DUSEL ISE Workshop

Science Requirements to Facilities Design Basis

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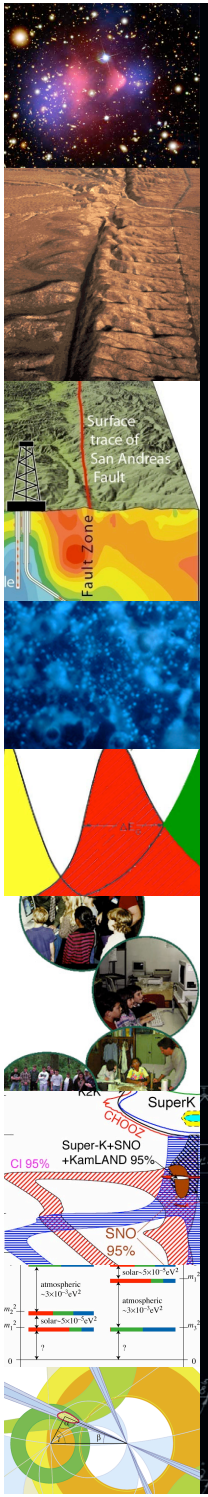
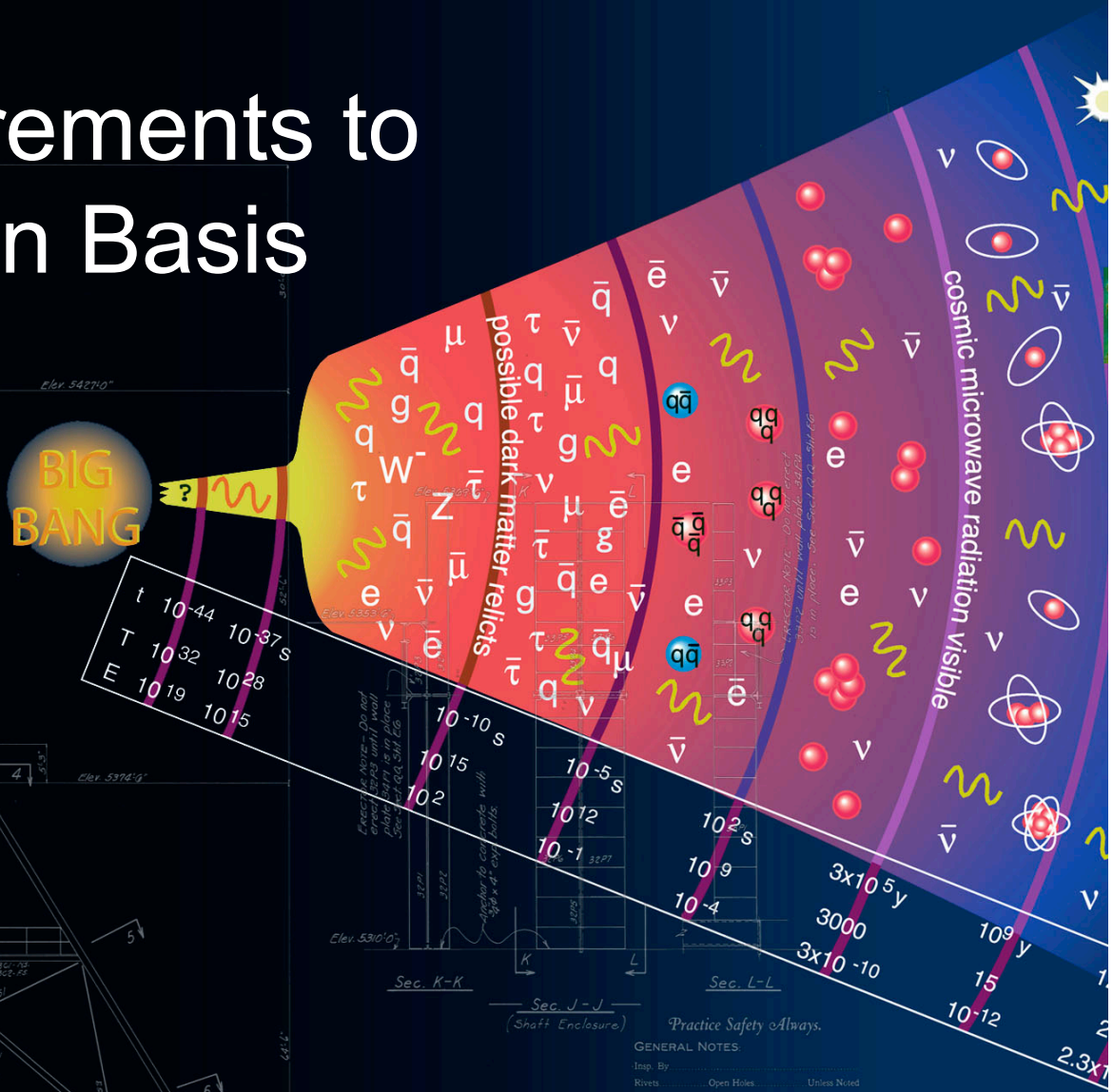
SDSMT





Lead, South Dakota, September 30-October 1, 2009

Figure Courtesy PDG and LBNL

Process – Determine Footprint

Configuration management

- Timing
  - Establish preliminary footprint
  - Acquire additional information at the S-4 meeting (pivotal)
  - Refine Preliminary Footprint
  - Configuration management board for later changes

Developmental Baseline Configuration

Design Configuration Workshop - 15-16 Sept. 2009

Project Scope for Preliminary Design - Subject to Configuration Control

WBS 1.3 Surface Site Infrastructure Alterations and Upgrades

WBS 1.5 Infrastructure for Underground Construction and Operations

* WBS 1.6 Near Surface Access (300 L)

WBS 1.7 Mid-Level Campus and Laboratories (4850 L)

WBS 1.8 Deep Level Campus and Laboratories (7400 L)

WBS 1.9 Other Levels and Ramps (nominal “Laboratory Footprint’”)

Science Considerations

- Project is ***"Science Driven"***
- Match science requirements with facility capabilities
- S-4's helpful as a generic model
- S-4's provide a framework but is not the entire set
- *Other activities may be important to operation of the facility but not directly related to the science, e.g. water removal*

Infrastructure Interface

- **General principles:**
  - DUSEL facility responsibility:
    - Resources shared by multiple experiments
    - Interface management.
  - Experiments responsibility:
    - Provide engineer design, facilities, and equipment *specific to experiment*
    - Fiscal management
    - Construction oversight
    - Installation of experiment.

