

SUPL

A new underground laboratory for science

Geoffrey Taylor, University of Melbourne, 2022 AIP Congress, Adelaide, 15 December, 2022

Stawell Gold Mine - A Brief History

Mining in the area since 1800's

Crocodile Gold obtained the mine in 2012.^[3]

- Plans to transition to an [open cut](#) style of mine - to invert Stawell's big hill, a local landmark^[4]
- Local and environmental groups prevented the move.

North Grampians Shire Council and townspeople in search of alternative uses of the Stawell mine:

- Katie Mack (UM astro.) radio talk on underground dark matter detection
- 2014 - Jeremy Mould (Swinburne) and Elisabetta Barberio (Melbourne) proposed SUPL.
- Hug support from NGSC

2015 SGM absorbed by Newmarket Gold Inc.^[5]

2016 new ownership of Kirkland Lake Gold:

- Ceased underground mining
- Lay off 150 staff - mine put in limbo^[6]

2017 Arete Capital Partners controlling share

2019 Mine fully operational:

- First gold pour since the closure occurring that February.^{[7][8]}
- Arete supportive of SUPL (Chair, Campbell Olsen in particular) - very important.

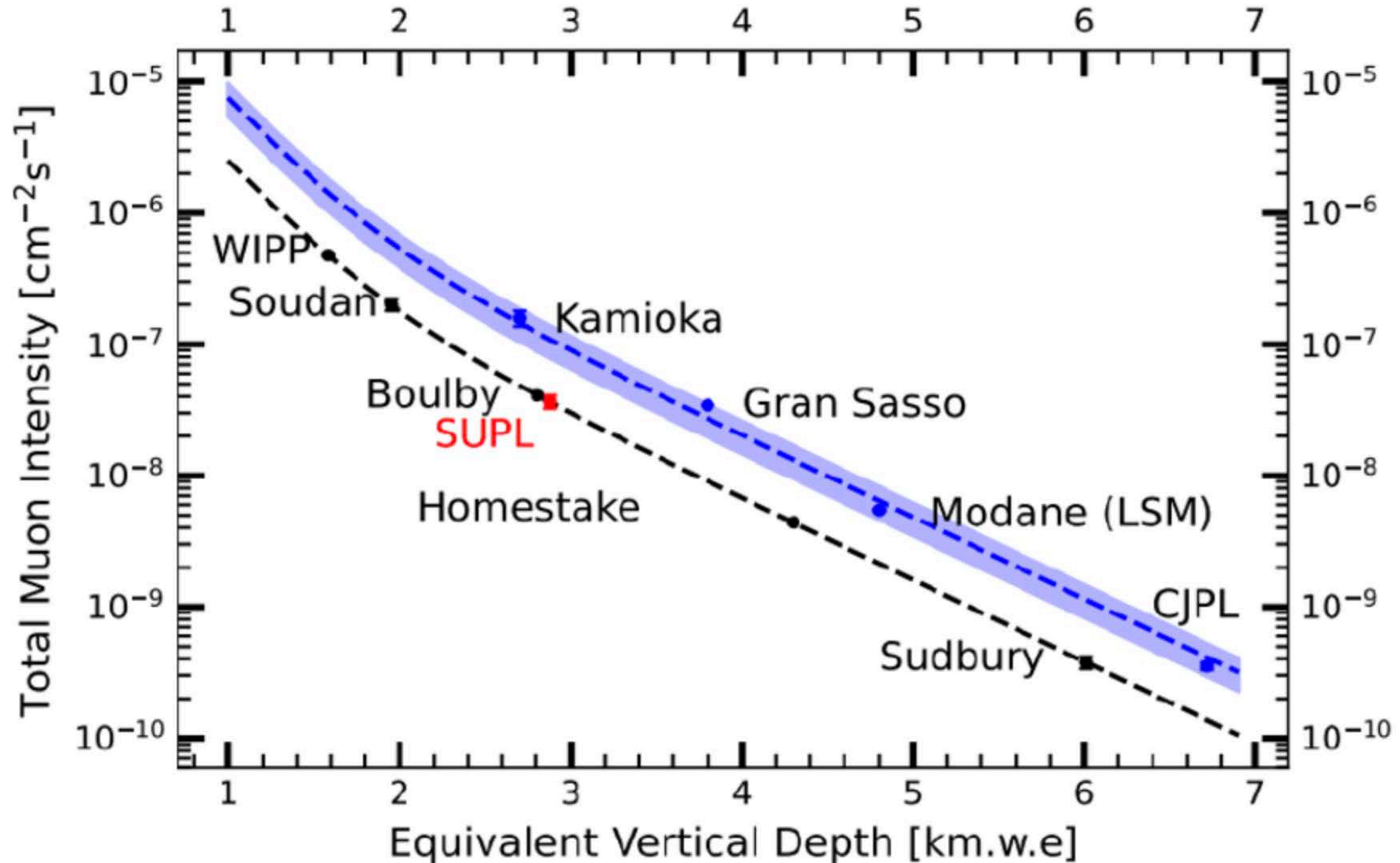
2019 construction commenced on the [Stawell Underground Physics Laboratory](#)

SUPL "opened" in August 2022.^[9]

Very Low Background Radiation Environment

- Direct Dark Matter Detection (SABRE see talk by I. Bolognino)
- Other low background Particle Physics Detector Development
- Low background nuclear spectroscopy laboratory
 - HPGe spectrometer(s) proposed by ANSTO
- Quantum device measurement (reduction of cosmic ray upsets)
 - Proposal for multi-user Dilution Refrigerator installation underway from UQ, Swinburne and UWA
 - (Similar trajectories at SNOlab (Canada); Fermilab (USA); Europe (various))
- Possible low-radiation studies in biological systems
- Geology and seismic studies.

