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MTSU Clean Energy Initiative Project Funding Request

There are five (5) sections of the request to complete before submitting. See <http://www.mtsu.edu/sga/cleanenergy.shtml> for funding guidelines. Save completed form and email to cee@mtsu.edu or mail to MTSU Box 57.

1. General Information	
Name of Person Submitting Request Drs. W. Anderson and N Phillips as PI	
Co PIs Dr. F. Bailey, Dr. J. Carter, Dr. M. Knight, Mr. Matthew Wade	
Department/Office ABAS, Biology, CIM	Phone # (Office) 898-2523 (ABAS)
MTSU Box # Campus box 5	Phone # (Cell) 615-809-4432
E-mail warren.anderson@mtsu.edu	Submittal Date

2. Project Categories (Select One)	
Select the category that best describes the project.	
<input type="checkbox"/> Energy Conservation/Efficiency	<input checked="" type="checkbox"/> Sustainable Design
<input type="checkbox"/> Alternative Fuels	<input type="checkbox"/> Other
<input type="checkbox"/> Renewable Energy	

3. Project Information
<p>a. Please provide a brief descriptive title for the project.</p> <p>b. The project cost estimate is the expected cost of the project to be considered by the committee for approval, which may differ from the total project cost in the case of matching funding opportunities. Any funding request is a 'not-to-exceed' amount. Any proposed expenditure above the requested amount will require a resubmission.</p> <p>c. List the source of project cost estimates.</p> <p>d. Provide a brief explanation in response to question regarding previous funding.</p>
3a. Project Title: Water Conservation and recycling for rural and urban citizens
3b. Project Cost Estimate \$25,000

3c. Source of Estimate,

After an onsite visit, Vince Guarino of Rainwater Resources Inc. made some suggestion in preparing a budget estimates. His contact information is vine@rainwaterresources.com

3d. If previous funding from this source was awarded, explain how this request differs?

N/A

4. Project Description

(Completed in as much detail as possible.)

- a. The scope of the work to be accomplished is a detailed description of project activities.
- b. The benefit statement describes the advantages of the project as relates to the selected project category.
- c. The location of the project includes the name of the building, department, and/or specific location of where the project will be conducted on campus.
- d. List any departments you anticipate to be involved. Were any departments consulted in preparation of this request? Who? A listing may be attached to this form when submitted.
- e. Provide specific information on anticipated student involvement or benefit.
- f. Provide information for anticipated future operating and/or maintenance requirements occurring as a result of the proposed project.
- g. Provide any additional comments or information that may be pertinent to approval of the project funding request.

4a. Scope: Work to be accomplished

Murfreesboro is ranked as one of the top 10 US cities for population growth in 2012-2013. Water use changes are inevitable because population growth and changing precipitation patterns. There is a need to demonstrate how water resource plans can reduce demand and increase water supply by modifying water use operations. In 2005 US EPA estimated, the average American citizens used 300 gallons of water per day. Two hundred and ten gallons of water are used indoors. Ninety gallons of water is used outdoors. Thirty-seven percent of outdoor use is used for irrigation. The demand for water resources are increasing for urban uses.

The Tennessean has brought the importance of water to the middle Tennessee public. The USA Today section published a series of articles on water December 18, 20 and 21 2015. The articles titles were "Water Wars", "Groundwater Depletion" and "A Scorched and Sparse Survival".

The MTSU School of Agribusiness & Agriscience [ABAS] has a history of providing students with quality experiential learning opportunities. The dairy and garden projects are extensions of ABAS's teaching philosophy which

places an emphasis on hands-on learning. The dairy produces fluid milk for sale to a Coop; and supplies our on-campus milk processing plant. Dairy products which are sold to campus cafeterias include whole, reduced fat, skim, cream and chocolate milk. ABAS students get hands-on learning experience on the dairy [Figure 1] and at the dairy processing facilities on campus. MTSU Dairy Science students have also competed nationally in dairy products tasting.

The MTSU School Agribusiness & Agriscience [ABAS] hosts an annual field day at the Experiential Farm Laboratory in September. The 2015 Field days feature student involvement in the dairy, honey and gardens. Four hundred people from Rutherford and surrounding counties attended the field day and milking demonstration. MTSU School Agribusiness & Agriscience hosts numerous K-12 grade school tours. This past academic year 1800 students and teachers toured the farm laboratory. The farm laboratory is a public and education resource in middle Tennessee.

