DOE/EA-1605

ENVIRONMENTAL ASSESSMENT FOR BIOMASS COGENERATION AND HEATING FACILITIES AT THE SAVANNAH RIVER SITE

AUGUST 2008

U. S. DEPARTMENT OF ENERGY
SAVANNAH RIVER OPERATIONS OFFICE
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LIST OF ABBREVIATIONS/ACRONYMS

AEGL	Acute Exposure Guide Levels
BAQ	Bureau of Air Quality
BDF	biomass-derived fuel
BFB	bubbling fluidized bed
BMPs	best management practices
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	carbon monoxide
CSWTF	Central Sanitary Wastewater Treatment Facility
CWA	Clean Water Act
DOE	U.S. Department of Energy
EA	environmental assessment
ECM	Energy Conservation Measure
ERPG	Emergency Response Planning Guidelines
ESP	electrostatic precipitator
FMB	Fourmile Branch
FY	Fiscal Year
gpm	gallons per minute
HAPs	Hazardous Air Pollutants
HF	hydrogen fluoride
ID	induced draft
kV	kilovolts
kVA	kilovolt-amps
LAER	Lowest Achievable Emission Rate
MACT	Maximum Achievable Control Technology
mbtu	million British thermal units
mgd	million gallons per day
NAAQS	National Ambient Air Quality Standards
NA NSR	Nonattainment New Source Review
NEPA	National Environmental Policy Act
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
O_3	ozone
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbons
Pb	lead
PM	particulate matter
pph	pounds per hour
ppm	parts per million
PRV	pressure reducing valve
psi	pounds per square inch
ROW	right-of-way

SCDHEC	South Carolina Department of Health and Environmental Control
sf	square foot
SNCR	selective non-catalytic reduction
SIP	State Implementation Plan
SO_2	sulfur dioxide
SRARP	Savannah River Archaeological Research Program
SRNL	Savannah River National Laboratory
SRS	Savannah River Site
SWPPP	Stormwater Pollution Prevention Plan
TDF	tire-derived fuel
TEEL	Temporary Emergency Exposure Level
tpy	tons per year
TRL	Three Rivers Regional Municipal Solid Waste Landfill
µm	micrometer
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
UTR	Upper Three Runs
VOC	volatile organic compound
WSRC	Washington Savannah River Company

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1.0 INTRODUCTION

The U.S. Department of Energy (DOE) prepared this environmental assessment (EA) to analyze the potential environmental impacts of the proposed construction and operation of new biomass cogeneration and heating facilities at the Savannah River Site (SRS) (Figure 1-1). The facilities would consist of two Energy Conservation Measures (ECMs); (1) a new biomass cogeneration facility to replace the existing coal-fired D-Area powerhouse, and (2) two new biomass heating plants at K and L-Areas, to replace the existing oil-fired K-Area steam plant. In addition to analyzing the proposed action, the No Action Alternative was also considered.

1.1 Background and Proposed Action

A large portion of SRS (the F, H, and S-Areas) is supplied with its energy and steam from a coal-fired powerhouse in D-Area, while an oil-fired steam plant in K-Area supplies steam energy to both K and L-Areas (Figure 1-2). The coal-fired D-Area powerhouse was constructed in the 1950s and the K-Area oil-fired steam plant was installed in 1992. Both are in need of significant modifications to reliably supply energy for DOE's continuing missions and to meet current environmental regulations and air emission restrictions. In addition they represent significant overcapacity relative to current and projected needs. The project described in this EA would replace the two existing facilities with three biomass energy facilities. Specifically, DOE's proposed action is the construction and operation of the following facilities: a new biomass cogeneration facility, to replace the existing D-Area powerhouse; and two new biomass heating plants at K and L-Areas, to replace the existing K-Area steam plant. The proposed biomass cogeneration facility and heating plants would supply energy to the F, H, K, L, and S-Areas of SRS. The proposed project would help SRS meet its energy requirements for an initial term of 21 years, with the potential for many years of continued operation after the initial term.

The project is being proposed under the authority and terms of the DOE Biomass and Alternate Methane Fuel Energy Savings Performance Contract number DE-AC26-02-NT41457. DOE anticipates the proposed project would create significant energy and energy cost (dollar) savings to SRS. The savings would result from fuel switching, reductions in line losses by placing the steam plants several miles closer to end user facilities, and improved operations with new equipment that is sized to better match to the load requirements. In addition to providing for much of SRS's steam needs with a renewable energy source, the project would create benefits to the surrounding area. All three plants would utilize biomass obtained from the region, and would use the best available control technology for the reduction of air emissions.

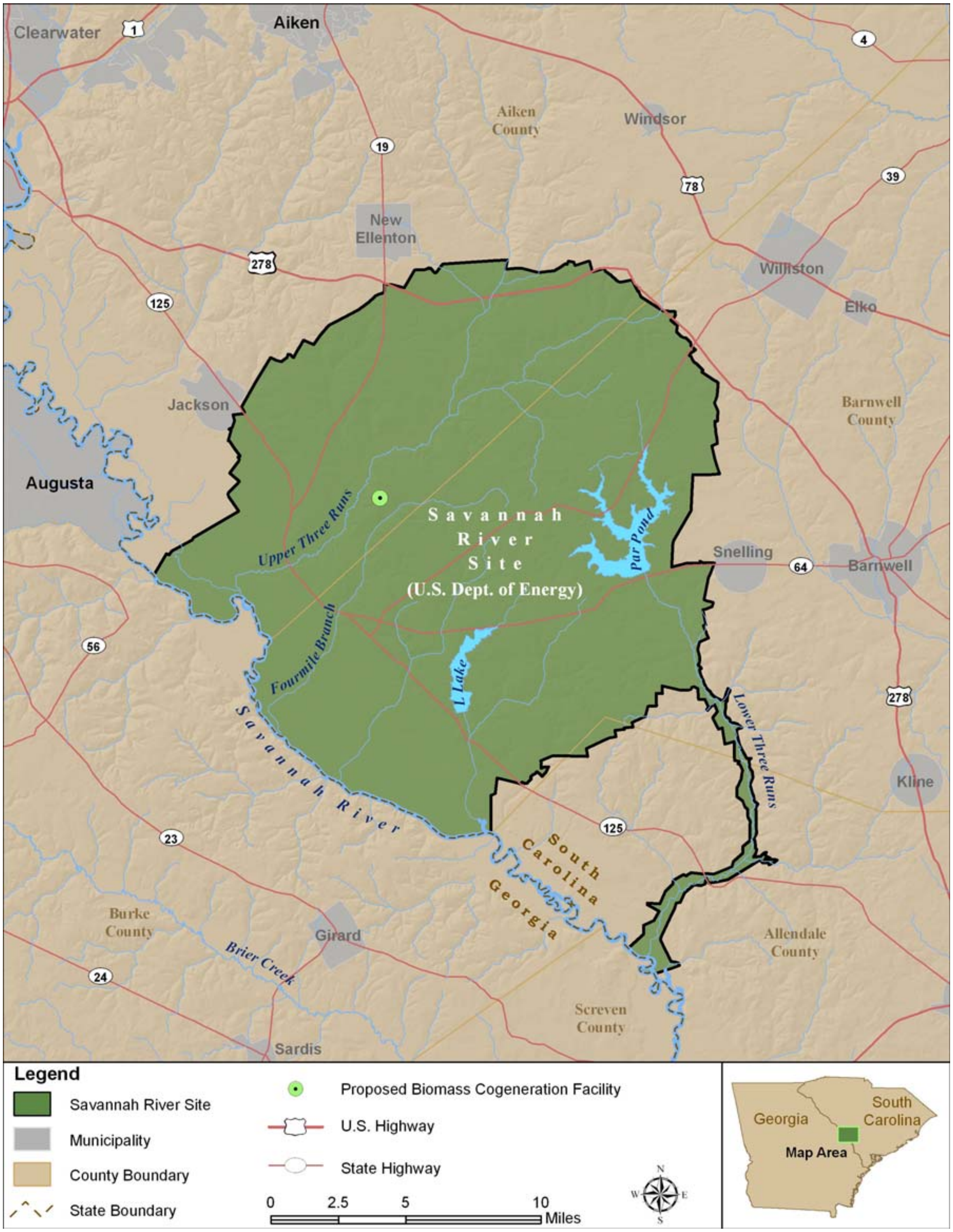

Figure 1-1. SRS Vicinity Map

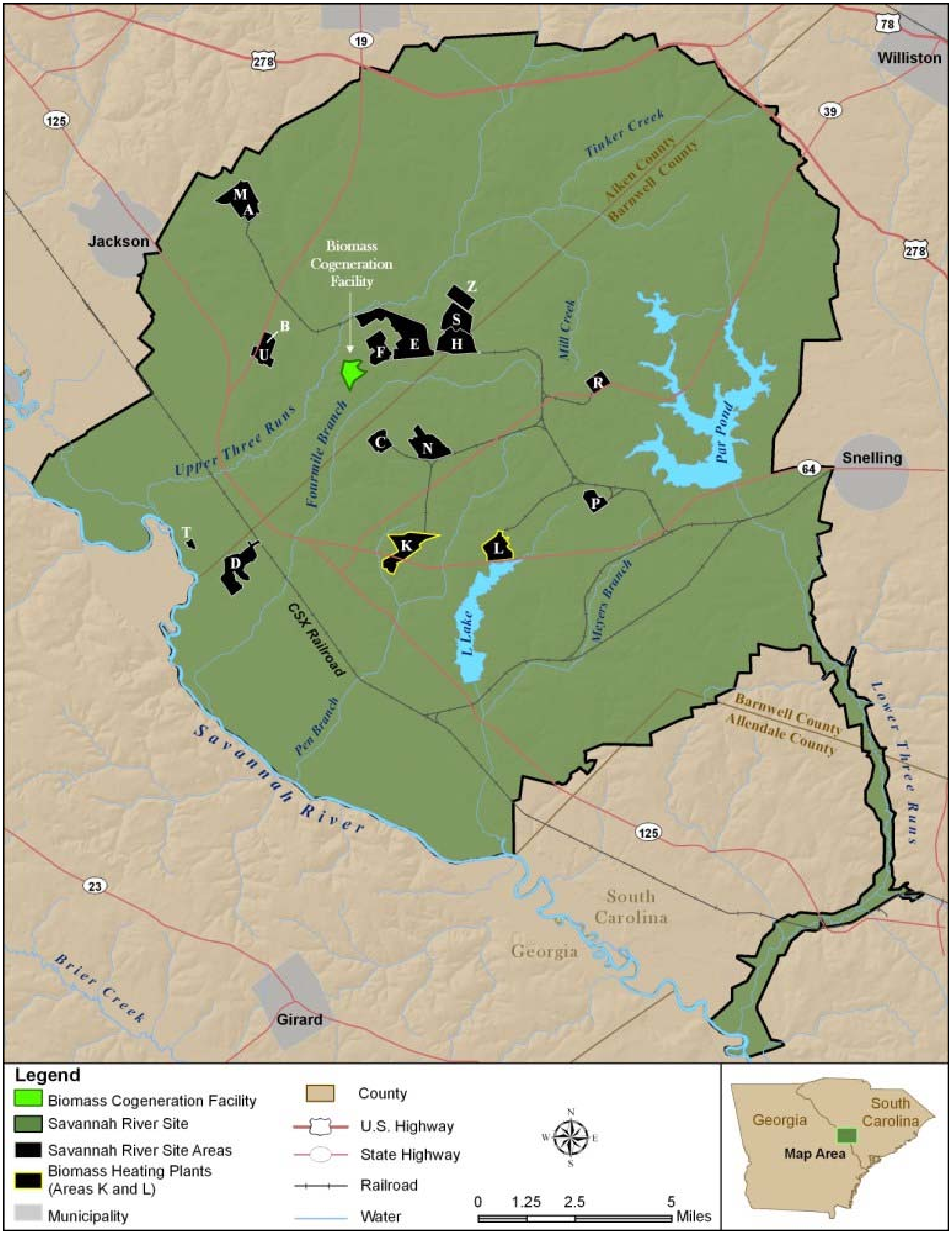

Figure 1-2. SRS Site Map

1.2 Purpose and Need

The purpose of the proposed action is to supply large portions of SRS with reliable and efficient sources of energy. DOE needs to generate energy to support continuing and future SRS missions through more efficient and environmentally preferable means. DOE needs to utilize biomass and bio-derived fuels as a fuel source to move towards meeting requirements set forth in the Energy Policy Act of 2005, Public Law 109-58, which directs all Federal agencies to increase their renewable energy use, with a goal of using (1) 3 percent or more renewable energy in Fiscal Year (FY) 2007 through 2009, (2) 5 percent or more renewable energy in FY 2010 through 2012, and (3) 7.5 percent or more renewable energy by FY 2013.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 Proposed Action

The proposed action, the construction and operation of biomass cogeneration and heating facilities at SRS, would consist of the following two Energy Conservation Measures (ECMs): a new biomass cogeneration facility to replace the existing coal-fired D-Area powerhouse; and two new biomass heating plants, one in K-Area and one in L-Area to replace the existing oil-fired steam plant in K-Area. The ECM project components are described in detail below.

2.1.1 ECM 1: Biomass Cogeneration Facility

The biomass cogeneration facility would be located on a 30-acre site near the center of SRS on an old abandoned borrow pit that appears to have had no restoration. The facility would produce approximately 850,000,000 pounds of steam per year which would be exported to the 200-Area users and would meet all of the thermal energy (steam) requirements of the F, H, and S-Areas of SRS. The facility would also produce from 6 to 15 megawatts (MW) of electricity which would be connected and distributed to the SRS electrical distribution system for use onsite. Electricity output would vary based on the quantity of excess steam available after the steam load requirements are met.

2.1.1.1 Biomass Energy

Biomass fuel would be burned in the new facility to produce steam and power. The biomass would consist of primarily low-value wood residues and wood waste by-products with a small percentage of biomass-derived fuel (BDF) and oil delivered from the local Aiken and Augusta areas. Biomass sources may include low-value forest products, forest residues and wood processing waste by-products, agricultural crops, construction waste, and alcohol fuels. Wood is the most common form of biomass and is available from several waste sources. This material includes by-products from manufacturers such as furniture mills, saw mills, paper mills and other wood product manufacturers; low-value forest products, such as small trees and top wood, and defective or deformed trees; forest residues, such as dead wood and hazardous wildland fire fuels and landscaping waste. Woodwaste is typically in the form of sawdust, woodchips, pellets, and wood scraps such as crates and pallets, and is regularly used as an energy source for heating and power generation. There are numerous sources of biomass available within 100 miles of SRS and the fuel would be procured through purchases from local biomass suppliers. Many of the local suppliers obtain a portion of their biomass through timber sales from SRS. In the future, SRS may evaluate the potential of increasing the quantity of onsite biomass fuel while minimizing impacts to current forest products management. If feasible, the forest product mix may be modified to increase the availability of small wood suitable for bioenergy as forest products are sold and removed from the Site. In addition, the possibility of planting and utilizing short rotation woody crops is being evaluated as a sustainable source of fuel through establishing and monitoring of experimental and demonstration sites. This potential increase in the quantity of onsite biomass would allow the proposed biomass cogeneration facility to maximize the use of onsite biomass sources. Any such proposed changes to the SRS Natural Resources Management Plan to increase the quantity of onsite biomass would undergo the appropriate NEPA review.

The majority of all bioenergy (64 percent) generated in the U.S. is derived from wood products (DOE 2005a). Bioenergy, in turn, is the largest source of domestic renewable energy. Of all energy consumed in the U.S., approximately 6 percent currently comes from renewable energy sources (DOE 2005a). Bioenergy had an installed capacity of 9,733 megawatts (MW) in the U.S. in 2002, which amounted to 47 percent of all renewable energy consumed (DOE 2006a). Hydroelectric (45 percent), geothermal (6 percent), wind (2 percent), and solar (1 percent) sources account for the other sources of renewable energy used in the U.S. (DOE 2005a).

Clean biomass would make up 70-100 percent of the fuel source for the cogeneration facility. Up to 400,000 tons a year of biomass would be processed in the proposed cogeneration facility. The clean biomass would consist of:

- **Forest Logging Residues**: Material not typically harvested or removed from logging sites in commercial hardwood and softwood operations; and, material resulting from forest management operations such as precommercial thinning and removal of dead and dying trees, and in the reduction of hazardous wildland fire fuels;
- **Low-Value Forest Products**: Typically small trees and top wood, and defective or deformed trees normally used for pulp and composite material manufacturing, but usually of such low value as to make their cost for transportation marginal;
- **Wood Waste Residues**: Bark and woody materials that are generated in primary wood-using mills when roundwood products are converted to other products. Examples are slabs, edgings, trimmings, sawdust, shavings, veneer cores and clippings, pulp screenings, bark residues and other wood waste;
- **Urban Wood Waste**: The portion of the waste stream that can include discarded wood products, whole trees, pruned branches or stumps generated during street and park maintenance. The primary constituents of urban wood waste are used

lumber, trim, shipping pallets, trees, branches, and other wood debris from construction and demolition clearing and grubbing activities.

BDF would make up to 30 percent of the heat input source for the cogeneration facility. The BDF would consist of tire-derived fuel (TDF) coming from scrap tires brought to transfer stations and to landfills. The maximum permitted amount of BDF processed in the proposed facility would be approximately 1.1 million British thermal units (mbtu)/year or 43,000 tons of tires/year.

In addition, each biomass boiler would be capable of burning fuel oil in the event the biomass feed system fails. As fuel oil is used, the biomass consumption would decrease. Five percent of the fuel input for the proposed cogeneration facility could be fuel oil. This consumption would vary, as it would be a backup fuel only.

The delivery trucks would enter SRS using an existing primary road to the plant entrance. A deceleration lane would be added for trucks to enter the cogeneration facility as part of this project. Once onsite, the trucks would be unloaded using a truck dumper. A fire suppression system would be part of the cogeneration fuel storage area. The trucks would exit behind the cogeneration facility where a new traffic light would be installed. The current graveled road would be paved to support the biomass truck deliveries. Peak truck traffic would be an 8 hour operation with 7 to 8 trucks per hour, 5 days per week.

