

# Choice of tunnel concept and excavation method

Joint Rail and Road Project Ringerike Line and E16 Highway (FRE16)

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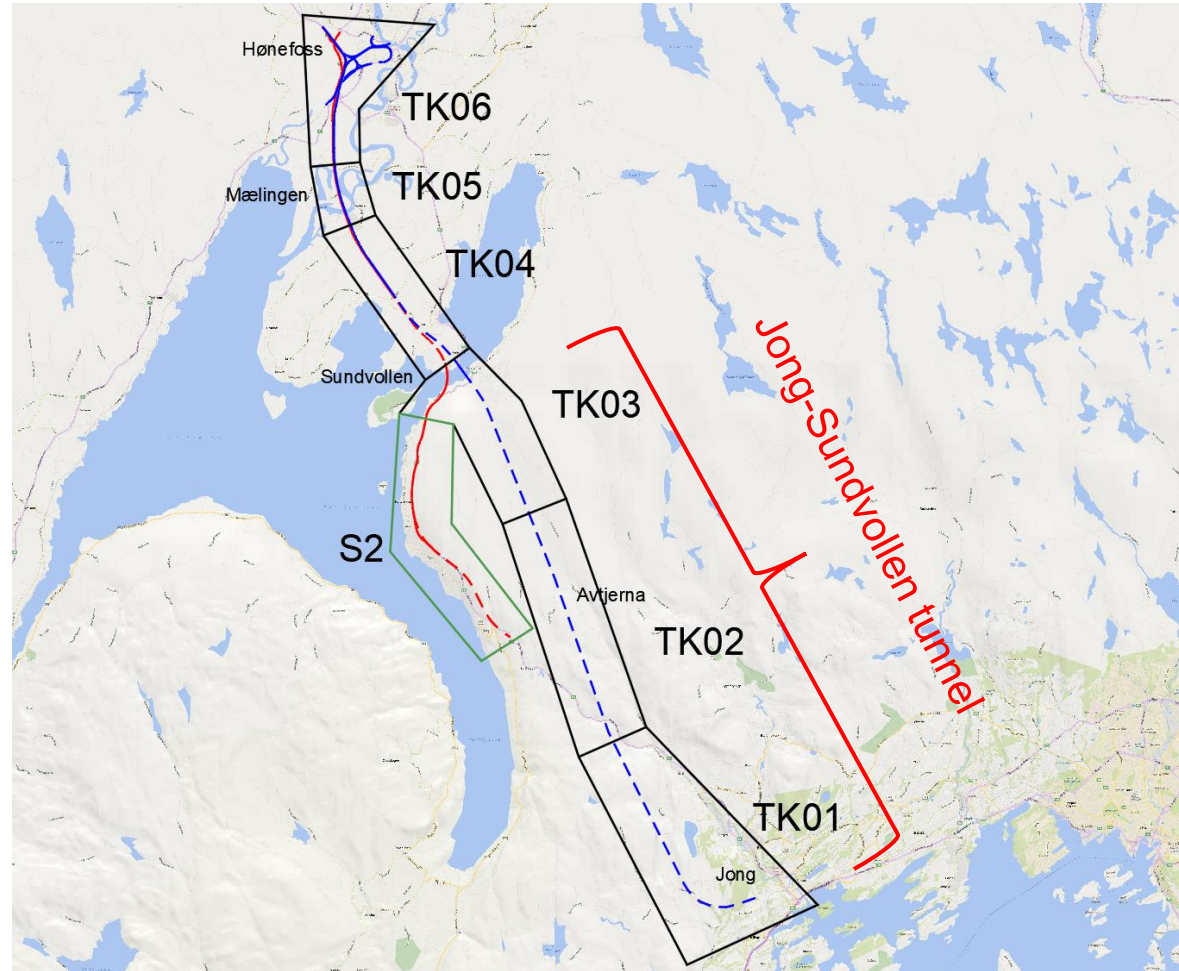
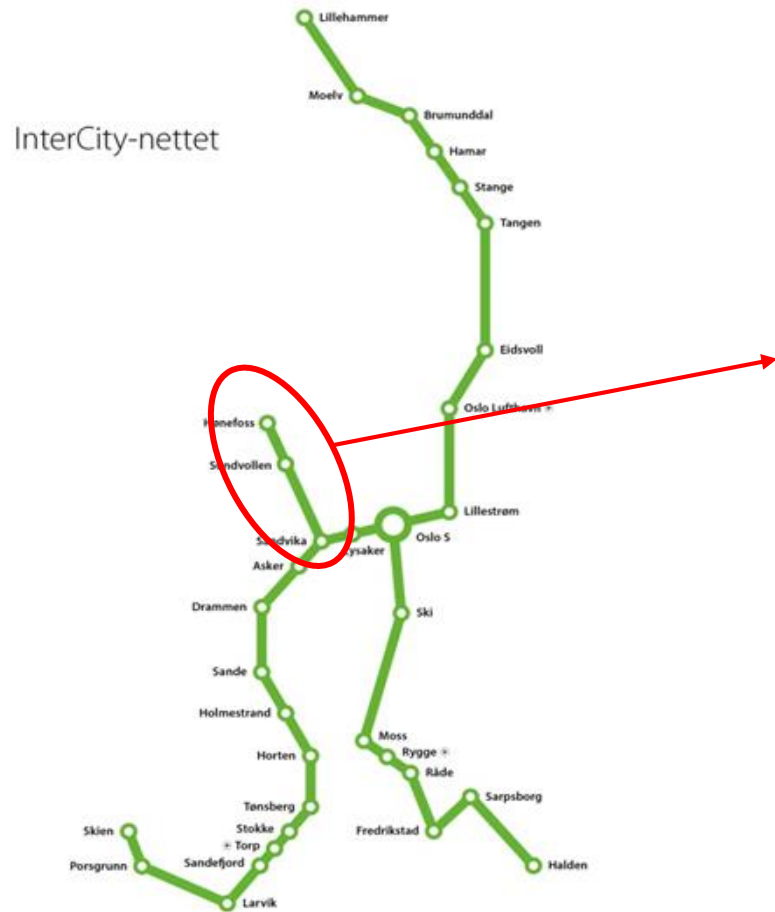
# Agenda

