

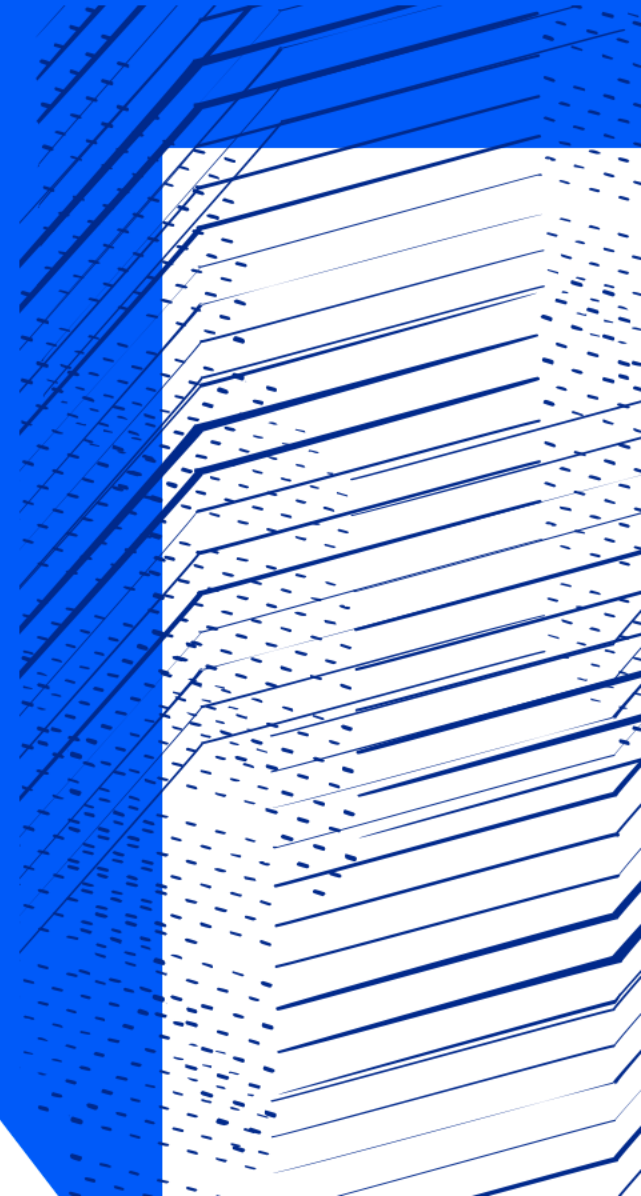


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Laboratory

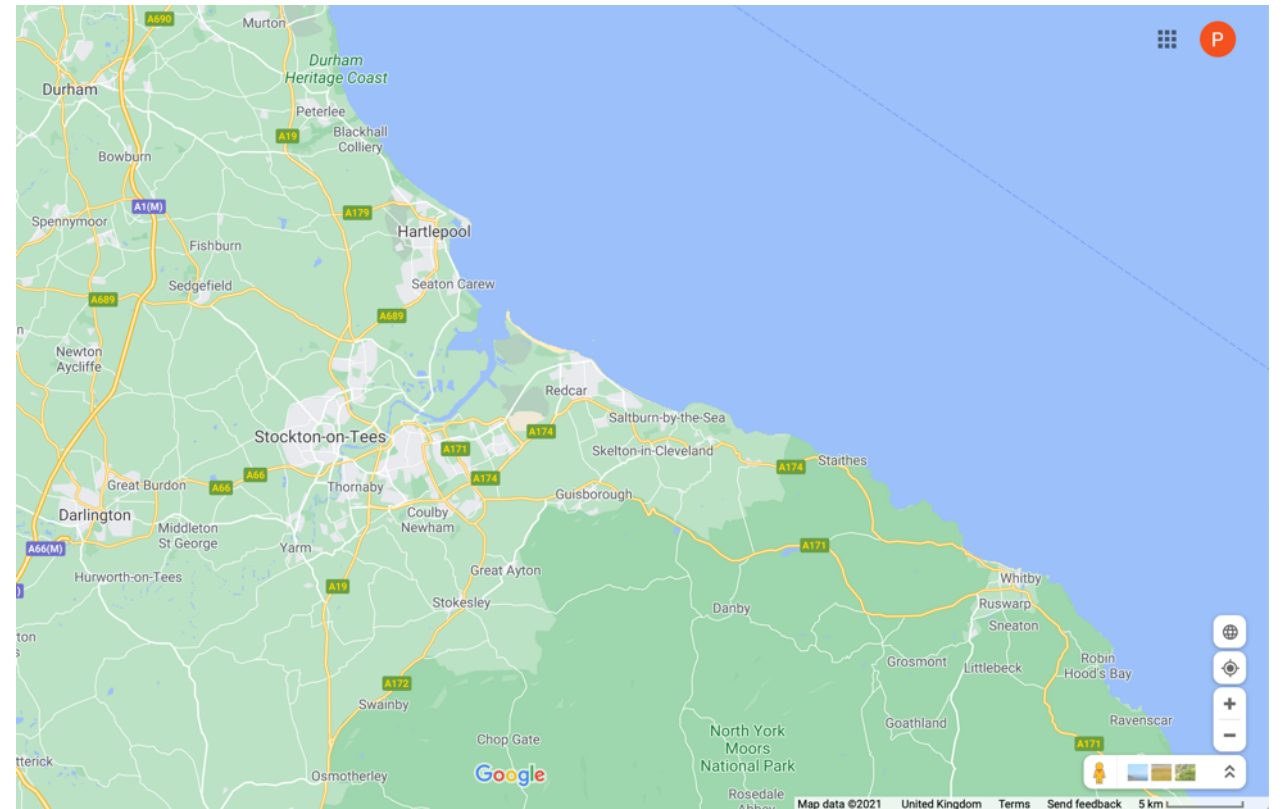
# Update from The Boulby Underground Laboratory