Underground to avoid cosmic ray radiation





Stawell - Where is it?

(Or about 500km south-east
of here in Adelaide)



- 230km west of Melbourne
- 3 hour drive



Biggest change since 1945 : the vehicles

Main street, Stawell, ca.1945 (State Library Victoria) , via SBS



Mining has improved over the years!

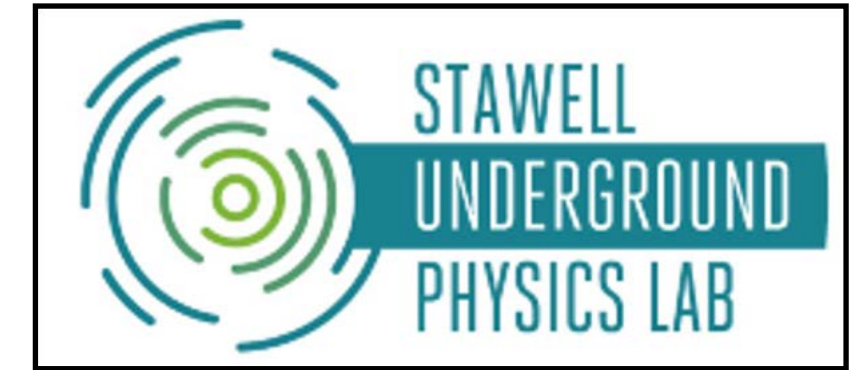
The Mines, Stawell 1912. Library of Victoria, via SBS

Stawell Gold Mine

Decline mine - series of spiralling roads to ~1600m depth



SUPL Ltd

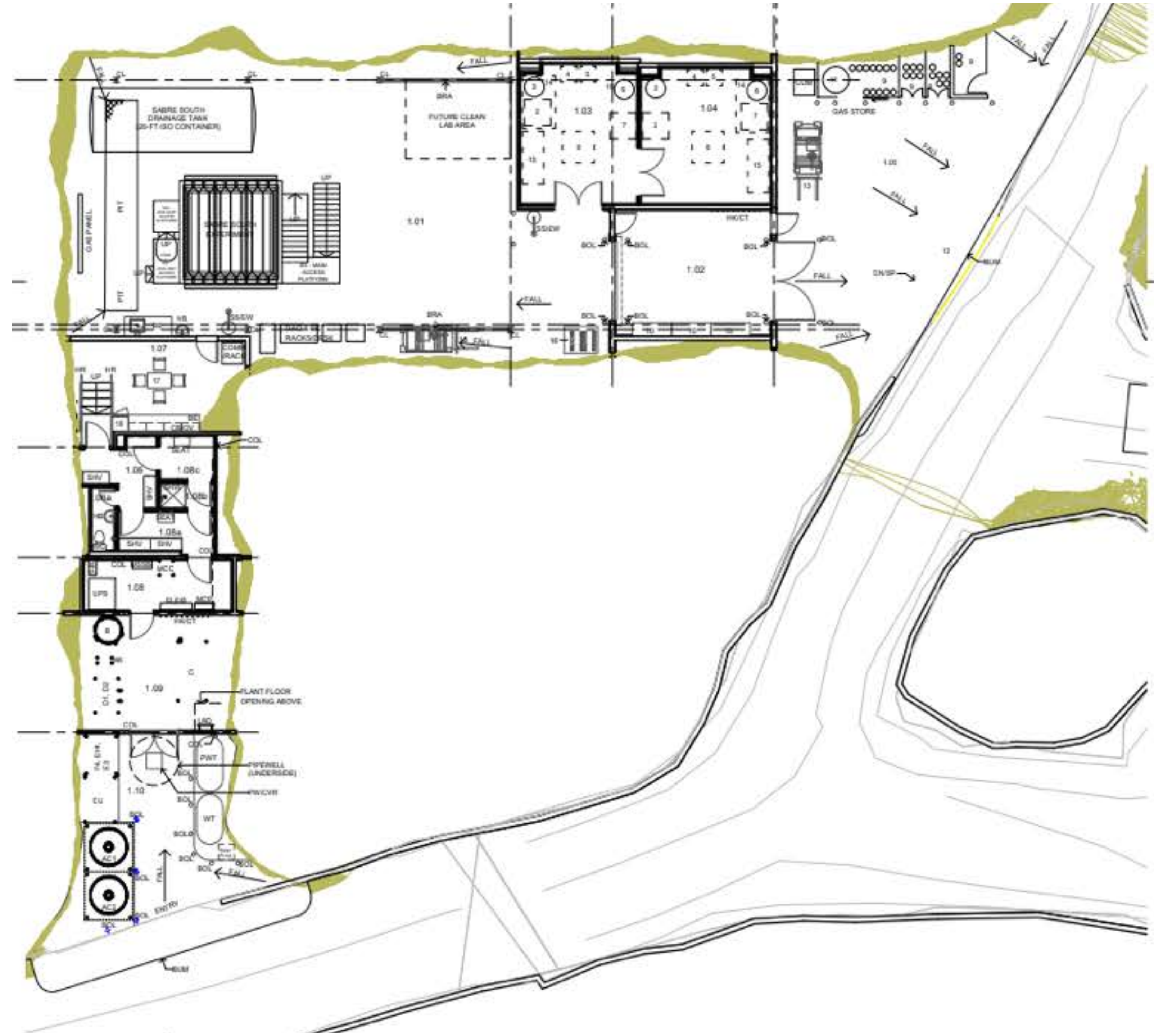


- Formalised in 2023
 - Initial Partners:
 - The University of Melbourne
 - ANU
 - Swinburne University
 - University of Adelaide
 - ANSTO
 - Chair: Dr Sue Barrell
- Acting on requirement for Sustainability of Operations
 - Although origins with DM/SABRE —> science diversification critical
 - Seeking other partners
- State and Federal funding requirements specify breadth of activities to be sought
- Access agreement between SUPL Ltd and SGM Ltd just signed.

