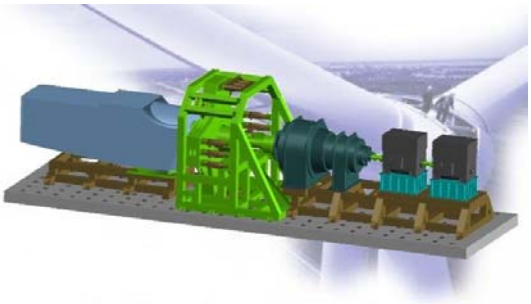
DOE/EA-1761

FINAL
ENVIRONMENTAL ASSESSMENT

for the

CLEMSON UNIVERSITY
WIND TURBINE DRIVETRAIN TEST FACILITY



NORTH CHARLESTON, SOUTH CAROLINA

U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Golden Field Office

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ACRONYMS AND ABBREVIATIONS

AC	Alternating Current
APE	Area of Potential Effect
ARRA	American Recovery and Reinvestment Act (Recovery Act)
ASTM	American Society of Testing and Materials
AOC	Area of Concern
BFS	Blade Force Simulator
BMP	Best Management Practice
BRAC	U.S. Defense Base Closure and Realignment Commission
CFR	Code of Federal Regulations
Clemson	Clemson University
CMMC	Charleston Marine Manufacturing Company
CNC	Charleston Naval Complex
CURI	Clemson University Restoration Institute
CWS	Charleston Water Systems
DC	Direct Current
DOE	Department of Energy
DTTF	Clemson University Wind Turbine Drivetrain Test Facility
EA	Environmental Assessment
EERE	Energy Efficiency and Renewable Energy
EO	Executive Order
GIS	Geographic Information System
FEMA	Federal Emergency Management Agency
FIRM	Federal Insurance Rate Map
HALT	Highly Accelerated Life Testing
HUD	U.S. Department of Housing and Urban Development
LEED	Leadership in Energy & Environmental Design (U.S. Green Building Council)
LUC	Land Use Control
MS4	Municipal Separate Storm Sewer Systems
msl	Mean Sea Level
MW	Megawatt
NCSD	North Charleston Sewer District
NEPA	National Environmental Policy Act
NFA	No Further Action
NPDES	National Pollutant Discharge Elimination System
NREL	National Renewable Energy Laboratory
OCRM	Office of Ocean and Coastal Resource Management
OSHA	Occupation Safety and Health Administration
RCRA	Resource Conservation and Recovery Act
RDA	Charleston Naval Complex Redevelopment Authority
SCDHEC	South Carolina Department of Health and Environmental Control
SCDNR	South Carolina Department of Natural Resources
SCE&G	South Carolina Electric and Gas

SCPR	South Carolina Public Railways
SCSPA	South Carolina State Ports Authority
SHPO	South Carolina State Historic Preservation Office
SPCC	Spill Prevention Control and Countermeasure
SWMU	Solid Waste Management Unit
SWPPP	Stormwater Pollution Prevention Plan
THPO	Catabawa Tribal Historic Preservation Office
U.S.	United States
U.S.C.	United States Code
USACE	United States Army Core of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VCC	Voluntary Cleanup Contract

CONTENTS

Section Page

1. INTRODUCTION 1
1.1 National Environmental Policy Act and Related Procedures 2
1.2 Purpose and Need 3
1.3 Public Scoping 3
2. PROPOSED ACTION AND ALTERNATIVES 8
2.1 DOE's Proposed Action 9
2.2 Clemson University's Proposed Project 9
2.2.1 Background 9
2.2.2 Purpose and Need of Proposed Project 12
2.2.3 Description of Facility Location 13
2.2.4 Description of Proposed Facility 17
2.2.5 Construction and Installation 18
2.2.6 Operation 19
2.2.7 Transportation 20
2.2.8 Electrical infrastructure 21
2.3 No-Action Alternative 23
3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES 24
3.1 Geology and Soils 27
3.1.1 Affected Environment 27
3.1.2 Environmental Consequences 27
3.1.2.1 Proposed Project 27
3.1.2.2 No-Action Alternative 28
3.2 Water Resources 28
3.2.1 Affected Environment 29
3.2.1.1 Stormwater 29
3.2.1.2 Floodplains 29
3.2.1.3 Groundwater 30
3.2.2 Environmental Consequences 31
3.2.2.1 Proposed Project 31
3.2.2.2 No-Action Alternative 32
3.3 Cultural Resources and Historic Preservation 32
3.3.2 Cultural/Historical Impacts 33
3.3.2.1 Proposed Project 33
3.3.2.2 No-Action Alternative 34
3.4 Socioeconomic and Environmental Justice Impacts 34
3.4.1 Affected Environment 34
3.4.2 Socioeconomic and Environmental Justice Impacts 36
3.4.2.1 Proposed Project 36
3.4.2.2 No-Action Alternative 36
3.5 Infrastructure and Energy 36
3.5.1 Affected Environment 36
3.5.1.1 Water and Wastewater Infrastructure 36
3.5.1.2 Electrical Infrastructure 37
3.5.2 Environmental Consequences 37
3.5.2.1 Proposed Project 37
3.5.2.2 No-Action Alternative 38
3.6 Health and Safety 38

3.6.1 Affected Environment 39
3.6.2 Health and Safety Consequences 40
3.6.2.1 Proposed Project 40
3.6.2.2 No-Action Alternative 40
3.7 Noise 40
3.7.1 Affected Environment 40
3.7.2 Noise Environment Consequences 41
3.7.2.1 Proposed Project 41
3.7.2.2 No-Action Alternative 41
4. CUMULATIVE IMPACTS 42
4.1 Introduction 42
4.2 Reasonably Foreseeable Actions 42
4.3 Cumulative Impacts Analysis 44
5. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES 48
6. REFERENCES 49

LIST OF TABLES

Table Page

1-1 Summary of Public Comments Clemson Wind Turbine Drivetrain Testing Facility North Charleston, South Carolina 4

LIST OF FIGURES

Figure Page

2-1 General Location Map 10
2-2 Charleston Naval Complex and Surrounding Areas 10
2-3 Location of Building 69 within the Charleston Naval Complex 11
2-4 Street View of Building 69 11
2-5 Charleston SC HUD Certified Renewal Community Map 12
2-6 Proposed Layout to Building 69 – Level 1 13
2-7 Proposed Layout to Building 69 – Level 2 14
2-8 Location of Building 69 within Charleston Naval Complex 15
2-9 AOCs and SWMUs near Building 69 16
2-10 Area of Demolition 18
2-11 Wind Turbine Drivetrain Test Rig #1 19
2-12 Wind Turbine Drivetrain Test Rig #2 20
2-13 CMMC 500 ton Barge Crane 21
3-1 Flood Insurance Rate Map 30
3-2 Location of Groundwater Monitoring Wells 31
3-3 Building 69 in Relation to Charleston Navy Yard Historic District 33
3-4 Charleston Renewal Communities 35
4-1 Location of Major Planned Projects 43
4-2 1951 Sanborn Map 45

APPENDICES

Appendix A – Environmental Assessment Distribution List
Appendix B – Consultation Letters
Appendix C – Floodplain Assessment

1. INTRODUCTION

The *Energy Independence and Security Act of 2007* (Title V, Subtitle E) directed the U.S. Department of Energy (DOE) to establish a grant program which specifically supports research and development for increasing the reliability of large-scale wind turbines to help reduce energy use and emissions at the local and regional level. This grant represents a Presidential priority to deploy the cheapest, cleanest, and most reliable energy technologies available—energy efficiency and conservation—across the country (DOE, 2009a).

Clemson University is proposing to construct and operate a Wind Turbine Drivetrain Test Facility (DTTF) at the Clemson University Research Institute in North Charleston, South Carolina. This project would promote industry/government/university collaboration in research and workforce education and would be manned with a dedicated workforce to service industry needs with additional services offered by established local industries as needed by customers (Kelly et al., 2009).

The proposed wind turbine test facility would be built on the Charleston Naval Complex (CNC), on a brownfield site formerly owned by the U.S. Navy. The facility would consist of two test rigs equipped with independent drive systems. Each test rig would be capable of testing a range of wind turbine drivetrains, up to a 15-megawatt (MW) unit on Rig #1 and up a 7.5-MW unit on Rig #2. Rig #1 would have the capability to apply loads to the main shaft of the specimen drive-train, replicating forces and moments along three axes thereby simulating actual blade forces experienced in the field (Kelly et al., 2009).

The facility would be located at a former warehouse and shipping facility (Building 69), approximately 82,000 square foot in size, which would be subject to interior renovations prior to the occupancy by Clemson University Research Institute (CURI). A portion of Building 69, constructed around 1942, and a nearby three-sided structural steel and metal panel building would be demolished. In addition, an approximately 700-foot-long rail spur would be constructed, and electrical transmission lines would be installed from the facility to a nearby new or enhanced substation (Kelly et al., 2009).

DOE has provided a grant to Clemson University under the American Recovery and Reinvestment Act (ARRA) Funding Opportunity Announcement DE-FOA-0000112 titled *Recovery Act: Large Wind Turbine Drivetrain Testing Facility*, on behalf of the DOE Office of Energy Efficiency and Renewable Energy, Wind and Hydropower Technologies Program (DOE 2009b). Clemson University would use DOE funding to design, permit, and construct the DTTF. The grant award to Clemson University for this project would be $44.6 million. The total cost of the project is estimated to be about $95.5 million.

Federal funding of projects requires compliance with the *National Environmental Policy Act of 1969*, as amended (NEPA; 42 U.S.C. 4321 et seq.), Council on Environmental Quality regulations (40 CFR Parts 1500 to 1508), and DOE NEPA implementing procedures (10 CFR Part 1021). Thus, DOE prepared this draft environmental assessment (Draft EA) to evaluate the potential environmental impacts of providing a grant under DOE's initiative. In compliance with NEPA and its implementing procedures, this Draft EA examines the potential environmental impacts of DOE's Proposed Action (authorizing the expenditure of federal funds under this grant), Clemson University's proposed project, and the No-Action Alternative (if DOE chooses not to provide financial assistance for this project, Clemson University may not proceed with the project). The purpose of this EA is to inform DOE and the public of the potential environmental impacts of the proposed project and alternatives.

This EA is organized as follows. Chapter 1 describes the purpose and need for the proposed DOE agency action and the scope of the analysis. Chapter 2 describes the DOE Proposed Action, Clemson University's proposed project, the No-Action Alternative, and DOE's action alternatives. Chapter 3

describes the affected environment and potential environmental impacts of the Proposed Action, proposed project, and No-Action Alternative. Chapters 4 and 5 discuss Cumulative Impacts and Irreversible and Irretrievable Resources of the project. The remaining sections of the EA provide references and background information to support the findings discuss in the document. Appendix A contains the distribution list for this document, Appendix B contains a copy of consultation letters related to this project, and Appendix C presents the floodplain assessment.

1.1 National Environmental Policy Act and Related Procedures

In accordance with the DOE NEPA implementing regulations, DOE must evaluate the potential environmental impacts of its Proposed Action that may have a significant impact on human health and the environment, including decisions on whether to provide federal funding to government agencies and private entities. In compliance with these regulations and DOE's procedures, this Draft EA:

- Examines the potential environmental impacts of the Proposed Action and the No-Action Alternative;
- Identifies unavoidable adverse environmental impacts of the Proposed Action;
- Describes the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity; and
- Characterizes any irreversible and irretrievable commitments of resources that would be involved should DOE decide to implement its Proposed Action.

DOE must meet these requirements before it can make a final decision to proceed with any proposed Federal action that could cause adverse impacts to human health or the environment. This Draft EA provides DOE and other decision-makers with the information needed to make an informed decision about the construction and operation of the proposed DTTF. The EA evaluates the potential individual and cumulative impacts of the proposed project. For purposes of comparison, this EA also evaluates the impacts that could occur if DOE did not provide funding (the No-Action Alternative), under which DOE assumes that Clemson University would not proceed with the project. No other action alternatives are analyzed.

The brownfield site where the DTTF would be located is within the 100-year floodplain of the Cooper River (FEMA, 2004a). Pursuant to Executive Order 11988, *Floodplain Management*, each Federal agency is required, when conducting activities in a floodplain, to take actions to reduce the risk of flood damage; minimize the impacts of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by floodplains. Regulations issued by DOE that implement this Executive Order are contained in 10 CFR Part 1022, "Compliance with Floodplain and Wetland Environmental Review Requirements." This regulation requires DOE to prepare a floodplain assessment for any proposed action in the base floodplain, which is the 100-year floodplain (that is, a floodplain with a 1.0 percent chance of flooding in any given year). At 10 CFR 1022.2(b), the regulation also states that whenever possible, DOE shall accommodate requirements of the Executive Order through the applicable NEPA procedures. Accordingly, it is DOE's intent that this EA meet the requirements for a floodplain assessment as described in Sections 3.2.1.2 and 3.2.2.1 as well as meeting requirements under NEPA.

1.2 Purpose and Need

The purpose of the Proposed Action is to support the mission of the ARRA program established by Congress and implemented by DOE to reduce energy use and emissions at the local and regional level. Providing funding would partially satisfy the need of that program to assist U.S. cities, counties, states, territories, and Native American tribes to develop, promote, implement, and manage energy efficiency and conservation projects and programs designed to:

- Reduce fossil fuel emissions;
- Reduce the total energy use of the eligible entities;
- Improve energy efficiency in the transportation, building, and other appropriate sectors; and
- Create and retain jobs.

The Recovery Act enacted legislation to create jobs, restore economic growth, and strengthen America's middle class through measures that modernize the nation's infrastructure, enhance America's energy independence, expand educational opportunities, preserve and improve affordable health care, provide tax relief, and protect those in greatest need. Provision of funds would partially satisfy the needs identified under the Recovery Act.

1.3 Public Scoping

In accordance with applicable regulations and policies, DOE sent scoping letters to potentially interested local, state and Federal agencies, including the Governor of South Carolina, the South Carolina State Historic Preservation Office (SHPO), U.S. Fish and Wildlife Service (USFWS), the U.S. Army Corps of Engineers (USACE), Federal Emergency Management Agency (FEMA) Region 4, and the Catawba Tribal Historic Preservation Office (THPO). DOE also sent scoping letters to other potentially interested individuals and organizations to solicit public comment (Appendix A), and published the Scoping Letter on the DOE internet site (www.eere.energy.gov/golden/Reading_Room.aspx). The scoping letter described the Proposed Action and requested assistance in identifying potential issues to be evaluated in the EA.

In response to the scoping letter, DOE received eight comment letters. Table 1 summarizes the comments and the resultant responses.

Table 1-1. Summary of Public Comments Clemson Wind Turbine Drivetrain Testing Facility North Charleston, South Carolina.

Commenter	Date of Correspondence	Summary of Comments	Summary of Response	Section Addressed
Wannetta Mallette Community Mitigation Plan Project Manager	June 11, 2010	Noise, Vibration Control and Monitoring resulting from the testing facility's operation and construction.	Clemson intends to comply with regulatory guidelines and will implement engineering controls necessary to achieve this goal.	See Section 3.7
		Income/Poverty - Ms. Mallette is concerned that the local community will have a disadvantage due to poverty, educational attainment, and racial discrimination that will act as a barrier to the local community realizing economic benefits from the project.	Clemson's policy is to hire personnel based on merit with no preferential treatment provided based on race, gender, or religion. One assumed benefit of this project will be to provide jobs in the technical and service industries.	See Section 3.4
		Aesthetics - Ms. Mallette is concerned that off-site placement of wind turbines and construction equipment may result in a diminished view corridor for the local community.	The renovation of Building 69, outdoor directional lighting, facility maintenance and landscaping, and construction of a rail spur would result in no or a negligible change in the view of the industrial setting of the project area and surrounding area. Although the DTTF project is meant to support the development of large scale wind turbines, there are no plans to permanently install large scale wind turbines as part of this project.	See Section 3
		Floodplains - Ms. Mallette is concerned that the proposed project will increase the already severe repetitive flooding of the adjacent community.	The results of the floodplain assessment conclude that the proposed DTTF facility would have no impacts on lives or property in the area because the proposed project would not alter the depth of flood waters or otherwise modify inputs to, or flow of, water in Charleston County floodplain.	See Section 3.2.1.2
		Traffic Impacts - Ms. Mallette is concerned about the operation and construction of the facility on existing roadways.	The roadway traffic generated by DTTF workforce is expected to be minimal, given the permanent workforce of approximately 21 people.	See Section 3
		Railroads - Ms. Mallette is concerned that the community south of Viaduct Road will have substantial impacts from the potential redevelopment of the Macalloy property. She would like to see noise and vibration studies completed.	As proposed, this project will have no affect on rail traffic south of Viaduct Road or on the redevelopment plans for the former Macalloy tract.	See Section 3
		Community Relations - Ms. Mallette would like to see a discussion of the public communication and involvement process.	The project has been well publicized in the local media and has been well received by variuos community groups including The Coastal Conservation League and the County of Charleston.	See Section 3.4

Table 1-1. Summary of Public Comments Clemson Wind Turbine Drivetrain Testing Facility North Charleston, South Carolina (cont).

USFWS	June 22, 2010	The proposed actions will have no effect on resources under the jurisdiction of the Service that are currently protected by the Endangered Species Act of 1973, as amended. Therefore, no further action is required under section 7(a)(2) of the Act.	No Response Necessary	See Section 3
USACE	June 21, 2010	It has been determined that the referenced property does not contain any wetland areas or other waters of the United States and, as such, Department of the Army authorization will not be required for mechanized land clearing, excavation, or the placement of dredged of fill material on this site.	No Response Necessary	See Section 3
USFWS	June 21, 2010	Proposed project should be aware of any existing or potential federally listed threatened and endangered species that may occur within the proposed project area. Potential impacts to the Least Tern, a state listed threatened and endangered species known to nest on flat building rooftops, should be addressed.	The roof of Building 69 has a slight slope to the north and south, with the peak in the middle. The roof is a bituminous hot melt roll roof over insulation and steel sheeting. There are no pebbles or observed nesting sites on the roof. Therefore, no habitat for any federal endangered species of concern or the state species of concern, the Least Tern, would be impacted by the proposed project.	See Section 3
South Carolina Department of Health and Environmental Control (SCDHEC) Office of Coastal and Resource Management (OCRM)	June 18, 2010	OCRM certifies that the project is consistent with the CZMA provided that no wetlands are disturbed, all necessary state and federal permits are obtained (including NPDES permit), and the work does not contravene the policies of the coastal zone management program.	No Response Necessary	See Section 3.2.1.1
Catawba THPO	June 15, 2010	Please notify the Catawba if Native American artifacts and/or human remains are located during ground disturbance activities.	In the event that archeological materials or human remains are encountered during ground disturbing activities all such activities will stop and Clemson will notify the SHPO and THPO of the discovery and ask for their direction on how to proceed.	See Section 3.3

Table 1-1. Summary of Public Comments Clemson Wind Turbine Drivetrain Testing Facility North Charleston, South Carolina (cont).

SCDHEC Bureau of Land and Waste Management	June 11, 2010	Land use controls are applicable to this property including groundwater use restrictions and a dig permit process. The navy should be contacted prior to any construction or digging on the property. A consistency determination from DHEC OCRM may be needed.	Clemson's development of the property would include unavoidable ground and possible groundwater disturbance. Prior to these activities Clemson will obtain dig permit from the Navy.	See Sections 3.1 & 3.2.1.3
USEPA	June 10, 2010	Project Need - The project need should be clearly stated	The purpose of the proposed DTTF project is to facilitate mass-produced large-scale wind turbine technology by providing highly accelerated life testing (HALT) of utility scale wind turbine drivetrains (up to 15MW) for manufacturers concurrently supporting the mission of the ARRA program established by Congress and implemented by DOE to reduce energy use and emissions at the local and regional level.	See Sections 1.2 & 2.2.2
		Alternatives - Analysis of alternatives including the rationale for rejecting alternatives should be provided.	DOE's alternatives to its Proposed Action consist of the other technically acceptable applications received in response to the Funding Opportunity Announcement DE-FOA-0000022 titled Recovery Act: Large Wind Turbine Drivetrain Testing Facility.	See Section 2.4
		Wetlands - The NEPA document should discuss the location, amount, type and quality of wetland acreage in the study area.	Based on review of several available resources including soils maps, national wetland inventory map, and after conducting an onsite pedestrian survey of the property, Clemson University requested concurrence from the USACE regarding the presence of wetlands on the project site. In a letter dated June 21, 2010, the USACE concluded that the reference property does not contain any wetland areas or other waters of the United States.	See Section 3
		Water Quality - The document should discuss best management practices, erosion control, proposed water body crossings, and the NPDES General Permit.	DOE dismissed coastal waters, wetlands, sole source aquifers, public water supply wells, and surface waters as areas of potential affected water resources. DOE concluded that the facility would have no impact on stormwater, floodplains, or groundwater conditions.	See Section 3 & 3.2

Table 1-1. Summary of Public Comments Clemson Wind Turbine Drivetrain Testing Facility North Charleston, South Carolina (cont).

USEPA	June 10, 2010	Noise - The document should discuss the background noise levels, expected noise levels, and distance to the closest residence/receptor. Estimated incremental noise increases should be discussed. EPA considers all noise increases over 10dBA significant and has a target noise level of 55dBA DNL for outdoor areas for potential receptors.	Clemson intends to comply with regulatory guidelines and will implement engineering controls necessary to achieve this goal.	See Section 3.7
		Environmental Justice - Potential environmental justice impacts should be discussed in the NEPA document. The assessment should include a discussion of demographics in the area versus nearby areas. If the percentages of minorities are elevated coordination with affected populations should be described. Regardless of the affected population significant effects of human health should be avoided.	The specific location of the proposed facility (away from residences) and the type of development (negligible impacts to air quality or aesthetics) are not expected to produce environmental harm to any specific group or nearby community.	See Section 3.4
		Air Quality - All emissions from the project should be in compliance with NAAQS. Construction equipment should be properly maintained to reduce emissions. Open burning, if necessary, should be minimized and coordinated with local government. The use of water rather than oils/chemicals should be used for dust suppression.	The greater Charleston/North Charleston area is designated as an attainment area for all regulated pollutants. There would be a temporary small increase in emissions during demolition and construction activities. There would be a negligible increase in emissions during DTTF operations from a natural gas fired emergency generator, regional power plants, and transportation of materials and personnel.	See Section 3
		Cultural Resources - A cultural resource survey should be coordinated with the SHPO. Procedures for the discovery of archaeological sites during construction to stop work until SHPO approval should be discussed.	In the event that archeological materials or human remains are encountered during ground disturbing activities all such activities will stop and Clemson will notify the SHPO and THPO of the discovery and ask for their direction on how to proceed.	See Section 3.3
		Biodiversity - The NEPA document should discuss biodiversity aspects of the project.	The site lacks significant biodiversity because the entire site is developed with a building and asphalt parking areas. The vegetation is limited to landscaped bushes and trees along the edges of the property.	See Section 3
		Endangered Species - EPA recommends early coordination with the USFWS. The NEPA document should discuss survey results and adjustment of the proposed project.	After consulting the USFWS Section 7 Consultation website, Clemson requested concurrence from the USFWS that no protected species or habitat would be impacted by the proposed project. The USFWS provided a letter dated June 22, 2010 concluding this project would have no affect on resources protected by the Federal Endangered Species Act of 1973.	See Section 3
USEPA	June 10, 2010	Cumulative Impacts - The NEPA document should discuss cumulative impacts resulting from the implementation of the proposed project. Although the effects of the proposed project could be minimal, in conjunction with other local projects there could be a great impact on the surrounding area.	The long term cumulative impact would be overwhelmingly positive by converting contaminated properties and abandoned buildings into carefully developed properties that are a benefit to the surrounding community, while minimizing potential community exposure to soil and groundwater contamination.	See Section 4

1.4 Consultations and Public Comment-Response Process

1.4.1 CONSULTATIONS

DOE consulted with the South Carolina SHPO to comply with the review requirements of Section 106 of the *National Historic Preservation Act*, as amended (16 U.S.C. 470 et seq.). DOE also communicated with the USFWS to meet the requirements in the *Endangered Species Act of 1973*, as amended (16 U.S.C. 1531 et seq.). Copies of DOE's consultation correspondence are in Appendix B.

