SOUTH DAKOTA BOARD OF REGENTS

Budget and Finance

AGENDA ITEM: 7 – V

DATE: October 3-5, 2017

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SUBJECT: SDSU Precision Ag Classroom & Laboratory Building and Berg Ag Hall Renovation Facility Program Plan

South Dakota State University requests approval of its Facility Program Plan for the Precision Ag Classroom & Laboratory Building and Berg Ag Hall Renovation project at an estimated cost of $55,000,000. The original Preliminary Facility Statement was approved by the Board of Regents in August 2015 and assigned Regent Morgan as the building committee representative. EAPC Architects were appointed as the design team with Clark Enersen Partners as the laboratory design consultants. A revised Preliminary Facility Statement was then approved by the Board of Regents in December 2016.

The project will include construction of a new classroom and laboratory building totaling 129,000 gross square feet, the renovation of the first and second floors of Berg Ag Hall, totaling 41,422 gross square feet, and demolition of the Seedhouse, West Head House, and Wheat House, totaling 22,395 gross square feet. This will result in an additional 106,605 square feet of space.

The College of Agriculture and Biological Sciences (CABS) and the Jerome J. Lohr College of Engineering (JJLCOE) have partnered to strengthen university programming that will help meet the increasing demand for a highly skilled workforce needed for 21st century agricultural production. Responding to this global trend is part of SDSU's land-grant university mission, updated classrooms and laboratory space is required to meet this need.

Modern and sufficient classrooms, and laboratory and engineering space will provide the specialized experiential learning and research environment that is needed for university faculty to lead research and development of a workforce of agronomists and engineers who can apply the complex data analytics that are central to precision agriculture.

Meeting the growing demand for a highly skilled workforce in precision technology development and use in South Dakota will require the convergence of teaching, research and

(Continued)

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DRAFT MOTION 20171003_7-V: I move to approve SDSU's Facility Program Plan for the Precision Ag Classroom & Laboratory Building and Berg Ag Hall Renovation project at an estimated cost of $55,000,000. SDSU requests the authority to continue with design services on this project funded with private donations; this will allow the details of the project scope and cost estimates to be refined.

outreach efforts of plant, soil and agronomic scientists, agriculture engineers, statisticians and data scientists, economists and climatologists into a more collaborative environment.

The Ag Engineering Department will vacate the Ag Engineering building at the completion of this project. The building will be retained to house other research and classroom space that will remain in continued use after the Precision Ag project is completed. The university is working on a space plan that will reassign other departments and uses to the remaining vacated spaces.

Additional details of the project can be found in SDSU's attached Facility Program Plan document.

Funding for this project's construction will come from the South Dakota Corn Utilization Council, SDSU sponsored program overhead funds to service bonds, private funds and agricultural property tax rebate funds.

Project Funding Sources:

$6,000,000	- South Dakota Corn Utilization Council
$7,500,000	- Building Authority Financing paid by SDSU's Research Infrastructure Improvement Fund
$10,000,000	- Donations
$31,500,000	- Ag Property Tax Rebate Funds
$55,000,000	- Total Project Funding

The utility and operating costs of the facility will be funded from university operating budgets.

SDSU estimates the need for additional maintenance and repair at $1,100,000. The amount would be slightly less than that given the buildings coming off-line and the dollars going to remodel a current facility. The impact is estimated at closer to $900,000. Because this is an academic facility, that money would have to come from HEFF or state funded maintenance and repair. The system is currently at 1.8% of total replacement value investment annually in maintenance and repair and the HEFF pool is not growing to fund additional maintenance and repair.

FACILITY PROGRAM PLAN
FOR
PRECISION AG CLASSROOM & LABORATORY BUILDING & BERG AG HALL RENOVATION
SOUTH DAKOTA STATE UNIVERSITY

DATE: September 5, 2017

South Dakota State University requests approval of this Facility Program Plan (FPP) for the Precision Ag Classroom & Laboratory Building project. The project will include construction of a new classroom and laboratory building and the renovation of the first and second floors of Berg Ag Hall. SDSU requests that the FPP be approved and the project be included with other capital improvement projects to be submitted by the BOR to the 2018 legislative session.

The original Preliminary Facility Statement was approved by the Board of Regents in August 2015. A building committee was appointed and the design team of EAPC Architects, with the Clark Enersen Partners as laboratory design consultants were selected to design the project. A Revised Preliminary Facility Statement was approved by the Board of Regents in December 2016.