- Joint Rail and Road Project Ringerike Line and E16 Highway (FRE16)
  - Short Project information
  - Timeline Decision processes
- Tunnel Concept
  - General guidelines Bane NOR
  - Decision process FRE16
- Excavation method
  - General guidelines Bane NOR
  - Decision process FRE16

# Project status

- Zoning plan filed for State approval 20th May 2019
- Approval expected Autumn 2019
- Preparation of Invitations to Tender are ongoing
- Extensive geological and geotechnical mapping of ground condition
- Start-up for main preparatory works in 2020/21

# Ringerike Line and E16 Highway



# 23km tunnel from Jong to Sundvollen

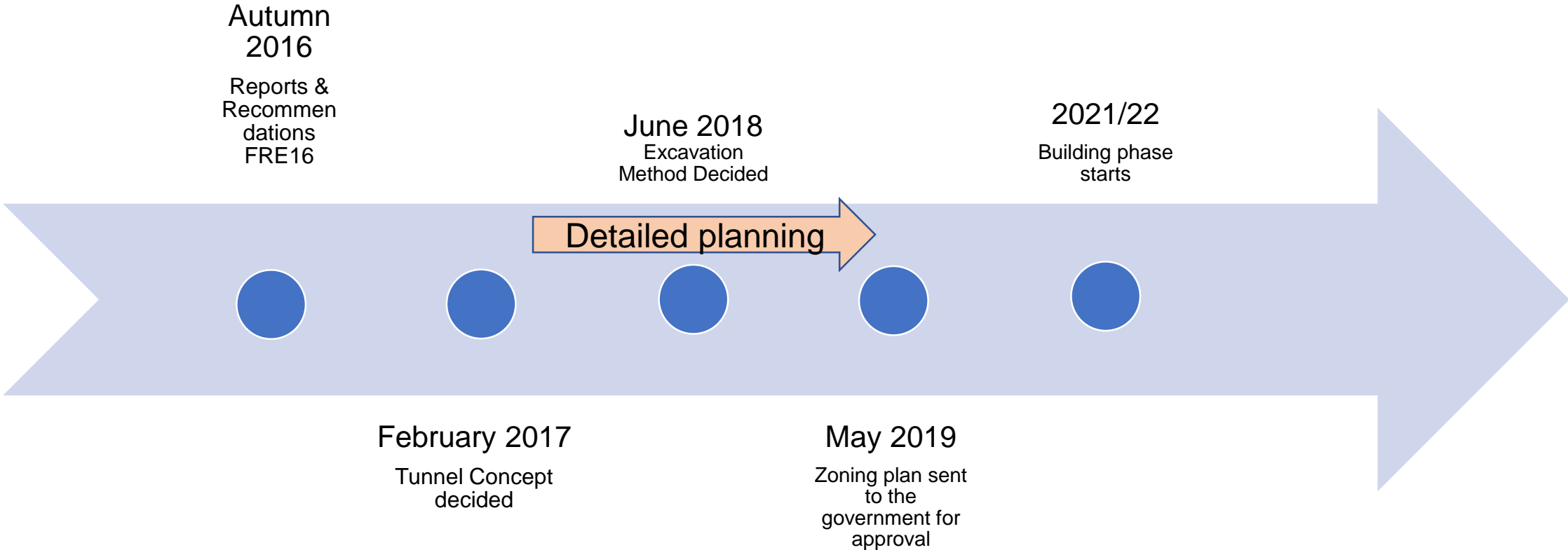
- 4 access points at Jong/Reverud, Nordby, Avtjerna and Sundvolden
- High overburden of up to 350m and through vulnerable nature
- Expected large variations in the rock conditions and water leakage with high water pressure
- Two tunnel-tubes with the possibility to escape from one tunnel tube to the other