South Carolina State Historic Preservation Officer

DOE sent a letter to the South Carolina SHPO on June 7, 2010, requesting information on historic properties within and near the proposed site at the former Charleston Naval Base Complex in Charleston, South Carolina. The State Preservation Officer requested additional information via an email dated July 1, and received such information from DOE on July 9. In a letter dated August 10, 2010, the State concurred with DOE's assessment that the project would have no adverse effects on historic properties.

U.S. Fish and Wildlife Services

The applicant corresponded with the USFWS and received a letter dated June 22, 2010, that stated the proposed project will have no effect on resources under the jurisdiction of the Service. The USFWS referred the applicant to the USACE if the action could affect wetlands.

On June 15, 2010, the applicant sent a request for wetlands determination to the USACE. The applicant received a response from that agency dated June 21, 2010, which stated that the proposed project property does not contain any wetland areas or other waters of the United States and that Department of Army authorization is not required.

1.4.2 Comment-Response Process

DOE issued the Draft EA for comment on September 1, 2010, and posted it on the Golden Reading Room web site (http://www.eere.energy.gov/golden/Reading_Room.aspx). DOE sent postcards to the individuals listed in Appendix A of this EA of the EA's availability on the web and to announce a 15-day public comment period on the EA. The comment period ended on September 14, 2010. DOE received two comments, both of which discussed environmental justice issues and economic impacts that could be experienced in the economically distressed neighborhoods surrounding the CNC. Section 3.4.1 of this EA describes the socioeconomic conditions in the neighborhoods surrounding the proposed project site. Sections 3.4.2 and 4.3.5 describe the potential economic benefits of the project to the surrounding communities. Text was added to Section 3.4.2 to clarify DOE's conclusion that this project would not result in disproportional impacts to low income or minority populations. One comment also stated that the EA should discuss the cumulative impacts due to mobile air emissions, truck, vehicular and rail traffic. These topics are addressed in Section 3 under Air Quality and Traffic and Transportation, and DOE concludes that the potential impacts would be negligible.

2. PROPOSED ACTION AND ALTERNATIVES

This chapter describes DOE's Proposed Action (Section 2.1), Clemson University's associated proposed project (Section 2.2), the No-Action Alternative (Section 2.3), and DOE's alternatives (Section 2.4).

2.1 DOE's Proposed Action

Under the Proposed Action, DOE would authorize Clemson University to expend Recovery Act funding to design, permit, and construct a Wind Turbine DTTF. Specifically, Clemson University would use DOE funding to purchase and install a Wind Turbine DTTF for Highly Accelerated Life Testing (HALT) of drivetrains for large wind turbines up to 7.5 and 15 MW in size (Barker and Kelly, 2010).

2.2 Clemson University's Proposed Project

Clemson University proposes to design, construct and operate the DTTF for HALT of drivetrains for large (up to 15 MW) wind turbines as part of the CURI facilities. Wind turbine manufacturers would use the facility's state-of-the-art testing facility to acquire quality assurance data necessary for drivetrain design verification. The DTTF would be located in and around Building 69 on the CNC. Building 69 would be renovated to contain two test bays (Rig #1 and Rig #2), support equipment, overhead cranes for moving equipment, offices and other spaces for personnel, visitors, and instrumentation. A rail spur to an existing rail line would be developed within the property to facilitate the delivery and departure of drivetrain units. The local energy provider, South Carolina Electric and Gas (SCE&G), has committed to upgrading the electrical grid servicing the southern portion of the CNC to accommodate this and other anticipated uses in the area (Kelly et al., 2009).

Once the facility is constructed, it would consist of two test rigs capable of simultaneously testing various sized drivetrains and their components. Additional information about the test rigs is provided in Section 2.2.6.

Although this project is meant to support the development of large-scale wind turbines, there are no plans to permanently install large scale wind turbines as part of this project. The primary mission of this facility would be proprietary commercial testing of drivetrains, generators, and nacelles for the industry. With the objective to accelerate the development of advanced drivetrains, strong efforts would be made to foster collaborations with industry and government and to encourage the continuous improvement of HALT protocol and analytical tools resulting in a more in-depth understanding of turbine generator assemblies (Kelly et al., 2009).

2.2.1 Background

The DTTF would be located on CNC, a former U.S. Navy Base in North Charleston, South Carolina. This location has existing access to transportation infrastructure by water, roadway, and railway. It also offers the opportunity for future expansion if necessary. The CNC provides a unique industrial and research environment due to its location near an existing deepwater port, railway infrastructure, and supporting industries within an area which carries brownfield[1] site status. The existing facility size, dimension, and past use, and the surrounding resources to include the transportation infrastructure lend

1. With certain legal exclusions and additions, the term "brownfield site" means real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant (USEPA, 2009b).

itself to efficient conversion into the proposed DTTF (Kelly et al., 2009). Figures 2-1 through 2-4 are provided to show the project location and existing conditions of Building 69.

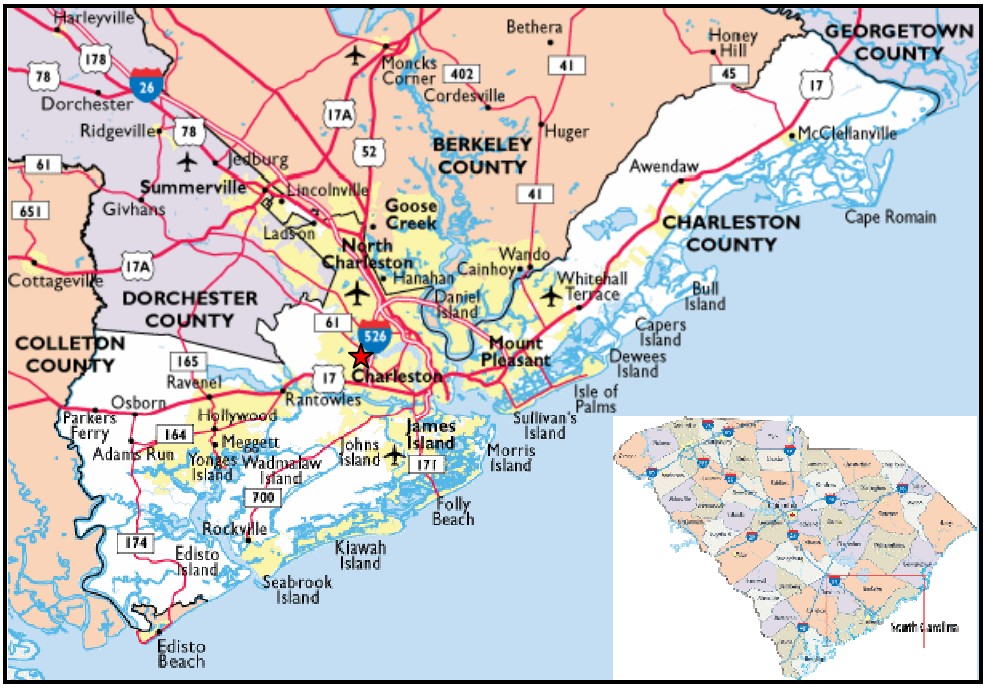

Figure 2-1: General Location Map
Source: SCIway.net 2007

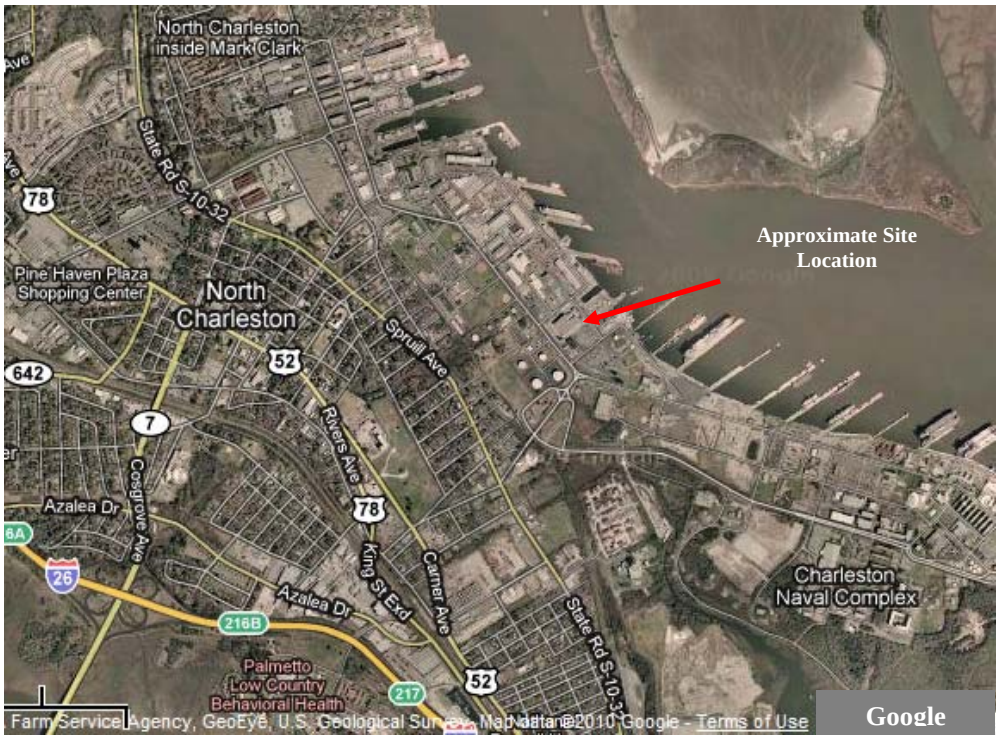

Figure 2-2: Charleston Naval Complex and Surrounding Areas

Figure 2-3: Location of Building 69 within the Charleston Naval Complex

Figure 2-4: Street View of Building 69
Source: Kelly et al, 2009.

The proposed DTTF is located in a U.S. Housing and Urban Development (HUD) certified Economically Distressed Area and is surrounded by a HUD-certified Renewal Community (Figure 2-5) affording potential economic development incentives (HUD, 2010). Clemson University anticipates a benefit to the local community by employing a dedicated workforce and contracting additional services offered by established local industries as needed. It is anticipated that the facility would serve as the catalyst for a wind industry cluster to form in North Charleston and the surrounding area, increasing employment and economic activity over the next twenty years (Kelly et al., 2009).

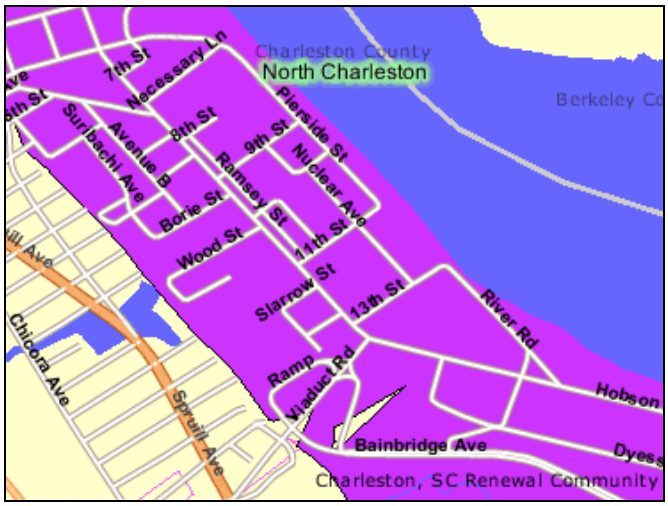

Figure 2-5: Charleston SC HUD Certified Renewal Community Map
Source: HUD, 2010

2.2.2 Purpose and Need of Proposed Project

The purpose of the proposed DTTF project is to facilitate mass-produced large-scale wind turbine technology by providing HALT of utility scale wind turbine drivetrains (up to 15 MW) for manufacturers. If funded, this project would be the world's only facility equipped to test drivetrain units of these capacities. Worldwide, the rapid increase in wind turbine size has resulted in the development of large-scale prototype turbine assemblies and components. Currently comparable facilities do not exist that can test units larger than 5 MW (NREL, 2010). Clemson University proposes to provide a facility capable of testing these large scale prototype wind turbines and their drivetrain components.

Testing facilities for advanced large scale wind turbine drivetrains are needed to provide an environment for controlled prototype testing of next generation off-shore wind turbine equipment. In addition, independent third-party verification is required to meet turbine certification and design standards in the future. Performance data results would generate new knowledge that would lead to improved designs and increased reliability by identifying design deficiencies for product improvement. Current testing technology is done through live installations of prototype equipment. This approach does not lend to a controlled testing environment since the equipment is tested only to the extent of existing weather conditions. By optimizing wind turbine drivetrain capabilities within a controlled environment, the proposed project would support wind energy technology development and ultimately production of more efficient and economical large scale wind turbines to be utilized in domestic and foreign markets. Ultimately, the proposed DTTF project would assist in the reduction of wind turbine costs, facilitate product financing, and increase the quality of mass production, both by reducing initial investment and preventing costly retrofits. The lower cost of wind energy directly supports the DOE goal of meeting twenty percent of America's energy demand with wind energy by the year 2030 (Kelly et al., 2009).

The benefits of wind energy make it the second largest new energy resource in the U.S. electrical grid. Wind energy is a renewable energy source that is both abundant and not depleted by use. Environmental benefits include the lack of harmful air emissions and lack of water consumption. Social benefits include revenue for farmers and ranchers through land lease programs and decreasing America's dependence on non-renewable resources like coal, fuel oil, and natural gas (NREL, 2005). The DTTF project supports the DOE's Energy Efficiency and Renewable Energy mission to invest in clean energy technology, improve energy efficiency, and increase available domestic sources of energy (Kelly et al., 2009).

2.2.3 Description of Facility Location

The proposed facility would be located on the CURI campus at the former U.S. Department of Defense Charleston Navy Base in North Charleston, South Carolina. The Charleston Navy Base was decommissioned in 1996 under the U.S. Defense Base Closure and Realignment Commission. The former naval facility (now known as the CNC) is located to the east of Spruill Avenue in North Charleston, South Carolina. The CNC extends along the Cooper River from just north of Noisette Creek to Shipyard Creek. Since the early 1940s the majority of the CNC was developed for use by the U.S. Navy, though portions were developed as early as 1902. Naval operations included construction, repair, and maintenance of ships/submarines, as well as support operations involving fuel and armament storage, training and administration. Additional development at the facility continued through the 1990s (S&ME, 2010a).

The proposed DTTF property is located along the eastern portion of the CNC and is roughly bounded by Hobson Avenue (to the west), Pierside Street (to the east), Supply Street (to the north) and Kilo Street (to the south). The proposed DTTF property consists of approximately 6.3 acres. The property is currently identified by the Charleston County Tax Assessor as a portion of TMS# 400-00-00-179 and is located at 1145 Pierside Street west of Dry Docks No. 3 and 4. The proposed site has been previously developed with paved parking areas, one large former navy warehouse (Building 69) and metal shed. Clemson University proposes to renovate this warehouse structure to accommodate the proposed DTTF project as shown in Figures 2-6 and 2-7. The site also includes a fenced area for surface parking and nearby access to dry-docks, piers, cranes, administrative buildings, and railway infrastructure (S&ME, 2010a). Vacant industrial properties adjacent to the property are possible areas for future expansion areas (Kelly et al., 2009). The location of the subject property within the CNC is included in Figure 2-8.

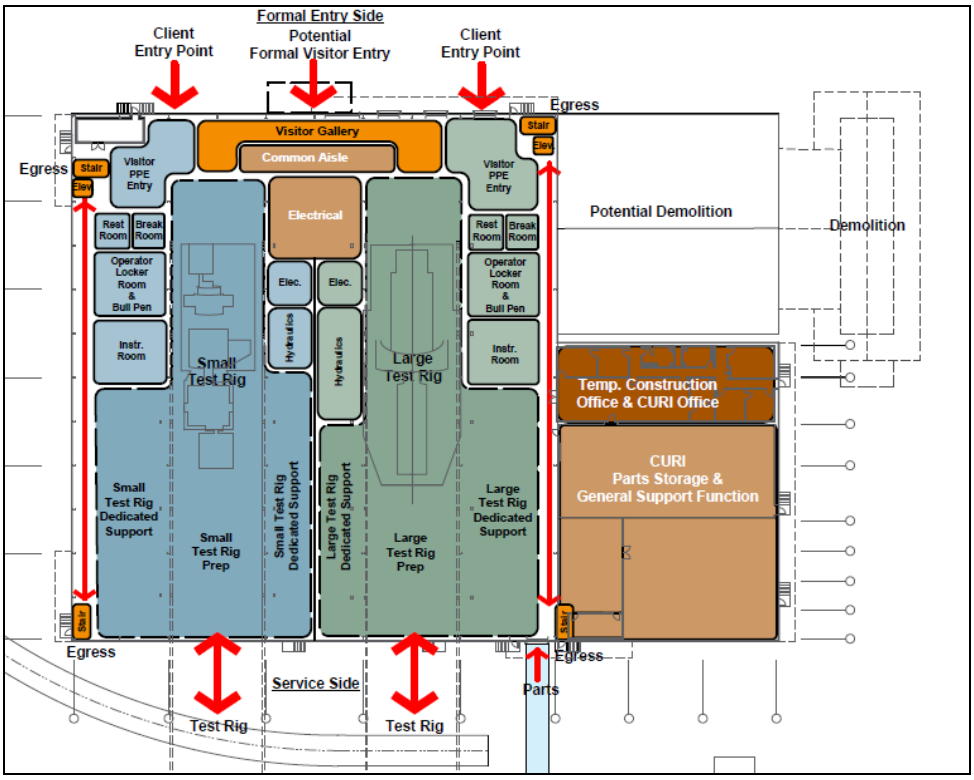

Figure 2-6: Proposed Layout to Building 69 – Level 1
Source: Fluor, 2010

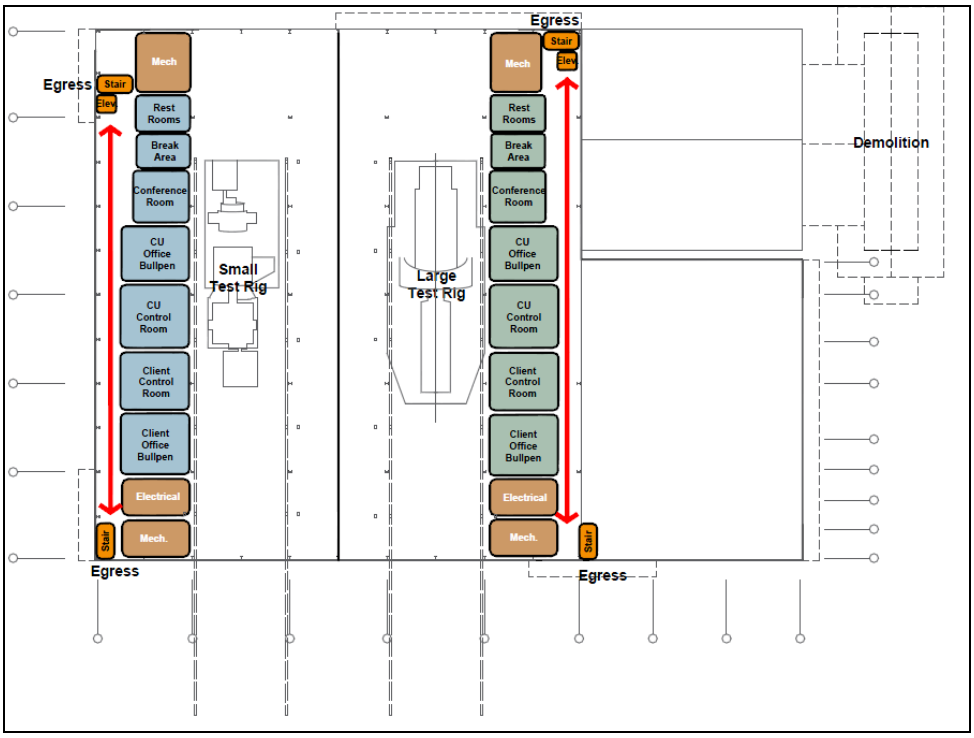

Figure 2-7: Proposed Layout to Building 69 – Level 2
Source: Fluor, 2010

Entrances to the subject property are from Supply Street and Pierside Street via Hobson Avenue, the main thoroughfare for the central portion of the CNC. Several secondary roads are located near the subject property providing access to marine-related infrastructure (dry-docks, piers, etc.) along the Cooper River. The surrounding areas consist of compatible development with primarily marine and industrial operations (S&ME, 2010a).

Building 69 was built in 1942, expanded in 1985, and decommissioned in 1995. It served as the main warehouse for the Navy's storage of non-hazardous materials. The facility was originally constructed as an acetylene plant in 1942. The facility was used as a central receiving and shipping warehouse beginning in 1955. Most of the materials, parts, and machinery purchased for the repair and maintenance of ships, submarines, vehicles, and equipment for the entire Naval Complex passed through Building 69 (S&ME, 2010a).

