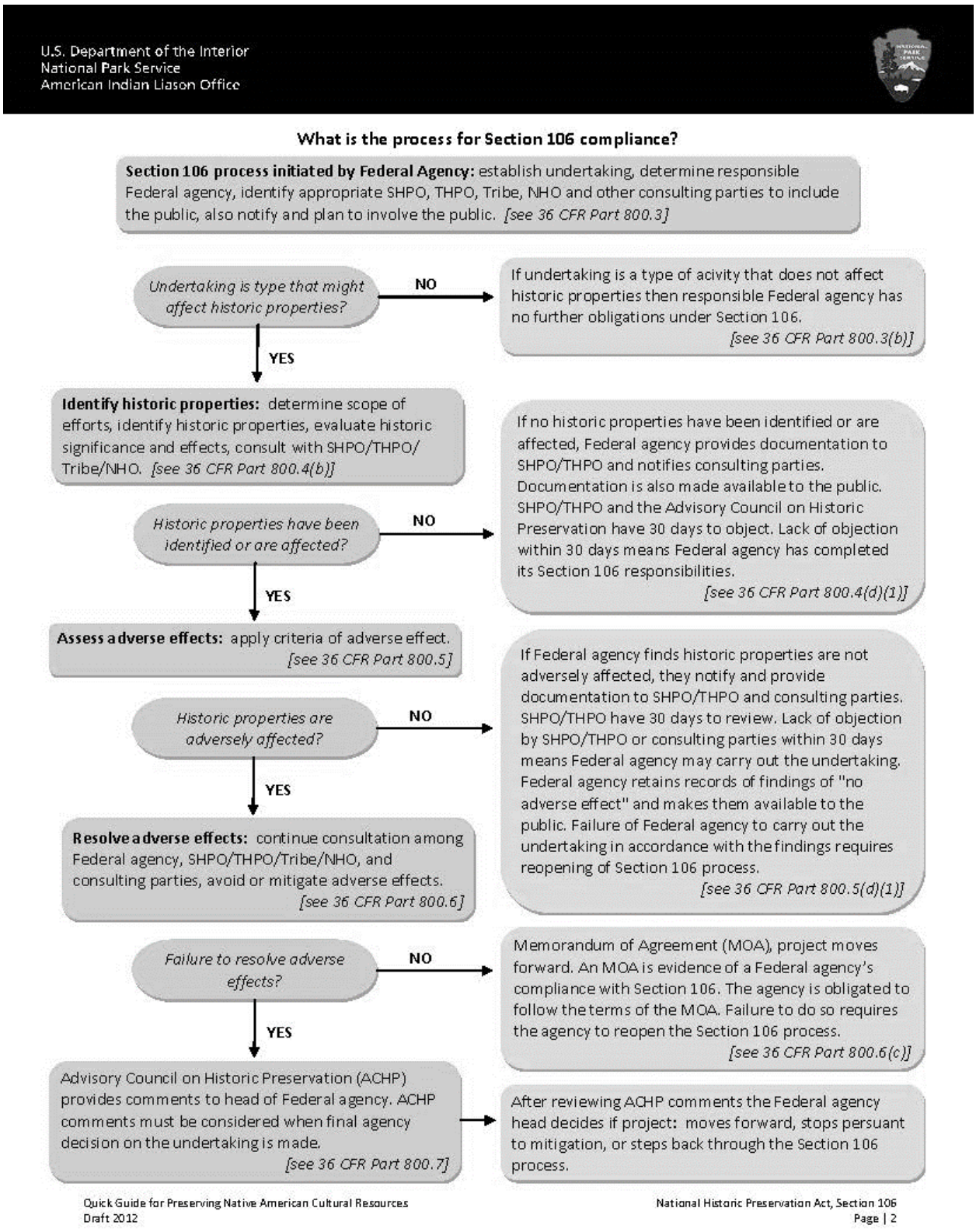

Figure 2.6: Section 106 Process

However, mitigation is not defined in any way, and the code states that an agreement must be made with or without Advisory Council participation. Mitigation is agreed upon by the agency involved, the State Historic Preservation Officer or Tribal Historic Preservation Officer, depending on the site location, and any other consulting parties. Historically, if the agreement includes demolition of historic resources, the agreement usually stipulates that the resource be documented to Historic American Building Survey standards as mitigation. Other mitigation measures include public education and outreach. While the "document and destroy" method of mitigation is typical, occasionally stipulations are made for buildings to be deconstructed or salvaged as a mitigation measure. Two examples of reuse as a mitigation tool include the Collins Building at the Port of Everett in Everett, Washington, and the New Franklin Viaduct in Howard County, Missouri.

The Collins building was erected circa 1925 by the William Hulbert Mill Company, and despite various changes in ownership, operated continuously as a casket manufacturing company until 1996. The building was wood framed, utilizing common post and beam construction on each of the three stories. The building occupied 60,000 square feet in total, and the exterior was sheathed in 6 inch beveled cedar siding, originally treated or stained, and painted red in 1991. Large expanses of wood-sash windows occupied each level, with the exception of the northwestern corner of the building.[24] In 2006, due to the building's significance within the narrative of manufacturing and industry in Everett, the Collins Building was listed on the National Register of Historic Places. By 2010, the building had stood vacant for 14 years and fallen into disrepair. Subject to Section 106 requirements, mitigation for demolition of the

[24] "Port of Everett's Collins Building Mitigation Strategy," Port of Everett, 2009.

structure included public education and documentation of the building. In addition, creative mitigation was employed and as a stipulation in the memorandum of agreement, the building was deconstructed and materials were made available for qualifying entities for historic property rehabilitation. Additional materials were sold to a salvage company and used in the rehabilitation of another historic property at the port. This building serves as an excellent case study of employing material reuse and recycling as creative mitigation when a building cannot be saved.

A second example of reuse as a mitigation strategy is the New Franklin Viaduct in New Franklin, Missouri. As trading and commerce in New Franklin grew in the nineteenth century, a desire for rail transit emerged in the area. In the late 1800s, the Missouri, Kansas, and Texas Railroad extended rail service to New Franklin, including a connection to St. Louis. Due to the city's location and size, several tracks converged there, creating dangerous conditions, particularly an at grade crossing at Missouri Route 5, which required motorists to cross eight tracks. In 1936, the Federal Highway Act provided funds for hazards created by at grade crossings. Both the Missouri, Kansas, and Texas Railroad and the State Highway Department targeted the crossing at New Franklin as a high priority, given its record of severe and fatal accidents. Due to the site's prominent location, plans for the bridge included a higher level of architectural treatment than other projects during this time. The viaduct was dedicated in 1940 and is noted as one of the most significant projects during this era. By 1986, the Missouri, Kansas, and Texas Railroad ceased operations on the line passing under the viaduct, and the switching yard was closed. Several years later, the Missouri Department of Transportation proposed removal of the structure due to high maintenance costs and constructing an at grade parkway in its stead. Subject to Section 106, the project went through mitigation and as a part of

the memorandum of agreement, and both reuse and recycling were included as conditions. In 2010, the bridge was deconstructed, and portions of the decorative balustrade were installed as a feature of a pedestrian walkway in nearby Katy Trail State Park. In addition, over fifty percent of the remaining concrete from the structure was recycled, providing aggregate for the new parkway.[25] Educational signage was installed on the pedestrian trail, explaining the reuse and recycling that occurred when the significant structure was removed (Figure 2.7).

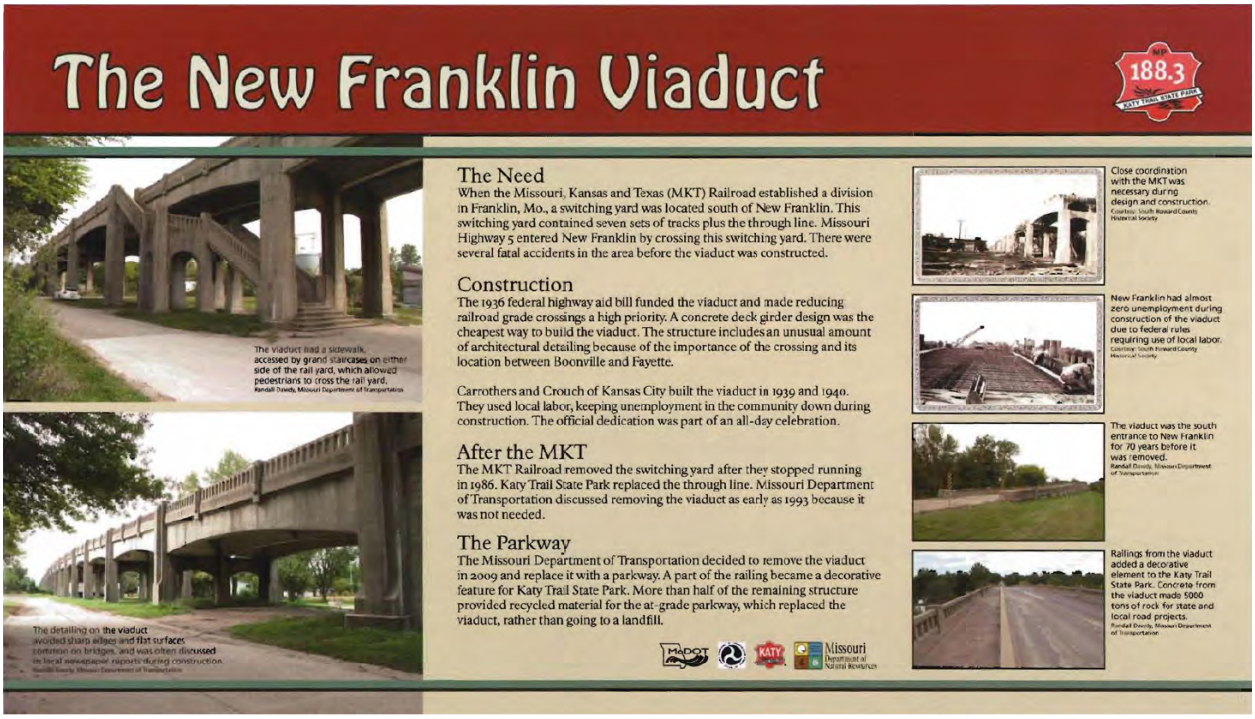

Figure 2.7: The New Franklin Viaduct: Educational Mitigation

This case study provides another example of reuse as creative mitigation, highlighting the environmental, economic, and social benefits of reuse. While the Collins Building and the New

[25] Missouri Department of Transportation, *New Franklin Viaduct, Bridge Number K744, Historic and Photographic Documentation* (2010).

Franklin Viaduct are examples of mitigation related to the Section 106 process, they set a precedent for all preservation construction and demolition projects with regards to material reuse.

Conclusion

This chapter established a baseline of knowledge surrounding material reuse and the evidence supporting its viability as a sustainable practice. The environmental benefits of material reuse are substantial and include decreased landfilling and saving energy embodied in materials. There are also economic benefits to material reuse, although economic feasibility must be determined based on individual projects, as many factors play into the cost of the operation.

Additionally, the historic precedent for material reuse was discussed. Material reuse is not a novel idea. The practice has occurred throughout history, as seen in the examples given. However, at some point opinion of the practice shifted and it is currently frowned upon by most preservationists. This should not be the case, as material reuse has been a part of building processes for many years. Material reuse provides an opportunity for buildings earmarked for demolition to meet a sustainable end rather than end up in a landfill after documentation is completed. The two examples given, the Collins Building and the New Franklin Viaduct, are excellent examples of material reuse during the historic preservation mitigation process. Material reuse offers an opportunity for creative mitigation, underscoring the sustainable aspects of historic preservation. This chapter provided context for the following chapters, which will explore these topics first in general on university campuses in the United States, and secondly at the University of Georgia specifically.

CHAPTER THREE:

SUSTAINABILITY AND PRESERVATION ON UNIVERSITY CAMPUSES

The previous chapter provided context for the existing relationship between sustainability and historic preservation. It also examined evidence for material reuse as a sustainable building practice as well as historic precedent for material reuse. The historic preservation mitigation process was discussed, offering examples of creative mitigation utilizing material reuse, and creating an opportunity for better integration of the two fields. This chapter will build on the previous chapter, providing an overview of these efforts on university campuses in general, in order to provide information on the current state of preservation and sustainability on university campuses. Additionally, two case examples will be discussed, giving insight into preservation and sustainability efforts, specifically material reuse, on academic campuses.

Sustainability on University Campuses

Institutions of higher education offer a unique opportunity to promote and practice sustainability. College campuses are operated similarly to towns or cities, with independent planning, design, and construction efforts. Additionally, institutions of higher education are often considered leaders, combining research and scholarship with service and an orientation towards public good. In an article promoting the role of higher education in the field of sustainability, Anthony Cortese articulates, "Higher education has the unique academic freedom and the sheer exposure to critical thinking to comment on society and its challenges, and to engage in bold

experimentation in environmental sustainability."[26] Institutions of higher education can set a precedent for innovation in sustainable practices.

Literature on the current state of sustainability at higher education institutions is very limited, and not much has been published on the topic. However, there is currently an organization that tracks data at individual institutions. The Association for the Advancement of Sustainability in Higher Education (AASHE) is a non-profit organization whose goal is to drive change at the higher education level related to sustainability. AASHE has over 1,000 member institutions, 641 of which are located in the United States. AASHE provides resources and professional development, with a goal of equipping future leaders to solve sustainability challenges. AASHE also coordinates the Sustainability, Tracking, Assessment & Rating System (STARS). This system has the following goals:

- Provide a framework for understanding sustainability in all sectors of higher education.
- Enable meaningful comparisons over time and across institutions using a common set of measurements developed with broad participation from the international campus sustainability community.
- Create incentives for continual improvement toward sustainability.
- Facilitate information sharing about higher education sustainability practices and performance.
- Build a stronger, more diverse campus sustainability community.[27]

The STARS system gives points for various aspects of sustainability on campus and can accumulate to varying ratings including platinum, gold, silver, bronze, and reporter. STARS is a

[26] Anthony Cortese, "The Critical Role of Higher Education in Creating a Sustainable Future," *Planning for Higher Education* 31, no. 3 (2003) 15-22.
[27] "STARS Overview," STARS: A Program of AASHE, accessed April 12, 2016, https://stars.aashe.org/pages/about/stars-overview.html.

self-reporting system, placing the responsibility of tracking and reporting on participating institutions.[28]

Even with the organization of a tracking system and ratings, sustainability on college campuses lacks comprehensive research. The data available is difficult to access and may or may not include all aspects of sustainability, including data on construction and demolition waste. In his 2012 article, Matthew James states, "Even with the importance of sustainability measures that colleges and universities have recognized, many institutions have yet to take the responsibility to engage in change or be leaders in green efforts."[29] Although universities are poised to be leaders in the field of sustainability, their exact impact is unknown, and more research is needed to determine the current state of sustainability on college campuses.

Preservation on University Campuses

As mentioned previously, institutions of higher education have unique governance in campus planning efforts. As time passes, campus planning efforts have grown to include historic preservation, in order to preserve the particular history that academic campuses contain, telling a story of the evolution of higher education in America. Again, comprehensive research on the topic of preservation on college campuses is lacking.

In 2002, the Getty Foundation established the Getty Foundation Campus Heritage Initiative (GFCHI). This program assisted institutions of higher education in the United States through grants to research and survey campus historic resources. Additionally, colleges and

[28] Ibid.
[29] Matthew James and Karen Card, "Factors Contributing to Institutions Achieving Environmental Sustainability," *International Journal of Sustainability in Higher Education* 13, no. 2 (2012), 166-176.

universities were assisted in preparing campus preservation plans as well as detailed conservation assessments and analyses. Eighty-six campuses across the nation were recipients of grants.[30] Robert Melnick, director of the Getty Foundation's Campus Heritage Grant program for several years, reflected on the initiative and provided insight into the process in an article entitled "Lessons from the Getty's Campus Heritage Initiative." In the article, Melnick states that there is "still much work to be done" in reference to historic preservation on university campuses. Additionally, he points out a need to better integrate preservation into campus planning efforts in general, "There is a real need to develop and share models for the integration of historic resources within broader campus planning efforts. One purpose of the Getty initiative was to get historic resources 'on the table' in any campus planning discussion."[31] One aspect of this integration is the relationship between preservation and sustainability.

While comprehensive data is lacking on the current state of preservation at institutions of higher education, preservation does appear to be a highly relevant and important aspect of campus planning. Many colleges and universities have recognized the need to preserve the history of their institutions and incorporate historic resources into campus planning.

Case Examples

While research or comprehensive information is limited on material reuse at the institutional level, several other universities have adopted reuse principles in their building standards. The University of North Carolina at Chapel Hill and Stanford University are both

[30] Robert Z. Melnick, "Lessons from the Getty's Campus Heritage Initiative," accessed April 12, 2014, http://www.aia.org/practicing/groups/kc/AIAB081859.
[31] Ibid.

attempting to integrate sustainability goals into building practices on campus in a meaningful way. As larger, public institutions, an examination of these schools' policies and procedures can offer precedence for establishing a greener building program on campus and meeting goals set by UGA in the Strategic Plan.

University of North Carolina at Chapel Hill

The University of North Carolina at Chapel Hill (UNC) is a public university chartered only a decade after the University of Georgia. Of comparable size and enrollment to UGA, UNC prides itself with a similar vision of teaching, research, and public service. UNC is also oriented toward both sustainability and historic preservation, as evident by practices on campus.