Considerations

- Identification of “Requirements” vs. “Desirements”
- Must be able to adequately support the science that is chosen
- Must fit within the “box” as far as budget is concerned
- Interface between facility and experiments, i.e. where does the facility end and the experiments begin?

Goals of this Presentation

1) Present current concepts of facility responsibilities compared to experiment responsibilities

2) Gather inputs from experiment collaborations regarding those concepts

3) Gather input from experiments regarding their expectations from the facility

Near-Term Plan

- Preliminary Configuration Meeting held September 15-16, 2009 (Project Meeting)
- Input from experiments during DUSEL Design Meeting September 30 – October 3, 2009
- Configuration Meeting (Project) ~ first week November, 2009
- Place under Configuration Management
- Subsequent changes to be approved by a Configuration Management Board

Requirements

- Physics experiments (related to facility deliverables)
  - Space
  - Access
  - Long Term Stability (Large Volumes)
  - Utilities
    - Power
    - Data communications
    - Ventilation
    - Reduced Radon Air
    - LN2
  - Safety
  - Cleanliness
    - Laboratory environment
    - Amenities/office environment

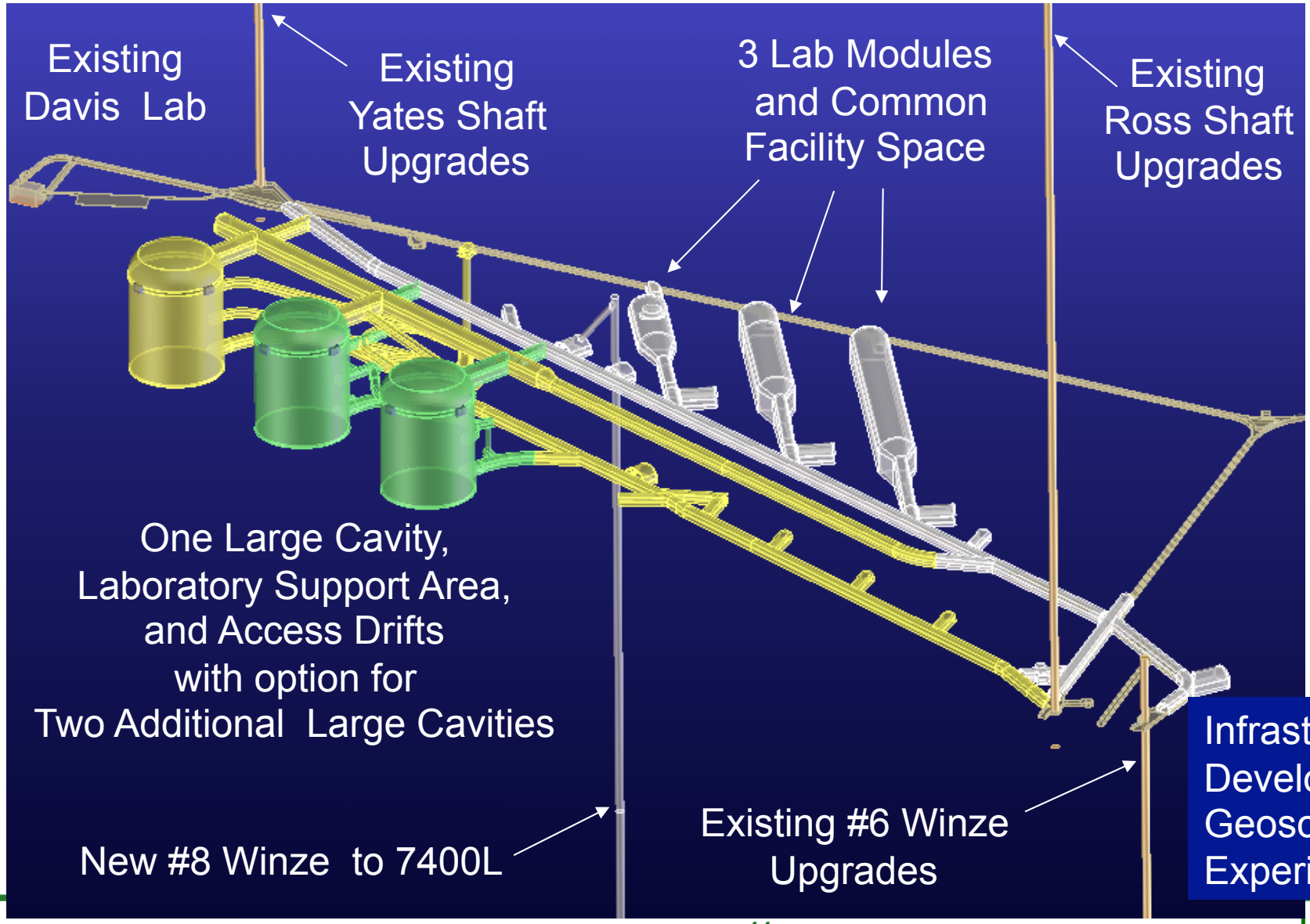
Scope Summay- Space and Access

Science Drivers for Development at 4850:

- Depth requirements for Shielding
- Space requirements to accommodate identified experiments
  - Lab modules
  - Mega-cavities

