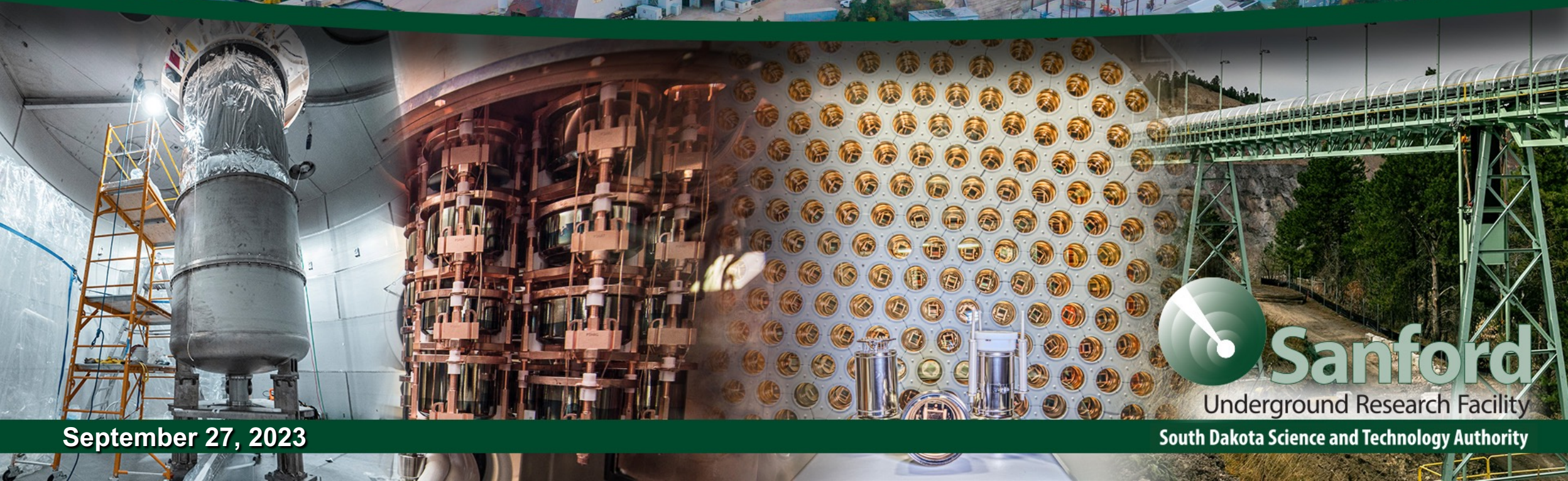
Sanford Underground Research Facility

America's Underground Science Laboratory

Mike Headley

SDSTA Executive Director

SURF Lab Director



Sanford Underground Research Facility

South Dakota Science and Technology Authority

September 27, 2023

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 195 full-time and 15 part-time staff members.
- We own, operate and maintain the SURF facility in support of world-leading science experiments. Currently, 31 science groups and 2137 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) between U.S Dept of Energy (DOE) and SDSTA.

