AD&I Meeting

CONVENTIONAL FACILITIES AND SITING GROUP

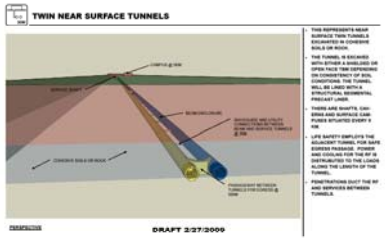
Main Linac Tunnel Configuration Study & Baseline Options

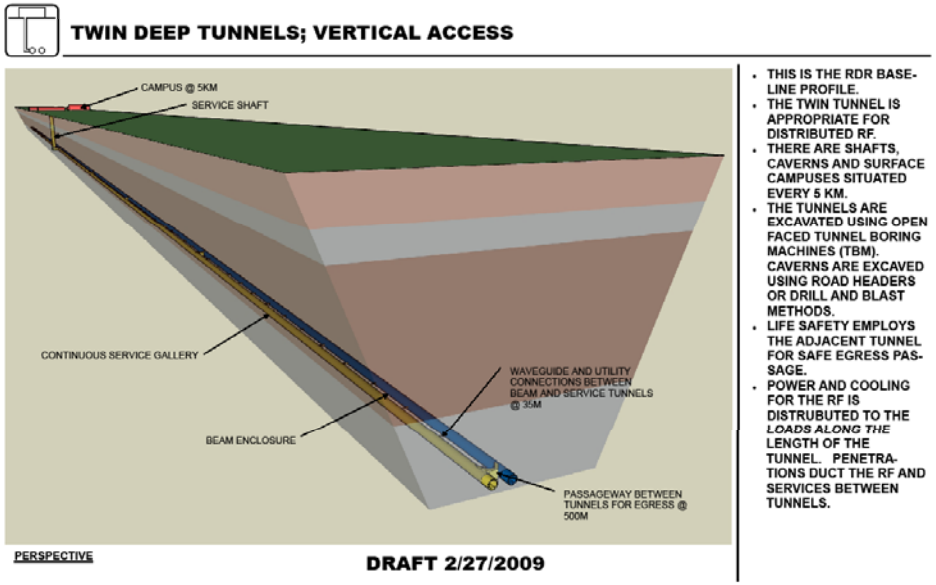
Tom Lackowski

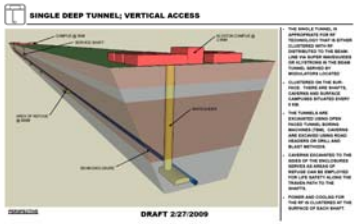
Tunnel Configurations

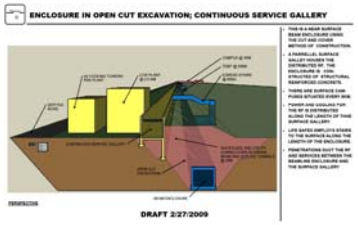
- Development of study configurations
  - The deep twin tunnel arrangement used in the RDR is used as the baseline for functional requirements. Adjustments are made to suit the configuration under study.
  - Configurations have been adapted from the XFEL and Project X Collaborations. Additional configurations have been generated to optimize the requirements of alternative technical arrangements such as the KlyCluster.
  - This study is evaluating both deep tunnel excavation and near surface solutions.

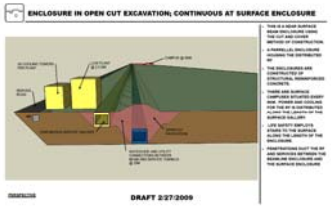
Configurations

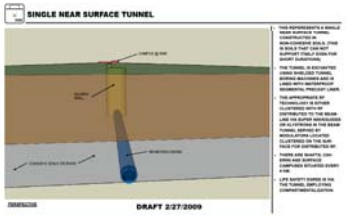






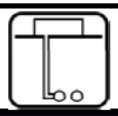
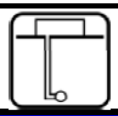
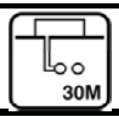
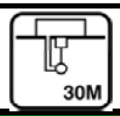
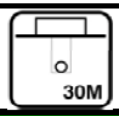
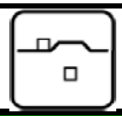






ftp://fess-ftp.fnal.gov/public/ilc/agenda/VE%20Efforts/MAIN%20LINAC%20TUNNEL%20CONFIGURATION%20STUDIES/ilc%20scheme%20%20Feb%2016%202009.pdf

