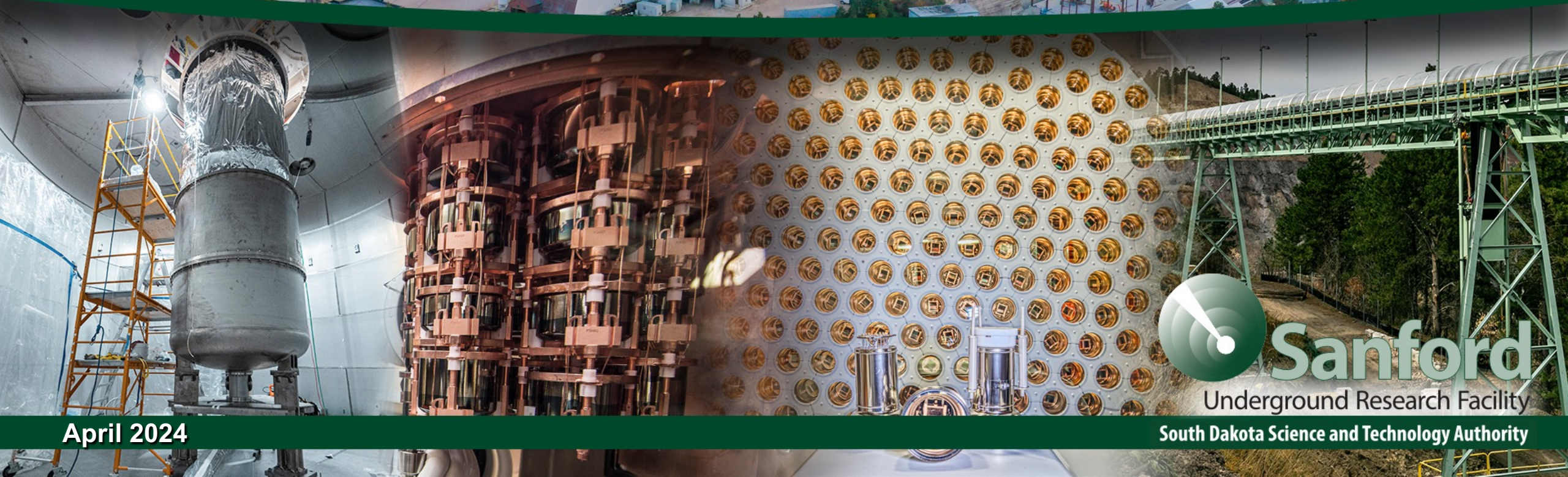


Sanford Underground Research Facility

America's Underground Science Laboratory

Mike Headley

SDSTA Executive Director
SURF Lab Director



April 2024

South Dakota Science and Technology Authority

Mike Headley - Executive Director

- **31 years experience.** Served as a senior executive, project manager, and systems engineer working on major space (satellite and ground) systems, underground facility construction, operations, and maintenance for DOE, NSF, USAF, USGS, State of South Dakota.
 - Supported wide range of science users, military users and national level decision-makers.
 - Projects ranged in cost up to \$6B USD.
- **15 years at SURF.** Served as South Dakota Science and Technology Authority (SDSTA) Executive Director for 10 years and SURF Lab Director for 11 years.
- Certified as a Project Management Professional (PMP).



SDSTA Overview



SURF Mission:

We advance world class science and inspire learning across generations.

SURF Vision:

The world's preferred location for underground science and education.