2.1.1.2 Facility Components

The proposed cogeneration facility would include two 120,000 pounds per hour (pph) (210,000 mbtu/hr input) boilers and one 20 megawatt turbine. Each boiler would have full capacity fuel-oil burners that would serve as a back-up in case the biomass fuel system is inoperable. The proposed facility would have a footprint of approximately 20,000 square feet (sf), with an additional 2,200 sf administration building in front of the plant, a detached garage, and fuel yard covering approximately 12-acres.

The development on the site would include four main components: 1) the fuel handling yard, 2) the steam/combustion system, 3) the water treatment system, and 4) the turbine and electrical system. The 850 pounds per square inch (psi) steam produced by the steam plants would pass through a single extraction turbine. Steam required by SRS would then be transferred to an existing steam distribution system, and the remaining steam would flow through the other stage of the turbine for additional power generation.

The combustion/steam system would include the components from the fuel feeder to the exhaust stack and the steam auxiliaries. A bubbling fluidized bed (BFB) combustion technology is proposed for this project. BFB technology uses high pressure air to fluidize a 2-3 foot bed of sand (inert material) in suspension. The fuel source is fed into the system through air spouts and dropped onto the bed. The system operates using air to reduce the bed temperature and minimize nitrogen oxide (NOx) emissions. BFB technology is preferable to the circulating fluidized bed (CFB) for biomass fuels due to its ability to better tolerate various fuel types, as well as larger variations in both fuel mixture density and moisture content. BFBs have the advantage of reduced air emissions due to a more stringently controlled temperature in the combustion process.

The BFB boiler would produce steam at 850 psi, 825° F. The steam would pass through a condensing steam turbine when generating electricity, or, if the turbine is down, through a pressure reducing valve (PRV) station which would reduce the pressure to 385 psi. The 385 psi steam would be distributed to the existing system via the interconnection to the existing steam header located just across an existing road from the new plant.

Each boiler would include a flue gas handling system, which would consist of an induced draft (ID) fan to pull the boiler flue gas through the economizer, and then through a multiple cone dust collector. The ID fan would exhaust into a fabric filter baghouse and then to an integral exhaust stack. The baghouse would capture particulate matter from the flue gas with removal efficiencies of 99.9+ percent. Because of the lower bed temperature of a BFB, a baghouse would be used instead of an electrostatic precipitator (ESP). The baghouse would be more effective in capturing sulfur and mercury components and has minimal energy requirements compared to the ESP. The flue gas would then exit through a stack adjacent to the ID fan and baghouse, to be located just outside of the new facility.

The flue gas from the steam plant would be treated in the combustion system using selective non-catalytic reduction (SNCR) technology to reduce nitrogen oxides. Urea would be injected into the furnace typically above the over-fire air ports, reacting with the oxides to form innocuous nitrogen and hydrogen.

Cooling process water for the facility would be drawn from the Savannah River. New more efficient pumps would be installed in the 681-3G Pumphouse to provide the water to the biomass cogeneration facility. A new pipeline would be installed from the proposed facility site to the nearest water main pump house in C-Area, a distance of approximately 1.5 miles. Of this distance, the pipeline would follow an existing right-of-way (ROW) for a mile and would then branch off for 0.5 miles through forested land. Industrial wastewater from the facility would be discharged via a discharge system to Upper Three Runs (UTR). The ash and other waste generated during facility operations would be disposed of at the nearby permitted Three Rivers Regional Municipal Solid Waste Landfill (TRL). A new electrical feeder line would be constructed to tie the facility into the SRS electrical grid system at the 251-F substation.

Construction of the cogeneration facility is scheduled to begin in September 2008, and would continue for 2.5 years. A peak number of 200 construction workers would be required during the construction period. The facility would be online near the end of 2010, and would operate 24 hours per day for an initial term of 21 years, though the serviceable life of the facility would be over 30 years. Approximately 20 employees would be required for operation of the facility.

2.1.2 ECM 2: Biomass Heating Plants for K and L-Areas

ECM 2 would consist of two new biomass heating plants; one would service K-Area and the other would service L-Area. The new K-Area plant would be adjacent to the existing oil-fired steam plant within the fenced area. The L-Area plant would be located on the footprint of Building 183-4L which was removed during site decommissioning and demolition. Both plants would consist of a combustion and steam system. The steam plants would each be capable of producing 10,500 pph of steam. Additionally, both the K and L-Area biomass heating plants would only burn clean biomass and no BDF. The biomass fuel (wood materials) would be stored at the fuel yard adjacent to the proposed cogeneration facility (ECM 1), and would be trucked to the K and L-Area plants up to a maximum of one trip per day at both sites. The fuel would be loaded onto a walking floor-bed truck at the fuel yard and then parked at the metering bin for each steam plant.

Each of the new plants would be installed in a new enclosed metal building with an adjacent covered shelter to house the fuel storage and delivery equipment. A fire suppression system would be part of each of the fuel storage areas. The total footprint of construction would be 3 acres for each plant, for a total of 6 acres. The total construction period for both plants would be approximately 18 months. Once operational, both plants would only produce steam, and would distribute the produced steam within their respective service areas (K and L). The pipeline connecting K-Area and L-Area would no longer be needed and would be capped and left in place. The boilers at the K and L plants would each have less than 1400 gallons a day of steam blow down water at peak per plant. This water would drain to the existing sanitary sewer system in K-Area and to permitted outfall L-07 in L-Area.

Each of the two biomass plants would use up to 2,500 tons per year of biomass (5,000 tons total for both plants). The plants are scheduled to operate during the colder months of November through April. Each of the plants would also be equipped with fuel oil burners for fuel oil combustion during system startup and backup. Up to about 5 percent of the plants' total fuel input could be fuel oil. Boiler feed water would be supplied from the river water system in L-Area and from the well water system in K-Area.

During the evaluation of water sources for the K and L plants, domestic water, well water, river water sources, and recycling of condensate were considered. Since feedwater is directly converted to steam and there is no condensate return system available in either area, the recycling of condensate as a water source is not a viable alternative. Based on the location of the K-Area steam plant near the well water and the condition of the process wells in K-Area, well water was determined to be the most reliable source for steam plant feedwater. The river water system is not located near the new plant and was not considered to be cost effective as a steam plant feedwater source. In L-Area, the river water system would be used because it is located in close proximity to the new biomass heating plant and the condition of the process water wells is similar to the K-Area wells. Domestic water was also considered but the 4-inch water line that feeds L-Area originates from K-Area and is inadequate to supply both the domestic water needs of L-Area facilities and the new biomass heating plant.

2.2 Alternative 2: No Action Alternative

Under the No Action Alternative, DOE would continue to operate the coal-fired D-Area powerhouse, which produces both steam and electricity for onsite consumption, and the oil-fired K-Area steam plant, which produces only steam. These facilities are past their design life and are in need of significant modifications and upgrades to bring them into compliance with current environmental standards and permitting requirements.

The existing D-Area powerhouse currently burns almost 160,000 tons of coal annually and would continue to use coal at a similar rate under the No Action Alternative. In FY 2007, 6,569 truckloads of coal were delivered to the D-Area powerhouse, totaling 153,954 tons of coal. On average, 26 truckloads were delivered to the site each day and the average weight of coal delivered per truckload was 23.4 tons.

The D-Area powerhouse is close to the Savannah River and is located several miles from its end users (F, H, and S-Areas) and must distribute steam through a large distribution pipeline to these areas, losing valuable energy in the process. In addition to steam, the powerhouse also produces approximately 20 MW of electricity on average that is consumed by DOE facilities onsite. Electricity output is based on the quantity of excess steam available after the steam load requirements are met.

The D-Area powerhouse withdraws an average of 50 million gallons of water per day from the Savannah River. Water that is used for steam plant feedwater is treated at the 483-D water plant. Untreated raw water, which is used for condenser cooling passes directly through the condenser, is discharged directly through the powerhouse's outfall. The primary National Pollutant Discharge Elimination System (NPDES) permitted outfall for the facility, D-01, discharges an average of 40.2 million gallons/day. Discharge limits are in effect for temperature, temperature difference between river water intake and discharge, residual chlorine, pH, total suspended solids, oil/grease, and manganese.

The D-Area powerhouse employs 60 people and is operated by a contractor. The existing oil-fired K-Area steam plant is maintained by SRS personnel, but no employees are permanently assigned to the facility.

The K-Area steam plant consists of two boilers, one 30,000 pph and one 60,000 pph; the 30,000 pph steam plant has been and would continue to be the primary boiler. The K-Area steam plant serves both K and L-Area users, and a 2.5 mile pipeline delivers steam to the L-Area from K-Area. The steam that travels in this distribution pipeline also loses valuable energy before reaching L-Area. The source for process water for the K-Area plant would continue to be from the well water system in K-Area.

2.3 Alternatives Considered but Dismissed

The Council on Environmental Quality (CEQ) regulations for implementing National Environmental Policy Act (NEPA) require that Federal agencies explore and objectively evaluate all reasonable alternatives to a proposed action and to briefly discuss the rationale for eliminating any alternatives that are not considered in detail. For this project, two alternative locations were considered for the biomass cogeneration plant, but were dismissed from further analysis. These alternatives are described below and represent the full range of alternatives considered for this action.

2.3.1 Alternative Site 1

Alternative Site 1 is in close proximity to the main steam header, SC Highway 125, and a 115 kilovolts (kV) electrical system. Drawbacks to this location include the distance of the site from the F-Area production wells and the Central Sanitary Wastewater Treatment Facility (CSWTF). The major drawback to this site is the distance to the 200-Area end-users (SRNL 2007). This site is the closest of the considered locations to the existing powerhouse site. Therefore, compared to the other locations, more steam line would have to stay in service if this site was used. The cost of operating and maintaining this additional line would be considerable. The energy loss from transporting the steam across this distance is also considerable (AFS 2007; SRNL 2007). To compensate for this energy loss, more fuel would be needed (AFS 2007). For these reasons, Alternative Site 1 was dismissed from further evaluation.

2.3.2 Alternative Site 2

Alternative Site 2 is close to the 200-Area end-users and groundwater production wells. However, it is far from the highway, CSWTF, and the steam main (SRNL 2007). Because of the distance from a main SRS thoroughfare, this site location would create access difficulties for construction activities and fuel delivery. Further, the site is in close proximity to a remediated nuclear waste operations site (AFS 2007). However, the key drawback of this site is that it is in close proximity to the H-Area meteorological tower and therefore would interfere with the tower's operation (SRNL 2007). For these reasons, Alternative Site 2 was dismissed from further evaluation.

2.3.3 Other Alternatives

DOE also considered alternatives related to water sources, the discharge of industrial effluent, and the cooling of process water, but did not evaluate them in this EA. The biomass cogeneration facility would require process water for steam and cooling tower makeup and for backwash and regeneration cycles associated with the plant's water treatment system. Expected water flow demand could peak at 2,000 gallons per minute. Alternative sources of process water identified but not considered in this EA included: (a) treated effluent from CSWTF, (b) groundwater from existing F-Area production wells or new production wells installed at the preferred plant site, and (c) the SRS domestic water system. DOE determined that the CSWTF was not a viable water source because the volume of treated effluent would not be sufficient to meet facility needs. Although the site's groundwater resource could easily accommodate projected water demand, DOE determined the use of existing or new production wells would not be cost effective. From this analysis, DOE has determined the SRS domestic water system has sufficient capacity to support the proposed action, but its use for this purpose would not be economical. The biomass cogeneration facility would draw its water from the existing river water system. If, at some point in the future, the river water system is no longer available due to insufficient river flows, the above water source alternatives would be reconsidered.

A potential alternative to discharging industrial effluent (steam and cooling tower blow down) to UTR is to discharge this waste stream to CSWTF. DOE determined that the site's wastewater treatment facility could not accommodate the increased inflow, and this option was not considered in the EA. The use of air-cooled condensers as an alternative to the construction and operation of cooling towers was also identified. However, air-cooled condensers are space and energy intensive, and would not function effectively during the hot and humid summer period. Therefore, DOE did not evaluate this alternative method for cooling process water in this EA.

3.0 AFFECTED ENVIRONMENT

SRS occupies approximately 300 square miles of land adjacent to the Savannah River, primarily in Aiken and Barnwell Counties in South Carolina. It is located approximately 25 miles southeast of Augusta, Georgia, and 20 miles south of Aiken, in west-central South Carolina (Figure 1-1). SRS was established in the early 1950s by the U.S. Atomic Energy Commission, DOE's predecessor agency. Until the early 1990s, the primary SRS mission was the production of special radioactive isotopes to support national defense programs. More recently, the SRS mission has evolved into nuclear material legacy management, waste management, environmental restoration, and decontamination and decommissioning of facilities that are no longer needed for SRS's traditional defense activities (DOE 2002). SRS continues to support the nuclear weapons stockpile through its tritium missions.

3.1 Soils and Physiography

SRS is located on the Aiken Plateau of the Atlantic Coastal Plain, approximately 100 miles west of the Atlantic Ocean. Approximately 25 miles north of SRS is the Fall Line, the geographical separation between Piedmont and the Coastal Plain. Northwest of the Piedmont are the Appalachian Mountains. The physiography of SRS is comprised of two major physiographic components: the Aiken Plateau and the alluvial terraces of the Savannah River. The Aiken Plateau is a dissected, sandy plain situated between the Savannah and Congaree Rivers on the Upper Atlantic Coastal Plain of South Carolina. Its sandy sediments dominate the SRS landscape and range in elevation from 250 to 400 feet above mean sea level. The alluvial terraces of the Savannah River occur below 250 feet mean sea level. Seven soil associations are represented with SRS (Rogers 1990). Generally, sandy soils occupy the uplands and ridges and are less fertile than the loamy-clayey soils of the stream terraces and floodplains (Rogers 1990)

3.1.1 Proposed Biomass Cogeneration Facility Site

The biomass cogeneration facility site encompasses a variety of soil types. These include the Blanton, Troup, Udorthents, Ailey, Dothan, Norfolk, and Vaucluse – Ailey Series. Blanton and Troup soils are well-drained sandy loams formed in marine and wind deposits along the Coastal Plain. They are highly permeable and found on slopes ranging from 0-45 percent. Dothan soils are deeply formed, well-drained and slowly permeable. They are also formed from marine deposits along the Coastal Plain on slopes ranging from 0-12 percent. The Norfolk soil series consist of loamy sands that are moderately permeable and considered to have negligible to medium levels of surface runoff. Slopes range from 0-10 percent. Ailey and Vaucluse – Ailey soils are well drained clayey loams. They are typically located on slopes between 6-15 percent and considered to have a high to very high surface runoff potential, be well-drained and have slow permeability. Udorthents are soils that have been excavated, disturbed and constructed upon (Rogers 1990).

3.1.2 K and L-Areas

Soils at K and L-Areas are predominately classified as Udorthents and urban land due to the developed nature of the area. Since these proposed sites are within developed areas, no further soil descriptions are necessary.

3.2 Water Resources

3.2.1 Surface Water

3.2.1.1 Savannah River

The Savannah River flows through the Southeastern U.S., forming the border between South Carolina and Georgia. It is approximately 350 miles long with two major tributaries, the Tugaloo and the Chattooga Rivers. The river begins in Lake Hartwell and flows as freshwater until it reaches the City of Savannah, where it begins to be tidally influenced, and widens into an estuary before emptying into the Atlantic Ocean. The Savannah River forms the southern border of SRS.

Total flows of the river near the project site range from 1.8 million gallons per minute (gpm) to 4.5 million gpm; with averages of approximately 3.8 million gpm (USGS 2008). Water is withdrawn from the Savannah River at the 681-5G Pumphouse for dedicated use at the D-Area powerhouse within SRS at an average rate of 50 million gallons per day (mgd). In 2006, water withdrawals for use at the powerhouse ranged from 24,000 gpm (34.5 mgd) (November) to 41,000 gpm (59 mgd) (August). Process water is discharged back into the river at an average rate of 28,000 gpm. Discharge limits are in effect for temperature, temperature difference between river water intake and discharge, residual chlorine, pH, total suspended solids, oil/grease, and manganese.

Savannah River water for the new biomass cogeneration facility would be supplied from the 681-3G Pumphouse. The 681-3G Pumphouse currently supplies small quantities of river water to the River Water System that runs throughout SRS to maintain the level of L Lake. New more efficient pumps would be installed in the pumphouse to provide the water to the biomass facility. The proposed cooling process water discussion can be found under section 2.1.1.2.

3.2.1.2 Proposed Facility Site

The two most prominent natural surface water features near the project site are UTR and Fourmile Branch (FMB) tributaries to the Savannah River. Both of these streams flow past the proposed biomass cogeneration facility site to the Savannah River. UTR, which is the largest stream on SRS discharging into the Savannah River, is the only SRS stream that has its headwaters located outside of SRS. Average flow rates in these two streams range from 50,664.7 gpm to 109,848.2 gpm (FMB and UTR, respectively) (DOE 2002). Surface drainage from the proposed biomass cogeneration plant site is to the UTR watershed.

The South Carolina Department of Health and Environmental Control (SCDHEC) regulates the physical properties and concentrations of pollutant constituents in effluents and receiving surface waters at SRS via the NPDES program. In the past, the concentrations of selected pollutant constituents (e.g., iron and pH) in both UTR and FMB have exceeded applicable water quality criteria on rare occasions. These exceedances, however, were naturally occurring (e.g., high metals content in soils or natural biological processes) and not attributable to site-related activities (DOE 2007).

3.2.1.3 K and L-Areas

K and L-Areas are located near the center of SRS. Surface water from these areas drains to the Savannah River. L Lake is a 1000-acre man-made surface water impoundment. In the past decade, several of the contaminants listed above have exceeded USEPA benchmark criteria in stormwater outfalls to both Pen Branch and Steel Creek water bodies. Specifically, selected stormwater outfalls to these two tributaries have had elevated levels of cadmium, copper, manganese, iron, and zinc (DOE 2007). SRS has implemented control measures to mitigate identified sources of nonpoint pollution within these drainage areas.

3.2.2 Groundwater

Groundwater beneath SRS is found in the Floridan Aquifer System. Groundwater within this aquifer typically travels south toward the Savannah River. The Savannah River and other surface water bodies within SRS are all considered to be “gaining streams” or streams that receive groundwater discharge. The flow of groundwater within the proposed project area is typically horizontal, but may occasionally flow vertically due to changes in hydraulic pressure and discharge.

