You Can’t Manage What You Don’t Know: SNOLAB’s Approach to Asset Management

On ne peut pas gérer ce qu’on ne connaît pas : l’approche de SNOLAB en matière de gestion des actifs

Jodi Cooley
SNOLAB
Executive Director
-
Directrice générale

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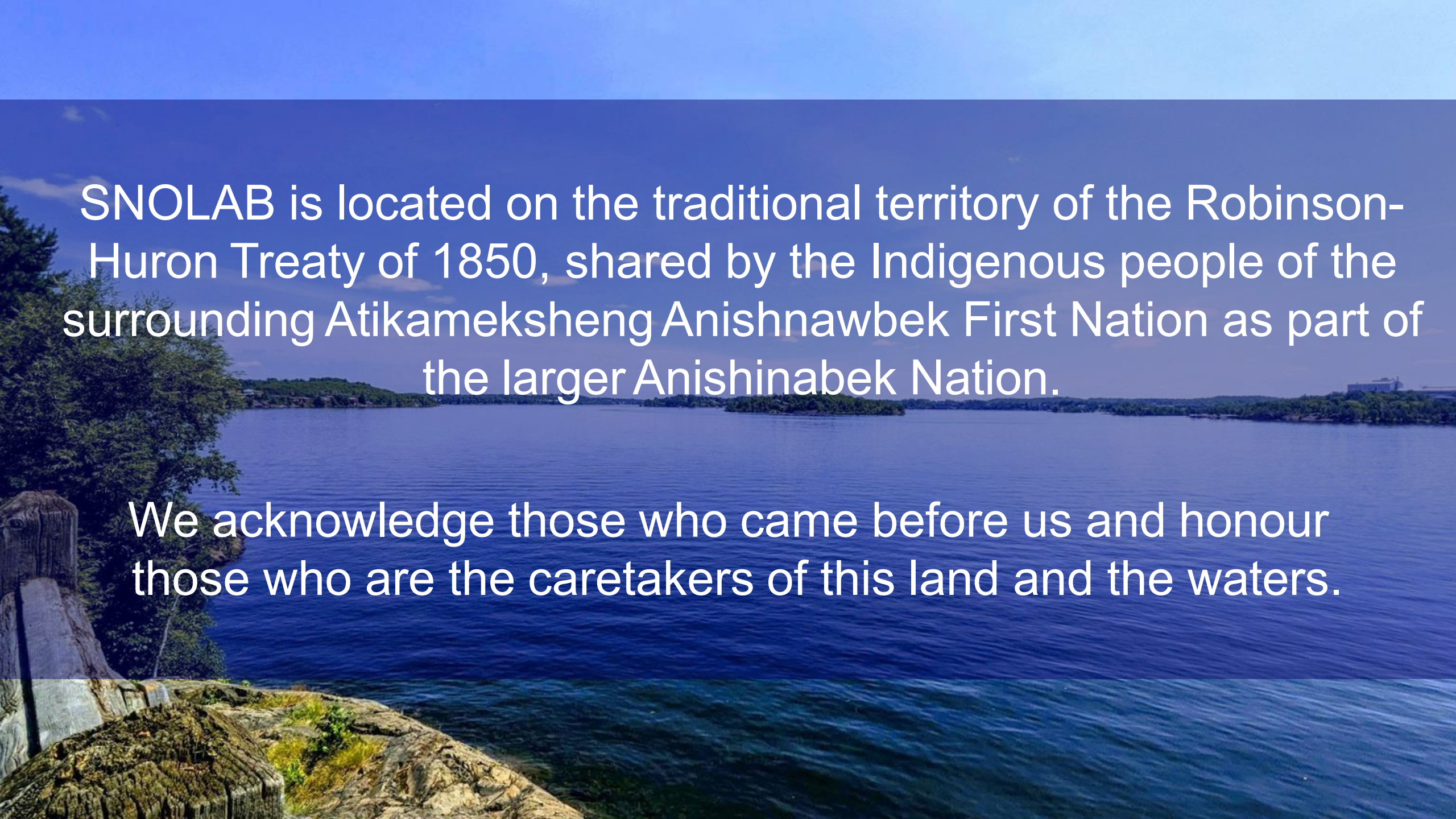
Jodi Cooley