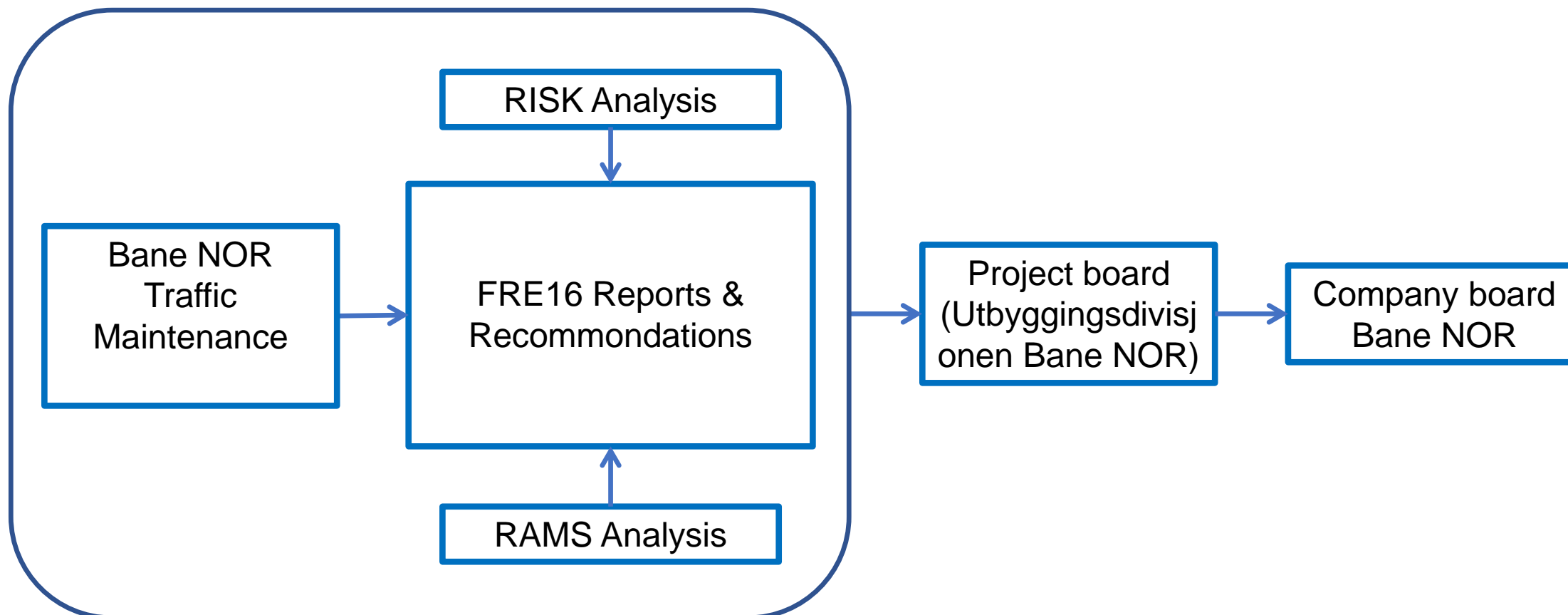


# Decision Timeline

## Tunnel Concept & Excavation Method FRE16

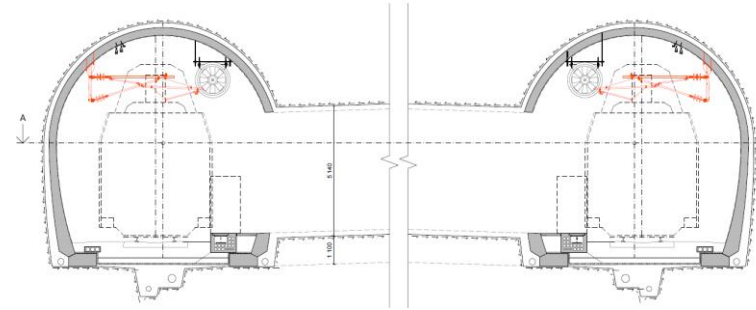


# Decision process – Tunnel Concept

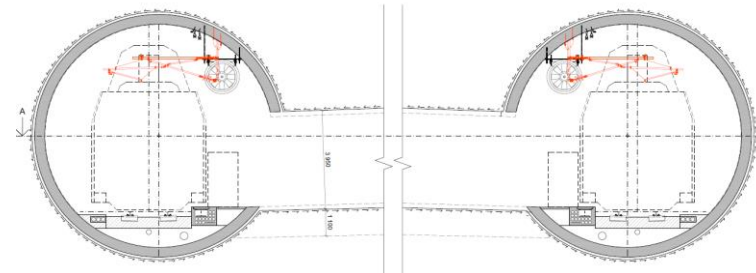