Excavation for SUPL

Cut out of existing decline at depth of 1024m

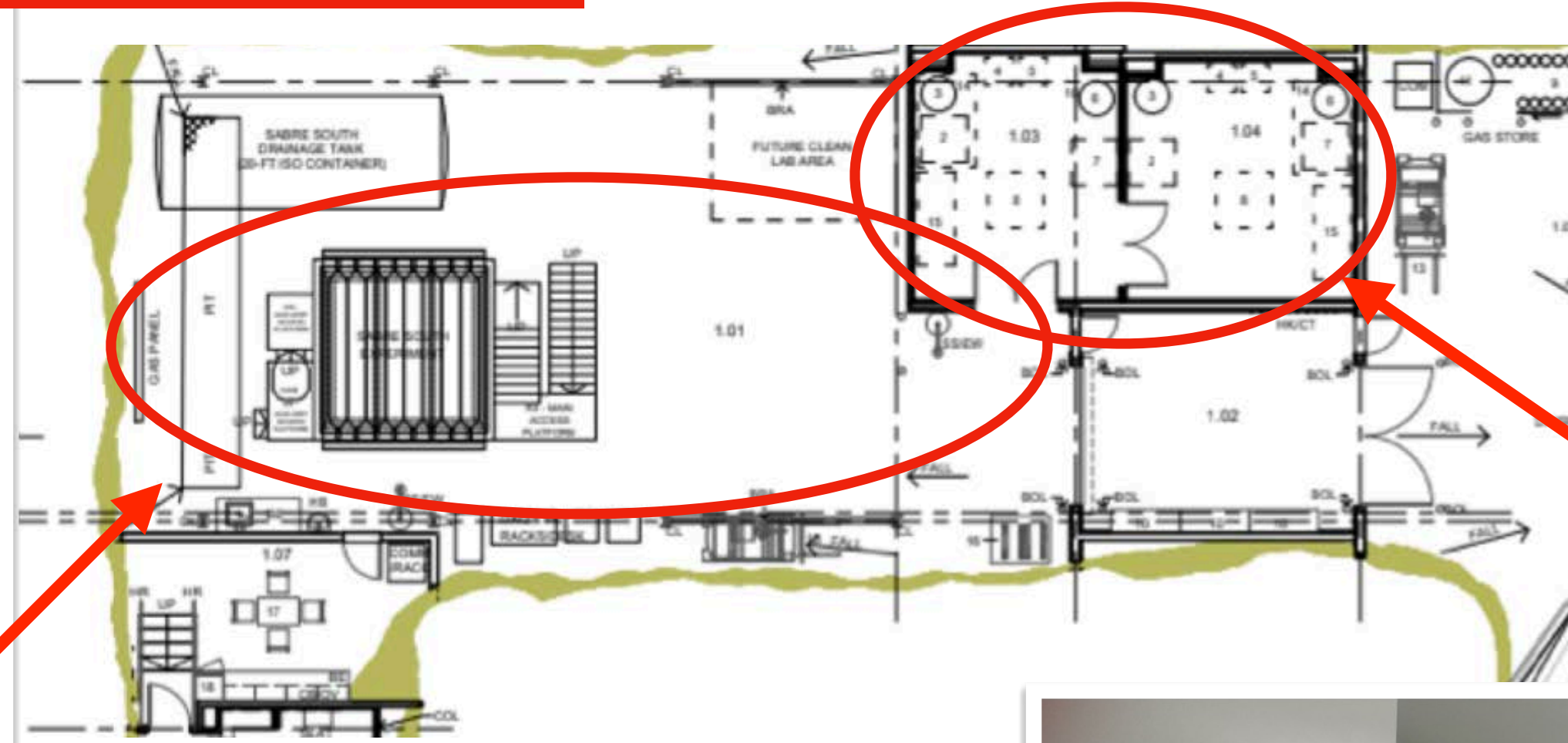
(Mine operations now at ~200-400m depth only)





SUPL Main Laboratory

6mm TekFlex coating of walls and ceiling to reduce Radon emanation into the laboratory