From 2001 to 2011, UNC saw major campus growth and revitalization. David Godschalk terms this the "dynamic decade" in his book detailing campus planning efforts during this era. Godschalk critically examines the planning practices during this decade, and uses them to establish principles for creating a sustainable campus. He insists, "The triple bottom line for a campus plan is *sustaining the past, present, and future*. It is the *intersection* of these concerns that determines the beauty and functionality of a contemporary university campus." [32] The decade discussed in the book was monumental for campus development and began with a new campus master plan. Although the plan did not specifically mention campus sustainability,

[32] David Godschalk and Jonathan B. Howes*, The Dynamic Decade: Creating the Sustainable Campus for the University of North Carolina at Chapel Hill*, 2001-2011 (Chapel Hill: The University of North Carolina Press, 2012), 12.

Godschalk argues that the plan can be viewed through the lens of sustainable development and can offer insight for other educational institutions.[33]

While sustainability was not necessarily mentioned, historic preservation played a key role in the development of the plan and in campus development during the subsequent decade. In 2002, a campus preservation manager was hired, and a survey of historic resources on campus commenced. Both a historic preservation campus plan and a campus historic landscape plan were completed. These documents guide planning decisions made for both historic and non-historic projects, ensuring that historic fabric is maintained and new fabric meshes well with the historic campus and landscape. In discussing the preservation plan and preservation efforts on campus, Godschalk promotes preservation as a sustainable practice. He argues for establishing an "ethic of sustainability" by promoting adaptive reuse of structures and utilizing existing buildings. He states, "Preservation's benefits far outweigh its costs, and true campus sustainability cannot be achieved without it."[34] Godschalk is acknowledging the necessity of integrating the two fields, highlighting the importance of both aspects in campus planning.

The University of North Carolina's campus planning efforts over the past decade have caused tremendous growth to the physical footprint and operations of the University. UNC's organizational structure differs slightly from UGA, in that it houses all construction-related departments together under the office for Facilities Operations, Planning & Design. This division also houses UNC's Office of Sustainability, which reports waste on campus comprehensively, including waste from all departments and divisions. In 2015, UNC had a total of 10,329 tons of waste produced on campus, including MSW, single stream and paper recyclables, organic

[33] Ibid.
[34] Ibid.

matter, and C&D waste. This is higher than UGA's total, however it includes reporting of contracted building project waste from campus, and UGA's total does not. UNC's recovery rate from waste on campus was around 45%, including C&D waste diversion. Comparatively, UGA's rate was 33%, not including any C&D waste diversion totals, as these totals are unavailable from capital building projects.

In order to facilitate C&D waste diversion from the landfill, UNC has comprehensive design guidelines that include multiple sections related to C&D waste. Firstly, the document outlines the primary goal for C&D waste from campus: "Within the limits of the construction schedule, contract sum, and available materials, equipment, products and services, the Owner has established that this Project shall generate the least amount of waste possible and employ processes that ensure the generation of as little waste as possible."[35] This is executed through a Construction Waste Management Plan, to be completed by the contractor prior to construction. This includes a waste assessment completed by the contractor which should adhere to a hierarchy specified in the guidelines. The hierarchy includes materials to be reused in the project, materials to be reused elsewhere on campus, materials to be recycled, and materials to be disposed of. Each waste pathway contains lists of materials included, but adds that this is not a limitation. For example, suggested salvageable materials include but are not limited to: slate roof, wood flooring, brick pavers, stone walls, architectural details, building equipment, and program equipment.[36] Following completion of the project, contractors are required to submit detailed documentation of all materials recycled, salvaged, reused, or disposed of, including

[35] University of North Carolina Design Guidelines, Section 01505: Construction Waste Management, updated July 2014.
[36] Ibid.

tonnage, transportation costs, receiving party, disposal costs, net savings, and revenue generated. While the goals outlined in this document are similar to UGA's guidelines, UNC has much more detailed requirements for contractors outlined in their document. It is much more comprehensive and outlines material specific requirements for contractors while establishing a waste hierarchy for materials leaving building projects on campus. The material reuse process is well integrated into building projects, rather than operating as a separate unit. Additionally, contractors are required to assess the building project for reuse and recycling opportunities prior to beginning, allowing for a higher rate of recovery. The entire section of the guidelines relating to construction waste management can be seen in Appendix D.

The guidelines at UNC have led to several successful reuse projects on campus. A successful example of reuse is a renovation project at Phillips Hall, an academic building. The building underwent renovations to the slate roof, and during the project, 90% of the slate tiles were reused. Estimates of the project priced new slate at $200 per tile, while salvaging and reusing tile was estimated at only $65. This amounted to an estimated savings of $63,500 per estimates in the design phase. Additionally, somewhere between $300 and $2000 were saved in tipping fees.[37] This project had substantial economic and environmental benefits and reinforced UNC's goals and commitment to sustainable building practices.

[37] The University of North Carolina: Office of Waste Reduction and Recycling, "Construction and Demolition Waste Management Programs," presentation, Facilities Services Division.

Stanford University

A second institution with high standards for sustainability on campus is Stanford University in California. While Stanford is much smaller in enrollment than UGA and a private institution, its practices and sustainability ethic have set a precedent nationwide. Through sustainability efforts, Stanford has increased its landfill diversion rate from only 30% in 1995 to 65% in 2014. Stanford's goal is to achieve a 75% landfill diversion rate by 2020, striving towards becoming a zero-waste campus in the long-term. Detailed information is not available for Stanford's waste, but the Office of Sustainability produces a general report each fiscal year including diversion rates and important projects highlighting sustainability efforts on campus.

Similar to the organizational structure at UNC, all offices relating to building projects on campus are under one umbrella. The division of Land, Buildings, and Real Estate houses Building & Ground Maintenance, the Department of Project Management, the office of Sustainability & Energy Management, and the office of the University Architect/ Campus Planning and Design. All of these offices sit at the same level in the organizational structure and are coordinated under the leadership of one Associate Vice President. Sustainability is considered a vital part of building project management on campus and is just one factor in all decisions, although related to many other factors. Stanford sees the relationship of sustainability to other priorities as a tightly interwoven web, as seen in Figure 3.1.

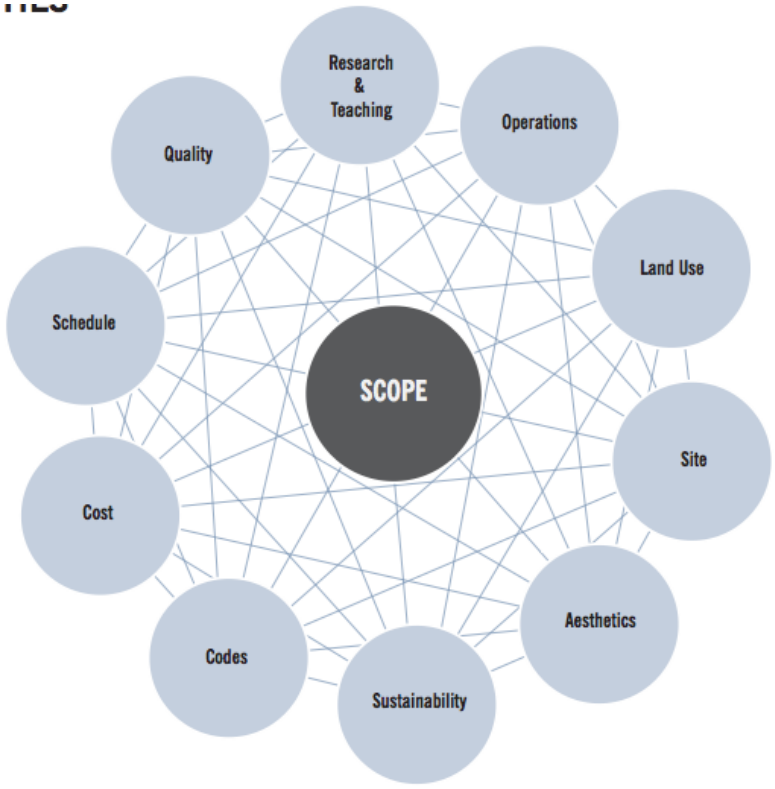

Figure 3.1: Project Considerations at Stanford[38]

Stanford's construction and design guidelines are not as specific in relation to waste management as those of the University of North Carolina. However, Stanford has been successful at implementing material reuse and recycling in their building projects. One example of this is the demolition of the Frederick E. Terman Engineering Center on campus. The building, completed in 1978, contained many sustainable features such as passive ventilation and locally sourced timbers. However, the building was no longer able to meet campus needs and was earmarked for demolition. The project was able to divert 99% of the waste from the building, either reusing or recycling almost the entire structure. Building materials such as roof tiles, concrete pavers, lighting, lumber, shutters, and site furnishings were all able to be reused. Many

[38] Stanford University, "Zone Management Project Delivery Process," June 2013. 30.

elements were reused on the site itself, as a community park was installed once demolition occurred. Materials such as concrete were recycled and crushed into aggregate for construction of the park. This project is a successful example of an alternative to traditional demolition, and it "showcases Stanford's ability to leverage salvage and recycling to achieve diversion rates in excess of 99% and to balance sustainability, costs, and neighborhood improvement goals."[39]

Stanford also takes great pride in historic preservation efforts on campus. The campus, founded in 1891, was designed by Frederick Law Olmsted and Charles Coolidge. The campus is laid out in iconic quadrangles on an east-west axis, with arcades and red-tiled roofs. All materials used in the construction of the historic campus were locally produced, making it a sustainable effort from the beginning. As the campus expanded, other buildings were designed by both notable local architects as well as nationally known architects, such as Frank Lloyd Wright.[40] Campus preservation efforts are directed through a collaboration between the University Architects Office and Heritage Services, an independent office housed in the division of Land, Buildings, and Real Estate. Heritage Services was established to assist the University in identification and management of historic buildings and archaeological sites at Stanford. While the University Architect's office directs design efforts for building projects, Heritage Services provides assistance with evaluation, permitting, and public education for preservation efforts.[41]

Sustainability and preservation efforts at Stanford appear to operate completely independent of each other. However, Stanford's high standards for sustainability in building

[39] Sustainable Stanford, "Fact Sheet: Sustainable Demolition," Stanford University.
[40] "Historic Preservation," Stanford University Architect / Campus Planning & Design, accessed April 13, 2016, https://lbre.stanford.edu/architect/historic_preservation.
[41] "Heritage Services," Land, Buildings, & Real Estate, accessed April 13, 2016, https://lbre.stanford.edu/heritage/Resources.

projects creates a safety net under all building projects, whether they involve a historic structure or not. Historic building projects are held to the same high standards as non-historic projects. This creates a culture of sustainability in campus planning that is pervasive, encouraging all projects to strive towards goals of waste diversion and sustainable development.

Conclusion

Both Stanford University and the University of North Carolina set a precedent for campus planning and operations. These universities have established strong sustainability and preservation ethics and serve as an example for other institutions. Both Stanford and UNC have established material reuse and recycling programs and policies at the institutional level. While this practice is not common, it is possible, and is an effective way to reduce landfilling. Both of these case examples show successful material reuse at an institutional level, with building project policy to reinforce University responsibility. These cases will be compared to the University of Georgia, and served to inform the evaluation and recommendations provided in Chapter 5.

CHAPTER FOUR:

UGA POLICY AND PROGRAMS

The previous chapters of this thesis have provided context for both the sustainability movement and historic preservation, particularly in relation to waste management. A larger, general background was given, followed by an overview of these efforts on university campuses. This chapter aims to explore the current programs and policies related to sustainability and preservation at the University of Georgia. The chapter will begin with an overview of sustainability efforts on campus. Next, it will examine policy at the university, including the UGA Strategic Plan and Campus Preservation Plan. These documents provide insight into the University's goals and priorities in these two fields. It will then examine more specific policy and procedure including the organizational structure and budget. Finally, it will look at specific programs related to building project management.

Sustainability on Campus

Historically, it appears that sustainability is a priority to students on campus, and even more so in recent years. In 2009, students elected to self-impose a "green fee" of three dollars per semester. Approved the following year, the fee helped establish the Office of Sustainability, allowing more directed sustainability efforts on campus. In 2013, the student government voted to increase the fee by one dollar each semester, passing with a 75% approval rate. However, the Board of Regents did not approve this increase. Both the initial fee and the increase were not

mandated in any way by the University and rather were a student led initiative, pointing towards a general social interest in sustainability on campus. At the current rate of $3, the fee is only half of the average green fee assessed by universities similar to UGA.[42] In 2015, President Jere Morehead announced increased institutional support for the office, allotting an additional $80,000 in the budget, without raising student fees.

The Office of Sustainability, located within the Facilities Management Division, directs all sustainability-related efforts on campus. These include, but are not limited to "efforts to significantly reduce energy and water use, improve air and water quality, provide sustainable food and transportation options, purchase environmentally responsible products and equipment, minimize waste and increase recycling."[43] Additionally, the office coordinates research and student academic projects related to sustainability. These responsibilities come directly from the University Strategic Plan, which outlines the University's sustainability goals.

UGA Strategic Plan 2020

Upon examination of the current University of Georgia Strategic Plan, last updated in 2012, it is clear that the University is committed to becoming a more sustainable institution. The plan underscores the importance of the University's commitment as a land and sea grant institution to serve the state of Georgia and therefore serve as a leader in facing "unprecedented environmental challenges." Calling on the World Commission on Environment and Development's statement regarding sustainability, the University acknowledges that "a sustainable University is one that meets the needs of the present without compromising the

[42] Emily Kopp, "UGA Votes to Increase Green Fee," *The Red and Black*, November 18, 2013.
[43] "What We're Doing," Sustainable UGA, accessed April 10, 2016, http://sustainability.uga.edu/what-were-doing/.

ability of future generations to meet their needs."[44] The plan not only calls for a reduction of environmental footprints, but also a focus on education and research surrounding sustainability. It emphasizes that "sustainability should be infused into formal and informal educational opportunities throughout the University."[45] As a guiding document, the plan is clear in its mission that as a leading public research institution, the University has a duty to evaluate and improve its sustainability practices.

Seven "strategic directions" are outlined in the strategic plan, with the last being "Improving Stewardship of Natural Resources and Advancing Campus Sustainability." Within this direction, eight priorities are outlined. The strategies are as follows:

a. Annually evaluate and update the University's sustainability performance in instruction, research, public service, campus development, and operations activities.
b. Demonstrate a commitment to reducing fossil fuel use, thereby reducing the University's carbon emissions.
c. Update UGA Guidelines for Design and Construction to incorporate, implement, and monitor current sustainable design strategies, including Leadership in Energy and Environmental Design (LEED) and Sustainable Sites Initiative standards when appropriate.
d. Integrate sustainability into the student experience through curricular and co-curricular activities both in the classroom and beyond.
e. Enhance the coordination, support, and awareness of the University's sustainability efforts by establishing a coordinating body to lead efforts, increasing endowments for sustainable activities and promoting campus sustainability efforts.
f. Encourage the further development and use of mass transportation to and on campus.

[44] Ibid.
[45] Ibid.

g. Demonstrate a commitment to sustainability through reduced potable water usage, decreased waste, and increased use of sustainable and locally grown foods.
h. Develop and implement a process for evaluating opportunities for on-site renewable energy in capital projects.[46]

Included in the plan are specific goals related to each strategy. Goals relating to building projects are as follows:

1. An annual report on the status of and progress in sustainability performance in instruction, research, public service, campus development, and operations activities by 2020.
2. By 2020, reduce University consumption of energy by 25 percent.
3. Updated Guidelines for Design and Construction by 2020.
4. Increase number of courses with curricular sustainability component by 10 percent by 2020.
5. A functioning coordinating body to oversee sustainability efforts by 2020.
6. Interpretive signs installed by 2020.
7. Decrease waste stream to landfills by 65 percent by 2020.[47]

Of utmost importance in relation to building projects on campus is the University's commitment to reduce the waste stream to landfills by 65 percent by the year 2020. While this goal includes all waste produced at the University, net construction and demolition waste is an area for potential reduction.

Preservation on Campus

The University of Georgia has a large historic property inventory with around 850 buildings over 40 years of age dispersed in over 20 counties across the state of Georgia. These

[46] University of Georgia Office of Academic Planning, *Building on Excellence: University of Georgia 2020 Strategic Plan*, accessed February 6, 2016, http://oap.uga.edu/uploads/sp/UGA_Strategic_Plan_2020_October_30_2012.pdf
[47] Ibid.

buildings range from campus academic buildings to agricultural outbuildings, and have a wide range of construction dates spanning over 200 years. Historic preservation efforts on campus related to buildings are the responsibility of the Office of the University Architects.

In 1998, statewide legislation established the State Agency Historic Property Stewardship Program, developed by the Georgia Historic Preservation Division to ensure that cultural resources were considered in the ongoing planning by Georgia's state agencies. The legislation establishing this program mandates, "Each agency shall commence by not later than December 31, 1998, consistent with the preservation of such properties and the mission of the agency and professional preservation standards established by the division and in consultation with the division and with the 1998 Joint Study Committee on Historic Preservation, a study of planning processes which may be required for any preservation as may be necessary to effectuate this Code section."[48] Although required over a decade ago by this legislation, the University of Georgia is currently without a campus preservation plan. However, in 2014, the University began developing a plan, a process which is still ongoing. Phase one of the plan, which included a level one survey of all University-owned historic resources, was completed by UGA's FindIt Program. FindIt is a cultural resource survey program housed in the Center for Community Design & Preservation, the public service unit of the College of Environment and Design. Four graduate fellows completed survey of the University buildings over the course of the 2014-2015 academic year.

The University owns 850 historic buildings in total, of which 340 are in Clarke County, the location of the university's main campus. Ten resources are listed on the National Register of

[48] O.C.G.A. § 12-3-55 (1998).