# Tunnel Concepts to be considered

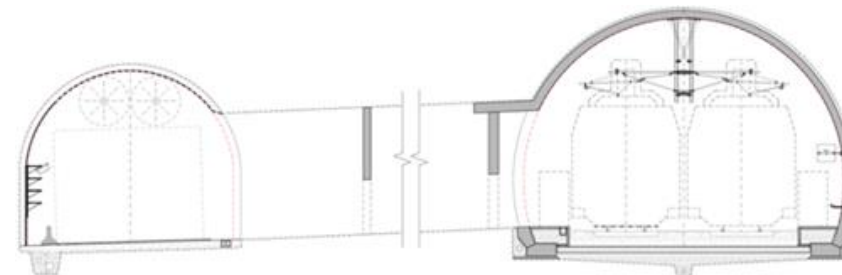
- Two single-track tunnels, Drill & Blast



- Two single-track tunnels, TBM



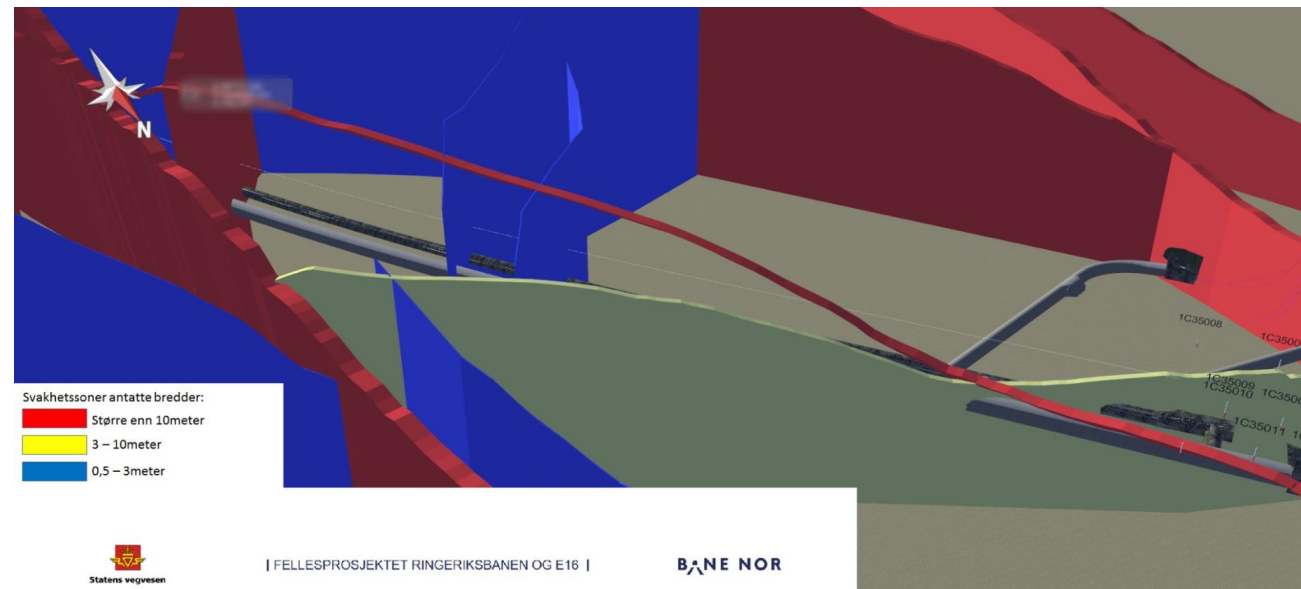
- One double-track tunnel with a parallel escape and service tunnel, Drill & Blast