Currently, Building 69 stands on 6.3 acres of property including a fenced area for surface parking of vehicles, nearby access to dry-docks, piers and cranes, administrative buildings, railway infrastructure and nearby vacant industrial properties. The property provides adequate space for lay-down of construction equipment (S&ME, 2010a). Following renovation, the building would be approximately 66,400 sq. ft. providing sufficient space for the installation of test cells and staging areas for preparation of test specimens before and after testing. The existing ceiling height varies from 39 to 42 ft, giving adequate space for crane-way systems to be installed to handle equipment related to the smaller of the test units. Changes to the building roof and an altered roof configuration will be required to accommodate the needs of the larger test rig (Rig #1). Building 69 has existing infrastructure to support lighting and ventilation needs (Fluor, 2010).

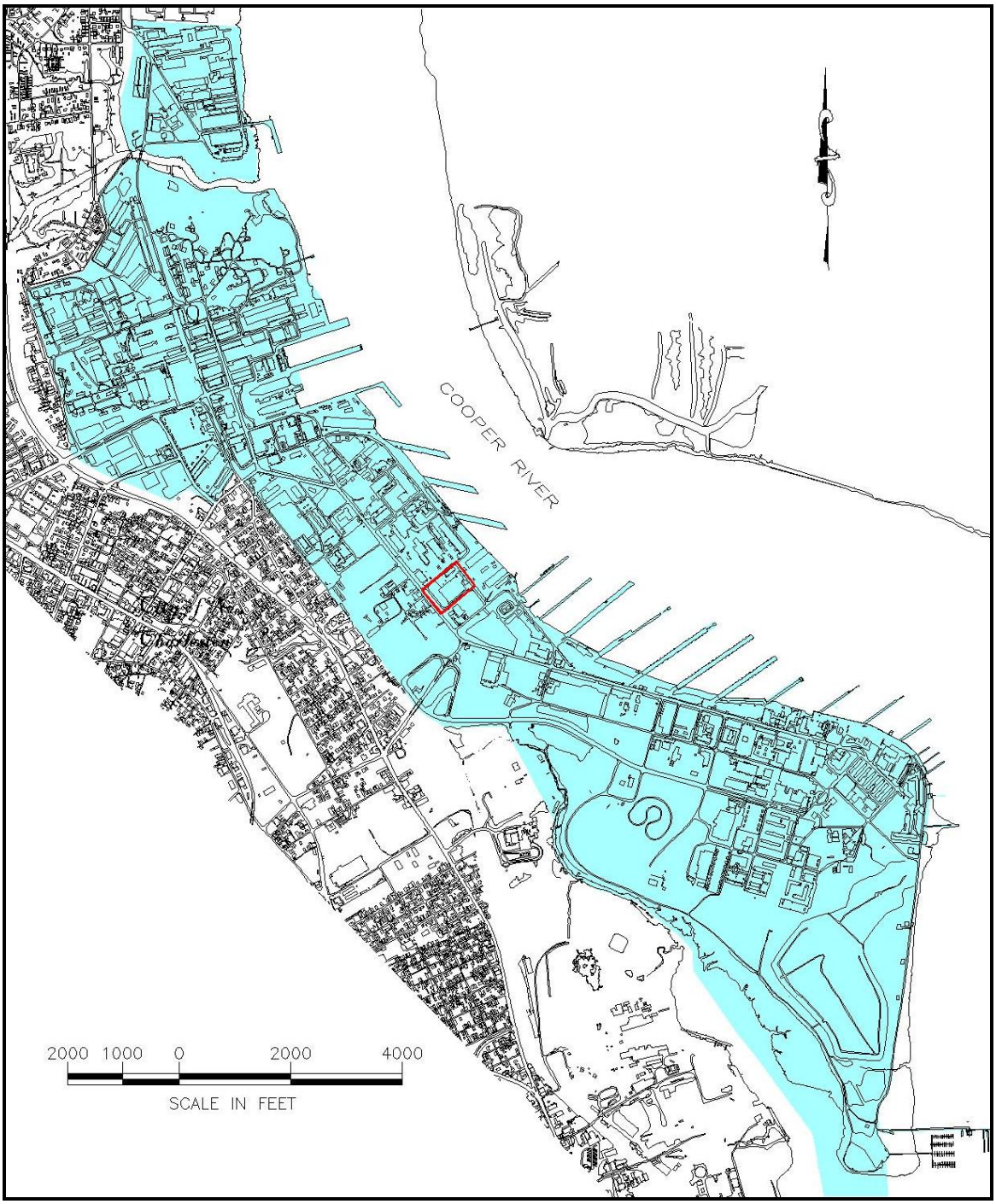

Figure 2-8: Location of Building 69 within Charleston Naval Complex
Source: RDA, 2010

Historical uses of the surrounding properties have been military/industrial from the early 1900s until the base closure in 1996. Since the base closure to the present day, more commercial types of businesses are utilizing the base as tenants; however, the majority of the surrounding property is vacant or marine/industrial in use (S&ME, 2010a).

The subject area of the CNC is generally flat and slopes gently downward toward the Cooper River to the northeast. The groundwater is assumed to flow downward with topography in a northeasterly direction towards the Cooper River. The proposed DTTF property is comprised mostly of impermeable paved land. A stormwater sewer system collects precipitation runoff and drains it to outfalls along the Cooper River. Improvements to the stormwater sewer system, authorized by the Navy along Supply Street and Dry Dock No. 3, were recently completed. This included the installation of new pipes and vaults from Dry Dock No. 3 west to Hobson Avenue (S&ME, 2010a).

In the location of Building 69, subsurface soil conditions are somewhat variable. The proposed site location is near former marshland that was filled in the early 1940s (S&ME, 2010a). The local bearing stratum (Cooper Marl) in this area is approximately 40-60 feet below land surface (Weems and Lemon, 1993).

A Phase I Environmental Site Assessment was conducted for Clemson University in 2010 per American Society of Testing and Materials 1527-05 standards that indentified evidences of recognized environmental conditions[2] in connection with the project area. The CNC has been extensively assessed for environmental contamination by the U.S. Navy as part of their Resource Conservation and Recovery Act (RCRA) Hazardous Waste (Part B) Permit as issued in May 1990. The South Carolina Department of Health and Environmental Control (SCDHEC) has managed the corrective action measures associated with the closure of the CNC per the South Carolina Hazardous Waste Management Act. Through the RCRA corrective action process, the SCDHEC and the U.S. Navy have identified over 400 Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) on the CNC. Many of these locations required additional assessment and remedial action. Several sites have been identified on and near the subject property that have the potential to contain or have been confirmed to contain hazardous substances, mainly in the soil or groundwater. Most of the Areas of Concern and Solid Waste Management Units have been granted no further action[3] status by the U.S. Environmental Protection Agency (USEPA) or SCDHEC including the implementation of engineering and land use controls (LUCs) (S&ME, 2010a).

Two AOCs (616 and 617) exist in the immediate area of Building 69. Both AOCs are related to a paint shop and galvanizing facility that formerly occupied the area; AOC 616 has been closed via a no further action decision while AOC 617 remains an active area of investigation/ monitoring by the Charleston Naval Complex Redevelopment Authority and SCDHEC. The Navy's assessment of the property also identified the location of an underground storage tank located on the northern corner of the property. The Navy's information indicated that tank is no longer in use, but is unclear whether the underground storage tank has been removed from the ground (S&ME, 2010a).

The LUCs associated with the subject property include groundwater use restrictions, property use restrictions, engineering controls, and digging/excavation restrictions. The groundwater use restriction prohibits the extraction, utilization, or consumption of any groundwater from the aquifer below except for monitoring or remediation purposes (CNC, 2007). Figure 2-9 is provided to detail the identified AOCs and SWMUs near the proposed DTTF.

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2. The American Society of Testing and Materials definition of a recognized environmental conditions is the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, ground water, or surface water of the property (ASTM International, 2005).

3. No Further Action status indicates the end of corrective action based on reported site conditions and land use. If new information becomes available or a different land use reported the governing regulatory agency can reopen the case at a future date (USEPA, 2009a).

Figure 2-9: AOCs and SWMUs near Building 69
Source: CH2MHill, 2007

In addition to the requirements under the U.S. Navy's RCRA Permit, Clemson University acquired the subject property subject to a Voluntary Cleanup Contract (VCC) under the SCDHEC's Brownfield Program. Under the terms of the VCC (07-5044, as amended), Clemson University is considered a non-responsible party with respect to the existing environmental issues associated with the site as long as certain obligations are met. These obligations include public notice of the VCC, notification of proposed construction activities, allowing access to the U.S. Navy and the SCDHEC to continue RCRA investigations, protections of sample locations, and negotiation with the U.S. Navy and the SCDHEC to alter or amend items associated with the in-place LUCs (e.g., development of plans to minimize construction worker exposure; minimize, properly handle, and dispose of generated soil and groundwater waste; etc.). These actions are considered committed measures (VCC, 2007).

2.2.4 Description of Proposed Facility

The facility would consist of two test rigs equipped with independent drive systems, capable of simultaneously providing up to 7.5 MW and 15 MW of shaft input power to units under test. The proposed facility layout is shown in Figures 2-6 and 2-7. The proposed renovation of Building 69 would alter the interior layout of the structure to contain two test rigs (Test Rigs 1 and 2) with a side-by-side configuration, preparation and breakdown areas, and office space. Rooms for instrumentation preparation and test rig control are also planned. The facilities associated with each test rig would be isolated from one another for commercial proprietary reasons. Additional office space, video conference rooms, and facilities would be available to visiting customers and scientists at the adjacent Clemson Conservation Center (Kelly et al., 2009).

Building modifications would also include construction of two isolated interior foundations for the test drive equipment, installation of two bridge crane systems (one at 100 to 150-ton capacity and one at 300 to 400-ton capacity), preparation areas, supplementary works spaces around the test rigs, and approximately 7,000 sq. ft. of conditioned operating areas (Kelly et al., 2009). The gantry cranes would extend approximately 80 feet out of the building to straddle the rail spur extension (Tuten, 2010). This would facilitate movement of equipment into the building for set-up and breakdown as well as onto and off of the test rigs.

Clemson University has committed to reducing energy demands by requiring all new construction and major renovation projects to strive to attain Silver Certification through the Leadership in Energy and Environmental Design (LEED; Clemson, 2005). The LEED process was developed by the U.S. Green Building Council and is a framework to provide facility owners with assurances that a building is designed, constructed, operated, and maintained with consideration of reduced energy use, increased water efficiency, and improved indoor air quality (United States Green Building Council, 2010). By renovating Building 69 with LEED principles, Clemson University hopes to reduce the facility's environmental footprint and benefit from savings from reduced cost of utilities in the future (Clemson, 2005).

Conceptual and preliminary design is occurring concurrently with this NEPA review. Design and construction details presented in this EA are based upon Clemson University's due diligence performed prior to the DOE grant application and on Clemson's Project Management Plan. Project information from these sources, as updated by Clemson during the EA process, is the basis for the analysis within this EA. Final facility design and construction would occur, as appropriate, after completion of the NEPA process.

2.2.5 Construction and Installation

If DOE funding is approved, the construction of the facility is anticipated to begin in late 2010. The project has been divided into five phases:

- Phase I – Engineering, permitting, and detailed design
- Phase II – Construction, fabrication and installation
- Phase III – Commissioning
- Phase IV – Certification and accreditation of the test rigs; and,
- Phase V – Operation

The anticipated timeframe for the first four phases is twenty-four months for test Rig #2 and thirty months for Rig # 1. Following installation of the drivetrain test rigs and supporting equipment, the programming and testing of the data acquisition system and testing operations for both rigs are expected in the spring 2013 (Kelly et al., 2009).

Clemson University would contract geotechnical investigations for the proposed site prior to construction. Those results would be implemented in the final designs of the facility, specifically for the foundation of the two test rigs (Tuten, 2010).

Preconstruction activities would include the demolition of the oldest (circa 1942) portion of the building as well as an adjacent dispatching station and shed. A three-sided structural metal panel building of approximately 9,500 sq. ft. in the paved area to the north of Building 69 would also be dismantled and demolished to existing grade. The foundations of the demolished portion of the building and dispatching station would remain maintaining the same elevation as the remaining sections of Building 69 (Figure 2-10; Kelly et al., 2009).

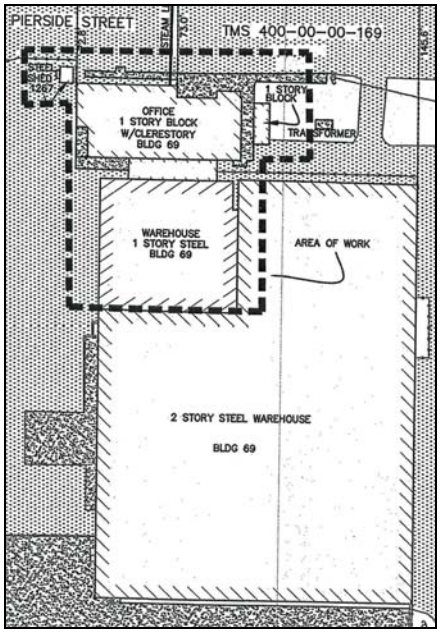

Figure 2-10: Area of Demolition
Source: Forsberg, 2010

Prior to the planned demolition and renovation of Building 69, Clemson University has identified and plans to abate regulated hazardous building materials including asbestos containing materials and lead based paint. The asbestos containing materials and lead based paint coated components will be abated. Additional hazardous building materials such as mercury sources, and polychlorinated biphenyls (PCB) were not identified. Worker protection and disposal standards would be practiced during removal activities per Occupational Safety and Health Administration (OSHA), SCDHEC, and USEPA regulations (See Section 3.6; S&ME 2010b).

Clemson University's development of the property would include unavoidable ground disturbance during construction, including soil disturbance during the installation of the

equipment foundations, rail spur, utilities, parking areas and landscaping. Prior to these activities Clemson University would develop an appropriate Stormwater Pollution Prevention Plan (SWPPP), obtain a land disturbance permit, and a dig permit from the Navy as described in Section 3.1. If archaeological materials or human remains are encountered during ground disturbing activities, Clemson would notify the SHPO and the Catawba Indian Nation THPO of the discovery and ask for their direction on how to proceed (Tuten, 2010). Clemson has contracted Terracon to complete geotechnical investigations for the proposed site to aid in the design process. The results of the study would be implemented in the final designs of the facility and provide further insight into the necessary supports to provide an operational and safe DTTF environment (Fluor, 2010).

2.2.6 Operation

Testing of the drivetrain components of a wind turbine would occur on one of two test rigs located within Building 69, allowing two companies to test their equipment separately yet simultaneously. It is estimated that a maximum of ten drivetrain assemblies would be tested in a year (Tuten, 2010). The basic infrastructure and utilities including municipal water and sewer are available to the project site (Kelly et al., 2009).

The facility would conduct HALT on all drivetrains. HALT is a methodology that is increasingly being used to determine reliability of products. HALT subjects a product to variable environmental parameters and loading conditions that assist to identify the limiting failure modes of a product. The facility would consist of independent bays housing two instrumented test rigs that are capable of simultaneous testing. The rigs would be equipped with independent drive systems. This design allows the use of standard components to create modular systems. Acoustic insulation would be installed on and in the proximity of both rigs to maintain the isolation of test rigs and provide the needed sensitivity for monitoring and testing purposes. The acoustical insulation also serves the purpose of maintaining an OSHA safe environment in regard to noise exposure (See Section 3.6), and protecting surrounding areas from noise from the facility (See Section 3.7; Kelly et al., 2009).

Data gathering and sensor capabilities would focus mainly on the forces and dynamic accelerations encountered by the test articles. Other sensor values that would be available include temperature, acoustic levels and frequencies, lubrication oil analysis, climatic behavior, vibration, deformation, power losses, and grid interactions. A customer's specific needs would be considered when tailoring a test plan. In addition to assisting in the optimization and improved design of drivetrains, the facility would give researchers a failure sequence that can be compared to field data to help troubleshoot failing wind turbines (Kelly et al., 2009).

The following paragraphs explain the test rigs and the specifics about the proposed operation.

Test Rig #1

Test Rig #1 (Figure 2-11) would be designed to perform HALT with up to 15 MW of shaft input power on drivetrains and generators. The unit would be powered by two 8.5 MW motors to assure a full 15 MW of power can be delivered to the test article after all gearing and frictional losses are accounted for. A unique feature of Rig #1 would be the ability to replicate the actual forces and moments exerted on the drivetrain of a wind turbine by the wind turbine blades seen in real life situations. Called a "blade force simulator (BFS)," this piece of equipment would apply loads to the main shaft of the specimen drivetrain, replicating forces and moments along three orthogonal axes to simulate actual blade forces experienced in the field. Customers would have the ability to program the BFS to test under a variety of wind loading scenarios (Kelly et al., 2009).

Test Rig #1 would be able to test nacelles, complete drivetrains, gearboxes, high speed generators, and direct drive generators up to 15 MW with BFS.

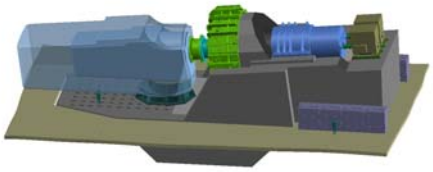

Figure 2-11: Wind Turbine Drivetrain Test Rig #1
Source: Kelly et al., n.d.

By utilizing the blade force simulation system, the following demands could be met:

- Simulation of normal and fatigue loads resulting from recurrent structural loading conditions
- Simulation of ultimate and extreme loads (rare external design conditions)
- Simultaneous application of all 6 loads (forces and moments along 3 axis)
- Application of all 6 loads with different frequencies
- Application of all 6 loads with different magnitudes

Test Rig #2

Test Rig #2 (see Figure 2-12) would be designed with a 7.5-MW speed reducer gearbox based on the design of an existing wind turbine gearbox with special features for the test rig (e.g., gear ratio and mount). Control and power outputs (resulting from the fluctuating input loads) from the turbine would be used for design model validation and response of the complete test system. In this situation the test rig input power to the test specimen would be proportionally responsive to the control outputs provided by the turbine control system (Kelly et al., 2009).

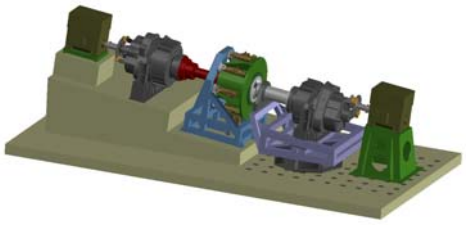

Figure 2-12: Wind Turbine Drivetrain Test Rig #2
Source: Kelly et al., 2009.

Test Rig #2 would be able to test complete drivetrains, gearboxes, and direct drive generators up to 7.5 MW.

The dynamometers envisioned for this facility have the ability to test drivetrains and generators up to 15 MW capacity with 30% overload and simulate real world conditions. Application of loads to the main shaft of the test drivetrain (on Test Rig #1) would simulate actual blade forces experienced in the field (Kelly et al., 2009).

The DTTF would store petroleum oils for use and lubrication of equipment. The storage of significant quantities of oil is regulated by 40 CFR Part 112, Spill Prevention Countermeasures and Control (SPCC). If threshold quantities of the SPCC requirements are met or exceeded by the storage of oils and lubricants, Clemson University would develop a SPCC plan to provide for the safe handling, storage, and use of petroleum fluids (Tuten, 2010).

2.2.7 Transportation

Building 69 is strategically positioned for transportation of equipment. It is located next to Pier J (operated by Charleston Marine Manufacturing Company (CMMC)), Dry Dock 3 (owned by the CURI), railway infrastructure, and major roads leading to nearby Interstates 26 and 526. Drivetrains and associated equipment would be transported primarily by ship arriving at the nearby Cooper River or Wando Terminals operated by the South Carolina State Ports Authority (SCSPA). Test specimens would then be moved to the test facility using a crane barge. Pier J is 750 ft. × 80 ft., has a depth of 35 ft. at low tide, and is accessible through a 45 ft depth mean high water shipping channel. Off-loading capacity to move drivetrains with a mass up to 500 tons from ships would be available at Pier J using J. E. Oswalt

and Son's 500-ton crane barge (as shown in Figure 2-13) that currently services Charleston marine interests. The test specimens arriving by ship would be moved by J. E. Oswalt and Son's onto Pier J and loaded onto a tracker and transported within the CNC to Building 69 for transfer into the DTTF building (Kelly et al., 2009).

Figure 2-13: CMMC 500 ton Barge Crane
Source: J. E. Oswalt and Sons, 2009

South Carolina Public Railways would construct an approximate 700-foot rail spur from an existing rail line adjacent to Building 69 that would be routed alongside the facility under the crane gantries. Drivetrains would be lifted from the railway by the crane gantries into the building and onto the appropriate test rig (Tuten, 2010). The rail spur would terminate on the south side of the building (Fluor, 2010) and would be utilized for equipment arriving by rail or being moved locally within the region by rail (See Figure 2-14; Tuten, 2010).

The CNC is easily accessible by Interstates 26 and 526. Major roads in the complex are capable of handling overweight vehicles. CMMC in cooperation with Detyens Shipyard and J.E. Oswalt & Sons Crane Services could provide pass-through services to customers to meet their equipment logistics, handling, and rigging requirements (Kelly et al., 2009).

2.2.8 Electrical infrastructure

Power would be supplied to the test facility by SCE&G through its 115kV transmission system and stepped down to a utilization voltage of approximately 13.8kV. The electrical distribution line to the facility would be constructed by SCE&G (Kelly et al., 2009). SCE&G has completed and is planning continual substation improvements that will upgrade the electrical infrastructure providing uninterruptable power to the southern portion of CNC to serve many customers including the DTTF (Fluor, 2010).

The power provided to the test rigs would be converted from alternating current (AC) to direct current (DC) before being utilized. This conversion serves multiple purposes that include:

- Isolation from the utility so that intentionally introduced disturbances on the generating unit under test are not propagated back into the host utility grid.
- Variable speed output can be easily created utilizing variable frequency drive controllers for the dynamometer input drive motors allowing the unit to adjust to a wide range of wind turbine sizes.
- Both 50Hz and 60Hz wind turbines may be tested with the same dynamometer so that generating units designed for use anywhere in the world may be accommodated.
- Energy output from the generating unit under test can be easily recycled without interacting with the host utility grid.