The dairy now milks 60 head two times per day. After each milking the parlor is cleaned by a water deck spray. Each day 3,200 gallons of water from the consolidated utility district are used to clean-up the facility. In 30 days 96,000 gallons of water are used. On an annual basis this is 35% of the total water used which costs MTSU \$8,000 per year. The funds requested would retro fit the parlor roof with gutters to act as catchment area. The milking facility is shown in Figures 1. The milk parlor roof catchment area [Figure 2 & 3, small roof] is 130 feet long by 60 feet wide or 7,800 square feet. A portion of loafing shed roof would be a catchment area [Fig 2 & 3, large roof] is 84 feet by 20 feet or 1680 square feet. The total catchment area would be approximately 9,500 square feet.



Figure 1: aerial view of Dairy facility [milking parlor on right, loafing shed on left] and farm looking north.

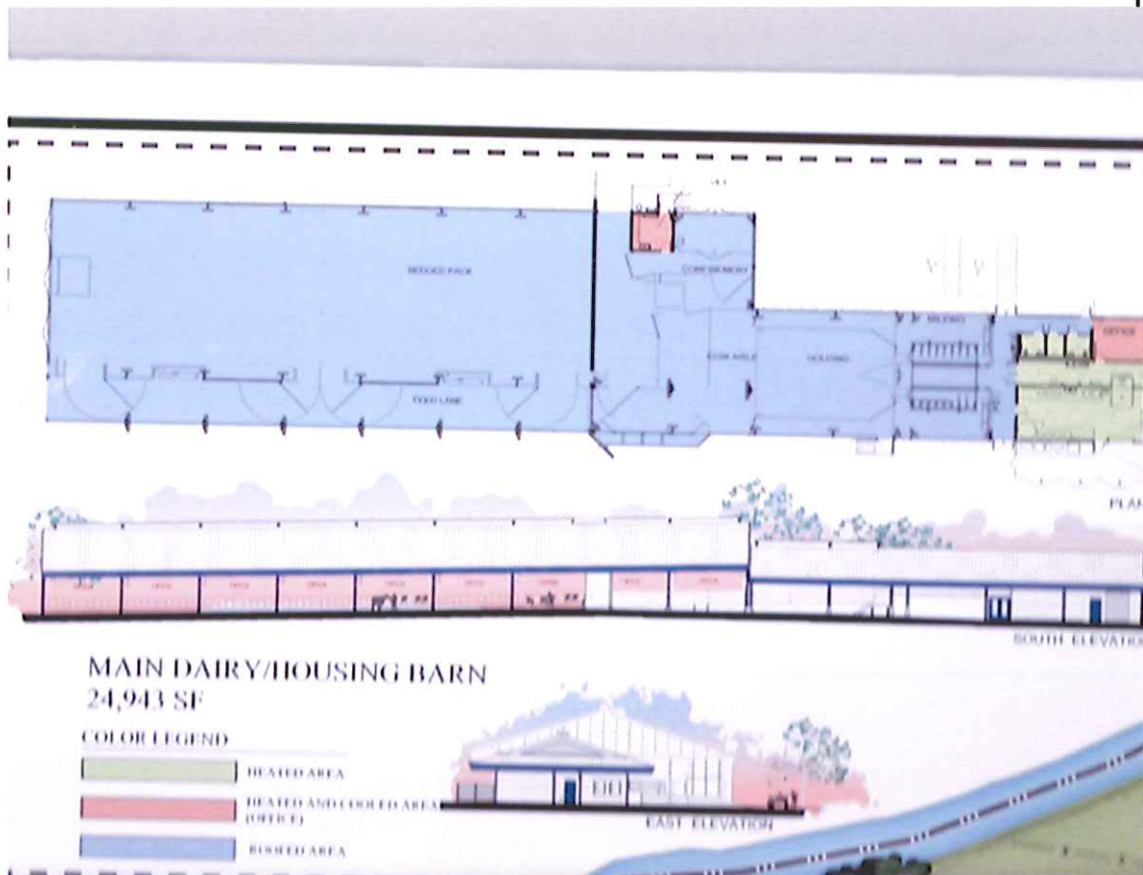
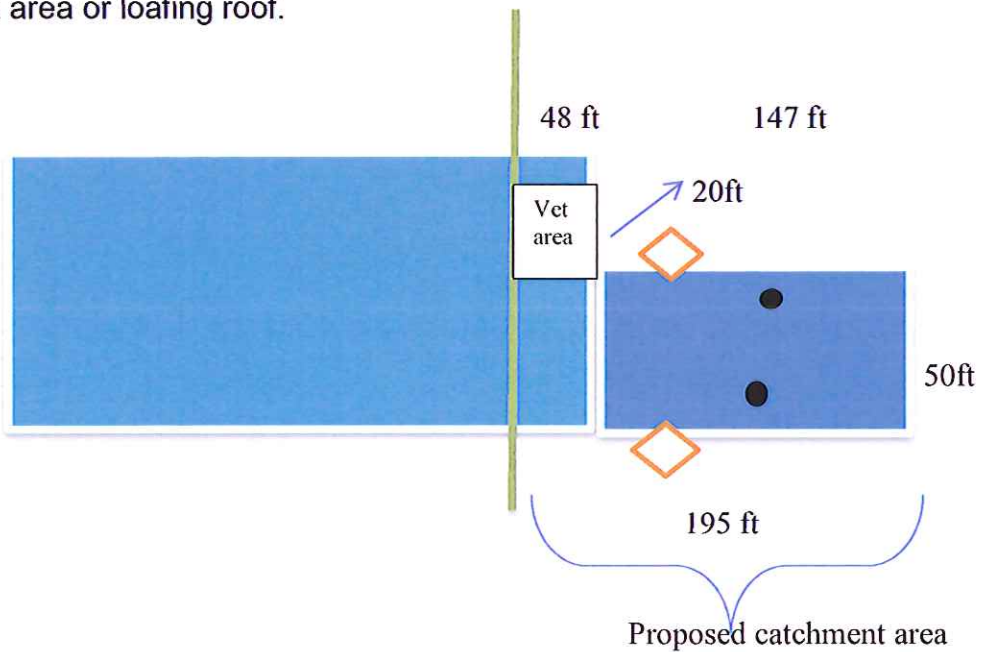