SDSU requests the authority to continue with design services on this project. This will allow the details of the project scope and estimates to continue with minimal cost implications to the project.

A. Programmatic Justification for Discrete Spaces

The College of Agriculture and Biological Sciences (CABS) and the Jerome J. Lohr College of Engineering (JJLCOE) have partnered to strengthen university programming in order to meet an imperative societal need: feed more people using fewer resources in a manner that is socially acceptable and economically and environmentally sustainable. Actions taken by these Colleges, the University, and the BOR have allowed SDSU to prepare the nation's first multidisciplinary major in precision agriculture in 2016 and to strengthen the precision agriculture research collaboration between JJLCOE and the South Dakota Agricultural Experiment Station (AES). The new academic program will help meet the increasing demand for the highly skilled workforce needed for 21st century agricultural production.

Precision agriculture is the suite of expert technologies, methods and applications that is being employed globally to help produce more food with less water, fertilizer and treatments. Agricultural machinery is advancing beyond basic mechanization to include continuous processing of agronomic data in the field and to enable real-time adjustments that will allow an acre of land to achieve food production levels that would not be possible with manual labor or simple machines.

Responding to this global trend is part of SDSU's land-grant university mission. The two colleges are driving innovation and education by conducting new research and developing new curricula to educate a workforce that will harness the continual flow of precision agriculture knowledge and technology. The precision agriculture research initiatives involve both CABS

and JJLCOE scientists. The former are jointly appointed in two departments — Plant Science and Agriculture and Biosystems Engineering — and work in research spaces on campus and at AES field stations throughout the state. The latter are in three departments — Mechanical Engineering, Mathematics and Statistics, and Electrical Engineering and Computer Science. Collaborations are also active with scientists and engineers in the commercial sector and at other universities.

Modern and sufficient classroom, laboratory and engineering space will provide the specialized experiential learning and research environment that is needed for university faculty to lead research and development of a workforce of agronomists and engineers who can apply the complex data analytics that are central to precision agriculture. Updated laboratory, class lab, and classroom space is needed. There are three primary objectives of this building initiative:

1) Strengthen SDSU's ability to deliver a workforce more highly trained in decision management and application, geospatial imaging, plant and soil sensing, agricultural big data analysis, and field use of novel technology that supports changing food production industry needs;
2) Strengthen SDSU's collaborative research programs in three domains of precision agricultural — data acquisition, data processing and analysis, and decision-making; and
3) Expand experiential learning opportunities for engineering students so they graduate prepared to design the next generation of agricultural machinery that will increase world food production, and for statistics and data science students so they graduate prepared to address the big data challenges presented by precision agriculture.

Meeting the growing demand for a highly skilled workforce in precision technology development and use in South Dakota will require the convergence of teaching, research and outreach efforts of plant, soil and agronomic scientists, agriculture engineers, statisticians and data scientists, economists and climatologists into a more collaborative environment. The new curriculum in precision agriculture will merge traditional agronomic fields of study with engineering technology and data sciences to provide state-of-the-art multidisciplinary courses emphasizing advances in precision agriculture technology. This innovative curriculum will require modern physical space for the following:

- Space to support and encourage design, construction and installation of data acquisition and control sensors on large agriculture equipment;
- Space to support laboratory and studio-style learning with high-speed computers, software and technology unique to precision agriculture;
- Specialized laboratories to support cross disciplinary collaborative research in soil chemistry, soil physics, crop production, ag engineering, aerial imaging, water management and sensor development; and
- Space for rapid prototyping and state-of-the-art fabrication and manufacturing methods.

The program space requirements and scope of the project have been developed. The project scope will include construction of a new building and renovation of the first and second floors of Berg Ag Hall. The new facility shall be designed as a collaborative laboratory, class lab, and classroom facility. Interactive and collaboration areas will be integrated into the circulation

corridors of the building and in office areas. Conference rooms will be generally accessible to all building occupants to augment collaborative opportunities and as points where research and learning can take place outside of the walls of the facility. The renovated space in Berg Ag Hall will primarily be devoted to research laboratories and laboratory support facilities.

There are other smaller facets to the project scope. The first and second floor renovations of Berg Ag Hall will complete the renovations to this building. The lower level and third floor were renovated in 2009-2010 with the 2007 BOR Critical M&R Bond Issue. Mechanical space, elevator installation, and utility upgrades were also completed and developed to serve a fully renovated building.

