EA-0893; Environmental Assessment Gazes Cardiac Research Institute Medical University of South Carolina

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1.0 EXECUTIVE SUMMARY

1.1 Description

The Department of Energy (DOE) proposes to authorize the Medical University of South Carolina (MUSC) to construct and equip of the Gazes Cardiac Research Institute in the lower two stories of the nine story Strom Thurmond Biomedical Research Center. Construction of the Institute and the Center are considered "connected" actions, and the assessment of potential environmental impacts from both is accordingly combined.

1.2 Alternatives

DOE's alternative to the proposed action would be not to authorize construction under the terms of the grant. The impacts of this alternative would be the same as the impacts of the proposed action, inasmuch as the Institute would comprise only two of the nine-story Strom Thurmond Biomedical Research Center, and the University proposes to proceed with the Center even if DOE funding is withdrawn. Other alternatives, which included co-location with other facilities and construction at other sites on campus, posed impacts of similar type and magnitude.

1.3 Affected Environment

The affected environment would be a fully developed urban zone, the Charleston Peninsula. The site has existing structures which would be removed. The only flora and fauna identified is associated with urban vegetation including trees, lawns and gardens. The location is within a floodplain.

1.4 Construction Impacts

The building would be constructed of poured in place concrete placed on piles. Environmental impacts of the two year construction period is limited to construction traffic, noise of pile driving and construction machinery, and various typical minor impacts associated with building construction.

1.5 Operating Impacts

Once constructed, the proposed project would use material containing radionuclides, and various hazardous materials in conducting clinical studies, patient treatment, animal studies, and in various laboratory procedures increasing the current annual MUSC waste generation of 3475 tons, by approximately 25%. Some fraction of these materials would ultimately enter one of three managed waste streams: hazardous waste, medical/biological waste, and radioactive/mixed waste. Some fraction would be emitted to the air and water environments.

Waste storage, removal and disposal would be managed under an existing RCRA permit; MUSC has waste management and safety programs currently in place. Radiological safety programs would be conducted pursuant to a MUSC Nuclear Regulatory Commission license to use radioactive materials, and to applicable EPA and OSHA regulations governing hazardous materials in the work place. The proposed project would be covered by MUSC's RCRA permit, and existing waste management and safety programs would be expanded for the proposed project. Risks to the environment, including the floodplain associated with waste management, have been evaluated and are found to be minor. The proposed project would be in compliance with all applicable environmental laws and regulations, such as those protecting the air, water and land environments. Other effects from project activities, including those affecting the floodplain are found to be minor.

1.6 Relationship to Other NEPA Review

Part of the project involves occupation of the proposed research center by the Department Of Veterans Affairs (VA). DOE has assumed NEPA lead agency role with review inputs from the VA.

1.7 Relationship to Land Use Plans and Policies

The project would conform with all applicable federal, state, and local land use plans and policies.

2.0 PURPOSE AND NEED FOR AGENCY ACTION

The leading source of mortality in the United States is heart disease. Research and development in a clinical setting is essential to acquire the knowledge needed for more advanced diagnostics, preventive care, and treatment. The MUSC is a leading national center for medical research. The project is needed to help reduce mortality from heart disease, and the purpose is to enhance the capacity of the MUSC to meet this need (Ref 2,4). The Congress has provide funding in DOE appropriations in support of a cardiac institute at the MUSC.

3.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

3.1 Description of the Proposed Action

The Department of Energy (DOE) proposes to authorize the Medical University of South Carolina (MUSC) to construct and equip two floors of the proposed nine story Strom Thurmond Biomedical Research Center (Center). The Report (S.Rep. No. 101-000) accompanying Public Law No. 101-514 (Ref. 1), recommended $6M be used to expand and consolidate basic and clinical research activities of the Cardiology Division of the existing Gazes Cardiac Institute. Constructing and equipping two floors at the Center would enable laboratories to conduct clinical research and outpatient diagnostic studies, examination of patients, cardiac epidemiology studies, and education and training. Both the clinical research and outpatient diagnostic studies would utilize nuclear isotopes and radioactive pharmaceuticals. The basic research laboratories would concentrate on heart failure in studies currently utilizing 12 different radioactive isotopes.

A grant was executed with MUSC on August 2, 1991, and grant funds are available to MUSC for the limited purpose of performing preliminary studies, including analysis necessary to conduct this environmental assessment. However, under the terms of the grant, the grantee may not initiate construction or take any other action which would affect the environment or limit alternatives until the DOE NEPA process has been completed and DOE has determined that such action should proceed.

3.2 Project Description

3.2.1 Construction Activities

The Institute would comprise approximately 20,400 square feet (sf) including 4700 sf on the main level of the building for out-patient study and orientation. The remaining 15,700 sf for the Institute would be clinical research space on the second floor. The Institute would have its own entrance (Ref 3). The site occupies approximately 1.34 acres, with an additional 0.20 acres subject to disturbance (Ref 32).

Construction of the Institute would be integrated with construction for the Center as described in section 3.1.4. Construction of the Center would be conventional poured-in-place concrete columns and beams supported on piles. There would be no basement and no excavation of soils other than for grading. The soils at the site are not contaminated, and existing buildings containing asbestos are being removed prior to construction of the proposed building (Ref 3, 30). Building construction is anticipated to take 32 months.

The Institute would include equipment and facilities for clinical cardiac studies, drug studies and associated research. It would also provide holding space for both large and small animals used in research. Equipment would include various laboratory instruments, storage facilities for materials used in research, and storage facilities for waste materials (Ref 3,4).

Prior to construction four existing buildings would be removed (see Chapter 4 for description of the buildings). Asbestos containing materials in these structures has already been removed, and asbestos removal is not part of the proposed action.

3.2.2 Operation Activities

3.2.2.1 Gazes Institute

The Institute's basic research mission would be heart failure studies. These studies would utilize various nuclear isotopes and radioactive pharmaceuticals, various hazardous and toxic materials, and animals. (See chapter 5 for list of specific radionuclides and hazardous materials which may be used.) Activities would also include a clinical practice given that some researchers would also be practicing physicians.

These uses would generate various waste products which would be correspondingly radioactive, radioactive mixed, hazardous, toxic, and biologically active. Activities involving the use of these materials, waste generation, as well as airborne or waterborne emissions and packaging for disposal, would be managed and controlled pursuant to Environmental Protection Agency (EPA), Nuclear Regulatory Commission (NRC), and State of South Carolina permits, regulations and standards. (See Chapter 5 for additional detail.)

3.2.2.2 Strom Thurmond Biomedical Research Center

The nine-story Strom Thurmond Biomedical Research Center would provide approximately) 190,000 square feet of space for MUSC and VA research in surgery, pharmacology, nephrology, cardiology, hematology, endocrinology, infectious disease, psychology/psychiatry and diabetes. The total project cost is estimated at $32,516,000 (Ref. 4).

MUSC/VA cardiology investigators using animal research would occupy the third floor of the building and an access elevator would connect the second and third floors. The fourth, fifth, and sixth floors would be allocated to MUSC/VA research activities. The seventh floor would be a small animal holding area. The eighth would be an operatory floor with associated support area and would house large animals. The remainder of the building would be for mechanical,

electrical and other support functions (Ref 3,30).

3.2.3 Connection of the Gazes Cardiac Research Institute to the Strom Thurmond Biomedical Research Center

The DOE funding involvement in the project is limited to the Gazes Cardiac Research Institute. However, for purposes of this EA, the Institute is considered to be a "connected action" [see 40 CFR 1508.25(a)(1)] with all other activities of the proposed nine story Center, as described above. In planning the Institute MUSC considered the various proposed research, clinical and educational activities to be "interdependent" (see 40 CFR 1508.25(a)(1)(iii)), since, research activities of the Institute would involve animal experiments and other activities requiring the active participation of persons and facilities at other floors of the Center. Moreover, infrastructure services, waste management, and health and safety control programs for the Institute would be indistinguishable from that which would be provided for activities within the Center as a whole. Accordingly, the EA evaluates the environmental impacts of the Center (Ref 3,4).

3.3 Alternatives To the Proposed Action

In planning for the Center four alternatives were considered.