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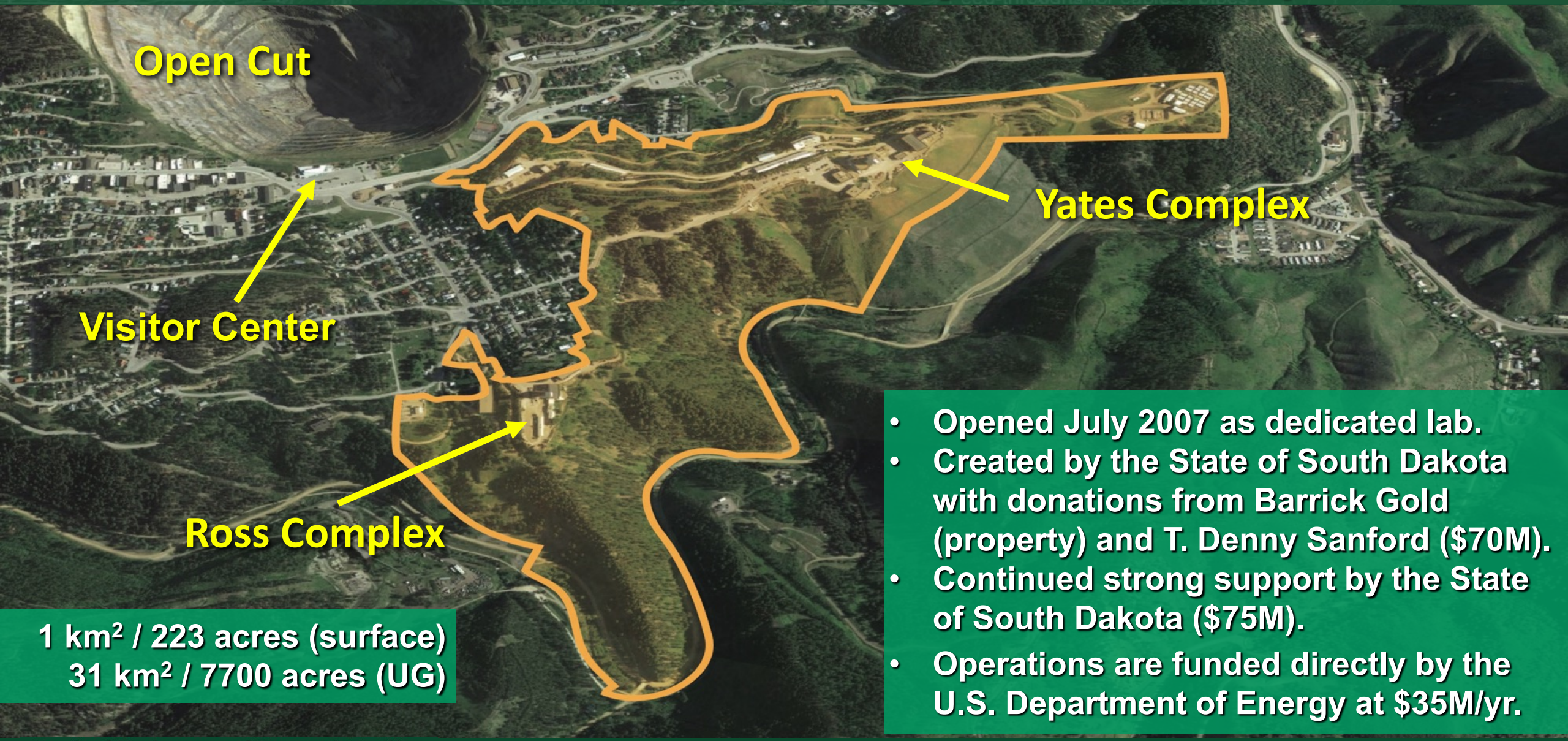
Nation's deepest UG lab, advancing world-leading, multi-disciplinary research



- 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 ($75M).
- Operations are funded directly by the U.S. Department of Energy at $35M/yr.