The Seedhouse, West Headhouse, and Wheat Greenhouse will be demolished to clear the selected site for the new building. The site was selected in part for its proximity to other related research and classroom facilities (Berg Ag Hall, Alfred Dairy Science, McFadden Northern Plains Biostress, Animal Science Complex, North Greenhouses, and the Plant Science Building and Greenhouses). The site is also proximate to campus utilities, completed upgrades to the chilled water infrastructure, and planned upgrades to the steam tunnel system. This project scope will include extensions to the steam tunnels for building service and to provide a utility loop for the steam utilities so additional redundancy is available in this quadrant of the campus.

The Ag Engineering Department will vacate the Ag Engineering building at the completion of this project. The building will be retained as it houses other Engineering College departmental research space and a large general classroom space (lecture hall) that will remain in continued use after the Precision Ag project is completed. The University is working on a space plan that will reassign other departments/uses to the remaining vacated space within the Ag Engineering building. Plant Science research space within the McFadden Northern Plains Biostress Laboratory and Plant Science Laboratory buildings will be reassigned and reused for plant science research.

The project will also complete some campus site planning goals. This project, in combination with the Steam Tunnel Infrastructure Upgrades will allow Rotunda Lane to be removed from service. Essential service access and off street parking for Berg Ag Hall, Alfred Dairy Science, and the new facility will be provided from a new driveway entrance off of Medary Avenue through the Dairy Science parking lot. Rotunda Lane will be converted into a primary north-south pedestrian pathway.

A parking area for 75 vehicles will be displaced by the new construction. The parking spaces will be replaced by new parking constructed adjacent to the new building and its loading area, and some new spaces constructed on the west side of Medary Avenue.

a. Gross square footage

The gross area of the schematic design of the new building will be 129,000 sf. A recapitulation of the tabulated floor areas of the building is shown below.

Space type	Floor Area
Research Laboratories	14,463

Research Laboratory Support	2,300
Industrial Research Laboratories	11,172
Industrial Research Laboratory Support	4,384
Teaching Laboratories	7,856
Teaching Laboratory Support	336
Industrial Teaching Laboratories	6,619
Lecture & Classroom Space	6,534
Interactive & Student Support Space	8,509
Office and Administrative Areas	12,516
General Building Support Spaces	3,242
Corridors/Circulation/Stairs/Lobby/Mech	42,039
Building Structure	9,030
Gross Floor Area	129,000 gsf

The gross area of the renovated space in Berg Ag Hall is 41,422 square feet. A recapitulation of the tabulated floor areas of the building is shown below.

Space Type	Floor Area
Research Laboratories	6,677
Research Laboratory Support	2,199
Teaching Laboratories	1,371
Teaching Laboratory Support	223
Interactive & Student Support Space	1,515
Office and Administrative Areas	10,830
Corridors/Circulation/Stairs/Lobby	15,707
Building Structure	2,900
Gross Floor Area	41,422 gsf

The Seedhouse, West Headhouse, and Wheat Greenhouse will be demolished. The gross areas of the facilities to be removed are:

Building	Gross Area
Seedhouse	17,030
West Headhouse	2,110
Wheat Greenhouse	3,255
Total Gross Area	22,395 gsf

B. Site analysis

The site selected is located at the corner of Medary Ave. and North Campus Drive directly west of Biostress. This location provides the project with the appropriate adjacencies to other related buildings on campus and is also positioned on a highly visible and well-traveled portion of the campus. The site of the new building is in the current location of the Seedhouse, in the northwest quadrant of the campus. The new facility will be west of McFadden Northern Plains Biostress, across North Campus Drive from the Animal Science Complex, and south of the Alfred Dairy Science Building. Medary Avenue will border the site on the west.

The site is generally flat with a slight slope downwards to the north. Service access to the new building, Berg Ag Hall and Alfred Dairy Science will be provided through a new driveway entrance off of Medary Avenue, south of the new facility.

All campus utilities will be available on the site or adjacent to the site. The steam distribution system will be extended from two possible locations (Alfred Dairy Science and the North Steam Tunnel) to serve the building and provide additional redundancy in the steam utility system serving this quadrant of campus. Domestic water service is available from near Berg Ag Hall. Electrical switchgear north of the site will be the point where we access electrical service for the new building. Sanitary sewer service is available from a municipal sewer main in Medary Avenue. Chilled water for air conditioning will be provided from the North Chiller Plant. It will be necessary for this project to install a new 750 to 1,000 ton chiller and cooling tower in the plant to provide the cooling capacity for the new building. The storm sewer system serving this quadrant of campus is available along the east edge or at the northeast corner of the site.