3.3.1 The No-Action Alternative

Under the no action alternative, Federal funding would not occur, thus, the "no-action" alternative, would effectively result in a shortfall in Federal funding for construction or equipping of the Center. Although the MUSC is committed to pursuing the project with or without the Federal support, a decision not to authorize construction would likely mean a delay in the project, depending on MUSC access to alternative funding sources (Ref 4).

3.3.2 Locate the Institute in a building dedicated exclusively to the work of the Institute.

This alternative was rejected by the University early in the planning process because of the need for animal facilities. Constructing animal facilities for the Institute alone was considered non-economic because of the small scale of Institute operations. In addition the planners felt it was essential for the Institute to have direct linkages to complementary research facilities, operations, and staff.

3.3.3 Co-locate the Institute in the multi-story Hollings Oncology Center currently under construction elsewhere on the MUSC campus.

This location would meet the need for adequate access to animal facilities and to complementary research facilities, operations and staff. However, the Hollings Center's purpose is oncology research, and therefore the planned Strom Thurmond Biomedical Research Center was judged to be more suitable by the University because its research mission was broader than cancer research.

3.3.4 Co-locate the Institute in the proposed Strom Thurmond Biomedical Research Center, but at a site about one block east of the selected site.

The University planners compared the two available sites, taking into account the schedule of availability of both sites, the parking situation, environmental considerations and other factors such as the desire to demolish outmoded buildings at the chosen site. The University stated that the site that was chosen was more advantageous because it met more of the criteria considered during the comparison.

4.0 THE AFFECTED ENVIRONMENT

4.1 Site Description

The proposed Strom Thurmond Biomedical Research Center to be located near the center of the Charleston peninsula in Charleston, South Carolina (see Figure 1). The proposed Center would be located on the campus of the Medical University of South Carolina (see Figure 2). Four low-rise residential buildings would be demolished to accommodate the new construction (see Figure 3).

The Center would be located in a downtown college campus in a fully developed urban region which includes institutional, residential and commercial activities. The site is free of contamination (Ref 3).

The site area is divided into streets and roadways with associated infrastructure: electric power, water supply, sewerage, street lighting, telecommunications. Land not occupied by structures includes driveways, parking lots, service areas, walkways, lawns, trees and other plantings.

The land exhibits very little topographic variation, but there is sufficient slope to accommodate normal drainage of runoff. Wildlife consists of insects, birds and small mammals typical of urban habitat which includes trees and grassy areas.

4.2 Air Quality

The Charleston area is an attainment area for all criteria pollutants.

4.3 Surface/Ground Water Quality

The natural terrain was originally of lower elevation and was probably a tidal wetland or coastal floodplain subject to tidal inundation. However, the area was filled many years ago (probably in the 19th century) to allow for the historic urban development that constitutes the current environment.

The site is within a 100 year floodplain that is 6.10 square miles and a 500 year floodplain of 7.53 square miles. Additional data are provided in section 5.1.1.3 and in an appended Floodplain/Wetlands Assessment (Appendix 1).

4.4 Soil

Prior land use was residential and there were no buried tanks. A Phase 1 Environmental Assessment prepared by

General Engineering Laboratories of Charleston, June 13, 1991 reported: "A visual inspection of the subject sites and surrounding properties was conducted on June 3, 1991...". The inspection revealed no evidence of prior environmental stress to the site.

5.0 ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION AND ALTERNATIVES

The total environmental impacts of the proposed action and alternatives are described below.

5.1 Environmental Impacts of Construction

Construction would take place over a thirty to thirty six month period. Traffic load would vary from less than ten truck trips per day (during pile driving) to an approximate peak traffic load of 80 truck trips per day delivering materials and carting away wastes when the interior is being equipped and finished. Construction would employ a peak of approximately 70-80 workers.

5.1.1 Sensitive Resources

5.1.1.1 Historic/Archeological

There are no known affected historical/archeological resources (Ref 5, 6).

5.1.1.2 Federal/State-Listed or Proposed Protected Species or Critical Habitats

The U.S. Fish and Wildlife Service in Charleston, and The South Carolina Wildlife and Marine Resources Department have reviewed the proposed site and report that there are no known threatened or endangered species or critical habitats associated with the area of potential impact (Ref 7).

5.1.1.3 Floodplain/Wetlands

There are no affected wetlands according to the Fish and Wildlife Service and the U.S. Army Corps of Engineers (Ref 7,8). Reference to the USGS quadrangle for Charleston (Figure 1 & Ref 10) does not show a wetland at the site. However the site is located in a floodplain area according the Corps of Engineers (Ref 9). Accordingly, a Floodplain Assessment pursuant to 10 CFR 1022.12 is appended to and made a part of this EA (See Appendix 1).

The proposed additional footprint represents a very small fraction of the respective floodplain, consequently the proposed action would not impede drainage or otherwise cause adverse hydrologic effects in the floodplain. The Floodplain Assessment finds that there would be no adverse effects on the floodplain from the net additional 10,000 square feet of building footprint (allowing for demolition of existing structures), and that the probability of hazardous

materials reaching the floodplain environment as a result of 100 and 500 year floods would be negligible.

5.1.1.4 National Forests, Parks, Trails, etc.

There are no national forests, parks or trails at the site (Ref 3,10).

5.1.1.5 Prime Farmland

There are no prime farmlands at the site (Refs 3,10).

5.1.1.6 Special Sources of Water

The site is not part of a supply watershed, the groundwater underlying the site is not a sole source aquifer, and the project would not employ wells. Construction will not impact on the aquifer (Refs 3,10).

5.1.1.7 Coastal Zone

The South Carolina Coastal Council has certified construction of the proposed Center is consistent with the Coast Zone Management Program to the maximum extent practicable (REF. 37).

5.1.2 Erosion/Run-Off

The site is flat, and the soils constitute largely fill material. Any erosion or soil runoff to be induced by construction would be limited by conventional construction methods, such as proper grading and channeling of runoff, and installation of erosion control devices as specified on the construction contract documents. The building contractor would be required to submit a plan for erosion and runoff control as part of the contract (Ref 3, 30). An NPDES permit would not be required because the site is less than 5 acres (Ref 32, 33).

5.1.3 Demolition/Construction Waste Disposal

5.1.3.1 Asbestos

Removal of asbestos in the four buildings was accomplished prior to the start of the project and is not part of the proposed action. Accordingly, the proposed action does not involve handling or removal of asbestos.

5.1.3.2 Excavation Waste

The building would be constructed on piles so that no excavation waste is expected other than some old pavement or asphalt (Ref 3).

5.1.3.3 Demolition Waste

Demolition waste from the four buildings would consist primarily of wood and masonry materials, as well as wiring, pipes, fixtures, carpeting materials, asphalt from driveways and parking areas, etc. Demolition waste would be approximately 2000 cubic yards (Ref 4). These wastes would be conventionally disposed of by the contractor who would acquire the necessary permits.

5.1.3.4 Demolition/Construction Waste Disposal

The estimated quantity of building construction waste would be approximately 40 cubic yards per week over a two and a half year period of construction totalling 5,200 cubic yards of material. Materials would include masonry, brickbats, wood scraps, miscellaneous metal trimmings and scraps, finish material, cardboard, paper, polyethylene sheeting and various packaging materials typical of building construction (Ref 3, 4). These materials would be disposed of by the contractor via local recycling markets for appropriate scrap materials and via permitted landfill for the remainder.

5.1.4 Air Quality Impacts

Air quality impacts of construction would be those routinely resulting from the truck traffic, and on-site diesel or natural gas driven machinery. These would be low-level intermittent and transient impacts with no long term impact. A quantitative estimate has not been made, and no permit is required for these routine air emissions. Air quality during construction would be regulated in accordance with section 62.6 of the South Carolina Air Pollution Control Regulations and Standards which require the contractor to "sprinkle" or "wet down" the travel ways within the site to control fugitive dust emission during construction (Ref 4, 32).

5.1.5 Noise

Noise common to building construction would result from truck traffic, on-site diesel machinery, natural gas driven machinery, electric generators, motors, pumps and compressors. The loudest noise source would be pile driving during the foundation construction phase which would last about one to two months and would likely produce a 105 db at the source, 95 db 50 feet from the source, to 77 db 400 feet from the source (Ref 15). This level of noise would be in the "annoyance" range of 65 to 128 db, (128 db is called the "pain threshold") for persons on the street and in nearby buildings (Ref 15). This noise level would be somewhat abated for persons inside of buildings, but a quantitative decibel level has not been determined. Pile driving would be scheduled to avoid sleep disturbance (Ref 4).