A limited review of groundwater data from a well located north of the proposed project area (FGW-012D) indicates the presence of no contaminants above applicable maximum contaminant levels (Sentelle 2007). South of F and E-Areas, and directly east of the proposed biomass facility site, is a known contaminated groundwater plume located approximately 60 feet below grade. Since it can be assumed that groundwater is discharging to surface water, this plume is reaching the FMB tributary (SRNL 2007; DOE 2007). Production wells would not be considered a viable water source for the biomass cogeneration facility. The preferred water source for the biomass cogeneration facility and the L-Area plant would be the Savannah River, while the source for the K-Area plant would be the well water system.

3.2.3 Wetlands and Floodplains

There are no wetlands on the proposed project sites. However, there are contiguous stretches of forested or shrub lands and emergent wetlands in the immediate vicinity of the sites, particularly north and south of the proposed cogeneration facility, along the lengths of UTR, FMB, Pen Branch and Indian Grave Branch tributaries.

The proposed project sites are not located within the 100-year floodplain (DOE 2007). Although the proposed biomass cogeneration facility would have a discharge pipe to UTR which would cross floodplain and wetlands, this structure would not impact floodplain hydrology or associated wetland resources (AFC 2008, Appendix A).

3.3 Air Quality

Air quality is described by the concentration of various pollutants in the atmosphere. The significance of a pollutant concentration is determined by comparing the concentration in the atmosphere to applicable national or State ambient air quality standards. These standards represent the maximum allowable atmospheric concentrations that may occur and still protect public health and welfare with a reasonable margin of safety.

The U.S. Environmental Protection Agency (USEPA) regulates air pollutants for which standards for safe levels of exposure have been set via the Clean Air Act of 1990 (CAA): ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), particulate matter (PM), particulate matter 10 microns (PM_{10}) or less, particulate matter 2.5 microns ($PM_{2.5}$) or less, sulfur dioxide (SO_2) and lead (Pb). These pollutants are referred to as "criteria pollutants." In addition to the eight criteria pollutants outlined in the CAA, several other substances raise concerns with regard to air quality and are regulated via the CAA Amendments of 1990. These substances include hazardous air pollutants (HAPs), and toxic air pollutants such as metals, nitrogen oxides, and volatile organic compounds (VOCs).

For each criteria pollutant, the maximum concentration above which adverse effects on human health may occur is called a National Ambient Air Quality Standard (NAAQS) (See Table 3-1). Currently both Aiken and Barnwell Counties in South Carolina, where SRS is located, are in attainment for all criteria pollutants (i.e., pollutant concentrations are below NAAQS thresholds) (USEPA 2007a). However, $PM_{2.5}$, PM_{10} and O_3 are discussed below because of the possibility that the Central Savannah River Area could be declared nonattainment for these criteria pollutants (see nonattainment discussion at section 4.3.1.3).

3.3.1 Criteria Pollutants

3.3.1.1 Particulate Matter (PM)

PM is a mixture of small solid and liquid particles that are suspended in the atmosphere. Smoke and fly ash contain PM in a wide range of sizes, from 0.05 to 200 micrometer (µm) in diameter. As a basis of comparison, the width of a human hair ranges between 20 and 100 µm. PM is released through factory and utility smokestacks, vehicle exhaust, wood burning, construction activity, agriculture, and natural sources like volcanoes. PM also can form in the atmosphere when oxidized sulfur or nitrogen reacts to form aerosol particles. Such aerosols are called secondary fine particles, adding to PM levels in the atmosphere (USEPA 2007e). PM is regulated based on its size, with $PM_{2.5}$ regulated separately from PM_{10}. $PM_{2.5}$ particles, which can be carried much farther and higher than larger particles (like PM_{10}), are more likely to carry heavy metals and cancer-causing organic compounds into the alveoli, the deepest and most susceptible part of the lungs, and thus are more stringently regulated (Davis and Cornwell 1998). In addition to being regulated through particle size, PM is also sampled as total PM (the sum of various-sized particles).

3.3.1.2 Ozone (O_3)

O_3 is a gas composed of three oxygen atoms. It is not usually emitted directly into the air, but at ground-level is created by a chemical reaction between oxides of nitrogen (NOx) and volatile organic compounds (VOC) in the presence of sunlight. O_3 has the same chemical structure whether it occurs miles above the earth or at ground-level and can be "good" or "bad," depending on its location in the atmosphere. In the earth's lower atmosphere, ground-level O_3 is considered "bad." Motor vehicle exhaust and industrial emissions, gasoline vapors, and chemical solvents as well as natural sources emit NOx and VOC that help form O_3. Ground-level O_3 is the primary constituent of smog. Sunlight and hot weather cause ground-level O_3 to form in harmful concentrations in the air. As a result, it is known as a summertime air pollutant. Breathing O_3 can trigger a variety of health problems including chest pain, coughing, throat irritation, and congestion. It can worsen bronchitis, emphysema, and asthma. Ground-level O_3 also can reduce lung function and inflame the linings of the lungs. Repeated exposure may permanently scar lung tissue.

Table 3-1. National Ambient Air Quality Standards

Pollutant	Primary Standards	Averaging Times
Ozone	0.08 parts per million (ppm)	8-hour
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour
	35 ppm (40 mg/m^3)	1-hour
Nitrogen Dioxide	0.053 ppm (100 $\mu g/m^3$)	Annual (Arithmetic Mean)
Total PM	75 $\mu g/m^3$	Annual (Geometric Mean)
Particulate Matter (PM_{10}**)**	50 $\mu g/m^3$	Annual (Mean)
	150 $\mu g/m^3$	24-hour
Particulate Matter ($PM_{2.5}$**)**	15.0 $\mu g/m^3$	Annual (Mean)
	35 $\mu g/m^3$	24-hour
Sulfur Oxides	0.03 ppm	Annual (Mean)
	0.14 ppm	24-hour
	-------	3-hour
Lead	1.5 $\mu g/m^3$	Quarterly Average

Source: USEPA 2007b

3.3.2 Class I and II Areas

Federal Mandatory Class I Areas, as defined in the CAA, are the following that were in existence as of August 7, 1977: national parks over 6,000 acres (2,428 ha), national wilderness areas and national memorial parks over 5,000 acres (2,023 ha), and international parks. There are no Class I Areas near the proposed project site. The closest Class I areas are the Cape Romain Wilderness Area in South Carolina, and the Cohotta, Okefenokee, and Wolf Island Wilderness Areas in Georgia (USEPA 2007c).

Class II Areas are areas of the country protected via the CAA, but identified for somewhat less stringent protection from air pollution damage than a Class I area, except in specified cases (NPS 2005). The closest Class II areas include the Congaree Swamp National Park and the Ninety Six National Historic Site in South Carolina and the Chattahoochee River National Recreational Area and Ocmulgee National Monument in Georgia (NPS 2006; USEPA 2007c).

3.3.3 Current Emissions

The current D-Area powerhouse burns primarily coal, and some fuel oil and propane, while the K-Area steam plant uses fuel oil. Table 3-2 below summarizes air emissions from the current operations of the D-Area powerhouse and K-Area plant. SRS operates via two Title V Major Source Permits issued by the South Carolina Department of Health and Environmental Control Bureau of Air Quality (SCDHEC BAQ): Permit No. TV-0080-0041 which applies to the majority of SRS including K and L-Areas, and Permit No. TV-0080-0044 which applies to the D-Area Powerhouse facility. A Title V Major Source Permit is granted to a facility that has the potential to emit more than 100 tons per year (tpy) of any of the six criteria pollutants, or more than 10 tpy of any single HAP or more than 25 tpy of any combination of HAPs. The D-Area powerhouse and K-Area plant currently and historically have been in full compliance with their air quality operating permits and have had no reported violations. The current site permit for the K-Area plant is valid through March 2008. However, SCDHEC will not renew this permit until later in 2008 when the new replacement source of steam for A-Area (DOE 2006b), which is currently under construction, comes online. The renewal application was submitted to SCDHEC on September 18, 2007. The D-Area Title V permit was reissued by SCDHEC effective July 1, 2007 through January 12, 2012.

Wind directions at SRS are variable, and there is no prevailing wind at the site (DOE 2002). According to data collected in the 1990's, winds are most frequently from the southwest (9.7 percent of the time). Generally, atmospheric conditions at SRS are categorized as unstable (56 percent of time). The average wind speed for a measured 5-year period was 8.5 miles per hour (DOE 2002).

Table 3-2. Current Actual Emissions

Pollutant	**Emissions (tpy)**	
	D-Area	**K-Area**
Total PM	495.16	0.62
PM_{10}	429.52	0.19
$PM_{2.5}$	345.87	0.05
SO_2	5076.59	13.33
Sulfuric Acid	57.27	0.66
CO	48.17	0.94
NO_x	2948.41	4.51
VOC	3.92	0.04
Hydrogen Fluoride (HF)	14.25	0.00
Lead (Pb)	0.02	0.00

Source: SRS 2006

3.4 Biological Resources

3.4.1 Vegetation

SRS contains over 1,300 plant species that live within a variety of habitat types (Wike et al. 2006). The two most prominent habitat types found within the proposed biomass cogeneration facility site as well as K and L-Areas are developed lands and forested lands. Both K and L-Areas are developed, while the proposed biomass cogeneration facility site is currently undeveloped with some existing dirt roads. Land within SRS that has been developed typically still has some vegetative cover such as grasses and scrub-shrub vegetation.

The proposed biomass cogeneration facility site has no mature trees and consists of a very early successional pine environment, perhaps as a result of a relatively recent fire or selective site clearing. Dominant species in mature pine forests of this kind in this region include longleaf (*Pinus palustris*) and loblolly pines (*P. taeda*) as the major tree species. Other tree species include oak (*Quercus* spp.), cherry (*Prunus* spp.), and persimmon (*Diospyros* spp.). The understory regions are typically sparse in older forests and in newer forests, the understory regions are filled with dense blackberry (*Rubus* spp.), fennel (*Eupatorium capillifolium*), and sedge (*Andropogon virginicus*) (Wike et al. 2006). Information regarding the discharge pipeline ROW vegetation is discussed in Appendix A.

3.4.2 Wildlife

SRS supports over 100 species of reptiles and amphibians, 225 species of birds, and 55 species of mammals (Wike et al. 2006). Reptiles and amphibians thrive in this region's temperate, moist climate and are commonly found throughout the marsh and wetland areas on a year-round basis. Birds at SRS are migratory, seasonal, and permanent residents. White-tailed deer (*Odocoileus virginianus*) and feral pigs (*Sus* spp.) are common, and foxes (*Vulpes vulpes* and *Urocyon cinereoargenteus*), coyotes (*Canis latrans*), and bobcats (*Lynx rufus*) have been observed at SRS as well (Wike et al. 2006).

The mature forests and marshy areas on either side of the proposed biomass cogeneration facility site are presumed to provide habitat for a wide variety of wildlife. Previously developed areas such as K and L-Areas would have substantially less wildlife visits.

3.4.3 Threatened and Endangered Species

SRS is home to several species of both plants and animals that are Federally or State-listed as threatened or endangered. These include: the purple coneflower (*Echinacea laevigata*), pondberry (*Lindera melissifolia*), red-cockaded woodpecker (*Picoides borealis*), wood stork (*Mycteria americana*), short-nosed sturgeon (*Acipenser brevirostrum*), the American swallow-tailed kite (*Elanoides forficatus*), gopher tortoise (*Gopherus polyphemus*), southeastern myotis (*Myotis austroriparius*), star-nosed mole (*Condylura cristata*), and the big-eared bat (*Corynorhinus townsendii ingens* and *C. t. virginianus*) (Wike et al. 2006). While habitat for several of these species is widespread on the Site, surveys have revealed that there are no threatened or endangered plant or animal species within the proposed biomass facility site (SRNL 2007). The developed K and L-Areas do not provide appropriate habitat for the threatened or endangered species that may occur on SRS.

3.5 Infrastructure

3.5.1 Waste Management

Most municipal, commercial, and industrial solid waste, including construction debris, generated within SRS is disposed of onsite in the Three Rivers Regional Municipal Solid Waste Landfill (TRL). The TRL is located onsite on SC Highway 125. TRL is permitted via Subtitle D of the Resource Conservation and Recovery Act and is compliant with the South Carolina Solid Waste Policy and Management Act (Haskins 2008; LSCOG 2008). The landfill currently receives approximately 115,000 tons of refuse annually, or about 315 tons per day and has extensive capacity remaining (USEPA 2006). TRL would be used by the project for disposal of construction/operation-generated solid waste.

There are two other smaller private landfills in Aiken County. Both are Class IV landfills that are able to receive mixed construction and demolition waste. These landfills primarily serve the landfill owners, both of whom are in the construction business, but occasionally take waste from outside parties (DOE 2002). No hazardous waste would be generated by the proposed action.

3.5.2 Utilities

3.5.2.1 Energy Distribution and Use

The electrical distribution system at SRS supplies power to facilities specializing in the stabilization of nuclear materials for long-term storage or disposal. Power is also being supplied to facilities undergoing decommissioning and deactivation onsite. Many of these facilities may contain hazardous waste requiring disposition, before full decommissioning. To distribute the electrical power across SRS, there are approximately 114 miles of 13.8 kV overhead lines and 18 miles of underground distribution cable (SRS 2005b).

Steam is currently generated and distributed from facilities in A, D, and K-Areas with a facility in H-Area now in standby condition. The A-Area replacement steam facility was the subject of an EA in 2006. It is currently under construction and would replace the over capacity and outdated old A-Area steam plant (DOE 2006b). The steam generated at SRS is used directly in power generation, processing nuclear material, moving liquid waste, operating evaporators in F and H-Areas, H-Canyon, and the Tank Farm, and excess steam is distributed to area buildings for use in heating systems. The D-Area coal fired steam generation plant would be decommissioned if DOE implements the proposed action (SRS 2005b). All steam and power generated at SRS is consumed onsite.

3.5.2.2 Water Distribution and Use

The River Process Water System is used to take water from the Savannah River and deliver it to facilities throughout SRS for use as cooling water. With minor exceptions, the basic components of the cooling water system have remained unchanged since their original installation in the 1950’s. The river water system originally consisted of a 50-mile-long distribution network with 46-inch to 84-inch diameter pipe and three pump stations. Of the three original pump stations, two are still in operation and one is used primarily for pumping water from the Savannah River to maintain the level of L Lake and, in times of drought, Par Pond; the other pump station supplies the D-Area Powerhouse.

Domestic water is drawn from 20-inch diameter production wells using vertical turbine pumps that are installed in the aquifer approximately 700 feet below the surface. The domestic water distribution systems have approximately 32 miles of intra-area distribution piping and 26 miles of inter-area distribution piping with five elevated storage tanks. The domestic water system produces and distributes all domestic water to SRS in compliance with State and Federal regulations, for use in bathrooms and other domestic water uses. Water quality is governed by the Secondary Water Quality Standards, such as taste, odor, or appearance. Most of the domestic water produced is used directly by the SRS workforce population; however, some domestic water is used for equipment cooling, fire protection water, and as make up water to cooling towers (SRS 2005b).

The sanitary wastewater systems provide for the collection, treatment, and discharge of sanitary wastewater effluent within NPDES outfall limits for the SRS population. The sanitary sewer facilities include a central treatment plant, five smaller treatment plants, 58 miles of sewer pipe and 44 lift stations. Ninety-six percent of the SRS sanitary wastewater is treated at the CSWTF. The remaining 4 percent of the SRS sanitary wastewater is generated and treated at smaller, independent, treatment facilities located at SRS (SRS 2005b).

Boiler feedwater is used to supply the boiler with water for steam production. The feedwater system is also used to pressurize and deliver deaerated steam plant feedwater from the deaerator and desuperheater to the steam plants. Existing steam plant feedwater services are found in K and D-Areas, for use with the existing steam plants. The sources and volumes of water used are discussed in Section 3.2.

3.5.3 Traffic

Four primary roads provide offsite access to SRS. They are SC Highway 125, the main access route from the Augusta/North Augusta/Allendale region; SC Highway 19, which provides access from the Aiken/New Ellenton region; SC Highway 39, which provides access from the Williston region; and SC Highway 64, which provides access from the Barnwell region. More than 130 miles of primary roads, 1,100 miles of secondary roads, and 33 miles of railroads crisscross SRS, and approximately 20,000 vehicle trips a day occur on these SRS roadways with people commuting to and from work as well as traveling among SRS sites to perform tasks (DOE 2005b). The primary highways used by SRS commuters are SC Highway 19, SC Highway 64, and SC Highway 125; 40, 10, and 50 percent of the workers use these routes, respectively. Considerable congestion can occur during peak traffic periods onsite on SRS Road 1-A, SC Highway 19, SC Highway 125, and US Highway 278 at SRS access points (DOE 2002).

The current volume of traffic is 8 vehicles per hour for the secondary road and 542 vehicles per hour for the primary road near the proposed site for the cogeneration facility. The existing design maximum capacities for these roads are 1,000 and 1,500 vehicles per hour, respectively. Thus, these roads are currently operating at 0.8 percent and approximately 36 percent of capacity, respectively. The vast majority (75 percent) of the traffic occurs on these site roads during the morning and evening shift changes (DOE 2004).

3.6 Socioeconomics

The socioeconomic region of influence for the proposed action is a six county area around SRS where the majority of construction and site workers reside and where supporting services and infrastructure are found. The six counties are Aiken, Allendale, Barnwell, and Bamberg Counties in South Carolina, and Columbia and Richmond Counties in Georgia (DOE 2002).

The 2006 population within this six-county area was approximately 503,000. The majority of the SRS worker population resides within the following counties: Aiken (30 percent), Columbia (21 percent), and Richmond (39 percent). The average of the six counties' percent growth was approximately 14.8 percent from 1990 to 2006. Columbia County, and to a lesser extent Aiken County, contributed to most of the growth due to migration from surrounding counties and States. Over the same period, Bamberg and Barnwell Counties experienced net emigration (STATS Indiana 2008).

