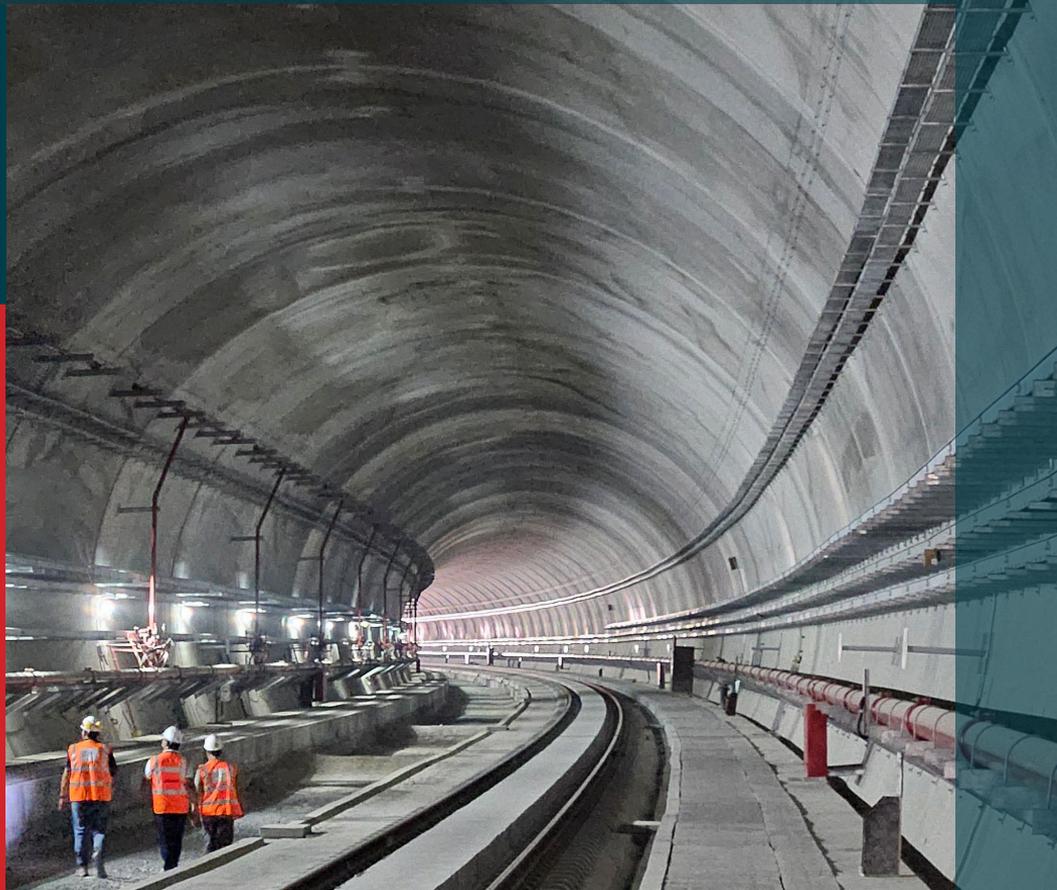


Mardi de l'AFTES – Lyon
José González del Tánago

RETOUR SUR LE CHALLENGE DE LA
CONCEPTION-RÉALISATION DES
9 TUNNELS DE L'EXTENSION
DU RÉSEAU FERROVIAIRE
DES EMIRATS ARABES UNIS
(UAE)