Paul Scovell – 07/01/2025



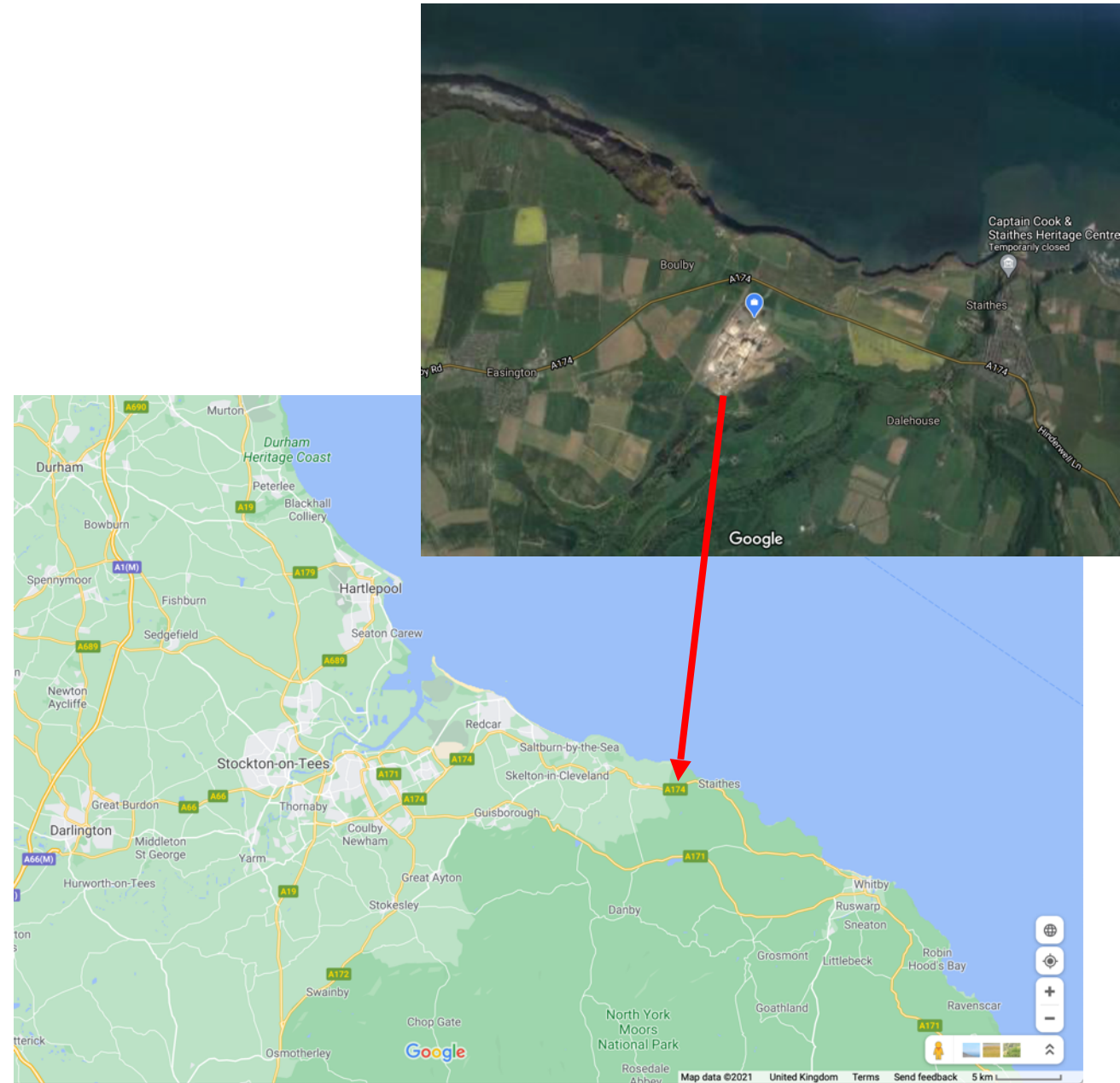
# Boulby Mine

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- About 25 minutes north-west of Whitby



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Boulby Underground Laboratory