Executive Director | SNOLAB

Professor of Physics | Queen’s University

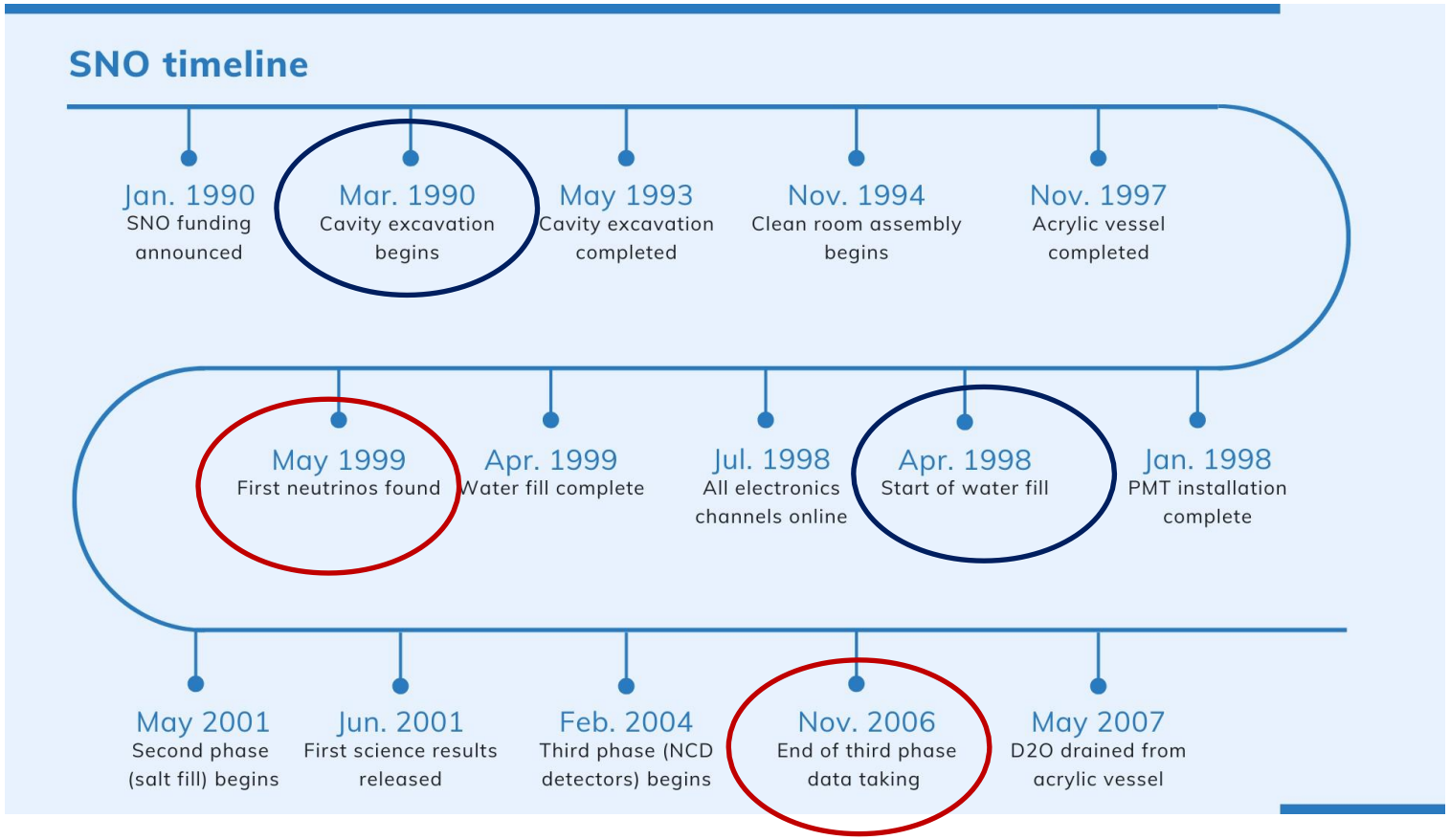


SNOLAB is located on the traditional territory of the Robinson-Huron Treaty of 1850, shared by the Indigenous people of the surrounding Atikameksheng Anishnawbek First Nation as part of the larger Anishinabek Nation.

We acknowledge those who came before us and honour those who are the caretakers of this land and the waters.

SNOLAB Origin Story: The SNO Era (1984 – 2006)

- The **SNO collaboration** was formed in 1984 to study solar neutrinos using heavy water.
- The **experiment took 8 years to build.**
- **SNO operated from 1999 to 2006**.
- **Scientific Accomplishment**: Proved that neutrinos have mass and change flavors, which solved the long-standing "solar neutrino problem".