SYSTRA



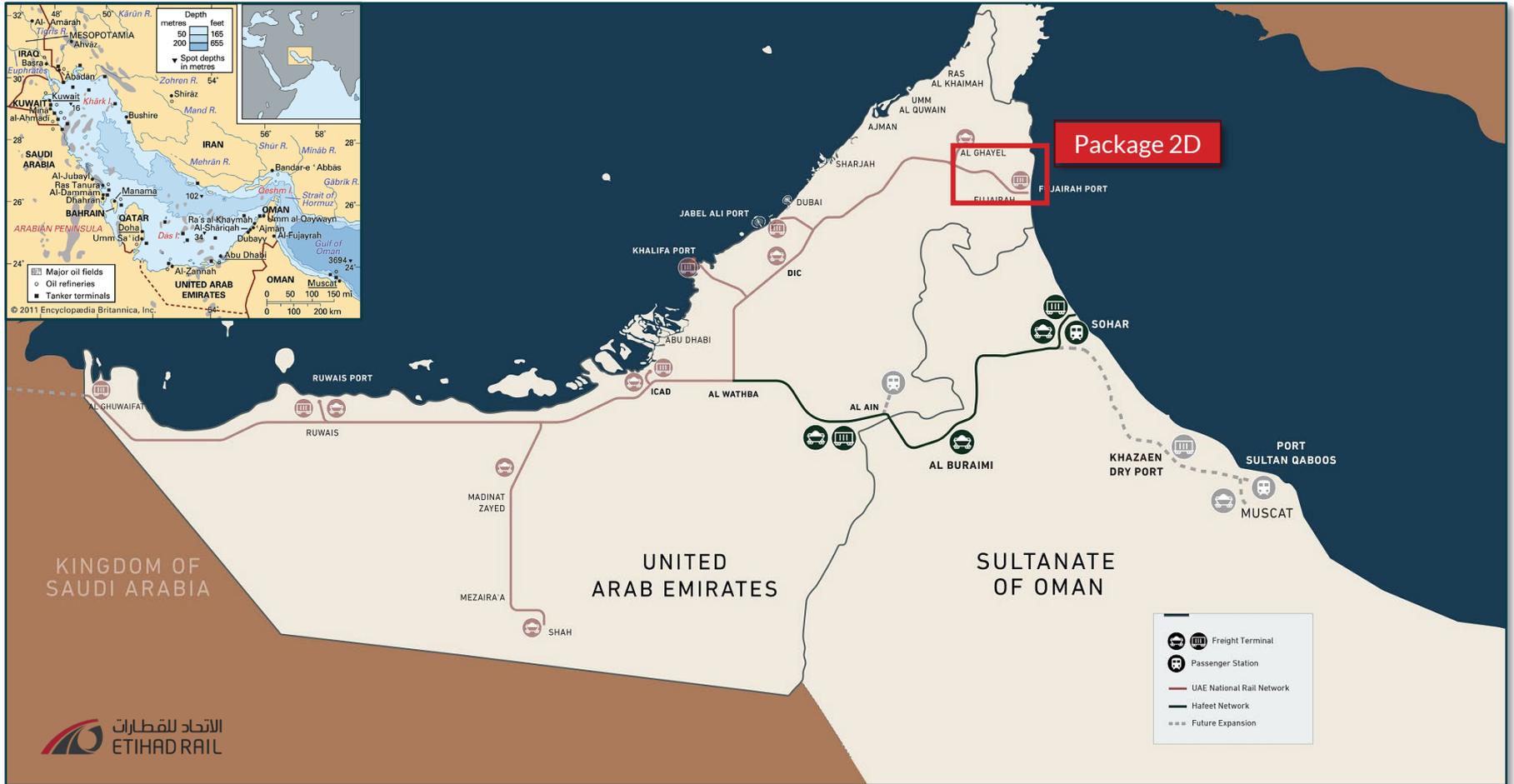
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- 4. Phase 2b** : Conception du portal et stabilité de pentes
- 5. Phase 3** : Control d'ingenierie pendant la construction
- 6. Phase 4** : Drainage, Revêtement et finalisation