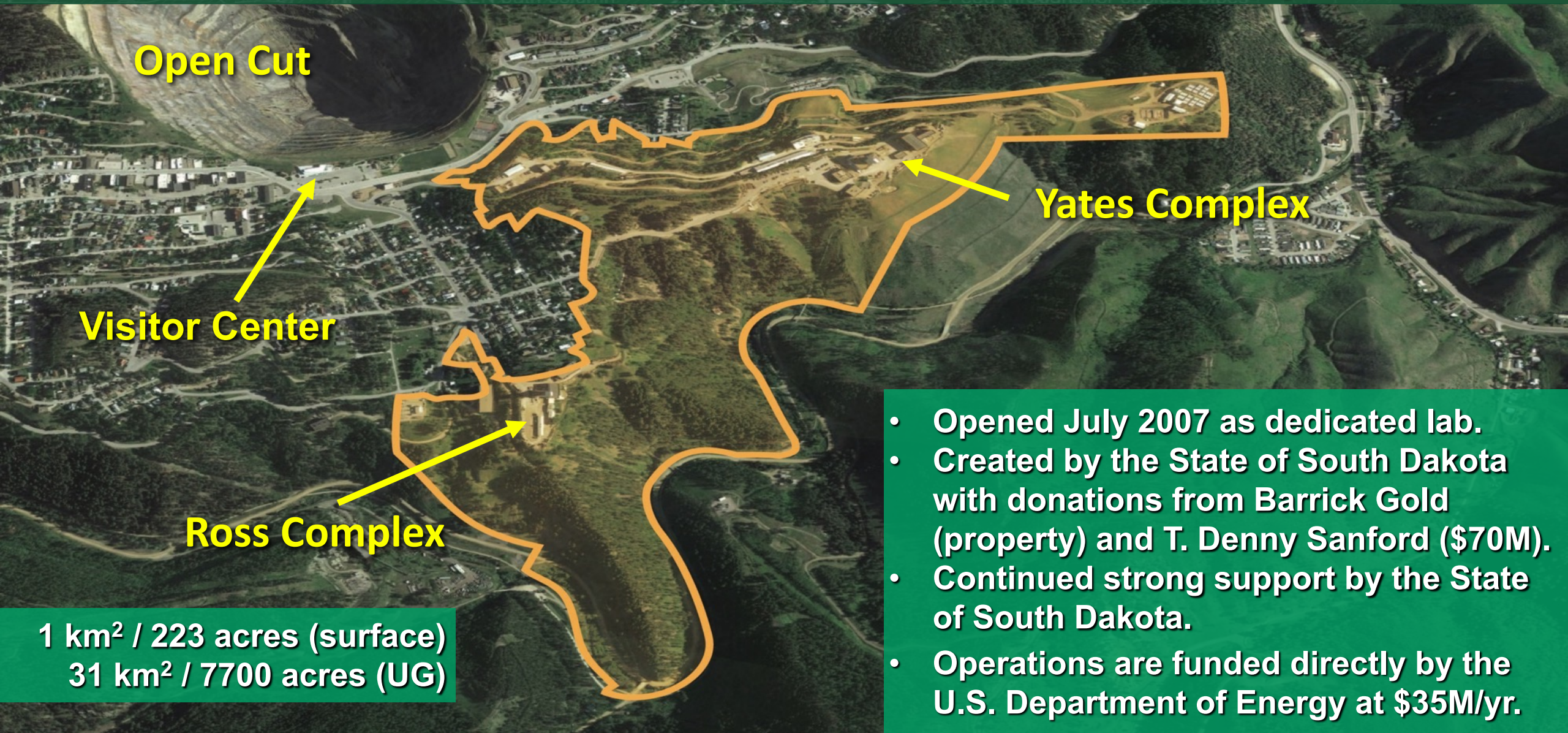
- SDSTA currently has 186 full time staff members. 400 total FTE at SURF across all employers.
- We own, operate, and maintain the SURF facility in support of world-leading science experiments. Currently, 29 science groups and over 2000 collaborators.
- We support the construction of the Long-Baseline Neutrino Facility (LBNF) to host the Deep Underground Neutrino Experiment (DUNE) at SURF.
- We provide leadership in K-12 and public STEM education and outreach.
- SURF operations is federally funded through a five-year Cooperative Agreement (CA) with DOE's Office of Science. Five-year renewal is under consideration for a Sep 2024 start.

SURF Operations Cooperative Agreement (CA)

- CA established a direct relationship between DOE and SDSTA.
- Includes 5 years of SURF operations at \$125M total (Federal FY20-24).
- Under the CA, the SDSTA operates and maintains SURF in support of the science mission. Provides all personnel, facilities, equipment, supplies, and services. Manages the overall effort.
- CA scope includes "Basic Support" to approved Non-Proprietary users without charge. The user will pay for costs incurred for services over and above basic support.
- Costs to support Proprietary users must be fully recovered per DOE direction.
- DOE funds SURF Infrastructure Improvement Projects through the CA to ensure safe and reliable operations.
- CA "renewal" for an additional five years is in process. Planning a Sept 2024 award.