Figure 2: Diagram of the new Dairy floor plan. Collecting water from the parlor, vet area or loafing roof.



Diamond shapes = two 5000 gallon cisterns
 Blue rectangle = vet holding area & milk parlor
 Large rectangle = loafing shed

Linear gutter length = 195 ft + 147 ft + 20 ft + 48 ft = 410 ft

Gutter guard length = 410 ft

Black Circles are water pumps to move water from cisterns to wash tanks in parlor

Figure 3 Proposed 10,000 square feet catchment area

Cistern

The first water coming off the roof as a rainstorm begins is contaminated with airborne particulates. This will be diverted from the cisterns. Less than 0.1 inches of rainfall needs to be diverted from the cistern. Gutter guard will cover the gutters that direct water to the cistern and minimize leaf litter entering the cisterns or a watertight gravel and sand filter box may be used to pretreat water entering on top of the cistern.

A reinforced cisterns will be placed above ground. It will be located upslope and 10 feet away from water tight sewage disposal lines. The cisterns will be place southwest side of the milking facility. The interior cistern walls will be smooth. The top will be reinforced and fits tightly over the tank. A manhole on each cistern will be 2 feet across with a tight fitting cover will allow for maintenance tightly over a curb on the cistern cover. The manhole opening will be near a corner.

The inflow and overflow pipes of the cistern will be the same diameter. The cistern will be vented. A cleanout drain will be 3 to 4 inches in diameter to avoid clogging. All outside openings will be screened.

The flush tanks consume 3,200 gallons of water per day in cleaning the milking parlor. Using an annual water bill of \$8,000 it is possible to estimate savings. Is it possible to predict a payback period if catch water is used to fill the flush tanks?