Configuration Matrix

							
	DEEP		NEAR SURFACE				
	Twin Deep Tunnels	Single Deep Tunnel	Twin Near Surface Tunnels	Near Surface Tunnel, at Surface Gallery	Single near Surface Tunnel	Enclosure in Open Cut, Cont. Gallery	Enclosure & Cont. Gallery in Open Cut
EXCAVATION	TBM	TBM	TBM	TBM & OPEN CUT	TBM	OPEN CUT	OPEN CUT
No of TUNNELS	TWO-TUNNEL	ONE-TUNNEL	TWO-TUNNEL	TWO-TUNNELS	ONE-TUNNEL	ONE-TUNNEL	TWO-TUNNELS
SHAFT SOIL	VARIES	VARIES	VARIES	VARIES	SOFT / SLURRY	NA	NA
TUNNEL SOIL	ROCK	ROCK	COHESIVE SOIL or ROCK	COHESIVE SOIL -Low permeability	Saturated Sand & Gravel	SOILS VARIES	SOILS VARIES
SERVICE SPACE	SECOND TUNNEL	SURFACE BUILDINGS	SECOND TUNNEL	CONTINOUS SERVICE GALLERY	AT CAMPUSES	CONTINOUS SERVICE GALLERY	CONTINOUS SERVICE GALLERY
ILC Technology	DISTRIBUED RF	CLUSTERED RF	DISTRIBUED RF	DISTRIBUED RF	CLUSTERED RF	DISTRIBUED RF	DISTRIBUED RF
SIMILAR TO	RDR Sample Sites	RDR & CLIC	RDR	Dubna ILC	XFEL	Project X	Project X
ACCESS	Vertical Shaft	Vertical Shaft	Vertical Shaft	Vertical Shaft	Vertical Shaft	Hatch	Hatch

- ***Electrical power levels remains constant. Clustered RF reduces electrical distribution.***

Unit Assembly Costs

- Deep tunnels, caverns and shaft taken from RDR.
- Open cut excavations, enclosures and surface galleries from Project X.
- Near surface tunnels cost are being generated by consulting Engineer.
- Material costs, labor and equipment rates used are for the Midwest U.S.
- Estimate comparisons are made in common year dollars (2006).

SB 2009 Guidance Impact

- **Single Tunnel solution for the Main Linacs and RTML (WA #2)**
  - **The current Configuration Study contains both twin and single tunnel alternatives. We plan to continue with both twin and single tunnel configurations?**
  - **Klystron Cluster Scheme CF&S implications are understood well enough for the Main Linac study.**
    - **We will need to explore the criteria that will allow for a single tunnel for the central region.**
    - **Need additional effort to value engineer process water and HVAC solutions**
  - **Suggest we add a single tunnel open cut configuration…Clustered RF**

SB 2009 Guidance Impact

What is the role of the near surface studies?

- **Should the new baseline include single tunnel in the Central Region?**
  - **We will need to explore the criteria for technical solutions that will allow for a single tunnel for the central region.**
  - **Explore flexibility of vertical alignment to allow for merging near surface central region with deep Main Linac.**

SB 2009 Guidance Impact

- How should we measure progress on a generic shallow site (as a site concept is moved closer to the surface, we expect surface – related differences to dominate the design).
  - Cost for mitigating surface features will be explored.
  - Criteria for tunnel stability
    - Seasonable movement
    - Ambient Vibration
- Life Safety requirements will be derived from NFPA 520 or reflects recently constructed accelerators complexes that have been accepted by DOE.

Summary

- Hanson Professional Consulting Engineers:
  - Will complete unit costs.
- Fermilab will assemble cost rollups
- Hughes Associates:
  - Perform Life Safety and Exiting Analysis for all configurations.