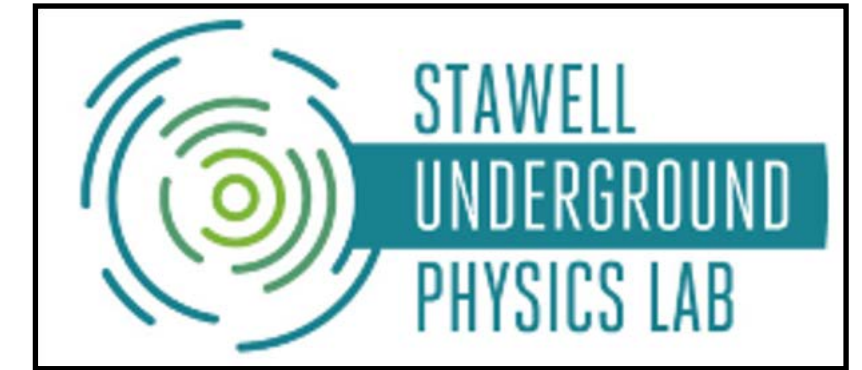
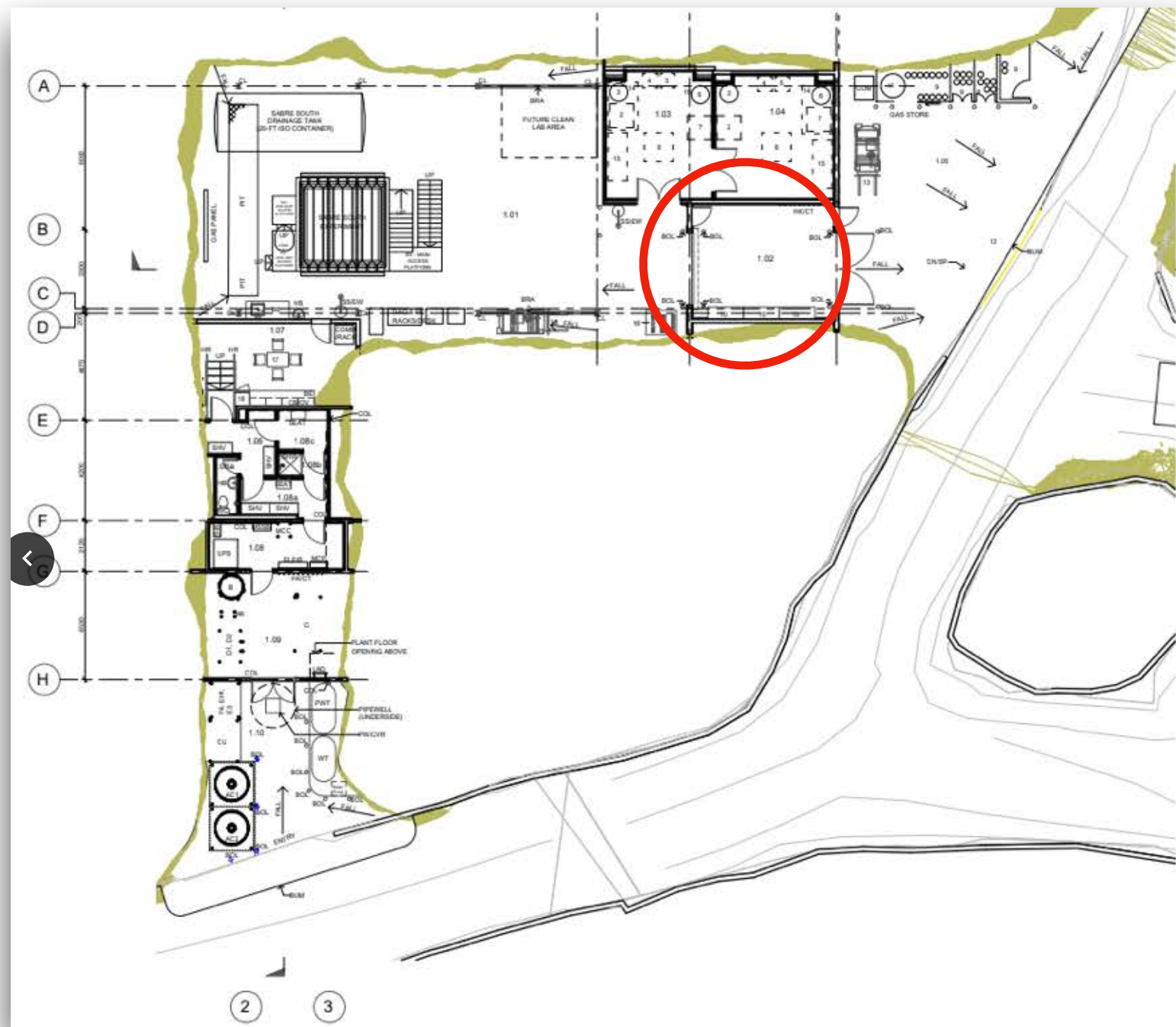
"HPGe" Lab Rooms