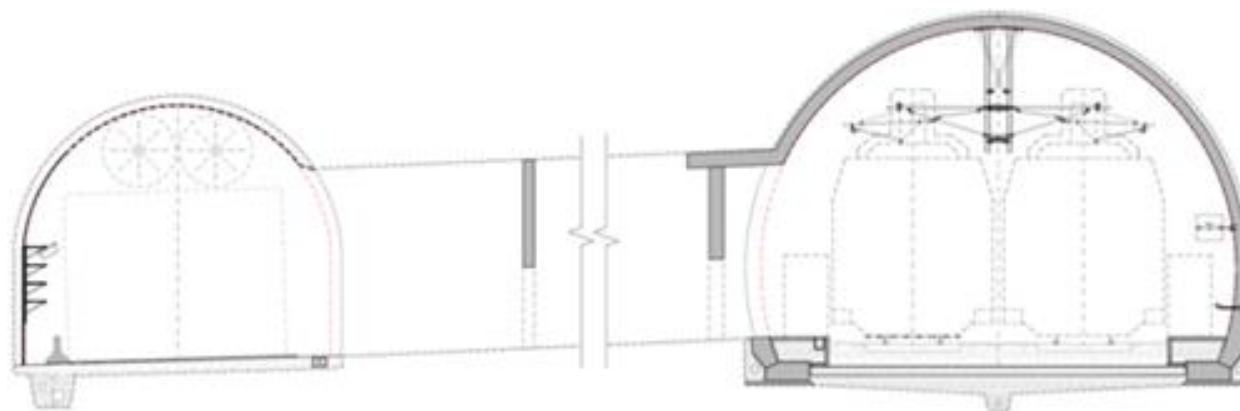
# Tunnel Concepts – Topics to be considered

- Traffic management, operation and maintenance
- Length of the tunnel and access tunnels
- Ground conditions and external impact
- Safety
- Cost
- Schedule and progress
- Excavation method