Historic Places (NRHP). A summary of these buildings, sites, and districts can be seen below in Figure 4.1. The oldest building on campus, Old College, was constructed in 1806 and is located in the Old North Campus NRHP district. The campus expanded to the south during the early twentieth century, with campus expansion increasing during the mid-century (Figure 4.3). Upon examination, there does not appear to be a historic unifying style for buildings on campus. However, the most common exterior materials are brick and concrete, as seen in Figure 4.4.

Name of Resource	Resource Type	Date(s)
Bldg 0033 (Athens Factory)	Individual Building	1833
Bishop House	Individual Building	1837
Carnegie Library	Individual Building	1910
Founder's Memorial House and Garden	District	1857
Lucy Cobb Institute	Individual Building	1859
Lumpkin House	Individual Building	1844
Oglethorpe Avenue Historic District	District	1891-1932
Old North Campus	District	1801-1903
President's House	Site	1856
White Hall	Individual Building	1892

Figure 4.1: University-Owned Properties Listed on the NRHP[49]

[49] "NPS Focus Digital Asset Search," The National Park Service, accessed April 10, 2016, http://focus.nps.gov/nrhp.

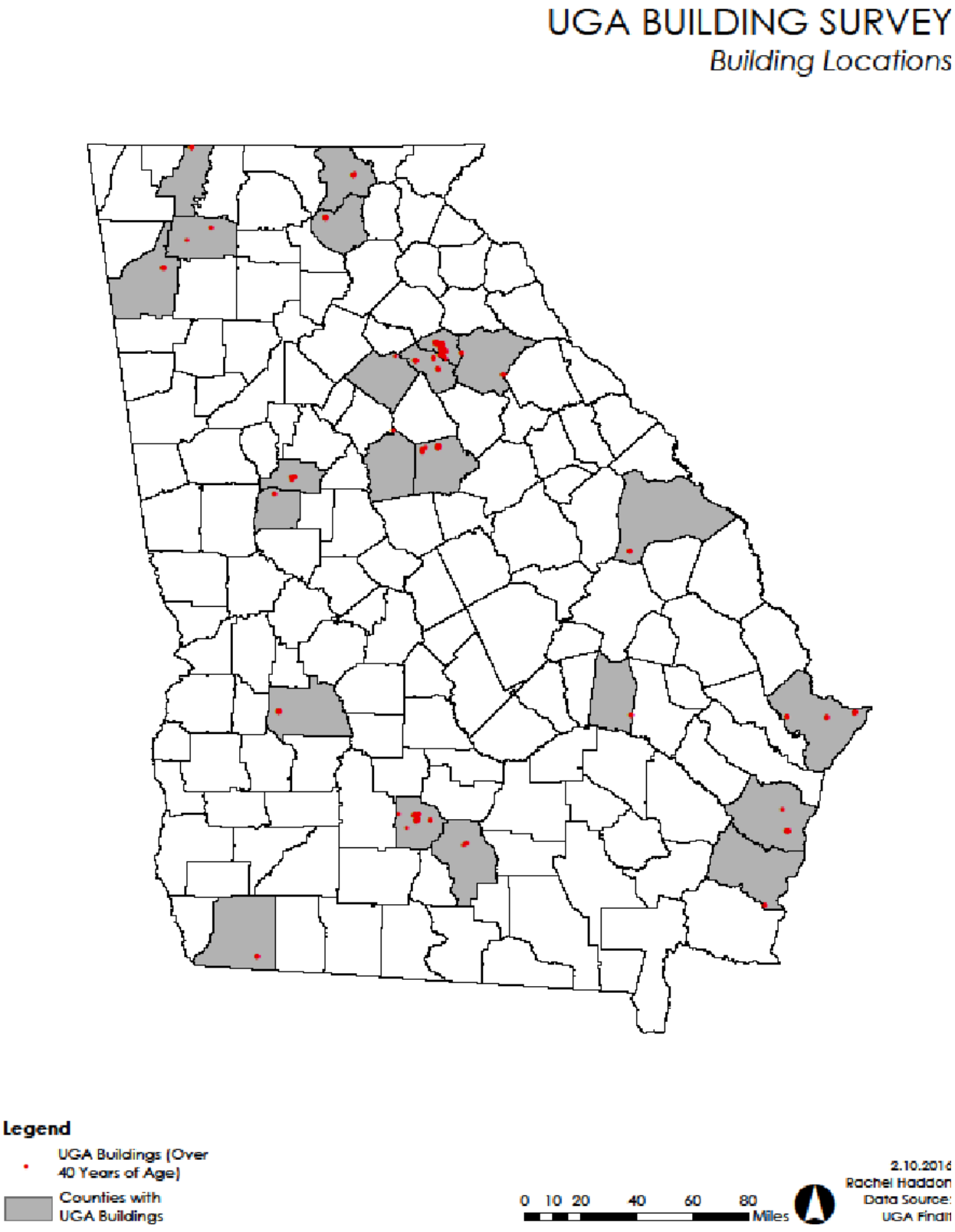

Figure 4.2: UGA Historic Building Locations

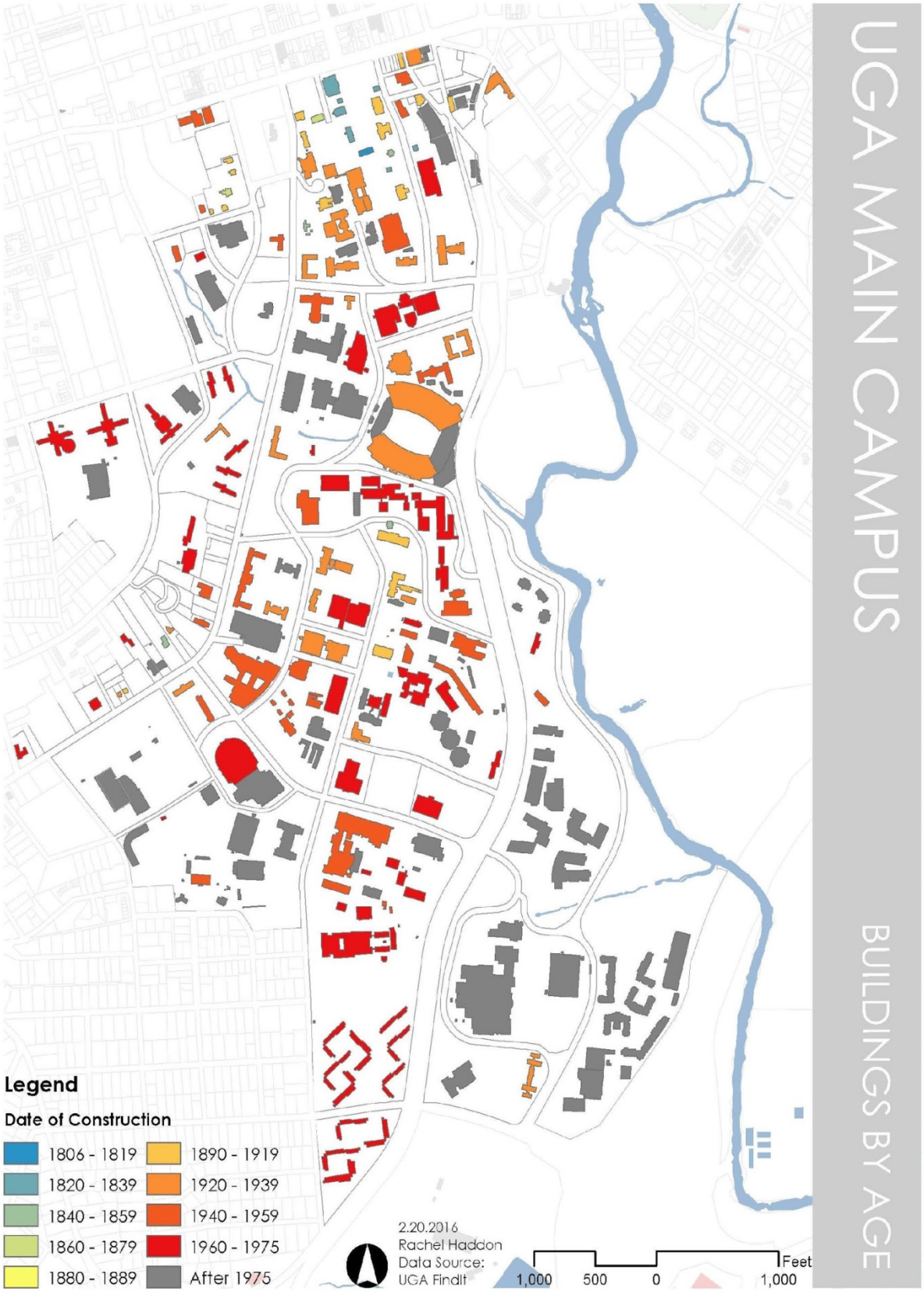

Figure 4.3: UGA Main Campus: Buildings by Age

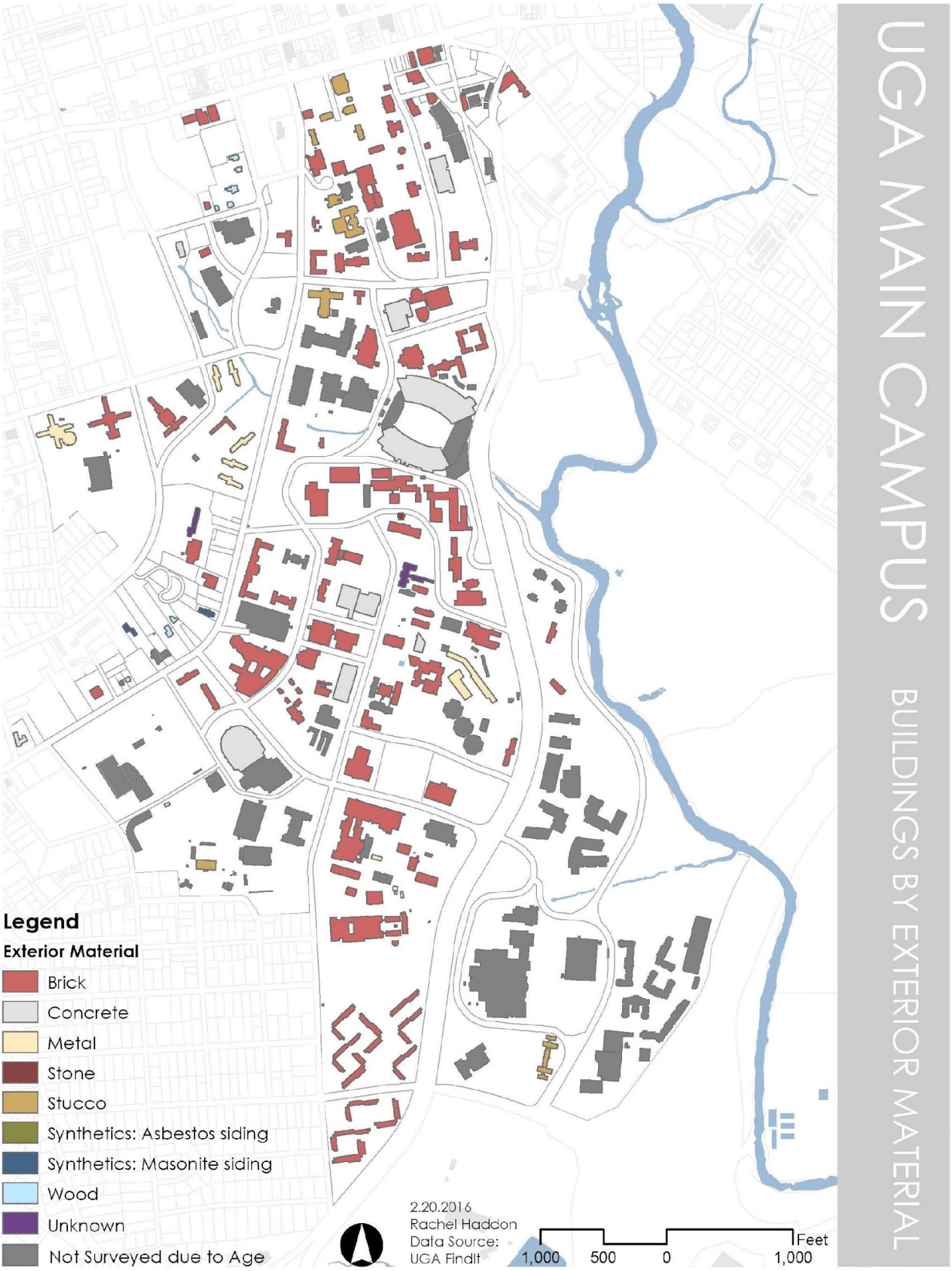

Figure 4.4: UGA Main Campus: Buildings by Exterior Material

In addition to the resources surveyed through the FindIt program, 113 resources, dispersed on eight different agricultural research stations across the state, were surveyed by New South Associates. These resources were slated for extensive renovation or demolition by the College of Agricultural and Environmental Sciences in 2014. New South Associates produced a report outlining significant resources as well as historical context for the buildings. The report recommended seven resources as significant, including three individual buildings and four districts. While the report found that the experiment stations held significance as a collection, they lacked integrity and cohesion as a group of resources. Many resources have been significantly altered or are in poor condition. The findings of the report were used in negotiations with the Georgia State Historic Preservation Office for the memorandum of agreement regarding the demolitions. Mitigation for this adverse effect included a two page educational brochure on the topic of Georgia's experimental stations.

Previously, the University lacked comprehensive data on the buildings, making campus planning difficult. As seen in the resource survey data, the University has a large building stock, including buildings considered to be historic by age. The large number of resources requires additional attention by those involved in campus planning to ensure best management practices of properties, including demolition, when necessary. The buildings slated for demolition by the College of Agricultural and Environmental Science are an example of necessary demolition. These buildings, no longer in use by the University, still carry maintenance and operation costs, and can be subject to demolition by neglect. While demolition is not preferred, it should be addressed when necessary, and creative resource mitigation such as material reuse should be considered.

Building Projects on Campus

Project Funding

Building projects on campus can be differentiated monetarily by the funding source of the project. Depending on the type of project, two separate budgets exist to fund the projects: the operating budget and the capital budget. The operating budget of the University includes all funds generated through tuition, fees, and other revenue. This budget is a comprehensive fiscal plan which directs the operations of the University. All building projects under this budget are non-capital projects and are operation and maintenance related. These projects are generally smaller in scale and budget.

In contrast, a separate budget exists specifically for capital projects. The University defines the capital budget as follows: "a budget established to account for funds used in the acquisition, construction, renewal or replacement of new or existing physical properties or land. Each capital outlay project is budgeted as a line item and must be accounted for separately."[50] Included in this budget, but distinguished from capital projects, are Major Repair and Rehabilitation (MRR) projects. These funds are approved on an individual project basis and cannot exceed one million dollars. Typically, capital projects are managed by the Office of the University Architects. Examples of capital building projects, including those funded with MRR funds, can be seen in Figure 4.5.

[50] "Finance Policies: Capital Budget," University of Georgia, accessed February 21, 2016, http://policies.uga.edu/FA/nodes/view/821/Capital-Budget

PROJECTS COMPLETED IN FY 2014

No.	Project	Total Project Cost	Funding Source
1	Bolton Dining Commons	26,700,000	$21.7M UGAREF
			$5M Auxiliary Funds
2	Rock Eagle 4-H Cabin Replacement - Phase II	2,500,000	State Appropriations
3	Engineering Structural Testing Lab	1,250,000	Institutional Funds
4	Georgia Center 5th Fl Hotel Renovation	1,125,000	Auxiliary Funds
5	Reed Hall Roof Replacement/Mechanical Upgrades	925,000	Auxiliary Funds
6	HSC Facility/Infrastructure Upgrades - Phase III	900,000	Institutional Funds
7	Caldwell Hall - 5th-6th Fl Renovations	850,000	$650K MRR Funds
			$200K Institutional Funds
8	Law School Renovations - Phase III	800,000	Private Funds
9	Turf Grass Research Facility	680,000	Institutional Funds
10	Boyd, 7th Floor Renovation - Phase II	675,000	$585K Institutional Funds
			$90K MRR Funds
11	RE Talmadge Auditorium A/V Upgrades	700,000	$600K MRR Funds
			$100K Institutional Funds
12	CVM Pathology Lab Renovation - Phase II	550,000	$300K Institutional Funds
			$250K MRR Funds
13	Georgia Center Courtyard Renovation	495,000	Auxiliary Funds
14	Sapelo Island Power House Renovation	475,000	MRR Funds
15	Hill Hall MEP Upgrades	425,000	Auxiliary Funds
16	RE Water Infrastructure, Final Phase	425,000	$370K MRR Funds
			$55K Institutional Funds
17	Vandiver Hall Component Replacement	350,000	Auxiliary Funds
18	Georgia Center Laundry Room Renovation	235,000	Auxiliary Funds
19	Creswell Hall Ceiling Upgrades	200,000	Auxiliary Funds
20	Ramsey Center - Swim/Dive Renovation	60,000	Athletic Association
		40,320,000	

Figure 4.5: OUA Capital Building Projects Completed in Fiscal Year 2014[51]

[51] OUA Year End Report: Fiscal Year 2014, http://www.busfin.uga.edu/amr/oua.pdf

Project Type and Scope

In addition to budgetary differences in building projects, project type and scope affects the management of the project by the two separate divisions: the Office of the University Architects and Facilities Management Division. Facilities Management Division handles small-scale renovations on campus, which are non-capital projects. These renovations include interior remodeling and fixture replacements, dealing with common interior finishes such as wall coverings, lighting, doors, plumbing, and furnishings such as cabinetry or lab fume hoods. FMD has a dedicated construction department, but other FMD departments, such as the Grounds Department as well as the Operations & Maintenance Department, also deal with construction materials. The Grounds Department manages all elements of the campus exterior including landscapes, roads and walkways. Among other responsibilities, the Operations and Maintenance department provides manpower to the construction department through skilled trades and zone shops.