C. Description of Key Building Features

New Precision Agriculture Building
One of the overarching goals of the new Precision Agriculture program is to encourage collaboration and the design of the new building offers many features to help facilitate this important goal. There are breakout spaces and collaboration areas placed throughout the facility of various sizes for use by all building occupants. In addition, there is a large central circulation core that doubles as a collaboration area. This core is designed with clerestory windows that will bring light into the center of the building thus providing opportunities for lab spaces to be placed internally without losing natural light and to meet LEED criteria. Lastly, the research spaces and offices for each department have also been intermingled throughout the facility to ensure that the users will have ample opportunities to interact.

Throughout the process of ensuring that the spaces throughout the building were diversified, the design also works to retain important adjacencies and avoid conflicts. Noisy spaces were strategically placed in a cluster on the perimeter to help isolate the noise and provide exterior access with large overhead doors. Classroom spaces are positioned further away from the noisiest rooms. The 100-person classroom has been specifically placed across from the Mid Bay Machinery Laboratory to allow for smaller equipment to be brought into the classroom and observed using handheld cameras during the lecture. In total, this facility has 4 classrooms of varied sizes and 10 teaching laboratories. These teaching spaces have been placed near the main entrance to provide easy access and wayfinding for students.

The exterior facades of the building will consist of a mixture of brick, glass and metal panel. The use of brick helps tie the building into the existing fabric of the SDSU campus, and it will be supplemented by large expanses of glass to provide transparency and openness from the interior. The metal panel will provide a more modern look to portions of the building and the mixture of all three major materials will create a collaboration on the exterior that mimics the collaboration that is occurring within the building. There are also plans to include a maximum of a 100 KW Photovoltaic array on the large roof area facing south. This array will provide power to the facility and reduce electrical costs. In addition, the design will integrate the use of a perforated metal panel system called “SolarWall” that preheats the air with solar radiation before it enters

the mechanical system thus reducing energy costs during the winter months. The new construction will be designed to meet LEED Silver requirements as required by South Dakota statutes. The features noted above are essential to meeting these requirements.

Renovation of Berg Hall

The first and second floors of Berg Hall will be renovated under the scope of the Precision Ag program to provide updated teaching and research laboratories as well as faculty office space for those Plant Science department initiatives that are in direct support of the Precision Ag curriculum. This work will include new layouts and modernization of large portions of the first and second floors as well as complete mechanical and electrical upgrades in all affected areas. The mechanical shell spaces built as part of the most recent renovation and located at each floor on the east side of the building will be used to accommodate new equipment and infrastructure. Specific benefits to the Plant Science portion of the Precision Ag curriculum will include:

- Five new research laboratories and their associated support spaces focusing on Plant Pathology and Entomology
- An upgraded Plant Pathology Diagnostic Service Laboratory suite
- A new Plant Pathology and Entomology Teaching Laboratory and its associated Teaching Prep space.
- Fifteen upgraded Plant Science Faculty Offices
- Two Plant Science Staff Offices
- New Plant Science Graduate Student Work areas to accommodate 20 to 25 students
- Moderate renovations to non-Plant Science areas of the first and second floor to connect them to the new HVAC infrastructure

Mechanical Systems (new building and Berg Ag Hall) - Summary

The mechanical penthouse level will have air-handling units, return fans, and laboratory exhaust fans to serve climate control and exhaust requirements for internal spaces. Designated air handling units will serve the offices, corridors, and interaction room. These air handling unit will be equipped with a return air fans and will be a variable air volume system. For lab rooms, air handling units will provide a once through air flow pattern utilizing 100% outside air for laboratory ventilation. Dedicated outdoor air handling units will serve the laboratories, shared equipment rooms, and the glass wash space. Laboratory exhaust fans will be sized for appropriate redundancy and include heat recovery systems for energy conservation. Air handling and exhaust air systems will be sized with minimal spare capacity. Finned tube or ceiling panel radiation will be provided around the perimeter in areas with large amounts of exterior glazing. The building will be fire sprinklered.

Electrical / Communication / Security (new building and Berg Ag Hall) - Summary

The electrical design for this project will include the following:

- Primary electrical service to the facility including a 277/480 volt electrical service entrance and distribution systems throughout the facility.