Assuming rainwater collection is ideal. In Rutherford county maximum and minimum precipitation occurs in May and October. May's monthly precipitation calculated for the parlor roof catchment and parlor + vet roof catchment is 29,000 or 36,000 gallons per month. These figures are approximately 30% of monthly needs. October's monthly precipitation calculated for catchment area ranges from 15,000 or 19,000 gallons per month. These figures are 15% to 30% of monthly need [3200 gal/day * 31 days= 99,000 gal]. The storage capacity of the cistern(s) will influence the payback time. The flush tanks would drain a 10,000 gallon cistern in 3 days. The farm laboratory water bill would be reduced on an annual basis depending on the catchment area.

4b. Scope: Benefit Statement

The grant provides educational opportunity to students and public on water strategies for sustainable use of this essential resource. There are a number of campus buildings with a large footprint. Data from this proposed grant could be used to produce a cost-benefit analysis for other public buildings and private residences. Approximately 1,000 individuals tour the Experiential Learning Farm Laboratory each year. Monitored water use information can be provided through workshops at Extension Centers and MTSU Experimental Learning and Research Center. The Rutherford County NRCS office and Stones River Watershed Association support this water conservation demonstration. Water conservation data from the MTSU Experiential Learning and Research Center will be posted on the MTSU School of Agribusiness & Agriscience web pages. Data evaluation may indicate that the farm catchment area and cistern capacity be increased in the future.

budget

item Description	5,000 gal	ite ms	\$ cost
cistern		2	\$10,000.00
gutters/downspouts/fasteners			\$ 3000.00
down spout diverter			\$ 500.00
filters			\$ 250.00
water meters			\$ 250.00
pump - move water from cistern back to flush tanks/pipe			\$ 3000.00
supplies			\$ 4000.00
Sub-total			\$21,000.00
Signage			\$2000.00
Publication/web page			\$2000.00
Total			\$25,000.00

4. Project Description (continued)
<p data-bbox="256 195 862 226">4c. Location of Project (Building, etc.)</p> <p data-bbox="256 268 813 300">3211 Guy James Rd, Lascassas TN</p>
<p data-bbox="256 453 675 485">4d. Participants and Roles</p> <p data-bbox="256 527 1357 758">Faculty and staff will advise students on the successful completion of an old technology (cisterns) to present day economic situation. ABAS Farm Staff will oversee day to day operations involving cistern water usage. Student Ag organizations will assist in public outreach on this project through informational tours including this water conservation project.</p>
<p data-bbox="256 842 1027 873">4e. Student participation and/or student benefit</p> <p data-bbox="256 915 1357 1062">ABAS, Biology and CIM students will have the opportunity to acquire hand-on experience in see the application of science to manage available resources. Students will also learn sustainable farming operations through water conservation practices.</p>
<p data-bbox="256 1220 1149 1251">4f. Future Operating and/or Maintenance Requirements</p> <p data-bbox="256 1293 1295 1367">This may include periodic clean of the cisterns to maintain water quality.</p>
<p data-bbox="256 1556 1341 1629">4g. Additional Comments or Information Pertinent to the Proposed Project</p> <p data-bbox="256 1671 1003 1703">We have kept the following advised on this proposal:</p> <ol data-bbox="310 1703 1300 1850" style="list-style-type: none"> <li data-bbox="310 1703 1247 1734">1) MTSU Stormwater Program -C Allen, Cynthia.Allen@mtsu.edu, <li data-bbox="310 1734 1300 1850">2) Rutherford Co Planning & Engineering – Katie Peay, E.I.T. Project Engineer email: kpeay@rutherfordcountyttn.gov

5. Project Performance Information

Provide information if applicable.

- a. Provide information on estimated annual energy savings stated in units such as kW, kWh, Btu, gallons, etc.
- b. Provide information on estimated annual energy cost savings in monetary terms.
- c. Provide information on any annual operating or other cost savings in monetary terms. Be specific.
- d. Provide information about any matching or supplementary funding opportunities that are available. Identify all sources and explain.

5a. Estimated Annual Energy Savings (Estimated in kW, kWh, Btu, etc.)

Savings of 1200 to 2400 gallons of water

5b. Annual Energy COST Savings (\$)

5c. Annual Operating or Other Cost Savings. Specify. (\$)

Estimate cost saving \$3000

5d. Matching or Supplementary Funding (Identify and Explain)