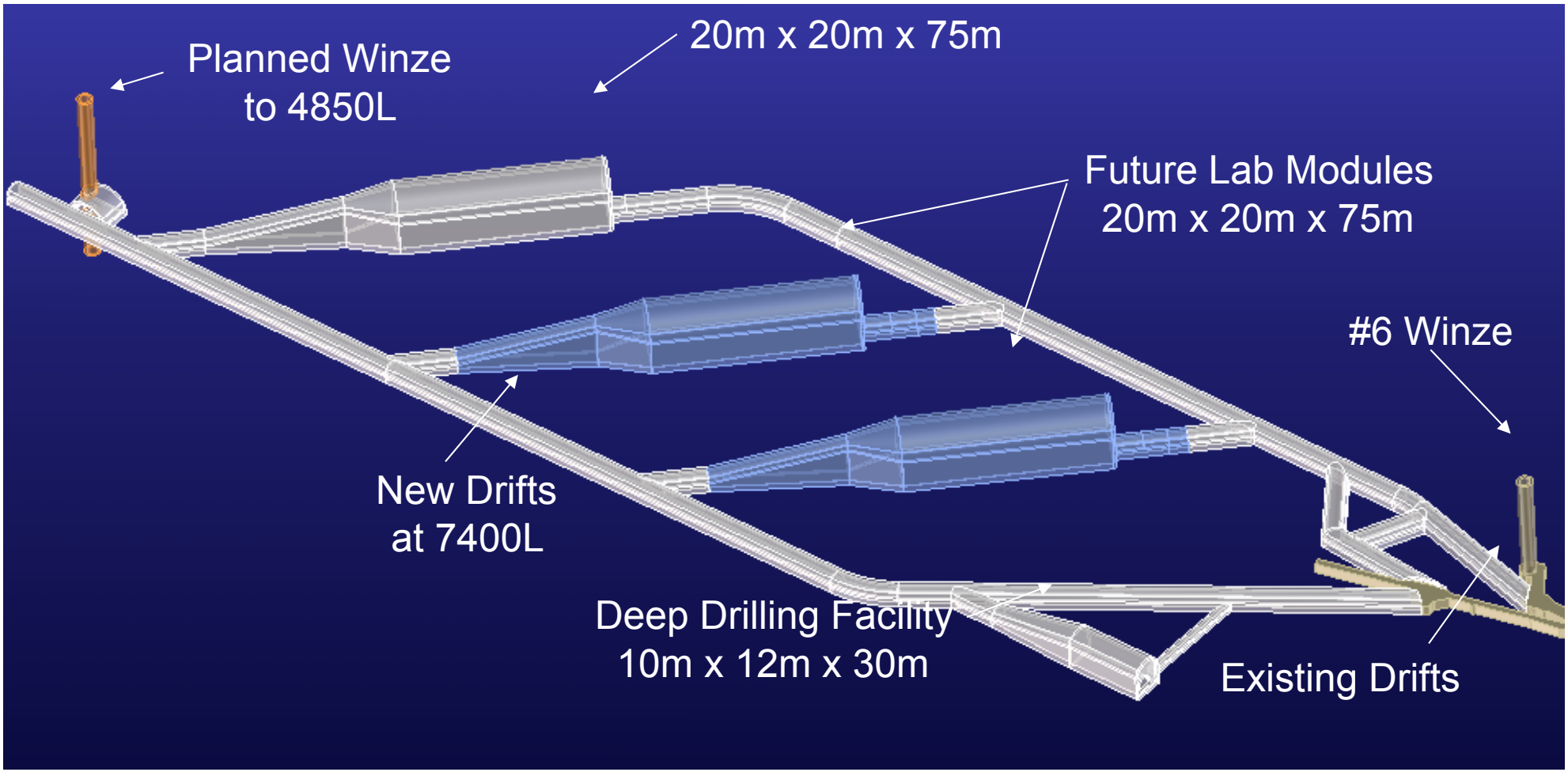
WBS 1.7 Mid-Level Campus and Laboratories at 4850L

Scope Summary

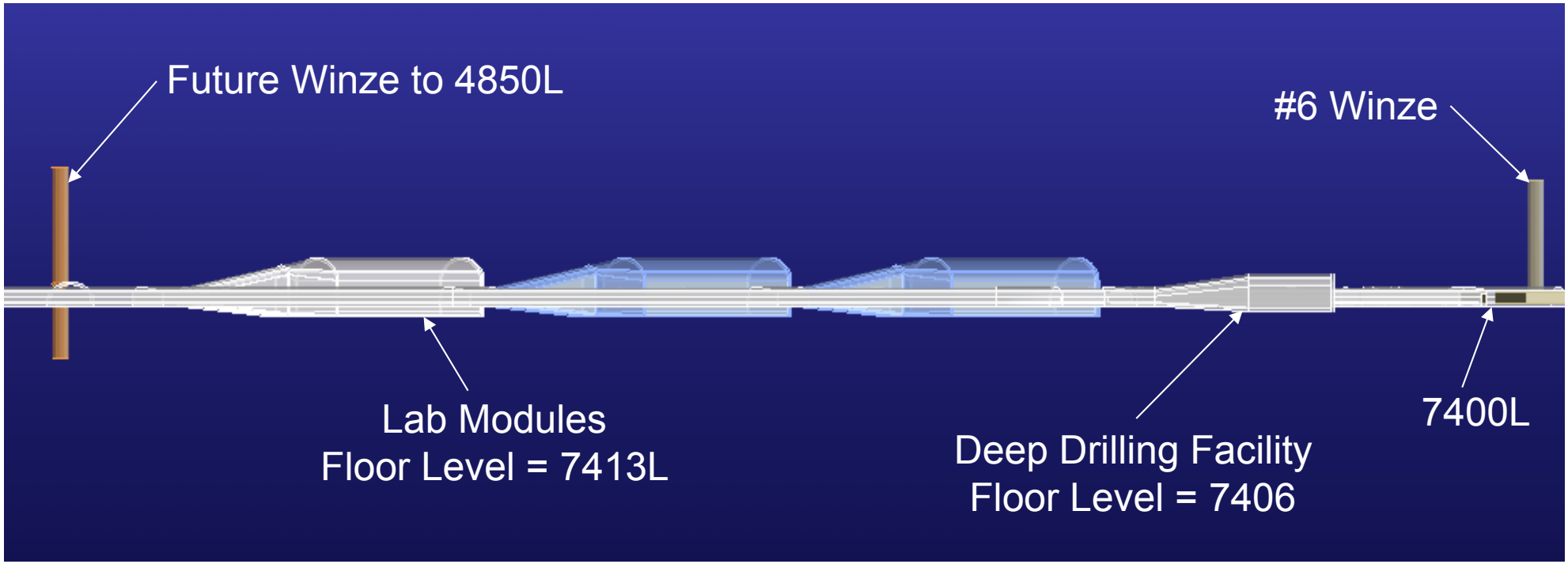


7400 Level Preliminary Layout

Science Driver: Greater depth required for greater attenuation



7400 Level Preliminary Layout,
Elevation View



Requirements

- Non-Physics experiments (facility deliverables)
  - Identified area (volume) for experiment
  - Access
  - Utilities
    - Power
    - Data communications
    - Ventilation
  - Safety