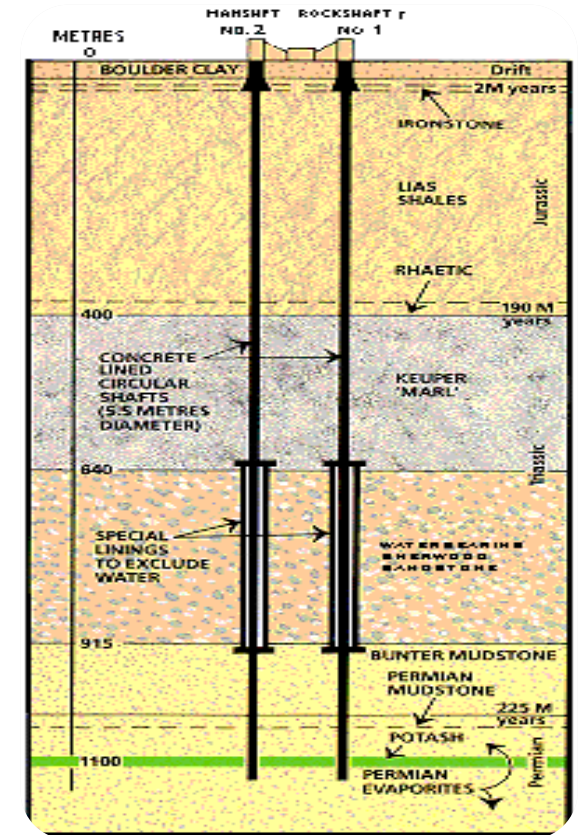
*Credit: Qualter Hall*



*Credit: Google Maps*

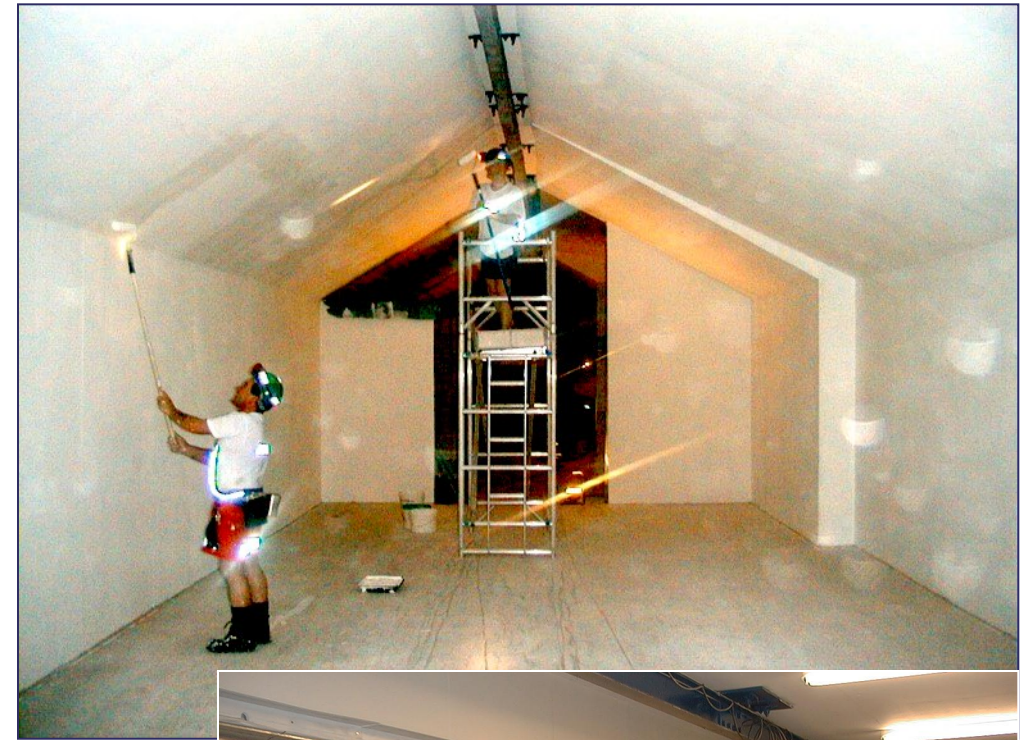
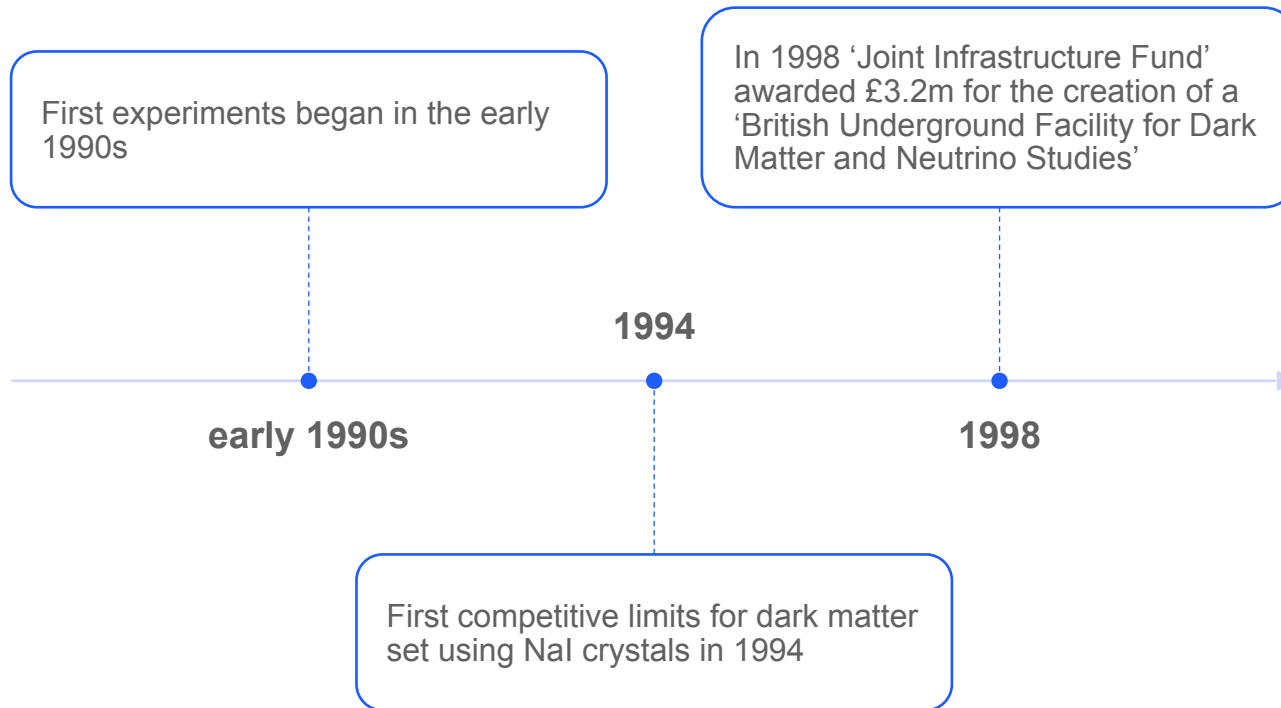
# Boulby Mine