Trucks and generators produce about 95 db at the source. 76-89 db at 50 feet and about 58 to 66 db at 400 feet thus producing noise at the lower end of "annoyance" (Ref 15). Such operations would likewise be scheduled to avoid sleep disturbance (Ref 4).

Certain construction machinery such as jackhammers and air drills would produce noise levels in excess of those mentioned above. Typical noise levels during construction of commercial buildings which integrate the effect of all noise sources range from 77 db to 89 db depending on phase of the construction, measured at the building site and

dissipating with distance - by approximately 2/3 at 400 feet, or approximately to 55-60 db (Ref 15).

Criteria for average acceptable outdoor sound levels range from 55 db for residential land use to 70 for office buildings and outdoor recreation areas (these are day-night integrated values) (Ref 15). Thus in general, construction noise would appear to be within acceptable ranges for the surrounding land uses, without taking into account increased daytime tolerance for transient construction periods.

5.1.6 Traffic, Parking, Relocation, etc.

The level of traffic generated by the construction is not likely to exceed 80 trips per day at the peak activity level. Local parking is essentially related to current MUSC uses, and would not be adversely affected in that abundant alternative parking in nearby campus lots and streets is available. Demolition of the existing building would require the relocation of several students in residence to other MUSC residential buildings. Two retail establishments leasing space would be affected. A uniform shop is relocating to another MUSC location. A sandwich shop with a year to year lease has been duly notified of lease termination. Office uses including a mammography site are part of MUSC operations and are being relocated to other facilities.

(Ref 4)

5.2 Environmental Impacts of Operation

5.2.1 Domestic Waste

Domestic class solid waste would be about 1875 tons per year from the Center, of which about 35% would be attributable to the Institute (Ref 27). This compares with 7500 tons per year for the University (Ref 3). 80-90% of the solid waste would be incinerated at the Spruill Avenue municipal incinerator in North Charleston, and the balance deposited at a county landfill facility, the Bee's Ferry Road landfill. These quantities are within the design capacities for these facilities (Ref 3)

5.2.2 Sanitary Waste

The Center's sanitary waste, discharged to a street-side sewer connection, would approximate 20,000 gallons per day, of which approximately 35% would be attributable to the Institute (Ref 27). Discharge of sanitary waste is covered by the SC Department of Health and Environmental Control (Ref 3). The sanitary waste load would include wastewater from toilets, bathrooms, and kitchen sinks, and would not include any significant sources of hazardous materials (Ref 27). The Charleston Commission of Public Works provides both sewer and water services to the University.

The sanitary waste load would include some soluble radionuclides. The 20,000 gallons per day would include approximately 500 gallons per day carrying approximately 5 millicurie (mCi) of tritium (H-3)(half life = 10.2 years) and 0.5 mCi carbon 14 (C-14)(half life = 5000 years) annually, plus an additional 30 mCi annually (0.082 mCi daily) of various other isotopes. Isotopes released to the sewer would come from laboratory operations in the form of aqueous solutions such as rinse and wash water from glassware and instrument cleaning, and occasionally from disposal of aqueous tissue culture media or animal excreta (Ref 27). (See section 5.2.6 for list of radionuclides which may be used).

A Federal regulation governs the discharge H-3, C-14 and other radionuclides to sanitary sewers (Ref 24). The following table contains a comparison of the proposed sewer releases with two limit tests provided in the regulations for C-14 and H-3:

Table 5.1 Comparison Of Proposed H-3 and C-14 Sewer Releases

RADIONUCLIDE	(1) DAILY DISCHARGE (mCi)	(2) CONCENTRATION (mCi/ml)	(3) DAILY DISCHARGE LIMIT PER REGULATION APPENDIX C (mCi)	(4) CONCENTRATION LIMIT PER REGULATION APPENDIX B (mCi/ml)
H-3	5,000	6.6 E-5	1E+4	1E-2
C-14	500	6.6 E-6	1E+3	3E-4

Comparing columns (2) and (4) as well as columns (1) with (3), it is apparent that even doubling of releases to the sewer of H-3 and C-14 would not cause the MUSC to exceed the respective limits per the regulation.

In addition the regulation sets an annual discharge quantity limit of 5 Ci per year for H-3 and 1.0 Ci per year for C-14. This compares with projected annual releases of 1.825 Ci and 0.1825 Ci respectively. The regulation excludes excreta from individuals undergoing medical diagnosis or therapy in the calculation of releases for purposes of compliance.

Finally, the regulation limits the discharge of all other radionuclides (excluding H-3 and C-14) to 1000 mCi per year which compares with 30 mCi projected.

5.2.3 Hazardous Waste

5.2.3.1 Gross Quantities and Sources

The Center would generate approximately 12,727 pounds of hazardous waste annually under a current RCRA permit to the MUSC as a "large quantity generator" (Ref 3, 12, 13, 27). Approximately 35% of this load may be attributable to the Institute (Ref 4). Total University hazardous waste reported on MUSC's 1991 Hazardous Waste Report Forms was 50,906 pounds, and for 1990 73,211.5 pounds. (Additional detail is provided later in this section.) About 10,000 pounds would be transfer of currently generated wastes from activities to be moved to the new Center, and approximately 3,500 pounds would be the incremental hazardous waste load of the Institute. This represents 6.9% to 4.8% of the MUSC total for 1991 and 1990 respectively (Ref 27). The new project would not require a new or amended RCRA permit (Ref 4, 27). The sources of these wastes would be analytical laboratories, clinical treatment facilities, surgical operations, and animal research (Ref 4, 27).

5.2.3.2 Method of Storage and Handling

Hazardous wastes would be stored in closed or sealed labeled containers and packages per regulation, either in 55 gallon metal drums, 20 gallon fiber drums, or 5 gallon metal pails for subsequent pickup, transport and disposal by licensed contractors. There would be a properly designed well-lighted area of about 400 square feet consisting of a separate room with elevated platform, handling equipment and other appropriate appurtenances for safely storing packaged and labeled hazardous wastes in the containers, according to their form as described below (Ref 27).

On-site waste management procedures are the responsibility of an environmental health & safety officer (Ref 27) and are in accordance with rules, regulations and procedures as prescribed by the University pursuant to prevailing federal and state standards and conditions of the RCRA permit (Ref 11, 27).

5.2.3.3 Forms of Hazardous Waste and Off-Site Treatment

Off-site hazardous waste treatment by contractor would be performed according to the following treatment methods (quantities are approximate):

Table 5.2 Off-Site Hazardous Waste Treatment Methods

WASTE FORM	PERCENT OF TOTAL	TREATMENT METHOD
Flammable Liquid	50-70	Incineration
Chemotherapy	10-15	Incineration
Poisons	10-15	As appropriate
Corrosives	10-15	Neutralization
Oxidizers	5-10	Chemical reduction
Reactives	1-2	As appropriate

5.2.3.4 Constituents of Hazardous Wastes

The University files an annual EPA Form GM - Waste Operation and Management- 1991/1992 Hazardous Waste Report with the U.S. Environmental Protection Agency. The same or similar waste materials as are currently being generated are likely to be generated by the proposed facility. Quantities reported for current operations vary considerably from year to year. While the total for the proposed facility is expected to increase by about 25%, individual chemical production may be somewhat greater or less than existing quantities. The following summary information is from the 1991 and 1992 Hazardous Waste reports (Ref 21):

Table 5.3 Summary of Hazardous Waste Reported on EPA Form GM (IN POUNDS)

TYPE OF MATERIAL	YEAR	
	1991	1992
Spent		
Non-halogenated solvents (ethanol, xylene-tissue staining waste)	11,517.5	19,683
Formalin - tissue preservative and tissue staining waste (formaldehyde, methanol, ethanol, water solutions)	1,657.5	2,980
Non-halogenated solvents (toluene, scintillation counter fluid and tissue staining waste)	3,640	3,464
South Carolina Hazardous Waste		
Hazardous chemotherapy waste	14,970	3,034
Laboratory Waste Chemicals Lab Packed and Shipped		

For appropriate treatment	2,249.5	2,811
For incineration	10,597.5	12,141
For blending into fuel	7,990	9,394
(Corrosives) for neutralization	1,230	3,048
For chemical oxidation	22	620
For chemical fixation	8	24
For landfill disposal	195	0
For metal recovery	60	180
Acutely Hazardous Waste (P-listed) Lab Packed and Shipped		
For incineration	25	0
For appropriate treatment	20	14
Total Reported On Forms (1990-73,211.5)	50,9065	7,573

5.2.3.5 Compliance With Waste Disposal Regulations

MUSC has on file the applicable operating licenses of all of its hazardous waste disposal contractors, and contracts for hazardous waste disposal are renewed each year on a competitive basis among qualified licensed contractors (Ref 27). Appropriate treatment methods employed by contractors include incineration and neutralization. Approximately 95 percent of these wastes currently disposed of by a single contractor, Environmental Enterprises of Cincinnati, Ohio. In some cases, wastes are subject to chemical reduction by MUSC prior to collection. Chemicals that are no longer needed by one department may be given to another University department in lieu of disposal for reuse. Some flammable liquids (methanol, ethanol, toluene) may be distilled and reused, contributing to waste volume reduction (Ref 27).