The total civilian labor force for the region of influence was approximately 243,000 in 2006 with average unemployment rate of approximately 8.1 percent. Comparatively, the unemployment rate was 4.6 percent in both the United States and Georgia, and 6.5 percent in South Carolina. All counties in the region of influence have unemployment rates greater than both the United States and Georgia, except for Columbia County with 4.1 percent. Aiken County had 6.5 percent of its population unemployed, Allendale County had 11.5 percent, Barnwell County had 9.9 percent, Bamberg County had 10.2 percent, and Richmond County had 6.2 percent (STATS Indiana 2008).

Total employment by sector ranges from approximately 300 people in mining to 56,000 in Government and Government enterprises. The average per capita personal income in 2005 was $25,092 for the six counties. For the same year, the per capita personal income was $34,685 for the United States, $28,427 for South Carolina, and $31,088 for Georgia (STATS Indiana 2008).

SRS currently employs approximately 10,000 people (DOE 2007). The existing coal-fired D-Area powerhouse employs 60 people. The existing oil-fired K-Area steam plant is not manned but maintained by SRS employees.

3.7 Human Health, Safety and Environmental Justice

Primary concerns to human health within SRS include exposure to air pollution including both smokestack and radiological emissions. As discussed in Section 3.3, various emissions can cause breathing problems, throat and eye irritation, cancer, birth defects, and damage to immune, neurological, reproductive, and respiratory systems (USEPA, 2007f). National and State ambient air quality standards represent the maximum allowable atmospheric concentrations that may occur and still protect public health and welfare with a reasonable margin of safety. In addition, the Occupational Safety and Health Administration (OSHA) regulations specify appropriate protective measures for all employees.

Radiological exposure can cause a variety of health impacts including cancer (the primary health effect), genetic mutation, burns, radiation poisoning or sickness (USEPA 2007g). Natural background radiation can come from cosmic, terrestrial, and internal body sources. Other common sources of exposure to radiation include medical practices, weapons test fallout, consumer and industrial products (such as cellular phones), and nuclear facilities. Because of this, radiological health concerns must be evaluated within the context of all sources of exposure. Doses of radiation are expressed as millirem; the effective doses which include the dose from existing internal level and the dose attributable to sources external to the body (DOE 2002). Exposure to radiation in the SRS area is approximately 357 millirem per year. The amount of radiation exposure attributable to SRS is only 0.1 percent of the total annual average environmental radiation dose for people within 50 miles of SRS. Other nuclear facilities located within 50 miles of SRS (e.g., Energy Solutions and Plant Vogtle nuclear generating station) are also minor sources of radiation exposure (DOE 2002).

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, requires all Federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. The nearest residential areas to SRS have significant low-income and minority populations (DOE 2002).

3.8 Cultural Resources

Through a cooperative agreement with DOE, the Savannah River Archaeological Research Program (SRARP) of the South Carolina Institute of Archaeology and Anthropology, University of South Carolina, provides services required by Federal law for the protection and management of archaeological and cultural resources on SRS. To facilitate management of these resources, the SRARP defined three archaeological zones for SRS based on an area's potential for containing sites of historical or archaeological significance (DOE 1995). Zone 1 represents areas with the greatest potential for having significant resources; Zone 2 possesses areas with moderate potential; and Zone 3 represents areas of low archaeological significance.

The proposed project area (Figure 1-2) of approximately 165 acres for the construction of a new biomass cogeneration facility and supporting infrastructure has been surveyed for prehistoric and historic archaeological resources. Approximately 30 acres of previously vegetated land would be cleared in order to construct the biomass cogeneration facility. Five archaeological sites containing historic materials and six archaeological sites containing prehistoric materials have been located within the 165-acre site use area. Additional archaeological testing is currently underway at these sites to assess their research potential to contribute to understanding the prehistoric and historic period occupation on SRS. The proposed discharge pipeline ROW, water intake pipeline ROW, as well as overhead transmission line ROW would be reviewed for cultural resources prior to proposed construction. Prior to any activity with potential impact to the sites in these areas, a consultation process would be initiated with the South Carolina Historic

Preservation Office to formally determine the National Register of Historic Place eligibility of specific sites, and to determine necessary and appropriate mitigation measures (SRARP 2008).

The proposed construction footprints for the K and L-Area biomass heating plants would be 3 acres each. These proposed plants would be constructed in developed areas where surveys for archaeological and cultural resources have found no such resources.

3.9 Noise

Noise is generally defined as unwanted sound. Noise can influence humans or wildlife by interfering with normal activities or diminishing the quality of the environment. Noise levels heard by humans are dependent on several variables, including distance, ground cover, and objects or barriers between the source and the receiver, as well as atmospheric conditions. Certain land uses, facilities, and the people associated with these noise levels are more sensitive to a given level of noise than other uses. Such “sensitive receptors” include schools, churches, hospitals, retirement homes, campgrounds, wilderness areas, hiking trails, and some species of threatened or endangered wildlife. There are no sensitive receptors within many miles of the project area.

3.10 Recreation

The project area is contained entirely within SRS. Public use of the natural resources at SRS is presently limited to controlled hunts and to various science literacy programs encompassing elementary through graduate school levels (DOE 2002). In addition, walking and fitness trails for SRS employees are found in A and B-Areas.

3.11 Land Use

SRS occupies a roughly circular area of approximately 300 square miles (192,000 acres), and contains production, service, and research and development areas. The production facilities occupy less than 10 percent of SRS; the remainder of the site is undeveloped forest or wetlands. SRS is a large (300 square miles) Federal facility available for wildlife management and research activities (DOE 2002). The proposed action is limited to a total footprint of between 40-50 acres of new ground disturbance, in areas adjacent to existing development. No changes to land use or land use designations at SRS would result from implementation of the proposed action.

4.0 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND ALTERNATIVES

4.1 Soil and Construction-Related Impacts

4.1.1 Alternative 1: Proposed Action

4.1.1.1 Proposed Facility Site

The majority of impacts to area soils as a result of the implementation of the proposed action would occur during the construction process. The conversion of previously undeveloped land, originally used as a borrow pit, for the development of the new facility, access road, and pipeline would result in soil disturbance.

Construction equipment to be used during the various facets of site development would include bulldozers, backhoes, earth scrapers, motor graders, heavy haul trucks, large tractors, concrete trucks, asphalt pavers, concrete pavers, rollers, and compactors. As with almost any construction project involving the use of heavy equipment, there is some risk of an accidental fuel or chemical spill, and the potential contamination of soils. To reduce the potential for soil contamination, fuels would be stored and maintained in a designated equipment staging area. A person(s) designated as being responsible for equipment fueling would closely monitor the fueling operation, and an emergency spill kit containing absorption pads, absorbent material, a shovel or rake, and other cleanup items, would readily be available on site in the event of an accidental spill. Following these precautions, the potential for an accidental chemical or fuel spill to occur and result in adverse impacts to soils would be negligible.

The use of construction equipment would also physically disturb soils. Soil disturbance is defined as anything that causes the impairment of physical, chemical and biological properties and processes, such as erosion, compaction, displacement, rutting, burning, loss of organic matter, and mass movement of soil (DeLuca 2001; USDA 2005b). Heavy equipment results in soil compaction, reducing the porosity and conductivity of the soil. Such compaction is likely to slightly increase the amount of surface runoff in the immediate area. Stabilization of the soils would be required to prevent sediment runoff impacts to water sources, possibly degrading water quality. An erosion/sediment control plan would be developed and implemented.

The soils that would be disturbed during the construction process are typically found on shallow to moderate slopes, are slowly to rapidly permeable, and experience negligible to moderate levels of surface runoff. These qualities would impact the amount and speed of any runoff of disturbed sediment. Any soils that are excavated on slopes, or are less permeable and experience high levels of runoff are more likely to be displaced and to result in sediment running off into surface waters.

NPDES via the Clean Water Act limits the discharge of any pollutant, including sediments, to waters of the United States. The discharge of stormwater runoff from construction sites is regulated via the NPDES program. Typically, sediment erosion rates from construction sites are 10 to 20 times greater than those from agricultural lands, and 1,000 to 2,000 times greater than those from forest lands. A Stormwater Pollution Prevention Plan (SWPPP) would be developed for the site, as required by the NPDES permit. SWPPPs contain measures to reduce soil erosion and prevent pollution from petroleum, oil, lubricants, and other chemicals or hazardous/toxic materials at construction sites. Specifically, SWPPPs assess the characteristics of the site such as nearby surface waters, topography, and stormwater runoff patterns; identify potential sources of pollutants such as sediment from disturbed areas, and stored wastes or fuels; and identify best management practices (BMPs) which would be used to minimize or eliminate the potential for these pollutants to reach surface waters through stormwater runoff.

Standard construction BMPs, such as installing perimeter silt fences, spreading straw and mulch to protect exposed ground, covering stockpiles of earth or soils, and so forth, would minimize runoff, erosion and impacts to on and offsite soils during construction activities. Once the facility becomes operational, storm water from the plant area would continue to be regulated, and the impacts to soils would be minimal. Soils in this area have likely been disturbed and would be cleared of vegetation and turned into impervious surfaces. In addition, the construction of the facility would add 30 acres of impervious surface to the proposed project area. The transformation of vegetated and previously unpaved land to impervious surfaces would result in soil disturbance, compaction and potentially displacement. DOE expects the overall impacts to soils at the proposed facility site from both construction and operation activities to be long-term and minor.

4.1.1.2 K and L-Areas

DOE expects that impacts to soils from the construction of plants at K and L-Areas to be similar to those described above for the proposed facility site. As these two areas currently house facilities, the land and soils are already disturbed and compacted. Additional demolition and construction at these sites would not likely result in more than minor impacts to soils. The total footprints for the plants would be 6 acres. DOE expects the overall impacts to soils to be long-term and minor.

4.1.2 Alternative 2: No Action

Under the No Action Alternative, the proposed biomass cogeneration facility and satellite biomass heating plants in K and L-Areas would not be constructed and DOE would expect no impacts to SRS soils.

4.2 Water Quality Impacts

4.2.1 Alternative 1: Proposed Action

4.2.1.1 Proposed Facility Site

4.2.1.1.1 Construction

General construction impacts associated with the development of the proposed facility site could affect water resources by increased stormwater runoff from the site carrying sediment and contamination loads into surface water during times of heavy rain and by contamination from construction activities infiltrating area soils and percolating down into the groundwater. Increased stormwater runoff from developed sites leads to increased erosion of exposed soils, which leads to increased siltation in surface waterbodies. The first flush of rains after a long dry period would carry pollutants deposited on pavement into soils and water bodies, posing a risk of contaminating water and harming aquatic life. The incorporation of mitigation measures into the design phase of the project would reduce impacts to water resources below the level of significance. In particular, the wetlands and surface water tributaries would be protected to the maximum extent possible by the implementation of appropriate BMPs.

The construction phase of the project would require coverage via the NPDES general permit for stormwater discharge from large construction activities. SCDHEC's Bureau of Water is authorized to issue NPDES permits in the State of South Carolina. The chief requirements of the NPDES general permit for large construction sites in South Carolina are a stormwater management and sediment control plan, construction Notice of Intent, the creation of a SWPPP, the implementation of BMPs, and a project timeline (SCDHEC 2006). DOE expects the overall impacts to surface water from the construction activities of the proposed facility site to be short-term and minor.

Throughout the construction process no excavations would occur within the vicinity of the area aquifer or contaminated plume. Therefore, DOE expects no impacts to groundwater as a result of the proposed action.

The routing of the discharge outfall to UTR would slightly encroach upon wetland areas of UTR near the proposed facility site. A Clean Water Act (CWA) Section 404 wetlands permit application including a plan to minimize impacts to the wetlands area for this outfall would be submitted to the U.S. Army Corps of Engineers. The discharge pipe would extend into UTR and a Construction in Navigable Waters Permit would have to be obtained from SCDHEC. When applying for the 404 permit the navigable waters permit would be on the joint application form. A Section 401 Water Quality Certification is required along with the Section 404 permit. The Section 401 Certification would also be on the joint application form with the 404 permit application. With the implementation of all BMPs to minimize runoff from the construction site and minimize direct encroachment on the wetlands and their associated floodplains, DOE expects the impacts to wetlands and floodplains to be localized and minor (AFS 2008b).

4.2.1.1.2 Operation

Impacts to surface water as a result of the implementation of the proposed action would result from water withdrawals for use in the new facility and discharges of process water. Once operational, the new facility would be permitted via SRS's existing NPDES permit for wastewater discharges. DOE expects that the facility would be in full compliance with this permit and that consequently impacts to surface water from runoff throughout the life of the project would be negligible.

The new facility would require approximately 600-2,500 gpm of water to be withdrawn from the Savannah River for use as cooling water, fire protection, steam makeup water, and for water treatment equipment backwash. DOE expects water use to be closer to 800 gpm, but could reach 2,500 gpm occasionally, if all intermittent users are online simultaneously. Currently, SRS uses between 24,000 and 41,000 gpm of river water, on average, for operations of the D-Area plant. The diameter of the existing water intake structure in the river, which would be used for the proposed action, would meet current impingement velocity requirements via the CWA. DOE expects no measurable effects on fish, other aquatic life, or aquatic habitat. The proposed cogeneration facility would decrease the amount of river water currently drawn from the Savannah River by over 2,900,000,000 gal per year. This is especially significant as the level of the Savannah River is low and this project would support efforts to manage water usage within the river basin. When compared to the No Action Alternative, the decrease in the water withdrawal rate represents a long-term, beneficial and moderate impact.

Process water, containing trace amounts of added chemicals such as amines, phosphates, sulfites and anti-scale treatment, would be discharged from the facility into UTR, approximately 1 mile northwest of the plant. The discharge would be added to SRS's existing NPDES wastewater permit which allows for point source discharge to UTR. This permit would require regular monitoring and reporting (SCDHEC 2008). The NPDES permit application for this new discharge has been submitted to SCDHEC.

No additional impacts to groundwater, wetlands, or floodplains are expected during the operations of the proposed facility.

DOE expects that overall operational impacts to water quality from the implementation of the proposed action would not be long-term and would be negligible to minor. In addition, DOE expects the impacts of the substantial decrease in Savannah River water withdrawal rates to be beneficial, long-term, and moderate.

4.2.1.2 K and L-Areas

4.2.1.2.1 Construction

DOE expects construction impacts to surface water to be similar to those described above. The required NPDES permits would cover construction activities at K and L-Areas, as well as at the proposed new facility site. Similar BMPs would be implemented to ensure mitigation against contaminated runoff. DOE expects overall impacts to surface water from the construction activities at K and L-Areas to be short-term and minor.

Throughout the construction process, no excavations would occur within the vicinity of the area aquifer and therefore, DOE expects no impacts to groundwater as a result of the proposed action.

DOE expects no impacts to either wetlands or floodplains. No construction activities would occur on or within the vicinity of any wetlands or floodplains. With the implementation of BMPs to minimize runoff from the construction site, the risk of any contaminated runoff impacting wetlands is negligible.

4.2.1.2.2 Operation

Process water used at the K and L-Area plants would be provided by the site well water system and Savannah River, respectively. The steams at the K and L-Area plants would each have less than 1400 gallons a day of steam blow down water at peak per plant. This water would drain to the existing sanitary sewer system in K-Area and discharge to permitted outfall L-07 in L-Area. DOE expects no surface water impacts, nor impacts to wetlands or floodplains, as a result of operating the biomass plants.

4.2.2 Alternative 2: No Action

The current D-Area powerhouse draws an average of 50 million gallons per day (mgd) of water from the Savannah River. Water that is not converted to steam is then discharged through a NPDES permitted outfall back into the river at an average rate of 40.2 mgd. This amount varies seasonally, and in 2006, the gpm withdrawal rate for the plant ranged from a low of 24,000 gpm (34.5 mgd) in November to a high 41,000 gpm (59 mgd) in August. In the worst case scenario (high withdrawals and low-river flows), this withdrawal rate represents almost 2.3 percent of the flow in the Savannah River. If the No Action Alternative was selected, this impact on Savannah River water flows would continue.

DOE expects no additional impacts to groundwater, wetlands, or floodplains, as a result of the No Action Alternative.

4.3 Air Quality Impacts

4.3.1 Alternative 1: Proposed Action

4.3.1.1 Construction

A construction permit, obtained through SCDHEC's Bureau of Air Quality (BAQ) for emissions from new industrial facilities, would be required before commencement of any construction activities on the proposed facility and plants. This permit would include coverage for the projected emissions of the proposed biomass cogeneration facility, as well as the steams at K and L-Areas.

During the actual construction process, the equipment used to construct the proposed facility and plants would intermittently emit quantities of five criteria air pollutants: carbon monoxide (CO), nitrogen oxides (NOx), sulfur dioxide (SO_2), particulate matter (PM_{10}), and volatile organic compounds (VOCs). In addition to tailpipe emissions from heavy equipment, ground surface disturbance during excavation and grading activities could potentially generate fugitive dust.

Fugitive dust, such as dirt stirred up from construction sites, can affect both environmental and public health. The type and severity of the effects depend in large part on the size and nature of the dust particles. The types of effects that can occur to humans include inhalation of fine particles that can then accumulate in the respiratory system causing various respiratory problems including persistent coughs, wheezing, eye irritations, and physical discomfort. Construction personnel would implement appropriate mitigation measures, such as applying water to exposed surfaces or stockpiles of dirt, when windy or dry conditions promote problematic fugitive dust emissions. Adhering to mitigation measures and BMPs would reduce the adverse impacts from fugitive dust emissions. DOE expects the overall impacts from fugitive dust emissions would be temporary in duration and of minor intensity.

Exhaust emissions from equipment used in construction, coupled with likely fugitive dust emissions, could cause minor, short-term degradation of local air quality. DOE expects the overall impacts to air quality from the construction of the proposed biomass cogeneration facility and plants to be short-term and minor.

4.3.1.2 Operation

Overall emissions would change with the shift from a coal-fired power plant to a biomass cogeneration facility. DOE expects the overall emission levels would decrease, but the emissions of some criteria pollutants would increase. SRS currently operates via a Title V-Part 70 Operating Permit, as discussed under Section 3.3.4. A new operation permit would be obtained to include the new emissions coming from the cogeneration plant. DOE and Ameresco Federal Solutions, the proposed plant operator, would obtain an operating permit for the new cogeneration facility and the plants in K and L-Areas.