Power, gas and LN2 supplied



Fast-closing door

Entrance Room for Cleaning Incoming Equipment

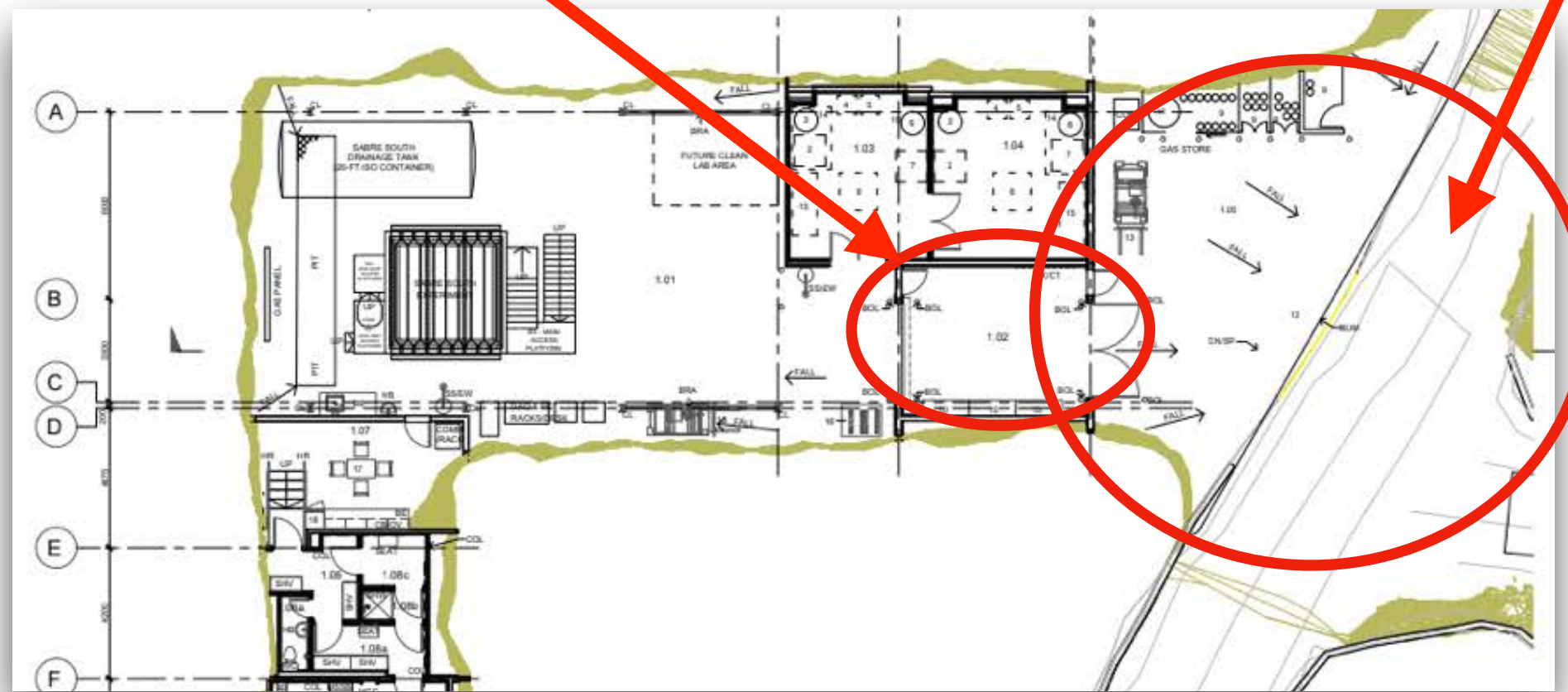




Ante-Room for equipment Clear