5.2.4 Biological/Medical Waste

The current rate of biomedical/medical waste at MUSC is about 3440 tons per year. Of this total amount the Center's biological infectious waste from human and animal sources would be approximately 217 tons per year and the Institute would produce about 117 tons per year. This represents a minor increase (10.3%) above the current MUSC rate (Ref 27).

This waste would be stored in labeled sealed containers, and placed in reusable carts that are 31 X 31 X 48 inches which are stored in a well lighted room of approximately 400 square feet. Containers would be collected at least twice weekly for transport to an off-site disposal facility by a licensed contractor, currently Incendere Inc. of Norfolk, Virginia (Ref 3, 27).

On-site biological/medical waste management procedures are the responsibility of a staff environmental health & safety officers and follow prescribed university procedures based on federal and state requirements (Ref 11, 27).

5.2.5 Radioactive and Mixed Waste

5.2.5.1 Gross Quantities

The total solid and liquid radiological waste for MUSC is currently about 8.25 tons per year (48 pounds per day). The Center would increase this amount by 1.24 tons per year and the Institute would produce an additional 0.41 tons per year. These wastes are a modest increase that can easily be handled by MUSC. These wastes would be collected, containerized, labelled and stored in a designated area for bi-weekly collection, transport and disposal by a licensed contractor.

(Approximately 500 gallons of wastewater containing radionuclides from washing operations would be disposed of via the sanitary sewer system as described in section 5.2.2).

5.2.5.2 Sources

The radiological wastes would come from laboratory experiments in which radionuclides are used for in-vitro studies (i.e. tissue culture, cell labelling, biochemistry, etc.). There would be very little or no use of these radionuclides in-vivo (Ref 27).

5.2.5.3 Constituents

These wastes would principally contain H-3, C-14, and P-32, and I-125, with smaller amounts of S-35, Cr-52 and Ca-45. In addition some small percentages of other isotopes listed in section 5.2.6 may also wind up in the waste stream (Ref 27).

The liquid portion of these wastes would be primarily (99%) organic based scintillation counting fluids (toluene based) which are classified as mixed hazardous waste (Ref 27).

The solid portion would consist mainly of laboratory trash containing residual radioactive contamination, unused low-level solid radioactive material, and radioactivity contaminated animal carcasses.

5.2.5.4 Disposal

Radioactive and mixed wastes would be packaged and labeled and placed in 55 gallon drums. The drums would be collected once every two weeks by licensed contractor for disposal at a low-level radioactive waste burial facility operating by Chem-Nuclear System Inc. in Barnwell, South Carolina. Liquid mixed waste would be disposed of by fuel blending at Quadrex Inc. in Gainesville, Florida, or an equivalent contractor facility (Ref 3, 27). Records are kept for each type of disposal as required by Federal and State regulations (Ref 27). Fuel blending consists of charging the qualified portion of the liquid waste together with a conventional fuel (such as diesel), in a stationary engine which produces useful electric power. Contractor facilities would be expected to meet NESHAPS Subpart 1 requirements for the resulting radiological emissions to the atmosphere.

5.2.5.5 Health and Safety

On-site radioactive and radioactive mixed waste management procedures are the responsibility of an environmental health and safety officer and are in accordance with rules, regulations and procedures as prescribed by the university pursuant to federal and state requirements (Ref 14, 25, 27).

5.2.6 Use of Radionuclides and Radiation Exposures

5.2.6.1 License

MUSC has a Radiation Control Council which controls policies and procedures and a Radiation Safety Department which monitors and controls all radiation producing activities under a South Carolina Broad License for use of radioactive materials (Ref 14, 20). The program includes the monitoring and control of personnel exposure from electronic products such as diagnostic radiographic units (Ref 25)

The license (Ref 20) is issued by the South Carolina Department of Health and Environmental Control under federal authority. The License lists 33 radioisotopes, their chemical or physical form, and the maximum radioactivity permitted in possession at any one time. The proposed project would increase existing uses of some of these materials, but would not exceed the license limits, and a new or modified license would not be required (Ref 25, 27).

Compliance with the provisions of the license are assessed by annual inspections conducted by the South Carolina Department of Health and Environmental Control. In the last 10 years the Department has found only occasional minor violations of the technical terms of the license, which were promptly corrected, and found no significant violation. The 1992 inspection report concluded that there were no current violations (Ref 4, 27).

5.2.6.2 Materials Covered by License

The first item listed in the license incorporates all elements between Atomic Number 3 and 83. The complete list follows:

Atomic Nos 3-83, Gold 198, *Carbon 14, *Chromium 51, Gallium 67, *Hydrogen 3, Indium 113, Iodine 123, *Iodine 125, Iodine 131, Potassium 42, Krypton 85, Molybdenum 99, Nickel 63, *Phosphorus 32, Phosphorus 33, *Sulfur 35, Strontium 90, Technetium 99, Tin 113, Xenon 127, Xenon 133, Cesium 137, Radium 226, Radon 222, *Calcium 45, Cobalt 57, Cesium 137, Iodine 125, Gadolinium 153, Cesium 137, Cesium 137, Cesium 136

* Denotes most commonly used radionuclides at MUSC (Ref 22)

These currently most commonly used isotopes at the University would also be those most used at the Center, and approximately 25% of these isotopes would be used by the Institute. The principal sources and radioactivity levels expected at the Center would be: C-14 (5mCi), H-3 (40 mCi), I-125 (25 mCi), P-32 (60 mCi), S-35 (30 mCi), Ca-45 (1 mCi), Cr-51 (10 mCi), all other licensed material < 10 mCi.

5.2.6.3 Uses of Radionuclides

All radionuclides used in the Center would be for medical/biological research (Ref 20). Other materials listed on the University's Broad License would be used for specified purposes not associated with the Center (i.e. medical

diagnostic/therapeutic materials, sealed sources) (Ref 27). For restricted areas, 10 CFR 20.101 allows 1.25 rems per calendar quarter to the whole body, 18.75 rems to hands, forearms, feet and ankles, and 7.5 rems to the skin of the whole body. For unrestricted areas 10 CFR 20.105 allows 0.5 rems whole body radiation annually, a limit of 2 mrems per hour, and of 100 rems of continuous exposure in seven days.

5.2.6.4 Radiation Control

Radiation exposures of personnel would principally result from contact with radioactive isotopes and from electronic products used in clinical and research work (Ref 27).

MUSC has a radiation safety program in which approximately 1200 personnel wear radiation monitoring badges of various types appropriate for the expected types of radiation exposure. This program would apply to the Institute and to the Center. MUSC abides by the "as low as reasonably achievable" (ALARA) concept of radiation protection (Ref 25, 27, 28, 29). The Federal regulations (Ref 29) specify radiation limits to personnel in restricted and unrestricted areas, and MUSC represents that its existing program is well within the prescribed limits above (see section 5.2.6.6) (Ref 4, 27).

5.2.6.5 Training

MUSC requires that all laboratory personnel be adequately trained in the handling and use of radioactive materials prior to beginning work in laboratories or other areas where potential exposure may occur. The Radiation Safety Office requires proof of training (Ref 27) .

The proposed Strom Thurmond Center would have approximately 200 persons subject to badging, 100 of whom would be new MUSC employees. Of these approximately 50 would be at the Institute and 25 would be new employees. All of these persons would complete the training requirements (Ref 27).

