

Capital Budget Request

Construct VTCRI Biosciences Research Addition

Overview

Agency	Virginia Polytechnic Institute and State University (208)
Project Code	none
Project Type	New Construction
Biennium	2016-2018
Budget Round	Initial Bill
Request Origin	Previously Submitted
Building Name	
Project Location	Roanoke Area
Facility/Campus	Other
Source of Request	Agency Request
Building Function	Higher Education Vivarium and Research Laboratory -- 100% E&G
Infrastructure Element	Laboratory

Contains significant technology costs? No

Contains significant energy costs? No

Agency Narrative

Agency Description

Project Summary:

Since opening in 2011, the Virginia Tech-Carilion Research Institute (VTCRI) has recruited 24 faculty research team leaders (soon to be 30) and their teams to Roanoke, Virginia, totaling over 200 employees during the first five years of its existence. These investigators include several of the most highly recognized senior scientists in the world, particularly in the area of neuroscience. The teams have achieved over \$15 million in annual extramural research funding with a total extramural research portfolio of over \$50 million with \$107 million in research expenditures and a \$236 million economic impact for the Commonwealth.

The existing VTCRI facility in Roanoke provides laboratory space for up to a maximum of 30 research teams and the building is now completely full with the recent hire of Dr. Sontheimer. Thus, the trajectory of medical research discovery and economic impact from the institute is expected to smooth out. This project is a high priority request to construct a four-story building for translational biomedical research and education to keep the medical discovery and economic trajectory moving upward.

The addition will support another 15 research teams focused solving problems of the brain, heart disorders, and cancer. The facility is envisioned as a 45,500 gross square foot addition to the existing Virginia Tech-Carilion School of Medicine and Research Institute in Roanoke. The proposed project will serve as a fully operational and contained biomedical research and research education facility.

The success and growth of the VTCRI programs in brain (neuro-) science, cardiovascular and regenerative sciences, and cancer research in particular, require new facilities with large instrumentation located as part of the existing laboratory institute. This project will provide the necessary facilities to hire more researchers to focus on these medical challenges that will in turn generate research work to continue the growth of medical scholarship and economic success for the institute, Roanoke, and the Commonwealth.

Physical Description of the Facility:

The proposed facility includes 45,500 gross square foot addition to the existing Virginia Tech-Carilion School of Medicine and Research Institute in Roanoke. The addition will add approximately 12,800 gross square feet to the facility footprint and is envisioned to match the existing facility with primarily brick veneer and precast concrete accents. A glass and aluminum curtain wall vertical circulation enclosure will connect the addition to the existing building.

The new building will house VT faculty and staff that includes biomedical and behavioral scientists and their research teams, MD/PhD scientist physicians, veterinarians, facility management, special instrumentation technicians, shared core research facilities and laboratory animal technicians. There will be flexibility in some animal rooms to support other types of specialized animal research including experimental surgical procedures and in situ optical imaging. The building location will require design elements that accommodate periodic access for removal and replacement of MRI units located on the second floor.

The addition will largely include two types of spaces. The first type is surgical-type suites for high intensity biomedical research and procedure laboratories with animal imaging facilities that require high field magnetic resonance imaging. Second, in addition to the surgical suites, animal surgical bays with specialized monitoring equipment will be part of the research and educational/training protocols. Some procedural suites and holding spaces are expected to be designed to biosafety level three (BSL3).

This co-location of these facilities in close proximity with the existing VTCRI research facility and laboratories and the provisions of research space to several new teams of translational investigators who will interface with the teams in the current VTCRI building will provide the opportunity to achieve critical mass in several specialized research areas for advanced neurological, cancer, cardiovascular, regenerative medicine and infectious diseases.

Justification

Program Description:

The investigators' work has been published in leading translational medical/scientific journals such as Science Translational Medicine, Nature Immunology, Nature Neuroscience, Nano Letters and Proceedings of the National Academy of Sciences and Trends in Cardiovascular Medicine. Moreover, the research team leaders' published discoveries have received considerable national attention from media such as the New York Times, Time, Newsweek, CNN, BBC and the Wall Street Journal. The core teams include brain (neuroscience), heart, and cancer.

The research teams have developed and deployed unique and powerful new interactive technologies. For example, the VTCRI human cognitive and computational neuroscience research group has invented and employed a unique interactive real time human functional brain imaging network that has its hub in Roanoke, linking sites around the U.S. and the world to the VTCRI's brain imaging facility. This high throughput network is able to address issues of complex brain function in decision making in health and disease in children and adults at an unprecedented scale and with a new level of quantitative precision between individuals, and within groups in real time. Moreover, this worldwide "Roanoke Brain Study," is also marrying the world's first longitudinal human deep brain phenotyping approach with the power of combined genomics and next generation informatics.