Primary emissions from the new cogeneration plant would include PM, SO_2, CO, NO_x, and VOC. Emissions that would be substantially decreased include sulfuric acid, HF, and lead. Table 4-1 illustrates the change in emissions as a result of the proposed action. Note that the new facility would still emit PM, denoted as Total PM and PM_{10} and although $PM_{2.5}$ is marked with "n/a", $PM_{2.5}$ is still being emitted in small quantities and incorporated into Total PM emission values. The current D-Area facility does not collect $PM_{2.5}$ emission data.

As mentioned above and illustrated in Table 4-1, the majority of pollutants that were emitted during the operation of the coal plant would decrease substantially. CO and VOCs – highlighted in red and underlined – are the only two pollutants that would increase as a result of the implementation of the proposed action. The decrease of sulfuric acid, HF, and lead is attributable to the cessation of coal combustion as these pollutants are directly associated with the burning of coal. The increase of CO and VOC levels can be attributed to the incorporation of wood and TDF.

DOE expects the proposed facility and plants would decrease the overall air emissions rates for: PM by more than 400 tons a year; NOx by more than 2,500 tons a year; and SO_2 by more than 3,500 tons a year.

Using EPA's Emission Factor Database, the renewable fuels used for this project would reduce green house gas (e.g., water vapor, carbon dioxide, methane, ozone) emissions by at least 100,000 tons a year decreasing the carbon footprint of SRS.

Both ECMs would reduce energy consumption by eliminating over 6 miles of steam distribution lines (3.5 miles for ECM 1 and 2.5 miles for ECM 2). The reduced steam distribution pipe would decrease fuel consumption by at least 10 percent from reduction of in-line steam losses.

Table 4-1. Current and Potential Air Emissions

Pollutant	Current Actual D-Area Coal Plant* (tpy)	Current Actual K-Area Plant* (tpy)	Current Actual Total Max. (tpy)	Proposed Co-generation Plant (tpy)	Proposed Potential K & L Plants (tpy)	Proposed Potential Action Total (tpy)	Potential Emissions Change (tpy)
Total PM	495.16	0.62	**495.78**	42.49	7.06	**49.55**	**-446.23**
PM_{10}	429.52	0.19	**429.71**	37.34	7.06	**44.40**	**-385.31**
$PM_{2.5}$	345.87	0.05	**345.92**	n/a	n/a	**n/a**	**n/a**
SO_2	5076.59	13.33	**5089.92**	45.99	0.88	**46.87**	**-5043.05**
Sulfuric Acid	57.27	0.66	**57.92**	n/a	n/a	**n/a**	**-57.92**
CO	48.17	0.94	**49.10**	239.15	9.53	**248.67**	199.57
NO_x	2948.41	4.51	**2952.92**	275.94	14.11	**290.05**	**-2662.86**
VOC	3.92	0.04	**3.96**	31.27	0.60	**31.87**	27.91
HF	14.25	0.00	**14.25**	n/a	n/a	**n/a**	**-14.25**
Pb	0.02	0.00	**0.02**	n/a	n/a	**n/a**	**-0.02**

*Maximum annual emissions b/w 2003-6
Source: Bulgarino, 2008

The net change in emission levels and types marks an overall decrease in emission levels for the energy generated at SRS. While the levels of CO and VOC would increase, they are still expected to be within the permitted amounts allowed as a result of the construction and operating permit. However, the threshold required to trigger a Title V Major Source permit is a total increase of 100 tpy of any criteria pollutant. Therefore, a Title V Major Source permit would be required for operation of the biomass cogeneration facility.

Chapter 2 (Section 2.1.1) discusses the breakdown of combustion components for the biomass cogeneration facility. Primary emissions resulting from burning this type of fuel include PM, oxides of sulfur and nitrogen, and VOCs from wood products, and VOCs, chlorine, polycyclic aromatic hydrocarbons (PAHs), and several metals from TDF. The most common volatile organic compound emitted from TDF combustion is benzene, which is classified as a known human carcinogen. Common PAHs include benzo(a)pyrene, butadiene, and styrene; and common metals emitted are zinc, arsenic, lead, mercury, and chromium VI (EJN No date). Chlorine compounds that undergo combustion form dioxins and furans. See Section 3.3 for a description of the potential human health impacts of these compounds.

The new biomass cogeneration facility would be permitted to burn up to 30 percent TDF; in this case at least 70 percent of fuel would be wood-based and up to 30 percent could be TDF. Limiting the amounts of TDF that are burned at any given location limits the projected emissions of potentially hazardous compounds to levels that are not anticipated to pose a threat to human or ecosystem health.

4.3.1.3 Consequences of Nonattainment

SRS could be in an area declared nonattainment for PM_{10}, $PM_{2.5}$, and ozone at some future date (see Section 3.3, Air Quality). When an area is designated nonattainment for any of the criteria pollutants, the affected State must draft a plan known as a State Implementation Plan (SIP) to improve air quality and outline the control measures the State will take in order to meet National Air Quality Standards (NAAQS). These air pollution control measures include a process called Nonattainment New Source Review (NA NSR) permitting.

NA NSR applies to new major sources or major modifications at existing sources for pollutants where the source location is not in attainment with NAAQS. All NA NSR permits require that the proposed air pollution source install the Lowest Achievable Emission Rate (LAER), pollution controls, emission offsets, and an opportunity for public involvement. LAER is the most stringent emission limitation derived from either of the following: the most stringent emission limitation contained in the SIP for a similar source, or the most stringent emission limitation achieved in practice by a similar source. Also, sources must obtain emissions reductions from existing sources located in the vicinity of the source NA NSR source. The emission reductions, generally called "offsets", must offset the emissions increase from the new source or major source modification to ensure reasonable progress toward meeting the NAAQS. The emission reductions must also provide a net air quality benefit.

4.3.1.4 Abatement Technology

Actions that would aid in decreasing the overall impacts of air emissions include limiting when the plant would be operating, and utilizing abatement technologies to help decrease emission levels at the source. The proposed plant's abatement measures include a fabric filter baghouse to reduce PM, and selective non-catalytic reduction (SNCR) to reduce nitrogen oxide formation (AFS 2007). Baghouse filters work to curb PM emissions by trapping particulate matter in a fabric bag, similar to the way a vacuum cleaner operates. The filters are cleaned by blowing air through in the reverse direction and collecting the PM. This process effectively removes up to 99.9+ percent of particulate matter (USEPA 1998).

The SNCR method effectively reduces NO_x emissions via a process of injection. Urea would be injected into the steam boiler at temperatures high enough to result in a chemical reaction between water and urea that forms ammonia, which in turn reacts with NO_x and oxygen to form nitrogen and water. In addition, limestone would be injected into the flue gas and, via sorption reactions, reduce NO_x and sulfur compounds (USEPA 1999).

Multicyclone technology would be implemented at the K and L-Area plants to aid in decreasing air emissions. This technology reduces the temperature of combustion by dilution of the combustion products with excess fuel, air, flue gas, or steam. The resulting chemical reactions prevent the majority of the nitrogen from becoming ionized and forming NO_x (USEPA 1999).

4.3.1.5 Associated Traffic

In order to provide the new biomass cogeneration facility and heating plants with sufficient levels of biomass fuel, there would be trucks traveling in and out of both the cogeneration facility and the K and L-Area plants. Major air emissions from these vehicles include PM, NO_x, CO, and VOC. These vehicles would represent a small percentage increase in the current traffic levels during both construction and operation of the proposed facility. DOE expects that the additional vehicular emissions would result in negligible impacts to air quality.

DOE anticipates that overall impacts to air quality from the implementation of the proposed action would be long-term, regional, and minor due to the increase in CO and VOCs. In addition, however, impacts to air quality would also be long-term, regional, and moderately beneficial due to the decrease in sulfuric acid, NO_x, HF, and lead emissions.

4.3.2 Alternative 2: No Action

Under the No Action Alternative, no operational changes would occur at either the D-Area powerhouse or at the K-Area plant. These facilities would continue to run on coal, fuel oil, and propane, respectively. These fuels would continue to be delivered to the site. However, both the D-Area powerhouse and K-Area plant are reaching the end of their serviceable life and would require significant upgrades in order to not only meet emissions standards, but to remain functional and reliable in the foreseeable future. Therefore DOE expects that if the No Action Alternative was implemented, the existing facilities would either receive needed upgrades, or be required to go offline. Though the continued release of fossil fuel-related emissions into the atmosphere can be expected to have air quality impacts ranging from local to global, a measurable change of these emissions is not expected to occur in this instance. Instead, since the status quo would be maintained under the No Action Alternative, DOE expects impacts to air quality would be incremental and adverse, long-term, and minor to moderate.

4.4 Biological Resources

4.4.1 Alternative 1: Proposed Action

4.4.1.1 Vegetation

Construction preparation at the proposed cogeneration facility site would require the removal of shrubs, immature trees, and grasses. Approximately 30 acres of previously vegetated land would be cleared in order to construct the biomass cogeneration facility. A total of 0.5 linear miles of previously undeveloped forested land would be cleared of its existing mature trees to allow for the installation of the buried 12-inch river water intake pipeline and its associated ROW. The upland ROW portion of this pipeline would be between 50-75 feet wide, and would be maintained by regular mowing and vegetation removal. No herbicides would be used. Overstory vegetation in the proposed river water intake pipeline ROW includes loblolly pine (*Pinus taeda*), slash pine (*P. elliottii*), longleaf pine (*P. palustris*), sweetgum (*Liquidambar styraciflua*), and water oak (*Quercus nigra).*

There would also be a new over head and underground electrical feeder installed from the new plant to the F-Area Substation. The feeder would follow the existing secondary road and route through the primary road and into F-Area. The over head feeder line ROW would be approximately 1.3 miles long by 50 feet wide and would require tree clearing on the existing secondary road and within F-Area. A total of about 0.6 linear miles of minimally developed land would be cleared of trees to accommodate the new over head electrical feeder. A portion of the new feeder line ROW would be located adjacent to an existing feeder line ROW. The underground sections of the feeder line ROW would be approximately 800 and 1000 feet long and would be located under the proposed cogeneration facility parking area to avoid interference with 115 kV overhead electrical lines. No wetlands would be impacted as a result of the construction of the new feeder lines. Overstory vegetation in the upland feeder line ROW includes loblolly pine (*Pinus taeda*), slash pine (*P. elliottii*), longleaf pine (*P. palustris*), sweetgum (*Liquidambar styraciflua*), and water oak (*Quercus nigra).*

The threshold level of significance for vegetation impacts is removal in amounts that would permanently alter the habitat in a manner detrimental to the species living there. Construction of the proposed plant and its pipelines and feeder lines would contribute to the fragmentation of an existing forest habitat. The biomass cogeneration facility site is an old abandoned borrow pit that appears to have had no restoration. The soil is highly disturbed and not characteristic of an intact series. Prior to removal of the soil, the area was most likely a Blanton sand series. The site supports fairly sparse vegetation that consists of volunteer loblolly pine typically 1 to 4 meters in height. The seedlings are not evenly distributed on the site, and appear to be nutrient deficient based on foliar coloration. This is not unexpected due to the prior history of the site. There is very little herbaceous cover at the site and broomsedge (*Andropogon* spp.) and bahia grass (*Paspalum notatum*) have established themselves, although they are also scattered. Due to the substantial amount of undeveloped land that would remain at SRS, DOE expects these adverse impacts to be localized and that terrestrial productivity not be adversely affected. The proposed facility would have a discharge pipe that would go to UTR and would cross wetlands but would not impact floodplain hydrology or associated wetland resources (Appendix A).

4.4.1.2 Wildlife

Any wildlife that uses the proposed cogeneration facility site would likely be displaced as a result of the proposed action. As discussed above, a portion of this area would be cleared of its vegetation, effectively limiting any wildlife habitat. Section 3.4 discusses the potential wildlife residing or using this portion of SRS. Many of these species are mobile generalist species that use a variety of interspersed and fragmented habitats and range over wide areas for food and cover. Such species include small mammals, white-tailed deer (*Odocoileus virginianus*), and migratory birds. Therefore, many wildlife species would be able to avoid the disturbance by relocating to adjacent minimally disturbed areas. Earth-moving activities may result in some unavoidable mortality to burrowing and less mobile fauna. DOE expects that the existing rural fauna would be replaced by a more urban setting in the proposed developed area.

Impacts to vegetation and wildlife at K and L-Areas would be less than those at the proposed biomass cogeneration facility site. As these areas have been previously developed, there is unlikely to be more than negligible impacts to area vegetation and any species that may utilize the area.

DOE expects overall impacts to both vegetation and wildlife to be long-term and minor throughout the biomass cogeneration facility and plant sites.

4.4.1.3 Threatened and Endangered Species

As there is no known State or Federal threatened or endangered species that exist at the proposed facility site or at the previously developed K and L-Areas nor is the habitat suitable for threatened or endangered species known to occur on or near SRS, DOE has determined the proposed action would not have more than a negligible impact to threatened and endangered species. Therefore DOE has determined that formal consultations with State and Federal natural resource agencies would not be required for these proposed actions.

4.4.2 Alternative 2: No Action

With no new construction or development taking place, DOE expects no impacts to vegetation, wildlife, or threatened and endangered species, as a result of the No Action Alternative.

4.5 Infrastructure

4.5.1 Waste Management

4.5.1.1 Alternative 1: Proposed Action

4.5.1.1.1 Construction

As a result of the proposed action some building material debris and associated rubble would be generated. This type of waste would be disposed of onsite at the TRL. The volume or weight of the debris is not known at this time, but would likely be small relative to the yearly totals over the lifespan of the landfill. Considering this is a one-time increase in waste disposal the impacts to the landfill would be negligible.

4.5.1.1.2 Operation

Waste ash resulting from the combustion of woody materials would be deposited in an approved solid waste management facility. The amount of ash generated would vary seasonally, as the two new biomass heating plants at K and L-Areas would only be operational during the coldest winter months. In a typical year they would be operating for approximately 4 months; in exceptionally cold years they may be online for as many as 5 months, from December to April if necessary. The total annual generation of waste ash from all three sites is estimated to be 8,000 tons, of which less than 30 tons would be coming from the K and L-Area biomass heating plants. This would represent a 7 percent increase in waste entering the TRL, based on estimates of current inputs. The impact of waste generated would be minor; the landfill at its busiest is already expected to be receiving nearly twice the current amount of waste annually. Much of the material being used as fuel at SRS as a result of the proposed action, especially the TDF, would have otherwise gone directly into a landfill. The amount of waste entering the landfill as a result of the proposed action is approximately 2-3 percent of the original material, a substantial decrease both in weight and volume of waste.

No hazardous waste would be generated as a result of the proposed action and therefore none would require disposal. This would be a decrease from the No Action Alternative (Bulgarino 2008). DOE expects the overall impact of implementing the proposed action on waste management would be beneficial, long-term, and moderate; the biomass fuels being burned in the new plants would reduce the amount of ash (compared to coal) entering landfills by greater than 95 percent.

4.5.1.2 Alternative 2: No Action

Under the No Action Alternative, there would be no additional waste generated beyond current levels. With no change in operations, DOE expects no impacts to waste management and none of the beneficial impacts discussed under the proposed action would be realized.

4.5.2 Utilities

4.5.2.1 Alternative 1: Proposed Action

4.5.2.1.1 Energy Distribution and Use

4.5.2.1.1.1 Construction

Throughout construction activities, there would be short lapses in service and energy transmission as components of the project would require shut down while they are taken offline or added on. There would also be a short time during the official transition from the old D-Area plant to the new biomass cogeneration facility, and old K-Area steams to the new K and L-Area biomass heating plants when utilities, such as power and water, in those areas would be shut off. This would be a minor disruption of service.

4.5.2.1.1.2 Operation

As a result of the proposed action, power would be transferred between the existing F-Area substation at 13.8 kV and the biomass cogeneration facility on the secondary road over a new overhead feeder line roughly two miles in length. The proposed route of this new line would be from the primary F-Area entry road parallel to circuit 2B and across the primary road to the site. This would terminate in a 2,500 kilovolt-amps (kVA) pad mounted transformer on the site. The secondary voltage of the transformer would be 4,160 volts. The purpose of this utility feed would be to handle all startup needs and provide backup should the turbine and the emergency generator be out of service at the same time. From the 2,500 kVA pad mounted transformer, an underground feeder would serve a 4,160 volt package substation located in the main process building. This substation would be made up of feeder breakers for the two turbines, the generator, the utility feed, and the general plant process power distribution system. The general plant process power would be distributed at 480 volts from a 3,000 amp main combustion chamber located adjacent to the package substation.

Steam produced by the cogeneration facility would be connected across the secondary road from the facility to the existing steam transmission line.

As a result of the proposed action, steam would be generated in both K and L-Areas and not exported from these areas. The 2.5-mile pipeline between the areas would no longer be used, as L-Area would have its own steam from the new biomass heating plant. By eliminating the pipeline, energy lost in transmission between areas would be retained. DOE anticipates that overall impacts would be beneficial, long-term, and minor to moderate.

4.5.2.1.2 Water Distribution and Use

4.5.2.1.2.1 Construction

Throughout construction activities, there would also be short lapses in water service as components of the project would require shut down while they are taken offline or added on. This would be a negligible to minor disruption of service.

4.5.2.1.2.2 Operation

As a result of the proposed action, the Savannah River would be the source of process water, through a connection at the existing river water valve house in C-Area. This operational change would require some upgrades, including the installation of a new pump in the 681-3G Pumphouse before operation. The pipes used to tap into the main would be 8 to 10 inches in diameter. The process waste water would be discharged to an outfall approximately one mile from the cogeneration plant on UTR.

Approximately 500 feet of additional steam pipe, on above-ground pipe supports, would be required to connect into the existing distribution system located across the secondary road from the proposed site. A steam meter would be placed in the steam line to measure steam flow delivered to SRS end users. In K and L-Areas, the new biomass heating plants would be connected to the existing steam distribution lines.

