San Luis Valley Potato Research and Storage Facility

April 2022

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Executive Summary

In 2017, the San Luis Valley Research Center lost its potato storage facility to a wind microburst exceeding 80-mph. This project will construct a replacement 27,000gsf fresh market potato research, breeding, certified seed and production storage building. The program is currently leasing low quality space nearly nine miles from the site.

The primary aim of the potato research program is to help the Colorado Potato industry in the areas of breeding for potatoes adapted to the San Luis Valley, long-term storage strategies, and maintaining quality for new lines of certified seed in the proposed storage facility.

Local, rural communities are significant beneficiaries of Colorado's potato production:

- The Colorado potato industry **annually contributes ~$600MM to Colorado's economy**
- with the San Luis Valley region representing ~97% of that market share.
- More than 4,000 jobs are supported by the 120+ San Luis Valley farms making the San Luis Valley Potato industry this region's largest employer.
- This industry's viability hinges on the farmers' and associated support services' ability to adequately store more than 2.1 billion pounds of potatoes each year.
- An investment in the SLVRC is also an investment in the economic development of the San Luis Valley. In the Valley, roughly 50% of the value of goods and services is directly tied to agriculture, as is much of the non-urban tax base. Potatoes are a high input crop where much of the labor and supplies are sourced locally, so the economic multiplier of the investment is significant relative to other opportunities. It fits importantly into CSU's commitment to rural Colorado.

The San Luis Valley Research Center is an anchor enterprise in the local community:

- The SLVRC employs **29 fulltime personnel** and educates 30+ CSU graduate-candidates, Adams State University undergraduates and local high school students.
- This facility is important in the broader context of the research center – it is an update to facilities that are sorely needed to accomplish our mission, attract talented employees, and provide basic services.
- The **Colorado Potato Administrative Committee allocates $250,000 annually** to CSU faculty from assessments on Potato sales. Their support has assisted CSU participation in national research collaboration and win federal grants exceeding $500,000.

In addition, the facility itself can be used for other crops that will need to be stored for research purposes. This is an investment that can nimbly adjusted to address any number of crops and enterprises requiring climate-controlled storage. This Colorado State University asset has become a welcoming and engaging fixture determined to educate the local community, to host visitors from all over the world, and to serve the agricultural industry in southern Colorado.

The estimated budget range is $12M-$15M, depending on delivery method and timing of the project approvals. We are requesting state capital construction funding of 83% with a 17% cash match.

Justification

Program mission and history

Colorado has a long rich tradition of growing potatoes dating from the early 1880's and today is one of the top production areas in the US. The San Luis Valley is unique in that it is one of the largest, high altitude (7,600 ft.), irrigated crop production areas in the United States, surrounded by 12,000-14,000 foot mountains. Geography, climate, and water supply make it the United States' premier location for raising potatoes. In response to these drivers, the SLVRC has become a vertically integrated research site addressing national and world-wide challenges to potato production.

The first San Luis Valley Research Center was established in 1888 (the same year the main station at Fort Collins was established) on 200 acres of state land near the Rio Grande River, seven miles east of Del Norte. Beginning in 1940, the principal research activity was focused on selecting potato varieties adaptable to the region. In 1979 a potato breeding program was initiated to complement the selection activity. Research on cultural practices including disease and pest studies was also conducted. In the early 1920s, the Colorado Certified Seed Growers Association initiated a seed certification program located on the Colorado State University campus which was co-located at the SLVRC in 1964.

The major objectives of the Colorado Potato Breeding and Selection Program are: (1) to develop new potato cultivars with increased yield, improved quality, improved nutritional and health characteristics, resistance to diseases and pests, and tolerance to environmental stresses; (2) to collaborate with growers, shippers, processors, and research/extension personnel to assess the production, adaptability, marketability, and other characteristics of advanced selections from the Colorado program; (3) to provide a basic seed source

of selections to growers for seed increase and commercial testing; (4) to evaluate promising selections for possible export (interstate and international).

The Colorado State University potato program is committed to developing research-based information and extension education programs to support the Colorado potato production and marketing system and consumers alike. The research center has a continuing commitment to the people of the San Luis Valley (SLV) and the State of Colorado to provide research information, conduct extension education and seed certification programs.

Relation to Academic Strategic Plan

Inspired by its land-grant heritage, Colorado State University (CSU) is committed to excellence, setting the standard for public research universities in teaching, research, service and extension for the benefit of the citizens of Colorado, the United States and the world. All aspects of the land grant mission – discovery, learning and engagement – are manifested at the facility. The investment of the facility is symbolic of the renewal of CSU's commitment to its mission-based activities.