5.2.6.6 History of Radiation Exposure

MUSC represents that there have been no reports of injury from radioactive exposures, or any exceeding of radioactive exposure limits in the University's history of using radioactive materials and X-Ray machines. Based on MUSC monitoring of badges, the annual dose to individuals has not exceeded approximately 10% of the allowable dose (Ref 14, 27). The maximum permissible dose by state regulation is 5000 mrem/year for a radiation worker (Ref 27, 29 and SC DEH Titles A,B, C)

Accordingly, routine operations of the laboratories and clinical facilities would not be expected to result in excess of established regulatory levels of radioactive or radiation exposures to personnel at the facility.

5.2.6.7 Health effect of Radiation Exposure

The 500 mrem badged exposure can be compared with the U.S. average annual dose of 228 mrems. "Normal" individual doses may be considerably higher. For example, 100,000 miles of travel would add 67 mrem, sky diving at 5000 feet elevation would add 50 mrem, and contributions from radon in the soil 100 to 500 mrem (Ref 36).

Exposure of the public to radiation from radionuclides at the center would likely be unmeasurable. Approximately 70-

75 persons would be employed at the Center of which perhaps 50 would be badged.

The Nuclear Regulatory Commission reports a probability of 500 cancer deaths per million person-rem dose equivalent for the general population and 400 for workers (Ref 34).

Assuming a worker dose level of 10% of the allowable limit (badged exposure of 0.5 rems/year), the cancer death probability associated with the Center would be 200 deaths per million population (or 2 per 10,000).

5.2.7 Air Emissions

5.2.7.1 Radioactive

The MUSC Radiation Safety Department oversees and controls the amounts of radioactive releases to the environment from its operations.

None of the radionuclides would be expected to be emitted to the air environment (Ref 27), with the possible temporary exception of approximately 5 mCi per day of Iodine-125 from a radio-iodination process which is currently being phased out at the university (Ref 27). The radio-iodination process would be phased out over the next five years as commercial suppliers of iodine can supply a more economical supply. This level of emissions would result in about 3-5 orders of magnitude less exposure than the EPA limit of 3 mrem/year for Iodine and 10 mrem/year for all other radionuclides to the maximally exposed receptor (Ref 14, 23, 27).

5.2.7.2 Criteria Pollutants

The principal potential source of project emissions would be the building boiler facility, which would be expected to qualify for a boiler stack emissions permit from the South Carolina Department of Health and Environmental Control - Bureau of Air Quality Control (Ref 3,4).

The University currently has permits for 8 boilers (some natural gas and some No. 2 fuel oil) and stacks. The Center would constitute a 9th. The Center's boiler would use natural gas. The Center's boiler system has not yet been designed (Ref 3,4). Design considerations for the proposed boiler would involve details such as piping and duct locations, and selection of equipment based on manufacturers bids. Any boiler supplied would have approximately the same level of emissions as data from another building on campus with approximately similar heating system characteristics provides the following criteria emission estimates (pounds per hour): particulate matter - 0.48, SO - 0.0015, CO - 0.50, and NOx - 2.51 (Ref 31). NOx is regulated as an "air toxic" by the Bureau. MUSC is currently in compliance with air quality regulations (Ref 4).

5.2.7.3 Toxic Compounds Released to the Air

5.2.7.3.1 Sources

Small quantities of solvents are expected to be used in the Center's laboratories and could be vented to the atmosphere. These solvents would be methanol, toluene, and xylene. The quantities that are volatilized are minor and are not

expected to violate the building emissions permit to be issued by the South Carolina Department of Health and Environmental Control.

Approximately 13,500 pounds per year of solvent would be used by the Center or less than about 40 pounds per day (see section 5.2.3). Approximately 35% of this amount would be attributable to the Institute (Ref 4). Solvents include principally methanol, ethanol, xylene and toluene.

Solvents are stored in sealed containers prior to use, and spent solvents for waste are again stored in sealed containers.

In addition, NOx from a natural gas boiler, classified as an "air toxic" under South Carolina regulation, is described above as a criteria pollutant.

5.2.7.3.2 Impact on Air Quality

Among the solvents expected to be used, only toluene is listed in 40 CFR Part 61, National Emission Standards for Hazardous Air Pollutants as a substance "for which a Federal Register Notice has been published that included consideration of the serious health effects, including cancer, from ambient air exposure to the substance". In the absence of formal federal regulatory standards, except for toluene, the basis for assessing impact on air quality are Threshold Limit Values (TLV) published by the American Council of Government Industrial Hygienists (Ref 26).

Table 5-4 provides an estimate of the impact of selected solvents (methanol, toluene, and xylene) on air quality. Solvents selected for analysis were those for which data was available in a study by Geraughty and Miller (G&M) (Ref 18). G&M computed acceptable emission limits based on established TLVs (Ref 26). These can then be compared with projected emissions for the selected solvents. (Additional emission analysis for solvents not covered by G&M was not considered necessary because it appeared extremely unlikely that the quantities of any solvent used would approach the TLV.)

Table 5-4, Column 1 states the assumption that 15 to 25% of the solvent used would be vented to the atmosphere. This is a conservative assumption in that actual percentages are likely to be less. Columns 2 states the resulting annual emission rate and Column 3 states the equivalent grams/sec of emissions. Column 4 is an estimate of concentration of the substance in the stack by applying a proportionality factor based on emission rate to G&M results. Column 5 is the maximum ambient exposure experienced at ground level 100 meters from the source as a result of the emission rate obtained by applying the proportionality factor to G&M results. Column 6 is the 8 hour time-averaged exposure limit based on Threshold Limit Values (TLV) G&M cited from the literature. Column 7 is the emission rate which would just meet the limiting TLV.

Table 5.4 Estimate of Impact of Selected Solvents

MATERIAL	(1) % MATERIAL VENTED	(2) AVERAGE ANNUAL EMISSION (lb/yr)	(3) EMISSION RATE (gram/sec)	(4) STACK CONCENTRATION (ppm)
methanol	25	450	0.61	3149
toluene	15	75	0.104	177
xylenes	15	1800	1.359	3781

MATERIAL	(5) MAXIMUM AMBIENT EXPOSURE (micrograms/m3)	(6) 8 Hr TLV/TWA EXPOSURE LIMIT (micrograms/m3)	(7) LIMITING EMISSION (grams/sec)
methanol	1708	262,000	9,635

toluene	2.42	150,000	5,516
xylenes	36.5	434,000	15,962

These results show expected ambient exposure to be 2 to 5 orders of magnitude below the acceptable exposure levels. Comparing columns 5 and 6 for concentration, or columns 3 and 7 for emission rate show this. While this analysis is approximate, the error would not exceed an order of magnitude.

The materials listed on Table 5-4 have not been identified as confirmed or suspected human carcinogens by the ACGIH (Ref 26). A characterization of other potential effects of releases of these materials to the air would be beyond the scope of this EA.

5.2.7.4 Hazardous Air Pollutants (NESHAPS)

NESHAPS requirements per subpart l on radionuclide releases have been described in section 5.2.7.1. None of the toxic materials described in 5.2.7.3 are subject to exposure or emission limits per NESHAPS.

5.2.8 Noise

Sources of noise in the proposed facility would include conventional heating, ventilating and air conditioning machinery and conduits. Pumps, motors and compressors would be isolated from building working areas with conventional housing and soundproofing. Accordingly the indoor level of noise would be typical of office buildings, and would be well below that which would create a disturbance or cause harmful effects on persons (approximately 40 to 60 db depending on location, season, time of day, and local indoor activity level) (Ref 17). Noise from the building to the outside environment would be associated with ventilation outlets on the roof. These would be expected to be low level rushing or hissing sounds characteristic of air flowing in forced conduits and would probably be inaudible at the ground level (Ref 17). A quantitative estimate for this source is not available.

5.2.9 Socioeconomic Impacts

The proposed Center would add approximately 70-75 new personnel with total annual wages approximating $1,900,000. In addition the Center would result in the purchase of approximately $1,000,000 in goods and services. Approximately 35% of these totals would be attributed to the Institute. Total MUSC employment is about 7,500 persons (Ref 4).

The project would result in life extension to persons as a result of current therapies, and future therapies resulting from the research. The magnitude of this impact cannot be assessed.

The project has not elicited any known opposition and there is no expectation of controversy (Ref 4).