SNO: Nobel Recognition (2015)

Dr. Arthur B. McDonald, the SNO director, was co-awarded the Nobel Prize in Physics in 2015 for this discovery.

Expansion to SNOLAB (2002-2012)

- Due to the success of SNO, **funding was approved in 2002 to expand the facility** into a general-purpose, deep-underground laboratory.
- **Construction was completed in 2009,** and the facility entered operation as a "clean" space in March 2011.
- **Grand Opening (2012):** The expanded SNOLAB facility was completed, adding 3,700 m² of cleanroom space. It officially opened as a multi-program facility in 2012.
- Note: Staff in 2009 was approximately a dozen. Today we have 153 staff members.

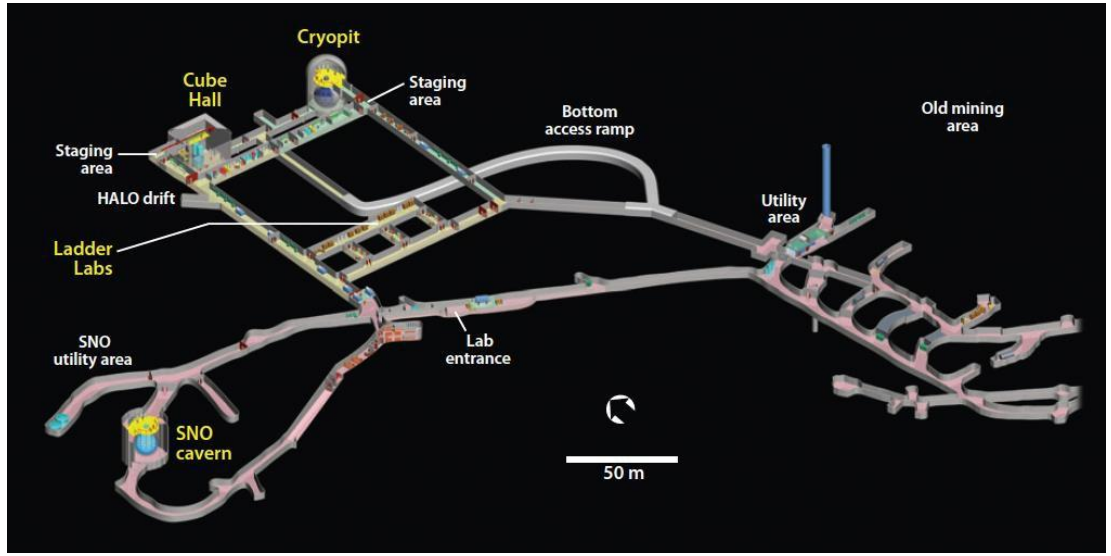
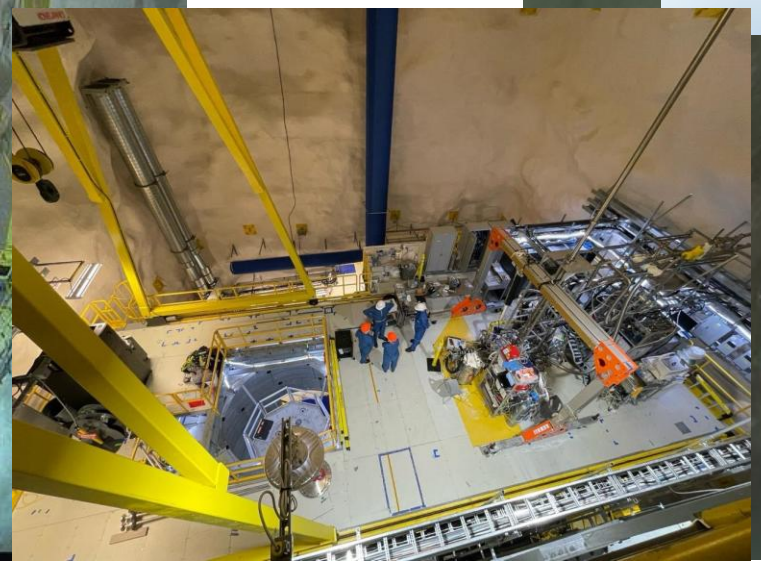