Sanford Underground Research Facility

Nation's deepest UG lab, advancing world-leading, multi-disciplinary research



1 km² / 223 acres (surface)
31 km² / 7700 acres (UG)

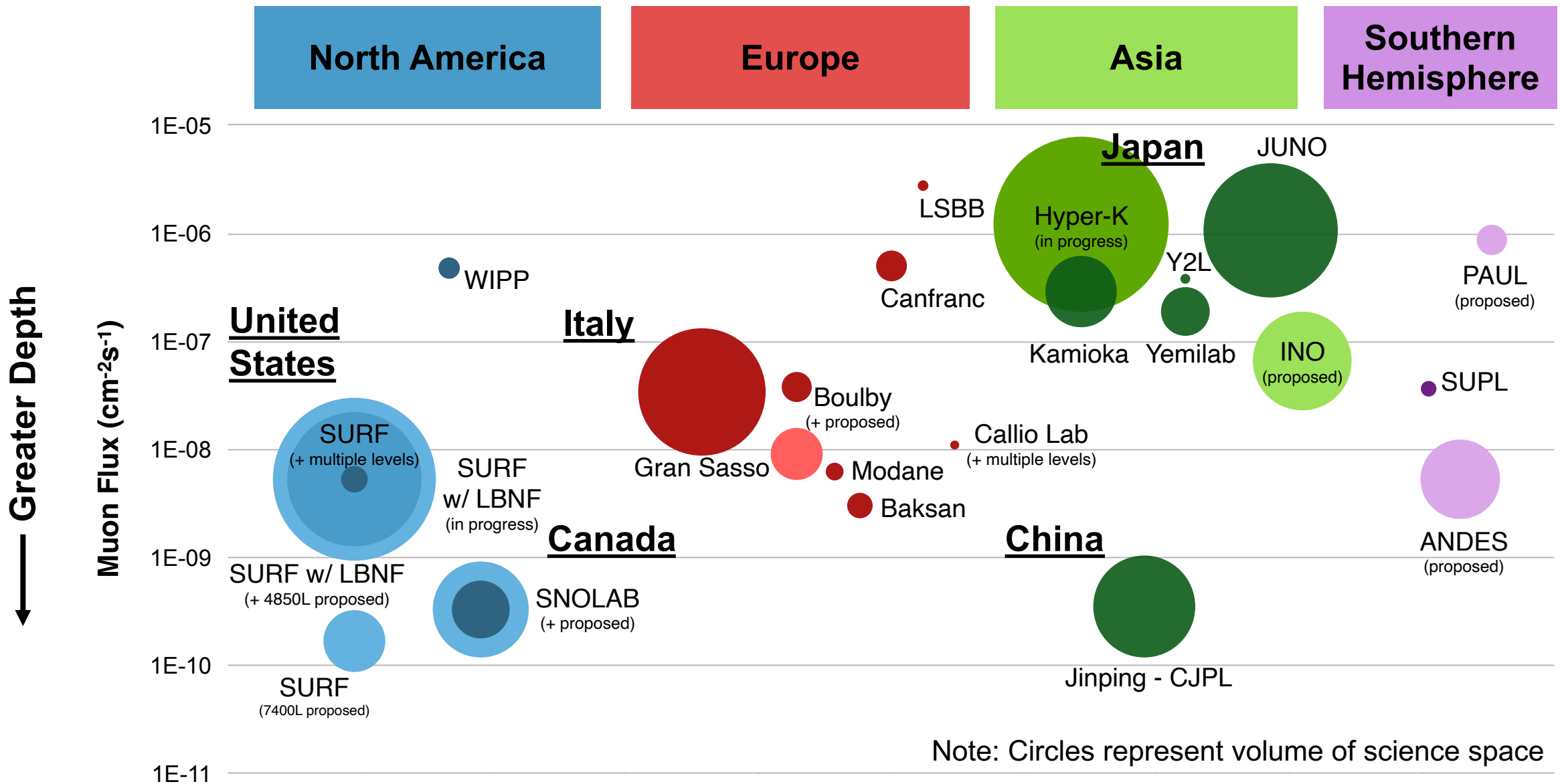
- Opened July 2007 as dedicated lab.
- Created by the State of South Dakota with donations from Barrick Gold (property) and T. Denny Sanford (\$70M).
- Continued strong support by the State of South Dakota.
- Operations are funded directly by the U.S. Department of Energy at \$35M/yr.