This energy model would allow more flexibility as specimens can be tested that are not compatible with North American standards. With this model, power can be recycled. Converting the power to DC would eliminate the need for additional equipment and a special protection plan for the local utility. Once DC power has been created, it would supply the variable speed drives in the dynamometer. The dynamometer

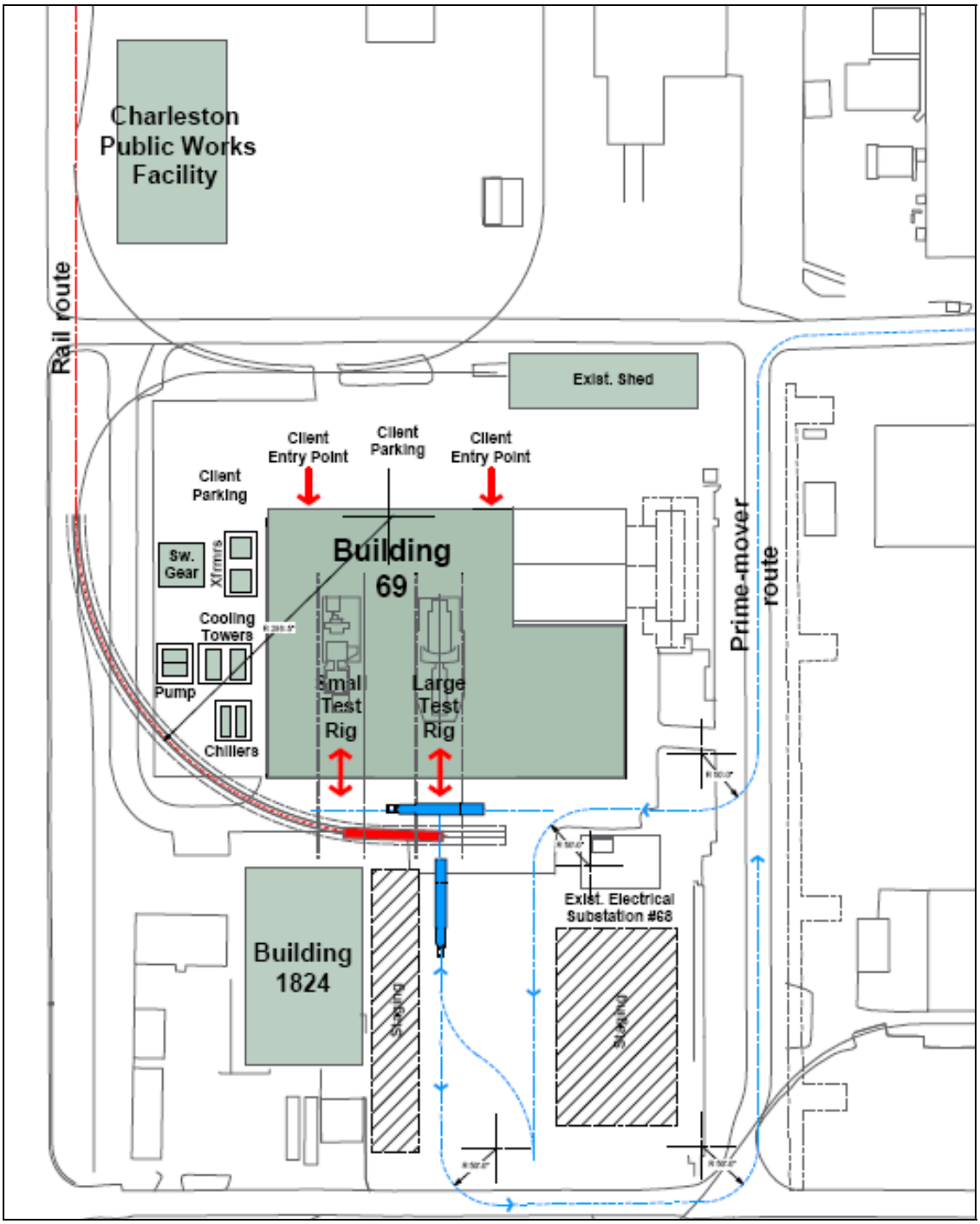

Figure 2-14: Proposed Site Plan
Source: Flour, 2010

would simulate the wind input for wind turbines or other prime mover inputs for the generating unit being tested. The output power from the unit being tested would be compared with a simulated utility grid and monitored for performance. Concurrently, the resultant power flow would be looped such that the unit under test would supply the majority of the power running the test rig. The host utility would be needed only to supplement the power needs to replace energy loss in the system. An additional purpose of the

system would be to test the response of the test unit and its auxiliary equipment to various fault scenarios (Kelly et al., 2009).

Clemson University would develop a system to convert the power provided to the test rigs from AC to DC before being utilized. This conversion serves the purpose of protecting the SCE&G infrastructure and allowing greater testing flexibility. Isolation would be created from the utility so that intentionally introduced disturbances on the generating unit under test are not propagated back into the host utility grid and energy output from the generating unit under test could be easily recycled without interacting with the host utility grid. Once DC power is created, it would supply the variable speed drives in the dynamometer test unit. The dynamometer would simulate the wind input for wind turbines or other prime mover inputs for any generating unit under test. The output power from the generating unit under test would be operated parallel with a simulated utility grid, not in connection with SCE&G, and its outputs would be monitored for performance against design parameters (Kelly et al., 2009).

At the beginning or end of a test cycle, the simulated grid power would be created by converting power from the DC bus back into the operating AC frequency of the unit under test, either 50Hz or 60Hz. This power would supply the auxiliary controls and supporting equipment in the unit under test and provides a source for the unit to synchronize and parallel. Once the unit under test was in operation and producing power, the direction of power flow in the converter feeding the simulated grid would reverse and the power from the unit would be fed back to the DC bus. In this state of operation, the host utility would only be supplying power to replace losses in the system. The power conversion unit between the DC bus and the simulated grid would be modulated to simulate grid disturbances under certain test sequences. This would allow for direct measurement of all responses in the unit under test as well as its supporting equipment.

The electrical system includes a simulated grid fault system designed for IEC 61400 -12-1, IEC 61400 – 21 testing. The purpose of this system would be to test the response of the test unit and its auxiliary equipment to various fault scenarios. The most common concern for a wind turbine would be grid fault ride through verification, but this fault simulator also would be universal to other generating units. Output from the simulated grid power convertor would be limited in these scenarios so as to not mask the characteristics of the unit under test (Kelly et al., 2009).

2.3 No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funds for the construction of the proposed DTTF. As a result, installation of the project would be delayed while Clemson University looked for other funding sources, or abandoned if other funding sources could not be obtained. Furthermore, reductions in fossil fuel use and improvements in energy efficiency would not occur and DOE's ability to achieve its objectives under the Recovery Act would be impaired.

Although Clemson University's proposed project might proceed if DOE decides not to provide any form of financial assistance, DOE assumes for purposes of this Draft EA that the project would not proceed without this assistance. If the project did proceed without DOE's financial assistance, the potential impacts would be essentially identical to those under DOE's Proposed Action (that is, providing assistance that allows the project to proceed). In order to allow a comparison between the potential impacts of a project as implemented and the impacts of not proceeding with a project, DOE assumes that if it decided to withhold assistance from this project, final design and construction of Clemson University's proposed DTTF would not proceed.

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter of the Draft EA examines in detail the potential environmental impacts of the proposed project and the No-Action Alternative for the following affected environmental resource areas.

- Geology and Soils
- Water Resources
  - Stormwater
  - Floodplains
  - Groundwater
- Cultural Resources
- Socioeconomics and Environmental Justice
- Infrastructure and Energy Use
- Health and Safety
- Noise

DOE EAs commonly address other resource and subject areas. In an effort to streamline the NEPA process, this assessment did not examine some resource areas at a higher level of detail. The focus for the more detailed analysis was on those activities or actions that would require new or revised permits, have the potential or perceived potential for significant adverse environmental impacts, or have the potential for debate.

For the reasons discussed below, DOE concludes that Clemson University's proposed project would result in no impacts or minor impacts to the following resource areas and the detailed description and analyses of these resources are not necessary and thus not carried forward in this chapter.

Air Quality

The greater Charleston/North Charleston area is designated as an attainment area for all regulated pollutants (SCDHEC, 2010b). There would be a temporary, small increase in emissions during demolition and construction activities, as the project would occur primarily within an existing building and on existing concrete and other hard surfaces. The only stationary source of emissions at the DTTF would be a generator greater than 150-kilowatt rated capacity designated for emergency use only (Tuten, 2010). The DTTF would require electricity from the regional grid, which would result in a negligible increase in greenhouse gases and other air emissions from regional power plants. Transportation of construction and operations materials and personnel, including transportation on the rail spur to the facility up to 20 times per year, would result in no detectable increase in emissions in the surrounding region as the transportation requirements for this project would be a very small proportion of the existing barge, rail, and motor vehicle transportation in the area.

Air permitting of pollutant sources and ensuring compliance is governed by SCDHEC under Standard No. 2 of South Carolina regulation 61-62.5 as required by the Clean Air Act and the State Implementation Plan. The emergency generator would be exempt from permitting and would not affect or impact the current air quality status at the project site, community, or region (SCDHEC, 2009c).

Biological Resources

All demolition and construction activities would occur within a developed industrial area with no natural, undisturbed areas and very little landscaping. The site lacks significant biodiversity because the entire site is developed with a building and asphalt parking areas that is surrounded by developed industrial areas. The vegetation is limited to landscaped bushes and trees along the edges of the property. No

wetlands or other surface waters would be disturbed and no marine or tidal aquatic environment would be affected (USFWS, 1988). After consulting the USFWS Section 7 Consultation website (USFWS, 2010a), the South Carolina List of Endangered, Threatened and Candidate Species (USFWS, 2010b), and the South Carolina Rare, Threatened, and Endangered Species Inventory (SCDNR, 2006), Clemson University requested concurrence from the USFWS that no protected species or habitat would be impacted by the proposed project. The USFWS provided a letter dated June 22, 2010 concluding this project would have no affect on resources protected by the Federal Endangered Species Act of 1973 (USFWS, 2010c). That letter is included in Appendix B. In an earlier letter dated June 21, 2010, the USFWS recommended that the Least Tern, which is classified as threatened by the State of South Carolina, be further analyzed in the EA due to its tendency to nest on flat rooftops during the summer months (USFWS, 2010d).

The Least Tern is a small migratory shore bird that uses pebbly rookery islands and isolated beaches as their natural habitat (SCDNR, 2010). Recently they have been observed nesting on the edge of flat pebble roofs near water. The South Carolina Department of Natural Resources (SCDNR) has requested that anyone observing a Least Tern nest please notify the agency (Petersen, 2010). Currently there are three reported sightings of the Least Tern reported on the SCDNR Charleston County Species Occurrence Map (SCDNR, 2006).

The roof of Building 69 has a slight slope to the north and south, with the peak in the middle. The roof is a bituminous hot melt roll roof over insulation and steel sheeting (Tuten, 2010). There are no pebbles or observed nesting sites on the roof.

Thus, DOE concludes that the proposed project would not affect any federally or state protected threatened or endangered species or their critical habitat, and would have minimal or no impact on other biological resources.

Wetlands and other Surface Waters

Based on review of several available resources including soils maps (NRCS, n.d.), national wetland inventory map (USFWS, 1988), consulting former wetland delineations for the property (USACE, 1988), and after conducting an onsite pedestrian survey of the property, Clemson University requested concurrence from the USACE regarding the lack of wetlands on the project site. In a letter dated June 21, 2010, the USACE concluded that the reference property does not contain any wetland areas or other waters of the United States (USACE, 2010). That letter is included in Appendix B.

No surface waters would be modified and stormwater would be controlled by best management practices detailed in a site-specific Stormwater Pollution Prevention Plan approved by SCDHEC's Office of Ocean and Coastal Resource Management (OCRM) (See Section 3.2). No Wild or Scenic Rivers set aside for preservation are located in Charleston County (National Wild and Scenic Rivers, 2007). Therefore, DOE concludes that wetlands and other surface waters would not be impacted by the proposed project.

Coastal Zones

Demolition and construction activities would occur within a developed industrial area. DOE received a notice on June 18, 2010 from OCRM certifying that the proposed project is consistent with the South Carolina Coastal Zone Management Program. A copy of the letter is located in Appendix B.

Sole Source Aquifers

There are no sole source aquifers, as classified by the USEPA, in South Carolina (USEPA, 1988).

Land Use

The proposed project location is zoned as light industrial by the City of North Charleston (City of North Charleston Property Information System, n.d.). The surrounding areas within the CNC are also zoned for industrial development. Based on the historic industrial nature of the area, current zoning, and planned operation as a large machine testing facility, the proposed DTTF would not change the nature of the land use. Furthermore, the facility would not physically divide the City of North Charleston community or be incompatible with Charleston Naval Complex Redevelopment Authority's (RDA's) plans for current and future uses of the area. Therefore, DOE has concluded the project would not impact land use under the proposed project.

Aesthetics

The renovation of Building 69, outdoor directional lighting, facility maintenance and landscaping, and construction of a rail spur would result in no or a negligible change in the view of the industrial setting of the project area and surrounding area (Tuten, 2010). The proposed project would have a minor beneficial effect on aesthetics in the immediately surrounding area as the renovation of Building 69 would transform a neglected building into a properly maintained facility. The facility would have outdoor directional exterior lighting for the purposes of safety and security that would not impact aesthetics.

Waste Management

The construction and operation of the DTTF may create small amounts of hazardous waste and typical quantities of non-hazardous solid waste (Tuten, 2010). Recyclable materials would be collected from the site and transported to a recycling facility (Charleston County Government, 2009) in accordance with the Clemson University Solid Green Program (Clemson University, 2006). The Charleston area has sufficient capacity for the disposal of both hazardous and nonhazardous solid waste in the region (Knich and Slade, 2009). As discussed in Section 2.2.3 all hazardous waste would be handled and disposed of under the guidance of the Navy and RDA (Tuten, 2010). Therefore DOE has concluded that the DTTF project would have no impact on waste management.

Traffic and Transportation

The community surrounding the proposed DTTF and CNC includes a network of roads including Interstates 26 and 526, US-52 (Rivers Avenue), and several high capacity thoroughfares to effectively handle traffic. During the typical commuting hours, the higher volume roadways can become congested with slower moving traffic, particularly during inclement weather or when traffic accidents occur. In general, however, these roads are typically open for the free flow of traffic and are in good repair. Lane closures and shutdowns of entire roads are rare and usually associated with emergencies. The roadway traffic generated by DTTF workforce is expected to be minimal, given the temporary work force of 50 to 100 people and the permanent workforce of approximately 21 people (Kelly et al., 2009).

The CNC maintains active railways that may be used for the delivery of equipment. Each unit tested would be transferred to and from the site for an expected total of 20 transfers per year or 10 test specimen deliveries (Tuten, 2010). Rail transfers to the facility will be performed by South Carolina Public Railways (Kelly et al., 2009). In an effort to reduce interfering with vehicular traffic, the policies of the South Carolina Public Railways for rail movements on the CNC include night service only, a maximum of 10 cars per train, and a maximum speed of five miles per hour (Fluor, 2010).

The majority of the drivetrain equipment is expected to be transported by barge, with marine handling infrastructure available on the CNC (Kelly et al., 2009). Equipment transported by barge will be routed by tracker within the CNC with minimal disturbance to the North Charleston community. Due to the small number of estimated annual turbine transfers, there would be no impact to ongoing or future use of the existing, highway, railway, or waterway transportation infrastructure.

3.1 Geology and Soils

The geology and soil conditions for a property are important in determining the predicted behavior of earth materials on which a structure would rely for its foundation. Geotechnical engineers study site-specific soil surface and subsurface conditions to determine building foundation requirements.

Soil contamination is the presence of hazardous substances either mixed, physically or chemically interacting with naturally occurring soil. The presence of contaminated soil complicates construction due to the possibility of hazardous substances being spread if proper precautions are not observed. Hazardous materials in soil can impact human health and environmental quality (USEPA, 2010d). The potential effects of contaminated soil at the Project site on human health are discussed in Section 3.7, and the potential effect on groundwater, stormwater, and surface water quality are discussed in Section 3.3.

3.1.1 AFFECTED ENVIRONMENT

As discussed in Section 2.2.3 the CNC has been extensively assessed for environmental contamination and over 400 SWMUs and AOCs were identified on the CNC. Several sites have been identified on and near the subject property with the potential for or confirmation of containing hazardous substances in the soil or groundwater. The soil contamination at the property generally is related to the past military related industrial uses of the property including the galvanizing facility and paint shop (S&ME, 2010a). The contaminated soil is currently covered by impermeable barriers. These barriers prevent the soils from affecting human health or the spread of contamination.

3.1.2 ENVIRONMENTAL CONSEQUENCES

3.1.2.1 Proposed Project

Clemson University's development of the property would include ground disturbance activities during construction from the removal of select areas of current impermeable barrier and installation of the equipment foundations, rail spur, utilities, and landscaping (Kelly et al., 2009). The two large equipment foundations and heavy bridge crane loads would require removal of a portion of the building slab and installation of a new foundation structure(s), which could expose contaminated soils (Tuten, 2010). Construction of the rail spur (700 × 15 feet) and utilities may require the removal of portions of the existing paved surface for extension of the railroad tracks and utility trenches (Fluor, 2010). Due to the removal of the protective impermeable barrier, the exposed soils could be resuspended by wind or leached by precipitation and impact stormwater or groundwater. Any soils selected for removal would be characterized to determine the proper method of disposal under a SCDHEC approved Contamination Management Plan. While waiting for characterization, the soils would be stored in such a way as to prevent exposure such as in enclosed drums or staged on plastic sheeting with the use of a large plastic cover over the staged piles of potentially contaminated soil. Detail regarding associated impacts to stormwater and human health are located in Sections 3.2.1.1 and 3.6, respectively.

As discussed in Section 2.2.3, Clemson University's acceptance of the property and subsequent existing VCC contract requires coordination with SCDHEC and the U.S. Navy to develop and implement site and activity specific plans to properly handle and dispose of soil prior to beginning work (VCC, 2007). By following all related requirements and protocols, the proposed project would have negligible impact on the geology or soil conditions.

3.1.2.2 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to the DTTF project. DOE assumes that the project would not proceed without this assistance, and contaminated soil would not be disturbed.

3.2 Water Resources

Water resources include all surface and groundwater transport within a defined watershed. Consideration of water resources could be restricted to a defined project area, a hydrologic watershed unit, or an entire regulatory district, depending on the purpose of the analysis. Within a regulatory context, water resources are specifically controlled to prevent over-utilization, pollution, and degradation of these resources (SCDHEC, 2001).

This section describes the existing water resources on and in the area of the project site and affected environment for potential consequences to water resources of the proposed project and the No-Action Alternative. As described in the introduction to Chapter 3, impacts to certain water resources (coastal zones, wetlands, sole source aquifers, public water supply, and surface water) are not analyzed in detail because the proposed project would have no or negligible impact on those resources. The water resources addressed in this section are stormwater, floodplains, and groundwater.

The SCDHEC's OCRM manages the permitting program to oversee the design of stormwater treatment and retention facilities in Charleston County, one of the eight coastal counties of South Carolina. The SWPPP program, administered by OCRM, is actively used to improve water quality by certifying that stormwater runoff is controlled or treated and discharged with no adverse effect to the environment in the South Carolina coastal plain. This program includes issuance of permits for site development and construction in accordance with the National Pollutant Discharge Elimination System (NPDES; SCDHEC, 2010a).

The regulatory statutes involved in the issuance of SWPPP construction permits in the South Carolina Coastal Zone are known commonly as "land disturbance" or stormwater discharge permits (SCDHEC, 2010a). This program requires that applicants demonstrate that a project's temporary and permanent site configuration would maintain flow, water quality, and discharge of run-off without adverse physical or chemical effects to upstream or downstream surface waters. The goal of the program is to insure that a project would not contribute to any further degradation of water quality, and that storm flows are mitigated to prevent flooding. Use of open ditches, stormwater retention ponds, swales, and stormwater dissipaters are all common structures civil engineers use to design sites so that construction and SWPPP permits may be approved. All approved SWPPPs include an evaluation of direct impacts to surface waters, including wetlands and other waters (SCDHEC, 2008).

Stormwater is runoff from precipitation that is not adsorbed into the ground either due to impervious surfaces or saturated soil. The water accumulates sediment and dissolves chemicals as it flows, which can impact water quality if it is not managed properly. The purpose of the NPDES permitting program is to enforce best management practices to minimize impacts to surface waters from these point sources. Common best management practices to be followed include use of geotextiles to reduce erosion, gradient terraces, riprap, seeding, dust control, permanent slope diversions, diversion dikes, brush barriers, filter berms or socks, construction entrances, and silt fencing (SCDHEC, 2005).

Floodplains are defined as lowlands adjoining inland and coastal waters and relatively flat areas and flood prone areas of offshore islands. Sixty-seven percent of Charleston County is located within the base floodplain (HUD, 1988). The base floodplain is defined as the 100-year floodplain, or a floodplain with a one percent chance of flooding in any given year (FEMA, 2004a). Charleston County is subject to

flooding due to hurricanes and tropical storms. The Charleston area has twelve documented hurricanes recorded for the past two centuries and is known to have geology that exacerbates flooding. These geologic features include both the low elevation of coastal areas and shallow ocean depths surrounding Charleston that contribute to greater storm surges (FEMA, 2004b). Due to the widespread development in flood zones and Charleston County's predisposition to flood hazards, the County has taken a proactive approach to flood mitigation (HUD, 1988). The local Flood Damage Prevention Ordinance is in compliance with FEMA requirements, and the City of North Charleston also participates in the National Flood Program (FEMA, 2010).

The potential presence of contaminated groundwater complicates construction due to the possibility of hazardous substances being spread if proper precautions are not observed. Hazardous materials in groundwater can impact human health and environmental quality. The impact to human health resulting from contaminated soil and groundwater is discussed in greater detail in Section 3.6.

3.2.1 Affected Environment

3.2.1.1 Stormwater

The project site on the former Charleston Naval Base is almost entirely paved or covered with structures. Due to the impervious nature of the property, stormwater runoff from the site is nearly equal to the amount of precipitation falling on the property. Stormwater flow is routed toward the Cooper River to the east via sheet flow and via stormwater drains connected to a newly renovated stormwater system along Supply Street.

Clemson University's planned renovations of the property include provisions for additional landscaping which would increase the site's permeability (Fluor, 2010). Because the proposed DTTF is within the boundaries and governance of the City of North Charleston Municipal Separate Storm Sewer Systems (MS4) and plans would involve ground disturbance activities within a half-mile of the Cooper River, Clemson University must apply to receive coverage under the NPDES general permit (SCR 100000) for stormwater discharges from the City of North Charleston MS4 and OCRM. Conditions of coverage under the NPDES general permit would require an approved SWPPP detailing conditions and control of erosion and sedimentation during construction (SCDHEC, 2001).

Petroleum oils would be stored in the DTTF for use and lubrication of equipment. Oil and other hazardous materials would be stored in accordance with applicable regulations, including the requirements for an SPCC as specified in 40 CFR Part 112 if threshold quantities are met. The SPCC would identify the practices to be implemented for the safe handling, storage, and use of petroleum fluids to prevent petroleum contamination of stormwater discharges.