As a result of the proposed action, existing domestic water pipelines would be tapped for bathroom use and other domestic water needs. An additional 0.3 miles of new pipeline would be required to bring the water and sanitary sewer lines from existing pipes to the new cogeneration facility.

DOE plans to use the existing water treatment system with minimal modifications to the chemical injection system in the current building for the new biomass heating plant located at K-Area. DOE would install a new water treatment system for use at the new biomass heating plant located in L-Area.

The proposed action includes many upgrades to the existing infrastructure, which has seen few changes since the 1950's. Replacing the coal-fired plant and steams would necessitate upgrading associated infrastructure to support the new biomass heating plants and biomass cogeneration facility. Whenever possible, the existing infrastructure, such as pipelines and feeder lines, would be used with the new plants and facility. However, in the case of water treatment facilities, the requirements of the new biomass heating plants and biomass cogeneration facility cannot be met with existing infrastructure and would be replaced. The direct impacts to utilities would be negligible, since the level of service provided would not change; only the infrastructure on which it is delivered would change. The only increase in existing site capacities would be a new river water pump in the 681-3G Pumphouse. The operational lifespan of steam production would increase as a result of the proposed actions.

4.5.2.2 Alternative 2: No Action

Under the No Action Alternative, DOE anticipates that minor to moderate amounts of steam would continue to be lost during the distribution process, both between the D-Area plant and its end users, and between K and L-Areas. In addition, the existing facilities and their infrastructure would require substantial and costly upgrades in order to stay online and meet permitting thresholds. This is anticipated to be very costly, but necessary. DOE expects the overall impact to utilities would be adverse, long-term, and minor, but continuing substantial investment would be required to maintain the systems.

4.5.3 Traffic

4.5.3.1 Alternative 1: Proposed Action

4.5.3.1.1 Construction

Construction workers would use both regional and local SRS roads to travel to and from the project site(s) throughout the duration of construction activities. However, since workers would be hired from the local area, the increase in vehicle miles traveled would be minimized.

For the site of the new biomass cogeneration facility near F-Area, both deliveries and workers would use the site entrance. This entrance can become congested during peak hours (DOE 2002). A recent study shows that this route is capable of supporting the proposed biomass trucks without impacting traffic flow (DOE 2004).

Some internal worker movement around and between sites would occur; this travel would be negligible considering the approximately 20,000 existing daily SRS vehicle trips (DOE 2005b). Further, this level of increase would not be sustained during the entire two-year construction period, as most workers would not be employed for the entire two years. The existing road capacity would accommodate construction deliveries and any additional construction workers associated with the proposed action.

DOE does not expect roads near SRS to be taxed beyond existing capacity. Given the existing level of traffic in SRS and the fact that SRS infrastructure was built for a considerably larger sized installation capacity, these additional trips should not measurably increase accident rates.

As part of the proposed action, the road leading to the biomass cogeneration facility would be paved, have a deceleration lane added, and driveways would be developed for the K-Area and L-Area biomass heating plants. The construction equipment and paving of the roads and driveways may cause temporary congestion. However, DOE anticipates that these impacts would be minimal nuisance impacts. Given the nature of the road system at SRS, alternative routes could be used, and any impact should be short-term. DOE would make advance notice to employees and the community, or post road signs indicating construction and any road closures, which would help lessen the transportation impact. Avoiding construction deliveries during the morning and evening shift changes would help reduce the conflict with the employee traffic, especially as the SC Highway 125 entrance security point is already congested at these peak hours (DOE 2004).

DOE expects that the overall impacts of the proposed action to transportation would be limited to short-term, and minor inconveniences such as longer wait times at security points and the need to use alternative routes.

4.5.3.1.2 Operation

The major source of traffic of the cogeneration facility operations would be the fuel delivery trucks to the handling yard. The normal truck traffic for fuel deliveries would be 7 to 8 per hour for 8 hours per day for 5 days per week. Thus, a peak total of 320 fuel delivery trucks a week, or 64 per day, would deliver fuel to the fuel handling yard next to the new biomass cogeneration facility (AFS 2007).

The SRS entrance used by the fuel delivery trucks could become congested during peak hours (DOE 2002). After delivering the fuel to the proposed cogeneration facility, the truck traffic flow would be regulated by a new traffic light to be installed at the primary road. The vehicles would then proceed offsite.

In addition, on average one truck per week would be used to deliver fuel to each of the K-Area and L-Area biomass heating plants from November to April. Compared to the 320 per week peak fuel delivery trucks to the fuel handling yard and the 20,000 daily existing trips on SRS, the weekly fuel deliveries from November to April to K-Area and L-Area would be negligible.

Assuming that the trucks complete travel and unloading within one hour, the peak 64 daily fuel delivery trucks to the fuel handling yard would cause the secondary road to the biomass facility to operate at approximately 3 percent of capacity and the primary road to operate at approximately 37 percent of capacity during the eight hours of delivery. Although the fuel deliveries constitute an increase, the roads would still be operating well below capacity.

Since the K-Area and L-Area plants would be unmanned, the operation of these plants should generate no additional traffic. The new biomass cogeneration facility would only require 20 employees instead of the current 60 employed at the D-Area powerhouse. This would result in a net loss of 40 jobs. This personnel decrease would be negligible considering the existing traffic and capacity of the primary and secondary roads. Given the 20,000 existing daily SRS vehicle trips and that the current infrastructure at SRS was built for a considerably larger population than currently exists, the trips to maintain the proposed action should be negligible. For the same reasons, additional accidents for the increased traffic should be negligible. Overall, because the roads would still operate considerably below capacity, DOE expects the change in on and offsite traffic would be long-term and negligible to minor.

4.5.3.2 Alternative 2: No Action

Under the No Action Alternative, the proposed plant and facility would not be built. The existing coal-fired D-Area powerhouse and the existing oil-fired K-Area steam plant would continue to operate. The secondary road would not be paved or have a deceleration lane added and the driveways at K-Area and L-Area would not be developed. The traffic light at the intersection of the secondary and primary roads would not be installed. The roads would remain below capacity. DOE expects the overall impacts to transportation as a result of the No Action Alternative to be negligible.

4.6 Socioeconomics

The threshold level of significance for socioeconomic resources is the potential of the project to result in a substantial change in population or employment increase or decrease in the region of influence.

4.6.1 Alternative 1: Proposed Action

4.6.1.1 Construction

It would take 2.5 years to build the new biomass cogeneration facility and nine months to build each of the smaller new biomass heating plants at K and L-Areas. Implementing the proposed action would require 200 temporary construction workers to be used for different tasks on and off throughout the entire construction period. Two hundred workers make up less than 0.1 percent of the total civilian labor force within the six county area surrounding SRS (STATS Indiana 2008). Compared to the employment at SRS, these 200 additional jobs would represent an increase of 2 percent (AFS 2007). Representing less than 0.1 percent of the total civilian labor force in the region of influence and 2 percent of the current employment at SRS, the proposed action would not significantly impact employment in the region of influence. Since the temporary construction workers would be recruited from the local areas (within daily commuting distance of SRS), there should not be an influx of people for these jobs. Consequently, DOE does not expect measurable impacts to housing and community services. The increase in job numbers, even temporarily, would likely stimulate economic activity from increased demand for goods and services, which would result in beneficial, short-term, and minor impacts.

4.6.1.2 Operation

The two smaller new biomass heating plants at K and L-Areas would be run by operators at the cogeneration facility. Since the existing oil-fired K-Area steam plant is unmanned, the two new plants would not need additional personnel. The new biomass cogeneration facility would only require 20 employees instead of the current 60 employed at the D-Area powerhouse. This would result in a net loss of 40 jobs. Compared to the 10,000 personnel at SRS, these 20 jobs lost represent 0.2 percent job loss (DOE 2007). In respect to the region of influence, these jobs represent less than 0.01 percent of the total labor force (STATS Indiana 2008). DOE expects overall impacts to jobs at SRS and within the region of influence from the implementation of the proposed action to be long-term and negligible to minor.

The projected annual cost savings of the proposed action is $26 million. With an estimated $142 million project design and construction cost, simple payback would occur in less than 11 years (AFS 2008a). DOE expects the economic impact of the proposed action to be beneficial, long-term and minor for the region of influence although cost savings and cost avoidance for SRS would be substantial.

4.6.2 Alternative 2: No Action

Under the No Action Alternative, the existing coal-fired D-Area powerhouse and the existing oil-fired K-Area steam plant would continue to operate. Thus, the annual cost savings of the proposed action would not occur, and current employment levels would likely continue.

The current powerhouse is oversized and coming to the end of its useful life. It would likely require significant upgrades to be dependable and to meet current Maximum Achievable Control Technology (MACT) air quality requirements. This is likely to result in adverse, long-term and increasing impacts to the SRS budget.

4.7 Archaeological and Cultural Resources

The primary site for the construction of a new biomass cogeneration facility and supporting infrastructure has been surveyed for prehistoric and historic archaeological resources. Of the approximately 165 acre proposed project area, approximately 30 acres of previously vegetated land would be cleared in order to construct the biomass cogeneration facility. Five archaeological sites containing historic materials and six archaeological sites containing prehistoric materials have been located within the 165-acre site use area. Additional archaeological testing is currently underway at these sites to assess their research potential to contribute to understanding of the prehistoric and historic period occupation on SRS. Prior to any activity with potential impact to the sites in this area, a consultation process would be initiated with the South Carolina Historic Preservation Office to formally determine the National Register of Historic Places eligibility of specific sites, and to determine necessary and appropriate mitigation measures (SRARP 2008).

The proposed construction footprints for the K and L-Area biomass heating plants would be 3 acres each. These proposed plants would be constructed in developed areas and were reviewed under previously approved site use permits. Therefore, DOE anticipates that the potential for the proposed construction footprints for the K and L-Area biomass heating plants to impact archaeological or cultural resources at SRS would be negligible.

Utility line construction ROWs for the proposed actions would be reviewed for impact to archaeological or cultural resources at SRS.

4.8 Human Health, Safety, and Environmental Justice

4.8.1 Alternative 1: Proposed Action

4.8.1.1 Construction

Because of the level and duration of air quality degradation expected during construction activities, DOE expects that the impacts to human health (workers and the public) would be negligible (See Section 4.3). Implementing the mitigation measures and BMPs would reduce the adverse impacts to human health from air quality. Workers would follow OSHA procedures, which would further reduce the impact to human health. Since the proposed action includes no drilling or excavations, additional groundwater contamination would not be a source of impacts to human health (see Section 4.2).

DOE believes the statistical risk of death of or injury to construction and biomass harvesting workers as a result of the implementation of the proposed action would be low. Given the 20,000 existing daily SRS vehicle trips (people commuting and performing job tasks) and that the current infrastructure at SRS was built for a considerably larger staff than currently exists, the risk of accidents from the minor traffic increase from the proposed action would be negligible (DOE 2005b).

4.8.1.2 Operation

The decommissioning of the existing coal-fired D-Area powerhouse and the existing oil-fired K-Area steam plant would cause a reduction in the majority of air pollutants, and an increase in CO and VOC emissions (see Section 4.3.1). DOE expects a net overall beneficial impact to air quality and human health. DOE expects accidents from operations would be minimal as long as OSHA regulations are followed. As discussed above, the risk of vehicle-related accidents is likely to be negligible due to the minor shift in expected traffic post-construction.

DOE does not expect the proposed action to result in any high or adverse impacts to health and safety. Therefore, there are no expected disproportionately high and adverse human health or environmental effects on minority and low-income populations in the SRS region of influence.

Neither construction nor operation activities of the proposed action would be audible offsite of SRS. Onsite impacts of noise during construction should be minimized by limiting construction activity to daylight business hours and by using properly maintained and muffled equipment. Hearing protection equipment would be required for sound levels that exceed Federal workplace standards. Implementing the preceding steps would result in no noise impacts from the proposed project.

No changes in radiation exposure are expected. Therefore, there would be no associated impact to human health. OSHA procedures would continue to be followed to minimize worker exposure to hazardous substances. These may include warning systems and alarms to detect exposures and spills, as well as informing the proper authorities of any incidents.

The proposed action is not anticipated to impact any public or recreational uses of the land. Furthermore, the offsite impacts of the Proposed Action (e.g. surface water withdrawals from the Savannah River and air emissions from facilities operations) are not anticipated to have any impact on recreation activities offsite of the proposed project area. The proposed project would not appreciably diminish recreation opportunities or the quality of recreation activities in the vicinity of the project area.

Therefore, given the small size of risks and additional exposures, DOE expects the overall impact to human health from the proposed action to be negligible.

4.8.2 Alternative 2: No Action

Under the No Action Alternative, risks from accidents, as well as to air emissions throughout the construction process would not occur. The continued operation of the D-Area coal plant would result in continued emissions from the plant throughout its serviceable life. As discussed in Section 4.3.2, the continued use of this plant without upgrades is unlikely. DOE expects any emissions released would be similar to current levels or less, with the addition of efficiency upgrades. DOE expects that overall impacts to human health as a result of the No Action Alternative would be negligible.

4.9 Cumulative Impacts

CEQ regulations (40 Code of Federal Regulations (CFR) 1508.7) require an analysis of the cumulative impacts resulting from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of who undertakes these other actions. Cumulative impacts can result from individually minor, but collectively significant, actions. This cumulative impacts section of the EA addresses only the cumulative effects arising from considering the proposed action in combination with other ongoing actions at SRS.

SRS is continuing to down-size and streamline its new mission of waste management, environmental restoration, and decontamination and decommissioning of facilities that are no longer needed for SRS's traditional defense activities. While old facilities are being decommissioned, newer and more modern facilities are being developed. Maximum Achievable Control Technologies would continue to get more advanced and further restrict emissions allowances from energy producing facilities.

In light of these developments, the proposed action contributes an incrementally and cumulatively beneficial impact to both the actions of SRS and, in context, to current and future regulatory actions governing air emissions (see nonattainment discussion in section 4.3.1.3).

4.10 Mitigation Measures

All future actions proposed as part of this project would employ the following mitigation measures to ensure that environmental impacts from construction and operation of the project are minimized to the greatest extent reasonable. Adherence to the following mitigation measures, in conjunction with adherence to all applicable and appropriate local, State, and Federal regulations and permits, should ensure that the construction and operation of the biomass cogeneration facility and heating plants at SRS have no significant adverse impacts to the human environment.

4.10.1 Soil

- Minimize the amount of vegetative clearing during construction activities to protect the soil cover and minimize erosion risks.

- Incorporate and maintain BMPs vigorously into all project plans; BMPs at construction activity sites typically consist of various erosion and sediment control measures such as silt fences, straw bales, and other temporary measures to be placed in ditches and along portions of the site perimeter to control erosion during construction activities. These temporary erosion prevention measurements should be maintained in place until the site vegetation is firmly established and soil has stabilized. Regular inspections of the erosion and sediment control measures should be performed after any storm event.

- Stabilize and revegetate all disturbed areas with native plant vegetation after commencement of construction activities. Proper seed selection would result in native plants with deep root systems, which would increase local times of stormwater concentration and reduce site outflows.

- Store and maintain all fuels in a designated equipment staging area to reduce the potential for soil contamination. Designate a person(s) as being responsible for equipment fueling who closely monitors the fueling operation, and have an emergency spill kit containing absorption pads, absorbent material, a shovel or rake, and other cleanup items, readily available onsite in the event of an accidental spill.

4.10.2 Water Resources

- Place BMPs along portions of the site perimeter to control erosion during all construction and demolition activities. Under all circumstances, sediment runoff from the site should be captured and prevented from entering area surface water bodies, especially the wetlands and UTR tributaries to the northwest of the site.

- Ensure that no excavations would occur within the vicinity of the area aquifer or contaminated plume throughout the construction process at the cogeneration facility site.

4.10.3 Air Quality

- Implement reasonable measures, such as applying water to exposed surfaces or stockpiles of dirt, when windy or dry conditions promote problematic fugitive dust emissions. Adhering to these BMPs would minimize any fugitive dust emissions.
- Minimize the amount of TDF burned in the cogeneration facility in order to minimize potential harmful air emissions.

4.10.4 Biological Resources

- Restore any area of undeveloped land as closely as possible to its original condition through soil stabilization BMPs and revegetation with native plants.

4.10.5 Waste Management

- Recycle or reuse as many materials as possible during the construction and operation phases of the project in order to minimize the amount of waste generated by the plant and facility. No hazardous waste would be generated as a result of the proposed action and therefore none would require disposal.

4.10.6 Transportation and Traffic

- Give advance notice to SRS employees and community, and install well-marked road signs, informing of road construction and/or road closures with respect to paving and upgrading of the secondary road.

- Avoid construction deliveries during the morning/evening shift changes, especially at the SC Highway 125 entrance security point.

4.11 Evaluation of Terrorism-Related Impacts

DOE does not believe that the presence of the new biomass cogeneration facility and heating plants would increase the probability of a terrorist attack on SRS or that these plants and facility would be a more attractive target for such an attack than the existing facilities. Therefore, the potential for the proposed and alternative actions considered in this EA to result in terrorism-related activity or impacts at SRS would be negligible.

4.12 Accident Analysis

The proposed action replaces the existing D-Area Power Plant and the K-Area Heating Plant with new plants. Both the proposed plants and facility, and the existing plants utilize similar equipment, chemicals, chemical storage tanks, and combustible fuel sources. The proposed action does not introduce any new accident potentials compared to the no action case, and, in fact, reduces the quantities of each chemicals used and in storage as compared to the present situation.

The maximum reasonable foreseeable accident associated from the proposed action would be the accidental or malicious release of the stored chemicals used to treat steam makeup water, exhaust gas, river water and cooling tower water. The bounding credible releases are considered to be 1) fire, which results in the boiling, volatilization, and airborne release of chemical tank contents, and 2) spill, which includes an immediate airborne release from splashing of tank contents and longer term airborne re-suspension of spilled chemicals. The chemicals of interest are: sodium hydroxide solution, sulfite solution, biocide chemical, anti-scale, urea, and sulfuric acid. These chemicals are commonly used in steam plant operations and would be stored in approved chemical storage tanks located within the building structure. One other foreseeable accident evaluated was the possibility of fuel fire, however this accident would be managed by using the fire suppression systems that would be installed at the fuel storage areas.