Sanford Underground Research Facility

Where in the world is SURF?



SURF in the Global Context





Dark Matter
LUX-ZEPLIN



Neutrinos
MAJORANA DEMONSTRATOR
LBNF /DUNE

Science Program

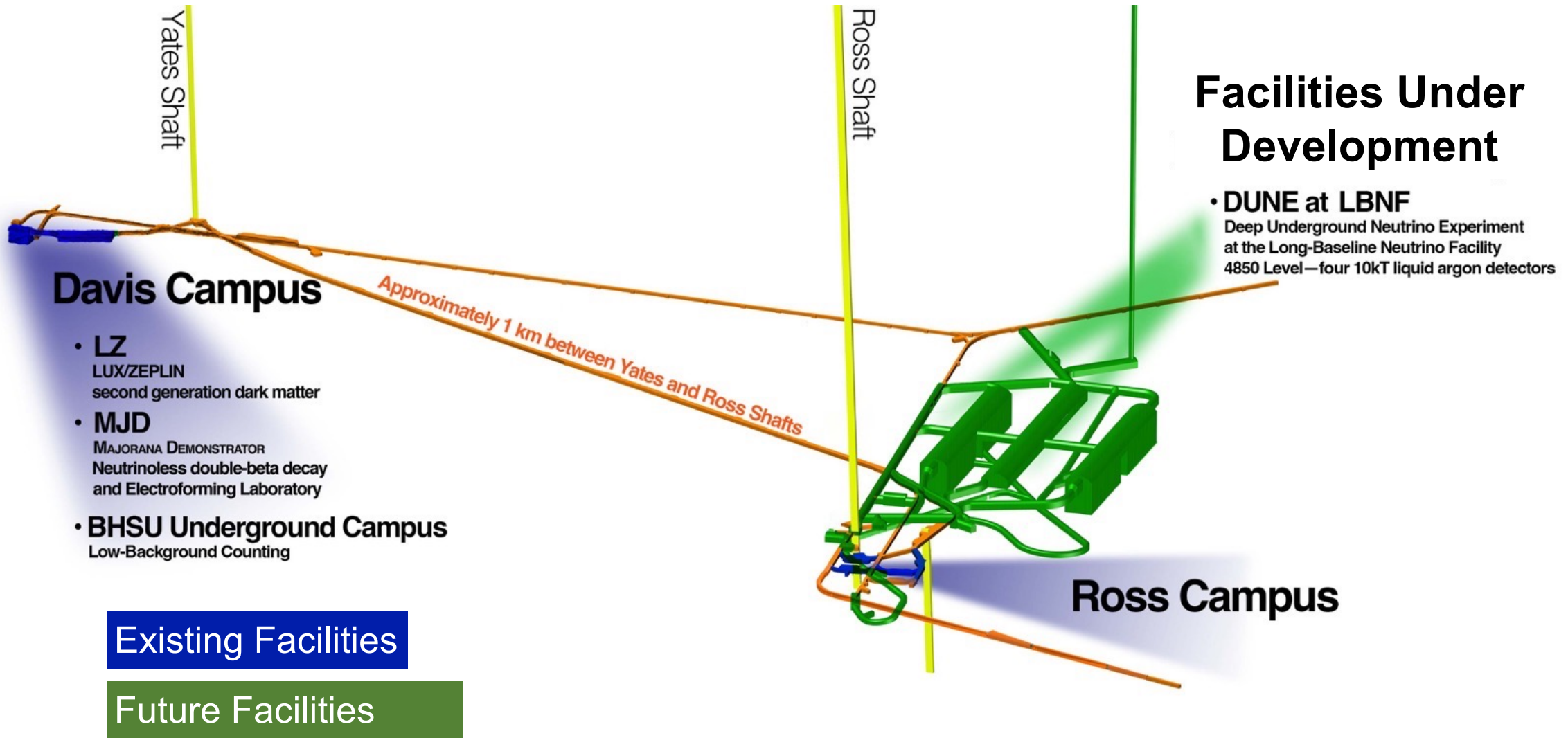


Biology
Extreme Life
Astrobiology