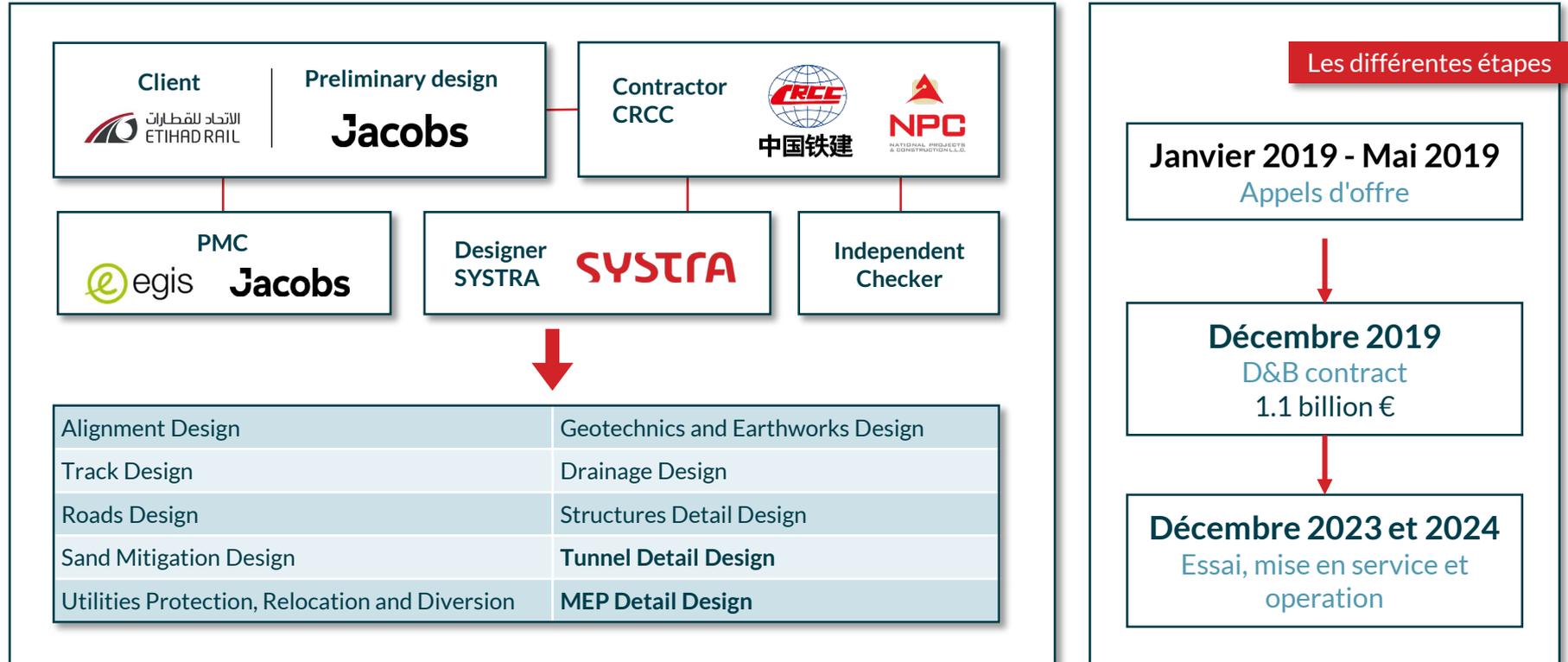


Introduction

Le projet D&B et le contexte ferroviaire des EAU



Les projets conception - réalisation (Design & Build) - étapes





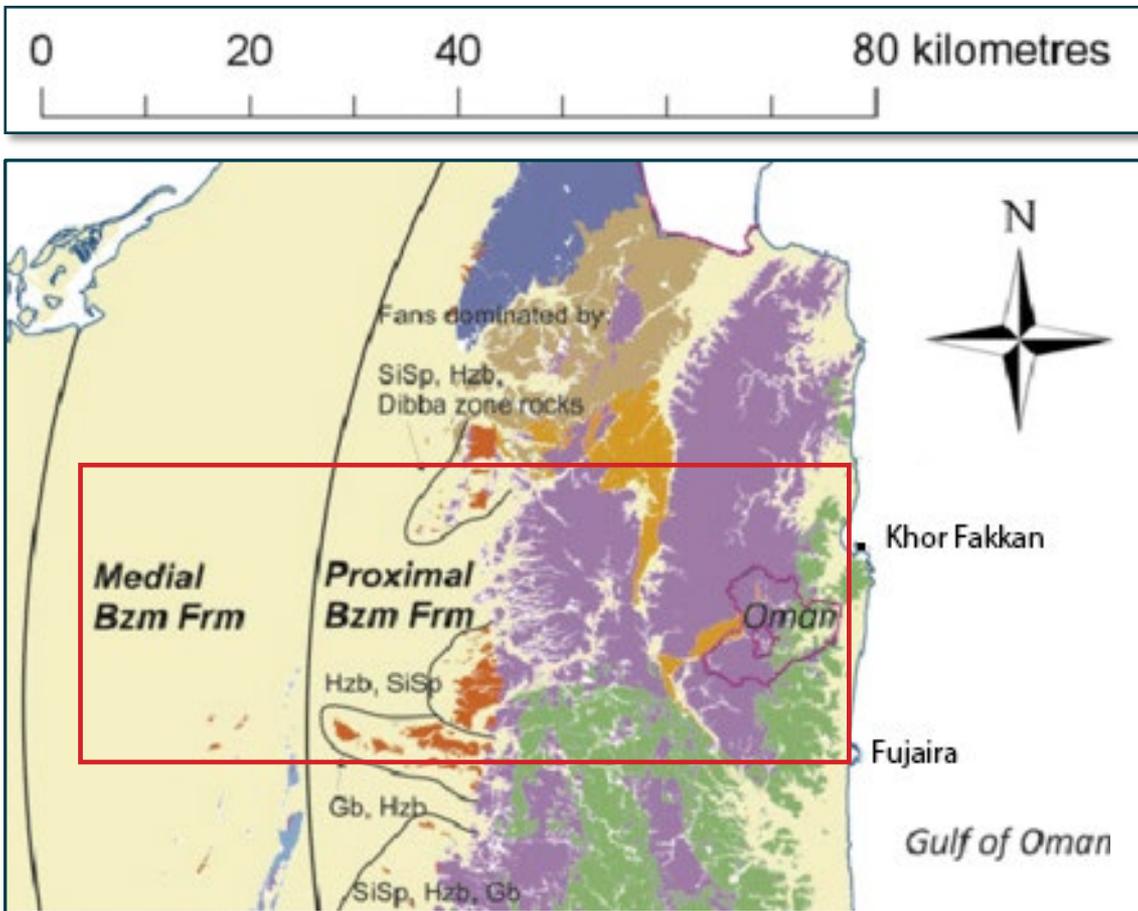
Tunnel	L _{tunnel mined} [m]	L _{tunnel total} [m]
T1	1623	1783
T2	386	406
T3	1259	1279
T6	288	308
T7	1085	1105
T8	273	293
T9	328	348
T10	967	987
T11	323	343
Total 9	6533	6853



Phase 1

Caractérisation géotechnique

Geology 250k





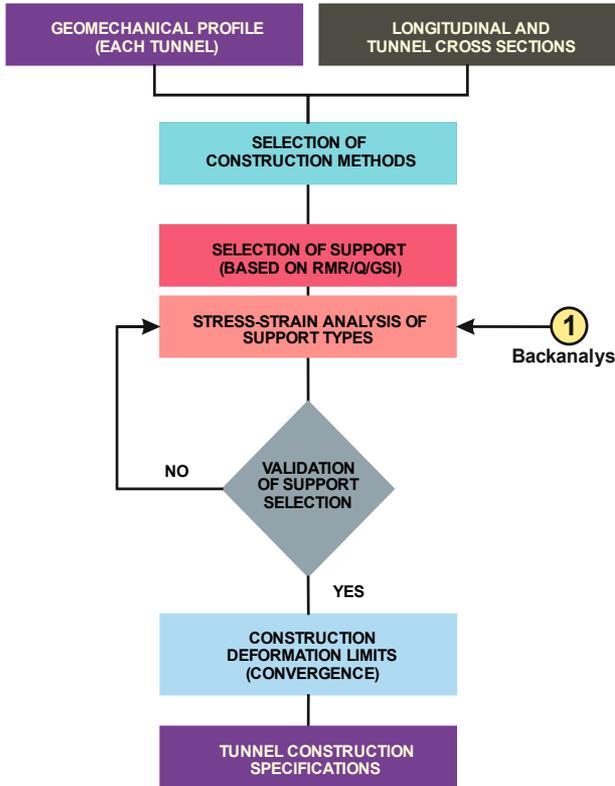
Tunnel	Lithologies found
T-1	Peridotites (Harzburgite, Harzburgite Bleached, Dunite, Mixed Unit)
T-2	Mixed Unit, Fujairah Gabbro
T-3	Harzburgite, Fujairah Gabbro
T-6	Layered Gabbro
T-7 T-8	Fujairah Gabbro, Layered Gabbro
T-9	Fujairah Gabbro
T-10	Fujairah Gabbro, Mirbah Gabbro
T-11	Mirbah Gabbro