Where Acute Exposure Guide Levels (AEGL), Emergency Response Planning Guidelines (ERPG), or Temporary Emergency Exposure Level (TEEL) threshold quantities are not available, Permissible Exposure Limit/Time Weighted Average values are used for risk level determinations. There are three levels of ERPGs:

- ERPG-1. The maximum concentration in air below which it is believed nearly all individuals could be exposed for up to one hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor.
- ERPG-2. The maximum concentration in air below which it is believed nearly all individuals could be exposed for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action; and
- ERPG-3. The maximum concentration in air below which it is believed nearly all individuals could be exposed for up to one hour without experiencing or developing life-threatening health effects.

The threshold quantities were compared to ERPG levels to qualitatively evaluate the risk. Release of the materials at risk was not evaluated as a composite, such as might be the case if the tank contents were to spill and become mixed. The concentrations are then compared to the individual threshold quantities provided in Revision 21, of AEGLs, ERPGs, and TEELs for chemicals of concern to determine whether the consequence risk to onsite areas and surrounding areas would be such that safety related controls would be required to prevent or mitigate a release.

Release of the quantities of chemicals evaluated would result in concentrations well below the ERPG-3 limits for the onsite worker (100 meters) and ERPG-2 for the offsite public. At these concentrations DOE expects no safety related controls would be required to prevent or mitigate a release of the materials at risk.

5.0 REGULATORY AND PERMITTING PROVISIONS CONSIDERED

DOE policy is to conduct its operations in compliance with all applicable Federal, State, and local laws and regulations, and Federal executive orders. Following is a listing of selected statutes, regulations, and executive orders that are applicable to the proposed and alternative actions considered in this EA.

5.1 National Environmental Policy Act of 1969, as amended

This EA has been prepared in compliance with the NEPA of 1969, as amended; the requirements of the CEQ Regulations for Implementing NEPA (40 CFR Parts 1500-1508); and DOE Regulations (10 CFR Part 1021), and DOE Order 451.1B. NEPA, as amended, requires "all agencies of the Federal Government" to prepare a detailed statement on the environmental effects of proposed "major Federal actions significantly affecting the quality of the human environment". This EA has been written to comply with NEPA and analyze the potential environmental impacts for proposed construction and operation of the new biomass cogeneration facility and heating plants at SRS.

5.2 Air Quality Regulations

A SCDHEC construction permit for emissions from new industrial facilities would be required from the Bureau of Air Quality before commencement of any construction activities on the proposed facilities. A SCDHEC Title V air emissions permit would be required for operation of the proposed cogeneration facility, and MACT regulations would be addressed. Air emission permits and controls would comply with 40 CFR 61-62 Air Pollution Control Regulations and Standards. Air emission permits and sources would comply with 40 CFR Part 63 NESHAP for Industrial, Commercial, and Institutional Steams and Process Heaters.

5.3 Water Regulations

5.3.1 Storm Water and Air Regulations

Construction activities would comply with the National Pollutant Discharge Elimination System (NPDES) general permit requirements for stormwater discharges from large construction activities, as administered by SCDHEC. Stormwater discharges of normal facility operation would meet the requirements for stormwater discharges from industrial activities. Bulk petroleum storage shall comply with the NPDES permit for Discharge to Surface Waters for discharges from bulk petroleum storage facilities. Bulk petroleum storage shall also comply with requirements of 40 CFR Part 112.

5.3.2 Savannah River Water Withdrawal Regulations

The diameter of the intake structure in the Savannah River would meet the impingement velocity requirement (0.5 ft/sec) and address Clean Water Act requirements, as required by 40 CFR Part 125 Subpart I.

5.3.3 Process Water Discharge Regulations

The construction of the discharge pipe would encroach upon jurisdictional wetlands of UTR. A Clean Water Act Section 404 wetlands permit, which regulates discharge of dredge and fill materials into "waters of the United States" would be obtained from the U.S. Army Corps of Engineers for this work, in accordance with 33 CFR Part 323. A discharge pipe going into UTR would require a Construction in Navigable Waters Permit from SCDHEC. A Section 401 Water Quality Certification is required along with the Section 404 permit.

Discharge of process water to UTR during operation of the cogeneration facility would require coverage under SRS's existing NPDES wastewater permit (SC0000175).

5.3.4 Domestic Water Regulations

The domestic water tie-in for the toilets, showers, and sinks would require a Public Water Works permit from the State of South Carolina (SCDHEC Regulation R61-58).

5.3.5 Sanitary Sewer Regulations

Both a Sanitary Sewer Construction Permit (SCDHEC Regulation R. 61-67) and a Sanitary Sewer Operation NPDES permit (SCDHEC Regulation R.61-9) would be needed from the State of South Carolina for construction and operation of the proposed facility's sanitary waste system.

5.4 Endangered Species Act, as amended (16 USC 1531 et seq.)

The Endangered Species Act is intended to prevent the further decline of endangered and threatened species and to restore these species and their habitats. The Act also promotes biodiversity of genes, communities, and ecosystems. None of the proposed actions considered in this EA would adversely impact these species of concern.

5.5 National Historic Preservation Act, as amended (16 USC 470 et seq.)

The National Historic Preservation Act provides that sites possessing significant national historic value be placed on the National Register of Historic Places. If a particular Federal action impacts a historic property, consultation with the Advisory Council on Historic Preservation is required. This consultation usually leads to a Memorandum of Agreement containing mitigative actions that must be followed to minimize adverse impacts to the historic property. Coordination with the State Historic Preservation Officer also ensures that potentially significant sites are properly identified and appropriate mitigation actions implemented. None of the proposed actions considered in this EA would adversely impact historic sites.

5.6 Integrated Safety Management System (48 CFR 970.5223-1)

The Integrated Safety Management System ("System") requires that work be performed safely and that there is adequate protection for employees, the public, and the environment. The System requires that hazards of the work to be performed are identified and evaluated and that administrative and engineering controls are implemented to prevent or mitigate such hazards and any related accidents or unplanned releases or exposures.

5.7 Executive Order 11988 (Floodplain Management)

Executive Order 11988, "Floodplain Management", directs Federal agencies to establish procedures to ensure that the potential effects of flood hazards and floodplain management are considered for any action undertaken. Impacts to floodplains are to be avoided to the extent practicable. None of the proposed actions considered in this EA would be subject to flood hazards or involve floodplain management issues.

5.8 Executive Order 11990 (Protection of Wetlands)

Executive Order 11990, "Protection of Wetlands", requires Federal agencies to avoid short- and long-term adverse impacts to wetlands whenever a practicable alternative exists. Any proposed action that impacts wetlands would be approved by the U.S. Army Corps of Engineers.

5.9 Executive Order 12898 (Environmental Justice)

Executive Order 12898 requires Federal agencies to identify and address disproportionately high and adverse human health or environmental effects of its programs, policies, or actions on minority and low-income populations. None of the proposed actions considered in this EA would adversely impact these sensitive populations.

5.10 Executive Order 13186 (Protection of Migratory Birds)

Executive Order 13186 requires Federal agencies to assess and mitigate the impacts of their actions on migratory birds and promote the conservation of migratory bird populations and their habitat. None of the proposed actions considered in this EA would adversely impact these species of concern.

6.0 AGENCIES AND PERSONS CONSULTED

The University of South Carolina's Savannah River Archaeological Research Program, the United States Department of Agriculture Forest Service-Savannah River, the South Carolina Department of Health and Environmental Control, Trinity Consultants, Three Rivers Landfill, Energy Products of Idaho, the Babcock and Wilcox Company, WSRC, and the Savannah River National Laboratory (SRNL) were consulted during the preparation of this EA.

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APPENDIX A

Floodplain/Wetland Assessment for Biomass Cogeneration and Heating Facilities at the Savannah River Site

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1.0 PROJECT DESCRIPTION

This Floodplain/Wetland Assessment is prepared in compliance with 10 CFR Part 1022 as an addendum to the Environmental Assessment for Biomass Cogeneration and Heating Facilities at the Savannah River Site (DOE/EA-1605). The proposed action consists of the construction and operation of the following biomass cogeneration and heating facilities: a new biomass cogeneration facility, to replace the existing D-Area Powerhouse; and, two new biomass heating plants at K and L-Areas, to replace the existing K-Area steam plant. The proposed biomass cogeneration facility would discharge its process water to Upper Three Runs (UTR), a tributary of the Savannah River. The discharge pipeline would encroach upon the forested/shrub and emergent wetlands adjacent to UTR, along with the creek's associated floodplains. The operation of this discharge requires a National Pollutant Discharge Elimination System (NPDES) permit. DOE is required to meet more restrictive conditions of the NPDES permit.

Additionally, a Clean Water Act Section 404 wetlands permit from the U.S. Army Corps of Engineers would be required to authorize the construction of the pipeline where it encroaches upon jurisdictional wetlands. This permit application would include the survey and plan to minimize impacts to the wetlands area for the discharge pipeline and outfall.

2.0 EFFECT ON FLOODPLAINS OR WETLANDS

The proposed pipeline could potentially impact a small area of forested wetlands of UTR. Soils within this drainage area are typically sandy and erodible. The impact to the wetland area is due to the routing of a buried 24-inch discharge pipeline from the new cooling tower basin at the proposed cogeneration plant to the UTR outfall. The sampling station for this pipeline outfall would be located adjacent to the cooling tower basin to allow for optimal access and to minimize additional wetlands impacts.

The proposed discharge pipeline would be approximately one mile long through upland vegetation of the site to allow for a gravity discharge before encroaching on the wetlands area northwest of the proposed plant location. The buried pipeline would have to cross the wetlands area in order to reach the discharge point in UTR. It is anticipated that less than 0.5 acres of wetlands would be disturbed. The pipeline routing would require a maximum ROW width of 15 feet to allow for the construction of the new line. Process water, containing trace amounts of added chemicals such as amines, phosphates, sulfites and anti-scale treatment, would be discharged from the facility into UTR, approximately 1 mile northwest of the plant. The discharge point would be permitted under SRS's existing NPDES wastewater permit which allows for point source discharge to UTR. This permit would require regular monitoring and reporting. The hydric soil of the area is classified as Pickney sand. Pickney sand, frequently flooded, has slopes less than 1 percent and is a very poorly drained soil in the floodplain along UTR. Non-hydric soils of the area include Troup and Lucy sands and Blanton sand. Troup and Lucy sands, 15 to 25 percent slopes, are well drained soils on the southeast banks of UTR and Tinker

Creek. They occur as intermingled areas of the Coastal Plain and Sand Hills. Most areas are rolling, and most are long and narrow. Blanton sand, 6 to 10 percent slopes, is a somewhat excessively drained soil in narrow upland swales and on low-lying ridges and side slopes. Because of the slope especially on Troup and Lucy sands, erosion can be a severe hazard on construction sites (Rogers 1990). Overstory vegetation in the wetland is predominantly water oak and laurel oak (*Quercus nigra* and *Q. laurifolia*), sweetgum (*Liquidambar styraciflua*) and loblolly pine (*Pinus taeda*).

The actual routing location would be surveyed before commencement of construction activities and would be optimized to minimize wetland encroachment to the greatest extent possible. Alternative routing locations avoiding the wetlands area would require substantially longer runs and more costly energy consumption, as the effluent would have to be pumped rather than gravity drained. UTR is the reasonable location for the discharge point for the proposed cogeneration plant, due to the high flow in the creek which would allow for adequate discharge dilution, and, the close proximity of the creek to the location of the proposed plant.

Silt fences and other erosion control structures as needed would be installed to ensure there is no deposition in the downslope floodplain or wetland areas. An erosion control plan for this proposed activity would be developed in accordance with applicable State and local floodplain protection standards and followed to ensure that no additional impacts to wetland would occur due to erosion and sedimentation. No excavated materials would be deposited in wetland areas. With the implementation of all best management practices, to both minimize runoff from the construction site and minimize direct encroachment on the wetlands and their associated floodplains, DOE expects the overall impacts to wetlands and floodplains of UTR from the proposed project would be minimal and short term. No long-term impacts are foreseen.

3.0 ALTERNATIVES CONSIDERED

Proposed and alternative compliance actions are covered in the Environmental Assessment for Biomass Cogeneration and Heating Facilities at the Savannah River Site (DOE/EA-1605) (DOE 2008). No floodplain/wetland impacts, except where noted in this assessment, are expected for the proposed or No Action Alternative considered within the scope of the EA. Where impacts are expected, appropriate mitigation plans would be formulated and implemented to compensate for these impacts. Typical mitigation choices would be wetland creation, restoration or enhancement, preservation, or use of Wetland Mitigation Bank credits.

4.0 REFERENCES

DOE (U.S. Department of Energy), 2008 Environmental Assessment for Biomass Cogeneration and Heating Facilities at the Savannah River Site (DOE/EA-1605). Savannah River Operations Office, Savannah River Site, Aiken, South Carolina.

Rogers, V.A., 1990. Soil Survey of Savannah River Plant Area, Parts of Aiken, Barnwell, and Allendale Counties, South Carolina, United States Department of Agriculture, Soil Conservation Service, Aiken, South Carolina.

Finding of No Significant Impact
for
Biomass Cogeneration and Heating Facilities
at the
Savannah River Site

Agency: U.S. Department of Energy

Action: Finding of No Significant Impact

Summary: The Department of Energy (DOE) has prepared an environmental assessment (EA) (DOE/EA-1605) to analyze the potential environmental impacts of the proposed construction and operation of new biomass cogeneration and heating facilities located at the Savannah River Site (SRS). The draft EA was made available to the States of South Carolina and Georgia, and to the public, for a 30-day comment period. Based on the analyses in the EA, DOE has determined that the proposed action is not a major Federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act (NEPA) of 1969. Therefore, the preparation of an environmental impact statement (EIS) is not required and DOE is issuing this finding of no significant impact (FONSI).

Public Availability: Copies of the final EA and FONSI or further information on the DOE NEPA process are available from:

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Background: A large portion of SRS (the F, H, and S-Areas) is supplied with its energy and steam from a coal-fired powerhouse in D-Area, while an oil-fired steam plant in K-Area supplies steam energy to both K and L-Areas. The coal-fired D-Area powerhouse was constructed in the 1950s and the K-Area oil-fired steam plant was installed in 1992. Both are in need of significant modifications to reliably supply energy for DOE's continuing missions and to meet current environmental regulations and air emission restrictions. In addition they represent significant overcapacity relative to current and projected needs. The project described in the EA will replace the two existing facilities with three biomass energy plants. Specifically, DOE's proposed action is the construction and operation of the following facilities: a new biomass cogeneration facility to replace the existing D-Area powerhouse; and two new biomass heating plants at K and L-Areas to replace the existing K-Area steam plant. The proposed biomass cogeneration facility and heating plants will supply energy to the F, H, K, L, and S-Areas of SRS. The proposed project will help SRS meet its energy requirements for an initial term of 21 years, with the potential for many years of continued operation after the initial term.

The project is being proposed under the authority and terms of the DOE Biomass and Alternate Methane Fuel Energy Savings Performance Contract number DE-AC26-02-NT41457. DOE anticipates the proposed project will create significant energy and energy cost (dollar) savings to SRS. The savings will result from fuel switching, reductions in line losses by placing the steam plants several miles closer to end user facilities, and improved operations with new equipment that is sized to better match load requirements. In addition to providing for much of SRS's steam needs with a renewable energy source, the project will create benefits to the surrounding area. All three plants will utilize biomass obtained from the region, and will use the best available control technology for the reduction of air emissions.

Purpose and Need for Agency Action: The purpose of the proposed action is to supply large portions of SRS with reliable and efficient sources of energy. DOE needs to generate energy to support continuing and future SRS missions through more efficient and environmentally preferable means. DOE needs to utilize biomass and bio-derived fuels as fuel sources to move towards meeting requirements set forth in the Energy Policy Act of 2005, Public Law 109-58, which directs all Federal agencies to increase their renewable energy use, with a goal of using (1) 3 percent or more renewable energy in Fiscal Year (FY) 2007 through 2009, (2) 5 percent or more renewable energy in FY 2010 through 2012, and (3) 7.5 percent or more renewable energy by FY 2013.

Proposed Actions: The proposed action, the construction and operation of biomass cogeneration and heating facilities at SRS, will consist of the following two Energy Conservation Measures (ECMs): a new biomass cogeneration facility to replace the existing coal-fired D-Area powerhouse; and two new biomass heating plants, one in K-Area and one in L-Area to replace the existing oil-fired steam plant in K-Area. The ECM project components are described in detail below.

The proposed biomass cogeneration facility (EMC 1) will be located on a 30-acre site near the center of SRS. The facility will produce approximately 850,000,000 pounds of steam per year which will be exported to the 200-Area users and will meet all of the thermal energy steam requirements of the F, H, and S-Areas of SRS. The facility will also produce from 6 to 15 megawatts of electricity which will be connected and distributed to the SRS electrical distribution system for use onsite. Electricity output will vary based on the quantity of excess steam available after the steam load requirements are met.

Biomass fuel will be burned in the new facility to produce steam and power. The biomass will consist of primarily low-value wood residues and wood waste by-products with a small percentage of biomass-derived fuel (BDF) and oil delivered from the local Aiken and Augusta area. Biomass sources may include low-value forest products, forest residues and wood processing waste by-products, agricultural crops, construction waste, and alcohol fuels. Wood is the most common form of biomass and is available from several waste sources. This material includes by-products from manufacturers such as furniture mills, saw mills, paper mills and other wood product manufacturers; low-value forest products, such as small trees and top wood, and defective or deformed trees; forest residues, such as dead wood and hazardous wildland fire fuels and landscaping waste. Woodwaste is typically in the form of sawdust, woodchips, pellets, and wood scraps such as crates and pallets, and is regularly used as an energy source for heating and power generation. There are numerous sources of biomass available within 100 miles of SRS and the fuel will be procured through purchases from local biomass suppliers. Many of the local suppliers obtain a portion of their biomass through timber sales from SRS.

BDF will make up to 30 percent of the heat input source for the cogeneration facility. The BDF will consist of tire-derived fuel (TDF) from scrap tires brought to transfer stations and landfills. The maximum permitted amount of BDF processed in the proposed facility will be approximately 1.1 million British thermal units (mbtu)/year or 43,000 tons of tires/year. In addition, each biomass boiler will be capable of burning fuel oil in the event the biomass feed system fails. As fuel oil is used, the biomass consumption will decrease. Five percent of the fuel input for the proposed cogeneration facility could be fuel oil. This consumption will vary as it will be a backup fuel only.