Organizational Structure at UGA

The University of Georgia has a complex organizational structure under the leadership of Jere W. Morehead, the president of the University. One Senior Vice President and nine Vice Presidents fall under The President's Office, one of which is the Office of the Vice President of Finance and Administration, as seen in Figure 4.6. The mission of this division is "to provide exceptional service and stewardship of the University's financial, human and physical

resources."[52] Seven divisions fall under the purview of this office, including the two offices that administer construction projects on campus: Facilities Management Division and the Office of the University Architects for Facilities Planning, highlighted in red in Figure 4.7. Each of these two divisions have distinctly separate missions and operations, although related and intertwined at the level of campus-wide operations. Figure 4.7 delineates the structure of the Office of the Vice President of Finance and Administration, with specific responsibilities of each office listed.

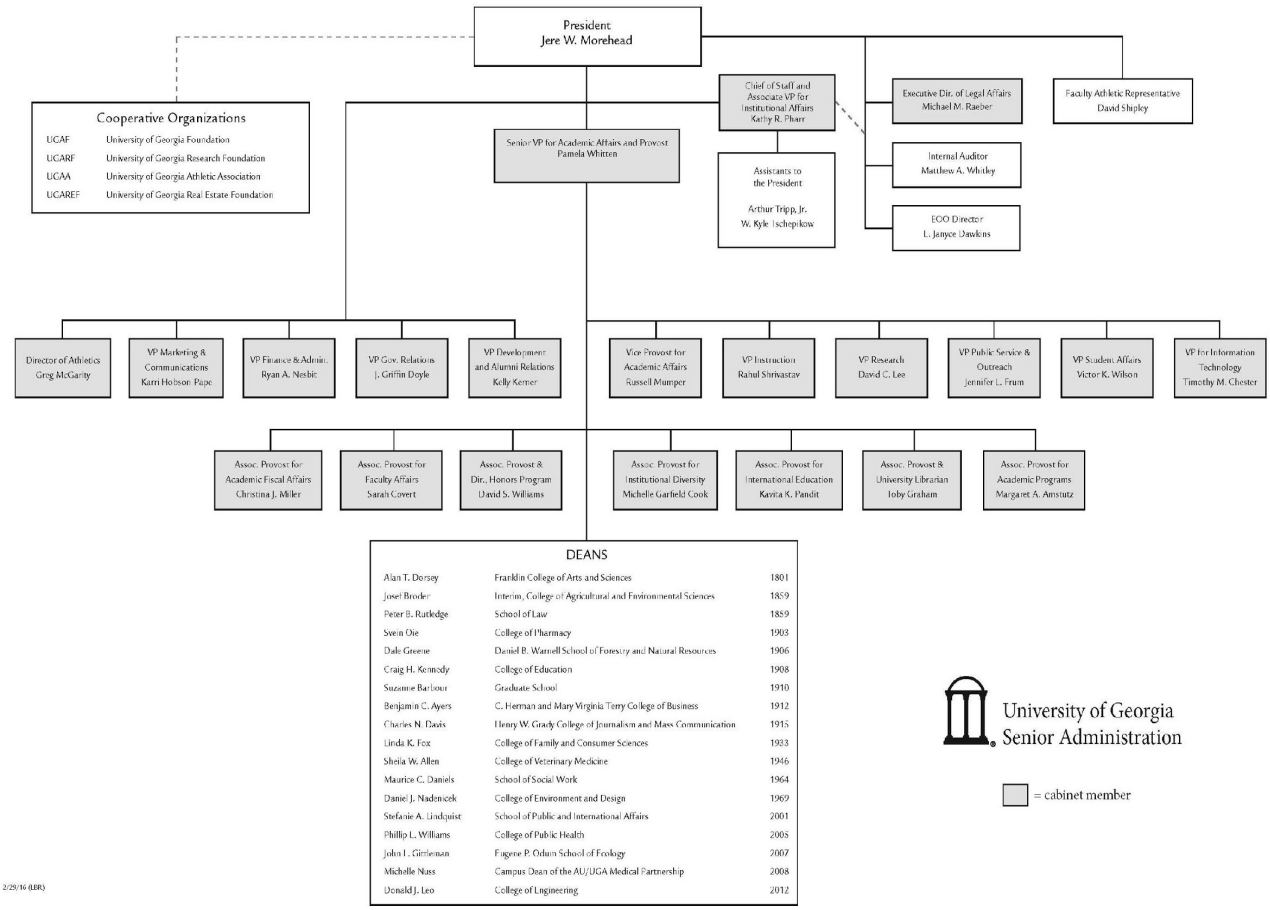

Figure 4.6: The University of Georgia Senior Administration[53]

[52] "Office of the Vice President of Finance and Administration," The University of Georgia, accessed February 20, 2016, http://www.busfin.uga.edu/.

[53] "Senior Administration," The University of Georgia, accessed April 10, 2016, http://president.uga.edu/uploads/documents/AdminChart.pdf.

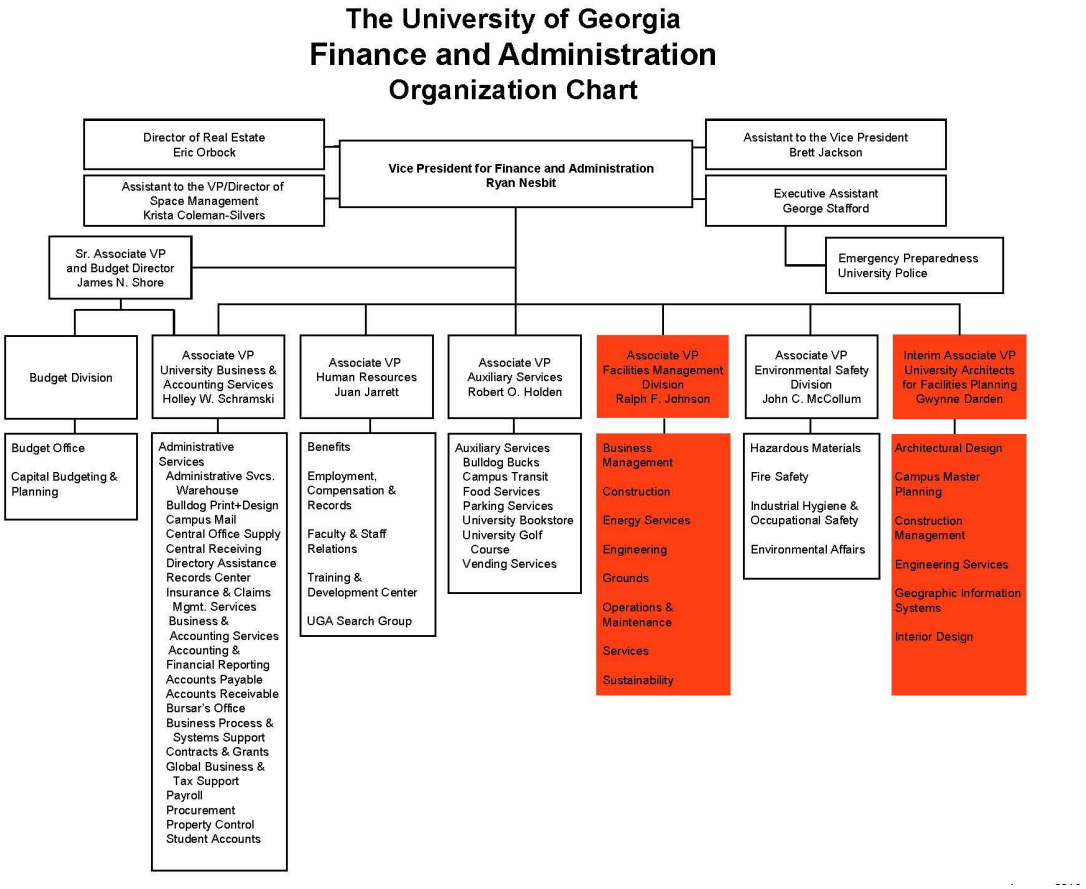

Figure 4.7: UGA Finance and Administration Organization Chart[54]

The Office of the University Architects for Facilities Planning's mission statement is to "enhance the academic, research and public service missions of the University of Georgia through the efficient and the orderly planning of the long-range physical development of University properties."[55] This office directs the campus wide planning of all major construction, renovation, and demolition projects. In addition, the Architect's office is responsible for the development and maintenance of the Design and Construction Guidelines, applicable to all

[54] "Finance and Administration Organization Chart," *The University of Georgia Vice President For Finance and Administration*, accessed February 20, 2016, http://www.busfin.uga.edu/svpfaorg.pdf

[55] "University Architects for Facilities Planning," The University of Georgia, accessed February 20, 2016, http://www.architects.uga.edu/.

University related building projects, whether an initiative of the architect's office or a different division of the University.

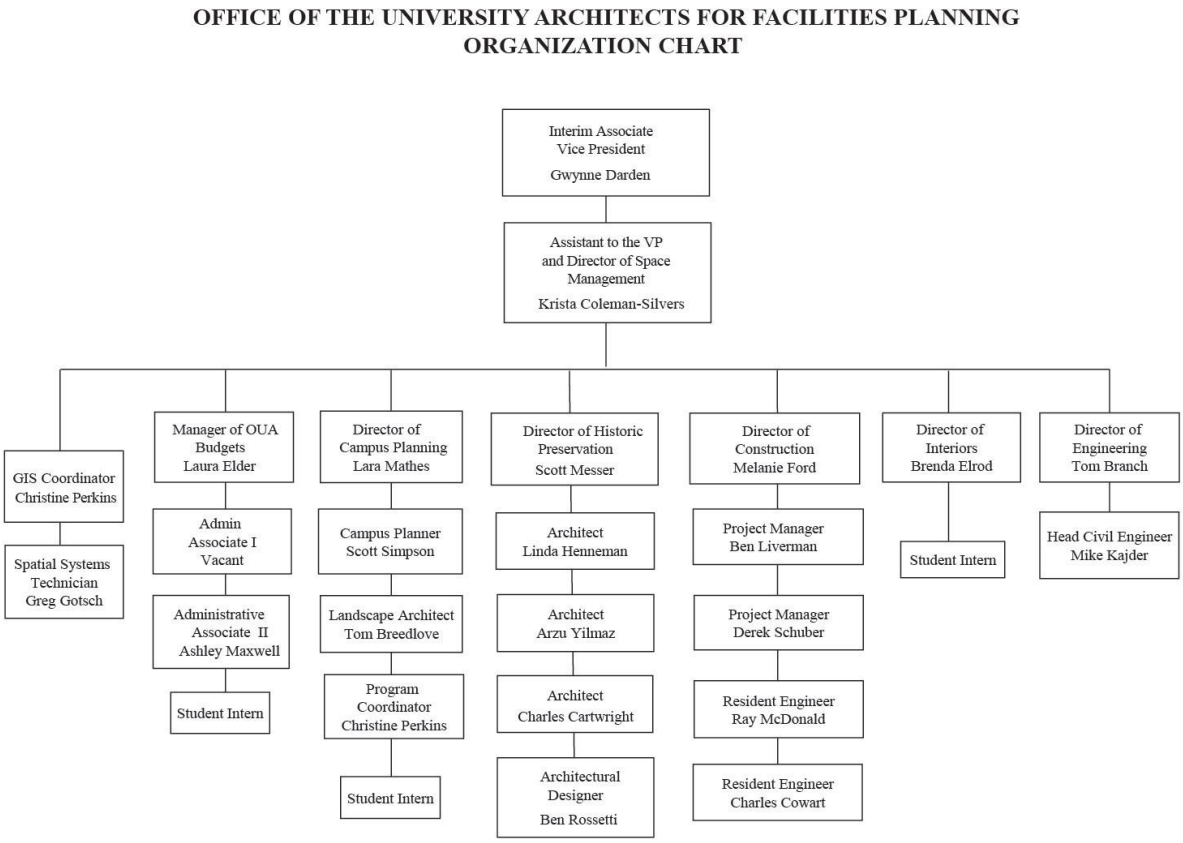

Figure 4.8: Office of the University Architects for Facilities Planning Organization Chart[56]

The second division responsible for building projects on campus is the Facilities Management Division (FMD). While this division is under the same umbrella as the Office of the University Architects, it has a very different mission and structure. The largest division within the Office of the Vice President for Finance and Administration, this division has 9 departments and over nine hundred employees. The mission of Facilities Management is "to maintain and enhance the learning environment through quality service and stewardship of UGA's natural and

[56] "Office of the University Architects Organization Chart," The University of Georgia, accessed February 20, 2016, http://www.architects.uga.edu/contact/staff.

physical resources."[57] The division's website reports on its home page that its operations "promote the long-term sustainability of the University of Georgia."[58] FMD houses the Office of Sustainability, whose mission is to coordinate sustainability initiatives on campus, as well as to ensure campus-wide implementation of the sustainability goals outlined in the 2020 Strategic Plan.

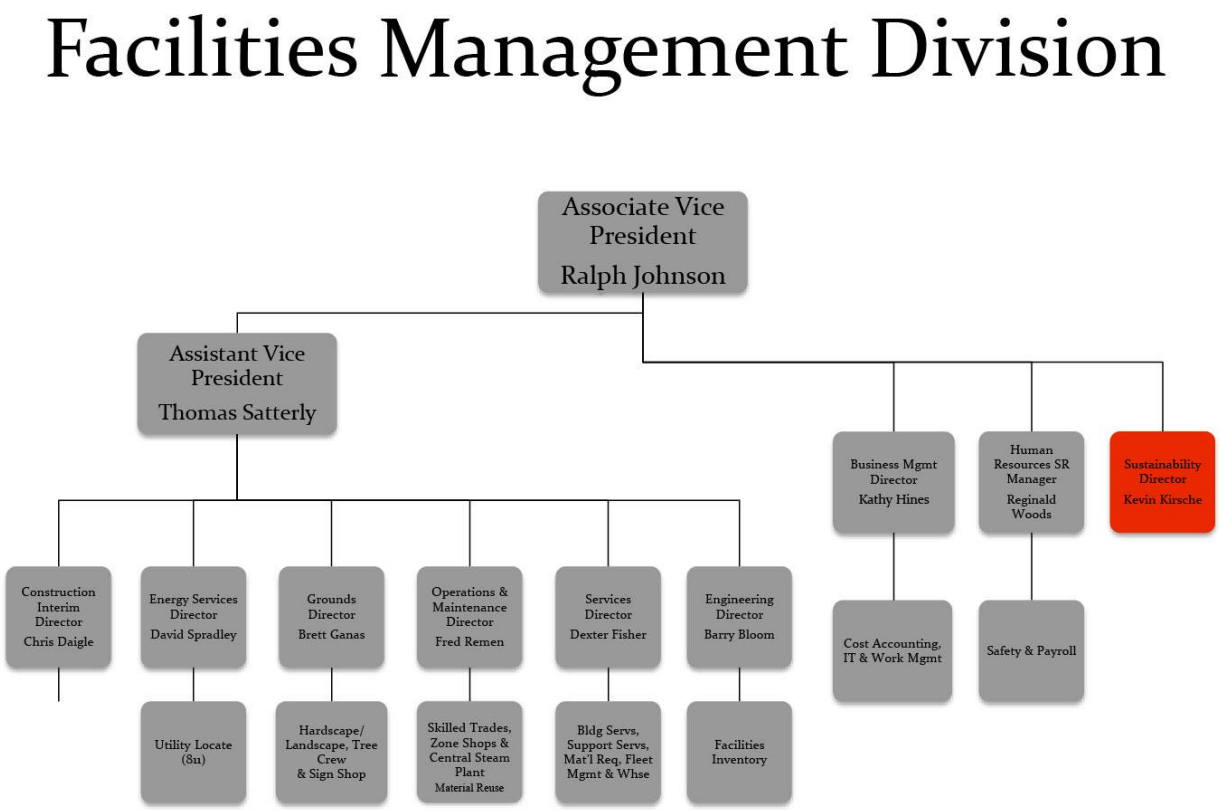

Figure 4.9: UGA Facilities Management Division Organizational Chart[59]

[57] "Facilities Management Division," The University of Georgia, accessed February 20, 2016, https://www.fmd.uga.edu//wp-content/uploads/2015/09/FMD-Brochure_090815.pdf.
[58] "The University of Georgia Facilities Management Division," accessed February 20, 2016, https://www.fmd.uga.edu/.
[59] "Facilities Management Division Organization Chart," The University of Georgia, accessed February 20, 2016, https://www.fmd.uga.edu//wp-content/uploads/2015/06/Current-Org-Chart-060516.pdf.

Construction and Design Guidelines

The University's 2020 Strategic Plan included a goal to revise the Office of the University Architects Construction and Design Guidelines, specifically in reference to sustainable building on campus. The current guidelines were last revised in 2013 and are published as a draft; they state that they "will continue to develop over time."[60] The standards form a comprehensive document, 528 pages in length, containing pertinent information related to construction and design on campus. The document is meant to be used in congruence with Board of Regents of the University System of Georgia standards. The guidelines cover many topics including but not limited to campus planning principles, procurement and contracting, general requirements of projects, material specific requirements, and construction waste management and disposal.