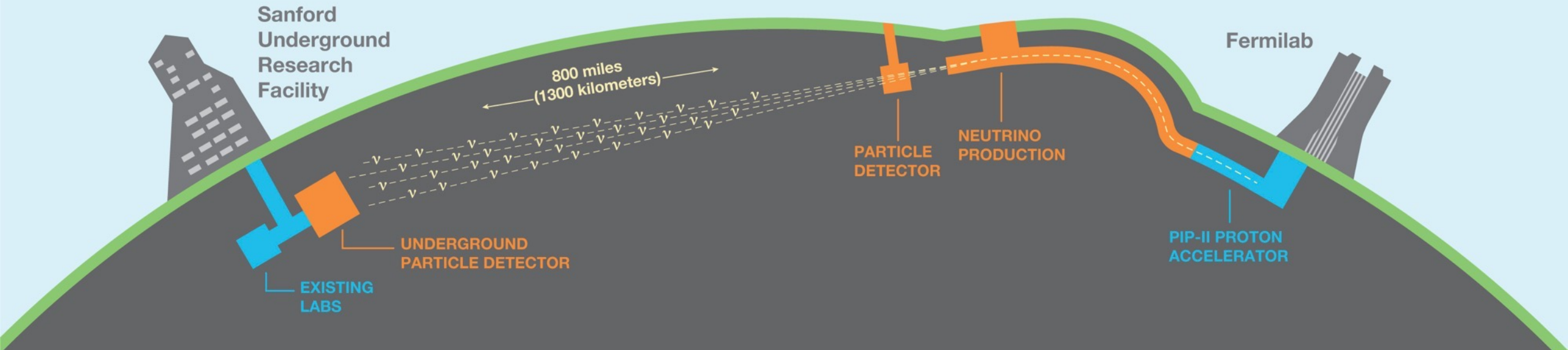
Geology
Geothermal Energy
Seismic Studies

4850L Science Facilities



Long-Baseline Neutrino Facility (LBNF)

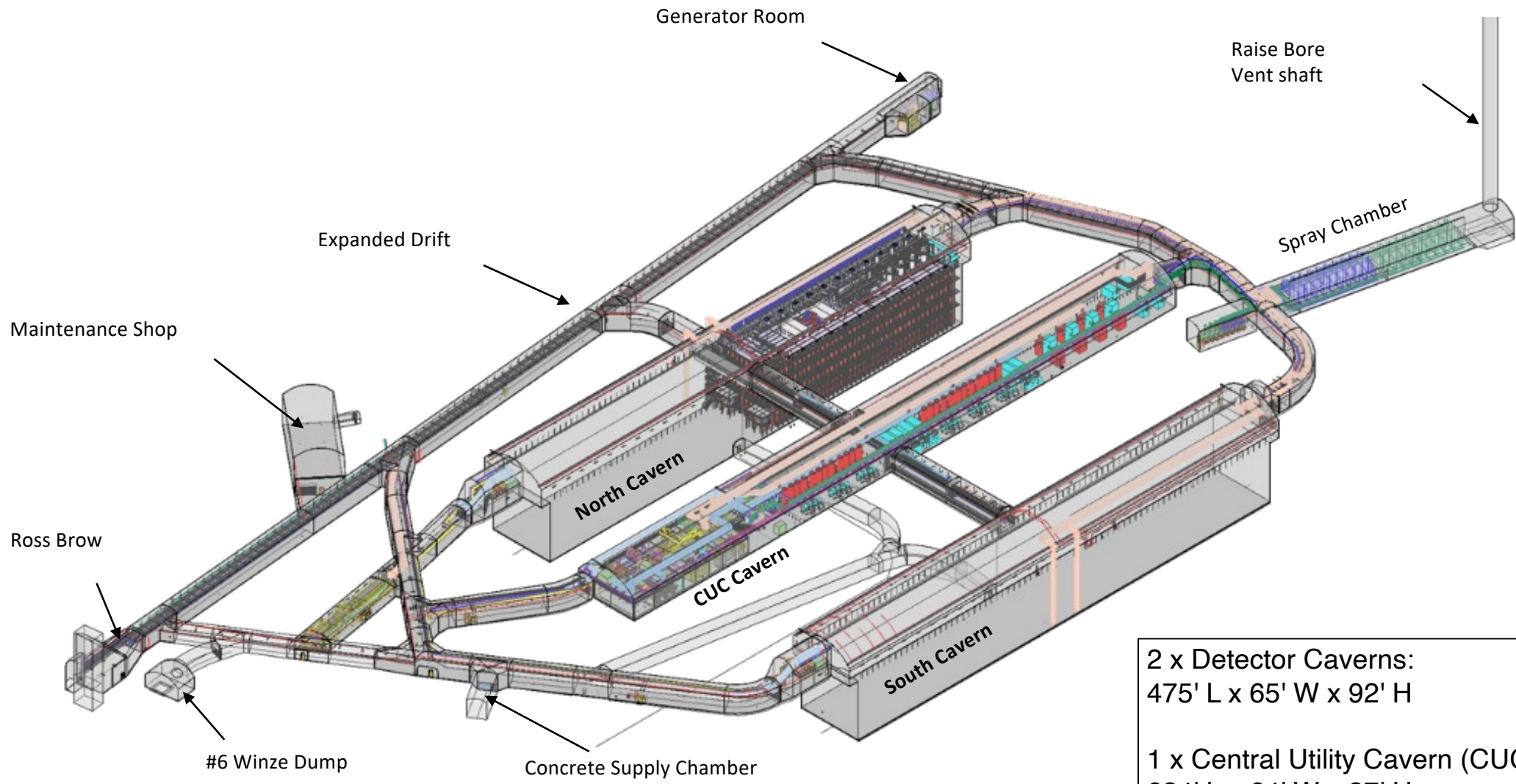
LBNF will host the Deep Underground Neutrino Experiment (DUNE)