The biomass fuel delivery trucks will enter SRS using an existing primary road to the plant entrance. A deceleration lane will be added for trucks to enter the cogeneration facility as part of this project. Once onsite, the trucks will be unloaded using a truck dumper. A fire suppression system will be part of the cogeneration biomass fuel storage area. The trucks will exit behind the cogeneration facility where a new traffic light will be installed. The current graveled road will be paved to support the biomass truck deliveries. Peak truck traffic will be an 8 hour operation with 7 to 8 trucks per hour, 5 days per week.

The proposed cogeneration facility will include two 120,000 pounds per hour (pph) (210,000 mbtu/hr input) boilers and one 20 megawatt turbine. Each boiler will have full capacity fuel-oil burners that will serve as a back-up in case the biomass fuel system is inoperable. The proposed facility will have a footprint of approximately 20,000 square feet (sf), with an additional 2,200 sf administration building in front of the facility, a detached garage, and biomass fuel yard covering approximately 12 acres. The development on the site will include four main components: 1) the fuel handling yard, 2) the steam/combustion system, 3) the water treatment system, and 4) the turbine and electrical system. The 850 pounds per square inch (psi) steam produced by the steam plants will pass through a single extraction turbine. Steam required by SRS will then be transferred to an existing steam distribution system, and the remaining steam will flow through the other stage of the turbine for additional power generation. The combustion/steam system will include the components from the fuel feeder to the exhaust stack and the steam auxiliaries.

A bubbling fluidized bed (BFB) combustion technology is proposed for this project. BFB technology uses high pressure air to fluidize a 2-3 foot bed of sand (inert material) in suspension. The fuel source is fed into the system through air spouts and dropped onto the bed. The system operates using air to reduce the bed temperature and to minimize nitrogen oxide (NOx) emissions. BFB technology is preferable to the circulating fluidized bed (CFB) for biomass fuels due to its ability to better tolerate various fuel types, as well as larger variations in both fuel mixture density and moisture content. BFBs have the advantage of reduced air emissions due to a more stringently controlled temperature in the combustion process. The BFB boiler will produce steam at 850 psi, 825° F. The steam will pass through a condensing steam turbine when generating electricity, or, if the turbine is down, through a pressure reducing valve (PRV) station which will reduce the pressure to 385 psi. The 385 psi steam will be distributed to the existing system via the interconnection to the existing steam header located just across an existing road from the new plant.

Each boiler will include a flue gas handling system, which will consist of an induced draft (ID) fan to pull the boiler flue gas through the economizer, and then through a multiple cone dust collector. The ID fan will exhaust into a fabric filter baghouse and then to an integral exhaust stack. The baghouse will capture particulate matter from the flue gas with removal efficiencies of 99.9+ percent. Because of the lower bed temperature of a BFB, a baghouse will be used instead of an electrostatic precipitator (ESP). The baghouse will be more effective in capturing sulfur and mercury components and has minimal energy requirements compared to the ESP. The flue gas will then exit through a stack adjacent to the ID fan and baghouse, to be located just outside of the new facility. The flue gas from the boiler will be treated in the combustion system using selective non-catalytic reduction (SNCR) technology to reduce nitrogen oxides. Urea will be injected into the furnace typically above the over-fire air ports, reacting with the oxides to form innocuous nitrogen and hydrogen.

Cooling process water for the facility will be drawn from the Savannah River. New more efficient pumps will be installed in the 681-3G Pumphouse to provide the water to the biomass cogeneration facility. A new pipeline will be installed from the proposed facility site to the nearest water main pump house in C-Area, a distance of approximately 1.5 miles. Of this distance, the pipeline will follow an existing right-of-way (ROW) for one mile and will then branch off for 0.5 miles through forested land. Industrial wastewater from the facility will be discharged via a discharge system to Upper Three Runs (UTR). The ash and other waste generated during facility operations will be disposed of at the nearby permitted Three Rivers Regional Municipal Solid Waste Landfill. A new electrical feeder line will be constructed to tie the facility into the SRS electrical grid system at the 251-F substation.

Construction of the cogeneration facility is scheduled to begin in September 2008, and will continue for 2.5 years. A peak number of 200 construction workers will be required during the construction period. The facility will be online near the end of 2010, and will operate 24 hours per day for an initial term of 21 years, though the serviceable life of the facility will be over 30 years. Approximately 20 employees will be required for operation of the facility.

ECM 2 will consist of two new biomass heating plants; one will service K-Area and the other will service L-Area. The new K-Area plant will be adjacent to the existing oil-fired steam plant within the fenced area. The L-Area plant will be located on the footprint of Building 183-4L which was removed during site decommissioning and demolition. Both plants will consist of a combustion and steam system. The plants will each be capable of producing 10,500 pounds per hour (pph) of steam. Additionally, both the K and L-Area biomass heating plants will only burn clean biomass and no BDF. The biomass fuel (wood materials) will be stored at the fuel yard adjacent to the proposed cogeneration facility (ECM 1), and will be trucked to the K and L-Area plants up to a maximum of one trip per day to both sites. The fuel will be loaded onto a walking floor-bed truck at the fuel yard and then parked at the metering bin for each steam plant. Each of the new plants will be installed in a new enclosed metal building with an adjacent covered shelter to house the fuel storage and delivery equipment. A fire suppression system will be part of each of the fuel storage areas. The total footprint of construction will be 3 acres for each steam plant, for a total of 6 acres. The total construction period for both plants will be approximately 18 months. Once operational, both plants will only produce steam, and will distribute the produced steam within their respective service areas (K and L). The pipeline connecting K-Area and L-Area will no longer be needed and will be capped and left in place. The plants at the K and L locations will each have less than 1400 gallons a day of steam blow down water at peak per plant. This water will drain to the existing sanitary sewer system in K-Area and to permitted outfall L-07 in L-Area.

Each of the two biomass plants will use up to 2,500 tons per year of biomass (5,000 tons total for both plants). The plants are scheduled to operate during the colder months of November through April. Each of the biomass plants will also be equipped with fuel oil burners for fuel oil combustion during system startup and backup. Up to about 5 percent of the plants' total fuel input could be fuel oil. Steam feed water will be supplied from the river water system in L-Area and from the well water system in K-Area.

No Action Alternatives: Under the No Action Alternative, DOE will continue to operate the coal-fired D-Area powerhouse, which produces both steam and electricity for onsite consumption, and the oil-fired K-Area steam plant, which produces only steam. These facilities are past their design life and are in need of significant modifications and upgrades to bring them into compliance with current environmental standards and permitting requirements. The existing D-Area powerhouse currently burns almost 160,000 tons of coal annually and will continue to use coal at a similar rate under the No Action Alternative. In FY 2007, 6,569 truckloads of coal were delivered to the D-Area powerhouse, totaling 153,954 tons of coal. On average, 26 truckloads were delivered to the site each day and the average weight of coal delivered per truckload was 23.4 tons.

The D-Area powerhouse is close to the Savannah River and is located several miles from its end users (F, H, and S-Areas) and must distribute steam through a large distribution pipeline to these areas, losing valuable energy in the process. In addition to steam, the powerhouse also produces approximately 20 megawatts of electricity on average that is consumed by DOE facilities onsite. Electricity output is based on the quantity of excess steam available after the steam load requirements are met. The D-Area powerhouse withdraws an average of 50 million gallons of water per day from the Savannah River. Water that is used for steam plant feedwater is treated at the 483-D water plant. Untreated raw water, which is used for condenser cooling passes directly through the condenser and is discharged directly through the powerhouse's outfall. The primary National Pollutant Discharge Elimination System (NPDES) permitted outfall for the facility, D-01, discharges an average of 40.2 million gallons/day. Discharge limits are in effect for temperature, temperature difference between river water intake and discharge, residual chlorine, pH, total suspended solids, oil/grease, and manganese. The D-Area powerhouse employs 60 people and is operated by a contractor.

The existing oil-fired K-Area steam plant is maintained by SRS personnel, but no employees are permanently assigned to the facility. The K-Area steam plant consists of two boilers, one 30,000 pph and one 60,000 pph; the 30,000 pph steam plant has been and will continue to be the primary boiler. The K-Area steam plant serves both K and L-Area users, and a 2.5 mile pipeline delivers steam to the L-Area from K-Area. The steam that travels in this distribution pipeline also loses valuable energy before reaching L-Area. The source for process water for the K-Area plant will continue to be from the well water system in K-Area.

Alternatives Considered But Not Evaluated: For this project, two alternative locations were evaluated for the proposed biomass cogeneration facility, but were dismissed from further analysis. Alternative Site 1 is in close proximity to the main steam header, SC Highway 125, and a 115 kilovolts electrical system. Drawbacks to this location include the distance of the site from the F-Area production wells and the Central Sanitary Wastewater Treatment Facility (CSWTF). The major drawback to this site is the distance to the 200-Area end-users. This site is the closest of the evaluated locations to the existing powerhouse site. Therefore, compared to the other locations, more steam line would have to stay in service if this site were to be used. The cost of operating and maintaining this additional line would be considerable. The energy loss from transporting the steam across this distance would also be considerable. To compensate for this energy loss, more fuel would be needed. For these reasons, Alternative Site 1 was dismissed from further evaluation.

Alternative Site 2 is close to the 200-Area end-users and groundwater production wells. However, it is far from the highway, CSWTF, and the steam main. Because of the distance from a main SRS thoroughfare, this site location would create access difficulties for construction activities and fuel delivery. Further, the site is in close proximity to a remediated nuclear waste operations site. However, the key drawback of this site is that it is in close proximity to the H-Area meteorological tower and therefore would interfere with the tower's operation. For these reasons, Alternative Site 2 was dismissed from further evaluation.

DOE also considered alternatives related to water sources, the discharge of industrial effluent, and the cooling of process water, but did not evaluate them in the EA.

The biomass cogeneration facility would require process water for steam and cooling tower makeup and for backwash and regeneration cycles associated with the facility's water treatment system. Expected water flow demand could peak at 2,000 gallons per minute. Alternative sources of process water identified but not evaluated in the EA included: (a) treated effluent from CSWTF, (b) groundwater from existing F-Area production wells or new production wells installed at the preferred facility site, and (c) the SRS domestic water system. DOE determined that the CSWTF was not a viable water source because the volume of treated effluent would not be sufficient to meet facility needs. Although the site's groundwater resource could easily accommodate projected water demand, DOE determined the use of existing or new production wells would not be cost effective. From this analysis, DOE has determined the SRS domestic water system has sufficient capacity to support the proposed action, but its use for this purpose would not be economical. The biomass cogeneration facility will draw its water from the existing river water system. If, at some point in the future, the river water system is no longer available due to insufficient river flows, the above water source alternatives will be reevaluated.

A potential alternative to discharging industrial effluent (steam and cooling tower blow down) to UTR is to discharge this waste stream to CSWTF. DOE determined that the site's wastewater treatment facility could not accommodate the increased inflow, and this option was not evaluated in the EA. The use of air-cooled condensers as an alternative to the construction and operation of cooling towers was also identified. However, air-cooled condensers are space and energy intensive and will not function effectively during the hot and humid summer period. Therefore, DOE did not evaluate this alternative method for cooling process water in the EA.

Environmental Impacts: The cogeneration facility site will be located on an old abandoned borrow pit that appears to have had no restoration. The soil is highly disturbed and not characteristic of an intact series. Based on the previous use of the proposed site, the potential for the construction and operation of the proposed action to impact environmental resources at SRS will be negligible. DOE also expects that the potential for the utility line right-of-way construction to impact environmental resources at SRS will be negligible. DOE expects that environmental impacts from the construction and operation of the plants at K and L-Areas to be similar to those for the proposed facility site. As these two areas currently house facilities, the land and soils are already disturbed and compacted. DOE expects that the potential for the utility line right-of-way construction in K and L-Areas to impact environmental resources at SRS to be negligible. DOE expects no adverse water quality impacts from the construction and operation of the proposed actions. The substantial decrease in Savannah River water withdrawal rates will be beneficial.

DOE expects that air emissions resulting from construction-related activities (e.g., equipment emissions, fugitive dust) at the three sites will be short-lived and minimal. They will not require permitting by the State. Overall emissions will change with the shift from a coal-fired power plant to a biomass cogeneration facility. DOE expects the overall emission levels will decrease, but the emissions of some criteria pollutants will increase. SRS currently operates via a Title V-Part 70 Operating Permit. A new operation permit will be obtained to include the new emissions from the cogeneration facility. Actions that will aid in decreasing the overall impacts of air emissions include limiting when the facility will be operating, and utilizing abatement technologies to help decrease emission levels at the source. The proposed facility's abatement measures include a fabric filter baghouse to reduce particulate matter (PM), and selective non-catalytic reduction (SNCR) to reduce nitrogen oxide formation. Baghouse filters work to curb PM emissions by trapping particulate matter in a fabric bag, similar to the way a vacuum cleaner operates. The filters are cleaned by blowing air through in the reverse direction and collecting the PM. This process effectively removes up to 99.9+ percent of particulate matter. The SNCR method effectively reduces NO_x emissions via a process of urea injection. Urea will be injected into the steam boiler at temperatures high enough to result in a chemical reaction between water and urea that forms ammonia which in turn reacts with NO_x and oxygen to form nitrogen and water. In addition, limestone will be injected into the flue gas and, via sorption reactions, reduce NO_x and sulfur compounds. Multicyclone technology will be implemented at the K and L-Area plants to aid in decreasing air emissions. This technology reduces the temperature of combustion by dilution of the combustion products with excess fuel, air, flue gas, or steam. The resulting chemical reactions prevent the majority of the nitrogen from becoming ionized and forming NO_x. Replacement of the existing facilities with biomass fueled facilities will substantially reduce greenhouse gas (e.g., water vapor, carbon dioxide, methane, ozone) emissions and minimize environmental compliance issues while more reliably providing steam for SRS missions and decreasing the SRS carbon footprint.

The potential for these activities to significantly impact the human environment (e.g., air, aquatic, terrestrial, and biotic resources) will be negligible. The potential for the proposed and alternative actions evaluated in the EA to significantly impact archaeological or cultural resources at SRS will be negligible. None of the proposed actions evaluated in the EA will be expected to have a measurable impact on migratory avian species. DOE expects overall impacts to both vegetation and wildlife to be long-term and minor for the proposed actions. There will be no effect on the population status of any threatened and endangered species within the proposed project areas or on a site wide level.

The potential for the proposed actions evaluated in the EA to result in terrorism-related activity or impacts at SRS are expected be negligible. The potential for the proposed actions evaluated in the EA to result in accidents from operation activities at SRS are expected to be negligible. Impacts to worker health and safety will be negligible due to the use of appropriate safety practices, personal protective clothing and equipment, and the provision of a safe and healthful workplace as required by Federal regulations. Workforce requirements and project costs of implementation of the proposed projects will be minimal when compared to the total SRS budget and employment (approximately $1.15 billion per year and 10,000 personnel, respectively). The socioeconomic impact(s) of the proposed projects on the human environment will be negligible. Based on the information and analysis presented in the EA, DOE has determined that the proposed construction and operation of the new biomass cogeneration facility and heating plants at SRS will not cause disproportionately high and adverse human health or environmental effects on minority and low income populations in the SRS region of interest. Infrastructure impacts from the proposed actions will be negligible as the new facility and plants will be smaller than the existing powerhouse and therefore require less infrastructure resources.

Cumulative Impacts: Construction-related activities of implementation of the proposed projects will be short-lived and the potential for any resulting air emissions to interact with other SRS pollutant sources or have a cumulative impact on criteria air pollutants will be negligible. SRS could be in an area declared nonattainment for PM_{10}, $PM_{2.5}$, and ozone at some future date. When an area is designated nonattainment for any of the criteria pollutants, the affected State must draft a plan known as a State Implementation Plan (SIP) to improve air quality and outline the control measures the State will take in order to meet National Air Quality Standards (NAAQS). These air pollution control measures include a process called Nonattainment New Source Review (NA NSR) permitting. NA NSR applies to new major sources or major modifications at existing sources for pollutants where the source location is not in attainment with NAAQS. All NA NSR permits require that the proposed air pollution source install the Lowest Achievable Emission Rate (LAER), pollution controls, emission offsets, and an opportunity for public involvement. LAER is the most stringent emission limitation derived from either of the following: the most stringent emission limitation contained in the SIP for a similar source, or the most stringent emission limitation achieved in practice by a similar source. Also, sources must obtain emissions reductions from existing sources located in the vicinity of the source NA NSR source. The emission reductions, generally called “offsets” must offset the emissions increase from the new source or major source modification to ensure reasonable progress toward meeting the NAAQS. The emission reductions must also provide a net air quality benefit. DOE expects that there will be a decrease of approximately 100,000 tons a year of carbon dioxide emissions by switching from coal combustion to biomass combustion and that the potential cumulative impacts of the actions evaluated in the EA on the human environment will be minimal.

Floodplain Statement of Findings: This is a Floodplain Statement of Findings prepared in accordance with Title 10 Code of Federal Regulations Part 1022. A floodplain and wetlands assessment was incorporated in the EA. With the implementation of all best management practices, to both minimize runoff from the construction site and minimize direct encroachment on the wetlands and their associated floodplains, DOE expects the overall impacts to wetlands and floodplains of UTR from the proposed project will be minimal and short term. No long-term impacts are foreseen. DOE will allow 15 days of public review after publication of this statement of findings before implementing construction of the proposed biomass cogeneration facility and two new biomass heating plants at K and L-Areas.

Determination: Based upon the information and analyses in the EA (DOE/EA-1605), DOE has determined that the proposed construction and operation of the new biomass cogeneration facilities and heating plants at SRS do not constitute a major Federal action significantly affecting the quality of the human environment within the meaning of NEPA. Therefore, an EIS is not required and DOE is issuing this FONSI.

Signed in Aiken, South Carolina, this 6th day of August 2008.

Jeffrey M. Allison
Manager
Savannah River Operations Office