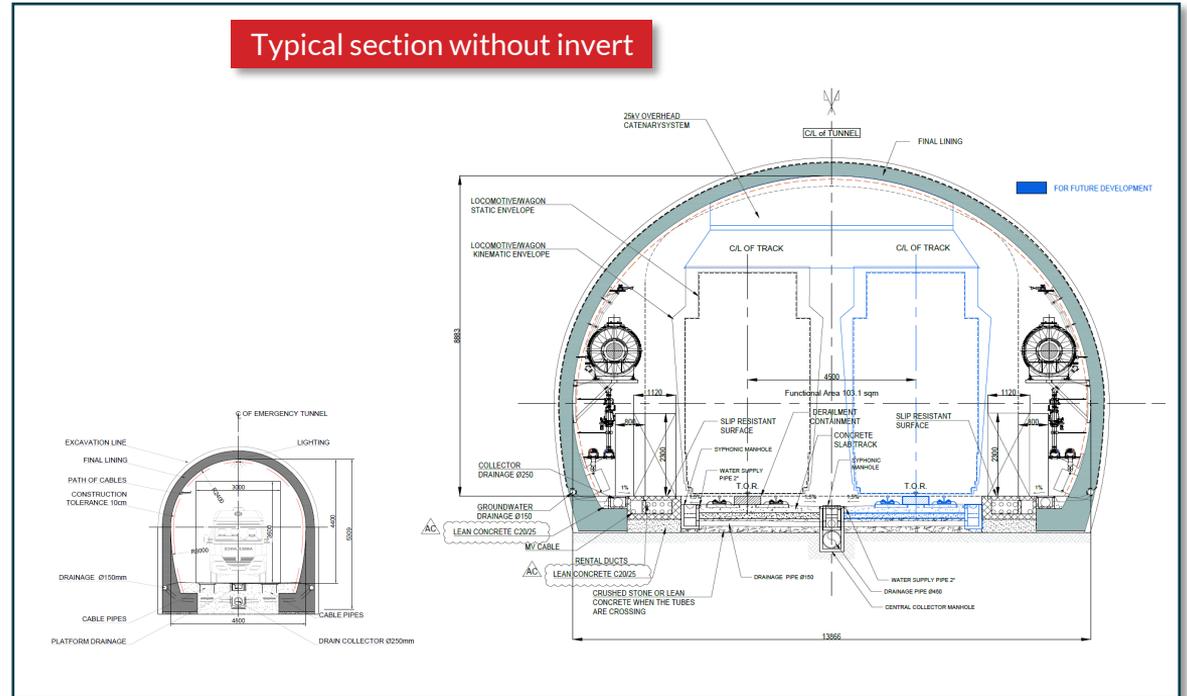


Phase 2a

**Conception du tunnel
(sécurité - structurel)**

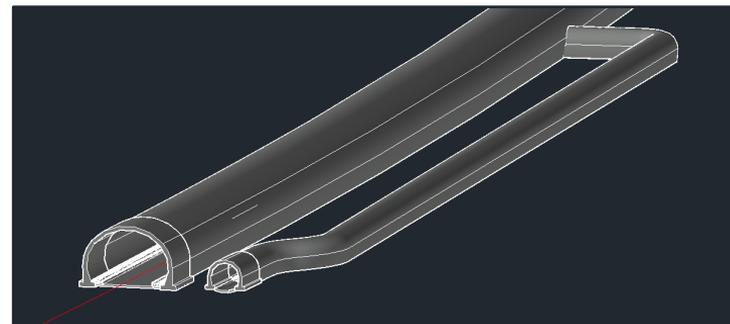
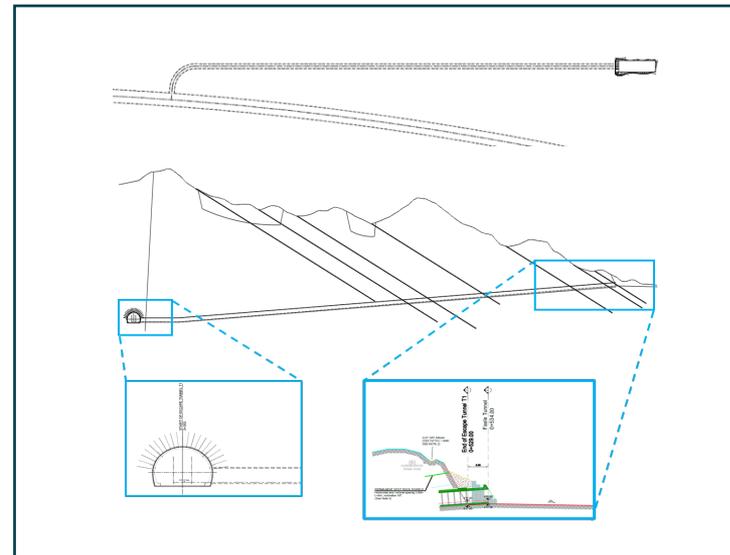
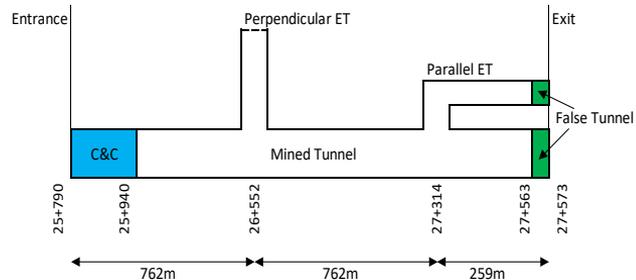