The University Strategic Plan references incorporating sustainable design strategies including LEED and the Sustainable Sites Initiative standards when appropriate. However, while this goal is included in the plan, in 2015 the state of Georgia passed House Bill 255, effectively banning the participation of newly constructed state buildings in the LEED program. The bill was put forth as a "fairness and protect Georgia jobs bill" according to Representative Mike Cheokas, one of the sponsors of the bill.[61] There was growing concern that the LEED program did not consider many sources of Georgia timber to be sustainable, thus forcing those participating in the rating program to source lumber from outside the state. The bill passed in the spring of 2015, and was effective July first, barring the University from participating in LEED for any new building projects, and thus eliminating this as a reasonable approach in revising the Construction

[60] "Design and Construction Standards," Office of the University Architects for Facilities Planning, 2013, 1.
[61] Molly Samuel, "Georgia May Ban Green Certification for State Buildings," accessed February 20, 2016, http://news.wabe.org/post/georgia-may-ban-green-certification-state-buildings

and Design Guidelines with reference to sustainability. The current guidelines briefly mention LEED and third party green building certifications, however there are no specific requirements set for the usage of green building standards or sustainable design in general. In the general requirements, the guidelines state as a component of facility performance that the university "requires and has been implementing efficient and sustainable designs for new construction and renovation for many years."[62]

Of specific importance to sustainability efforts on campus are the guidelines within the standards relating to construction waste management. This section of the standards begins with definitive examples of items considered to be C&D waste on projects sites. The standards then go on to discuss expectations surrounding waste management by contractors. The guidelines state, "the contractor is required to account for all waste materials removed from the project, and to recycle, salvage, or reuse, to the maximum practicable extent, all of the materials listed above within 20 miles of the construction site."[63] The standards dictate that the plan for C&D materials, including what path will be used for disposal, should be delineated in a Waste Management Plan, provided on or before a Pre-Construction Meeting. Specifically, the plan should address "1) separation, hauling and recycling procedures, 2) material recovery facilities and their distance from job site; and 3) markets for each material recovered."[64] The entire portion of the Construction and Design Guidelines relating to waste management can be found in Appendix B. While these guidelines are maintained by the Office of the University Architects,

[62] UGA Construction and Design Guidelines, 2013.
[63] UGA Construction and Design Guidelines, 2013. Section 01 74 19
[64] Ibid.

they are applicable to all building projects on campus. For non-capital projects managed by FMD, the guidelines still apply, and should be followed as though FMD is the "contractor."

As an example of these policies put into practice, the Construction Waste Management Plan from a recent capital building project was examined. The Science Learning Center, an ongoing capital construction project, will be a new 122,500 square foot facility on the south end of UGA's campus. The project has a budget of $48,000,000 and is being constructed by Whiting-Turner.[65] At the beginning of the document, a waste management goal is set for the project, mandating that a minimum of 75% by weight of waste generated on site will be recycled or reused. The plan dictates that a roll-off container will be available for waste materials to be manually sorted at a sorting facility. A designated area for specific materials will be made available and labelled bilingually, but only "occasionally, as space permits." The plan also specifies that each load removed from the site will be recorded by weight. Lastly, the plan discusses the waste stream options for specific materials, including recycling location options, if available. However, the handling procedures for each of the materials are not firm, including verbiage that allows for loopholes, such as instructions to recycle material "if a dedicated container is on site" and "otherwise place in commingle container." Based on the guidelines and the waste management plan, it is unclear how the data is actually tracked, and if it is compiled in any manner to procure construction and demolition waste totals for campus capital construction projects. This data is not included in the campus Sustainability Score Sheet, maintained by the Office of Sustainability, thus leaving out a large portion of the campus waste stream. The

[65] "Science Learning Center," Office of the University Architects for Facilities Planning, accessed February 20, 2016, https://www.architects.uga.edu/projects/science-learning-center.

complete Construction Waste Management Plan for the Science Learning Center can be seen in Appendix C.

Construction and Demolition Burden at UGA

The University of Georgia's scale and operations create a potential for a substantial waste stream leaving the campus. According to the University's Office of Sustainability, there are four primary waste streams at UGA: mixed recyclables, hard to recycle materials, organic waste (compost), and landfill. The Office of Sustainability currently tracks these waste streams, recording data in order to assess the University's commitment to reduce the waste stream by 65% by 2020, as outlined in the UGA Strategic Plan. The data is compiled into monthly score sheets and totaled by fiscal year. An example of these score sheets can be seen in Figure 4.10. As seen in the score sheet, landfill tonnage is separated into two line items: Oglethorpe and ACC. These items refer to the location of the landfill used. The University uses a local municipal solid waste landfill in Athens-Clarke County (ACC) for all of its solid waste. The other landfill data indicated is construction and demolition waste, which is disposed of in Oglethorpe County at a C&D specific landfill. Longitudinal charts on this data can be seen in Figure 4.11 and 4.12, showing both the tonnage and costs of C&D waste over the past 7 fiscal years.

Materials Recycled FY 2015	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Tot. (tons)
Single Stream	51.39	53.08	76.37	66.96	57.98	39.54	73.75	66.51	58.02	81.86	43	48.83	**717.29**
Mixed Paper	8.84	7.55	2.56	2.35	28.09	26.47	28.63	33.48	40.57	0.00	32.35	35.23	**246.12**
Office Paper	46.81	32.89	28.42	30.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**138.47**
Cardboard	2.74	17.68	4.22	4.24	2.08	2.44	5.04	3.07	7.22	1.52	1.77	5.67	**57.69**
Bottles & Cans	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.40**
Surplus Property	23.10	42.25	21.95	25.00	42.10	19.25	63.33	19.50	12.50	31.25	20.10	23.25	**343.58**
Scrap Metal	26.24	52.30	35.23	23.98	10.00	14.92	23.92	26.43	11.31	23.95	32.54	26.94	**307.75**
Leaf / Limb / Bedding / Food	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	**696.00**
Antifreeze	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	**5.16**
Fuel Filters	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	**3.60**
Vehicle Batteries	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	**1.20**
Pallets	3.920	2.540	0.00	0.000	0.000	0.000	3.430	0.000	0.000	1.475	0.000	0.000	**11.37**
Tires	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	**12.00**
Motor Oil	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	**2.16**
Cooking Oil	45.31	45.31	45.31	45.31	45.31	45.31	45.31	45.31	45.31	45.31	45.31	45.31	**543.72**
Repository Shredding	12.49	5.25	0.00	0.00	0.00	6.49	0.00	0.00	0.00	0.00	1.54	10.80	**36.57**
Admin Services Shred	0.00	0.00	0.00	7.50	6.76	0.00	7.20	0.00	14.39	0.00	6.80	0.00	**42.65**
C&D (Related Recycling)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Total Tons	**281**	**319**	**274**	**266**	**252**	**214**	**311**	**254**	**249**	**245**	**243**	**256**	**2,448**

Revenue Generated	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Tot Revenue
Pallets	$157	$127	$294	$0	$0	$145	$137	$135	$0	$103	$0	$146	**$1,244**
FCR Casella	$9,245	$4,442	$6,512	$3,388	$1,712	$1,359	$2,299	$3,732	$4,189	$1,330	$2,666	$3,017	**$43,891**
Scrap Metal	$5,517	$10,571	$8,044	$4,510	$1,693	$3,186	$3,352	$1,958	$930	$1,820	$2,569	$2,314	**$46,463**
Surplus Sales	$27,017	$13,723	$34,807	$24,266	$28,871	$21,366	$28,675	$27,545	$17,249	$22,804	$17,002	$33,717	**$297,042**

Waste Tonnage & Costs	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Totals
Cost	$14,284	$18,347	$18,828	$10,512	$16,014	$13,404	$17,086	$16,381	$18,731	$19,326	$16,004	$15,440	**$194,357**
Tonnage	340	455	449	442	383	319	407	390	446	461	381	368	**4,840**
% Waste Recycled	**45%**	**34%**	**39%**	**40%**	**44%**	**53%**	**39%**	**44%**	**40%**	**40%**	**45%**	**45%**	**Monthly Avg: 42.3%**

Savings	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Totals
Waste Diversion	$11,796	$9,993	$11,796	$0	$120	$12	$0	$0	$232	$461	$381	$368	$35,158
Actual Revenue	$41,936	$20,031	$49,658	$32,164	$32,276	$26,055	$34,463	$33,370	$22,368	$26,057	$22,237	$39,193	$379,808
Net Savings	$53,732	$30,025	$61,454	$32,164	$32,396	$26,067	$34,463	$33,370	$22,599	$26,517	$22,618	$39,562	$414,967

Landfill Tonnage & Costs	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Totals
Oglethorpe Costs	$0	$149	$18	$0	$66	$6	$0	$0	$12	$23	$0	$28	$302
Oglethorpe Tonnage	0	6	1	0	3	0	0	0	1	1	0	1	13
ACC Costs	$14,284	$17,696	$18,809	$10,512	$15,948	$13,397	$17,086	$16,381	$18,719	$19,302	$16,004	$15,411	$193,549
ACC Tonnage	340	421	448	442	380	319	407	390	446	460	381	367	4,799

Figure 4.10: UGA Sustainability Score Sheet, Fiscal Year 2015[66]

[66] "Sustainability Score Sheet: Fiscal Year 2015," UGA Office of Sustainability, 2015.

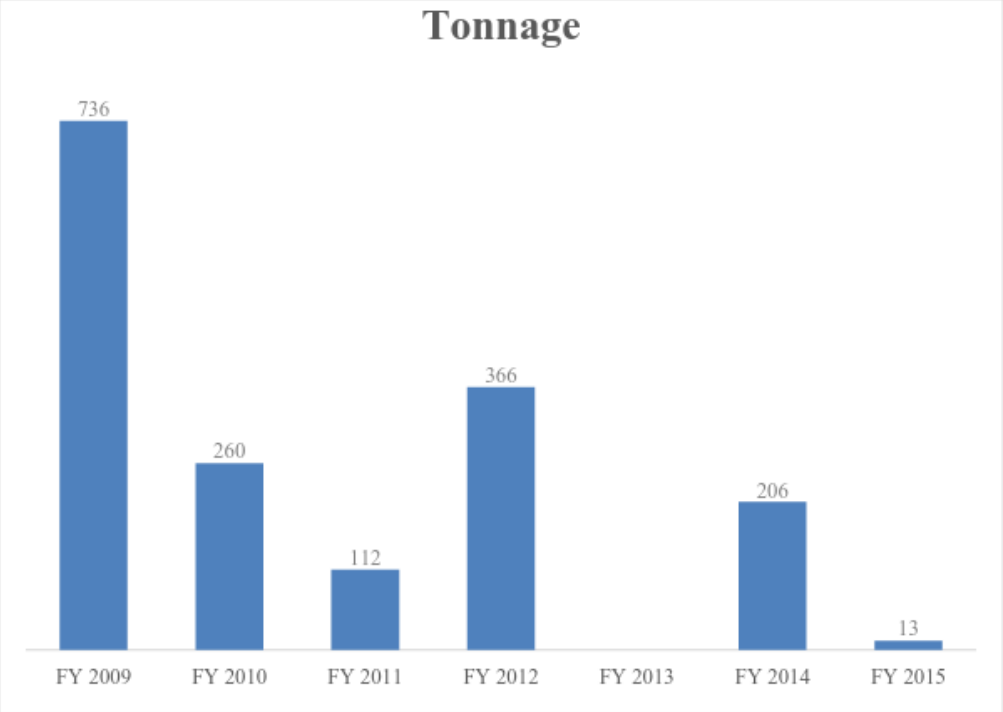

Figure 4.11: C&D Waste Tonnage: FMD Only

Figure 4.12: C&D Waste Cost: FMD Only

This data only accounts for C&D waste coming from FMD's waste stream and likely is not an accurate depiction of the C&D waste stream on campus. According to the data, the total tonnage for FY 2015 was only 13 tons, which is a very small amount of C&D waste in comparison with past years. The report is somewhat vague in that it does not specify if all departments within FMD are included in these numbers. Additionally, some C&D waste can be put into the MSW waste stream, causing an additional degree of inaccuracy in the reporting.

Upon examination, it appears that the University has a very small C&D waste stream. However, this data does not include C&D waste from any contracted building projects on campus, including all capital projects managed by the Office of the University Architects. These projects are contracted to outside companies and have a waste stream that is entirely separate from other campus waste. Data reporting any C&D waste coming from contracted building projects on campus is not currently tracked or reported in a comprehensive manner.

Conclusion

The University of Georgia is a large, public university with a substantial building inventory and complex organizational structure. Currently, efforts related to sustainability and historic preservation remain separate and individual efforts, although the programs are both related to building projects on campus. These programs are managed by separate entities, and in different divisions. However, the programs overlap in some ways, and could be better integrated on campus. One opportunity to better integrate the programs is through increased material reuse and recycling on campus. Current efforts of material reuse on campus will be discussed in the

following chapter. The information presented in this chapter will be returned to in the evaluation of the University's policy and programs in Chapter 6.

CHAPTER FIVE:

THE MATERIAL REUSE PROGRAM

As discussed in the previous chapter, the operations and programs related to sustainability and historic preservation remain quite separate at the University of Georgia. One opportunity to better integrate and strengthen these two efforts is the Material Reuse Program. This chapter will give an overview of the program, as well as discuss its operations. Lastly, challenges moving forward will be discussed. This chapter aims to explore the current Material Reuse Program, providing context for recommendations to expand the program made in the following chapter.

Overview

The Material Reuse Program at the University of Georgia was started by Christopher McDowell as a student-led initiative in 2011. McDowell, at the time a graduate student studying landscape architecture, was awarded a UGA Campus Sustainability Grant in 2012 to expand the program. McDowell intended to "demonstrate how construction and demolition waste products can be diverted from the landfill and converted into tangible community-based improvements."[67] The program diverts C&D waste from sites on both the UGA campus and within the greater Athens area. Additionally, materials are reused in campus, community based, and student projects. Since 2011, the program has diverted more than 280 tons of material from

[67] "Sustainability Grants," Sustainable UGA, accessed February 6, 2016, http://sustainability.uga.edu/get-involved/students/sustainability_grants/

the landfill.[68] Currently in its sixth year, the Material Reuse Program is coordinated by Chris McDowell, who is employed through a partnership between the College of Environment and Design and the Facilities Management Division.

The Material Reuse program also facilitates student service learning through a course in the College of Environment and Design, LAND 4911-6911: Design Build Lab. The course is designed to give students hands-on experience with design and construction principles and project management skills while working on a project for a real client. The course "explores emerging and sustainable design practices through the reciprocal processes of ideation, development, and fabrication."[69] The course offers students an opportunity to apply skills and knowledge learned at the university to community-based projects, creating a unique opportunity to interact with the Athens community.

Operations

Chris McDowell currently manages the Material Reuse Program (MRP). McDowell, the only employee of the program, has a joint appointment with the College of Environment and Design (CE+D) and the Facilities Management Division. His appointment with the CE+D is a teaching position, allowing for the program to have an educational component, the Design Build Course. Within Facilities Management Division, McDowell's program and position falls under the Operations and Maintenance department. McDowell's position at FMD began in September of 2014 and was established to further the mission of the MRP within Operations and Maintenance.

[68] Meeting Summary: Material Reuse Program Annual Review of Activities and Future Directions, 1 July 2015, University of Georgia.
[69] Course Summary: Design Build Studio, Fall 2015, University of Georgia.

However, the reach of the program has extended beyond this department and into other areas of FMD, as a need for coordination of recycling and reuse of materials across departments has arisen. McDowell's position at FMD allows for his integration in project management meetings, giving him insight into ongoing projects on campus. In addition to having assistance from volunteers on many projects, the MRP also has two student interns funded through the Office of Sustainability.

Typically, material in the MRP is sourced using three pathways: deconstruction, selective salvage, and material donations from outside parties. As discussed previously, deconstruction is the methodical disassembly of buildings with the purpose of recovering materials. Deconstruction typically involves the dismantling of a building from roof to ground. In contrast, selective salvage involves the strategic removal of certain portions of the building- typically portions or materials that are more valuable or more easily reused.

The MRP has completed two deconstruction projects, diverting a total of 106 tons of material from the landfill. The first deconstruction project was completed in partnership with the College of Veterinary Medicine. This project involved the deconstruction of an approximately 7,000 square foot horse barn and an additional two miles of fencing. The site, off College Station Road, was slated for redevelopment, chosen as the location for the new Veterinary Medicine Teaching Hospital. The process of deconstruction took about five weeks, and three pieces of equipment were provided by Vet Med. The original estimate of demolition for the site was around $44,000, and the MRP program was able to deconstruct the building for a fee of $10,000 paid by the Veterinary Medicine College.

An additional deconstruction project completed was at the Iron Horse Farm, operated by the College of Agricultural and Environmental Sciences' Crop & Soil Sciences Department. This project involved the deconstruction of three large buildings, totaling 20,000 square feet in total. The process took about 4 weeks, and required no heavy equipment. A demolition quote was not acquired for the project, however the MRP was paid $10,000 by Crop & Soil Sciences to complete the deconstruction.

In addition to deconstruction and material donations, MRP also receives material through selective salvage. On campus, material acquired through selective salvage comes mostly from renovation projects. These projects include both capital and non-capital projects, managed by either the Office of the University Architects or Facilities Management Division. Examples of selective salvage from capital projects managed by the Office of the University Architects on campus can be seen in Figure 5.1.

As mentioned above, selective salvage also takes place on non-capital projects managed by the Facilities Management Division. A summary of these projects can be seen in Figure 5.2. As seen in the examples given, selective salvage of materials varies greatly depending on the building and individual project. In addition, factors such as communication, timing, and storage, can impact ability to recover materials.[70]

[70] Manar Shami, "A Comprehensive Review of Building Deconstruction and Salvage Deconstruction Benefits and Hurdles," *International Journal of Environmental Technology and Management* 6, nos. 3/4 (2006): 246-247.