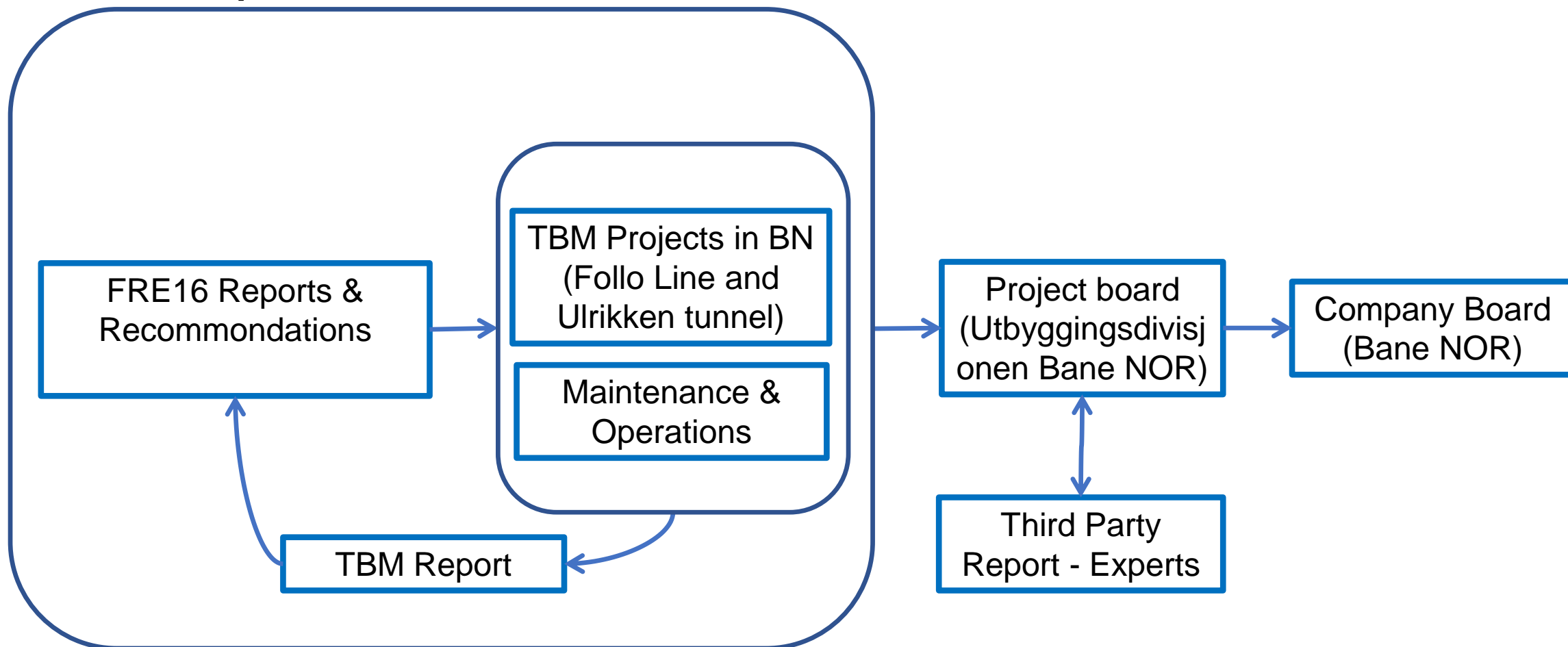
# Tunnel concept for the 23km tunnels from Jong to Sundvollen

- Two tunnels; one double-track tunnel with a parallel escape and service tunnel



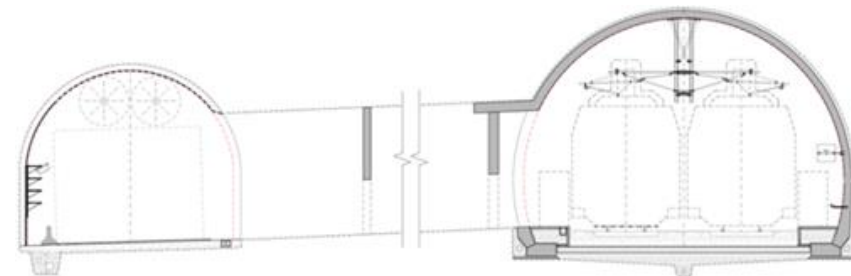
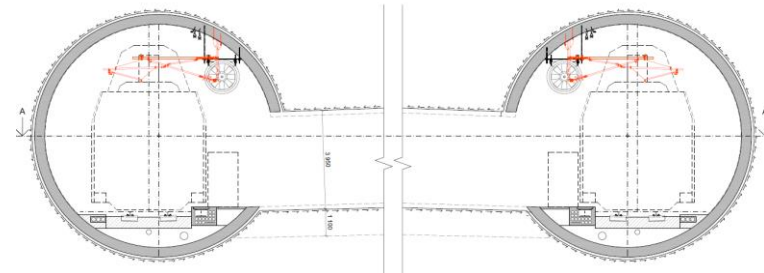
- Operation and maintenance
- Traffic management
- Cost
- Schedule and progress