These research programs also incorporate a considerable amount of research education and training including VT undergraduate students (including those from VT's new undergraduate neuroscience major), VT graduate students from multiple PhD programs including many from the newly established Translational Biology, Medicine and Health (TBMH) PhD program as well as medical students from the VTC School of Medicine and high school students from local schools. These students are actively involved in the research projects at the VTCRI – in fact in many cases (including high school students, undergraduates, graduate students and medical students), they have been co-authors on original research publications in major peer review scientific journals. Their participation in research projects is an essential component of their educational experience at Virginia Tech as part of the "hands on, minds on," approach.

The VTCRI neuroscience research and training program utilizes the construct of highly interdisciplinary teams, consisting of biologists, psychologist, physicists, mathematicians, computer scientists and engineers to address a wide range of health related challenges with innovative scientific solutions such as brain tumors, traumatic brain injury, addiction, neuropsychiatric disorders including autism, depression and post traumatic stress disorder, developmental disorders including cerebral palsy, and neurodegenerative disorders including Alzheimer's disease and other dementias, ALS and Parkinson's disease. When taken together, these disorders account for the greatest impact on the health, well-being and economy of the United States (including Virginia) of any category of health issues including heart disease and cancers.

In addition to the human based research, the VTCRI has leading groups developing new technology platforms, brain machine interfaces, brain/behavior rehabilitation strategies and performance enhancement in animal models of ALS, PTSD, TBI and Parkinson's disease.

Investigators from the VTCRI have also recently received multiple forms of recognition including a prestigious McKnight Neuroscience Foundation award in technological innovation, selection for global TED presentation and for the US/China National Academies of Science Kavli brain machine lecture, election to membership in the Academy of Behavioral Medicine, selection as a Brain and Behavior Research Foundation NARSAD Independent Investigator Award as well as establishing spin-off companies on wound repair/healing, ultrasound brain modulation and novel brain tumor treatments as well as identifying potential new therapeutic targets and diagnostics for neurodegenerative diseases, mental health disorders and neurorehabilitation strategies for children with cerebral palsy.

The VTCRI has also established a major research and research education presence in heart and regenerative medicine research working on repair of damaged heart, identification of risk and treatment for sudden cardiac death, wound healing and surgical scar reduction. The senior leader of these groups was selected as a CIT Commonwealth eminent scholar in heart and regenerative medicine and has developed a company that has discovered and is producing new compounds for wound healing that have moved from basic laboratory discovery to human clinical effectiveness trials.

The VTCRI has also developed a cancer research that has filed several new patents on potential cancer therapeutics for malignancies of brain and breast and invented microfluidic devices for visualizing these molecules as they interact with targets on cancerous cells with high resolution molecular scale cryo-electron microscopy. In addition, members of this group have discovered a new molecular pathway for targeting signals to cause malignant brain tumor cells to self-destruct. The group also has a team that is pushing the boundaries of simultaneously diagnosing and treating (theranostics) brain tumors as well as a new team led by one of the world's leading brain tumor researchers who has already developed and run human clinical trials on multiple new effective treatments for this deadly form of brain cancer and developed a successful biotech startup company that has run large scale human clinical trials and been grown and purchased by a larger company.

The growth of these research programs and their affiliated educational/training components along with the growth of the cancer and infectious disease groups over the next three years will require additional investigator laboratory facilities as well as specialized human subject

evaluation/interview and behavioral phenotyping rooms.

The university's strategic plan includes the following principle strategies that will be supported by this important project:

- Increasing the number of our programs recognized as among the best internationally
- Ensuring competency in data analysis and computational methods as a component of general education for all students
- Developing an appropriate infrastructure for e-learning
- Emphasizing translational research and scholarship
- Building upon existing and emerging strengths
- Maintaining growth in research expenditures toward a target of \$680 million by 2018.
- Increasing graduate enrollment toward a target of an additional 1,000 students
- Increasing the number of post-doctoral positions in STEM-H research areas.
- Increasing undergraduate involvement in meaningful research experiences and experiential learning (hands on minds on)
- Developing ways to integrate computational science/informatics and digital fluency for managing and analyzing complex data sets across a wide range of disciplines.
- Pursuing quality-of-life initiatives in support of the university as a vibrant, dynamic, and sustainable workplace
- Supporting a sustainable workplace
- Promoting life-long learning
- Implementing the Climate Action Commitment and Sustainability Plan as appropriate.