U.S. DOE's Flagship Neutrino Study Experiment

- LBNF is the platform for DUNE and provides:
 - Facilities at Fermilab to generate the world's most intense neutrino beam and the DUNE near detector.
 - Facilities at SURF on the surface and 4,850 feet underground support the DUNE far detectors.
- DUNE collaboration includes 1,427 researchers from 218 institutions in 37 nations.

LBNF Excavation Scope



2 x Detector Caverns:
475' L x 65' W x 92' H

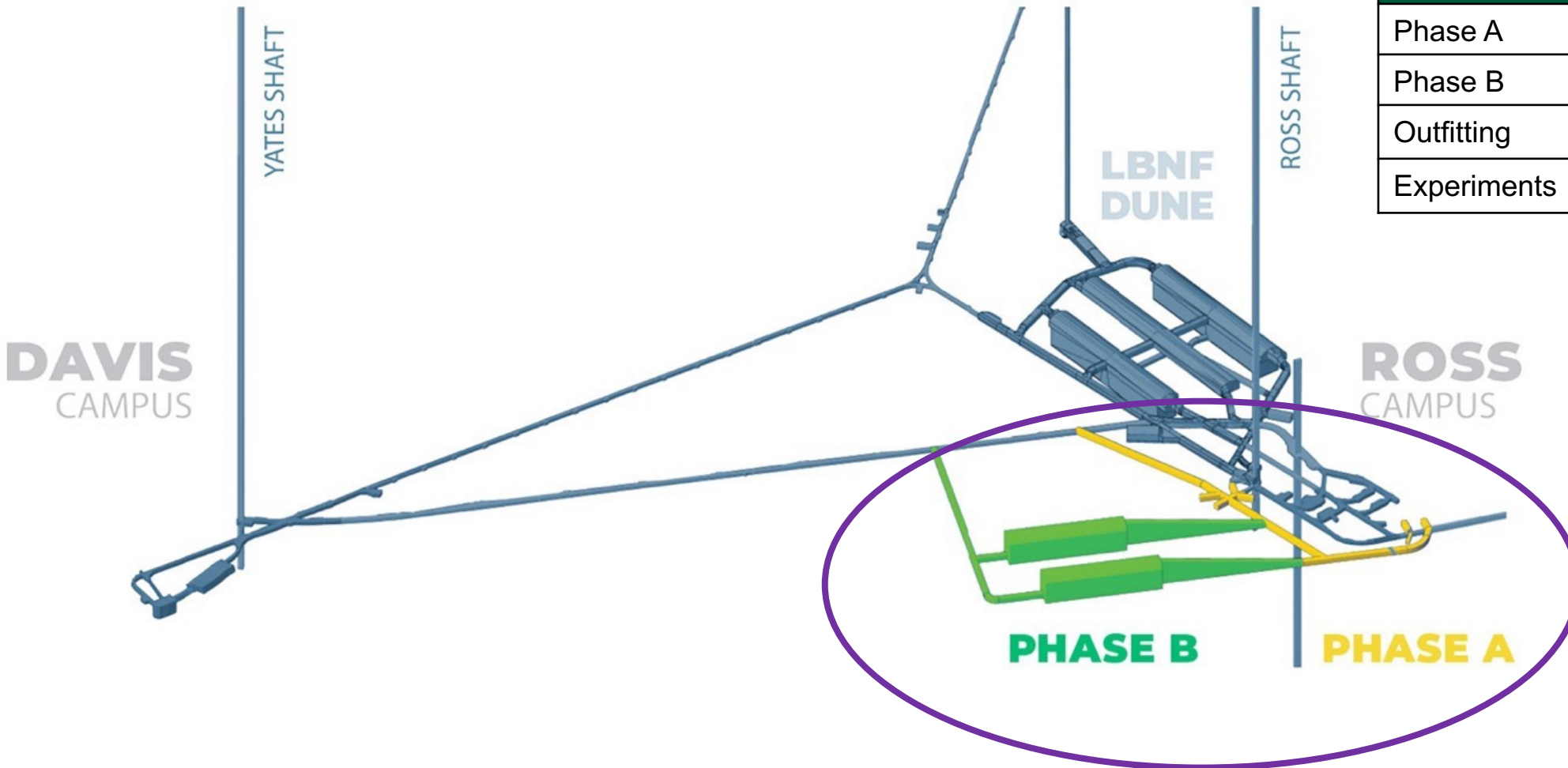
1 x Central Utility Cavern (CUC):
624' L x 64' W x 37' H