3.2.1.2 Floodplains

The proposed DTTF would be located within a base floodplain and, therefore, is applicable to the floodplain management requirements of 10 CFR Part 1022: Compliance with Floodplain and Wetland Environmental Review Requirements. The project area was originally developed in the mid 1900s (S&ME, 2010a) and the floodplain was irretrievably altered at that time resulting in a reduction of the beneficial aspects of a natural floodplain. Clemson University chose the DTTF due to its proximity to barge, rail, and major interstate corridors on a previously developed and contaminated property (Kelly et al., 2009). The beneficial values of the floodplain have already been impacted on this property by the complete coverage of the property by impermeable surfaces and construction of the existing warehouse.

The proposed DTTF project location is in the base floodplain zone designation AE[4] seen in FEMA Flood Insurance Rate Map (FIRM) attached in Figure 3-10 and reproduced below at Figure 3-1. The site elevation varies between 13 to 14.5 feet above mean sea level (msl), which is within the 100-year flood zone. The AE zone has base elevations of 13 and 14 feet (FEMA, 2004a). The existing structures are approximately four feet above grade, at an elevation of 17.83 feet above msl, which is above the 100-year flood wave crest height of 14.2 feet above msl (Forsberg, 2010).

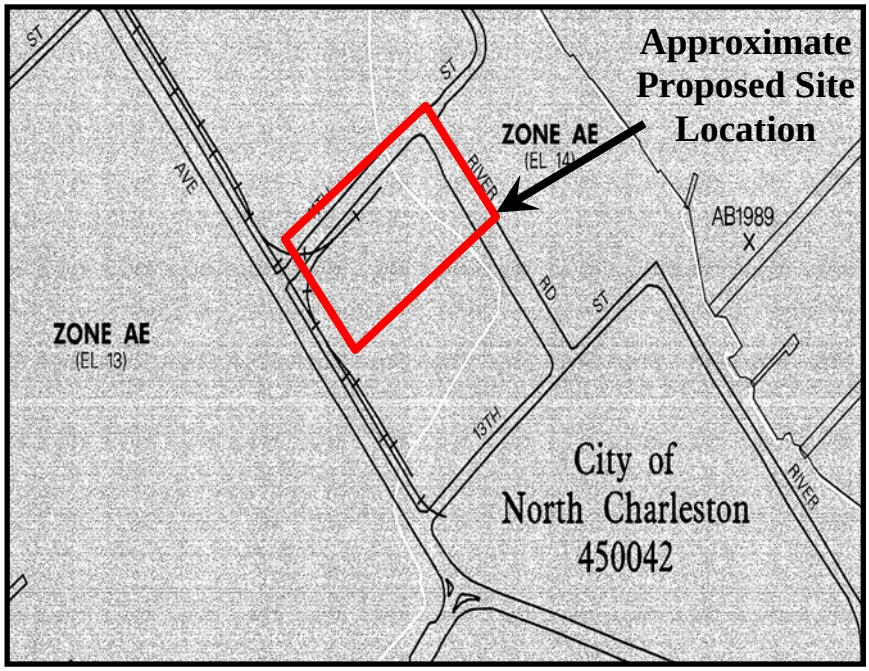

Figure 3-1: Flood Insurance Rate Map
Source: FEMA Map Service Center

3.2.1.3 Groundwater

As detailed in Section 2.2.3 of this report, AOCs and SWMUs have been identified pursuant to the U.S. Navy's RCRA Permit on and near the subject property that have the potential or confirmation of containing hazardous substances, mainly in the soil and groundwater. Most of the AOCs and SWMUs have been granted no further action status by either the USEPA or SCDHEC including the implementation of engineering and LUCs (S&ME, 2010a).

The LUCs associated with the subject property include groundwater use restrictions, property use restrictions, engineering controls, and digging/excavation restrictions. The groundwater use restriction prohibits the extraction, utilization, or consumption of any groundwater from the aquifer below except for monitoring or remediation purposes.

Clemson University has accepted a VCC under the SCDHEC's Brownfield Program requiring adherence to these policies. With concurrence from the U.S. Navy and the SCDHEC, these LUCs may be altered to allow for the proposed development (VCC, 2007).

Several groundwater monitoring wells exist on the subject property (Figure 3-2). Based on the nature of the proposed project, it is unlikely the wells would be damaged or destroyed by planned renovation

4. Flood zone designation AE is defined as the base floodplain where base flood elevations are provided. AE Zones are now used on new format FIRMs instead of A1-A30 Zones.

activities. However, Clemson University would protect the groundwater monitoring wells onsite during the construction phase of the project; if damage to a well occurs, Clemson University would coordinate with the U.S. Navy and the SCDHEC to repair or replace the groundwater monitoring well.

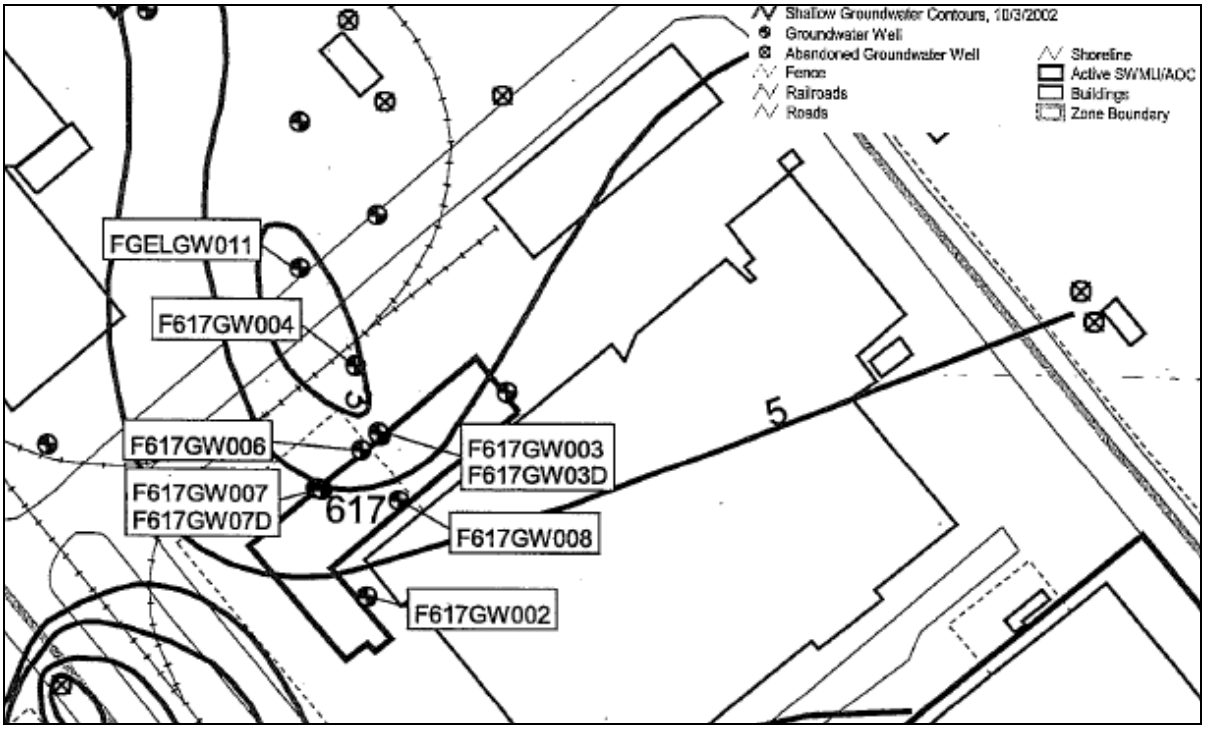

Figure 3-2: Location of Groundwater Monitoring Wells
Source: CH2MHill, 2005

3.2.2 Environmental Consequences

3.2.2.1 Proposed Project

Under Sections 401 and 404 of the Clean Water Act, ORCM has jurisdiction over stormwater permitting in the proposed site. ORCM requires that Clemson University's proposed renovation project be covered under the general NPDES permit following approval of a SWPPP by the City of North Charleston MS4, and OCRM review. Clemson University would conduct all construction activities following the practices detailed in the approved plan. The proposed renovation of the site would reduce the area of impermeable surface through the use of landscaping and infrastructure improvements, thereby reducing the quantity of stormwater discharge. Because Clemson University would create and implement the approved stormwater management and sediment control plan and SWPPP, DOE concludes the proposed facility would have no impact on stormwater quantity or quality.

According to 10 CFR Part 1022, a floodplain assessment must be completed to evaluate flood hazards and floodplain management for proposed actions that are located within a floodplain. DOE completed a floodplain assessment for the DTTF project including project description, floodplain impacts, and mitigation. The floodplain assessment is attached as Appendix C of this EA. The floodplain assessment also includes the "Notice of Proposed Floodplain Action." As a result of the floodplain assessment, DOE concludes that its Proposed Action of funding the DTTF project would have no adverse impacts on the natural and beneficial floodplain values. DOE also concludes that no impacts on lives or property in the area are anticipated because the proposed project would not alter the depth of flood waters or otherwise modify inputs to, or flow of, water in Charleston County floodplain.

The proposed DTTF project would require the exposure and removal of groundwater (dewatering) during foundation construction and other planned activities (Fluor, 2010). As a result, Clemson University would prepare plans in compliance with the existing RCRA Permit and VCC to be implemented during construction to allow for the safe handling and disposal of contaminated groundwater (Tuten, 2010). These committed measures were discussed in Section 2.2.3. After review of the local and regional groundwater conditions and given the involvement of the U.S. Navy and the SCDHEC via the requirements mandated by the RCRA Permit and the VCC protocol, the DOE concludes that the DTTF would have no impacts on groundwater resources.

3.2.2.2 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to the CU DTTF project, and DOE assumes that the project would not proceed without this assistance. Adverse impacts on the natural and beneficial water resources values and lives or property in the area would be the same regardless of the selected preferred alternative or no-action alternative.

3.3 Cultural Resources and Historic Preservation

Cultural resources are archaeological sites, historical structures and objects, and traditional cultural properties. Historic properties are cultural resources that are listed on or eligible for listing in the National Register of Historic Places because they are significant and retain integrity (per 36 CFR 60.4). Section 106 of the National Historic Preservation Act (16 U.S.C. § 470 *et seq.*) requires that federal agencies take into account the effects of their actions on historic properties. Section 101(b)(4) of the NEPA requires the Federal agency to coordinate and plan its actions to identify any unique historic or cultural characteristics of the geographic area (40 CFR 1508.27) of the proposed project and act accordingly.

Regulations for Protection of Historic Properties (36 CFR Part 800) describes the process for compliance with Section 106, including defining the Area of Potential Effect (APE), steps to identifying resources, evaluate effects, and consultation with interested parties including the SHPO and as well as other concerned parties.

The first step of the process is for the agency official to determine whether the action is an undertaking (36 CFR 800.3(a)). This action is an “undertaking” in that it is “a project, activity, or program funding in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; and those requiring a Federal permit, license or approval” (36 CFR 800.16(y)).

36 CFR 800.3(a)(1) states that “If the undertaking is a type of activity that does not have the potential to cause effects on historic properties, assuming such historic properties are present, the agency official has no further obligations under section 106, or this part.” By definition (36 CFR 800.16(i)) an “effect” is an “alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register.” The proposed project meets this criteria and is subject to review and consultation with SHPO and other concerned parties (identified in accordance with 36 CFR 800.3(f)).

3.3.1 Affected Environment

The APE consists of the entire 6.3-acre project area. This area was determined by considering the area that would be directly impacted by construction activities, including ground disturbance from the rail, equipment lay down areas, and demolition of portions of Building 69. Due to the nature of the project, development of an industrial facility in a traditionally industrial area, it is anticipated that the undertaking

would not have an impact on audible or visual conditions beyond those already existing in the area. Thus, DOE determined that the APE does not extend beyond the project boundary.

The Charleston Navy Yard Historic District is listed on the National Register of Historic Places (South Carolina Department of Archives and History 2006). Building 69 is located southwest of this district (Figure 2-8). A map of the Charleston Naval Yard District is included as Figure 3-3. This district, comprised of 57 contributing resources, primarily industrial and administrative structures, is nationally significant under National Register Criteria A and C (Laurens, 2006).

Figure 3-3: Building 69 in Relation to Charleston Navy Yard Historic District
Source: SCAHF 2006

There are no previously recorded archaeological sites in or adjacent to the APE. There has not been a systematic archaeological survey in the project area; however, the development during the twentieth century has covered much of the ground surface with concrete or asphalt.

3.3.2 CULTURAL/HISTORICAL IMPACTS

3.3.2.1 Proposed Project

DOE has concluded that no historic properties are present in the APE for this project. SHPO was contacted via letter dated May 26, 2010 (attached in Appendix B) and the Catawba Indian Nations officer was contacted in a letter dated May 25, 2010 regarding the proposed activities of the DTTF. A second letter, dated June 7, 2010 was sent to SHPO to initiate consultation, identify the proposed APE, request SHPO identify any other potential consulting parties, and request any additional input that they may provide. This letter also identified DOE's intent to determine that the undertaking would not pose an adverse effect to historic properties unless conflicting information was received via the consultation process.

On June 15, 2010, DOE received a letter from the Catawba Indian Nation's THPO concurring with the initial finding. It also stated that, if any Native American artifacts and or human remains are encountered during the ground disturbance phase of this project, the THPO should be notified.

On July 1, 2010, DOE received an email from the SHPO requesting additional information regarding the location of the proposed rail spur. DOE provided the requested information to the SHPO in a letter dated July 7, 2010.

DOE determined the proposed project would have no adverse effects (per 36 CFR 800.5(a)) to any historic properties. In a letter dated August 10, 2010 SHPO concurred with DOE's determination thereby concluding the Section 106 consultation process. In the event that archaeological materials or human remains are encountered during ground disturbing activities, all such activities will stop and Clemson University will notify both the SHPO and THPO of the discovery and ask for their direction on how to proceed.

3.3.2.2 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to the DTTF project, and DOE assumes that the project would not proceed without this assistance. Modification of Building 69 and the surrounding area would not occur and there would be no change in the area surrounding the Charleston Navy Yard Historic District.

3.4 Socioeconomic and Environmental Justice Impacts

Socioeconomics is defined as the activities and resources involved with the everyday human environment, particularly involved with population centers, their demographics and economic activities therein. Economic activity within a population typically includes employment and average income statistics and industrial or commercial growth. The perceived success of various initiatives, such as pro-growth or anti-growth sentiments and policies, as well as the impact of specific projects on a local population are dictated by changes in these fundamental socioeconomic indicators. Any public or private project undertaken can be deemed to have socioeconomic impacts, both positive and negative.

There are no Federal regulations dictating that decisions regarding publicly reviewed projects be based on socioeconomic considerations. However, there is one legal consideration in an executive order (EO) that pertains to socioeconomic and environmental justice issues. On February 11, 1994, EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* was issued by President Clinton. This rule requires that Federal agencies' actions substantially affecting human health or the environment do not exclude persons, deny persons benefits, or subject persons to discrimination because of their race, color, or national origin.

This EO was adopted to ensure the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no groups of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, state, tribal, and local programs and policies. EO 12898 is included in the socioeconomic section of this EA because it relates to various socioeconomic groups and the health and environmental effects that could be imposed on them. Consideration of environmental justice concerns includes race, ethnicity, and the poverty status of populations in the vicinity of a proposed project. Such information aids in evaluating whether a proposed action would render vulnerable any of the groups targeted for protection in the EO.

3.4.1 AFFECTED ENVIRONMENT

Ethnicity, poverty, income, and employment status information is presented to establish North Charleston's baseline socioeconomic conditions to provide an understanding of the socioeconomic forces

could be shaped by the project. According to the U.S. Census Bureau, the City of North Charleston was estimated to have approximately 87,295 people in 2006. The population of the city of North Charleston is composed of 48.7% African American, 43.5% Caucasian, and 7.7% Hispanic. People that self-identify as being of Asian, Native American, Pacific Islander, other ethnic groups, or of mixed ethnic origin comprise less than 1 percent of the population. The population in the state of South Carolina is 29.5% African American, 67.2 % Caucasian, and 2.4% Hispanic (United States Census Bureau, 2003). The population in the United States is 12.3% African American, 74.3% Caucasian, and 15.1% Hispanic (United States Census Bureau, 2008). When compared to the South Carolina and U.S. demographic distributions, the City of North Charleston has a higher than average African American population, and a Hispanic population that is somewhat higher than the state average but considerably lower than the national average.

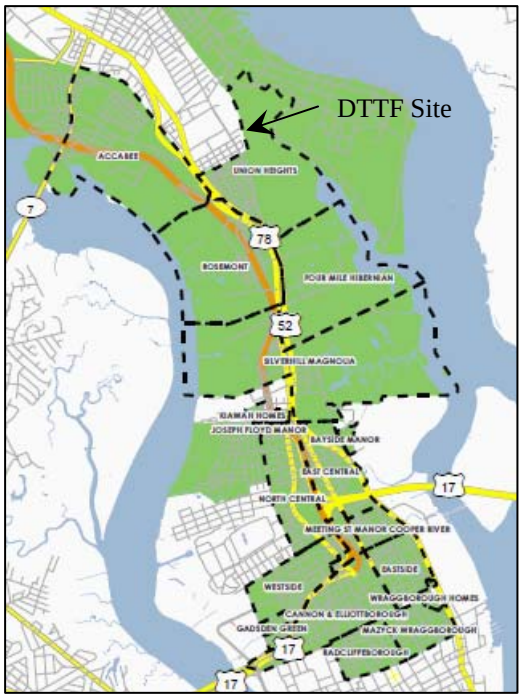

Figure 3-4: Charleston Renewal Communities
Source: City of Charleston, 2010

Twenty-four percent of North Charleston's population, compared to thirteen percent of the U.S. population, was below the poverty level. The median household income in North Charleston (in 2008 inflation adjusted dollars) was $36,461, which is lower than the national average of $52,175 (United States Census Bureau, 2008). In April 2010, the Charleston, Summerville, and North Charleston metropolitan area had an unemployment rate of 8.7% (United States Department of Labor, 2010).

To address North Charleston's high rate of poverty the surrounding area has been designated as a HUD-certified economically distressed area and is surrounded by a HUD- certified renewal community. This designation is designed to attract entrepreneurs and investors, stimulate job creation, and promote business retention through tax incentives (HUD, 2010). Reasonably foreseeable actions in that area that may have a cumulative effect on socioeconomic and environmental justice factors are discussed in greater detail in Section 4.2.

North Charleston residents are actively being engaged in developing and implementing plans to improve social and economic conditions throughout the North Charleston areas through the community organization Lowcountry Alliance for Model Communities. This group includes the seven nearest neighborhoods (Accabee, Chicora/Cherokee, Union Heights, Howard Heights, Windsor Place, Five Mile, and Liberty Hill) in North Charleston (Figure 3-4). Policy issues they have been active in developing include economic development, housing, community facilities, and land use with the goal of meeting North Charleston resident's social, residential, educational and economic needs for the future (AECOM, 2010).

The Lowcountry Alliance for Model Communities has developed a Revitalization Plan to study the existing conditions and trends of the impoverished area of North Charleston in an effort to concentrate efforts on the most significant needs of the citizens (AECOM, 2010).

During construction of the DTTF, the average daily construction workforce is estimated to be 50 to 100 workers (Tuten, 2010). Clemson University is currently working with local companies including CMMC Machine, LLC in North Charleston (CNC), SC; Detyens Shipyard in North Charleston (CNC), SC; and J.E. Oswalt & Sons in Batesburg, SC to provide operational support (Kelly et al., 2009).

3.4.2 Socioeconomic and Environmental Justice Impacts

3.4.2.1 Proposed Project

During the operation phase of the DTTF the permanent workforce would be approximately 21 employees. This number of people is too small to make an impact on social services or housing in the area. However, Clemson University anticipates that many DTTF customers would require the local service providers for such tasks as machining, welding, electrical, and equipment shipping needs. The DTTF project would have an immediate, temporary demand for people working in construction trades. Clemson University would also contract facility maintenance and operational support from local enterprises. Thus, the DOE concludes a small beneficial impact to the surrounding community would result from the proposed DTTF.

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*, directs federal agencies to address environmental and human health conditions in minority and low-income communities. The evaluation of impacts to environmental justice is dependent on demonstrating that significant, adverse impacts from the proposed project are not disproportionately borne by any low-income or minority groups in the affected community. The city of North Charleston has a higher proportion of people classified as minorities and a higher proportion of people with a low income than the population of South Carolina or the United States (see Section 3.4.1). However, as illustrated in this EA, Clemson's proposed project would not result in significant adverse impacts to any members of the community surrounding the proposed project site, or to anyone else. Therefore, DOE concludes that there would be no adverse and disproportional impacts to minority or low-income populations in the North Charleston neighborhoods surrounding the CNC or elsewhere in the surrounding region.

3.4.2.2 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to the DTTF project, and any beneficial socioeconomic impacts resulting from this project would not occur.

3.5 Infrastructure and Energy

This section describes the affected environment for and consequences to utility infrastructure and energy use of the proposed project. Specifically, this resource area addresses water, wastewater, electricity, natural gas and the ability of the electric grid to supply the large amount of energy necessary for the initiation of testing at the DTTF.

3.5.1 AFFECTED ENVIRONMENT

3.5.1.1 Water and Wastewater Infrastructure

The proposed site currently has access to potable water and wastewater infrastructure from the Charleston Water Systems (CWS) and the North Charleston Sewer District (NCSD). To protect the drinking water and local wastewater infrastructure from overburden, prior to constructing a new or modifying an existing water supply system a permit must be obtained from SCDHEC Bureau of Water. The new water main connections, sanitary sewer connections, and associated piping would be designed, permitted, and

installed as designed under the supervision of a professional engineer registered in South Carolina (Tuten, 2010).

The proposed facility would use potable water only for new toilet areas / break rooms and to operate the cooling tower. The cooling tower would originally be filled with purchased deionized water. The new piping would tie into the existing water line in the northwest corner of the building and would be sized to meet pumping loads for the facilities and cooling tower (Fluor, 2010). The estimated daily demand for potable water from the DTTF facility of 525 gallons per day, compared to a total daily demand of 65 million gallons per day from the Charleston Water System (Brown, 2010). The daily flow of wastewater for the facility would be approximately 525 gallons per day. The NCSD wastewater treatment plant is rated for 27 million gallons per day and the current average daily flow is approximately 14 million gallons per day (Jones, 2010).