Example: Long Baseline - Megacavities

- Large Volume of Excavation
- Long-term Stability
- Cool temperatures
- Low resistivity water
- Large volume of detector fluids
- Depth requirements

Large Cavity Detectors Facility Infrastructure

- Excavation and ground support for cavity
  - minimum 100kT water Cerenkov or
  - 5kT LAr
- Survey monuments within cavity
- Space for control room and staging
- Space for water purification
- Industrial water for purification
- Crane
- GPS clock signal
- Post-construction monitoring of rock conditions

Example: Non-Physics Experiment Requirements

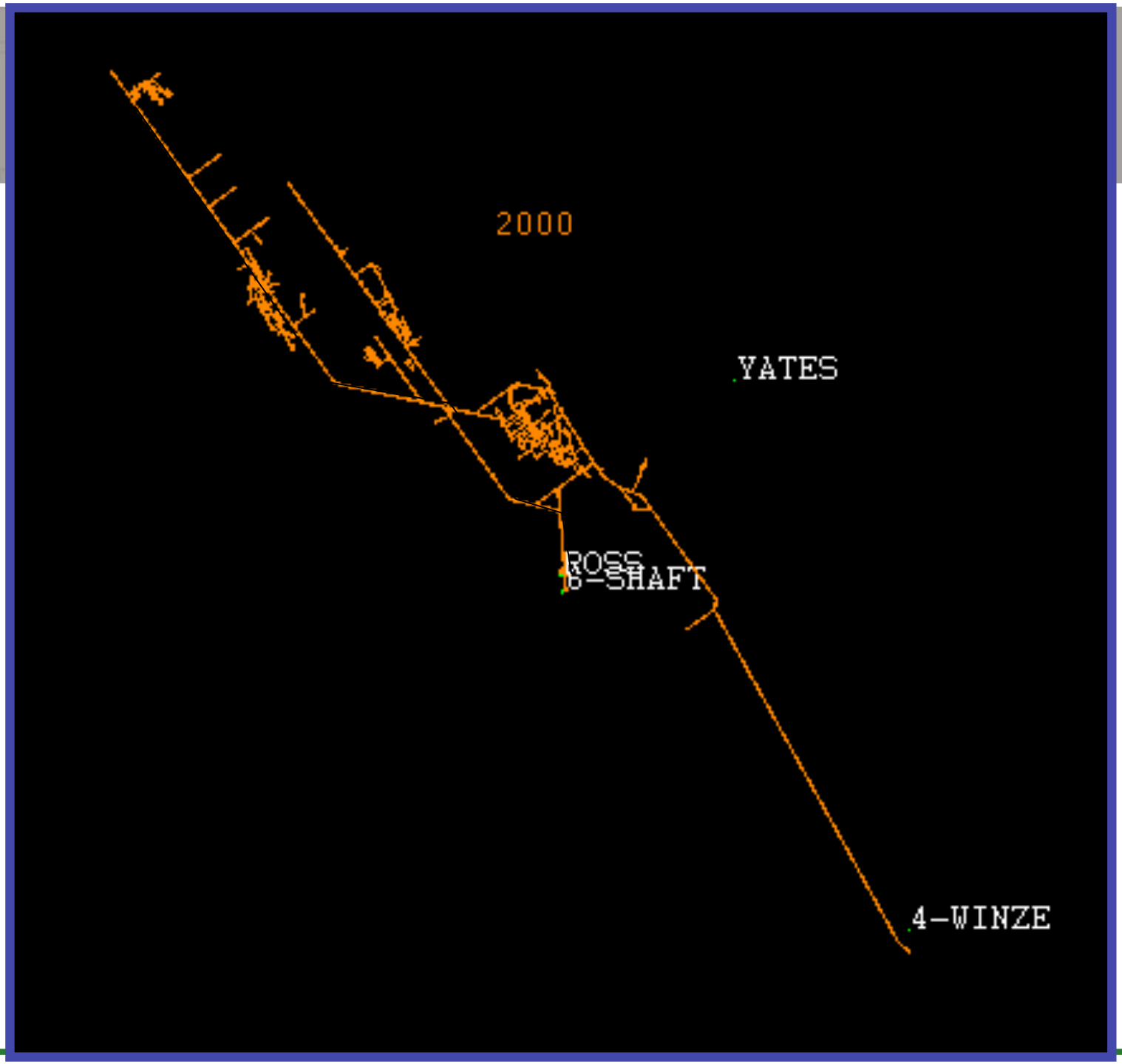
- Non-Physics experiments –types
- Identified laboratories
- Distributed laboratories
  - Transparent Earth
  - Geological investigations
    - Fault flow
    - Mineralogical characterization
  - Geobiology/Microbial ecology

Identified Laboratories

- Fracture Processes
  - 4850 L
  - 7400 L
- Coupled Processes
  - 4850 L
- EcoHydrology
  - 7400 L
- CO_2
  - From ? to ?