5.2.10 Accident Analysis

A medical research facility poses inherent risks due to the nature of the materials, and the potential for infection. These risks are minimized through standard protective measures that characterize medical clinical and research operations under various Federal and state programs of protection for workers, the public and the environment. Nevertheless,

accidents resulting in exposure to hazardous materials, radioactive materials, x-rays and biological materials may occur. MUSC has standard procedures in place (Ref 15) to both minimize the probability of occurrence, and to minimize the exposure of individual and release to the environment upon occurrence.

Theoretical causes of accidents may include but are not necessarily limited to the following events: spill of material while handling, dropping of an open container, knocking over an open container standing on a shelf, table or floor, inadvertent mixing of materials which react with the possibility of causing an explosion, a fire, or release of volatile materials to the air, breach of a sealed container due to a defect in the container or the seal, breach of a sealed container due to dropping, breach of a sealed container by object falling on the container, improper sealing of a container resulting in a spill upon handling and movement. There is also the potential of accidents in using needles, catheters and other instruments in diagnostic, therapeutic and experimental procedures involving human and/or animal subjects which could inadvertently transmit infectious diseases to the experimenter or the subject, as well as inadvertent exposure of research personnel to infected tissue, blood, urine or feces. There are also potential accidents associated with handling animals such as bites and scratches.

Quantifying of the probabilities and magnitudes associated with the above accident types would have to be based on data for all U.S. clinical research facilities in the same class as the proposed Center. No specific risk data are available for the toxic or carcinogenic health effects, however, no reasonable foreseeable significant adverse effects are expected during operation of the proposed facility. The availability of these data will not affect the reasoned choice among the proposed alternatives. The MUSC will follow a number of procedures as stated above, in their hazardous waste management program, to prevent any potential risks.

Over the past five years, MUSC data show that there have been no accidents involving releases of any waste or dangerous materials, no accidents resulting in excessive exposures of personnel to radiation, and no accidental infection of personnel (Ref 4). Accordingly, the probability of an accident whose consequences would include harmful levels of exposure to dangerous materials, radiation levels, or infection at MUSC is believed to be extremely small.

5.2.11 Risk of Natural Disasters

The site is in an area subject to periodic hurricanes which can damage structures and cause flooding through a combination of wind-induced tide and high rainfall. The specific risk of concern would be the release of hazardous, radiological, or biological waste materials (i.e. "at-risk" materials) to the environment in the event of extreme flood. This would involve the combination of a flood condition together with a breach of the containers containing the materials during the flood surge and prior to recession, and a subsequent exposure to the environment as receding flood waters drain back into the floodplain.

The first floor elevation is at 13.0 ft NGVD (National Geodetic Vertical Datum). The 100 year flood would reach 13.0 ft NGVD and the 500 year flood 14.2 ft NGVD (Ref 9).

The probability of convergence of the 100 or 500 year floods and breach of sealed containers during the flood event is computed to be once in every 450 thousand years, and 2.3 million years, respectively--an extremely small probability. The actual probabilities would be considerably smaller because waste storage containers are waterproof and sealed, because of safeguards required to comply with the RCRA permit (Ref 13), because of MUSC's "Procedures to Prevent Hazards" (Ref 15). Moreover, the quantity of material in any one container is small limiting the magnitude of releases. Accordingly, the expected probability of accidental release of at-risk materials to the environment at time of flood, and the corresponding probability of environmental damage is considered minor. (See Appendix I for computation of probability of releases of hazardous materials to floodplain.)

Another consideration would be flotation of containers to the floodplain on the receding flood wave. This would be extremely unlikely as the 100 year event would create no first floor flooding, and the 500 year flood would create a 1.2 ft flood on the first floor. Also, there would be no feasible pathway to the floodplain unless there were a simultaneous breach of the building's wall.

To further reduce the probability of accidental release during a flood event, and to assure negligible probability, MUSC has planned mitigation measures. (See Appendix I for description of measures to mitigate the risk of release of hazardous materials to the floodplain.)

5.2.12 Other Direct, Indirect, Cumulative or Long Term Impacts

5.2.12.1 Care of Laboratory Animals

Various laboratory animals are used in clinical studies. MUSC has a centralized program of veterinary care fully accredited by the American Association for Accreditation of Laboratory Animal Care, has an approved assurance from the National Institutes of Health, and is registered with the Department of Agriculture (Ref 16).

5.2.12.2 Utilities

The project would utilize existing university utility services such as electric power connections, water supply and telecommunication linkages. These have been planned and would have no adverse effects on the respective existing service capacities.

5.2.12.3 Traffic and Parking

The Center would increase vehicular traffic by 100 vehicles per day. The City of Charleston Traffic Department was kept apprised of the project during design and as a part of the City permitting process. MUSC has contracted with the City to provide staff parking in a new city garage approximately three blocks away. Improvements to the Doughty Street and Courtenay Drive have recently been completed which will enhance the traffic access to the area. The facility is within close proximity to both the VA hospital and MUSC via a network of City sidewalks (Ref 32).

5.2.12.4 Handicapped Access

The project was designed to be fully handicapped accessible and complies with the provisions of American National Standards Institute Guideline 117 and the American Disabilities Act. The facility will be accessible to handicapped persons via ramps and lifts.

5.2.12.5 Cumulative Effects

Cumulative environmental effects are not expected to occur from the construction and operation of the Gazes Cardiac Research Institute at the Medical University of South Carolina. Construction impacts would be short term and minimal. Domestic, biological, hazardous, and radioactive wastes generated from operations would not significantly increase current MUSC waste generation rates and could be handled under current disposal capacity in accordance with MUSC policies and procedures. Both nonradioactive and radioactive emissions from operations, when added to current MUSC levels, are expected to result in very small cumulative impacts.

5.3 Environmental Impacts of Alternatives

5.3.1 The No-action Alternative

A DOE decision not to authorize construction of the Gazes Institute would have the effect of delaying the implementation of the Institute, but would not result in changes of design, site, or operations as MUSC is committed to construction of the Strom Thurmond Center and of the Institute as part of the Center. Accordingly the environmental impacts would be the same as above.

5.3.2 Locate Institute at Dedicated Facility

The environmental impacts of locate of the Institute at dedicated facility (as described in section 3.3) would be virtually the same for construction and operational aspects.

5.3.2.1 Hollings Co-location

Construction and operational impacts are the same for this site as the proposed site. The fact that the Hollins Center had a narrower research mission was the major deciding factor.

5.3.2.2 Locate Center One Block Away

Impacts related to construction and operation are similar to the proposed site. The schedule for availability of this site, the limited parking, and the desire to remove outmoded buildings at the preferred site helped to rule this site out.

5.4 Compliance with Regulations

As discussed in previous sections, the construction and operation of Center will not be in compliance with Federal and state environmental regulations.

A building permit would be required by the State of South Carolina and the City of Charleston (Ref 4). All permits related to the various radioactive materials and wastes described above have been previously issued to MUSC and will cover the corresponding activities in the Center without modification.

Permits pertaining to operation of the new facility would be issued by the following agencies

(Ref 3):

- City of Charleston Board of Architectural Review
- City of Charleston Board of Appeals
- City of Charleston Technical Review Committee

- SC Department of Health and Environmental Control - Building Emissions
- SC Department of Health and Environmental Control - Boiler Stack Emission
- SC Department of Health and Environmental Control - Sanitary Sewer

Existing permits issued to MUSC covering hazardous waste disposal and possession of radiological materials will cover the proposed project and need not be modified for that purpose, as indicated elsewhere in this chapter.

6.0 RELATIONSHIP OF THE PROPOSED ACTION TO OTHER ACTIONS

The proposed action includes construction and operation of a portion of the Strom Thurmond Biomedical Research Center. The DOE is evaluating a grant proposal to authorize the musc to construct and equip the two lower floors of the proposed nine-story center. The action would expand and consolidate on-going clinical research and out-patient diagnostic activities of the Cardiology Division of the existing Gazes Cardiac Research Institute. Most of the remainder of the center would be occupied by the VA. Construction of the Institute and the Center are connected actions, therefore, potential environmental impacts of construction and operation of the Center are assessed in this document. The DOE assumed the lead agency role in preparing this environmental assessment, with input from the VA (Ref 19, 35).

