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: Ngee Sing Chong	
Department/Office: Chemistry	Phone # (Office):615-898-5487
MTSU Box # : PO Box 68	Phone # (Cell)):615-556-5509
E-mail: nchong@mtsu.edu	Submittal Date: September 30, 2019

2. Project Categories (Select One)			
Select the category that best describes the project.			
	Energy Conservation/Efficiency	X	Sustainable Design
	Alternative Fuels		Other
	Renewable Energy		

3. Project Information
a. Please provide a brief descriptive title for the project. **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.** c. List the source of project cost estimates. d. Provide a brief explanation in response to question regarding previous funding.
3a. Project Title: Pollution Monitoring of the Middle Point Landfill Facility in Rutherford County By Using An Environmental Friendly Headspace Instrument for Analyzing Water Samples Without Generating Chemical Waste
3b. Project Cost Estimate: The requested SCF project funding of $7990 will be used for the purchase of a headspace purge-and-trap device needed to analyze water pollutants at very low levels. Both Chemistry and Geology Departments will each provide matching funds of about $1500-$2500 toward the cost of laboratory consumables and other accessories.
3c. Source of Estimate: The price quote for the headspace autosampler from the manufacturer (Nutech) is provided.

3d. If previous funding from this source was awarded, explain how this request differs? My last Clean Energy project funding was for the upgrade of gas chromatography and emission spectroscopy instrumentation donated by Tennessee Health Department so that it can be used for laboratory instruction and research. This proposal is for the purchase of a headspace analyzer for analyzing pollutants from the Middle Point landfill so that Rutherford County Commission and its residents can have objective scientific data to choose a sound waste disposal option.

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

The sampling efforts will be carried out with the assistance of MTSU researchers and community volunteers. This collaboration will allow for community outreach by MTSU scientists through the process of citizen-science engagement. Initial meetings will be held to discuss and select the appropriate sampling locations. MTSU students and residents living in the vicinity of the Middle Point Landfill will be recruited to assist in the collection of air and water samples. The air samples will be collected with both ground-based 6-liter canisters and air sampling based on sorbent materials using drones and tethered balloons. The environmental monitoring of contaminants leaching out of the landfill will be carried out via the collection of water samples from the Stones River, in addition to samples from nearby residential well water sites. Sample sites will be mapped via GIS software to understand the context of the test results.

The analytes or contaminants present in the air samples will be analyzed by gas chromatography-mass spectrometry (GC-MS) after analyte preconcentration via cryogenic and Tenax traps. The analytes in the water samples will be extracted by solid phase extraction, purge-and-trap

technique, or a headspace instrument followed by analysis using GC-MS and quadrupole/time-of-flight mass spectrometry (q-TOF/MS). The volatile organic compounds in air will be analyzed using a method similar to the USEPA Compendium of Air Toxics TO-15 Method. There are 72 toxic compounds that will be quantified using calibration method previously used for a USEPA-funded project on ambient air monitoring in Shelby County, TN. Metal contaminants in water samples will be analyzed using atomic absorption spectrometry or inductively coupled plasma-mass spectrometry.

4b. Scope: Benefit Statement

Middle Point Landfill is at the northern part of Murfreesboro just outside of city limits and presents a public health concern for area residents in Walter Hill and Murfreesboro. Both air quality and water quality for the municipal supply are potentially impacted by the operations at the landfill site and there is little data available on the issue. Additionally, the landfill is close to capacity and discussions of how the city, county, and Middle Tennessee region will deal with solid waste are ongoing amongst stakeholders. This project aims to collect data on landfill-related contaminants in ambient air and water in order to understand the potential health risks to residents of the region. The data will be shared with stakeholders in Murfreesboro, Rutherford County, and Tennessee Department of Environment and Conservation. The chemical data will be used to make informed decisions about the environmental impact of Middle Point Landfill and help understand the full impact of a landfill approach to future waste disposal. This project will have a significant impact on our understanding of public health and will stimulate discussions about options for solid waste disposal.