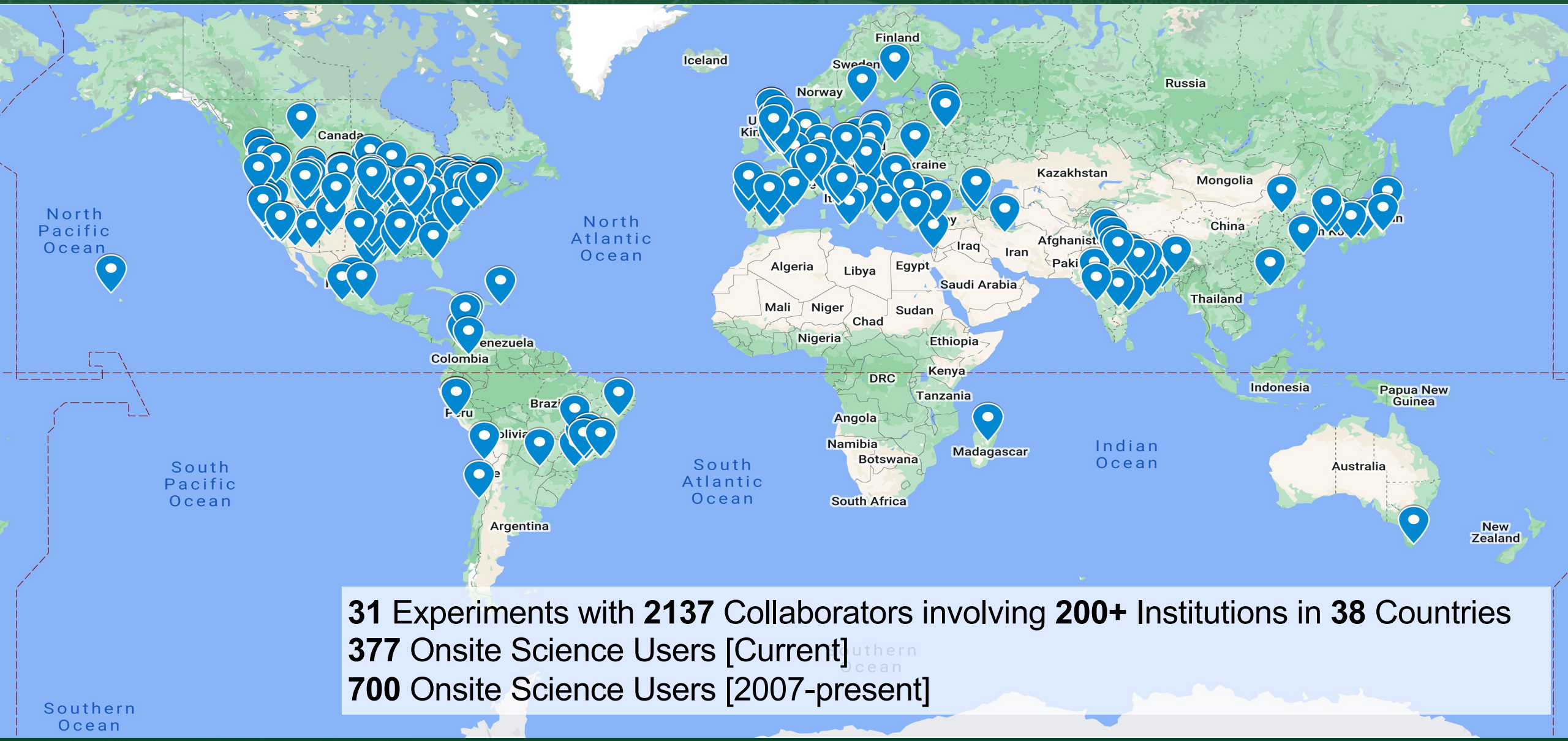
1 km² / 223 acres (surface)
31 km² / 7700 acres (UG)

4850L Science Facilities


Dark Matter
LUX-ZEPLIN
Neutrinos
MAJORANA DEMONSTRATOR
LBNF /DUNE
Science Program
Biology
Extreme Life
Astrobiology
Geology
Geothermal Energy
Seismic Studies

SURF Science Program

Hosting world-leading experiments and researchers from diverse scientific communities



31 Experiments with **2137** Collaborators involving **200+** Institutions in **38** Countries
377 Onsite Science Users [Current]
700 Onsite Science Users [2007-present]