7.0 RELATIONSHIP OF THE PROPOSED ACTION TO ANY APPLICABLE FEDERAL, STATE, REGIONAL, OR LOCAL LAND USE PLANS AND POLICIES LIKELY TO BE AFFECTED

Land use at and around the site is predominantly "institutional" as part of the campus of MUSC. This use includes hospitals, offices, classrooms, laboratories, and student dormitories, together with some small scale retail activity (Ref 4).

The proposed action has been reviewed by the City of Charleston Department of Planning and Urban Development with respect the land use, and has been found to be consistent with local land use policies (Ref 4). There are no specific state or federal determinants of land use other than those associated with construction in the flood plain as described in Appendix I.

8.0 LISTING OF AGENCIES AND PERSONS CONSULTED

(Ref 3,4)

Department of the Army, Charleston District Corps of Engineers

Mr. Mark A. Purcell, Regulatory Branch

Mr. James L. Joslin, Chief Hydraulics, Coastal & FPMS Section

City of Charleston, Department of Planning and Urban Development

Charles Edwin Chase, Preservation Office, Architecture and Preservation Division

South Carolina Department of Archives and History

Lee Tippett, Staff Archeologist, State Historic Preservation Office

South Carolina Wildlife and Marine Resources Department

Robert E. Duncan, Environmental Coordinator

Mr. Mabry, Attorney, Legal Office

South Carolina Department of Health and Environmental Control

Christine M. Sanford-Coker, Hydrogeologist, Trident District, EQC

Medical University of South Carolina

Henry B. Hargrove, Associate Radiation Officer

George von Kolnitz, Director, Physical Plant

M. Michael Swindle, DVM, Director Division of Animal Resources

Department of Veterans Affairs

John Baer, Director, Site Development and Environmental Services

Office of Construction Management, Washington, D.C.

9.0 REFERENCES

1 Public Law 101-514, Energy and Water Development Appropriations Act, 1991, Title III, Department of Energy, Energy Supply, Research and Development Activities

2 Senate Report 101-000, Report on the Energy and Water Development Appropriation Bill, 1991, Senate Committee on Appropriations

3 Environmental Evaluation, Strom Thurmond Biomedical Research Center and Gazes Cardiac Research Institute, Medical University of South Carolina, Submitted by Enright Associates Inc. to DOE/CHI, June 30, 1992

4 Representation to DOE by Mr. George Von Kolnitz, PE, University Project Manager, November 1992 (Written response to questions supplemented by telecommunications)

5 South Carolina Department of Archives and History, Letter from Lee, Tippett, Staff Archeologist, State Historic Preservation Office, May 21, 1992

6 City of Charleston, Department of Planning and Urban Development, Letter from Charles Edwin Chase, Preservation Officer, Architecture and, Preservation Division, April 27, 1992

7 South Carolina Wildlife and Marine Resources Department, Letter from Robert E. Duncan, Environmental Coordinator, May 1, 1992 endorsed by U.S. Fish and Wildlife Service, Roger Banks, Director, February 3, 1993

8 Department of the Army, Charleston District Corps of Engineers, Letter from Mark Purcell, Project Manager, Regulatory Branch, May 18, 1992

9 Department of the Army, Charleston District Corps of Engineers, Letters from James L. Joslin, Chief, Hydraulics, Coastal and FPMS Section, May 11, 1992 and November 18, 1992

10 USGS Quadrangle Map for Charleston, South Carolina

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13 EPA Region IV, Notice of RCRA Final Permit Decision, EPA ID No. SCD 069 316 271, Effective June 30, 1992

14 Letter from Henry B. Hargrove, MUSC Associate Radiation Safety Officer to Mr. Tony von Kolnitz, November 12, 1992

15 Medical University of South Carolina, Maintenance Manual, Section E - Procedures to Prevent Hazards

16 Memorandum from M. Michael Swindle, Diplomat of Veterinary Medicine, and Director of MUSC Division of Laboratory Animal Resources, October 28, 1992

17 Environmental Impact Data Book, Chapter 8 - Noise, Tables 8-1 to 8-4, Anne Arbor Science, 1979

18 Air Pollution Hazard Analysis for the Louisiana Tech University Institute for Micro-manufacturing, Geraughty & Miller Inc., December 15, 1992

19 Memorandum from Richard Stenzel to John Baer, Director, Site Development and Environmental Service, Department of Veterans Affairs, Office of Construction Management, 810 Vermont Avenue, Washington, D.C. 20420, July 13, 1993.

20 Radioactive Material License, Number SC 081-01, Issued to the Medical University of South Carolina by the South Carolina Department of Health and Environmental Control, Expiration Date January 31, 1995 (License issued pursuant to the Atomic Energy and Radiation Control Act, Section 13-7-40 and subsequent provisions of the South Carolina Code of Laws of 1976, and the South Carolina Department of Health and Environmental Control Regulation 61-63)

21 EPA Form 1C, 1991 Hazardous Waste Report, Filed by Medical University of South Carolina, Wayne L. Brannan, Director Occupational Health and Safety, EPA ID Number FSCD 069 316 271,

22 Letter from Henry B. Hargrove, Associate Radiation Safety Office, Medical University of South Carolina to DOE consultant Fred March, January 28, 1992

23 Code of Federal Regulations, 40 CFR 1061, Subpart I, National Emission Standards for Radionuclide Emissions from Facilities Licensed by the Nuclear Regulatory Commission

24 Code of Federal Regulations, 10 CFR 20.303: Disposal by Release into Sanitary Sewer Systems, as amended january 1, 1994

25 Radiation Safety Manual, Medical University of South Carolina, Revised Edition, December 1989, authorized by signature of James B. Edwards, DMD, President, Medical University of South Carolina

26 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, 1990-91

27 Letter from George von Kolnitz IV, Director of Engineering, Medical University of South Carolina to Fred March, Corrections to Draft EA Section 5.2, with updates of waste quantity estimates, April 15, 1993

28 Code of Federal Regulations, 10 CFR 35 - Nuclear Regulatory Commission, Medical Use of By-Product Material; 35.20 - ALARA Program

29 Code of Federal Regulations, 10 CFR 20 - Standards for Protection Against Radiation

30 Letter from James A. Binger, Enright Associates Inc., providing additional information pursuant to Environmental Assessment

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32 Enright Associates, James A. Binger, Principal, Letter of September 21, 1993

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35 Letter from Jon Baer, Site Development and Environmental Service, Department of Veterans Affairs, of July 27, 1993.

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37. Letter from H.Stephen Snyder, Director of Planning and Certification, South Carolina Coastal Council, of February 1, 1994

GAZES CARDIAC RESEARCH INSTITUTE
MEDICAL UNIVERSITY OF SOUTH CAROLINA
APPENDIX I FLOODPLAIN/WETLANDS ASSESSMENT

PREPARED BY
U.S. Department of Energy, Chicago Field Office
Programs and Facilities Management Division
FEBRUARY 1994

1. PROJECT DESCRIPTION

The Strom Thurmond Biomedical Research Center would be a nine-story 190,000 square foot facility where MUSC and VA staff would perform research in surgery, pharmacology, nephrology, cardiology, hematology, endocrinology, infectious disease, psychology, psychiatry and diabetes. It would house the Gazes Cardiac Research Institute, including the Charleston Heart Study (assigned approximately 20,400 square feet) which would include clinical cardiac studies, drug studies and associated research. The Center would also provide holding space for both large and small animals used in research (Ref 1-1, 1-2).

2. FLOODPLAIN/WETLANDS EFFECTS

2.1 Floodplain Nature of the Site

The proposed site has been determined not to be a wetland (Ref 1-3), but does constitute part of a floodplain (Ref 1-4 and 1-5) with Base Flood Elevation (100 year flood) of 13 ft National Geodetic Vertical Datum (NGVD)(equivalent to or approximating Mean Sea Level), and Critical Action Flood Elevation (500 year flood) of 14.2 ft NGVD. The site is also in a floodplain as defined by local Flood Insurance Rate Map (Ref 1-5) and Flood Hazard Boundary Map (Ref 1-5). The street level at the site is approximately 7 ft NGVD, and the elevation of the first floor of the building would be at 13 ft NGVD (Ref 1-2).

The site is near the eastern shore of the Charleston peninsula, a floodplain area which has been filled to permit urban development. The entire peninsula is an urban zone with typical mixed land use: residential, commercial, institutional, industrial, and some parks and recreation areas (Ref 1-2).