# Decision process – Excavation Method



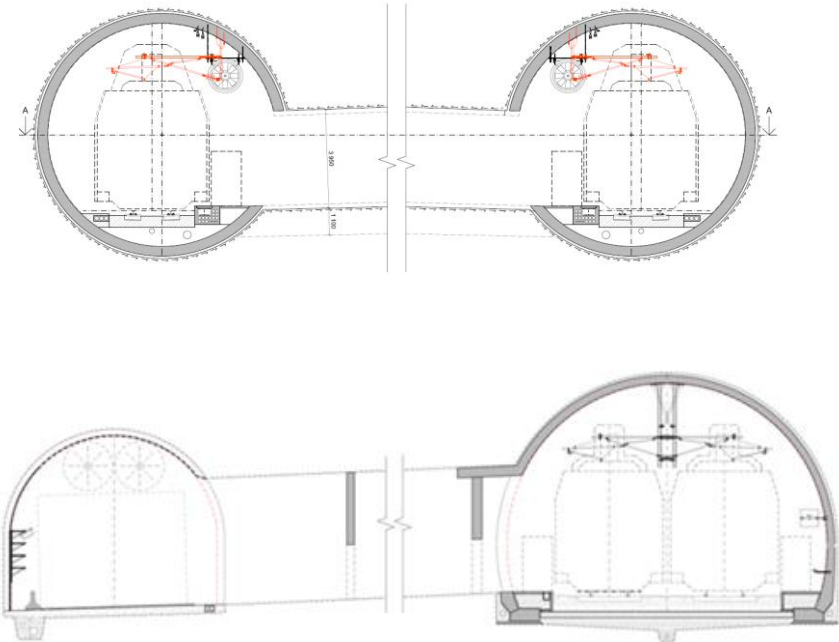
# Excavation methods to be considered

- TBM
  - Two single-track tunnels
  
- Drill & Blast
  - One double-track tunnel with a parallel escape and service tunnel,



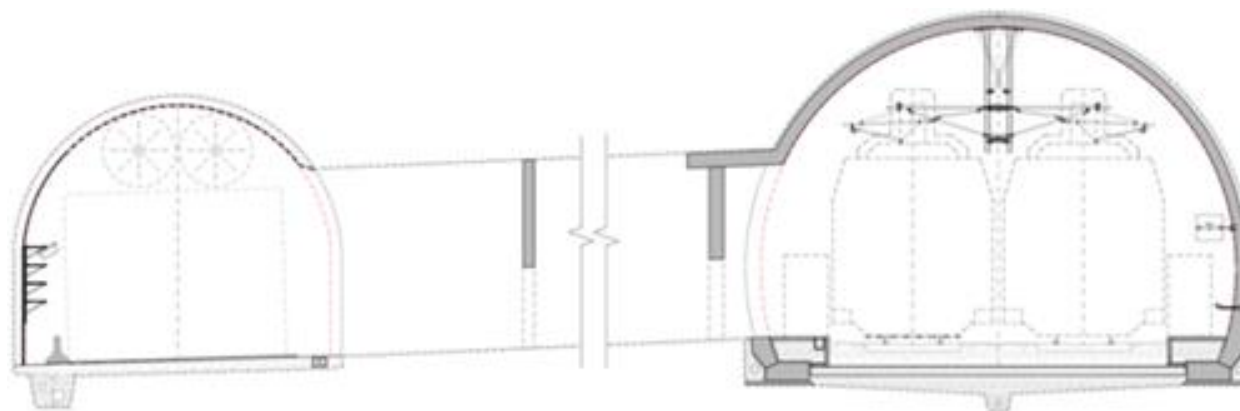
# Excavation method - Topics to be considered

- Investment costs
- Construction time
- Marked
- HSE
- Mass handling
- Climate accounting (CO2) and environment
- Risk assessment



# Tunnel concept for the 23km tunnels from Jong to Sundvollen

- Two tunnels; one double-track tunnel with a parallel escape and service tunnel



- Overall project risk handling



# Closing thoughts

- Every project is different and have to consider which tools is the best to solve the given task
- Risk was an important factor in the decision of excavation method in FRE16
- The project has ongoing work to optimize the chosen tunnel concept
  - The decision allows the project team to narrow the focus



# Ringerike Line and E16 Highway

For project information, please see:

Bane NOR's home page: [www.banenor.no](http://www.banenor.no)

Project home page: [www.banenor.no/prosjekter/prosjekter/RingeriksbanenogE16](http://www.banenor.no/prosjekter/prosjekter/RingeriksbanenogE16)