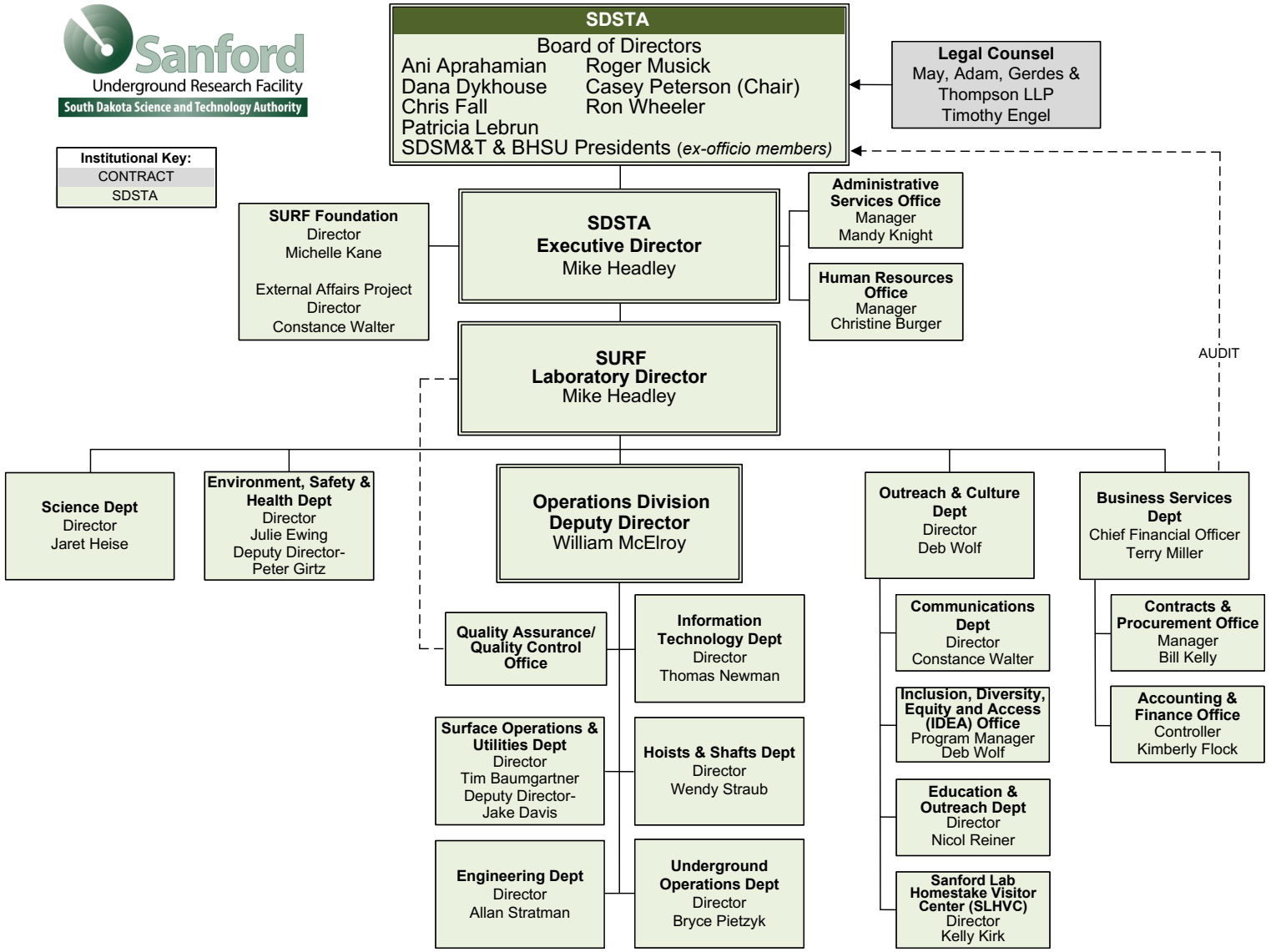
SURF Ops Cooperative Agreement Scope

- SDSTA operates SURF in support of the science mission. Provides all staff, facilities, equipment, supplies and services. Manages the overall effort.
- CA includes “Basic Support” to approved non-proprietary users without charge. Services above basic support are paid by the user.
  - Provision of usable underground space including utilities;
  - Volume of underground space should be appropriate to scientific need;
  - Safe underground access for experiment installation, operation & D&D;
  - Maintenance of SURF infrastructure: shafts, ventilation, dewatering, etc.
  - Communications and networking services;
  - Scientific and engineering liaison to help users work safely at SURF;
  - Provision of usable surface space to prepare experiments.
- Includes Infrastructure Improvement Projects (IIP) program funded yearly based on annual appropriation level.

LBNF/DUNE Logistics Support Services Contract

- Scope includes the movement of people and equipment from the surface to various underground levels to support LBNF/DUNE underground activities. Rigging of materials for transport below the cage is included.
- 85% of 31 FTE of Ross Shaft and Ross Hoist operator time and 20% Hoists/Shafts Director
- Remaining 15% on SURF Operations CA for shaft maintenance including weekly shaft inspections and any resulting maintenance.