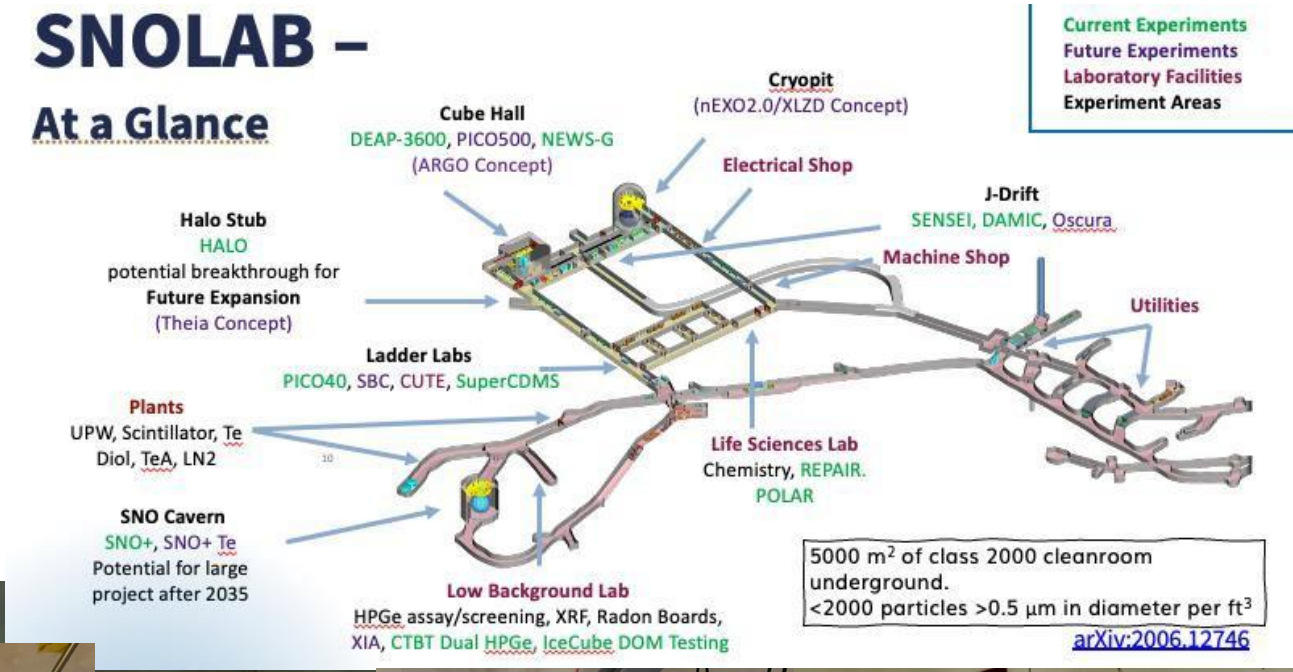
Table 1 Clean room laboratory spaces[a]