UGA Building	Type of Project	Material Salvaged
Tanner Building	Classroom conversion	Southern Yellow Pine dimensional lumber, windows, doors
Jackson Street Building	Total renovation	Southern Yellow Pine dimensional lumber
Memorial Hall	Total renovation	Southern Yellow Pine dimensional lumber/wall cladding, base boards
Caldwell Hall	4^{th}-6^{th} floor renovation	Western Cedar wall cladding
Boyd Hall	7^{th} floor chemistry lab	Casework, chemistry table tops
Journalism Building	Front office conversion	Southern Yellow Pine dimensional lumber, lights, doors
East Campus Village	Renovation	Steel tubs

Figure 5.1: Summary of Selective Salvage: Capital Projects

Project Location	Type of Project	Material Salvaged
Chicopee Complex	Demolition	Brick
Lake Herrick Complex	Demolition of outdoor exercise equipment	Landscape timbers
Agriculture Hill streetscape	Removal	Travertine light poles
Ramsey Center	Renovation	Plywood
Biosciences	Lab renovation	Metal cabinets
Treanor House	Renovation	sinks

Figure 5.2: Summary of Selective Salvage: Non-Capital Projects

Lastly, material is sourced from donations of material from off campus locations. This material is donated by individuals or companies, typically coming from deconstruction or salvage

projects. The MRP has also completed deconstruction and salvage projects on privately owned buildings such as three outbuildings at the Horton Farm, a log cabin at the home of Rufus Kidd, and lumber from the Jittery Joe's roaster building. The Horton Farm project encompassed the full deconstruction of a 10,000 square foot 1950s era pole barn, and two smaller turn-of-the-century outbuildings. This project was completed in partnership with the Athens Land Trust, and took over 175 student volunteers 12 days to complete. 15,000 linear feet of raw lumber and 700 sheets of tin were recovered from this project.

Storage

The Material Reuse Program currently houses material at a yard off South Milledge Avenue. The site, around 3 acres in total, contains an open-air, covered storage structure of approximately 3,800 square feet. An aerial photo of the storage yard can be seen in Figure 5.3. The site is also used by the Facilities Management Division for storage of grounds material. In addition, a small-scale concrete recycling operation is managed by the grounds department. Material is stacked and organized according to type, and an inventory is currently being conducted to accurately report materials available for use.

Figure 5.3: Material Reuse Storage Yard[71]

Reuse

While the process of taking in material is important, ensuring that there is an appropriate outflow of material is also a critical part of the Material Reuse Program. Material has been reused by the university in several projects on campus by both construction entities, FMD and OUA. Project examples on campus can be seen in Figure 5.4. Due to the limitations of reusing structural lumber, the wood reused in these projects was either used as a finish or in the landscape.

[71] Google Earth, accessed February 20, 2016.

Project Location	Type of Project	Material Used	Material Source
Jackson Street Building	Bench Construction	White Oak Timbers	Snyder Barn
State Botanical Gardens	Children's garden outdoor amphitheater seating	Antique pine timbers	Various mill buildings
State Botanical Gardens	Meditation Pad construction	White Oak (decking), Southern yellow pine	Snyder barn, Iron Horse Farm
Lily Branch Pavilion	Pavilion construction	Southern yellow pine dimensional lumber	Tanner
Goat Shed	Shed construction	Southern yellow pine dimensional lumber	Snyder Barn

Figure 5.4: Material Reuse Construction Projects on Campus[72]

Additionally, a large portion of material is used by students in the Design Build Course, as well as other student projects. Projects in this class are specified by community clients and then designed and built by students. Project type and scope differs each semester, but students are encouraged to design structures and sites using materials available at the MRP yard. The class has completed projects for several clients, including several sites for Athens-Clarke County and an outdoor community space at Pinewoods, a mobile home community north of Athens.

Project Location	Project	Material Used
ACC Landfill	Outdoor Classroom	Timbers, SYP dimensional lumber,Tires, Bathtubs
Pinewoods Community	Jardin Communitario	Earth construction, SYP dimensional lumber, granite
ACC Landfill	Composting Toilet	Concrete, Rubble, Bottles, Dimensional Lumber, Sheet Metal
ACC CHARM	Recycling Site	Concrete, recycling bins

Figure 5.5: Material Reuse: Design Build Projects[73]

[72] Chris McDowell, Material Reuse Program, 2016.

Program Data Summary

Since its inception in 2011, the Material Reuse Program at UGA has diverted over 474 tons of waste from the landfill. A breakdown of waste diverted from the landfill by year can be seen in Figure 4.1. The program has grown each year in the amount of material diverted, as it has become established. A substantial increase in diversion was seen in 2014, possibly correlated to McDowell's appointment within FMD.

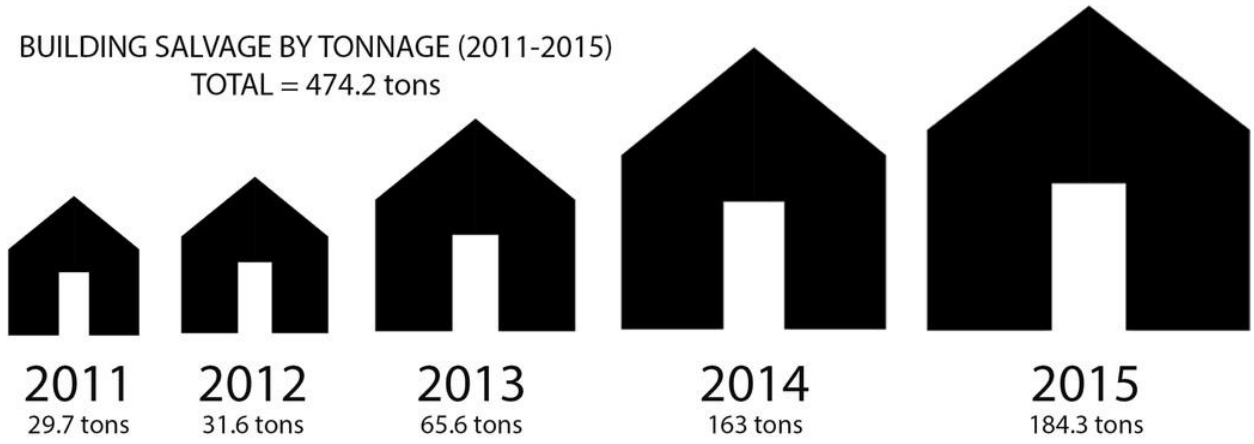

Figure 5.6: MRP Waste Diversion by Year[74]

Challenges

While there are many benefits to institutionalized material reuse at UGA, there are also several challenges of creating a larger scale program at an operational level. These challenges include but are not limited to staffing, communication, storage, access and inventory, time and money, and markets for materials. These challenges are not prohibitive, but need to be considered in order for growth of the program.

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[73] Ibid.

[74] Chris McDowell, Material Reuse Program, accessed April 11, 2016. http://www.thematerialreuseprogram.com/.

Staffing of the Material Reuse Program includes one full time employee and two interns. At this level of staffing, the program must rely heavily on volunteers for projects, and current needs of the program are difficult to manage with just one employee. Additionally, the involvement of students in the program carries issues of liability for the University, as they are participating in hands on construction. This is a challenge in managing the program and ensuring a safe work environment for students. Current staffing does not provide adequate time and resources for comprehensive management of the program. Facilitation of physical aspects of the program including deconstruction and salvage as well as construction projects is equally as important as are administrative organization and communication with other entities. Additional employees would allow the program to have dedicated roles for administration and project management, allowing for more specialized expertise in each role.

Currently, there is no established referral or communication system in place that systematically links building projects on campus to the Material Reuse Program. Referrals of material on campus come to McDowell usually through word of mouth or personal communication with individual projects. While McDowell is a part of the FMD system, the MRP remains somewhat separate from operations, forcing McDowell to advocate for the MRP constantly, to ensure both an inflow and outflow of material. An example of this breakdown in communication is a call McDowell received in January of 2016 about an Operations and Maintenance project at the Ramsey Center on the east side of UGA's campus. This project, managed by O&M and done by a subcontractor, involved renovations to the gym and required demolition of the wood flooring from the space, including subflooring. Midway into the project, McDowell received a call from management at O&M, informing him of available material.

McDowell then went to the job site, and had to negotiate with the client, Ramsey Athletics, and the subcontractor. By the time that MRP was involved in the project, the gym flooring had already been disposed of. McDowell was however, able to recover 164 sheets of ½" plywood, which was in excellent condition, having been buried underneath hardwood flooring. According to McDowell, the estimated value of this material was around $3500, and 3.3 tons of material was diverted from the landfill. However, MRP's involvement in this project was unplanned, and had a call not been placed to McDowell, the material would have ended up in a landfill. This project highlights the need for a referral system from project management to the MRP, in order to avoid unnecessary landfilling of reusable or recyclable material.

Storage of materials is also a key consideration. As discussed previously, the current program operates using a material yard of approximately 3 acres, including a 3,800 square foot covered, open-air structure. This storage facility is located approximately 4.5 miles from the program's office, which is currently housed by the Community Center for Design and Preservation on Broad Street.

While it is necessary to have ample space for materials, it is also important that they are accessible to those who use them. The yard is located approximately 4 miles from the Facilities Management Division's main offices at the Chicopee Complex. This location serves as the administration offices for this department, but also acts as material storage for projects. Related to access is the maintenance of a current inventory. Currently, the inventory of materials available at the yard is not firm, and rather is restricted to the program manager's knowledge of what is available. The development of an inventory system to be shared with parties in need of materials would encourage better utilization of material. University departments and entities

would have a better idea of the material available, and could take advantage of the opportunity to reuse material rather than purchase new material. However, maintaining an accurate and up to date inventory would require administrative support not currently in place at the program.

In the construction industry, both time and money are crucial factors in any project. Typically, once a project has been approved and a timeline for work is set, the project progresses rapidly. This can be a barrier to material reuse, because of the timeliness of construction projects. The timing of salvage or deconstruction must be factored into building projects. For example, in renovation projects, once a project begins, demolition of materials being renovated can occur rapidly, leaving very little time to salvage material. Also in the case of renovations, it may be unclear what materials can be salvaged until demolition has already begun. Materials hidden beneath finishes might be able to be salvaged, but this would not become apparent until after a project has been started. This creates a need for flexibility and communication between contractors and the University's Material Reuse Program so that reusable materials do not end up in the landfill.

Lastly, increasing the capacity of the Material Reuse Program creates a need to ensure that there are markets for the material. The main goal is to reuse materials, so there must be an appropriate balance of materials both entering and leaving the inventory. The process of finding pathways to reusing materials would be aided by the establishment and maintenance of an inventory. However, a greater awareness of the program in general and its importance must be developed in order to encourage greater utilization by campus entities, specifically Facilities Management Division. Those on campus participating in building projects must come to a greater understanding of the value of the program and material reuse in general, in order to

foster a culture of sustainable practices relating to building projects. Additionally, certain materials are unable to be reused or more costly to be reused. For example, local building codes in the United States require a grade stamp for all structural lumber. Wood that is reused requires a new grade stamp and must be inspected prior to use as a structural member, making it more costly to reuse it. This is not a limitation, but a challenge, as it is possible to reuse wood in a non-structural manner without acquiring a new grade stamp.

Conclusion

The Material Reuse Program is a unique program which is dedicated to reducing landfilling in Athens-Clarke County through the reuse of construction and demolition materials. The current program has a large student component, offering an opportunity for students to learn hands-on about material reuse in community driven construction projects. Students are able to engage in the program's operations as a volunteer for projects or as a class participant. While there are several challenges to expanding this program to an institutional scale, it offers the possibility to both help meet University sustainability goals, as well as create an opportunity for creative mitigation in the field of historic preservation.

CHAPTER SIX:

EVALUATION OF UGA PROGRAMS AND POLICIES

The previous chapters of this thesis have sought to provide a larger context of the sustainability movement related to material reuse as well as a context for building project management on UGA's campus. Current practices at UGA were examined, giving the reader insight into the operations, policies, and goals of the University, including direction for where the University is heading in the future. Two case examples from other universities were given, shedding light on how other institutions are integrating material reuse into building project policy on campus. This chapter aims to synthesize the findings of this research: firstly, by defining the relationship between historic preservation and sustainability at UGA, and answering the research question- what is the extent of the connection between sustainability and preservation at the University of Georgia and by offering conclusions drawn from research on the Material Reuse Program and building project policy and management on campus, answering a second research question- what are the costs and benefits of institutionalized material reuse and recycling for building projects at the University of Georgia? Lastly, this chapter provides recommendations stemming from the answers to the previous questions, answering the last research question- how can sustainability and historic preservation be well integrated within a university?

The Relationship between Preservation and Sustainability on Campus

After examining the current policies and practices involving sustainability and preservation on campus, it is evident that the two programs have very little relation to each other at the University of Georgia. The two efforts, historic preservation and sustainability, although both related to building projects in some way, operate very separately due to their missions and locations within the organizational structure at the University. Historic Preservation efforts are directed by the Office of the University Architects, and sustainability efforts are directed by the Office of Sustainability, housed in the Facilities Management Division. Due to this organization, the offices have limited interaction and communication.

The Role of Preservation in Sustainability

While preservation in general promotes itself as a "green" field, in practice this attitude only extends so far. Similar to the national program of preservation, when a building falls off the preservation docket, due to necessary or approved demolition, it also seems to fall off the sustainability docket. This could be rectified by creating a building program in general that is built upon a foundation of sustainability. Therefore, when a building must be demolished, whether it is historic or not, it is given equal treatment and falls to sustainable practices such as material reuse and recycling. While this is not singularly a preservation issue, the field of preservation in general and the preservation program at UGA should both recognize that they play a role in the building cycle and should encourage sustainable practices when demolition is necessary, rather than accepting the status quo of "document and destroy" allowing historic structures to contribute to the ever growing landfill burden in this country.

The Costs and Benefits of Material Reuse

Material reuse presents a unique opportunity for the University to engage in sustainable practices, adding value to the campus on environmental, social, and economic levels. The University currently has a growing sustainability program, with successful elements of recycling and composting related to municipal solid waste. Expanding the current Material Reuse Program would complement the University's sustainability efforts, creating an avenue for sustainability relating to construction and demolition waste.

On an environmental level, material reuse offers a direct path for material diversion from the landfill. As discussed, the current C&D waste landfill burden is not known for campus, except the waste coming directly from Facilities Management Division. While this data is helpful, it lacks a large portion of data regarding C&D waste from capital building projects on campus. This waste stream is potentially much larger, and data tracking is needed to determine the actual landfill burden on campus. However, greater utilization of the material reuse program would offer an alternative path for this waste, creating a greater diversion rate from the landfill. As discussed in Chapter 2, around 80% of a building's materials can be diverted from the landfill through either reuse or recycling,[75] while demolition offers an average recovery rate of only 20-30%.[76] Material reuse provides an opportunity for UGA to decrease landfilling, aiding in worldwide efforts to create solutions for finite resources including natural resources and limited space for landfills.

[75] Charles Kibert and Jennifer Languell, *Implementing Deconstruction in Florida: Materials Reuse Issues, Disassembly Techniques, Economics and Policy* (Gainesville, FL: Powell Center for Construction and Environment, 2000).

[76] US Environmental Protection Agency, *Characterization of Building-related Construction and Demolition Debris in the United States*, by Franklin Associates. EPA530-R-98-010 (Washington, D.C.: United States Government Printing Office, 1998) 3-9.

Complementing the added environmental value of material reuse on campus is the added social value that material reuse creates. Research on sustainability has documented growing public interest in sustainable development and has explored the many social reasons that drive people to minimize their waste in some way. This research is based primarily on municipal solid waste recycling, which is more visible to the general public than construction and demolition waste, but could be applicable to C&D waste. Research has been mostly focused on individual behaviors and knowledge, leaving out social context for the behaviors, and disregarding the impact of a greater social milieu on behavior towards recycling and reuse. Many individual factors such as convenience, availability, education, awareness, and expressed commitment impact people's likelihood to participate in a recycling program. However, other factors such as others' behavior and social norms can greatly impact a culture of reuse and recycling within a community. [77]

The influence of social norms and culture can be seen on campus within the student population. Students at UGA appear to be interested in sustainability and have a desire to improve sustainability efforts on campus, as witnessed by the students' self-imposed green fee. However, while students' awareness of sustainability on campus may be limited to areas that they interact with on a daily basis such as recycling of municipal solids or composting, it is likely that with increased education and awareness, students would rally around material reuse and recycling. Recently, through a campus sustainability grant, students in the Lamar Dodd School of Art and the Terry College of Business proposed and received funding for small-scale material reuse for student art projects. The project, originally titled the Shop Box, aimed to provide a

[77] Nicholas Schwab, Helen C. Harton, and Jerry G. Cullum, "The Effects of Emergent Norms and Attitudes on Recycling Behavior," *Environment and Behavior* 46, no.4 (2014): 403-422, doi: 10.1177/0013916512466093

formal location for students to exchange used or leftover art materials, utilizing a reused shipping container. The box would also serve as a path for materials from the Material Reuse Program to enter campus and be reused by students. Many art materials can be reused but end up in the landfill because there is no system to exchange materials. Students proposed the idea after seeing a need within their school and desiring to create a more sustainable work environment. The Shop Box provides an opportunity not only to create a cycle within the art school of materials, but also bring in other materials from campus such as lumber that can be easily reused in art projects. The box will be located directly behind the art school, in a visible location, promoting a sense of social good within the college and encouraging more sustainable practices for the school.[78]

The Shop Box highlights an opportunity for students on campus to embrace and participate in reuse and recycling of materials outside of municipal solid waste and composting. Increased awareness surrounding the issue at the art school called students to action, creatively solving the problem using resources already available to them. At the same time, students are able to reuse pieces of buildings and structures from campus, adding value to their art education at the University of Georgia. Reuse of materials on campus should include a public education component, to promote the story behind the materials, carrying the past life of the materials into a present that students can relate to. This piece of the program is especially important for materials coming from campus buildings no longer in existence. Interpretation of the materials used adds social value to the program and can create social capital in a similar manner to the farm-to-table movement.