- Commercial Polyhalite and Salt mine
- Shafts sunk in 1968 with full production from 1976
- Main tunnels mined through salt – remains of Zechstein sea
  - Potash (previously mined) sits above
  - Polyhalite sits below

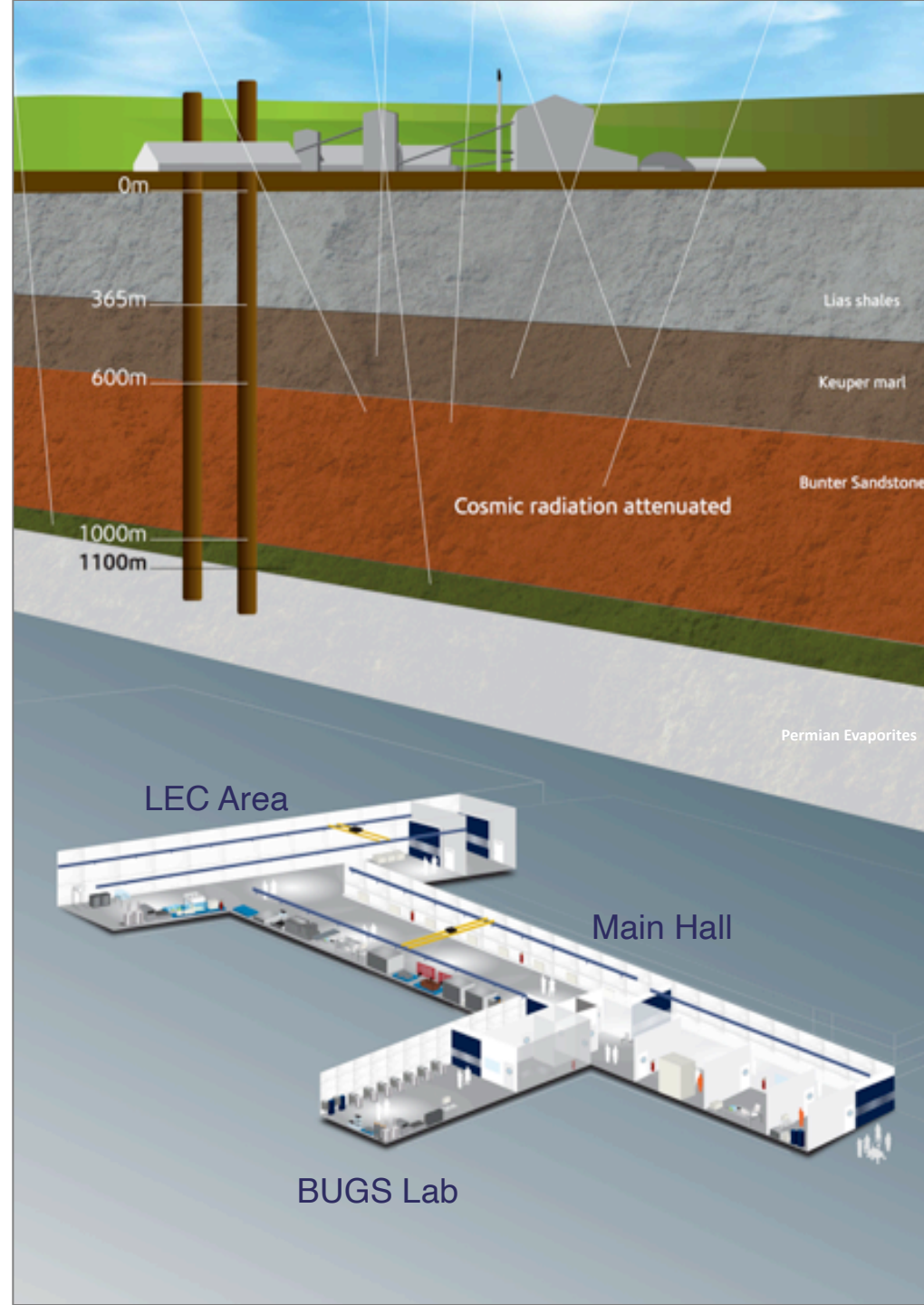


# The Boulby Underground Laboratory

# First Physics



# The current facility





# The current facility



# The current facility

- Boulby has hosted studies in the Dark Matter search for over two decades including NAIAD, DRIFT & ZEPLIN experiments
- Boulby currently hosts CYGNUS directional DM programme, NEWS-G/ Dark-Sphere R&D experiments
- The BUGS lab provides ultra low background material screening for worldwide experiments e.g. LUX-ZEPLIN