3.5.1.2 Electrical Infrastructure

SCE&G serves the midlands and southern South Carolina with natural gas and generates, transmits, and distributes electricity to approximately 659,000 customers throughout South Carolina, including the CNC (SCE&G, n.d.). SCE&G provides both electric and natural gas service to the Building 69 area. Currently the building is supplied with electrical service via underground lines that enter the east side of the facility. New underground electrical lines connecting the facility to the electrical grid would be necessary for the proposed project (Kelly et al., 2009).

The proposed project would be serviced by a 13.8kV electrical service. After initial startup energy demands of 13 MW, long term energy needs considering the generation of power by the tested drivetrains, is expected to be approximately 2.65 MW (Kelly et al., 2009). In 2009 the Charleston areas electrical energy requirements were approximately 6.3 billion KWh (SCE&G, 2010). To meet the DTTF's demands, SCE&G has committed to provide the off-site utility upgrades necessary to support both the DTTF project and additional ongoing projects to support continued development of the CNC. These upgrades would include the installation of a breaker station, transmission lines and substation improvements. This arrangement would provide uninterruptable power to the proposed project and to planned development in the project area including the SC Ports Authority's Navy Base Container Terminal currently under construction.

3.5.2 ENVIRONMENTAL CONSEQUENCES

3.5.2.1 Proposed Project

Clemson University has contacted CWS and NCSD for confirmation that the water and sewer utility systems can accommodate the additional demands of the proposed DTTF. As part of the Building 69 renovation, new or upgraded potable water and sanitary sewer connections to CWS and NCSD, respectively, would be necessary (Kelly et al., 2009). The demands on the water and sewer utility systems would be very small compared to the existing capacity, as noted in Section 3.5.1.1. Construction permits from SCDHEC Bureau of Water addressing available water and sewer would be required for approval prior to construction. DOE concludes that there would be negligible impacts to the water and wastewater infrastructure.

Clemson University is cooperating with SCE&G to ensure reliable uninterrupted service to Building 69 (Fluor, 2010). The DTTF would require a very small increase in the energy consumed from SCE&G; thus, there would be only negligible increases in electrical power generated (SCE&G, 2009) and resulting air emissions to support the proposed project. SCE&G supports the proposed DTTF project and confirms

that upgrades as detailed in Section 2.2.8 would be made in the general site area that would be able to accommodate the energy needs of the facility (Fluor, 2010).

Clemson is considering various means, including the primary use of DC current, as a means to ensure the facility would not impact the electrical grid by backflow of electrical current from the test rigs. The drivetrains would be creating energy through testing which would be harnessed and redirected or recycled to the test rig, allowing the operation of the rig to use minimal electrical power once testing is initiated (Kelly et al., 2009).

DOE concludes that the DTTF project would have negligible impacts on infrastructure and energy resources. A discussion of the SCE&G electrical upgrade to the grid is included in Chapter 4 as part of cumulative impacts.

3.5.2.2 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to the DTTF project, and DOE assumes that the project would not proceed without this assistance. Upgrades to SCE&G's electrical infrastructure on the CNC would continue to be driven by projects currently underway. The small increase in demand on utilities required for the proposed project would not occur.

3.6 Health and Safety

The definition of a safe environment is one in which there is a minimized risk for potential for death, serious bodily injury or property damage. Having a healthy and safe environment is usually the result of the collective safety awareness of the individuals within the area. Prevention measures to achieve safe conditions include proper planning, training, equipment, resources, and various types of health and safety plans (Travelers, 2008).

Known hazards to human health associated with the construction industry include acute hazards such as falling from a significant height, being struck by moving vehicles, or shocked from electrical lines (BLS, 2008a). Other hazards may be due to exposure to dangerous construction materials such as asbestos, lead, or particulates created by construction activities. Some materials may have an effect over the long term and are considered chronic exposures. These include exposure to noises or dangerous chemicals such as contaminated soil or groundwater. Some methods by which human health may be affected by contaminated soil or groundwater are directly through fugitive dust or volatile inhalation, oral ingestion, and/or dermal absorption or indirectly by consuming plants or animals that have been exposed (USEPA, 2010e).

According to the Department of Labor statistics on fatal occupational injuries in the year 2008, there were fourteen fatalities related to construction work in South Carolina (BLS, 2008a). Incidence rates[5] also indicate an increased hazard associated with construction work (BLS, 2008c). For the year 2008 the construction industry in South Carolina experienced 2.6 recordable cases with approximately twenty percent of the cases resulting in job transfer or restriction (BLS, 2008b).

5. The Incidence rate indicates the number of injuries and related illnesses per 100 full time for non-fatality statistics and cases per 100,000 full-time workers for fatality statistics. Non-fatality incidence rates are measured in terms of total number of incidences, number of days out of work per incidence and cases necessitating job transfer or restriction.

3.6.1 Affected Environment

One of the first steps in minimizing employee injury is to recognize possible hazards and develop plans for safe working practices. At the proposed DTTF, there is reason to believe that lead and asbestos containing materials were used in the construction of Building 69 and that the soil and groundwater are contaminated with chemicals of concern. In addition to hazards associated with these conditions are hazards associated with construction in general.

Clemson University works to develop and maintain a culture of environmental, safety, and health stewardship. This practice would be considered an integral part of the facility design process that would include safety eye washes, fire suppression, fire alarm, evacuation routes and other identified safety equipment and features in the facility. Key environmental, safety, and health activities in the design and renovation of the building would include the following:

- Asbestos assessment, and remediation and disposal;
- Lead based paint assessment, and remediation and disposal;
- PCB assessment, and if necessary remediation and disposal;
- Health and Safety Plan development to address potential construction worker exposure to soil and groundwater contamination;
- A Safety Review Plan of the proposed facility would be developed to understand the safety and health characteristics of the facility and its operations;
- The Safety Review Plan would be updated as the detailed design is generated;
- A Safety Training Program would be developed. All employees and contractors would be trained to the Plan prior to the commencement of construction. The program would be developed to meet all OSHA guidelines and would include at a minimum:
  - Lock-out/Tag-out
  - Confined Space Entry
  - Hot Work Permit
  - Heavy Overhead Lift
  - Safety Incident Reporting
  - Safety Observation
  - Fall Protection.

A Project Safety Manager would be assigned directly to the Project Manager. The Facility Director and Test Engineers would be responsible for ensuring the safe operations of the facility. Safety would be the responsibility of all employees and would be written into each job description. Each Facility worker, contractor, Customer representative or visiting scientist and students would be empowered with “Stop Work” or “Time Out” authority in the event a procedure is unclear or a worker feels a work situation is potentially unsafe. Incidents and “near miss” events would be discussed at Project meetings in order to understand events and to develop “lessons learned.” Changes to the scope, schedule, budget, or planned work activities may be initiated by a “lesson learned,” and provide sufficient reason to trigger a Change Request (Kelly et al., 2009).

3.6.2 HEALTH AND SAFETY CONSEQUENCES

3.6.2.1 Proposed Project

Clemson University would conduct construction activities under the practices detailed in Safety and Health Plans approved by a Health and Safety Professional or Certified Industrial Hygienist to address applicable OSHA requirements. A hazardous material building survey (S&ME, 2010b) identified lead based paint on the large industrial racks within Building 69, and asbestos in the floor tile and floor mastic and roofing products in the rear warehouse and former dispatch office. The warehouse portion containing lead components will be dismantled and recycled, and the asbestos containing materials will be completely removed and disposed in accordance with SCDHEC, OSHA, and USEPA regulations. No additional hazardous materials were identified. Regarding the site proper, the committed measure of allowing below-grade construction activities while adhering to existing U.S. Navy and SCDHEC site specific approved work plans would reduce the potential for worker exposure to potentially contaminated soil and groundwater at the project area. Clemson University is committed to create a safe environment for employees and dedicated to the implementation of safe working practices. DOE concludes that the proposed project would cause minimal risk to the health and safety of construction workers, facility occupants, and the surrounding community.

3.6.2.2 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to the DTTF project. DOE assumes that the project would not proceed without this assistance, and there would be no health and safety risks from construction and operation of the facility or disturbance of hazardous materials.

3.7 Noise

Noise is any unwanted, undesirable sound. It has the potential to interfere with communication, damage hearing, and, in most cases, it is viewed as an annoyance. Noise can occur in different volumes and pitches depending on the type of source and the distance away. It is important to consider the amount of noise that would be created during both the construction and operation phases of a project so as to not inconvenience people working or living in the surrounding areas (HUD, 2009).

The Clean Air Act established the Office of Noise Abatement and Control with the objective of studying the effect of noise of public health. When the Office of Noise Abatement and Control was closed in 1981, all responsibilities dealing with noise were given to state and local governments. The City of North Charleston has established and enforces noise ordinances to ensure that the public is not disturbed (USEPA, 2010a). According to the City of North Charleston noise ordinance, the proposed DTTF is exempt from noise restrictions due to the lack of residential areas located within 300 feet of the facility (Code of Ordinances: North Charleston, SC; 1986). The closest residential areas are more than 1,000 feet west of the proposed DTTF location.

3.7.1 Affected Environment

The proposed DTTF would include noise attenuation devices to reduce the noise inside and subsequently outside of the building. Each turbine test rig must run separately; thus, it is critical to eliminate noise or vibrations that can be transferred from one test rig to the other (Kelly et al., 2009). The architects of the proposed project would design the facility to prevent high levels of noise and vibrations (Fluor, 2010). Clemson University's intended design would meet OSHA noise regulations for working environments and City of North Charleston ordinances. However, within the individual test rig areas, technicians and

researchers would be required to wear hearing protection devices per the safety policies described in Section 3.6.

It is expected that there would be additional noise from the approximately 20 shipments of drivetrain components arriving and departing by rail, ship, and truck. The majority of the shipments would be by barge then transferred to the facility via tracker. In this scenario, transit of test specimens would be restricted to the CNC facility. Otherwise test specimens could arrive by rail domestically. The area surrounding the project contains an operating industrial shipyard, the primary CNC access road (Hobson Avenue), and railroad tracks; these infrastructure components are currently in frequent use by ships, large trucks, and railcars. The industrial nature of the area contributes to existing noise at the CNC (Tuten, 2010). In addition to noise generated from operations, many local businesses utilize the railway and trucks for shipments. Transportation noise is a large contributor to the noise environment (HUD, 2009).

3.7.2 Noise Environment Consequences

3.7.2.1 Proposed Project

As described in Section 2.2.3, noise attenuation for the two test rigs would be designed to reduce noise to prevent unwanted interference and maintain the required testing sensitivity between the two test cells. The noise attenuation would be in compliance with North Charleston's noise ordinance. The closest residents are located approximately 1,000 feet to the west of the facility and would not be affected by or experience increases in noise. Worker protection plans would be developed as described in Section 3.6 to eliminate long term effects to employees. Due to the small number of annual (approximately 20) shipments for the proposed DTTF, and the existing surrounding transportation patterns, DTTF would have a negligible impact to the existing noise environment due to transportation. Therefore, the DOE has concluded that the project would cause little or no change in noise in the surrounding area.

3.7.2.2 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to the CU DTTF project, and DOE assumes that the project would not proceed without this assistance. There would be no change in noise in the area surrounding Building 69.

4. CUMULATIVE IMPACTS

4.1 Introduction

The Council on Environmental Quality Regulations stipulate that the cumulative impacts analysis within an EA consider whether the potential environmental impacts resulting from the "incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such actions" (40 CFR 1508.7). Because the impacts of the proposed project generally would be minor and localized, DOE focused it's evaluation of cumulative impacts of the proposed project and reasonably foreseeable future actions within the City of North Charleston.

The City of North Charleston is centrally located on the Charleston Peninsula with the Cooper River to the North and the Ashley River to the South. Historically this area of the city was where much of the industrial land uses were located, with major rail and highway transportation corridors traversing the center of the peninsula. In 1996 the CNC was closed and the City of North Charleston experienced a decrease of approximately eleven percent in the labor force. Approximately 22,000 employees worked on the CNC (Charleston County, 2008). Since 1996, there have been minor improvements in the employment rate, and the City of North Charleston has implemented redevelopment strategies in an effort to revive the area as described and detailed in the North Charleston Comprehensive Plan Update 2008. One such effort was the creation of the Charleston Regional Development Alliance to recruit new manufacturing and support existing industry in the area (Robert and Company, n.d.).

Since the closure of the CNC, that site has become the home to a variety of industries, institutional concerns, and commercial ventures such as CMMC, LLC, Detyen's Shipyard, Excel Apparatus, Inc., Urban Electric Company, Charleston County Parks, Noisette Company, SCSPA, Neal Brothers, Charleston CPW, SeaCrest Investments, Inc., U.S. Department of Homeland Security, U.S. Coast Guard, NOAA, SPAWAR, and more recently CURI (U.S. Navy BRAC PMO, n.d.). Even with these opportunities the North Charleston area has not recovered the number of jobs previously available through the former CNC.

4.2 Reasonably Foreseeable Actions

Recently, local large scale industrial projects approved for development in North Charleston include the Boeing Assembly Plant, the SCSPA Charleston Naval Base Marine Container Terminal, and the Macalloy Industrial Park (Figure 4-1). Other recent developments of note include Cummins Turbo Technology, BAE Systems, Scientific Research Corporation, ITT Kaliburn, and S.C. Federal Credit Union headquarters (City of North Charleston, 2010b).

As part of the Boeing 787 Dreamliner assembly plant, a 584,000 square foot facility is being constructed on International Boulevard. This private project is projected to employ at least 3,800 jobs making it the fifth largest employer in the Charleston area (Charleston Metro Chamber of Commerce, 2009). The Boeing facility is expected to spur an aeronautical industry in the Charleston area. The facility is expected to be a $750 million investment (McDermott and Wenger, 2009).

Figure 4-1: Location of Major Planned Projects

SCSPA's Charleston Naval Base Marine Container Terminal is a 287-acre port facility located along the Cooper River within the former CNC. The SCSPA completed an Environmental Impact Statement in 2008 detailing the numerous unavoidable adverse impacts, irreversible commitment of resources, and cumulative impacts of the proposed project to the surrounding environment. The planned marine container terminal consists of five major components: the wharf, berth and access channel, container yard and support facilities, improvements to Tidewater Road, and stormwater management facilities. Several related actions associated with transportation for the facility include:

- Port Access Road (a four lane access roadway from Interstate 26)
- Meeting Street Interchange (I-26 Exit 217, the improvement of the existing interchange)
- Local Access Roadway (a four-lane roadway connecting Stromboli Avenue, Bainbridge Avenue, and the planned Port Access Road)
- Stromboli Avenue Improvements (upgrade of Stromboli Avenue including intersections with Carner Avenue and Meeting Street) and
- Bridge to Tidewater Road (a new bridge traversing Shipyard Creek; USACE, 2006)

The Macalloy Industrial Park is a 141-acre former Superfund site that would have light industrial, port-related development such as warehouses and container storage. The development is intended to facilitate transportation transfer between barges, trucks, and rail. The Macalloy Industrial Park area is located south of Shipyard Creek and the proposed Marine Container Terminal (Cherokee, 2007).

These projects could result in impacts to the surrounding environment, including investments of public funds; generation of highway, commercial vessel, aircraft, and rail traffic; increased noise levels; interrupted viewshed corridors; air pollutants (from mobile emission sources); increase of stormwater drainage/impairment of water quality; permanent loss of wetlands; dredging of shallow river channels; and filling of intertidal marine areas (USACE, 2006).

The cities of North Charleston and Charleston are also home to two planned large-scale residential and mix use developments: Magnolia and Noisette (City of North Charleston, 2010a). The Magnolia Project is a 216-acre mixed use planned development converting brownfield and historically industrial property into single family residential lots, multi-family residential units, retail space, office space, and associated parking. The planned development located on the Ashley River also features a public botanical garden, a waterfront park, greenway corridor including bike paths, public neighborhood park, and a Charleston County school site (The Post and Courier, 2007).

The Noisette Project is a similar urban renewal project planned for 240 acres of the northern portion of the former CNC. Although currently on hold due to the depressed housing market, the long range plan for the property includes residential homes, offices, and shops (The Post and Courier, 2010). Other residential developments of note located in North Charleston include I'On Group's Mixon Avenue Project, Hunley Waters, and the Oak Terrace Preserve (City of North Charleston, 2010a).

North Charleston has also worked independently and with educational entities to improve, maintain, and promote local educational facilities. Specific projects include the increase in extra-curricular activities for elementary and middle school aged children, continuous support of Charleston Southern University and Trident Technical College, and the inception of the Lowcountry Graduate Center, Strayer University, ECPI College of Technology, Virginia College, Miller-Motte, and Webster University. In 2004 Clemson University established the CURI on approximately 86 acres of the CNC. CURI aims to stimulate economic development through supporting restoration industries and environmentally sustainable technologies in six focus areas: Advanced Materials, Processes, and Systems; Community Revitalization; Historic Preservation and Materials Conservation; Renewable Energy; Resilient Infrastructure; and Restoration Ecology. The DTTF would be an important addition to the development of the CURI (City of North Charleston, 2010b).

The City of North Charleston is actively recruiting industrial developments. The South Carolina Department of Commerce believes that the DTTF could help attract 10,000 to 20,000 new jobs around the Charleston region by helping to establish a wind energy industry cluster (City of North Charleston, 2010b). Following DOE's announcement of the proposed DTTF project, IMO-Group, a German manufacturer of turbine parts announced that Charleston would be its preferred location for its facility to manufacture slew rings, wind turbine components (Office of the Governor, 2010).

4.3 Cumulative Impacts Analysis

Reasonably foreseeable actions planned, constructed concurrently with, or as a result of the DTTF were considered in this cumulative impact study. As discussed previously, the DTTF would be located on previously developed property with contamination of both soil and groundwater. This general area of North Charleston has been historically used for industrial purposes as seen in the 1951 Sanborn Map (Figure 4-2). According to the 1951 Sanborn Map, North State Lumber was located in the current site

of the Macalloy Industrial Park. In the location of the currently planned Magnolia Development was Malony Fertilizer, Virginia-Carolina Chemical, and American Agriculture Chemical Co. The U.S. Navy Yard, also referred to as CNC, is the proposed locations of the DTTF, Noisette Development, and SCSPA Marine Container Terminal (Sanborn, 1951).

Because of these historically industrial uses, many environmental impacts have already occurred on the project site and surrounding area.

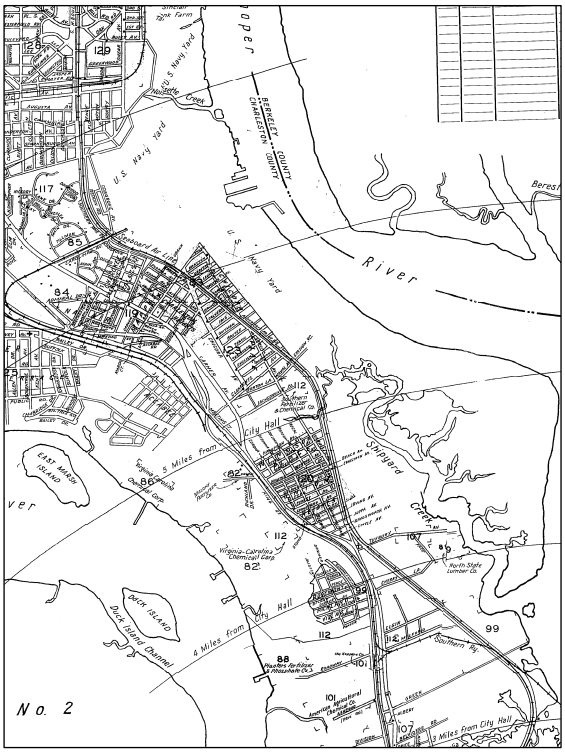

Figure 4-2: 1951 Sanborn Map
Source: Sanborn, 1951

4.3.1 SOILS AND GROUNDWATER

The construction and modification of these past, current, and planned development projects have the potential to have a short term negative cumulative impact by exposing contaminated soil and groundwater during site and facility improvements. However, local regulatory agencies are involved in the planning and oversight stages of each project to review pertinent proposed actions and obtain necessary permits. These agencies ensure that best management practices are maintained to minimize impacts to the local geology, soil, and groundwater environment.

The long-term cumulative impact will be overwhelmingly positive by converting abandoned contaminated properties into carefully developed properties that are a benefit to the surrounding communities, while further protecting the same communities from existing contamination.

4.3.2 WATER RESOURCES

The proposed DTTF project would have a negligible impact on the quantity and quality of stormwater runoff since the property currently is covered with impermeable surfaces, and hazardous materials generated from construction improvements would be handled and stored using practices detailed in a SCDHEC and U.S. Navy approved Waste Management Plan. In addition, the project would not involve site or facility elevation changes that would increase the risk of flooding. As discussed, the previous complete coverage of the property by impermeable surfaces and the existing warehouse has irretrievably altered the beneficial aspects of the natural floodplain. Also, the construction of the DTTF is expected to cause a positive impact on the base floodplain for the subject property regarding stormwater management, due to the projects proposed increase in the amount of pervious surfaces on the property. As discussed in Section 3.3, projects of this nature in Charleston County must acquire a Land Disturbance Permit which would require a Stormwater Pollution Prevention Plan and demonstration that appropriate stormwater and floodplain measures are implemented during construction.

Construction activities for reasonably foreseeable projects in North Charleston could cause a short-term increase in runoff into surface waters. Although construction of reasonably foreseeable projects in the area could also have a long term impact on water quality, the DTTF project would have no adverse impact on water quality as described in Section 3.2. Surrounding projects also could result in a short term and long term increases in the risk of flooding if new facilities cause an increase in the level of the

floodplain or obstruct the flow of floodwaters. The DTTF project would not affect the local floodplain, and would not contribute to any cumulative adverse impact to water resources.

4.3.3 CULTURAL RESOURCES

As discussed in Section 3.4, the Charleston Navy Yard Historic District is listed on the National Register of Historic Places (2006). This district, comprised of 57 contributing resources, primarily industrial and administrative structures, is nationally significant under National Register Criteria A and C.

The cumulative impacts on cultural resources from the proposed project and other past, present, and reasonably foreseeable project in the North Charleston area would be minimal. Construction planned in North Charleston, including the proposed project, would cause little or no change in the view from, or the view of, the industrial setting in the area, including the Charleston Navy Yard Historic District.

4.3.4 INFRASTRUCTURE AND ENERGY USE

As discussed in Section 3.5, CWS, NCSD, and SCE&G provide infrastructure to the North Charleston area and will be used to supply the DTTF and surrounding projects with potable water, wastewater, and energy supply. CWS and NCSD verified that they have significant capacity available for short term construction and long-term operational needs.