Area	Dimensions
SNO cavern	24 m (diameter) × 30 m (h)
Ladder Labs	32 m (l) × 6 m (w) × 5.5 m (h)
	23 m (l) × 7.5 m (w) × 7.6 m (h)
Cube Hall	18.3 m (l) × 15 m (w) × 19.7 m (h)
Cryopit	15 m (diameter) × 19.7 m (h)
Total	

~~Asset~~ Management: The First Decade

- Experiments at SNOLAB are large and complex to build.
  - *It took a decade to fill the lab.*
- Staff in 2009 was approximately a dozen.
  - *Today we have 153 staff members*
- If it breaks – buy a replacement and a spare





15 Year Plan: Why Now?

New decision-making framework was introduced in the 2024 Canadian federal budget to support Canadian Major Research Facilities.

– *Six research facilities introduced including SNOLAB*

Central Pillar Lifecycle funding for designated facilities

– *Requires CFI to assess long-term capital and operational needs of each MRF*

SNOLAB was asked to provide detailed and reliable budget estimates for the next 15 years under three budget scenarios. (***Also an asset management plan.)***

1. *Maintaining current levels of operation*
2. *Fully supporting the needs of the Canadian research community*
3. *Increasing global competitiveness.*

CFI Asset Management Request

An inventory of major capital assets, including:

- Scientific equipment
- Non-scientific equipment (e.g., fixed overhead cranes and lifting equipment, HVAC, standard power, control and communication systems)
- Buildings (if applicable)

For each asset include:

- Asset category and description
- Age of asset & Year of acquisition
- Estimated remaining useful life
- Asset condition (excellent / good / fair / poor)
- Description of repair and/or replacement requirements
- Estimated cost of repair and/or replacement considering inflation (in $)
- Estimated year of repair and/or replacement
- Risk-Based Priority ranking (1-high, 2-moderate, 3 - low)
- Rationale for the ranking.

Lifecycle Asset Modelling Capacity

SNOLAB has limited internal capacity for lifecycle modelling of capital assets (service life, repair/replacement timing, and cost forecasting).

- An external consultant (Roth) was engaged to provide this expertise.
- Roth uses specialized software to estimate asset lifespan, repair/replacement timing, and lifecycle costs.
- SNOLAB provided the initial inventory of assets for assessment.

Building an Asset List

Challenge:

Equipment and facility ownership at SNOLAB is complex.

- Most experiments are owned by multiple universities and/or international funding agencies.
- Some assets originally owned by universities have been transferred to SNOLAB.

Our Approach:

1. Extracted a list of assets from our Computerized Maintenance Management System (CMMS) work orders.
2. Validated and completed list by collaborating with managers and supervisors to identify missing items.

CUTE Test Facility is an example of a facility transferred to SNOLAB ownership.

So, We Have an Asset List – Now What?

Next Steps:

- **Asset ownership and categorization:** Project manager identified owners and grouped assets into:
  - Scientific equipment
  - Non-scientific equipment
  - Base Building
- **On-site review:** Roth toured SNOLAB with the project manager to view equipment.
- **Cost and lifespan estimation:**
  - Roth's software estimated repair/replacement costs and replacement years for non-scientific equipment.
  - SNOLAB internally evaluated scientific equipment for similar metrics.