NEWS-G: Spherical TPC R&D

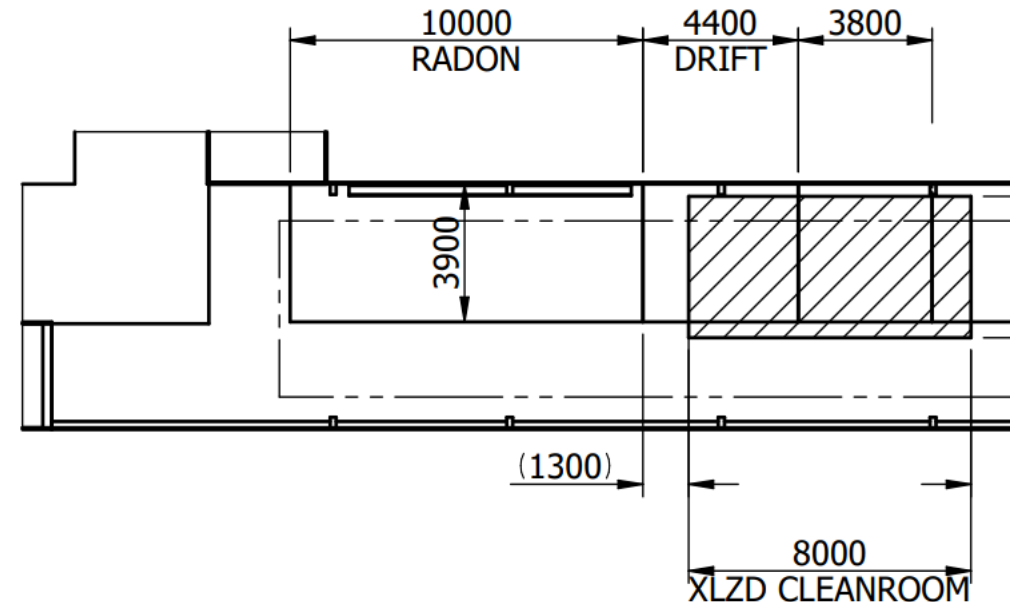
# Looking to the future

# Current Facility

- Looking to host a world leading medium scale dark matter detector in current facility at Boulby
  - £10 million fund announced last year
    - Over 5 years
    - To deliver a world leading DM result
  - Part of a wider demonstration of STFC commitment to expanding DM programme in UK
  - Awaiting results from this
- The current facility will also host XLZD@Boulby pre-construction projects
  - Cleanliness, Computing, Construction R&D etc

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# Boulby Development Project (BDP)

**UKRI Preliminary Infrastructure Funding  
£2.84M, 3 year project (2022/3-2024/5).**

The principal aim of the project has two components:

- To build a world-class underground laboratory in the North East region, suitable of hosting the most advanced, low background particle physics and multi-disciplinary underground science experiments
- To host a state-of-the-art, international, dark matter experiment in the new laboratory facility

