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How can the owner optimize a project for TBM?

NFF – TBM Applications III, 4-5. November 2019 Johannes Gollegger



What does the owner need?

- Persons in relevant positions with competence and experience in D&B and TBM
- Persons in relevant positions who are open minded
- Consultants with the knowledge in D&B and TBM

Two principle questions

• Is a TBM feasible / possible?

• Is a TBM beneficial?

Owner's decision

Cross section



Owner's decision

Alignment



⁵ Alignment study Follo Line Project

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Rig area – The Follo Line Project



Original proposal for rig area at Åsland

Rig area – The Follo Line Project



Revised design for rig area at Åsland

Lysbilde 7					
A2	Forfatter; 31.10.2019				
A3	Forfatter; 31.10.2019				

Deposit area – The Follo Line Project



⁸ Basement for a future residential area

Owner's decision

Ground investigation



Sample No. 13 marked BH 836, 106-107 m. Labels indicate sections used for preparation of UCS specimens. Yellow lines indicate sections used for determination of SJ and CAI.

Geological prognosis – Gotthard Base Tunnel - Faido



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System behaviour – Gotthard Base Tunnel - Faido



Actual geology – Gotthard Base Tunnel - Faido



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Changing ground conditions – fault zones



Ground conditions



Ulriken tunnel, Norway

Gotthard Base Tunnel, Switzerland

Tunnel length – longer more beneficial for TBM



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Tunnelkette Perschling, Austria

Vibration limits – D&B not possible Alternatives – TBM or D&S







Sochi – infrastructure for the winter Olympics 2014



Sochi – infrastructure for the winter Olympics 2014

	Rail Tunnel [m]	Road Tunnel [m]	Service Tunnel [m]	Total length [m]
Tunnel Complex T1	2.459	2.292	2.459	7.210
Tunnel T2	121			121
Tunnel Complex T3	4.554	3.169	3.197 / 2.530	13.450
Tunnel T3	449	-	-	449
Tunnel Complex T5	2.842	1.345	2.842	7.029
Tunnel Complex T6	407	-	-	407

General tunneling knowledge



Rock support in Sochi, Russia



Rock support Follo Line, Norway

Nuclear underground deposit – Posiva, Finland

- Dispose 24000 fuel bunddles in "40" years
 - 2000 waste containers
 - 12 bundles in one container
 - target 50 containers a year
 - 20-25 km of deposition tunnel
 - cross-section 14 m^2
 - 10-15 m of deposition tunnels for each container
 - max. tunnel length 350 m \rightarrow 60ish tunnels
 - 2 km of central tunnel
 - cross-section 44 m²
 - 25-40 m of central tunnel for each deposition tunnel

Nuclear underground deposit – layout



Other influencing factors

- Contract model risk sharing
- Contract specifications
- Early involvement of all stakeholders
- Environmental footprint

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Summary

- TBMs can be for many projects a suitable choice
- If TBMs are beneficial / competitive depends on many factors
- Object evaluation by people with knowledge in all considered methods – comparable factors



Thank you!