From Asset Table to Asset Strategy

- **Table population:** Entered asset data into CFI-prescribed format.
- **Data validation:** Scrubbed entries to ensure software estimates aligned with SNOLAB realities.
  - *Example:* Underground infrastructure often has shorter lifespans than software predicts.
- **Prioritization:** Manually identified the top 25 assets for attention in the upcoming fiscal year.
  - Considered asset history (e.g., systems receiving maintenance earlier than necessary).
  - Evaluated criticality: Does the system support essential infrastructure or health and safety?

Example: UPS Systems

A	B	C	D	E	F	G	H
Asset Category	Asset Name	High Priority Items for FY27	Asset Description	Acquisition year	Age of asset (years)	Estimated Remaining Useful Life (years)	Asset condition (excellent/good/fair/poor)
Base Building	Cryopit UPS System	NO	and controls. The UPS is located in the Cryopit and is fed from PP-27.	2008	17	3	3 - Fair
Base Building	Chillers UPS System	NO	The UPS system consists of an inverter, rectifier, batteries, and controls. The UPS is located in the Chiller Area, Room No. 146.	2008	17	3	3 - Fair
Base Building	Cube Hall UPS System	YES	The UPS system consists of an inverter, rectifier, batteries, and controls. The UPS is located in the Cube Hall Control room and fed from PP-23	2008	17	3	3 - Fair
Base Building	Ladder Labs UPS System	NO	The UPS system consists of an inverter, rectifier, batteries, and controls. The UPS is located in the ladder labs and is fed from PP-13.	2008	17	3	3 - Fair
Base Building	Refuge UPS Systems	NO	The UPS system consists of an inverter, rectifier, batteries, and controls. The UPS is located in the Refuge Room and is fed from PP-13	2008	17	3	3 - Fair
Base Building	SNO+ UPW Deck Pumps	NO	The sanitary waste drainage includes an ejector pump system complete with pump, copper /steel discharge piping and controls. The system is located in SNO Junction.	2008	17	3	3 - Fair

- Cube Hall UPS system flagged for early replacement because it supports critical life support systems.

Example: HVAC Units

A	B	C	D	E	F	G	H
Asset Category	Asset Name	Mike's Top Items for FY27	Asset Description	Acquisition year	Age of asset (years)	Estimated Remaining Useful Life (years)	Asset condition (excellent/good/fair/poor)
Base Building	Packaged Rooftop Units - AC-4	NO	The building HVAC includes a natural gas-fired packaged rooftop unit identified as AC-4. The rooftop unit is manufactured by Carrier with a cooling capacity of 14 tons. The unit is charged with refrigerant R-22.	2005	20	4	3 - Fair
Base Building	Packaged Rooftop Units - AC-3	YES	The building HVAC includes a natural gas-fired packaged rooftop unit identified as AC-3. The rooftop unit is manufactured by Carrier with a cooling capacity of 8 tons. The unit is charged with refrigerant R-22.	2005	20	4	3 - Fair
Base Building	Packaged Rooftop Units - AC-2	NO	The building HVAC includes a natural gas-fired packaged rooftop unit identified as AC-2. The rooftop unit is manufactured by Carrier with a cooling capacity of 16 tons. The unit is charged with refrigerant R-22.	2005	20	4	3 - Fair

- AC-3 is flagged for early replacement because it supports critical systems in the surface facility.

From Asset Strategy to Asset Plan

- **Current status:** SNOLAB has a strategy but not a fully implemented plan.
- **Next steps:**
  - Populate CMMS with asset table data.
  - Enable CMMS to generate alerts for scheduled maintenance or replacement.
  - As SNOLAB acquires new assets, enter them into CMMS.

Conclusion: Evolving to a Data Driven Asset Strategy

- **Starting small** – SNOLAB started small with a limited team managing complex experiments.
- **Rapid growth:** Facility expansion (2002–2012) and staff growth (153 today) increased the complexity of managing equipment and infrastructure.
- **Early approach:** Asset management was reactive—“if it breaks, buy a replacement (and a spare).”
- **Transition to strategy:** Built a comprehensive asset inventory, validated data, and prioritized top assets for maintenance and replacement.
- **Next steps:** Implement a CMMS-driven plan to monitor and maintain critical equipment proactively.
- ***SNOLAB now has a structured, data-driven approach to managing its assets, supporting both scientific excellence and operational resilience.***

Thank you!
Questions?