# Boulby Development Project (BDP)

## Tasks / Deliverables:

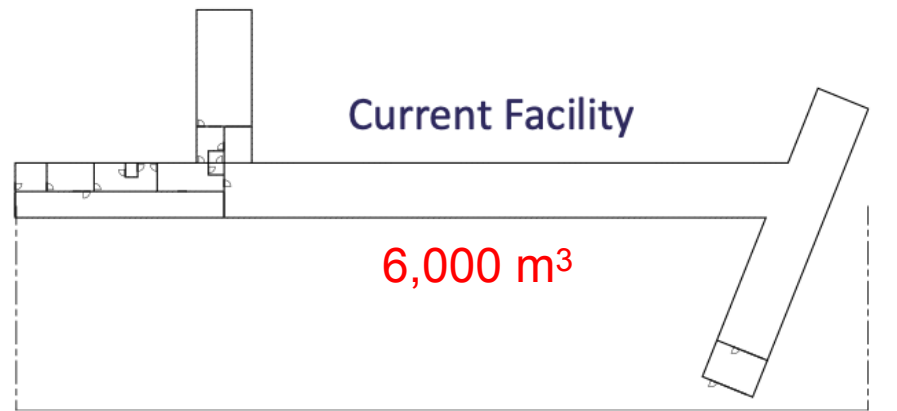
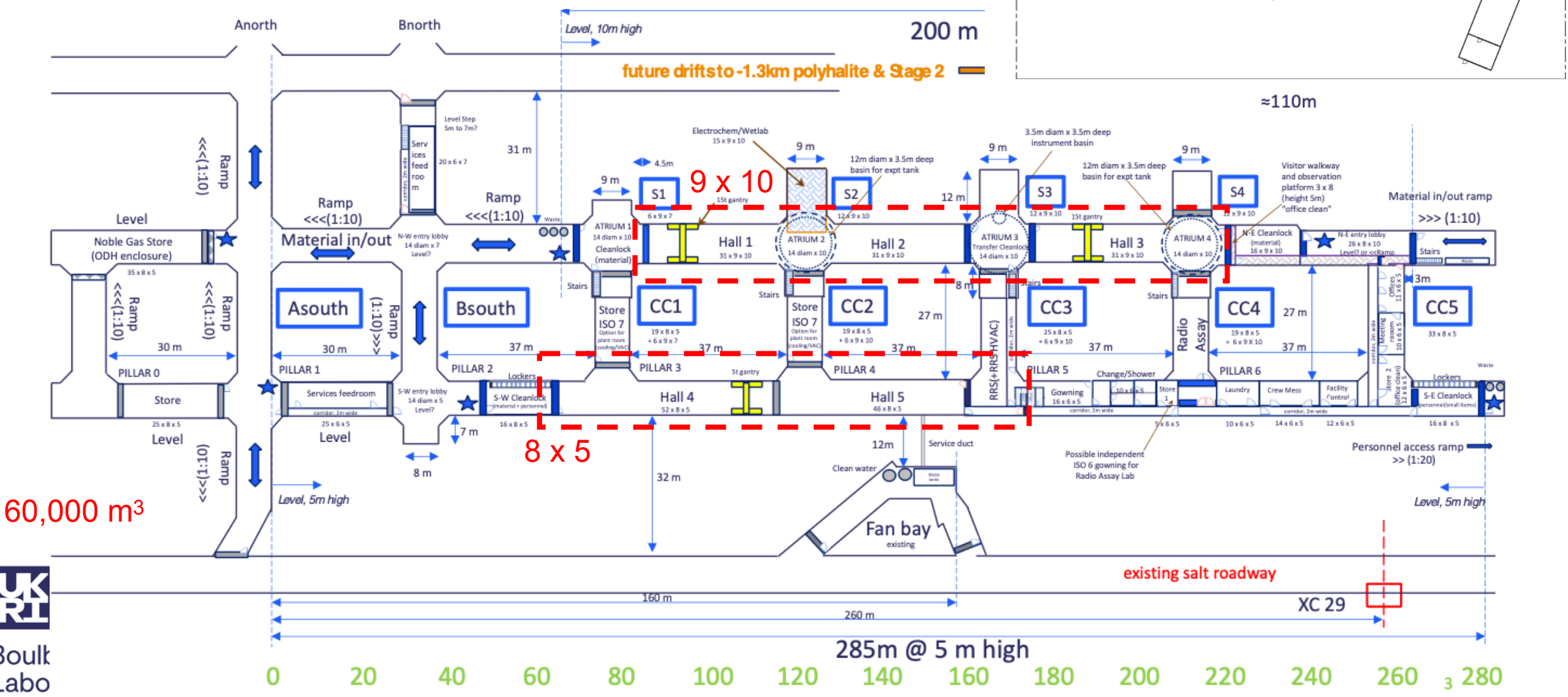
- 1) Facility design development (for sites at various depths and locations)
- 2) Science programme development
- 3) Business case(s), economic impact studies, risks → **Submission to Gov.**
- 4) Stakeholder engagement: Local, National & International:
  - Public & Partners
  - Government
  - Science communities & funders

# Continued expansion

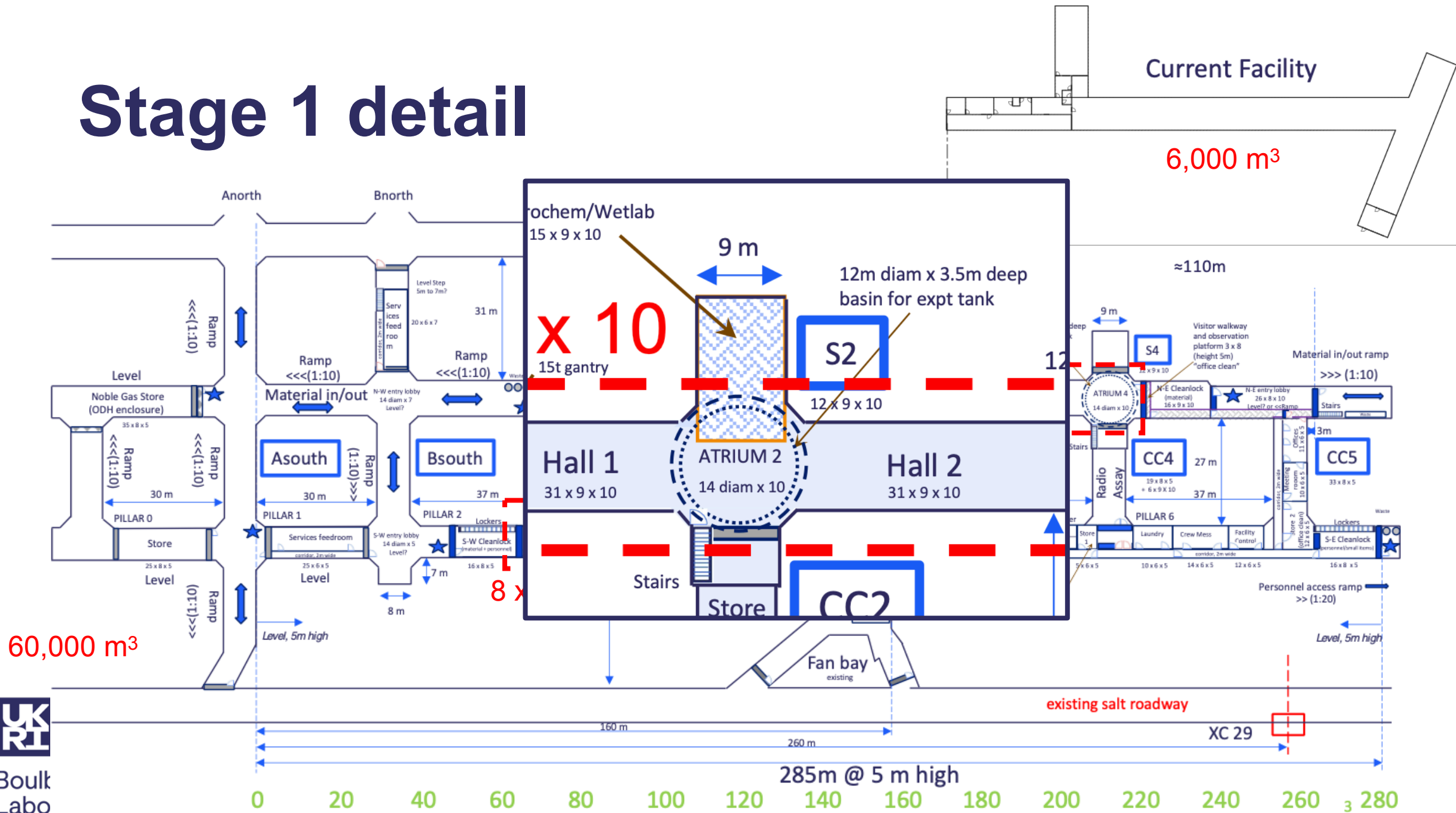
- Staged approach
- Stage 1 will be in current salt strata
  - Excavation beginning early
  - Designed for construction of XLZD and for long term multi-disciplinary laboratory
- Stage 2 will be deeper in polyhalite
  - Excavation beginning later
  - Large experimental excavation targeting next gen low-background particle physics