The DTTF requires the planned electrical infrastructure improvements for the southern portion of the former CNC including an upgraded 115kV transmission system. As discussed in Section 3.5.1.2, SCE&G has committed to provide the off-site utility upgrades necessary to support the DTTF project, the SCSPA Marine Container Terminal, and additional ongoing and future projects to support continued development of the former CNC. These upgrades will include substation improvements in addition to grid improvements which would provide uninterrupted electrical service to the southern end of the former CNC and surrounding communities. Due to SCE&G's preemptive upgrade of the electrical infrastructure on the southern portion of the CNC, no adverse cumulative impact to electrical services is anticipated due to the reasonably foreseeable projects. Furthermore, the reasonably foreseeable projects cumulative consumption of the local utilities will not exceed the capacity of utility providers in the area and are not anticipated to have an adverse impact on the local infrastructure.

4.3.5 SOCIOECONOMIC

Following the closure of the Charleston Naval Base in 1996, the City of North Charleston suffered from relatively high unemployment from which it has not completely recovered. The City of North Charleston has enacted multiple programs to assist the local community and recruit industry to the area, support new business, protect environmental justice issues, revitalize the area through tax incentive financing programs, and supplement the local school and technical college educational programs (Robert and Company, n.d.).

The DTTF project would have a small beneficial socioeconomic impact, which would contribute to the cumulative economic growth planned for the North Charleston area. Construction jobs would be created in addition to the potential influx of workers that may enhance existing local businesses. The long term cumulative impacts on socioeconomic would be positive. In addition to benefitting from the jobs created, added revenue, increase in land value, reuse of abandoned and contaminated properties, and renovation or demolition of dilapidated buildings would all enhance the local community. Measures the community may benefit from include the maintenance and construction of major transportation corridors, construction and renovation of local schools and upgrades of electric, potable water, wastewater, and

stormwater sewer infrastructures. The projects would continue to contribute to a revitalization of the economically depressed North Charleston area.

4.3.6 ENVIRONMENTAL JUSTICE

As mentioned in Section 3.4 the North Charleston area has a high rate of unemployment, poverty, and is estimated to have a population that is approximately 49.4 percent African American (U.S. Census Bureau, 2003). Some construction of reasonably foreseeable projects in the area could result in an adverse impact to the minority and low income populations in the area; however, the DTTF project would have negligible air emissions, negligible increase to traffic on railways or roadways, little or no increase in noise for surrounding residential areas, not affect water quality, and not create an adverse view for surrounding properties. Thus, the DTTF project would provide no contribution to any cumulative adverse impact to those populations.

4.3.7 HEALTH AND SAFETY

The construction and land disturbances planned for the North Charleston area have the potential to have a short term cumulative impact on health and safety via the potential exposure and handling of contaminated soils and groundwater during construction. However, local and state regulatory agencies will be involved in the planning, oversight stages, and permitting of each project. These agencies will ensure that best management practices are maintained to minimize impacts to human health and safety.

The long term cumulative impact will be positive by converting contaminated properties and abandoned buildings into carefully developed properties that are a benefit to the surrounding community, while minimizing the existing potential community exposure to soil and groundwater contamination.

4.3.8 WASTE MANAGEMENT

The construction and possible contaminated soil removal and disposal on the planned developments surrounding North Charleston will have a minimal short term cumulative effect. During these activities, construction debris will be created and disposed of by private contractors to local permitted landfills. Contaminated soils will be handled and disposed of under the projects' SCDHEC approved plan. The reuse and recycling of demolition debris will be handled on a project by project basis.

The long term cumulative impacts to waste management are minimal. The additional waste streams of the businesses and residential areas planned for development will likely increase the annual acceptance rates of the local municipal landfills, yet be within capacity use plans.

5. Irreversible and Irretrievable Commitment of Resources

Irreversible commitments of resources are actions of a proposed project that would result in the loss of resources, whether those are natural or cultural, that consequently could not be recovered or replaced promptly in the original or current condition. The proposed project would result in no irreversible or irretrievable commitments of resources during the construction of operational phase. The proposed DTTF property has been previously developed and environmental resources have already been impacted. Reuse of the property as the DTTF would result in a temporary, but not irreversible use of that property for other projects. The amount of new construction materials required for the proposed project, such as railroad ties, rails, and interior building materials would be minimal relative to the availability of those materials or the raw materials could be replenished; thus, there would be a negligible irretrievable commitment of construction resources. Long-term or permanent use of other resources, such as landfill space or the use of transportation corridors would be negligible. No consumption of raw materials or resources would be required for operation.

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APPENDIX A

This appendix contains a copy of the scoping letter and the list of persons and agencies who received a copy of the scoping letter and this Environmental Assessment.

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

May 26, 2010

SUBJECT: Notice of Scoping and Proposed Floodplain Action - Clemson University Research Institute Wind Turbine Drive Train Test Facility at the Former Charleston Naval Base Complex, North Charleston, Charleston County, South Carolina

The United States Department of Energy (DOE) is proposing to provide federal funding available through the American Recovery and Reinvestment Act of 2009 to Clemson University. The University is proposing to construct and operate a Wind Turbine Drive Train Test Facility (DTTF) at the Clemson University Research Institute in North Charleston, South Carolina. Details of the proposed project and its location are contained in the attachment. Pursuant to the requirements of the National Environmental Policy Act (NEPA), the Council on Environmental Quality regulations for implementing the procedural provision of NEPA (40 CFR Parts 1500-1508), and DOE's implementing procedures for compliance with NEPA (10 CFR 1021) and floodplain analyses (10 CFR 1022), DOE is preparing a draft Environmental Assessment (EA) to:

- Identify any adverse environmental effects that cannot be avoided should this proposed project be implemented.
- Evaluate viable alternatives to the proposed project.
- Describe the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity.
- Characterize any irreversible and irretrievable commitments of resources that would be involved should this proposed project be implemented.
- Identify and discuss effects of the proposed project on floodplains.

Potential Environmental Effects or Issues Identified for the Environmental Assessment

The EA will identify, describe and determine potential impacts, if any, on the environment and address mitigation to eliminate or reduce those impacts. At a minimum, DOE will evaluate the potential impacts that may result to:

- Air Quality
- Geology/Soils
- Biological Resources
- Water Resources, including Floodplains
- Cultural Resources
- Land Use
- Noise
- Utilities
- Infrastructure

Federal Recycling Program Printed on Recycled Paper

- Aesthetics
- Socioeconomics
- Waste Management and Hazardous Materials

Development of a Reasonable Range of Alternatives

DOE is required to consider a reasonable range of alternatives to the proposed action during an environmental review. The definition of alternatives is governed by the "rule of reason." An EA must consider a reasonable range of options that could accomplish the agency's purpose and need and reduce environmental effects. Reasonable alternatives are those that may be feasibly carried out based on environmental, technical, and economic factors.

The No Action Alternative will be addressed. The need for project redesign, or a project alternative, will be determined the course of environmental review.

Public Scoping

The DOE is sending this letter to interested federal, state, and local agencies to provide information on issues to be addressed in the EA. Agencies are invited to identify the issues within their statutory responsibilities that should be considered in the EA. The general public is also invited to submit comments on the scope of the EA.

This letter and the draft EA, when it is available, will be posted in the DOE Golden Field Office online reading room:
http://www.eere.energy.gov/golden/Reading_Room.aspx.

The DOE Golden Field Office welcomes your input throughout our NEPA process, but to ensure that your comments are received in time to be considered in the EA, please provide any them on or before **June 11, 2010** to:

Melissa Rossiter
NEPA Document Manager
Department of Energy
1617 Cole Boulevard
Golden, Colorado 80401
Melissa.rossiter@go.doe.gov

We look forward to hearing from you.
Sincerely,

Steve Blazek
NEPA Compliance Officer

3

Attachments:

1) Project Description
2) Site Location Map
3) Conceptual Site Plan

4

ATTACHMENT 1

PROJECT DESCRIPTION

CLEMSON UNIVESITY RESEARCH INSTITUTE
WIND TURBINE DRIVE TRAIN TEST FACILITY

Clemson University proposes to engineer, construct and operate a Wind Turbine Drive Train Test Facility for highly accelerated testing of drive trains for wind turbines up to 15 MW with a 30% overload capacity. The primary team on the project includes Clemson University, Clemson University Restoration Institute, City of North Charleston and Charleston, Charleston Naval Complex Redevelopment Authority, the Savannah River National Laboratory, and the State of South Carolina.

The proposed project site consists of 6.3 acres which was previously fully developed as part of the former Charleston Naval Base Complex in Charleston, South Carolina. The site elevation is 13 to 14.5 feet above mean sea level (msl) which is within the 100-year flood zone. The existing structures are approximately four feet above grade, at an elevation of 17.83 feet above msl, which is above the 100-year flood wave crest of 14.2 feet above msl.

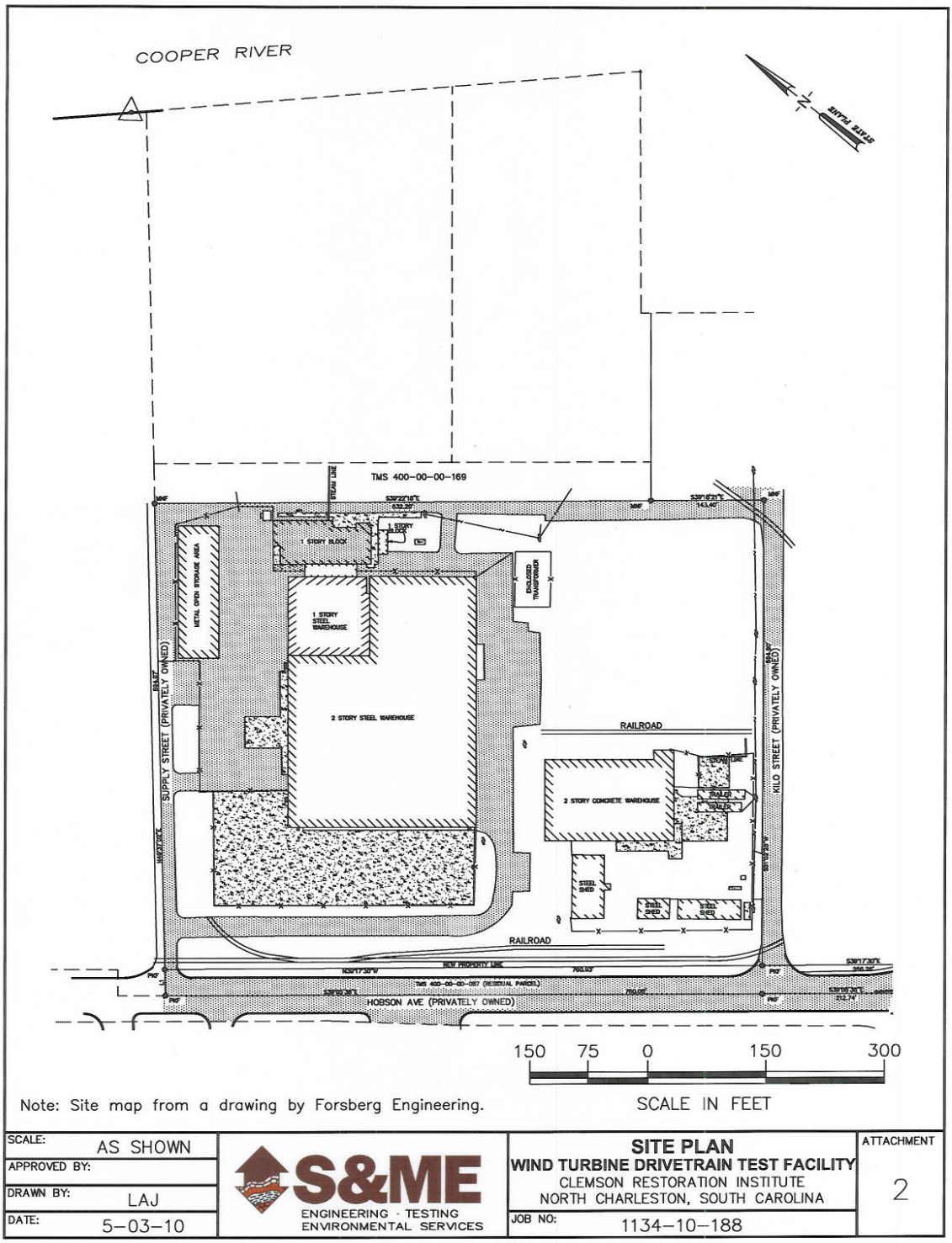
There is one large former warehouse and shipping facility (Building 69), approximately 66,448 square foot in size, which will be subject to interior renovations prior to occupancy by the Clemson University Research Institute. One portion of the main structure (Building 69), constructed around 1942, totals approximately 4,723 square feet, and is scheduled for demolition prior to occupancy by the Clemson University Restoration Institute CURI. The foundation of the building portion scheduled for demolition will remain, and is at the same elevation as Building 69. A three-sided structural steel and metal panel building of approximately 9,000 square feet is also scheduled for dismantling/demolition. Beyond these stated modifications, the only additional site changes or disturbances will be the installation of an approximately 600- to 700-foot-long rail spur running parallel to the building in an existing paved area. The rail spur will connect to an existing rail line and traverse the length of the property to allow delivery of, and ease the unloading of, the wind turbine drive trains test specimens. It is anticipated that there will be two to four drive train deliveries via the rail line per year.

The proposed project and resources will be a part of the Clemson University Restoration Institute campus. Building 69 will have two test bays, overhead cranes for moving equipment, offices, and other spaces for personnel and instrumentation. The noted rail spur will facilitate the delivery and departure of drive train units. The port has infrastructure that provides loading and unloading of drive trains, machine shop facilities, and access to more office space. It is anticipated that the local power company will enhance the existing power infrastructure to serve the proposed facility, including aboveground transmission lines to Building 69.

ATTACHMENT 1

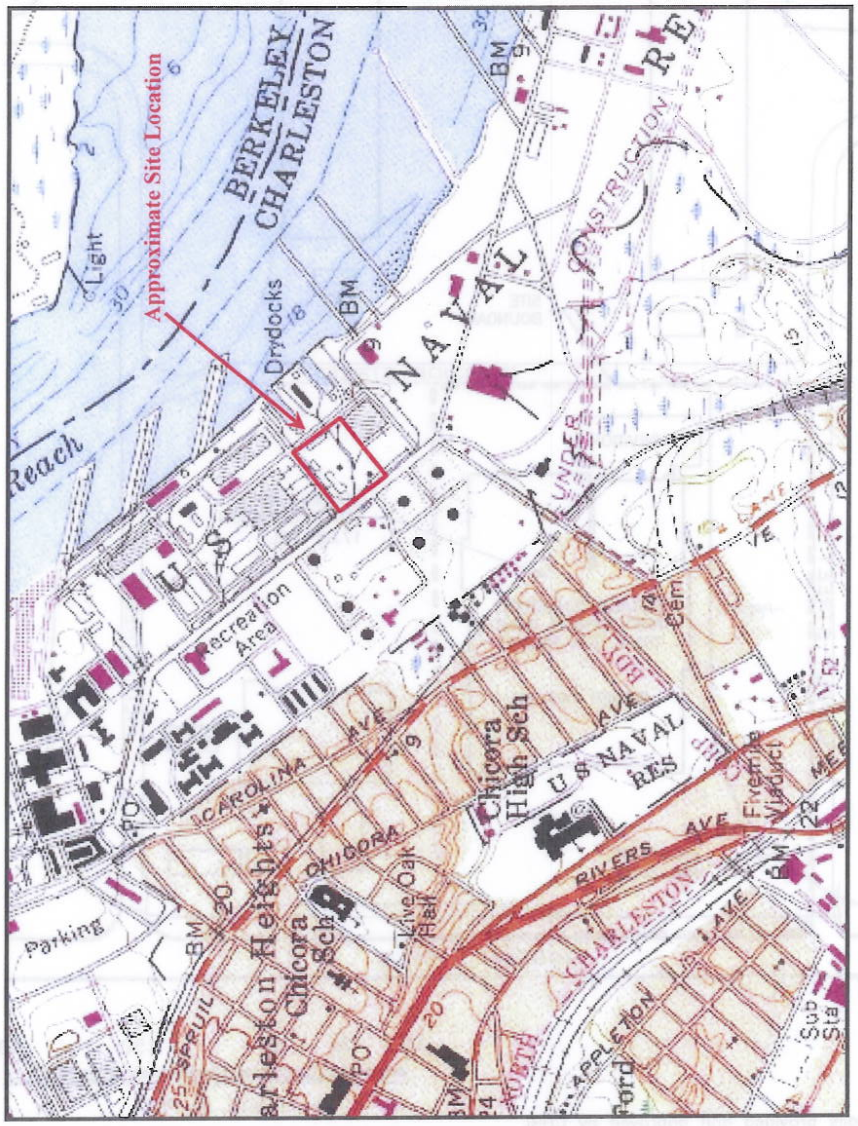
The facility will consist of two test rigs equipped with independent drive systems. Each test rig will be capable of simultaneously testing, a 7.5-MW drive train and a 15-MW turbine drive train. A climate chamber and sound separation system will be available for use on either rig. Rig #1 will have the capability to apply loads to the main shaft of the specimen drive train, replicating forces and moments along three orthogonal axes, thereby simulating actual blade forces experienced in the field.

While the facility's primary mission is to service the wind industry, the secondary missions are promoting industry/government/university collaboration in research and workforce education. The facility will be manned with a dedicated workforce to service industry needs with additional services offered by established local industries as needed by customers. It is anticipated over the next 20 years that the facility will serve as the catalyst for development of a wind industry cluster at and potentially surrounding the Charleston Naval Complex due to the unique industry/research environment near existing port, rail infrastructure and supporting industries. Project proponents anticipate that this development will create 113 temporary jobs associated with the construction of the facility and facility operation will require 21 full time positions. The potential development of a future wind industry cluster rising around the facility may indirectly create an additional 568 jobs associated with the proposed project.



Note: Site map from a drawing by Forsberg Engineering.

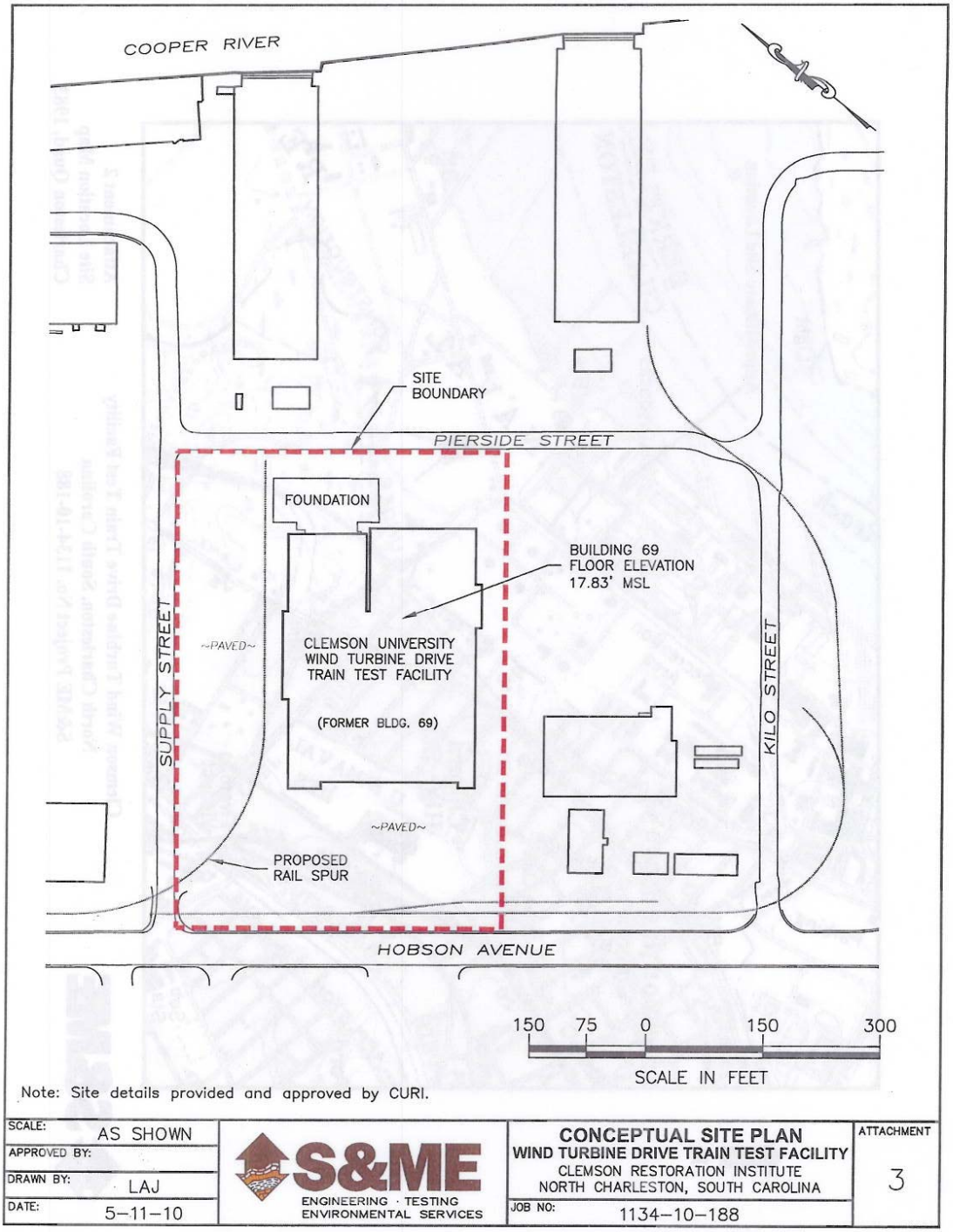
SCALE: AS SHOWN	S&ME ENGINEERING · TESTING ENVIRONMENTAL SERVICES	**SITE PLAN** **WIND TURBINE DRIVETRAIN TEST FACILITY** CLEMSON RESTORATION INSTITUTE NORTH CHARLESTON, SOUTH CAROLINA	ATTACHMENT 2
APPROVED BY:			
DRAWN BY: LAJ			
DATE: 5-03-10		JOB NO: 1134-10-188	



Clemson Wind Turbine Drive Train Test Facility
North Charleston, South Carolina
S&ME Project No. 1134-10-188

Attachment 2
Site Location Map
Charleston Quad, 1983

S&ME


COOPER RIVER
SITE BOUNDARY
PIERSIDE STREET
FOUNDATION
BUILDING 69
FLOOR ELEVATION
17.83' MSL
SUPPLY STREET
~PAVED~
CLEMSON UNIVERSITY
WIND TURBINE DRIVE
TRAIN TEST FACILITY
(FORMER BLDG. 69)
KILO STREET
~PAVED~
PROPOSED
RAIL SPUR
HOBSON AVENUE
150 75 0 150 300
SCALE IN FEET
Note: Site details provided and approved by CURI.
SCALE: AS SHOWN
APPROVED BY:
DRAWN BY: LAJ
DATE: 5-11-10
S&ME
ENGINEERING · TESTING
ENVIRONMENTAL SERVICES
CONCEPTUAL SITE PLAN
WIND TURBINE DRIVE TRAIN TEST FACILITY
CLEMSON RESTORATION INSTITUTE
NORTH CHARLESTON, SOUTH CAROLINA
JOB NO: 1134-10-188
ATTACHMENT
3