SDSTA Organization Structure

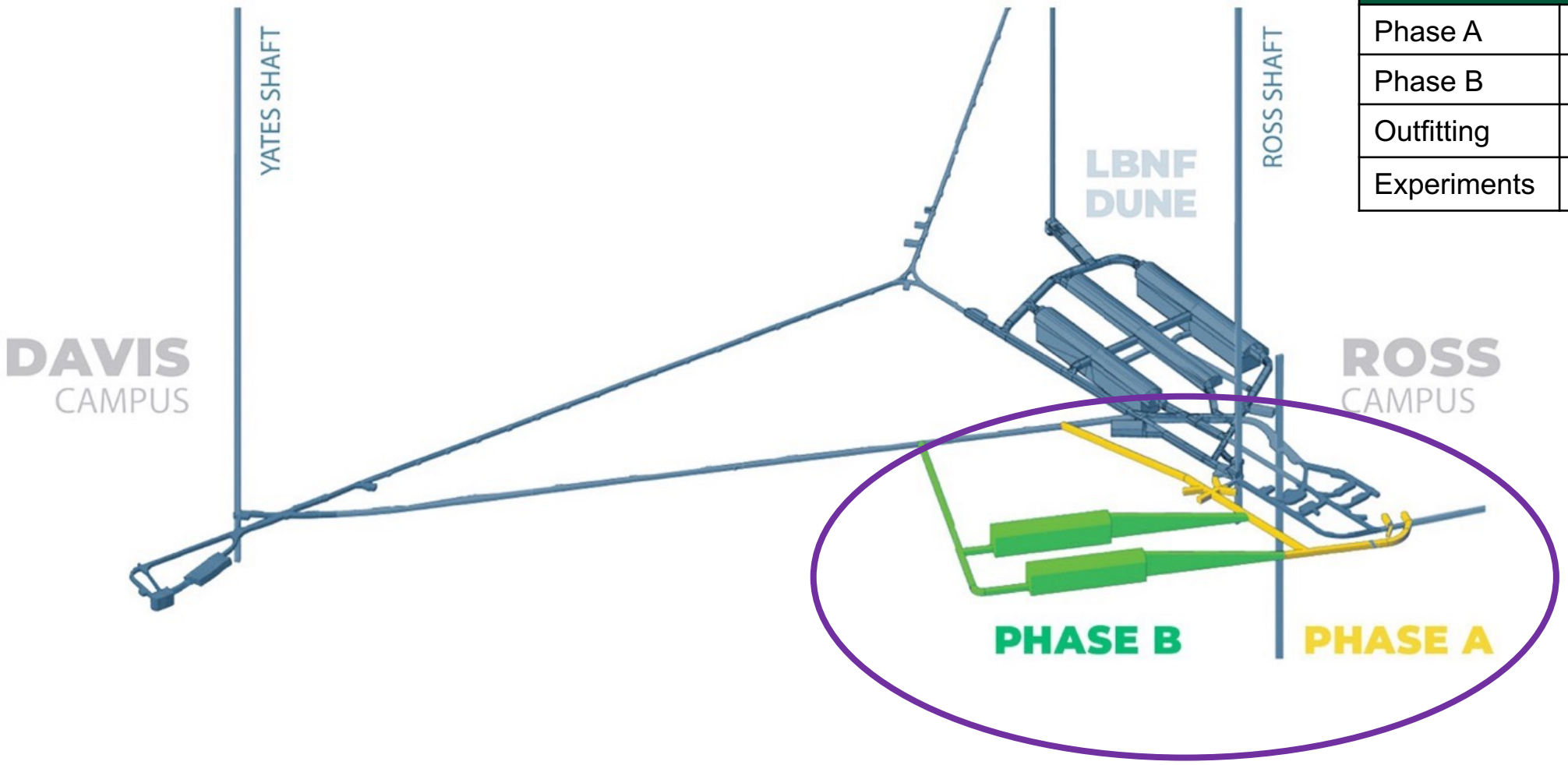


15 Year Horizon Goals

- The Long-Baseline Neutrino Facility (LBNF) and Deep Underground Neutrino Experiment (DUNE) have been constructed and are fully operational.
- Yates Shaft and Hoists have been fully reconstructed and modernized.
- Two additional large lab modules on the 4850L have been constructed and are fully operational.
- The Institute for Underground Science at SURF has been constructed and is fully operational with compelling, vibrant science and education programs.
- Foster commercial partnerships to advance technology development in the region, increase facility operations efficiency and safety, and expand workforce development opportunities.

4850L Space Needed for Future Experiments

LBNF/DUNE is SDSTA's top priority. Addressing FRA/DOE questions on LBNF/DUNE impacts.