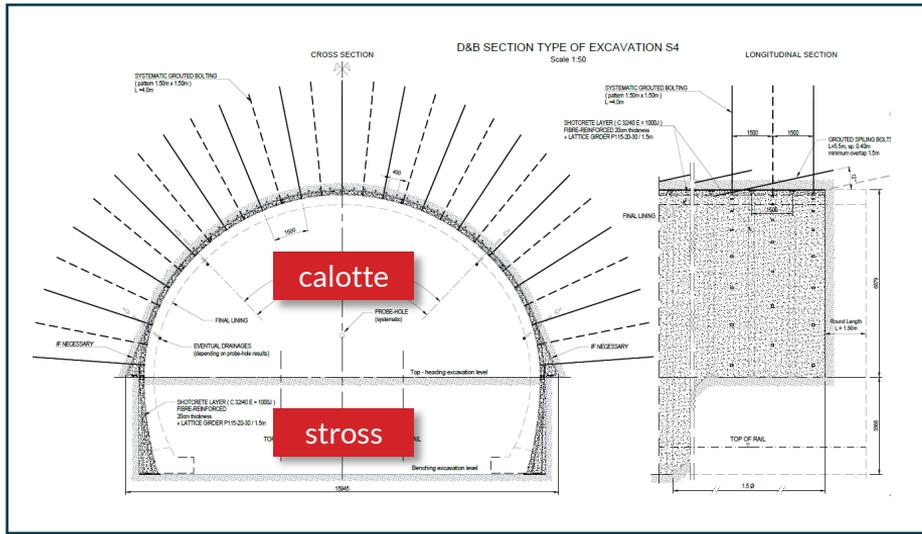
Le trafic de ce secteur est pour **le fret et les voyageurs** avec une section à double voie, une voie en exploitation et une voie en prévision pour l'avenir aussi système de catenaire



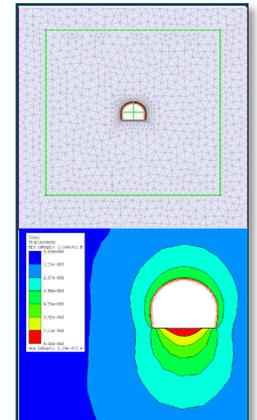
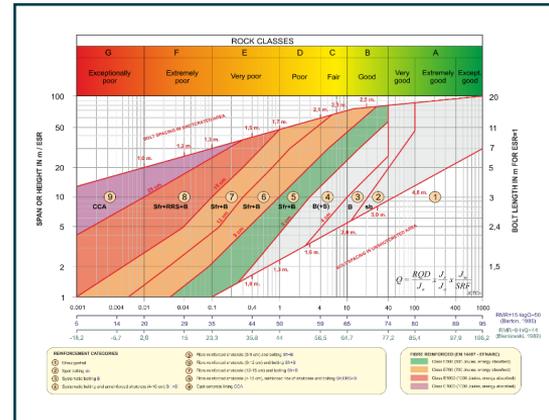
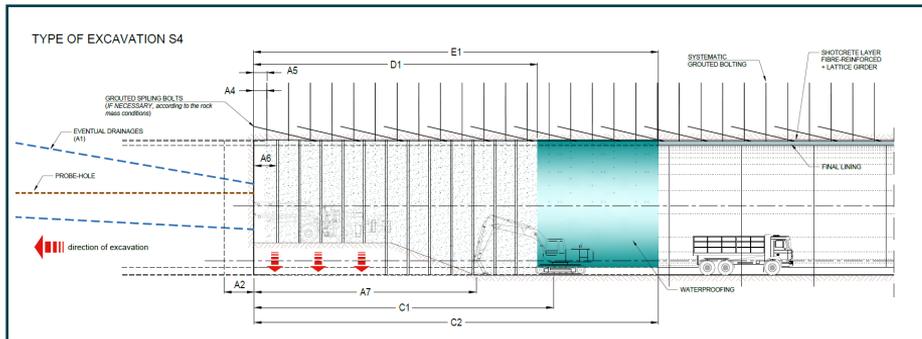
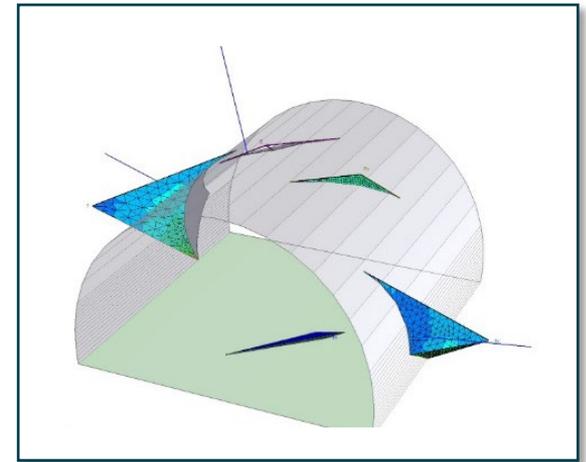
T1 SCHEMATIC LAYOUT