Physical Condition/functionality of Existing Space

Since the destruction of the potato storage facility staff has rented temporary space in the vicinity. They have encountered the following challenges:

- Inability to provide adequate protection to the novel potato varieties
- Inability to maintain consistency in research methods
- Inability to participate in national variety trials
- Inability to provide reliable and scalable storage management recommendations
- Inability to attract research collaboration and awards that address potato disease
- Inability to attract new potato research talent
- Inability to handle any quantity of potatoes in safe manners throughout a calendar year
- Inability to effectively prepare for seasonal milestones without adequate workspace
- Inability to adequately support research requests due to inefficient staff labor demands
- Inability to realize maximum net profits from operations due to low-quality local space available to rent

Other existing facilities include two labs in the processing building and three cold storage rooms with humidity control, shared by Potato Physiology and Potato Pathology/Seed Certification.

The limitations of the current laboratory and cold storage space include:

- Cold rooms have a low ceiling and limited space allows only 1 or 2 storage cribs.
- Seed storage sanitation restrictions prohibit moving material from the processing building into seed storage, creating logistical issues.
- There is no way to scale up pressure bruise experiments without a bulk storage facility.
- The facility is not ideal to study the sprout inhibitors for cross contamination limitations.

New Space Requirements

1. Horizontal macro potato storage w/temp, humidity and ventilation control
2. HD pallet potato storage w/temp, humidity and ventilation control
3. Open workspace

4. Research bulk storage w/temp, humidity and ventilation control
5. Additional bulk storage w/misters
6. Workspace adjacent to that area
7. Loading dock
8. Shipment room
9. Restroom facilities

Room type	Number	Total GSF
Macro bin storage	1	6,140
HD pallet storage	1	800
Open workspace	1	5,300
Research bulk storage	1	2,100
Bulk storage	1	4,200
Shipment	1	900
Building support		1,460

Example of bulk storage pile of potatoes with ventilation piping beneath.

Example of crib storage of potatoes

Equipment List

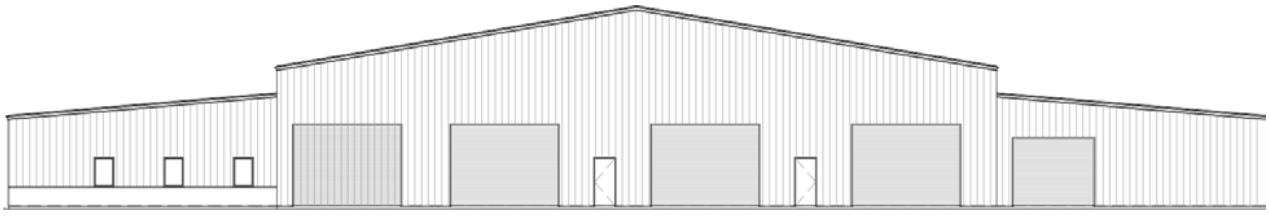
Telescoping / Arcing Piler	$	165,000.00
Electric Forklift	$	45,000.00
Spudnik Air Sep	$	135,000.00
Tomra FPS	$	135,000.00
Macro Bin Filler	$	65,000.00
2 Fixed Conveyors	$	60,000.00
Scissor Lift	$	35,000.00
Skid Steer	$	45,000.00
Telescoping Conveyor	$	65,000.00
LP Fork Lift	$	40,000.00
1-Row Harvester	$	250,000.00
1 Potato Truck w/ Bed	$	165,000.00
Utility Piler	$	25,000.00
Small Conveyor	$	15,000.00
Dirt Eliminator	$	180,000.00
Even-Flow Tub	$	160,000.00

Alternative analysis

The available rental options are inadequate for research and threaten the SLVRC's highly successful potato seed crop program. Daily travel to rented storage for quality checks diverts valuable labor resources and adds risk to employee operations.

Benefits of the Project

The new building is essential to the San Luis Valley Research Center, providing research-based information and extension education programs to support the Colorado potato production and marketing system and consumers alike. Strong, forward-looking research and extension programs enable the potato industry to be on the cutting edge of technology that is essential to competing in the markets of today and tomorrow.



SOUTH ELEVATION

Design Criteria

See conceptual floor plans and building elevations in Appendix.

Site Constraints

The facility will be located roughly where the original Potato Storage Barn was located. The site is flat and the main constraint is an existing transformer.