City & County Offices:

Charleston County
Office of County Administrator
Mr. O'Neal Allen, County Administrator
4045 Bridge View Drive
North Charleston, SC 29405-7464

City of North Charleston, SC
Office of the Mayor
Hon. Keith Summey
P.O. BOX 190016
North Charleston, SC 29419-9016

Charleston County
Public Works Department
Attn: Stormwater Management
4045 Bridge View Drive
North Charleston, SC 29405-7464

Charleston Metro Chamber of Commerce
Pennie Bingham, Senior Vice President
4500 Leeds Avenue., Suite 100
North Charleston, SC 29405

City of North Charleston
Department of Public Works
Engineering Division
1021 Aragon Street
North Charleston, S.C. 29405

City of North Charleston
Department of Planning and Management
William B. Gore, Zoning Administrator
Post Office Box 190016
North Charleston, SC 29419-9016

City of North Charleston
Lowcountry Alliance Model Communities
Wannetta Mallette, Project Manager
PO Box 190016
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Commissioners of Public Works
Charleston Water System
103 St. Philip Street
Charleston, SC 29403

North Charleston Sewer District
Post Office Box 63009/ 7725 Stall Road
North Charleston, South Carolina 29419

State Offices:

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Columbia, SC 29201

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Ocean & Coastal Resource Management
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SCDHEC - Bureau of Air Quality,
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SCDHEC - Bureau of Land and Waste Management
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SCDHEC RCRA Permit Compliance
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Review and Compliance Coordinator
South Carolina Archives and History Center
8301 Parklane Road
Columbia, SC 29223

South Carolina Institute of Archaeology and Anthropology
1321 Pendleton Street
Columbia, SC 29208

State Offices (cont'd):

South Carolina Department of Natural Resources
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Columbia, SC 29202

South Carolina Emergency Management Division
2779 Fish Hatchery Road
West Columbia South Carolina 29172

SC State Ports Authority
Jeannie Adame, Environmental Affairs Manager
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Charleston, South Carolina 29413

USDA-NRCS South Carolina State Office
Ann English, South Carolina State Conservationist
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Federal Offices:

Department of the Army
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Department of the Navy BRAC
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NOAA Fisheries Service
Southeast Regional Office
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NOAA Fisheries Service
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Atlantic Branch Supervisor, Fishery Biologist
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Charleston, SC 29412

NOAA Fisheries Service
Atlantic Branch: Charleston Branch Office
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Region 7 Environmental Quality Control Office
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Region 7 Environmental Quality Control Office, Air Quality
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U.S. Fish and Wildlife Service
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Charleston, SC 29407

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1536 Tom Stevens Road
Rock Hill, SC 29730

General Interest Groups:

Chicora-Cherokee Neighborhood Council
A.J Davis, Neighborhood Council President
2012 Success St.
North Charleston SC 29405-7893

Charleston Naval Complex Redevelopment Authority
1360 Truxtun Avenue, Suite 300
North Charleston, SC 29405-2005

Coastal Conservation League
P.O. Box 1765
Charleston, SC 29402-1765

Charleston County Park & Recreation Commission
Thomas J. O'Rourke, Executive Director
861 Riverland Drive
Charleston, SC 29412

Charleston Regional Development Alliance
David T. Ginn, President & CEO
5300 International Boulevard, Suite 103A
North Charleston, SC 29418

Metanoia - Rev. Bill Stanfield
2005 Reynolds Ave.
N. Charleston, SC 29405

The Navy Yard at Noisette Community Association
and Business District Association, Inc.
Jenny Wiedower, Executive Director
1450 Fifth Street, West
North Charleston, SC 29405

SCE&G Co.
Sid Ballentine
220 Operation Way, MC B102
Cayce, SC 29033-3701

Union Heights Neighborhood Council
Rahim Karriem, Neighborhood Council President
1994 Hugo Avenue
North Charleston, SC 29405

APPENDIX B

This appendix contains consultation correspondence for the proposed project.

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

June 7, 2010

Ms. Elizabeth Johnson
Deputy State Historic Preservation Officer
South Carolina Department of Archives and History
8301 Parkland Road
Columbia, South Carolina 29223-4905

Dear Ms. Johnson:

The United States Department of Energy (DOE) is proposing to provide federal funding to Clemson University to engineer, construct and operate a Wind Turbine Drive Train Test Facility (DTTF) at the Clemson University Research Institute in North Charleston, South Carolina. The facility would provide highly accelerated testing of drive trains for wind turbines. The proposed facility would supply information that will help the wind industry as well as promote industry/government/university collaboration in research and provide workforce education.

The proposed project site consists of 6.3 acres which was previously fully developed as part of the former Charleston Naval Base Complex in Charleston, South Carolina. There is one large former warehouse and shipping facility (Building 69), approximately 66,448 square feet in size, which will be subject to interior renovations prior to the occupancy by Clemson University Research Institute (CURI). Two existing buildings will be subject to demolition.

Beyond these stated modifications, the only additional site changes or disturbances would be the installation of an approximately 600- to 700-foot-long rail spur running parallel to the building in an existing paved area. The rail spur will connect to an existing rail line and traverse the length of the property to allow delivery of and ease the unloading of the wind turbine drive trains test specimens. It is anticipated that the local power company will enhance the existing power infrastructure to serve the proposed facility, including above ground transmission lines to Building 69.

The facility will consist of two test rigs equipped with independent drive systems. Each test rig will be capable of simultaneously testing, a 7.5 MW drive train and a 15 MW turbine drive train. A climate chamber and sound separation system will be available for use on either rig. The facility will have the capability simulate actual blade forces experienced in the field.

A review of existing information was conducted to identify any known historic and/or archeological resources that may be affected by the proposed undertaking. Building 69 is southwest of the National Register of Historic Places-listed Charleston Navy Yard Historic District. This district, comprised of 57 contributing resources, primarily industrial and administrative structures, is nationally significant under National Register criteria A and C.

Federal Recycling Program Printed on Recycled Paper

There are no previously recorded archaeological sites in or adjacent to the subject property. The ground surface in that area has been covered with concrete or asphalt during the twentieth century and there has not been a systematic archaeological survey in the project area.

Based on the review of existing information and knowledge that the proposed industrially-developed site has been covered with concrete or asphalt for much of the past century, DOE is of the opinion that no historic properties are present within the APE. Unless the consultation process reveals currently unidentified historic properties, DOE is prepared to make a determination that no historic properties would be affected by the proposed undertaking. In compliance with 36 CFR Part 800, the DOE will inform the South Carolina Department of Archives and History, State Historic Preservation Office of its final determination after contacting potentially affected tribal organizations and ask for your concurrence of this finding. Attached to facilitate your review of this project is the requisite South Carolina Department of Archives and History, State Historic Preservation Office Section 106 Project Review Form. The form includes a map detailing the location of historic sites in the general proposed project area.

DOE's Golden Office is preparing a draft environmental assessment (EA) for this project. DOE will include correspondence with your office in an appendix to the EA. DOE will send you a copy of the draft EA and respond to any specific comments you may have. At this time, we anticipate implementing a 15-day public comment period for this proposed project.

Please forward the results of your review and any requests for additional information to Ms. Melissa Rossiter of the Golden Field Office as soon as possible at the following:

Ms. Melissa Rossiter
NEPA Document Manager
U.S. Department of Energy
1617 Cole Boulevard
Golden, Colorado 80401-3305
Email: melissa.rossiter@go.doe.gov
Phone: 720-356-1566

Sincerely,

Steve Blazek

NEPA Document Manager

Attachments
1. Exhibit 1. Site Location Map
2. Exhibit 2. Conceptual Site Plan

United States Department of the Interior

FISH AND WILDLIFE SERVICE
176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407

June 22, 2010

JUN 2 4 2010

Mr. Bret Davis
Mr. Chuck Black, P.E., LEED AP
S&ME, Inc.
620 Wando Park Boulevard
Mt. Pleasant, SC 29464

Re: Protected Species Report
Clemson University Research Institute - Wind Turbine Drive Train Test Facility
Former Charleston Naval Base Complex
North Charleston, Charleston County, SC
FWS Log No. 2010-TA-0430

Dear Mr. Davis and Mr. Black:

The U.S. Fish and Wildlife Service (Service) has reviewed the plans for this proposed project. Based on our review and the information received:

☒ The proposed action will have no effect on resources under the jurisdiction of the Service that are currently protected by the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.)(Act). Therefore, no further action is required under Section 7(a)(2) of the Act.

☐ The proposed action is not likely to adversely affect resources under the jurisdiction of the Service that are currently protected by the Act. Therefore, no further action is required under Section 7(a)(2) of the Act.

If the proposed project will impact wetlands, please contact the U.S. Army Corps of Engineers, Charleston District. If you have any questions, please contact Ms. Morgan Wolf at (843)727-4707, ext. 219 and reference FWS Log No. 2010-TA-0430.

Sincerely,

Jay B. Herrington
Field Supervisor

JBH/MKW

TAKE PRIDE IN AMERICA

DEPARTMENT OF THE ARMY
CHARLESTON DISTRICT, CORPS OF ENGINEERS
69A Hagood Avenue
CHARLESTON, SOUTH CAROLINA 29403-5107

JUN 2 4 2010

REPLY TO
ATTENTION OF

June 21, 2010

Regulatory Division

Mr. Bret Davis
S&ME, Inc.
620 Wando Park Boulevard
Mt. Pleasant, South Carolina 29464

Dear Mr. Davis:

This is in response to your letter received June 15, 2010, requesting a wetland determination, on behalf of Clemson University Restoration Institute, for a 10.485 acre tract located between Hobson Avenue, Kilo Street and Supply Street in the City of North Charleston, Charleston County, South Carolina. The project area is depicted on the survey plat you submitted which was prepared by Forsberg Engineering and Surveying, Inc., dated December 21, 2009, and entitled "Plat Showing the Subdivision of TMS 400-00-00-087 (32.140 AC.) Irto Parcel A 10.485 AC and New Residual 21.655 AC City of North Charleston Charleston County SC".

Based on a review of aerial photography and soil survey information, it has been determined that the referenced property does not contain any wetland areas or other waters of the United States and, as such, Department of the Army authorization will not be required for mechanized land clearing, excavation, or the placement of dredged or fill material on this site.

Please be advised that this determination is valid for five (5) years from the date of this letter unless new information warrants revision of the delineation before the expiration date. All actions concerning this determination must be complete within this time frame, or an additional delineation must be conducted. For the purposes of 33 CFR 331.2, this is considered to be an approved jurisdictional determination.

In future correspondence concerning this matter, please refer to SAC 2010-00726-2JY. A copy of this letter is being forwarded to the South Carolina Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management for their information.

If you have any questions concerning this matter, please contact David Chamberlain at 843-329-8044 or toll free at 1-866-329-8187.

Respectfully,

for Charles R. Crosby
Chief, South Branch

D H E C

PROMOTE PROTECT PROSPER

C. Earl Hunter, Commissioner

Promoting and protecting the health of the public and the environment.

June 18, 2010

Melissa Rossiter
NEPA Document Manager
Department of Energy
1617 Cole Boulevard
Golden, CO 80401

Re: WIND TURBINE DRIVE TRAIN TEST FACILITY
CHARLESTON County
Funding Assistance – 70160

Dear Ms. Rossiter:

The staff of the Department of Health and Environmental Control's Office of Ocean and Coastal Resource Management certifies that the above referenced project is consistent with the South Carolina Coastal Zone Management Program provided that (1) no wetlands are disturbed or altered without appropriate authorization, (2) all necessary State and Federal permits and associated certifications are obtained prior to performing work and (3) the proposed work does not contravene the policies of the Coastal Zone Management Program. Necessary permits include but are not limited to the NPDES General Permit for Storm Water Discharges from Large and Small Construction Activities.

This certification shall serve as the final certification for the above referenced funding assistance only and does not alleviate your responsibility to obtain any other required local, state or federal approvals.

If you have any questions, please call me at 843-953-0243.

Sincerely,

TARA C MADDOCK
Stormwater Project Manager
Regulatory Programs Division

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
Ocean and Coastal Resource Management
Charleston Office · 1362 McMillan Avenue, Suite 400 · Charleston, SC 29405
Phone: 843-953-0200 · Fax: 843-953-0201 · www.scdhec.gov

August 10, 2010

Melissa Rossiter
NEPA Document Manager
U.S. Department of Energy
1617 Cole Boulevard
Golden, CO 80401-3305

Re: Clemson Wine Turbine Facility, North Charleston, Charleston County, SC
SHPO #: 10CW0358

Dear Ms Rossiter:

Thank you for your letter of June 7, which we received on June 9, regarding the above referenced project. We also received a project description and photos as supporting documentation for this undertaking. We requested additional information via e-mail on July 1, and received it on July 8. The State Historic Preservation Office is providing comments to the U.S. Department of Energy pursuant to Section 106 of the National Historic Preservation Act and its implementing regulations, 36 CFR 800.

The Charleston Naval Historic District is located adjacent to the project area. Based on the description of the Area of Potential Effect (APE) and the identification of historic properties within the APE, our office concurs with the assessment that there will be **no adverse effect** caused by this project.

If archaeological materials are encountered during construction, the procedures codified at 36 CFR 800.13(b) will apply. Archaeological materials consist of any items, fifty years old or older, which were made or used by man. These items include, but are not limited to, stone projectile points (arrowheads), ceramic sherds, bricks, worked wood, bone and stone, metal and glass objects, and human skeletal materials. The federal agency or the applicant receiving federal assistance should contact our office immediately.

If you have any questions, please contact me at (803) 896-6169 or cwilson@scdah.state.sc.us.

Sincerely,

Caroline Dover Wilson
Review and Compliance Coordinator
State Historic Preservation Office

S. C. Department of Archives & History • 8301 Parklane Road • Columbia • South Carolina • 29223-4905 • (803) 896-6100 • http://scdah.sc.gov

Catawba Indian Nation
Tribal Historic Preservation Office
1536 Tom Steven Road
Rock Hill, South Carolina 29730

Office 803-328-2427
Fax 803-328-5791

June 15, 2010

Attention: Melissa Rossiter
NEPA Document Manager
U.S. Department of Energy
1617 Cole Boulevard
Golden, Colorado 80401-3305

Re. THPO #	TCNS#	Project Description
2010510-2		Proposed to provide federal funding to Clemson University to engineer, construct and operate a Wind Turbine Drive Train Test Facility at the Clemson University Research Institute ion North Charleston, SC

Dear Ms. Rossiter,

The Catawba have no immediate concerns with regard to traditional cultural properties, sacred sites or Native American archaeological sites within the boundaries of the proposed project areas. **However, the Catawba are to be notified if Native American artifacts and / or human remains are located during the ground disturbance phase of this project.**

If you have questions please contact Caitlin Totherow at 803-328-2427 ext. 226, or e-mail caitlinh@ccppcrafts.com.

Sincerely,

Caitlin Totherow for

Wenonah G. Haire
Tribal Historic Preservation Officer

APPENDIX C

This appendix contains the Floodplain Assessment.

Floodplain Assessment

Floodplains are defined as lowlands adjoining inland and coastal waters which are prone to periodic flooding. Sixty seven percent of Charleston County is located within the base floodplain. The base floodplain is defined as the 100-year floodplain, or a floodplain with a one percent chance of flooding in any given year. It was determined that DOE's Proposed Action of funding the Clemson University Wind Turbine Drivetrain Test Facility (DTTF, DE-FOA-0000112) would be located within a base floodplain, and therefore be applicable to the floodplain management requirements of 10 CFR Part 1022, "Compliance with Floodplain and Wetland Environmental Review Requirements." The proposed DTTF project location is in base floodplain zone designation AE with base flood elevations of 13 and 14 feet above msl, as determined by Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (Figure 3-1). Flood zone designation AE is defined as the base floodplain where base flood elevations are provided.[6]

A "Notice of Proposed Floodplain Action" was provided in a scoping document dated May 26, 2010 to appropriate government agencies, including:

- Region IV FEMA Office
- SC Emergency Management Division Office
- State of SC Clearinghouse
- Catawba Tribal Historic Preservation Office
- City of North Charleston, South Carolina
- Charleston County, South Carolina

Project Area and Project Description—The DTTF will be located within the base floodplain in the previously developed Charleston Naval Complex, a former US Navy Base in North Charleston, S.C. The facility will be located in an existing US Navy structure (Building 69). This location features access to shipping by water, roadway, and railway. The wind turbine drivetrains proposed for testing are massive in size, with the expected weight being up to 500 tons per unit. Water-based loading and unloading of drivetrains is a primary attraction to the project location. The Charleston Naval Complex provides a unique industry/research environment due to its status as a brownfield site near an existing port, railway infrastructure, and supporting industries.

The proposed project area is an approximate total of 6.3 acres of base floodplains, which have been previously developed with paved parking areas and one large former warehouse and shipping facility (Building 69). The site elevation varies from approximately 13 to 14.5 feet above msl which is within the 100-year flood zone. The existing structure to be renovated to house the DTTF is approximately four feet above grade, at a finished floor elevation of 17.83 feet above msl which is higher than the 100-year flood wave crest elevation of 14.2 feet above msl. All project activities except transportation of materials, and including storage of hazardous materials and wastes, will occur within the renovated structure.

The proposed project involves interior renovations to Building 69 prior to occupancy by CURI. One portion of the structure totaling approximately 4,723 square feet is scheduled for demolition prior to occupancy by CURI. However, the foundation and building slab of this structure will remain, which is

[6] AE Zones are now used on new format FIRMs instead of A1-A30 Zones.

the same elevation as the remaining portion of Building 69. The only additional and applicable site changes or disturbances will be landscaping improvements and the installation of the remaining portion of approximately 700 linear feet of rail spur in an existing paved area. The rail spur will connect to an existing rail line and will allow shipment of the wind turbine drivetrain test specimens.

The proposed site is subject to flooding due to hurricanes and tropical storms that can impact the Charleston, SC area. The Charleston area has experienced twelve documented hurricanes recorded in the past two centuries and has geologic conditions that exacerbate flooding. These geologic features include both the low elevation of coastal areas and shallow ocean depths surrounding Charleston that contribute to greater storm surges. Due to the widespread development in flood zones and Charleston County's predisposition to flood hazards, the County has developed a proactive approach to flood mitigation. The local Flood Damage Prevention Ordinance is in compliance with FEMA requirements. The City of North Charleston also participates in the National Flood Insurance Program. Additional steps that will be taken by DTTF to minimize potential harm to or within the floodplain includes runoff controls, design and construction constraints.

Floodplain Impacts—The DTTF project would require renovation of the interior renovation of existing Building 69 warehouse. The existing building slab, which exceeds both the flood level and wave crest height for the 100-year flood zone, would not be modified. Stormwater flow will be decreased and drainage systems will be improved for Building 69 and within the subject property. Some areas of impermeable surfaces are would be removed for landscaping and installation of a railroad spur. These improvements would cause decrease in stormwater runoff and be a positive impact on the Charleston County base floodplain for the subject property. Furthermore the project would not cause a change to the elevation of any facilities within the base floodplain. DTTF would observe local floodplain ordinances, local sedimentation and erosion control ordinances, and other local and state requirements.

Because the proposed DTTF would be located within the Charleston County base floodplain, the proposed project location must be evaluated to determine if it is practical in light of its exposure to flood hazards, the extent to which it will aggravate the hazards of others, and the potential to disrupt floodplain values. Past coverage of the property by impermeable surfaces and the existing warehouse has irretrievably disrupted the beneficial floodplain values. The project will not create additional increase of flooding for nearby properties, as those properties have been impacted by previous development of the property.

The proposed DTTF site elevation is 13 to 14.5 feet above msl and the existing warehouse foundation building slab is approximately four feet above grade, at a finished floor elevation of 17.83 feet above msl. At the proposed DTTF location, the 100-year flood wave crest is 14.2 feet above msl and the stillwater flood elevation is 13 to 14 feet above msl. This indicates that the contents of Building 69 would not have a significant exposure to flood hazards, because the predicted floodwaters would not breech the foundation at the 100-year flood levels. Therefore, DOE has determined that the low chance of flooding for the interior of Building 69 and the benefits gained from the industrial nature of the surrounding land use and infrastructure allow for the practicability of the DTTF to be located at the proposed property.

Thus, DOE concludes that the Proposed Action of funding the DTTF project would have no adverse impacts on the natural and beneficial floodplain values. DOE also concludes that no impacts on lives or

property in the area are anticipated because the proposed project would not alter the depth of flood waters or otherwise modify inputs to, or flow of, water in the floodplain.

Because the proposed DTTF would be located within the Charleston County base floodplain, potential adverse impacts must be avoided, minimized or compensated for. As discussed, the previous complete coverage of the property by impermeable surfaces and the existing warehouse has irretrievably altered the beneficial aspects of the natural floodplain. Also, the construction of the DTTF is expected to cause a positive impact on the base floodplain for the subject property regarding stormwater management, therefore the minimization of impacts is not applicable.

Alternatives—For actions that would be located in a floodplain, DOE regulations at 10 CFR 1022 require consideration of alternatives that would minimize potential harm to or within the floodplain. The project area was originally developed in the mid 1900s and impacted the floodplain by the complete coverage of the property by impermeable surfaces and construction of the existing warehouse facility (Building 69). The proposed DTTF location was selected due to industrial land uses and its proximity to barge, rail, and major interstate corridors. The existing Building 69 floor slab elevation exceeds the base floodplain and wavecrest height, which is a form of mitigation against flooding. Because the project would not adversely affect the natural and beneficial floodplain values and would not impact lives or property within the floodplain, DOE did not consider or evaluate alternative locations or design options.

References

"Documentation for Areawide Compliance Process, Executive Order 11988 – Floodplain Management Berkeley, Charleston, Dorchester counties, South Carolina." US Department of Housing and Urban Development Columbia Office. Dated April 6, 1988.

"Flood Insurance Study – Charleston County, South Carolina and Incorporated Areas" Federal Emergency Management Agency. Dated November 17, 2004.

"Federal Emergency Management Agency Flood Insurance Rate Map." Charleston County, South Carolina and Incorporated Areas, Panel 502 of 855. National Flood Insurance Program. Map Number 45019C0502J. November 17, 2004.