Excavation Scale





More 4850L Space Needed for Future Experiments



Proposed Funding Model	
Phase A	\$13M State of SD
Phase B	\$100M Private
Outfitting	\$60M Federal
Experiments	Up to \$500M ea. - Fed/Intl

SURF K-12 Education & Outreach

Presentations and Field Trips

- K12 presentations
- Face to face
- Virtual options
- Field trips

Curriculum Units and Resources

- 17 unique curriculum units available for checkout
- 5-15 hours of fully designed and resourced science curriculum

Career Exploration and Development

- Davis-Bahcall Scholars Program
- Summer internship opportunities
- Pre-service educator program support

Supporting Teachers

- Professional development offerings
- Curriculum resources
- Science content support
- Just-in-time support



K-12 Education and Outreach - By the Numbers

On track to work with 16,000 students in 2023-24 school year

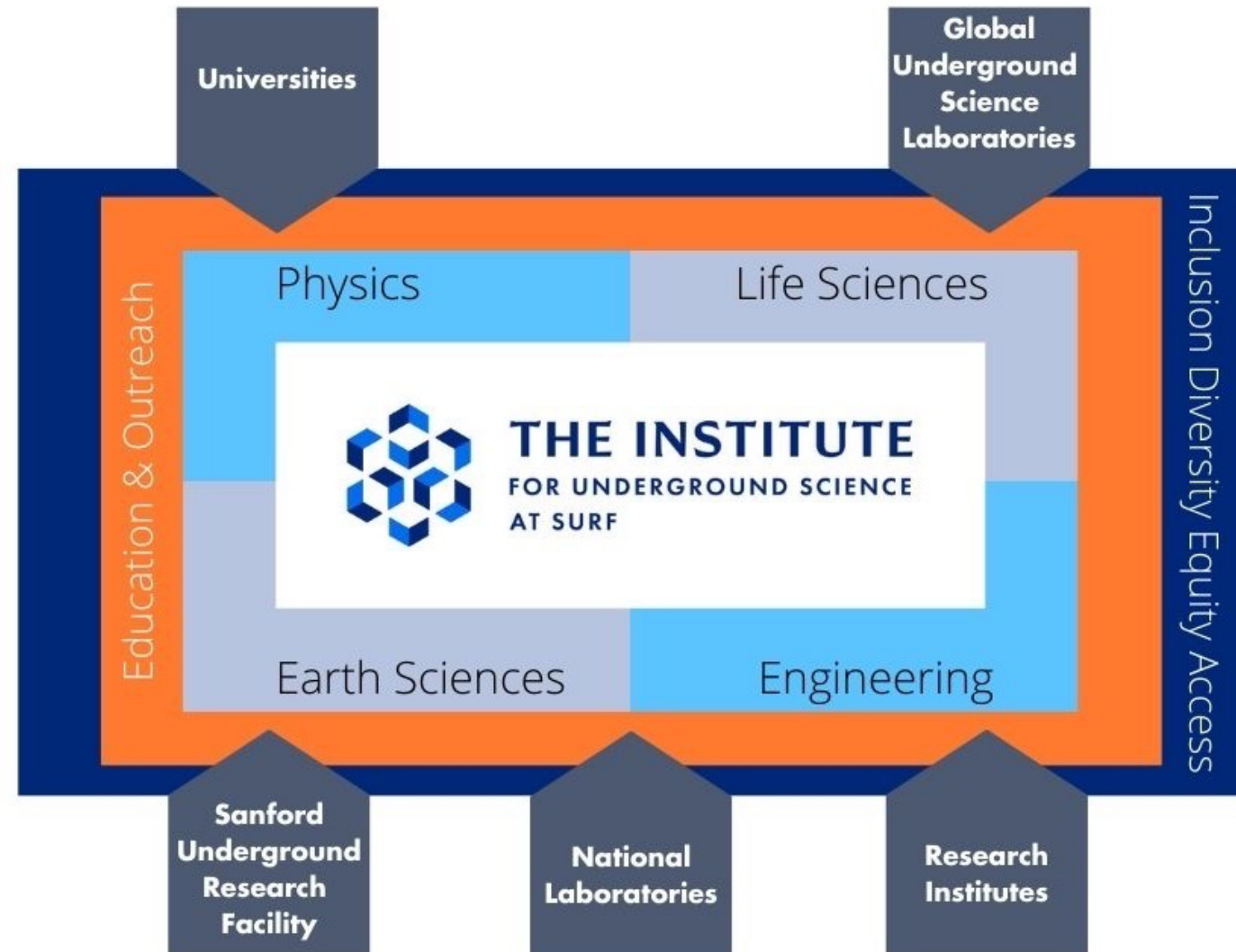
School Year	2019-2020 (COVID begins)	2020-2021 (during COVID)	2021-2022	2022-2023	2023-2024 (July – Jan)
Field Trips	254	58	485	972	530
Classroom Presentations	3,704	2,005	14,038	12,799	6,869
Curriculum Units	3,236	3,384	3,718	2,554	2,638
Other	918	298	1,468	1,596	995
Total Student Contacts	8,112	5,745	19,709	17,921	11,032

Providing high-quality professional development for 400 science teachers annually

Institute for Underground Science at SURF