Flood Mitigation Analysis
Not applicable to anticipated building site.

LEED Goal
Senate Bill 07-051 directs that state buildings undergoing substantial renovation or new construction conform to the High-Performance Certification Program. The Office of the State Architect has stated that USGBC LEED-NC Gold is the targeted standard of this program, or at a minimum, the highest obtainable LEED standard. The most current LEED publication at the time of design will be used. The inclusion of high-performance standards is an integral part of the project, beginning at the program plan stage.

This project is anticipated to be LEED certified.

Architectural

The project is anticipated to be a pre-engineered metal building on a 3' stem wall foundation with additional insulation on the interior.

Structural

- *Sample Storage areas* to have a smooth finish, sealed and centrally drained concrete floor. Capacity of the reinforced flooring ~4,000psi.
- Over-the-top "catwalk" style access to the stored potatoes should be considered. This access is only relevant to the two bays: *Large Crib Room* and *Bulk Potato Storage.* Macro Bins will be stacked at no more than 7 units high, and bulk piles will not exceed 13' feet in height. Thus "catwalk" solutions should be placed, modified and installed appropriately.

Mechanical Narrative

Climate-Control – At a minimum, each separate ventilation servicing the larger storage bays should be outfitted with evaporative cooling pads and supplemental spinning disk humidifiers. The minimum target temperature for the bays is no less than 36°F.
In addition, both automated refrigeration and heating systems shall be integrated into the ventilation controls and the potato storage bays in following prioritized order:

1. *Large Crib Room*
2. *Faculty Sample Storage Area(s)*
    I. *Vertically Stacked Area*
3. *Bulk Potato Storage*

The refrigeration system's capacity should be designed to facilitate no less than 0.5°F drop / day and is deemed sufficient at a capacity of 2°F drop / day. Both single and three phase options should be considered.

The heating system's capacity should be designed to maintain a maximum internal heat within each storage bay up to 60°F. When raising the internal temperature, the chosen heating system should be capable of raising the internal temperature of the storage bays no less than 2°F/day. Source of heat shall be either electric or propane fuel.

The ventilation controls must have the following features:

- The ability to be integrated into the existing WIFI infrastructure,

- Remote access that enables real-time viewing of panel settings,
- Remote access that enables the user to manipulate any function within the storage and ventilation control panel,
- Remote access must have permission settings that limits each user's accessibility based on their role at the San Luis Valley Research Center,
- Ventilation controls must accommodate refrigeration, automated heating, humidicell evaporative cooling function, extra humidity control, bay lights, sensing (CO_2, Ethylene correlation, c.f.m., humidity, temperature, etc.) at a minimum,
- Data from the ventilation system is appropriately warehoused and timestamped for recall purposes.

Plumbing - Service stations at maximum 20 to 25' spacings (or where it is intuitive) that supply:

- Static compressed air = 110psi air via 3/8" female fittings that delivers no less than 8.5cfm,
- Water taps with vacuum breakers that deliver a minimum 10gpm flow rate,

Electrical Narrative

Data connectivity and wireless fidelity shall be readily available throughout the entire Research and Production Storage Facility. Certain areas will understandably be inaccessible; however, the workspaces and storage spaces shall have full broadband internet connection through WIFI distribution. However, to mitigate breaks in connection a wireless mesh network shall be created to help cover and pass data. The SLVRC presently uses the provider Ciello for data connectivity, and the facility in question shall be integrated into that existing service. The minimum connection established in the prioritized workspace shall be no less than the FCC minimums; 25 MBPS for download speed and 3 MBPS for upload.

Full coverage LED lighting of workspace with a temperature range between 4,500-5,500K.

Service stations at maximum 20 to 25' spacings for 1 &3 Φ, 110 & 220-volt, 20-50A electricity receptacles.

The workspaces and other areas of the Research and Production Storage Facility need to adhere to OSHA Standard 1910 Laws and Regulations.

CSU Standards
The CSU Building Construction Standards Manual is available at:
http://www.fm.colostate.edu/constr_standards

The CSU Standards are to be used as guidelines for design. They are divided into 3 parts for use by Architects and Engineers: the first part is administrative; the second part discusses requirements for design and deliverables at each stage of the design process; the third part consists of the technical standards arranged by CSI division. The Standards are a work in progress, and as such, any question about the applicability of a standard should be discussed with the project manager. The Standards should never be referenced or copied in Contract Documents – the design is expected to embody and conform to the Standards. Contractors are not to be directed to review the Standards as a contract requirement.