Galerie
perpendiculaire 8%
522 m



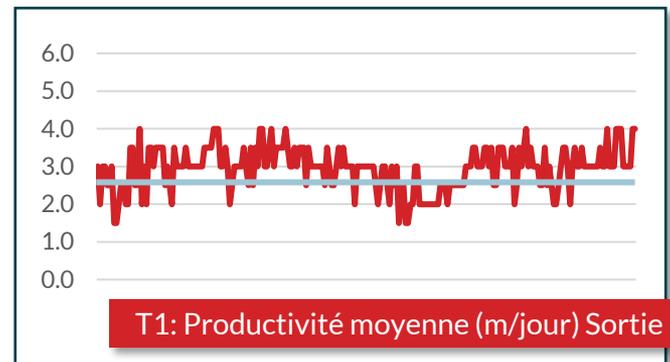
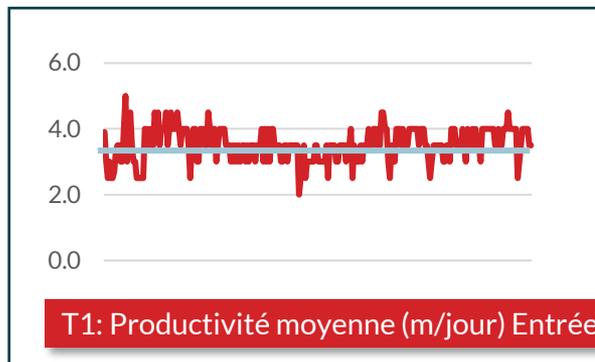
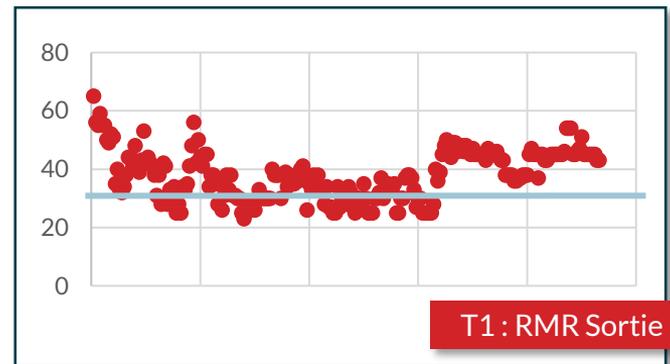
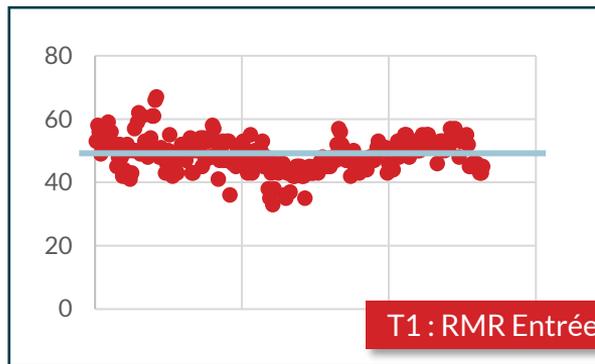


Class	RMR
S1	>80
S2	60-80
S3	40-60
S4	20-40
S5	<20



Construction: productivité moyenne (m/jour)

Tunnel		Productivité moyenne (m/jour)
T1	Main tunnel	3.2
	Escape-1	1.5
	Escape-2	1.2
T2	Main tunnel	2.0
T3	Main tunnel	3.1
	Escape	0.5
T6	Main tunnel	3.2
T7	Main tunnel	3.1
	Escape	1.6
T8	Main tunnel	2.2
T9	Main tunnel	1.8
T10	Main tunnel	3.0
	Escape	1.0
T11	Main tunnel	1.6