Existing Facilities:

The university has research space at the Virginia Tech Carilion Research Institute that provides laboratory space for up to a maximum of 30 research teams and also has some core instrumentation facilities including two human MRIs, laser scanning confocal microscopy, fluorescence activated cell sorting facilities, small animal husbandry and housing and molecular biology. While this can provide some services to the new research teams, there will be no more available individual lab space and no access to a number of critical core services including small animal high field imaging facilities, human room temperature MEG and low field human imaging that are critical to the development of new translational diagnostic and therapeutic approaches to several major groups of human diseases. In addition, many of the specialized procedures where laboratory animals are required to be adjacent to core high technology instrumentation cannot be carried out in the existing VTCRI facility. The addition will be connected to the existing Virginia Tech-Carilion Research Institute with secure connectors allowing circulation between the buildings on the second and third floors. The building location will require design elements that accommodate periodic access for removal and replacement of MRI units located on the second floor.

Funding Plan:

The program of this project request is 65 percent research and 35 percent student research education and training. The funding plan for this \$45.7 million project calls for \$30.8 million of General Fund support and \$14.9 million of nongeneral fund authorization. The nongeneral fund component is requested as a revenue bond authorization that will be repaid by overhead revenue generated from the research program and targeted fundraising that will occur in the university's capital campaign.

Options Considered:

To meet required testing protocols, the biomedical research, imaging and research education/training space must be an integral part of the adjacent VTCRI laboratory environment where principal investigators have their home lab programs, support staffs, other necessary reagents and instrumentation; thus, leasing or using the Blacksburg campus facilities is not feasible because of time constraints for transporting specimens, animals and workers. The project is needed in the 2016-2018 biennium to support the rapid growth of the research institute including new hires and grants that require deliverables in 2019 which are dependent on the additional biomedical research and imaging space.

Alternatives Considered

Costing Methodology

The project is anticipated to have high site conditions and is planned to utilize the Construction Manager at Risk delivery method. Project costs are estimated to the mid-point of construction using three percent escalation in accordance with the instructions for developing the Six-Year Capital Outlay Plan.

The method for estimating costs includes: 1) using unit costs in the Bureau of Capital Outlay Management's Construction Costs Database updated April 2015 with a regional market multiplier and a multiplier for softs costs; and 2) comparables as shown in the CR-3. Both methods are escalated to a construction midpoint of 2019 at three percent

On a total project cost basis, inclusive of design, construction, and equipment, the unit costs are \$1000 per gross square foot. The unit construction costs of the project are \$806 per gross square foot, including self-performed construction work. The building types in this request are integrated science center research laboratories and Biosafety Level three vivarium in the Bureau of Capital Outlay Management's Construction Costs Database.

The costs are driven above the averages in the Construction Costs Database because of foundation requirements for vibration controls near the railroad and specialized equipment in the construction budget as described below. The necessary adjacencies of this addition to the existing facility require the building be located directly adjacent to an active railroad track. No other land is available as an alternate location. Specialized

building systems and features will be required to achieve maximum efficiencies in research programs. To eliminate interference of trains and other outdoor disruptions, the building will require vibration isolation achieved by a 10 inch thick concrete floor slab, additional building insulation, and reinforced structural components. Inclusion of new vivarium and supporting laboratories will require larger HVAC systems providing additional air exchanges. Specialized built-in scientific equipment utilized in these research programs will include instrumentation and equipment such as a high field small animal MRI, a positron emission tomography (PET) Scanner, a nuclear magnetic resonance imaging (NMRI) system, a Cyclotron (particle accelerator), shielded rooms for room temperature MEG and a shielded area for the development and application of low (milli-Tesla) field MRI in humans.

Agency Funding Request

Phase	Year	Fund	Subsubject	Requested Amount
Construction	2017	0100 - General Fund	2322 - Construction, Buildings	\$30,848,000
Construction	2017	0815 - 9(D) Debt Service - Construction Costs	2322 - Construction, Buildings	\$14,852,000
Total				\$45,700,000