CSU INCLUSIVITY STANDARDS-as applicable to San Luis Valley Research Center

Colorado State University requires all capital construction projects to provide inclusive facilities. These facilities are consistent with CSU Strategic Plan, Climate Action Plan (CAP) and Principles of Community that "create and nurture inclusive environments," and "welcome, value and affirm members of our community, including their various identities, skills, ideas, talents, and contributions." Standards for each room type are located at: https://www.fm.colostate.edu/sites/default/files/standards/II-Chapter-34.Requirements_By_Space_Type.pdf.

CSU Accessibility Standards outline additional ADA requirements.

List of applicable codes –

(Approved building codes and standards are adopted by the Office of the State Architect (herein referred to as State Buildings Program (SBP)) and other state authorities, and are identified below. These minimum requirements are to be applied to all construction at state agencies and institutions of higher education owned facilities.

The 2018 edition of the International Building Code (IBC)
(As adopted by the Colorado State Buildings Program as follows: Chapter 1 as amended, Chapters 2-35 and Appendices C and I)

The 2018 edition of the International Existing Building Code (IEBC)
(As adopted by the Colorado State Buildings Program as follows: Chapters 2-16, Appendices A-C and Resource A) Effective July 1, 2016.

The 2018 edition of the International Mechanical Code (IMC)
(As adopted by the Colorado State Buildings Program as follows: Chapters 2-15 and Appendix A)

The 2018 edition of the International Energy Conservation Code (IECC)
(As adopted by the Colorado State Buildings Program)

The 2020 edition of the National Electrical Code (NEC) (NFPA 70®)
(As adopted by the Colorado State Electrical Board) Effective August 1, 2020

The 2018 edition of the International Plumbing Code (IPC). first printing (August 2017) (As adopted by the Colorado Examining Board of Plumbers)

The 2018 edition of the International Fuel Gas Code (IFGC) first printing (August 2017) (As adopted by the Colorado Examining Board of Plumbers)

The National Fire Protection Association Standards (NFPA)
(As adopted by the Department of Public Safety/Division of Fire Prevention and Control)

The 2018 edition of the International Fire Code (IFC)
(The 2015 edition continues to be adopted by the Department of Public Safety/Division of Fire Prevention and Control (DFPC). Projects requiring DFPC review should be designed with the most restrictive requirements)

The 2015 edition of the ASME Boiler and Pressure Vessel Code
(As adopted by the Department of Labor and Employment/Boiler Inspection Section) Effective July 1, 2017.

The 2017 edition of the National Boiler Inspection Code (NBIC)
(As adopted by the Department of Labor and Employment/Boiler Inspection Section) Effective July 1, 2017.

The 2015 edition of the Controls and Safety Devices for Automatically Fired Boilers CSD-1 (As adopted by the Department of Labor and Employment/Boiler Inspection Section) Effective July 1, 2017.

The 2015 edition of the Boiler and Combustion Systems Hazards Code, NFPA 85
(As adopted by the Department of Labor and Employment/Boiler Inspection Section) Effective July 1, 2017.

The 2013 edition of ASME A17.1 Safety Code for Elevators and Escalators
(As adopted by the Department of Labor and Employment/Conveyance Section) Effective April 1, 2017
The 2005 edition of ASME A17.3 Safety Code for Existing Elevators and Escalators
(As adopted by the Department of Labor and Employment/Conveyance Section

The 2011 edition of ASME A18.1 Safety Standard for Platform Lifts and Stairway Chairlifts
(As adopted by the Department of Labor and Employment/Conveyance

The current edition of the Rules and Regulations Governing the Sanitation of Food Service Establishments
(As adopted by the Department of Public Health and Environment/Colorado State Board of Health)

The Current edition of ICC/ANSI A117.1, Accessible and Usable Buildings and Facilities
As referenced in the adopted edition of the International Building Code.

Project schedule, cost estimates and financing

Schedule/phasing
Once necessary approvals and financing are in place, the project is estimated to take 18 months to complete.

Financing
The estimated budget range is $12M-$15M, depending on delivery method and timing of the project approvals. We are requesting state capital construction funding of 83% with a 17% cash match.

Cost estimate/methodology
Cost estimates were developed by a third-party cost estimator. CSU standards specify that the A/E document 20% of the construction budget in bid alternates, to cover potential volatility in the construction market as the project progresses.

Appendices

a. **Site map**
b. **Floor plans**
c. **Elevations**
d. **Budget**