SNOLAB COMMUNITY CONSULTATION

CANADIAN ASSOCIATION OF PHYSICS: JUNE 2025

15 YEAR PLANNING

& REVIEW UNDERGROUND COMMUNITY NEEDS

TO SUPPORT CANADIAN MAJOR RESEARCH FACILITIES

SCIENCE STRATEGY INCLUDES:

- INCREASE UNDERSTANDING OF PARTICLES & FORCES THAT HAVE SHAPED OUR UNIVERSE
- COLLABORATION: DEEP UNDERGROUND
- PURSUE EMERGING AREAS OF UNDERGROUND SCIENCE
- AN INTELLECTUAL HUB

OPTIONS:

Maintain current levels of operation

- CURRENT LAB @ 100%
- NEW MODEST BUILDING OFFSITE

NEW LIVELY CAMPUS

Fully support Canada's research needs

- EXPANDED UNDERGROUND LADDER LABS
- LARGER OFFSITE eg. TRAINING SPACE

Increase global competitiveness

- EXPAND: NEW LADDER LABS & LARGE CAVERN eg. beyond tonne-scale 0νββ beta decay, beyond 3rd gen dark matter experiment

LARGER Daycare, HOSTEL & more

THEMES:

- MRFs + MORE CAPITAL → EXPERIMENTAL INFRASTRUCTURE & FACILITIES
- ADVANCED INSTRUMENTS & DETECTION CAPABILITY
- SCIENCE & TECHN. EXPANSION
- PEOPLE & EXPERTISE

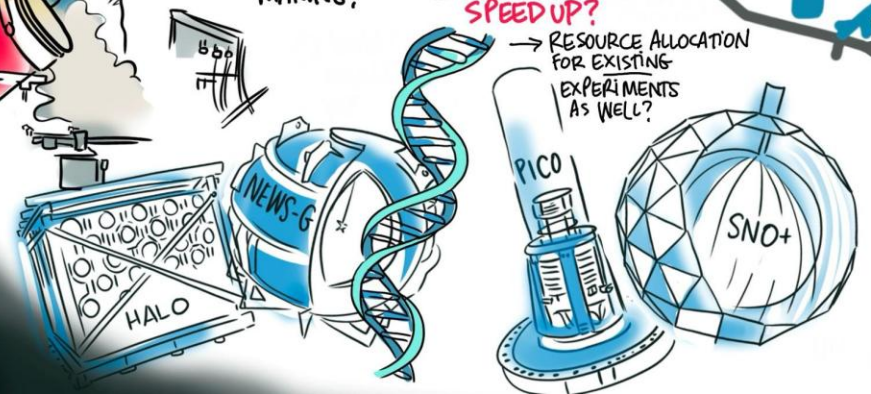
IDEAS FOR FUTURE EXPERIMENTS

- DARK MATTER
- NEUTRINOS
- QUANTUM SCIENCE
- LIFE SCIENCES
- ENVIRONMENTAL MONITORING

Q. HOW CAN SNOLAB TURN TO LARGER, NATIONAL STRATEGIES TO INFORM ITS DECISION-MAKING?

Q WHAT MIGHT SNOLAB SPEED UP?

→ RESOURCE ALLOCATION FOR EXISTING EXPERIMENTS AS WELL?



Q STAFFING CAPACITY WILL BE KEY TO ANY OF THE SCENARIOS

eg. ELIGIBILITY expanded to PAY people directly for research, new partnerships, etc.

UNDERGROUND IN SUDBURY, WITH 1200+ USERS

LIVE GRAPHIC RECORDING: DRAWING CHANGE