Planning Institute Launch on Dec 14

- Establish the world-leading center for underground science collaboration and intellectual community.
- Provide leadership in long-term science community planning.
- Engage with the global community for vision and leadership in a range of disciplines.
- Serve as a “hub” for information on global underground science.
- Foster close collaboration and integration with the science and outreach programs.
- Establish world leadership in K-12 and public E&O programs.



Cangleska Wakan, the Ethnobotanical Garden at SURF



Economic Impacts in South Dakota

- **\$75M in South Dakota investments have resulted in \$1.1B in federal (\$1.03B) and private (\$70M) investments (15x ROI for South Dakota).**
- SURF activities directly employ **400 FTE** (SDSTA, partners, contractors).
- **U.S. Dept of Energy** has made a **30+ year commitment** to SURF ops.

SURF Provides \$2B in Economic Impact in South Dakota, 2020-2029

Impact Type	Output (Millions)	Earnings (Millions)	Average Annual Employment
Direct	\$617	\$197	258
Indirect	\$704	\$454	920
Total	\$1,321	\$651	1,178

Source: AEG analysis of base data from SDSTA and Fermilab, U.S. Bureau of Economic Analysis RIMS II Multipliers, U.S. General Services Administration.

Note: Direct and indirect figures may not sum to total figures due to rounding.

Sanford Underground Research Facility

Thank You!