Other Levels -

Level	Justification/Comments
800L	Useful for underground mapping educational purposes;
2000L	Provides very wide access; useful for underground mapping educational purposes; will be important for geosciences; and may be important for geo-microbiology
3800L	May be useful for both geo-science ;study of mineralization (provides access between the 2600L and 4100L)
4100L	Connects the two main areas of mineralization at depth; important for geo-science—study of mineralization; good connector throughout this depth of the underground
5900L	Offers access to the #4 winze and to wide areas of the underground; midway between 4850L and 6800L
6800L	Connection to the #5 shaft; important to maintain monitoring of underground facilities
(8000L)	Only necessary for deep drilling if drill room not located at 7400 L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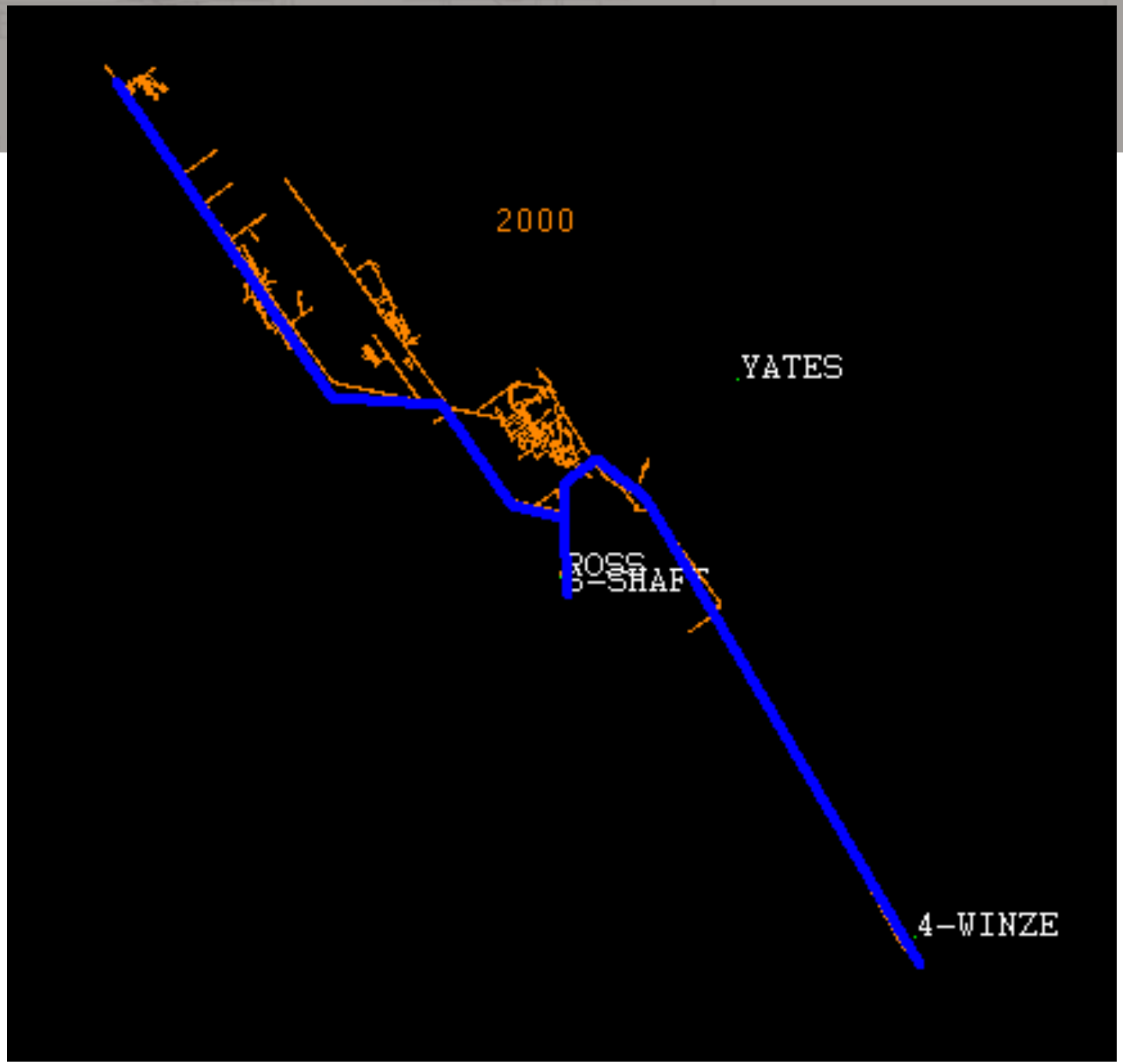