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

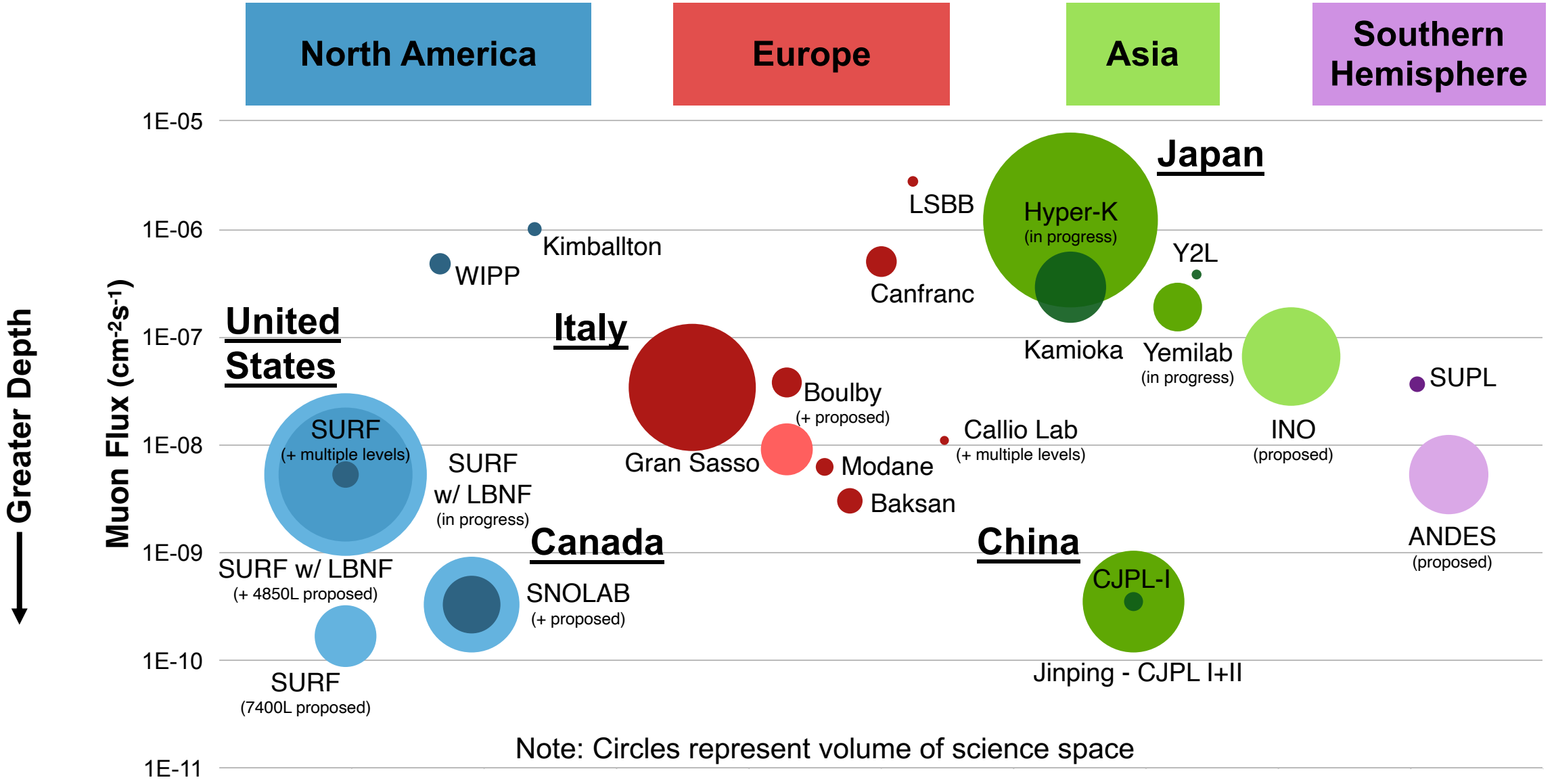
Presentations & Field Trips	Curriculum Units and Resources	Career Exploration and Development	Supporting Teachers
• K12 presentations • Face to face • Virtual options • Field trips in spring and fall	• 5-15 hours of fully designed and resourced science curriculum • 17 unique curriculum units available for checkout	• Davis-Bahcall Scholars Program • Summer internship opportunities • Pre-service educator program support	• Professional development offerings • Curriculum resources • Science content support • Just-in-time support

K-12 Education and Outreach: By the Numbers

School Year	2018-2019 (pre-COVID)	2019 – 2020 (COVID begins)	2020-2021 (during COVID)	2021-2022	2022-2023
Field Trips	1,117	254	58	485	954
Classroom Presentations	6,704	3,704	2,005	14,038	12,799
Curriculum Units	3,598	3,236	3,384	3,718	2,554
Other	1,055	918	298	1,468	1,596
Total Student Contacts	12,474	8,112	5,745	**19,709**	**17,903**

In the last 2 years, provided high-quality professional development for 1000+ teachers

Worldwide Underground Facilities



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Thank You!