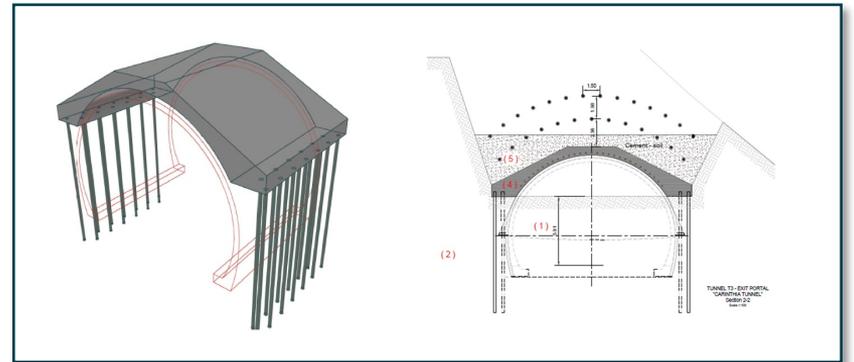
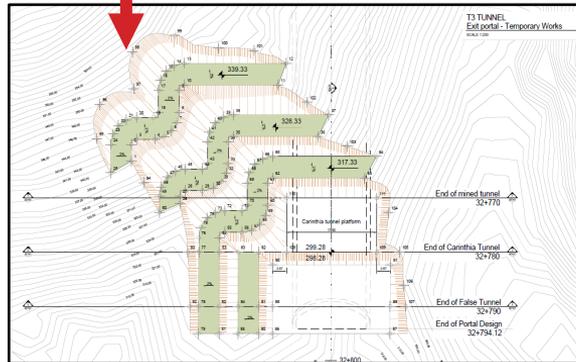
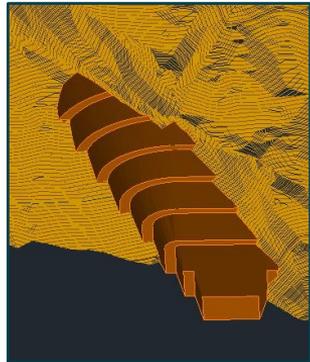
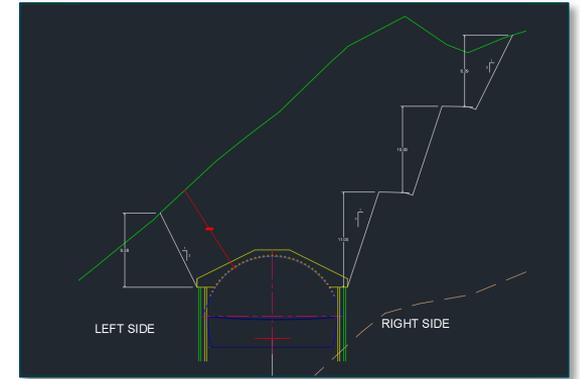
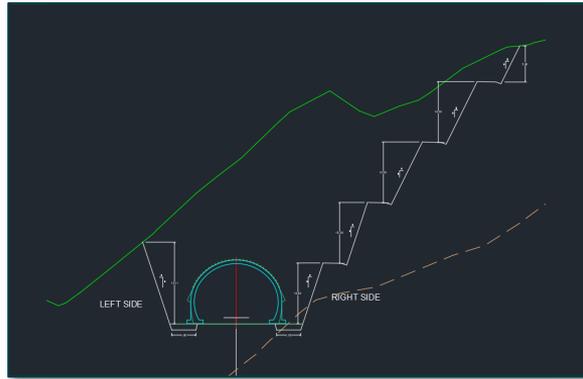
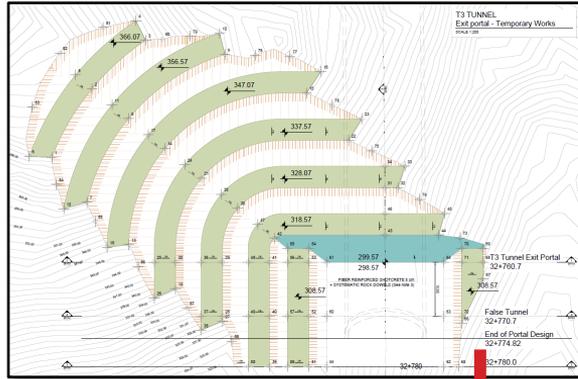




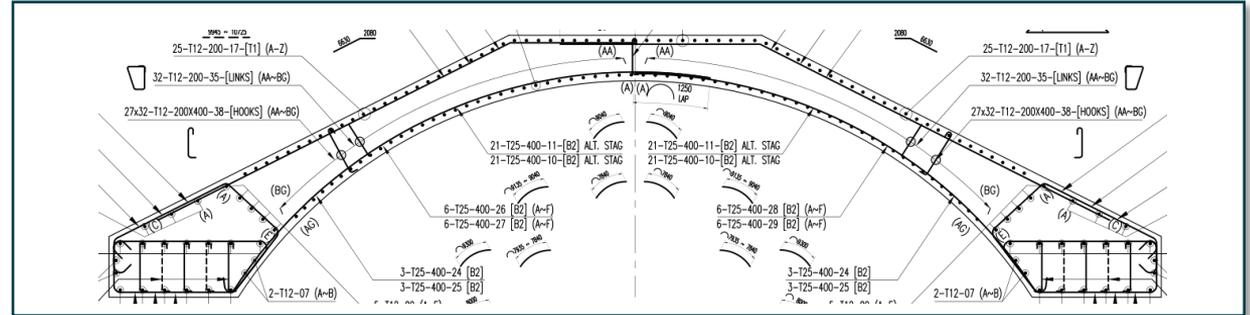
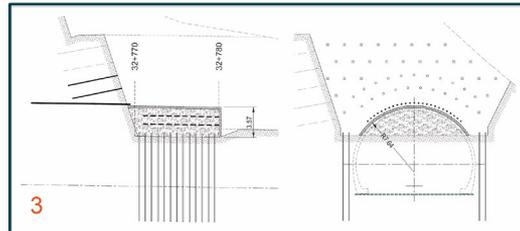
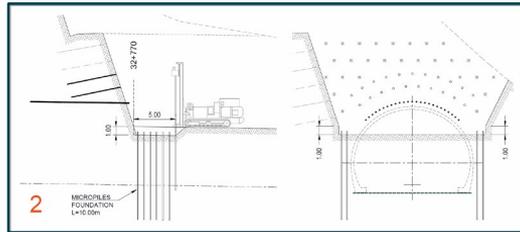
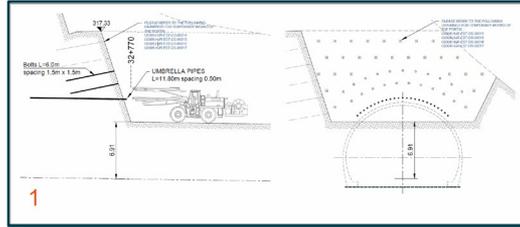
Phase 2b