[78] Joe Reisigl, "Creative Costs: How to Save on Art Supplies," *The Red & Black*, February 20, 2015.

The growing movement of farm-to-table in the agriculture industry creates an opportunity for people to connect a story and know where their food is coming from. Motivations to participate in this type of system are varied and include the availability of fresher and superior products, lower prices, and the desire to have a personal interaction with the person growing your food. Consumers desire to know where their food is coming from, having recognized that there are hidden costs of the commercial food industry which have long term consequences such as wasteful packaging or the loss of small family farms.[79] In a similar manner, material reuse gives the public an opportunity to follow the story of a material's past existence in a structure to its current use, attaching a positive interpretation to the construction industry, which also has many hidden costs. Highlighting material reuse through interpretation creates added social value for users of buildings. It allows users to interact with the history of the materials, while also creating social capital and a sense of public good through the environmental benefit of landfill diversion.

Recommendations

Considering the research findings discussed above, several recommendations can be made regarding policy and practice at the University in order to achieve the sustainability goals of the University. The following recommendations are organized according to the priorities outlined by the University in the 2020 Strategic Plan relating to sustainability.

I. *"Strategic Priority: Update UGA Guidelines for Design and Construction to incorporate, implement, and monitor current sustainable design strategies, including Leadership in*

[79] Michael J. Tippins, Kathleen M. Rassuli, and Stanley C. Hollander, "An Assessment of Direct Farm-to-Table Food Marketing in the USA," *International Journal of Retail & Distribution Management* 30, no. 7 (2002).

Energy and Environmental Design (LEED) and Sustainable Sites Initiative standards when appropriate."[80] Policies related to building projects on campus should be changed to reflect the University's commitment to sustainability. The current construction and design guidelines should be updated with more specific direction regarding construction and demolition waste. The current guidelines are vague, and do not include the level of detail necessary to regulate reuse and recycling practices during building projects. The University of North Carolina's guidelines set a precedent for the level of detail and information required to have a more successful reuse and recycling program on campus. Language favorable of sustainable practices should not be limited to the Design and Construction Guidelines. The Historic Preservation Plan currently under development should also consider sustainable best practices when written. It should require creative mitigation, ensuring that demolition of structures, when necessary, does not result in landfilling of valuable material able to be reused or recycled. The plan should not assume that sustainable campus building policy will be responsible for diversion of waste, and should advocate for sustainable demolition. Even once removed from historic structures, materials have inherent value and can still tell a story as a part of a new structure, being given a new life and new use.

[80] University of Georgia Office of Academic Planning, *Building on Excellence: University of Georgia 2020 Strategic Plan*, accessed February 6, 2016, http://oap.uga.edu/uploads/sp/UGA_Strategic_Plan_2020_October_30_2012.pdf, 28.

II. *"Strategic Priority: Integrate sustainability into the student experience through curricular and co-curricular activities both in the classroom and beyond."*[81] This priority is already being achieved in part through the Material Reuse Program. The program has a large educational component through both the Design-Build course offered to students and through extra-curricular student involvement. The course offers a unique opportunity for students, broadening their perspective while experiencing an aspect of sustainability that is not apparent in the everyday operations of the University. While it would be beneficial to expand the scope of the program, and create policy that encourages material reuse at an institutional level, it is important to retain the student and community oriented aspects of the MRP. This is unique to the University of Georgia, and should be highlighted as an innovative and beneficial program. Additionally, this goal presents an opportunity to include interpretation and education when material reuse has been implemented in a building project. This could be digital interpretation via a website, or could be physical signage. Connecting the story of a material's past, especially if being reused from another building on campus, informs students of a narrative including both sustainability and historic preservation.

III. *"Strategic Priority: Enhance the coordination, support, and awareness of the University's sustainability efforts by establishing a coordinating body to lead efforts, increasing endowments for sustainable activities and promoting campus sustainability efforts."*[82] Currently, the coordination and support of sustainability efforts is achieved through the

[81] Ibid, 28.
[82] Ibid, 28.

Office of Sustainability. However, the Office of Sustainability currently sits very low in the organizational structure, making communication and coordination of sustainability efforts across campus more difficult. If the University desires to make sustainability a priority, it should equip the office for success, placing it in a location that will allow for ease of management of sustainability efforts across all departments and divisions. Organizational restructuring should be considered. The Office of Sustainability currently has ease of access to information related to the Facilities Management Division, including the ability to track most waste streams coming from campus. As discussed, this does not include waste from capital building projects, which could possibly represent a large waste stream. Positioning the Office of Sustainability higher in the structure would change its jurisdiction and access to building project data.

IV. *"Strategic Priority: "Demonstrate a commitment to sustainability through reduced potable water usage, decreased waste, and increased use of sustainable and locally grown foods."*[83] Under this priority, the University has declared a goal to decrease the waste stream to landfills by 65 percent by 2020. In order to achieve this, the University needs a more accurate reporting system for construction and demolition materials leaving campus. Currently, the only waste tracked is waste leaving FMD, and these numbers are likely not accurate. Waste from capital projects is not tracked in a comprehensive manner, and rather is only tracked as expenses from projects. A system should be put into place to better track this data following the completion of projects, in

[83] Ibid, 29.

order to get accurate data on waste streams from campus. While the University has made sustainability a priority, and pledged to reduce its waste stream, this goal is not currently measurable. All waste streams from campus must be tracked and considered, in order for this goal to be attainable and realistic.

These recommendations were informed by case studies of similar efforts at the University of North Carolina and Stanford University. The policies and guidelines in place at these two universities are much more specific than those at UGA and serve as examples to aim for. Additionally, these universities appear to have more comprehensive and detailed tracking of waste, making it easier to evaluate their performance.

Conclusion

Limitations of Recommendations

The priorities and goals given along with recommendations are limited to the strategic priorities which can relate to material reuse. Four of the eight strategic priorities relating to sustainability were not given recommendations, and can be seen in Appendix A. Recommendations are suggestions of how expanding the Material Reuse Program to an institutional level could respond in many ways to the University's desire to increase sustainability on campus.

Implementation

The recommendations given are at a preliminary phase, and will take additional research and organization in order to be implemented. Firstly, adequate data is not available to accurately

assess the University's waste reduction goals. A baseline should be established which includes all waste leaving campus.

Additionally, once comprehensive waste data is available for UGA's campus, it would be possible to determine the intersection of lowest cost and highest benefit for material reuse on campus. This could result in the development of a matrix or tool to be used for evaluating buildings for deconstruction or salvage feasibility based on UGA specific costs, determined by an in-depth examination of costs associated with C&D waste from capital projects on campus. Additional staffing dedicated to material reuse or sustainability efforts in building projects on campus is needed.

CHAPTER SEVEN:

CONCLUSION

The field of sustainability has gained public awareness and interest, while also becoming a necessary priority at the global scale. As mankind is impacted by the changing environment and dwindling resources, it looks forward to evaluate the needs of future generations, and the planet's ability to handle those needs. While this is important at a global scale, it is also necessary to examine practices at lower levels, allowing for small changes to be made that could incrementally work towards a more sustainable world. The field of historic preservation has joined the conversation, reinforcing the opportunity historic buildings offer to utilize structures and materials already in existence. However, to what extent do these fields actually overlap and connect?

It is clear that the fields of preservation and sustainability remain mostly separate, although preservation has started promoting its green aspects. The role of preservation in the field of sustainability is currently limited to the idea that historic buildings can only be sustainable while standing. While it is true that "the greenest building is one that has already been built," there is also room for promoting sustainable practices when demolition or renovation is necessary. Preservation should not proclaim to be a green field only when historic resources are able to be saved. It has a responsibility to encourage sustainable practices, no matter what the end of a building is.

The concept of creative mitigation has the ability to envelope this responsibility of sustainability. When portions of a building are renovated or rehabilitated, existing materials can be reused or recycled when removed from a structure. Additionally, in the event that a building must be demolished, deconstruction increases the likelihood that materials are reused or recycled. This element of reuse and salvage could bring an important missing element to historic preservation. Once materials are removed from a building, they still retain some amount of aesthetic value and the ability to tell a story. The history of the building can live on in a new interpretation through the reuse of the materials. This type of creative mitigation of materials reused from a historic building can add a new layer of interpreting the past to current preservation efforts, pushing the boundaries of what is currently thought of as preservation. Broadening the scope of preservation and creating additional opportunities to "preserve" the past can only add to the value of our cultural heritage.

Considering that these two fields remain separate at large, this thesis sought to examine the current relationship between the two fields at the University of Georgia. University policies and programs were examined, seeking to answer the question: What is the extent of the connection between sustainability and preservation at the University of Georgia?

The University of Georgia is an institution that has charged itself with increasing sustainability efforts on campus, aiming to serve as an example to others in "reducing their environmental footprints to the greatest extent possible."[84] At the same time, the University has committed to completing a historic preservation plan for campus, highlighting its need for focused and defined preservation efforts. While these two endeavors are entirely separate, they

[84] University of Georgia Office of Academic Planning, *Building on Excellence: University of Georgia 2020 Strategic Plan*, accessed February 6, 2016, http://oap.uga.edu/uploads/sp/UGA_Strategic_Plan_2020_October_30_2012.pdf

are relevant, which should be considered in University planning and management. Building-related sustainability practices on campus should be well-defined and pervasive, establishing a sustainability safety net under all building-related policy on campus, including historic preservation policy.

Based on the current lack of relationship between the two fields, an opportunity exists to better integrate the two efforts. This gap can be filled by expanding the current Material Reuse Program and by creating policy to institutionalize the program. Building deconstruction and salvage allowing for material reuse and recycling should be the norm in construction projects on campus. This policy is a best-management practice that facilitates diversion of waste from the landfill, decreasing environmental impact during building projects.

In conjunction, the Historic Preservation Plan for campus currently under development should recognize the important role preservation could play in encouraging sustainable development. Acknowledging the economic and environmental value of historic building materials, preservation should encourage creative mitigation such as building material reuse and recycling, *when demolition or renovation is necessary*. This is a delicate balance, and while it may appear that encouraging material reuse and recycling advocates for building demolition, this is a poor excuse and allows preservation as a field to excuse itself from the sustainability conversation once a building has been condemned to demolition. Preservationists should not be allowed to walk away from building projects as soon as they are marked for demolition, claiming after documentation that a building in wait for demolition is no longer historic. Preservation, as a field promoting itself as "green," has a responsibility to the materials even if a structure cannot be saved. In conclusion to the question regarding the relationship of these two fields, it is clear

that preservation and sustainability efforts on campus are related The historic preservation plan should require creative mitigation such as material reuse and recycling when demolition is necessary. Additionally, while this is the ideal, sustainability efforts on campus should also be established such that a safety net is created that applies to all building related projects, whether they are related to historic structures or not.

While it appears that there are definite benefits to material reuse environmentally and socially, the economic cost to campus is unable to be determined due to a current lack of data on the construction and demolition waste stream from campus. Once a baseline for C&D waste from campus is determined, and data is available on waste costs, it may become apparent that the practice of reuse and recycling, especially in the case of deconstruction or salvage, is only economically viable for projects of a certain size or scope. However, as discussed, there are numerous benefits to material reuse and recycling, and these should be heavily considered when weighing costs. Ultimately, the University should be engaging in practices reinforced by policies which support its goal to create a more sustainable campus.

The intersection of sustainability and historic preservation at the University of Georgia is minimal. However, this intersection should be emphasized, and the two efforts should be well integrated. Expansion of the current Material Reuse Program provides an opportunity for the University to be a leader in both fields, setting a precedent for innovative and creative thinking, and serving as an answer to the final question explored in this thesis: How can sustainability and historic preservation be well integrated within a university? The current Material Reuse Program, if expanded to an institutional level, could serve as an example for other universities. This program is unique and should be highlighted as such. The program offers students an

opportunity to interact with preservation and sustainability personally, learning about the two fields in an unparalleled experience. This component of the program is quite valuable and should remain intact. The Material Reuse Program, if enhanced, can provide a gold standard for other institutions of higher education wishing to adopt a similar building program on campus.

In an article in Planning for Higher Education, Carl Elefante proposes the idea that preservation can play a significant role in preservation on university campuses: "Campus heritage offers the most complete course in achieving sustainability in the time frame we have."[85] While the idea that preservation can play a role in sustainability is by no means a new idea, the implications of this idea should be reexamined. Preservation creates an opportunity to promote sustainability even if historic structures are unable to be saved, sharing in a larger vision of sustainable development, "[meeting] the needs of the present without compromising the ability of future generations to meet their own needs."[86]

[85] Carl Elefante, "The Full and True Value of Campus Heritage," Planning for Higher Education 39, no. 3 (2011).
[86] World Commission on Environment and Development, Our Common Future (Oxford: Oxford University Press, 1987), 16.

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APPENDIX A:

UGA STRATEGIC PLAN 2020: INTRODUCTION AND STRATEGIC DIRECTION VII

Vision

The University of Georgia seeks to be one of the foremost public research universities in the world.

The Mission of the University of Georgia

The University of Georgia, a land-grant and sea-grant university with statewide commitments and responsibilities, is the state's oldest, most comprehensive, and most diversified institution of higher education. Its motto, "to teach, to serve, and to inquire into the nature of things," reflects the University's integral and unique role in the conservation and enhancement of the state's and nation's intellectual, cultural, and environmental heritage. [The entire mission statement may be found in Appendix G.]

Hallmarks of the 2020 Strategic Plan

Over the past quarter century, the University of Georgia has dramatically improved its reputation for undergraduate education and scholarship, as evidenced by its recent rise to 21st among national public universities in the 2013 *U.S. News & World Report* rankings. While other factors have contributed, the largest reputational gains are due principally to the steadily escalating credentials of each freshman class, improvements in the undergraduate experience, an outstanding honors program, the HOPE Scholarship, and the remarkable record of major national scholarships won by UGA undergraduates. Many of these gains are rooted in the 2010 Strategic Plan.

Now, the University is poised to take a similar leap with respect to its reputation for world-class research and graduate scholarship. To move into the ranks of the world's elite research universities, UGA must improve its research and graduate (particularly doctoral) programs to match the previous advances with undergraduate education. Although UGA has a number of highly ranked graduate and professional programs, the gap between undergraduate and graduate standings, as well as our relative research performance metrics, is what most differentiates us from America's top-tier state universities, including such aspirational institutions as the leading universities of California, Michigan, Wisconsin, Virginia and North Carolina. In addition, the output of UGA's research enterprise heavily influences our status in world rankings of research universities, and is likely to determine whether UGA is invited to join the prestigious Association of American Universities. Improving these metrics will not be easy; it will require a deliberate, sustained, and strategic effort.

Hence, a hallmark of the 2020 Strategic Plan is a multifaceted approach to accomplishing these overriding goals. Included are recommendations spanning several Strategic Directions, the most critical of which is to recruit aggressively world-class research faculty, particularly in strategic growth areas such as public health, human medicine, and engineering. Among these new recruits should be members of the National Academy of Sciences or other highly successful senior faculty who can help to either expand or create new centers of research excellence. These individuals incrementally elevate UGA's reputation by their decision to join the UGA faculty. But expanding the research faculty alone is not sufficient. Because quality research and quality graduate programs are virtually synonymous, it will also be necessary to expand graduate enrollments and to increase per capita support for graduate students in a number of disciplines. The international competition for talented graduate students is increasingly intense. To take the next leap in reputation, UGA must be prepared to invest appropriate funding and other resources to attract and retain the best faculty and graduate talent.

A supporting theme, also common to multiple Strategic Directions, reflects the urgent need to improve existing facilities and to create new quality space for research and scholarship in the Science, Technology,

Engineering, and Mathematics (STEM) disciplines. It will be difficult if not impossible to recruit the necessary research faculty without significant expansion and modernization of our research facilities. Among the most critical, UGA must commit to an onsite research facility at the new Health Sciences Campus in order to realize the full potential of that campus and the interdisciplinary studies it was designed to facilitate. Similarly, across campus there must also be increased investments in research infrastructure, including in core facilities, major equipment, and IT/computing resources. The Plan advocates for aggressive use of the Capital Campaign to raise funds for these space and infrastructure needs as well as others frequently identified by faculty as important: endowments for new faculty chairs and increased opportunities for faculty development (e.g., renewal and redirection of research interests).

The push to improve research and graduate education should not and must not equate to a de-emphasis on undergraduate education. UGA can advance as a leader among comprehensive national/world research universities only by continuing to improve the quality and scope of its undergraduate programs, which position the University to compete for the best and brightest students in Georgia and across the country. Thus, an appropriate hallmark of the 2020 Strategic Plan is a continued strong focus on undergraduates. Key objectives are to improve critical undergraduate metrics, including student retention and graduation rates, while simultaneously increasing the diversity of the student body. High priorities are to emphasize problem solving, collaboration, and critical thought in the curriculum–activities that are consistent with and supported by another priority: increasing opportunities for undergraduates to engage in faculty research. Expanding and improving UGA research programs will obviously help in meeting this priority and will provide our students with a richer palette of educational opportunities at the undergraduate level.

The 2020 Plan also reflects the consensus view that UGA must increase the level of interdisciplinary research, teaching, and service across campus. The Plan emphasizes the need to provide and promote interdisciplinary and joint degree experiences for graduate students, as well as the need to encourage strategic, interdisciplinary research across college boundaries. This need spans multiple Strategic Directions and is one of its hallmarks.