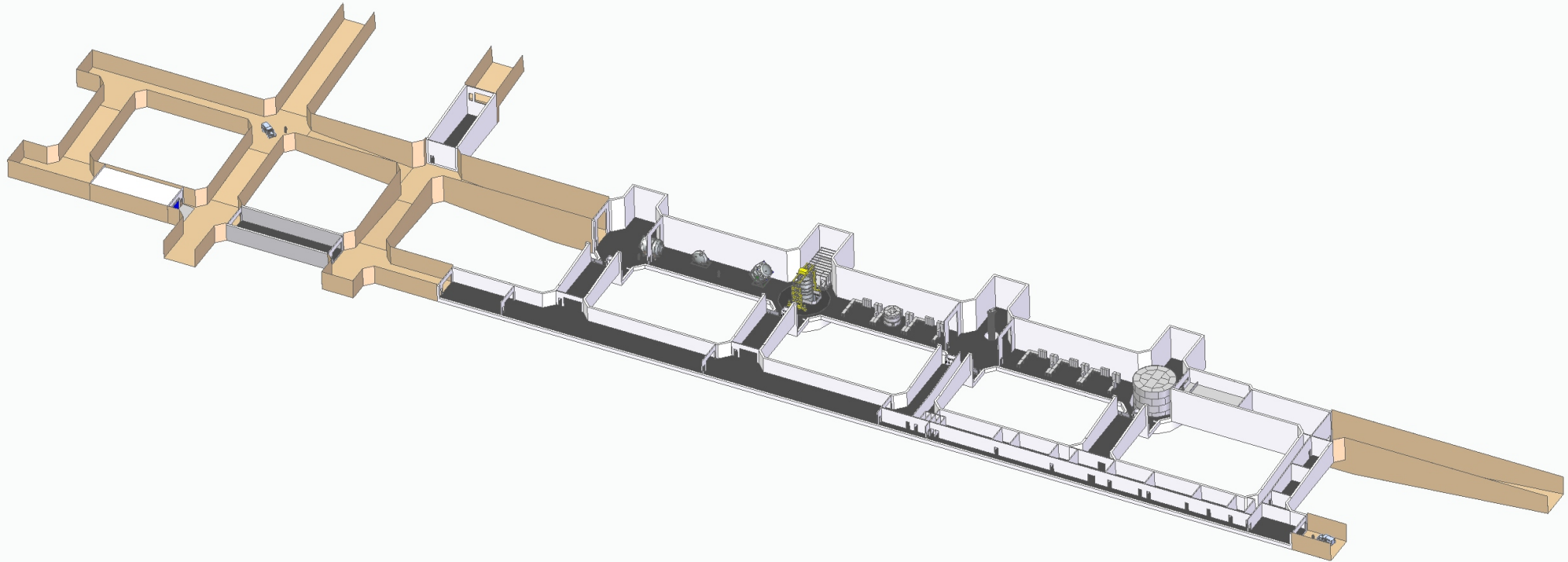
# Stage 1 detail



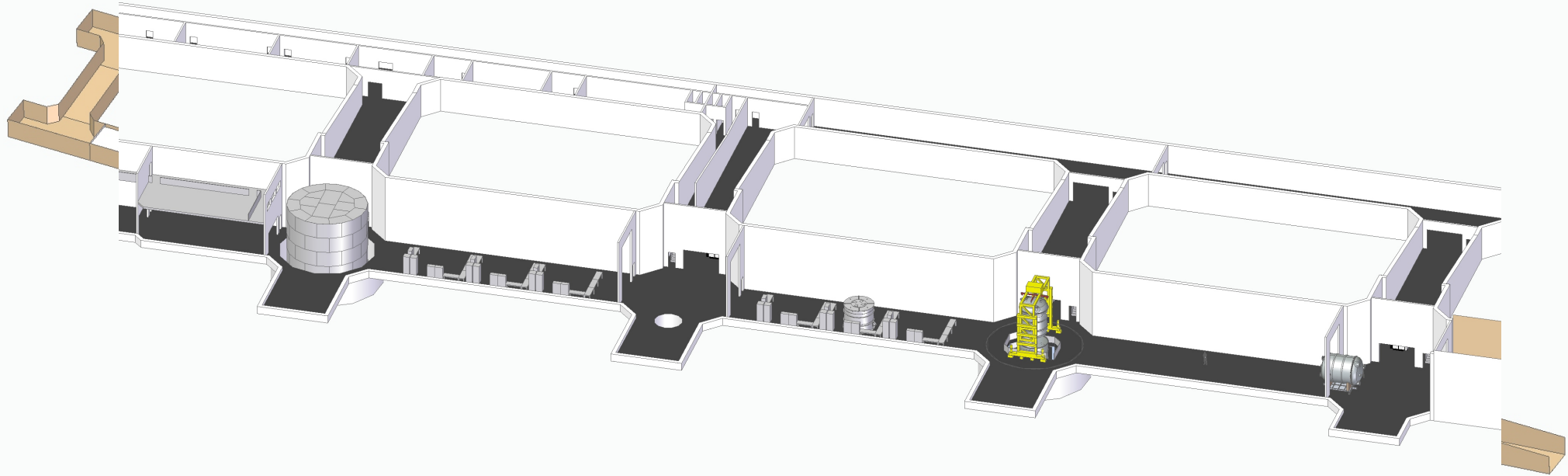
# Stage 1 detail



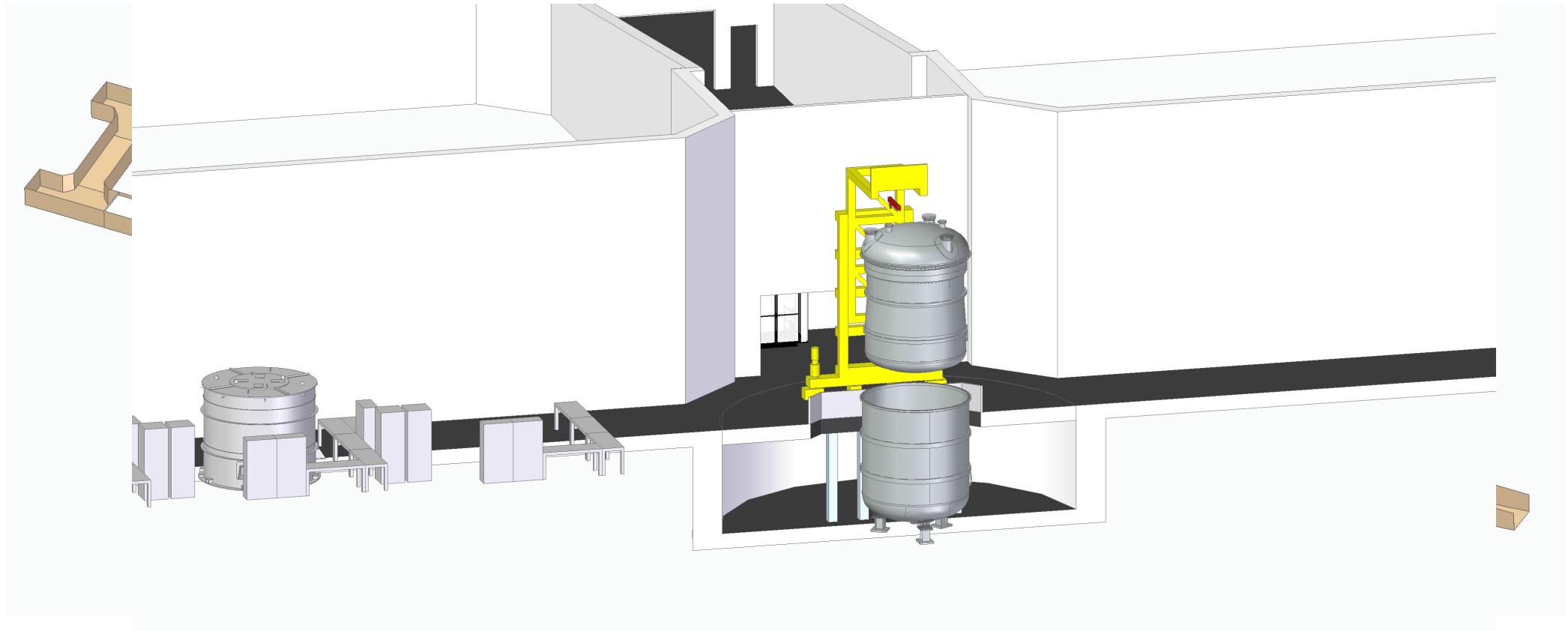
# Virtual views



# Virtual views



# Virtual views



# Where are we now?

- Footprint excavation of stage 1 complete
- Additional bolting and meshing currently underway
- Floor in north galleries to be milled out shortly
- Trial outfitting of lab planned for the near future
  - Small section to study methods for outfitting of new lab
  - This will also facilitate environmental studies
  - Radon, Seismicity, Magnetometry, Gravimetry, etc



# Conclusion

- There has been a rich history of scientific research at the Boulby Underground Laboratory
- This continues across many disciplines
- STFC committed to the future development of Boulby
- Excavation activity towards future facility has begun





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# Thank you

[boulby.stfc.ac.uk](http://boulby.stfc.ac.uk)

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 [@BoulbyUnderground  
Laboratory](https://www.facebook.com/BoulbyUndergroundLaboratory)

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Facilities Council](https://www.youtube.com/ScienceandTechnologyFacilitiesCouncil)