Project Costs

Cost Type	Total Project Costs	Requested Funding	DGS Rec
Acquisition Cost	\$0	\$0	
Building & Built-in Equipment	\$29,204,000	\$29,204,000	
Sitework & Utility Construction	\$3,901,000	\$3,901,000	
Construction Cost Total	\$33,105,000	\$33,105,000	
DESIGN & RELATED SERVICE ITEMS			
A/E Basic Services	\$4,559,000	\$4,559,000	
A/E Reimbursables	\$84,000	\$84,000	
Specialty Consultants (Food Service, Acoustics, etc.)	\$167,000	\$167,000	
CM Design Phase Services	\$557,000	\$557,000	
Subsurface Investigations (Geotech, Soil Borings)	\$72,000	\$72,000	
Land Survey	\$11,000	\$11,000	
Archeological Survey	\$0	\$0	
Hazmat Survey & Design	\$0	\$0	
Value Engineering Services	\$0	\$0	
Cost Estimating Services	\$28,000	\$28,000	
Other Design & Related Services	\$223,000	\$223,000	
Design & Related Services Total	\$5,701,000	\$5,701,000	
INSPECTION & TESTING SERVICE ITEMS			
Project Inspection Services (inhouse or consultant)	\$780,000	\$780,000	
Project Testing Services (conc., steel, roofing, etc.)	\$189,000	\$189,000	
Inspection & Testing Services Total	\$969,000	\$969,000	
PROJECT MANAGEMENT & OTHER COST ITEMS			
Project Management (inhouse or consultant)	\$825,000	\$825,000	
Work By Owner	\$89,000	\$89,000	
BCOM Services	\$11,000	\$11,000	
Advertisements	\$0	\$0	
Printing & Reproduction	\$0	\$0	
Moving & Relocation Expenses	\$56,000	\$56,000	
Non Built-In Data and Voice Communications	\$446,000	\$446,000	
Signage	\$39,000	\$39,000	
Demolition	\$0	\$0	
Hazardous Material Abatement	\$0	\$0	
Utility Connection Fees	\$167,000	\$167,000	
Utility Relocations	\$223,000	\$223,000	

Commissioning	\$390,000	\$390,000
Miscellaneous Other Costs	\$988,000	\$988,000
Project Management & Other Costs Total	\$3,234,000	\$3,234,000
Furnishings & Movable Equipment	\$2,029,000	\$2,029,000
Construction Contingency	\$662,000	\$662,000
TOTAL PROJECT COST	\$45,700,000	\$45,700,000

Capacity

Cost Type	Unit of Measure	Units	Cost Per Unit
Acquisition Cost		0	\$0
Construction Cost	GSF	45,500	\$728
Total Project Cost	GSF	45,500	\$1,004

Operating and Maintenance Costs (Agency)

Cost Type	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022
GF Dollars	\$0	\$0	\$592,383	\$610,155	\$628,459	\$647,313
NGF Dollars	\$0	\$0	\$285,222	\$293,778	\$302,592	\$311,669
GF Positions	0.00	0.00	3.04	3.04	3.04	3.04
NGF Positions	0.00	0.00	1.46	1.46	1.46	1.46
GF Transfer	\$0	\$0	\$0	\$0	\$0	\$0
GF Revenue	\$0	\$0	\$0	\$0	\$0	\$0
Layoffs	0	0	0	0	0	0

Planned start date of new O&M costs (if different than the beginning of the fiscal year):---

Supporting Documents

File Name	File Size	Uploaded By	Upload Date	Comment
04-CR-3 VTCRI.xls	625,664	Rob Mann	6/13/2015	CR-3_VTCRI Biosciences Research Addition

Workflow History

User Name	Claimed	Submitted	Step Name
Rob Mann	05/18/2015 11:25 PM	05/18/2015 11:25 PM	Enter Capital Budget Request
Rob Mann	05/18/2015 11:26 PM	05/18/2015 11:26 PM	Continue Drafting
Rob Mann	06/08/2015 05:39 PM	06/08/2015 05:40 PM	Continue Drafting
Jennifer Hundley	06/12/2015 04:23 PM	06/12/2015 05:42 PM	Continue Drafting
Rob Mann	06/12/2015 08:19 PM	06/12/2015 08:21 PM	Continue Drafting
Rob Mann	06/12/2015 08:22 PM	06/12/2015 08:22 PM	Continue Drafting
Jennifer Hundley	06/13/2015 05:55 AM	06/13/2015 06:32 AM	Continue Drafting
Rob Mann	06/13/2015 08:39 AM	06/13/2015 08:40 AM	Agency Review Step 1
Rob Mann	06/13/2015 09:02 AM	06/13/2015 09:03 AM	Agency Review Step 1
Rob Mann	06/13/2015 12:38 PM	06/13/2015 12:41 PM	Agency Review Step 1
Rob Mann	06/13/2015 07:05 PM	06/13/2015 07:10 PM	Agency Review Step 1
Rob Mann	06/13/2015 07:26 PM	06/13/2015 07:27 PM	Ready for DPB Submission
Bob Brodyen	06/14/2015 02:18 PM	06/14/2015 02:18 PM	Ready for DPB Submission
			DPB Review