- An engine powered standby/emergency generator system to supply required Life Safety Code electrical power loads and optional standby loads as designated by the facility Users.
- LED lighting systems and lighting controls will be used throughout the facility.
- Receptacle layouts will be designed to support computer equipment, lab equipment and general-purpose needs.
- Outlet boxes, raceway distribution systems and horizontal cable will be located to support the telecommunications provided by the University.
- Necessary electrical service to HVAC equipment.
- An analog, addressable type fire alarm system.
- A security system will be designed which subdivides the building into two distinct zones; public, and research and support zone. Public zone includes the lobby/interaction area and the seminar room. Research and support zone includes the rest of the building and is only accessed by passing through card-access doors. Security checkpoints provided with card-access doors at the building user's parking lot, from the lobby into the building "core", employee entry vestibule, and seminar entry vestibule at the north. A second level of security is provided for access to the lab wings. Raceways for a video surveillance system will be provided in accordance with direction provided by SDSU for both interior and exterior areas. Specific attention will be placed at all building entrance areas.

D. Illustrative Floor Plans

The schematic design showing the site plan, the floor plans for the new building, and the floor plans for the first and second floors of Berg Ag Hall is attached.

E. Initial Cost Estimates & Timeline

The project cost estimate is $54,995,914 and is recapitulated below. This estimate includes all anticipated construction and non-construction costs. This estimate includes contingency allowances for the project, design, and project management cost estimates.

Construction Costs	
1) Site Demolition, Building Demolition, Asbestos Abatement	$ 727,500
2) Site Utilities/NCP Chiller/NCP Cooling Tower/Parking	$ 3,325,000
3) Berg Ag Hall Renovations	$ 6,923,620
4) New Building Construction	$31,790,262
5) Subtotal Construction Costs	$42,766,382
6) CM@R estimating services (included in construction costs)	$ -
7) Construction Contingency (approximately 7%)	$ 2,993,647
8) Total Construction Costs	$45,760,029
Non-Construction Costs	
9) Architect/Engineer	$ 4,235,474
10) Survey/Geotechnical/Testing/Commissioning	$ 657,996
11) SDSU & OSE Project Management	$ 944,096
12) Relocation	$ 100,000
13) Furnishings & Equipment	$ 995,000
14) Network/Telecom/Technology/Custodial	$ 200,000
15) Owner Contingency (5%)	$ 2,103,319

16) Total Non-Construction Costs	$ 9,235,885
Total Project Costs	$54,995,914

An estimated timeline for the project is attached.

F. Impact to M&R

Based on recognized industry standards, the annual funding for maintenance and repair should be equal to 2 – 2.5% of the project costs or the building replacement value. The annual M&R allocation should be between $1,110,000 and $1,388,000 based on the construction cost. The building is an academic facility, therefore maintenance and repairs would be supported by HEFF.

G. Budget for Ongoing Operational Expenses

Utility expenses are estimated at $154,000 annually. This represents only utility consumption costs, and not utility connection costs, which are included within construction costs. We do not anticipate any necessary utility upgrades to the campus utility systems beyond what is described and included in the project scope, as a result of the project. We do anticipate that utility costs will change.

Berg Ag Hall is not fully air conditioned on the first and second floors. The renovated building will be fully air conditioned, adding costs for space cooling. The existing laboratory space is not well equipped or adequately ventilated. The renovated space will be fully modernized, and we expect electrical and HVAC costs to increase.

We estimate routine maintenance expenses for the new building to be 1.0% to 1.5% of the project costs projected to be between $555,000 and $830,000. Custodial services costs will change only for the amount of additional newly constructed space. There will be expenses to provide custodial equipment to stock the building, and they are estimated to be $70,000 one time costs. The University estimates the additional floor space will require an increase of $212,000 per year in custodial and simple maintenance costs including additional FTE's required.

H. Proposed Funding Sources

a. Construction

$6,000,000	- South Dakota Corn Utilization Council
$7,500,000	- Building Authority Financing paid by SDSU's Research Infrastructure Improvement Fund
$10,000,000	- Donations
$31,500,000	- Ag Property Tax Rebate Funds
$55,000,000	- Total Project Funding

b. Ongoing operations – The utility and operating costs of the facility will be funded from University operating budgets.
c. Maintenance and repairs – The maintenance and repair costs for this facility will be funded through HEFF.

End of Report
September 5, 2017