Equipment Entrance



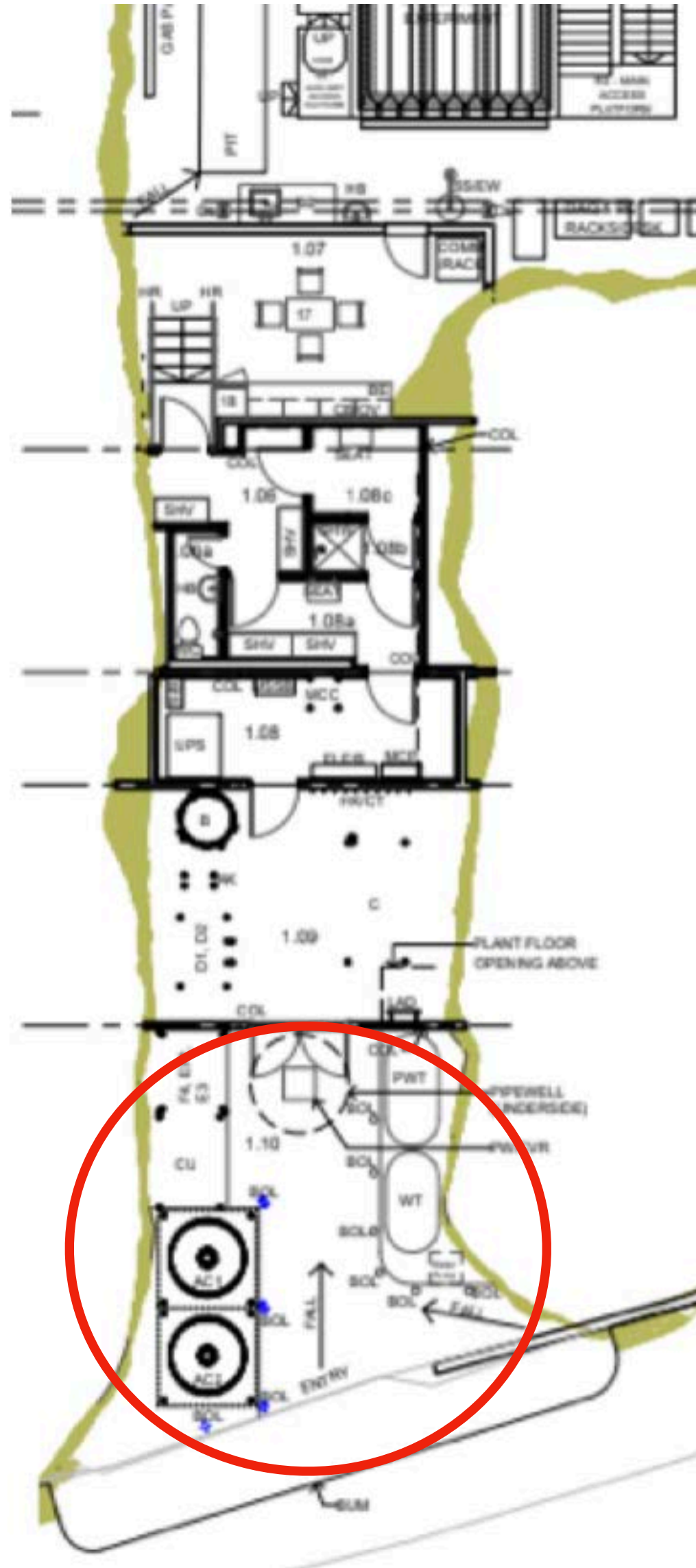
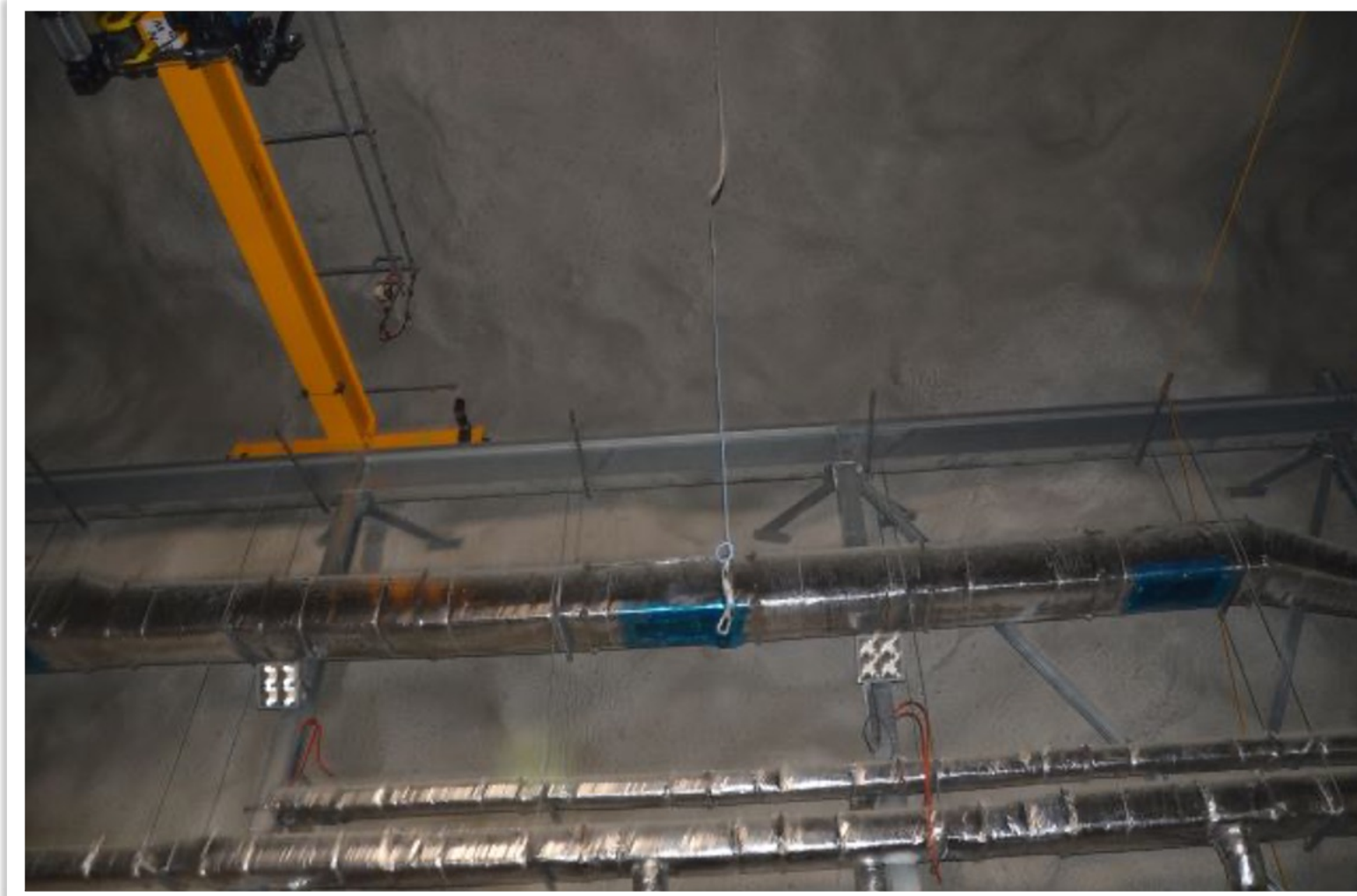
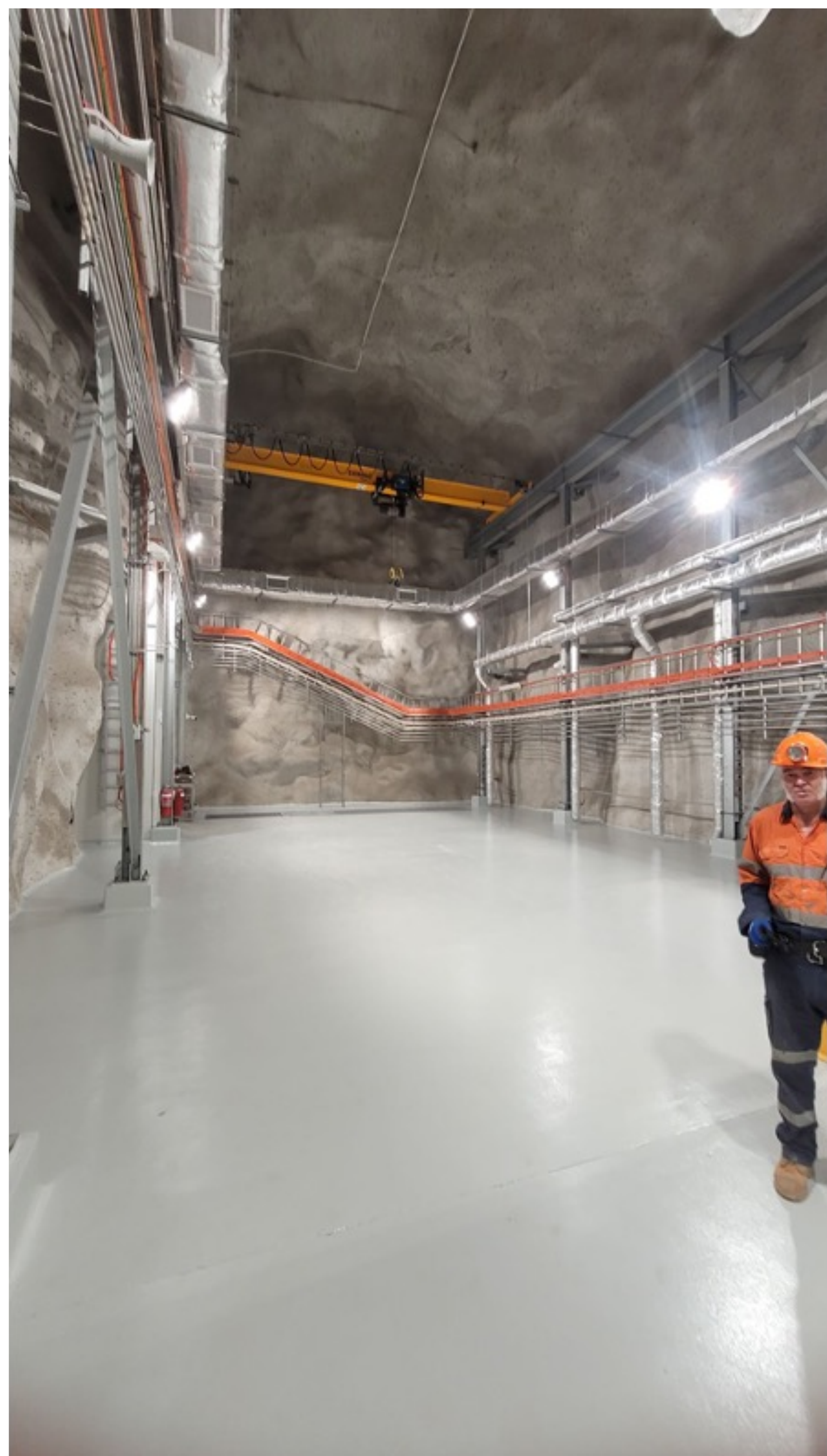