4-WINZE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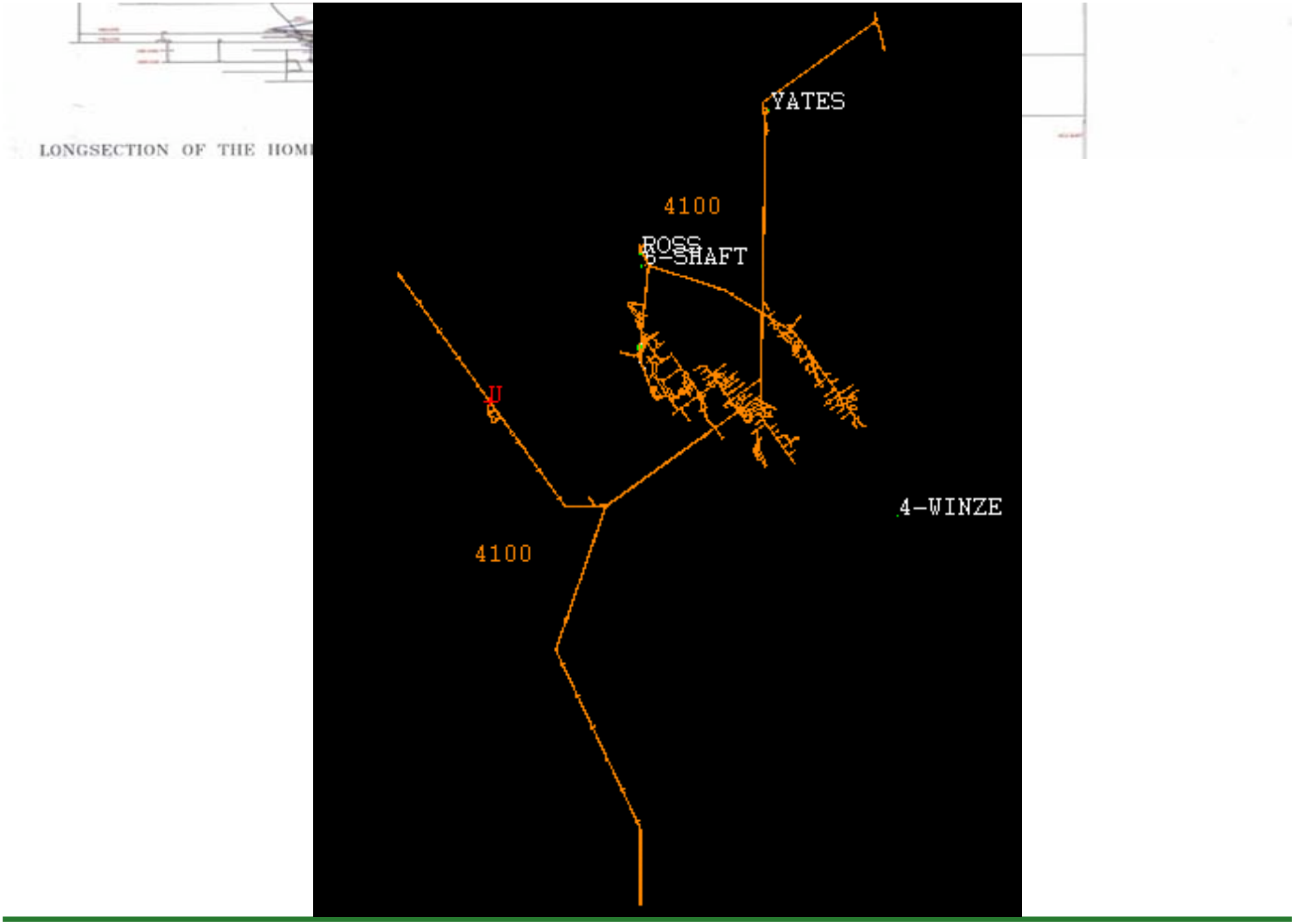
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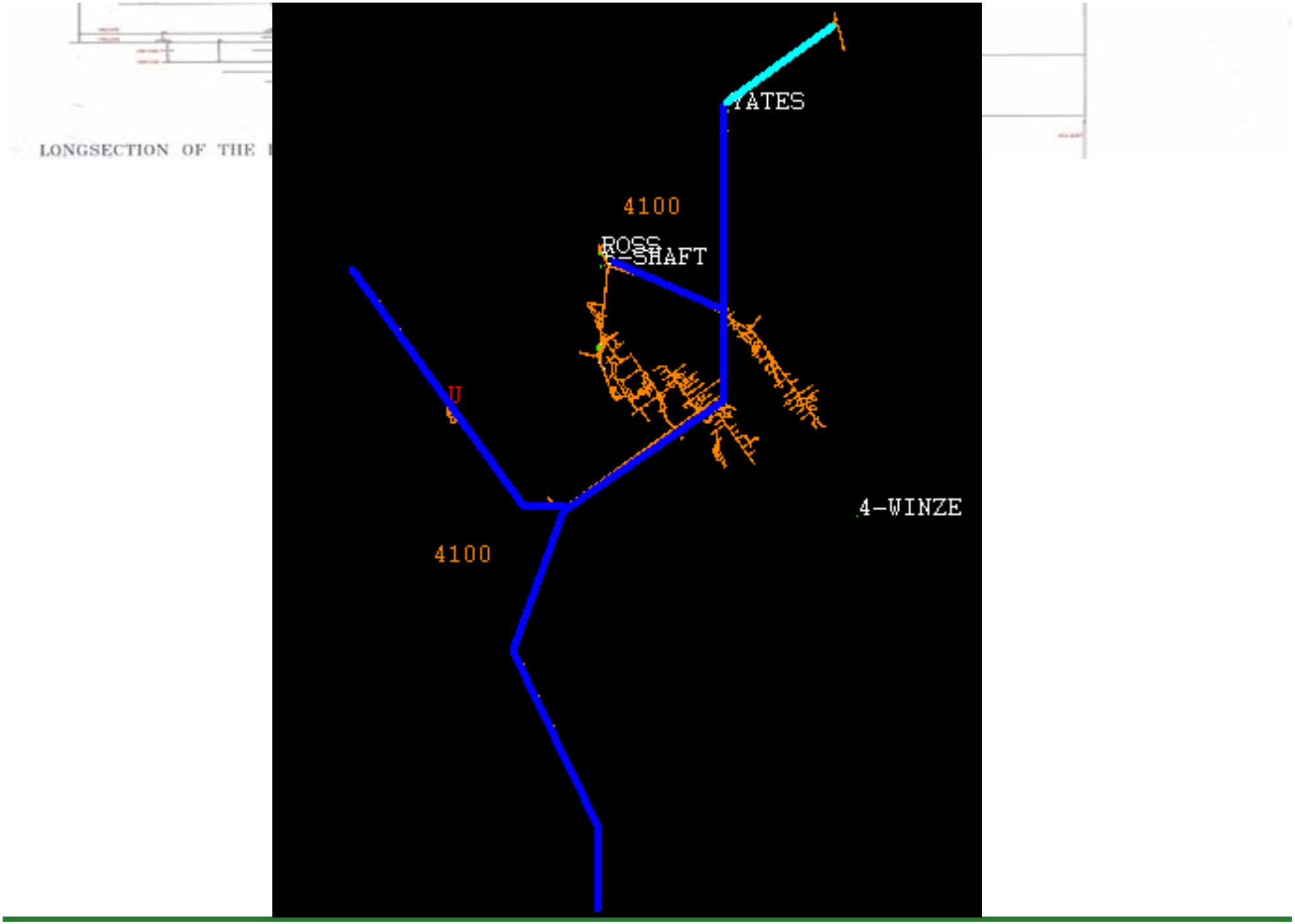
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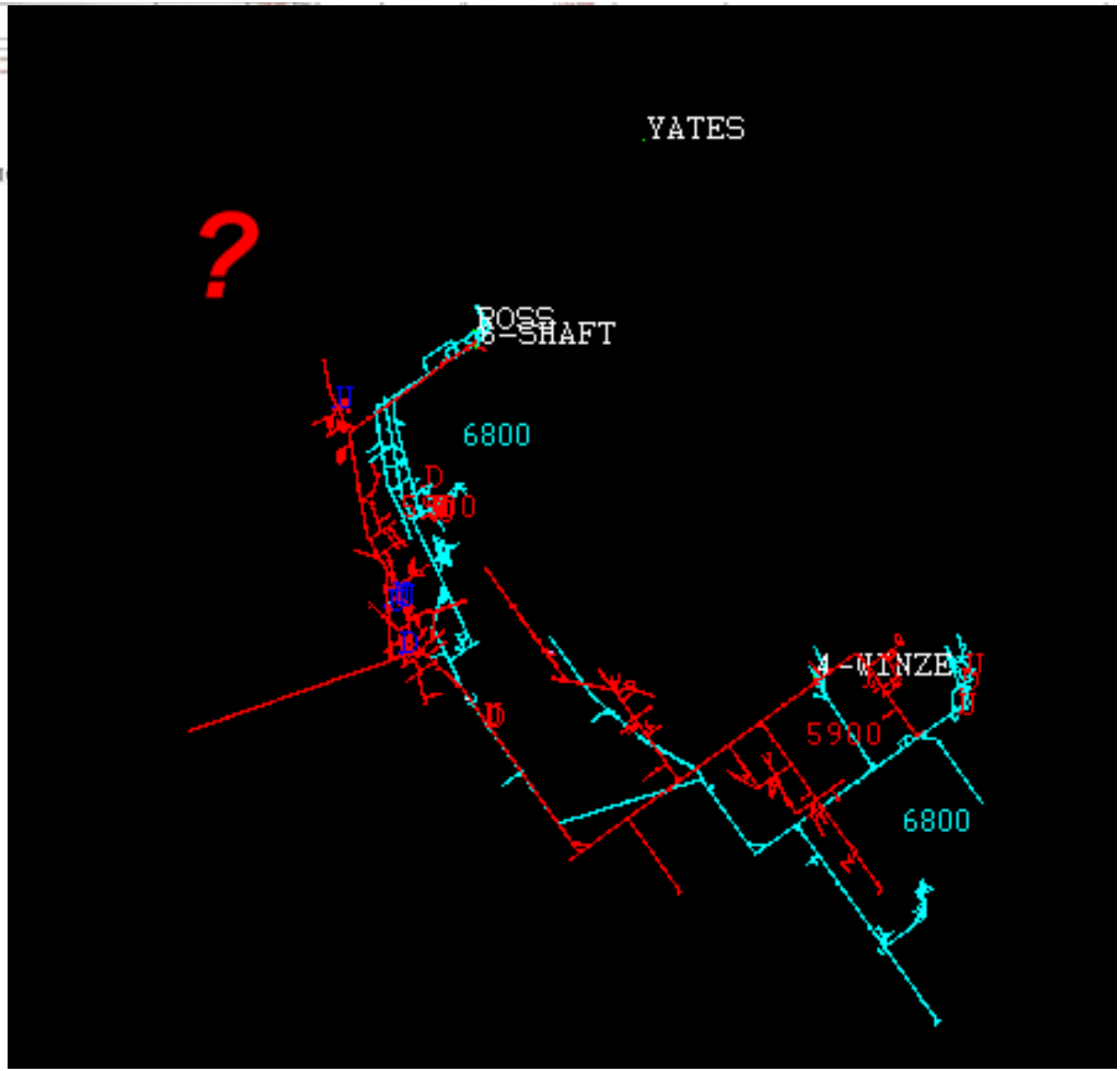
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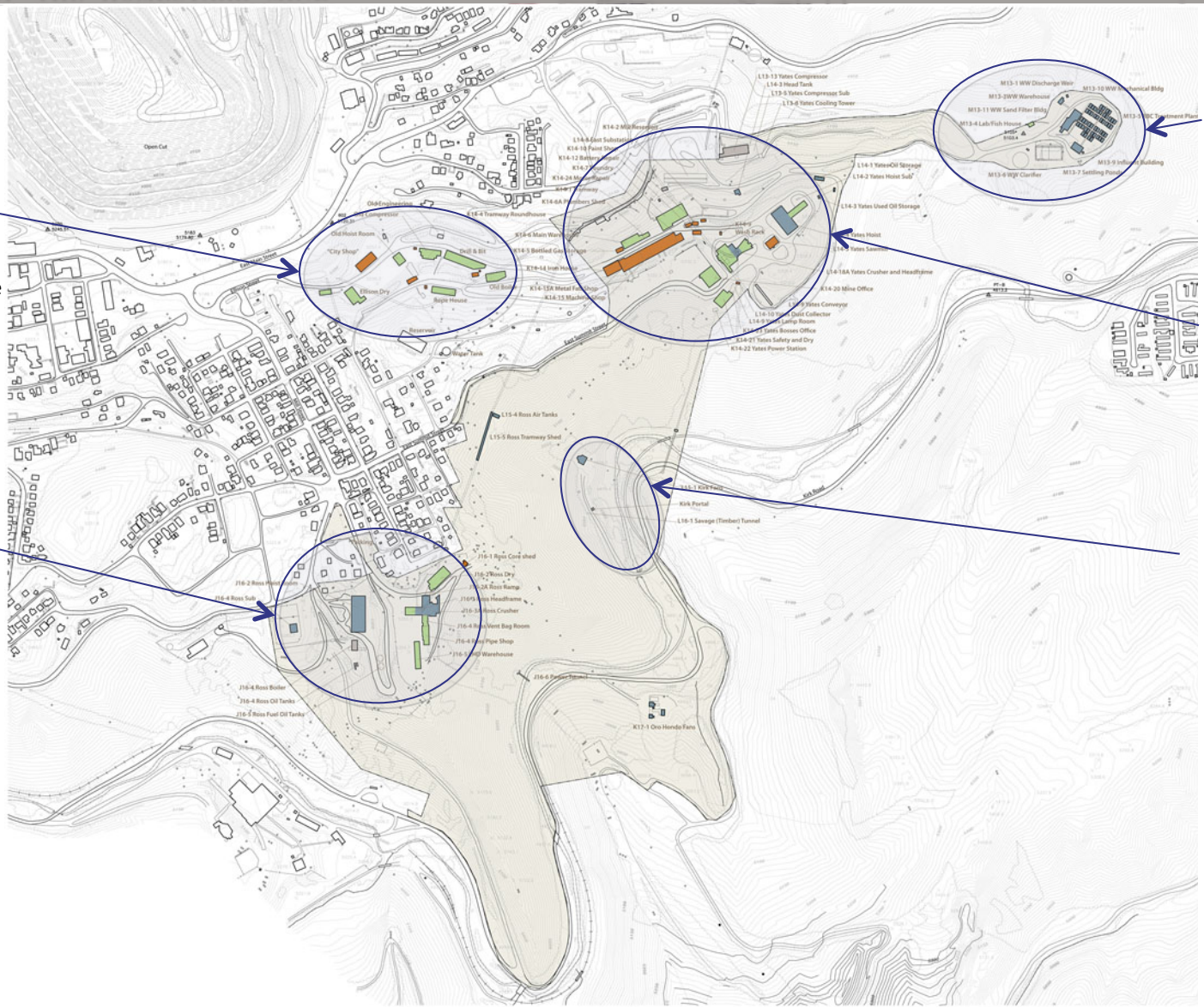
4-WINZE
5900
6800