A focus on the 21st century land-grant and sea-grant missions is another hallmark of the 2020 Strategic Plan. A priority is to find new ways to carry the resources and expertise of the University into the state—and even internationally—and provide leadership and skills to help communities, the private sector, and governments thrive in the 21st century. UGA is poised to address Georgia's most daunting issues: economic development and job creation, public health and obesity, and water resources and the environment. Connecting research done on campus to these key challenges will help address key quality of life issues in Georgia. Increasing participation by undergraduate and graduate students in community service learning exercises will help develop our students into collaborative problem solvers, entrepreneurs, and leaders in the state and the nation. Our students and faculty will be energized by deeper engagement around "grand challenge" themes, and the effort will encourage stronger links between UGA research and innovation and real-world problems while providing opportunities for the University to articulate and brand its strategic objectives.

Several Strategic Directions of the 2020 Plan highlight the importance of expanding and deepening UGA's global connections. International education and service learning efforts will raise UGA's profile around the globe while providing new opportunities for all three missions—instruction, research and service. In addition to maintaining study abroad enrollments, the University's priorities are to increase engagement in global research and to collaborate with agencies within our state to help Georgia compete successfully in the global marketplace.

Two other themes emerge in the 2020 Plan–sustainability and diversity. First, a comprehensive set of recommendations will allow UGA, which was after all the home of the pioneering ecologist Gene Odum, to emerge as a model institution and national leader in research and implementation in this important area.

Second, the Plan addresses the need to diversify the UGA faculty, student body, and staff through a series of steps. Although much has been accomplished in this regard, the University does not yet adequately reflect the diversity of the state it serves.

These, then, are the hallmarks of the UGA 2020 Strategic Plan: a clarion call to improving research and graduate education, while preserving and enhancing recent gains in undergraduate education; increasing interdisciplinary efforts across campus as well as local-to-global education and outreach experiences as keys to expanding opportunities for both research and education; establishing a leadership position in sustainability as a major theme for research, education, and service; and ensuring the future relevance of our missions by diversifying the UGA community to better reflect the demographics of Georgia.

Strategic Direction VII

Improving Stewardship of Natural Resources and Advancing Campus Sustainability

Because the University of Georgia is committed by its land- and sea-grant mission to serve people living and working in Georgia along with our vision to be a leading university internationally, it is incumbent upon the University to provide leadership concerning unprecedented environmental challenges. It is equally important for the University to manage financial and human resources with the greatest of care and respect and to the maximum benefit of the state. A sustainable university is one that meets the needs of the present without compromising the ability of future generations to meet their needs. It also creates opportunities for students, faculty, and staff to enhance the quality of life throughout their communities (Working Group on Sustainability, 2009; World Commission on Environment and Development). A sustainable university acts as a living laboratory where sustainability is researched, taught, tested, and constantly refined. UGA must demonstrate and promote leadership in sustainable living and learning, contextualizing the local as part of the global in sustainability.

Over the next decade, the University's campuses should be examples to others in reducing their environmental footprints to the greatest extent possible. This includes efforts to reduce energy use significantly, and intelligently, and carefully use and reuse scarce water resources, improve air and water quality, provide sustainable food and transportation options, purchase environmentally responsible products and equipment, increase recycling, and drastically reduce waste. Second, in the effort to prepare students for effective leadership on campus and beyond, sustainability should be infused into formal and informal educational opportunities throughout the University. Campus buildings and landscapes should be incorporated as teaching opportunities, which through design and functional interpretation will reveal innovative practices with the potential to enlighten and inform students and citizens about sound approaches to sustainable living. Third, research generated by UGA faculty and students as well as advances from the global community will be used to reduce dependency on fossil fuels, increase the reuse of materials, and continue the search for other methods that will reduce human impacts on the environment. A priority for the University at large is to design and construct buildings, plaza spaces, hardscapes, and other landscapes that embody the latest in environmental advances and to incorporate the increasing social nature of learning today by creating ample spaces for people to interact. To accomplish these goals, the University should establish a formal coordinating body to work with the UGA Office of Sustainability to develop and implement a comprehensive sustainability plan for the University.

a. **Strategic Priority: Annually evaluate and update the University's sustainability performance in instruction, research, public service, campus development, and operations activities.**

   Benchmark: Stages for developing a systematic evaluation of the University's sustainability performance in instruction, research, public service, campus development, and operations activities.
   Goal: An annual report on the status of and progress in sustainability performance in instruction, research, public service, campus development, and operations activities by 2020.

b. **Strategic Priority: Demonstrate a commitment to reducing fossil fuel use, thereby reducing the University's carbon emissions.**

Pre-benchmark Activity: Calculate the University's carbon footprint.
Benchmark: The University's carbon footprint when calculated.
Goals: By 2020:
Reduce carbon emissions by 20 percent.
Reduce University consumption of energy by 25 percent.
Increase purchase of energy from renewable sources by 10 percent.
Increase generation of energy from renewable sources by 10 percent.

c. **Strategic Priority: Update UGA Guidelines for Design and Construction to incorporate, implement, and monitor current sustainable design strategies, including Leadership in Energy and Environmental Design (LEED) and Sustainable Sites Initiative standards when appropriate.**

Benchmark: Stages of completion of drafting, gaining support for, and implementing the guidelines.
Goal: Updated Guidelines for Design and Construction by 2020.

d. **Strategic Priority: Integrate sustainability into the student experience through curricular and co-curricular activities both in the classroom and beyond.**

Pre-benchmark Activity: Develop a system for identifying and designating courses with a curricular sustainability component.
Benchmark: The number of courses with curricular sustainability component when system is implemented.
Goal: Increase number of courses with curricular sustainability component by10 percent by 2020.

Pre-benchmark Activity: Develop a system for identifying and designating co-curricular experiences with a sustainability component.
Benchmark: The number of available co-curricular experiences with sustainability components when system is implemented.
Goal: Increase number of available co-curricular experiences with sustainability components by 10 percent by 2020.

e. **Strategic Priority: Enhance the coordination, support, and awareness of the University's sustainability efforts by establishing a coordinating body to lead efforts, increasing endowments for sustainable activities and promoting campus sustainability efforts.**

Benchmark: Stages for establishing and charging a coordinating body to oversee sustainability efforts.
Goal: A functioning coordinating body to oversee sustainability efforts by 2020.

Benchmark: The level of endowment funds for sustainable activities in 2010-2011.
Goal: Increase the endowment for sustainable activities by 25 percent by 2020.

Benchmark: Stages of action to identify, develop, fund, and install interpretive signs for key campus sustainability efforts.
Goal: Interpretive signs installed by 2020.

f. Strategic Priority: Encourage the further development and use of mass transportation to and on campus.

Benchmark: The number of campus bus passengers in 2010-2011.
Goal: Increase the number of campus bus passengers by 2020.

Benchmark: The number of faculty, staff, and students who commute to campus who use alternate modes of transportation such as mass transit, bicycles, or walking in 2010-2011.
Goal: Increase by 20 percent the number of faculty, staff, and students who commute to campus using alternate modes of transportation such as mass transit, bicycles, or walking by 2020.

Benchmark: The number of Alternative Transportation Permits in 2010-2011(2,100).
Goal: Increase the number of Alternative Transportation Permits to 2,500 by 2020.

Benchmark: The steps to develop and implement a carpool membership program.
Goal: A carpool membership program with 1,000 users by 2020.

g. Strategic Priority: Demonstrate a commitment to sustainability through reduced potable water usage, decreased waste, and increased use of sustainable and locally grown foods.

Benchmark: The level of potable water usage in 2010-2011.
Goal: Reduce potable water use by 40 percent by 2020.

Benchmark: The level of waste stream to landfills in 2010-2011.
Goal: Decrease waste stream to landfills by 65 percent by 2020.

Benchmark: The level of sustainable and/or Georgia-grown foods in 2010-2011 (approximately 20 percent).
Goal: Increase the use of sustainable and Georgia-grown foods to 35 percent by 2020.

h. Strategic Priority: Develop and implement a process for evaluating opportunities for on-site renewable energy in capital projects.

Benchmark: Stages of development and implementation of an evaluation process.
Goal: Documented evaluations of opportunities for on-site renewable energy for each capital improvement project on campus by 2020.

APPENDIX B:

UGA DESIGN AND CONSTRUCTION STANDARDS RELATING TO CONSTRUCTION WASTE MANAGEMENT

The University of Georgia
Office of University Architects for Facilities Planning

01 74 19
CONSTRUCTION WASTE MANAGEMENT & DISPOSAL

1. **GENERAL**
   A. The University of Georgia has implemented strict recycling and waste management policies for all waste materials removed from its campus as a result of construction and demolition activity. These materials include:
      i. Asphalt
      ii. Concrete, concrete block, concrete masonry units (CMU), slump stone (decorative concrete block), and rocks
      iii. Brick
      iv. Paper, including bond, newsprint, cardboard, mixed paper, packing materials, and packaging
      v. Cement Fiber Products, including shingles, panels, siding
      vi. Paint
      vii. Glass
      viii. Plastics
      ix. Carpet and Pad
      x. Beverage Containers
      xi. Gypsum Wallboard
      xii. Ceiling Tiles
      xiii. Porcelain Plumbing Fixtures
      xiv. Fluorescent Light Tubes, per EPA regulations
      xv. Green materials (i.e. tree trimmings and land clearing debris)
      xvi. Metals (ferrous and non-ferrous) including, but not limited to, stud trim, ductwork, piping, reinforcing steel (rebar), roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
      xvii. Wood (non-pressure/chemically treated wood) including, clean dimensional wood, pallet wood, plywood, oriented strand board (OSB), particle board.
      xviii. Vinyl composition tile (VCT)
   B. The Contractor is required to account for all waste materials removed from the project, and to recycle, salvage, or reuse, to the maximum practicable extent, all of the materials listed above within 20 miles of the construction site. Upon request, Owner's Representative will provide assistance to the Contractor in identifying markets for recyclable materials. The Contractor shall make provision as practical for the Owner's Representative to utilize any recycled materials and processed waste materials on campus. If the Contractor believes that recycling, salvage, or reuse of any of these materials is impracticable, the Contractor must inform Owner before commencement of construction, and secure Owner's written authorization for an alternative means of disposal.
   C. The Contractor will be required to supply to the Owner on or before the Pre-Construction Meeting a Waste Management Plan which documents procedures to recycle, salvage, or reuse the materials listed above, including 1) separation, hauling and recycling procedures, 2) material recovery facilities and their distance from job site; and 3) markets for each material recovered. This plan must also address training and communications, recordkeeping, and reporting requirements to assure that all waste

materials are accounted for properly. At the Material Completion, the Plan shall be updated and submitted to the Owner' Representative with the total quantities of each waste material that was reused, salvaged, recycled, or disposed of, and the markets to which these materials were directed, so that it provides documentation in a single source of waste management performance on the project.

D. During construction, the Contractor shall maintain records of a) each type of material removed from the job site (including materials that are not recycled), b) the name(s) of specific end destinations for all materials removed (whether recycled or disposed of), and c) weights or measures of all types of materials removed. Every load of waste material that leaves the site must be documented (including receipts, pictures or tickets from material hauler or recovery facility) and reported to Owner's Representative on a monthly basis.

E. The Owner retains the right to inspect, and subsequently approve or disapprove any and all recycling end markets, reuse or salvage outlets, and/or waste disposal facilities that are involved in the receipt of recyclables and/or waste materials generated from the project. Disapproval of such a market or outlet may be based on past or current violations of federal or state environmental, health, or safety laws, improper disposal activities, risk or liability exposure, excessive distance from the job site, or any other reason deemed sufficient by Owner.

F. The Contractor shall include administrative and recordkeeping costs associated with Construction and Water Management in the Contractor Overhead Cost and Base Bid. All other associated costs shall be included in the Cost of the Work as part of the Guaranteed Maximum Price.

APPENDIX C:

CONSTRUCTION WASTE MANAGEMENT PLAN: SCIENCE LEARNING CENTER

CONSTRUCTION WASTE MANAGEMENT PLAN

Company Name:	**Whiting-Turner**	**Contact Person:**	**Kevin McGovern**
Project Location:	**UGA J-234 Science Learning Ctr.**	**Telephone #:**	**(770) 231-5645**
Address:	**UGA Campus**		
	Athens, GA		

Contractor Information
Contact Person: Kevin McGovern
Telephone #: (770) 231-5645

Waste Management Goals:

- This project will recycle for reuse a minimum of **75%** by weight of the waste generated on-site.
- Waste reduction will be achieved through building design, and reuse and recycling efforts will be maintained throughout the construction process.

Waste Prevention Planning:

- In accordance with L.E.E.D. requirements this project will recycle:
  - corrugated cardboard
  - white and colored office paper
  - concrete
  - unpainted/untreated wood
  - gypsum board
  - metal
- In addition to other requirements specified herein it is a requirement for the work of this project that the contractor comply with the applicable federal, state and local waste disposal requirements
- Of the inevitable waste that is generated, the waste materials designated in this specification shall be salvaged for reuse and or recycling where practical and possible. Waste disposal in landfills or incinerators shall be minimized where practical and possible. On new construction projects this means careful recycling of job site waste. On demolition projects, this also means careful removal for salvage.
- The Construction Waste Reduction Plan shall be implemented and executed as follows:
  - There will be a roll-off container on the job site for all materials to be considered for reclamation and/or recycling. This container will also contain un-recyclable material and will be sorted manually at sorting facility.
  - Occasionally, as space permits, there will be a designated area on the construction site reserved for dedicated dumpsters specifically labeled bilingually for respective materials to be received.
  - Before proceeding with any removal of construction materials from the construction site, Project Superintendent and/or assistant will inspect containers with requirements.

- Hauler will leave carbon-copy signoff ticket (see attachment 'Signoff Book');
- Hauler will record weight data for each load. Actual weight will be used when scales are available. If scales are unavailable weights will be determined by material density conversion factors.
- Recyclables and trash totals will be recorded and reported on a monthly basis. (see attached document 'Disposal Summary by Destination & Material')
- Hazardous waste will be managed by a licensed hazardous waste vendor.

Communication & Education Plan:

- The General Contractor will conduct an on-site pre-construction meeting with subcontractors. Attendance will be required for the subcontractor's key field personnel. The purpose of the meeting is to reinforce to subcontractor's key field employees the commitments made by their companies with regard to the project goals and requirements.
- Waste prevention and recycling activities will be discussed at the beginning of each weekly subcontractor coordination meeting to reinforce project goals and communicate progress to date. Subcontractors will be informed of dedicated hauls on roll-off containers for the week.
- As each new subcontractor comes on site, the recycling coordinators will present him/her with a copy of the Waste Management Plan and provide a tour of the recycling areas.
- The subcontractor will be expected to make sure all their crews comply with the Waste Management Plan.
- All subcontractors will be informed in writing of the importance of non-contamination with other materials or trash.
- Recycling coordinators shall inspect the containers on a daily basis to insure that no contamination is occurring and precautions shall also be taken to deter any contamination by the public.

Evaluation Plan:

- The General Contractor and Hauler will discuss monthly project's waste recycling goal of 75% by weight of the total project waste stream.

Expected Project Waste, Disposal, and Handling:

The following charts identify waste materials expected on this project, their disposal method, and handling procedures:

Material	Disposal Method	Handling Procedure
Clean dimensional wood, palette wood, plywood, OSB, and particle board	Recycle at: Garrett Farms Compositing Site	Keep separated in designated areas on site. Place in "Clean Wood" container if a dedicated container is on site. Otherwise place in commingle container.
Painted or treated wood	Walton C&D Landfill	Place in "Commingle" container.
Concrete Masonry Units	Keep separate for re-use by on-site construction or by site employees	Place in "Concrete" container if a dedicated container is on site. Otherwise place in commingle container.

Metals	Recycle at: Athens Auto Wrecking	Place in "Metals" container if a dedicated container is on site. Otherwise place on commingle container.
Gypsum drywall (unpainted)	Recycle at: Garrett Farms Compositing Site Related Recycling	Place in "Gypsum" container if a dedicated container is on site. Otherwise place in commingle container.
Insulation	Walton C&D Landfill	Place in "Trash" container if a dedicated container is on site. Otherwise place in commingle container.
Flooring	Walton C&D Landfill	Place in "Trash" container if a dedicated container is on site. Otherwise place in commingle container.
Glass	Glass Bottles: Recycle at: Athens-Clarke County Materials Recycling Facility	Keep separated in designated areas on site. Place in "Glass/Plastic bottles/Metal Cans/Mixed Paper/ Cardboard" container.
Cardboard, white and colored office paper	Recycle at: Athens-Clarke County Materials Recycling Facility	Keep separated in designated areas on site. Place in 8 Yd Front Load Cardboard container Broken down boxes. When situation warrants, will have dedicated roll-off container.

Waste Disposal and Recycling Sites:

Site Name	Site Address	Contact Number	Material
Walton C&D Landfill	145 Hwy 78 Monroe, GA 30656	(770) 266-6967	Construction & Demolition, Concrete, Asphalt, and Dirt
Garrett Farm	1441 Dials Mill Rd Statham, GA 30666	(706) 207-0376	Tree Debris, Concrete, Asphalt, and Dirt
Athens Clarke MRF	699 Hancock Ind. Way Athens, GA 30605	(706) 548-9855	Card Board, Glass, and Office Paper
Athens Auto Wrecking	8223 Hwy 29 South Athens, GA 30606	(706) 548-2211	Metal

Hauler Information:

Roll Off Systems
1100 B. Garrett Dr.
Statham, GA 30666
(770) 725-7655

EPD #: PBR 08-1010L