Photo: Leo Fincher-Johnson

SUPL External User Entrance



10 ton overhead crane

Views from each end
of the Main Lab

Photo: Leo Fincher-Johnson

August, 2022

Major infrastructure installed ...

Electrical Sub-station provided by SGM in decline tunnel



Photo: Leo Fincher-Johnson



But a very messy environment just outside go our clean lab!

Photo: Leo Fincher-Johnson

Its a mine - and a working mine at that

SGM very strict on ALL safety issues



20 Person Refuge



Sue Barrel (SUPL Ltd Board Chair) and GNT
Full mining PPE required

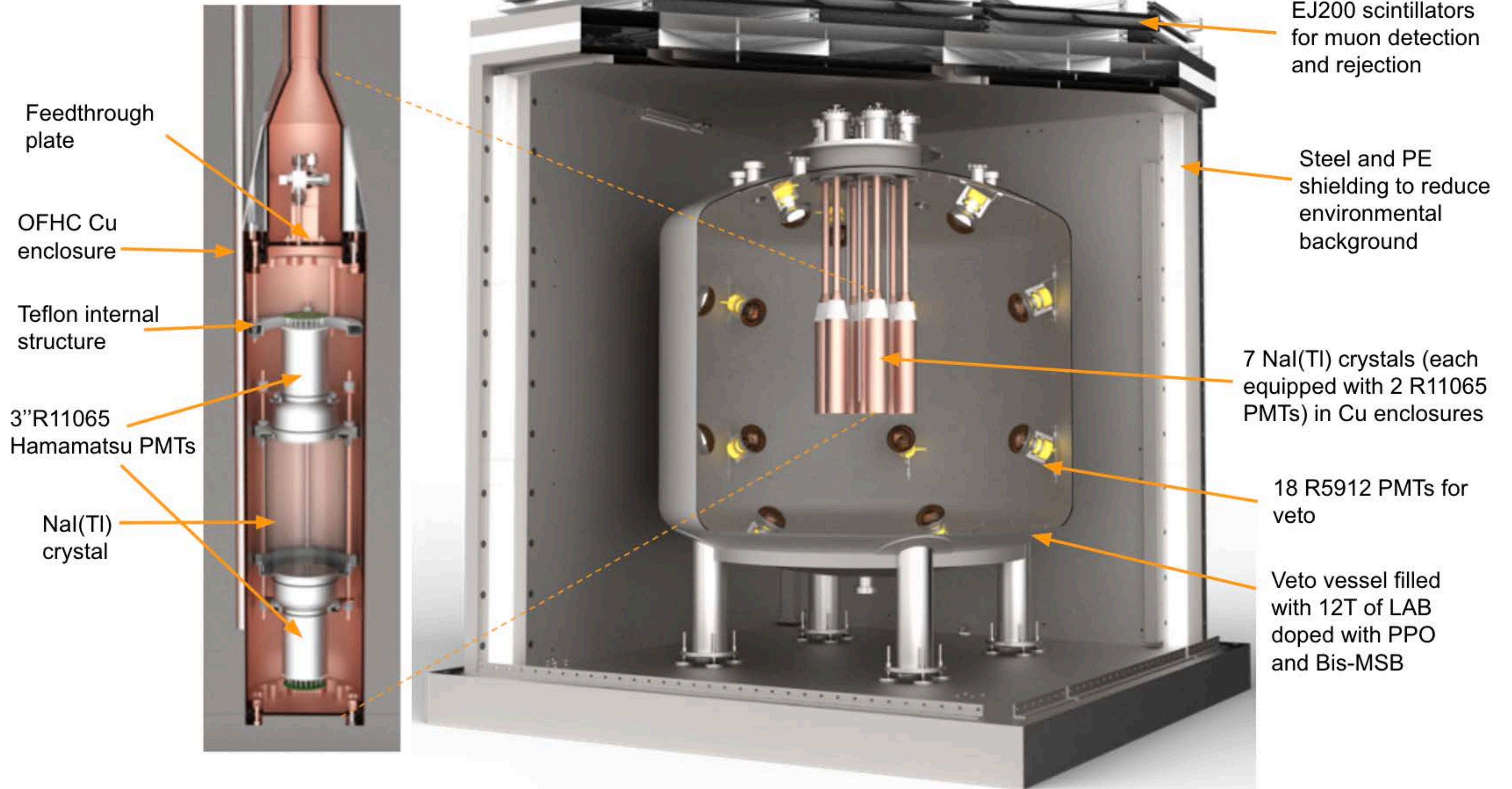
Photo: Leo Fincher-Johnson

SUPL
Official
Opening,
August 2022



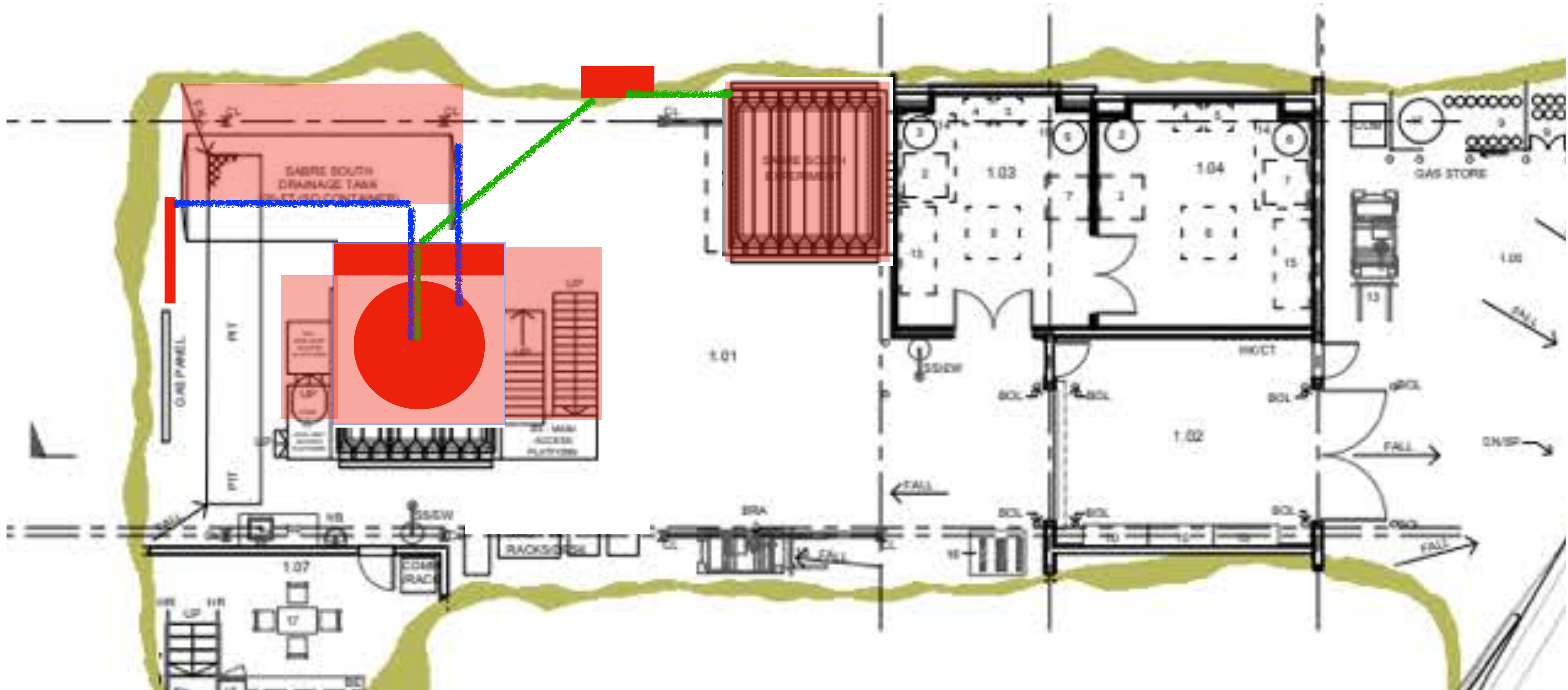
Photo: Leo Fincher-Johnson

DM Experiment - the first SUPL Activity

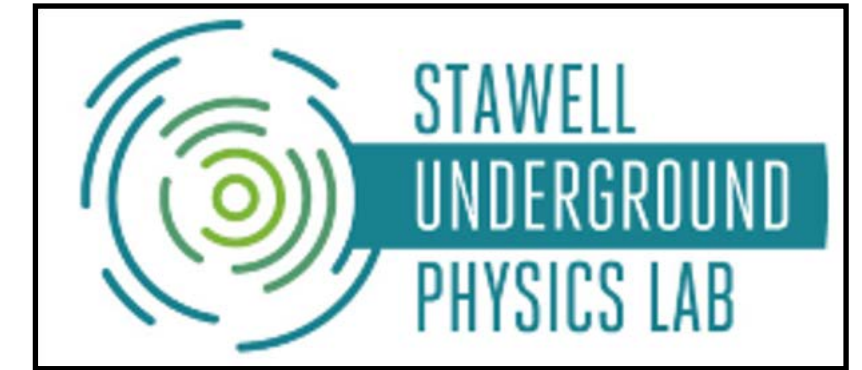


Initial SUPL/SABRE Layout

- we are looking to reduce the footprint in operation



SUPL will become national research infrastructure



- SABRE will become relatively “Passive” in operation
- Space will be freed up for other activities
- SUPL is actively searching for new partners, new activities, new funding.