2.2 Expected Elevation of Floods in Relation to Building Floor and Location of Hazardous, Biological/Medical and Radioactive/Mixed Waste Storage

The Base Flood Elevation would reach the first floor and produce a floor flood level of 0.0 in the case of the Base Flood, and 1.2 feet in the case of the Critical Flood.

Water reactive and other hazardous, toxic, medical/biological, and radioactive/mixed wastes would be stored on a secure floor surface, platforms or shelves in a designated room with floor area of approximately 400 square feet in sealed waterproof containers (Ref 1-2).

2.3 Probability of Container Breach and of a Spill Which Could Reach the Flood Plain

In the case of extreme flooding, sealed containers could be conceivably be disturbed, potentially breached, and release hazardous, radioactive and biological materials to the environment. The affected environment would consist of a zone of dispersion, with downstream dilution of potentially harmful materials, settling these materials into the soil and stream sediments, and biological uptake.

These potential environmental impacts have not been quantitatively assessed because the probability of the spill event simultaneous to the critical flood would be extremely small, and the amount of potentially spilled material limited as follows:

Material at Risk:

(1) 12,727 annual pounds hazardous waste collected twice weekly yields = maximum 122 pounds maximum stored on given day - in 55 gallon metal drums, 20 gallon fiber drums, or 5 gallon metal pails.

(2) 334 tons biological/medical wastes collected twice weekly = 3.2 tons maximum stored any given day - placed in reusable carts 31 x 31 x 48 inches (about 200 gallons).

(3) 1.65 annual tons radioactive/mixed wastes collected twice monthly = 130 pounds maximum stored any given day - in 55 gallon drums.

The weight of actual waste in a filled barrel or other container will vary because of differences in packaging of waste materials prior to placement, and differences in density of the waste (Ref 4). Only the first waste would be in an all

liquid form, the latter two being largely solid waste materials. Taking into account these differences the average weight of material at risk in a given drum would be approximately 100 pounds, in a fiber drum 36 pounds, in a pail 10 pounds, and 365 pounds in a reusable cart. The biological wastes would be largely solid, and in the event of container breach or tipping would likely not result in the material reaching the flood plain. This is because the 100-year flooding event would not reach the first floor, and the 500 year flood would cause an estimated 1.2 foot of water on the first floor. Also, building walls would have to be breached. Thus, the maximum quantity of material at risk for the floodplain in the event of a breach of container would be about 122 pounds of hazardous and 130 pounds of low level mixed radioactive wastes. Taking into account: (1) in the event of a breach the loss would be less than the total contents; and, (2) the mitigation measures (see EA section 3), the actual quantity of material at risk would be considerably lower than the respective container capacities or the average daily contents.

Probability of Release of Material at Risk: The only data base for release of materials from drum storage is the University's own record of no breach of containers and no releases in the past five years of operation. The actual probability of release on any given day is actually more than zero. Assuming one container would be breached causing an escape of material in 5 years (a very conservative assumption), there is a probability of .00022 = 2.2 E -4 of a breach on any given day. The probability of the 100 or 500 year flood occurring on a given day is 2.75 E-5 and .55 E -5 respectively. The respective joint probabilities of a container breach and the 100 or 500 year floods coinciding would be 6.0 E-9 and 1.2 E-9, respectively. These probabilities translate to an event which would occur once in every 450 thousand years, and 2.3 million years, respectively - an extremely small probability.

2.4 Hydrologic Effects in the Floodplain

It is unlikely hydrologic effects due to the location of the Institute in the floodplain would include impedance of the drainage of flood waters, additional displacement exacerbating upstream and downstream flood effects elsewhere, or accelerated local erosion leading to removal of soils and undermining of building, road and other infrastructure foundations. There is a net addition of approximately 9,000 square feet of mass in the floodplain, because the proposed building footprint would be approximately 20,000 square feet and four buildings at the site having a total footprint of approximately 11,000 square feet would be removed.

The area of the 100 year floodplain is 6.10 square miles, and that of the 500 year floodplain is 7.53 square miles. The proposed additional footprint represents a very small fraction of the respective floodplain, and would be highly unlikely to impede drainage or otherwise cause adverse hydrologic effects in the floodplain. The act conforms to the state and local floodplain standards.

3. MITIGATION OF FLOODPLAIN/WETLANDS EFFECTS

3.1 Mitigation Against Risk of Spill of Hazardous, Biological/Medical, and Radioactive Materials

Extreme floods in this area are associated with hurricane induced high tides combined with intense rainfall. MUSC monitors national and local weather advisories which predict the occurrence of extreme floods allowing adequate time to respond with contingency mitigation measures.

The maximum flood effect of 1.2 feet of water reaching the building's first floor is not likely to float the waste containers and the probability of releases of hazardous medical/biological or radioactive/mixed wastes in the event of extreme flood to the floodplain, would be less than computed above and consequently would be negligible.

In spite of the unlikely event of extreme floods MUSC has designated three levels of mitigation against the

contingency of extreme floods (Ref 1-2):

(1) Upon flood warning, the respective contractors would be called to remove any wastes in storage. This measure would reduce the amount of material at risk during the flood event. This assumes that contractors can schedule timely pickup and remove the wastes to higher ground where they would not be threatened by the flood. Using experienced hazardous waste handlers would not increase the risk of exposure during relocation, transport, or storage.

(2) Upon flood warning all new hazardous, biological/medical, and radioactive/mixed waste generation would be suspended. This measure would further reduce the amount of material at risk during the flood event.

(3) Upon flood warning, all containers containing hazardous, biological/medical, and radioactive/mixed waste, which may not have been collected, would be sealed and secured on their respective shelves above the floor level. This measure would reduce the risk of potential movement of the containers and the probability of breach with subsequent spill to the flood waters.

3.2 Mitigation Against Hydrological Effect of Building Footprint

The proposed action would be taken pursuant to standards for construction and drainage in the flood plain (Ref 1-2).

4. ALTERNATIVES

The following alternatives were considered in MUSC's planning process:

(1) Locate the Institute in a building dedicated exclusively to the work of the Institute.

(2) Co-locate the Institute in the multi-story Hollings Oncology Center currently under construction elsewhere on the MUSC campus.

(3) Co-locate the Institute in the Strom Thurmond Biomedical Research Center on a lot about one block east of the selected site.

Any alternative site or location within the areas considered by MUSC would result in the same kinds and level of impact on the floodplain as described above, as the elevations of the respective sites were approximately the same, and the elevation of the first floor with respect to the floodplain would be the same.

Mitigation measures as described above would apply to any alternative.

5. REFERENCES

1-1 Environmental Evaluation, Strom Thurmond Biomedical Research Center and Gazes Cardiac Research Institute, Medical University of South Carolina, Submitted by Enright Associates Inc. to DOE/CHI, June 30, 1992

1-2 Representation to DOE by Mr. George Von Kolnitz, PE, University Project Manager, November 1992 (Several Telecommunications)

1-3 Department of the Army, Charleston District Corps of Engineers, Letter from Mark Purcell, Project Manager, Regulatory Branch, May 18, 1992

1-4 Department of the Army, Charleston District Corps of Engineers, Letters from James L. Joslin, Chief, Hydraulics, Coastal and FPMS Section, May 11, 1992 and November 18, 1993

1-5 Forsberg Engineering and Surveying Inc., Letter Report of November 3, 1992, based in Federal Emergency Management Agency Flood Insurance Rate Map for the City of Charleston, South Carolina and on USGS Survey maps.

APPENDIX II SUPPORTING DOCUMENTS

Corps of Engineers, James L. Joslin, Statement on 100 year flood.

Corps of Engineers, James L. Joslin, Statement on 500 year flood.

Corps of Engineers, Mark A. Purcell, Statement on absence of jurisdictional wetlands.

U.S. Fish and Wildlife Service, Roger Banks, Signature and stamp attesting to no significant wetlands impact and unlikeliness of adverse effects on endangered species.

South Carolina Wildlife and Marine Resources Department, Statement of no known threatened or endangered species or critical habitats at site.

South Carolina Department of Archives and History, Statement low potential for archeological deposits at site.

City of Charleston, Department of Planning and Urban Development, Charles Edwin Chase, Statement of non-listing in Historic Architecture Inventory.