Other Levels and Ramps Facility Infrastructure

- Utilities:
  - Ventilation on “as needed” basis
  - Water for limited drilling operations
  - Electrical power
  - Basic communication backbone
- Ground control in identified areas
- Portable sanitary facilities
- Ramp system between 4850L and 8000L may remain open or may be replaced by new winze from 4850 L

WBS 1.3 Surface Site Infrastructure Alterations and Upgrades

Major Use Areas – Surface Facilities



Ellison Complex
Currently off-site but option to own. May be site for Sanford Science Center

Ross Complex
Construction related facilities and staging

Water Treatment and EH&S Facilities

Yates Campus
Primary science area

Kirk Portal
Access to future Near Surface Campus

Scope Summary

Yates Campus Architectural Concept: Key Functional Areas

Sanford Center for Science and Education

40,000 to 50,000 GSF
New Construction

Common Facilities For Users, Visitors, And Conferences

Up to 20,000 GSF
New Construction

Headframe, Hoist, and Operations

Nominally 30,000 GSF
Alterations and Upgrades
(Existing Infrastructure)

User Support Shops, and Geology Archive

Up to 35,000 GSF
Alterations and Upgrades.
and New Construction

Lab Administration and Dry

33,000 GSF
Alterations and Upgrades
(Existing Infrastructure)

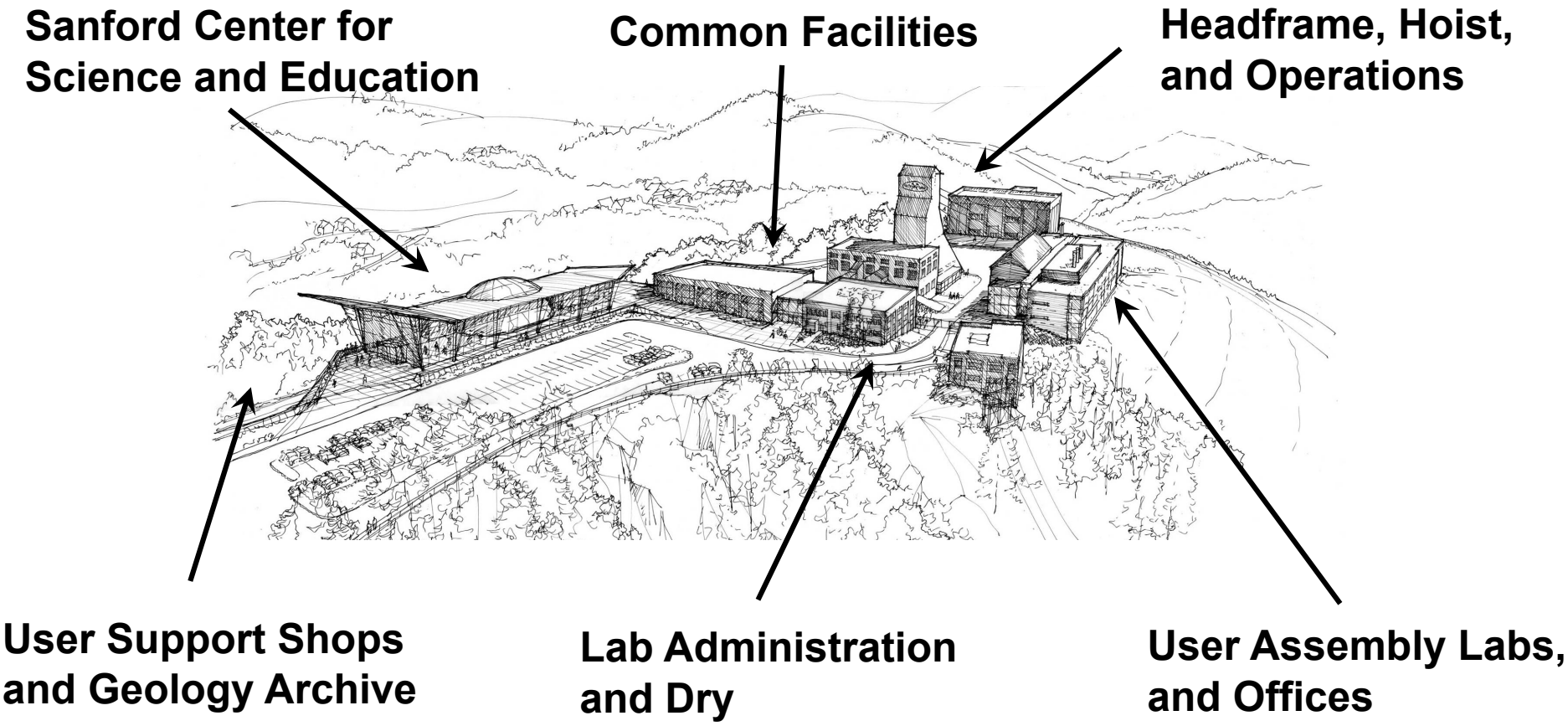
User Assembly Labs, and Offices

Up to 60,000 GSF
New Construction

Ref. - Master Site Plan and Program, Steve Dangermond

Scope Summary

Yates Campus Architectural Concept: Key Functional Areas



Ref. - Master Site Plan and Program, Steve Dangermond


LONGSECTION OF THE HOMESTAKE MINE

General Infrastructure Provided By Facility

- Construction infrastructure
  - Excavations
  - Waste rock removal
  - Ground support
- Laboratory space:
  - Lab modules
  - Surface labs
  - Other space
- Access:
  - Lifts and hoists
  - Adits and drift access to open areas and laboratory spaces
  - Conveyance for general maintenance and material transport at major campuses
- User Support Services
  - Necessary safety training
  - Operations and maintenance staff
  - 24 hour per day emergency response staff
- Utilities:
  - Ventilation, routine (air at ~10 Bq/m^3) and emergency
  - Water management to maintain dry environment
  - Sanitary water system
  - Low conductivity water
  - Waste heat removal
  - Power and lighting, routine and emergency
  - Data communication backbone
- EH&S infrastructure
  - Fire detection and extinguishing systems
  - Emergency exhaust
  - Air monitoring
  - Area isolation systems
  - Refuge stations