Besides providing pollution data to guide the waste disposal policies and to minimize public exposure to toxicants, the acquisition of the headspace instrument to carry out the analysis of landfill pollutants also yields great benefits in reducing the amount of chemical waste generated in the laboratory when older analytical methods are used. The chemical waste associated with these older methods include the use of solvents in liquid-liquid extraction procedures for preconcentration of analytes in water samples. The organic solvents such as methylene chloride, methanol, and acetone are not only costly to purchase but the solvent waste generated also requires substantial waste disposal cost. The purchase of a headspace purge-and-trap instrument can eliminate the use of solvents and hence solvent waste. Furthermore, it significantly reduces the tedious and laborious procedures for analyte extraction because the headspace technique is automated in the requested instrument, thereby allowing greater productivity in pollution analysis.

4. Project Description (continued)

4c. Location of Project (Building, etc.):

The Gas Chromatography Laboratory in Science Building Room 3101 and the Sample Preparation Facility in Room 3070 will be used for the processing and analysis of the water samples from Stones River and the air samples collected from downwind locations of the Middle Point Landfill in Rutherford County.

4d. Participants and Roles

Project Leader-Dr. Ngee Sing Chong (Planning and implementing the project and directing students in the analysis of air and water samples)

Geology Professor-Dr. Jeremy Aber (Recruiting student volunteers and directing students in sample collection efforts)

Instrument Support Specialist-Mr. Jessie Weatherly (In charge of the maintenance and repair of instruments throughout the project)

4e. Student participation and/or student benefit

This project provides experiential learning opportunities for students from different departments. Geology majors can apply their knowledge of hydrogeology and geological information system (GIS) in designing the sampling plan for collecting air and water samples. Chemistry majors will learn useful laboratory techniques such as inductively coupled plasma-mass spectrometry (ICP-MS), atomic absorption spectroscopy (AAS), and gas chromatography-mass spectrometry (GC-MS). Humanities majors will learn to communicate environmental issues to the public and influence policy makers in the City of Murfreesboro and Rutherford County.

4f. Future Operating and/or Maintenance Requirements

The project will continue to operate with the support of Chemistry and Geology Departments at MTSU. The cost of consumables for the headspace autosampler will be covered by the departmental operating expenses for student research projects.

4g. Additional Comments or Information Pertinent to the Proposed Project

This project seeks to provide objective scientific data related to the environmental impact of Middle Point Landfill. The environmental data will be conducive to the consideration of the future options for solid waste disposal by the City of Murfreesboro and Rutherford County government. This environmental monitoring project will also highlight MTSU's capability for investigating potential risks of human exposure to contaminants via the collaborative efforts of the Chemistry and Geology Departments. The ultimate goal is to utilize the scientific data for the protection of environment and human health.

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.)

Not Applicable

5b. Annual Energy COST Savings ($)

Not Applicable

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

Not Applicable

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

Both Dr. Chong and Dr. Aber each have about $1500-$2500 research expenditures that are covered by the Chemistry and Geosciences Departments, respectively. Both departments also financial support for both undergraduate and graduate students involved in this project via formal research coursework and thesis-based research. Furthermore, Dr. Chong and Dr. Aber have obtained a Public Service grant of about $4000 to cover the cost of laboratory consumables.

Quotation of Products
GD Environmental Supplies, Inc.

Quotation Date: Aug. 22, 2018
Quotation to: Dr. Ngee-Sing Chong

MTSU

Tel: 615-898-5487
Fax: 615-898-5182

Table of Quotation Price

Quantity	Description	Unit Price, $	Total, $
1	**Nutech2800 Headspace Autosampler**	**7990**	**7990**
	Shipping by ground		
	Sub Total		
Grand Total			**7990**

Payment: Prepayment or credit card payment
Quotation authorized and signed by:

George Dai, Ph. D.
President of GD Environmental Supplies, Inc.