**Conception du portal
et stabilité de pentes**

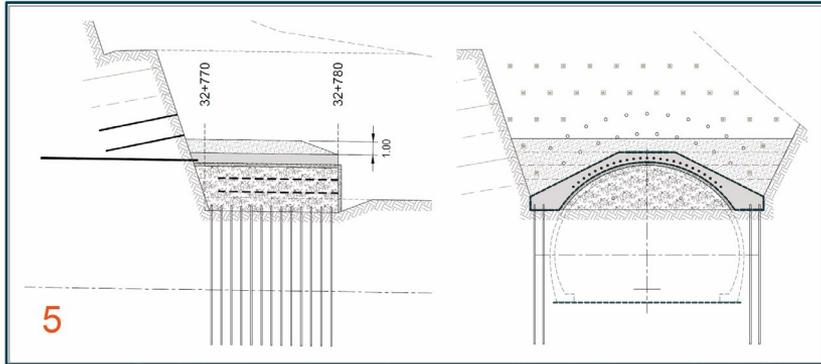
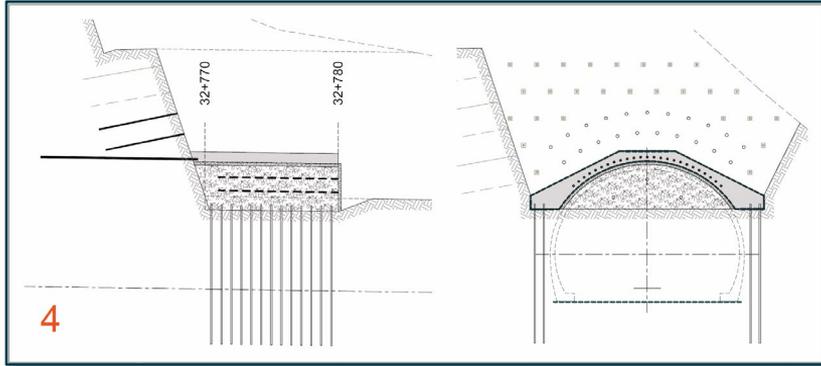
Portail T3 sortie - Méthode Carinthia



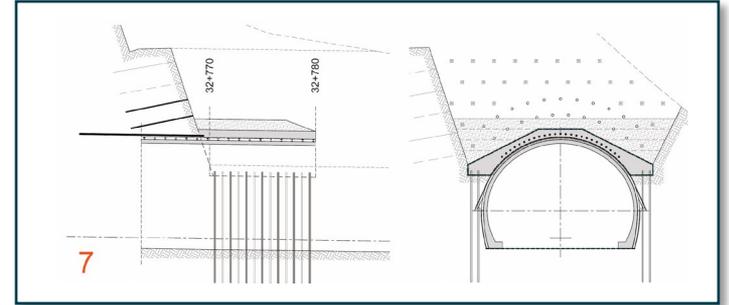
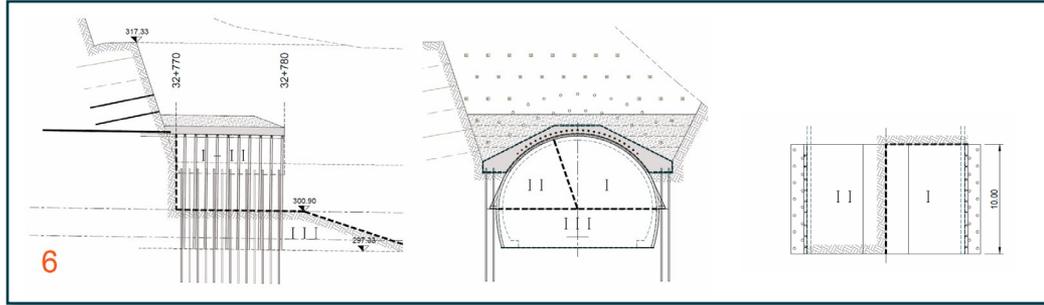
Phases de la méthode Carinthia



Phases de la méthode Carinthia



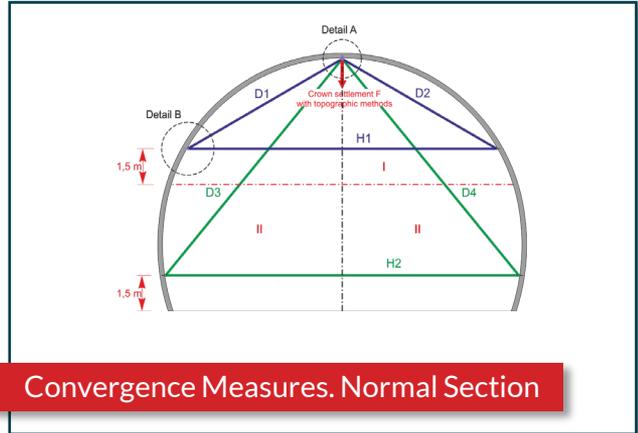
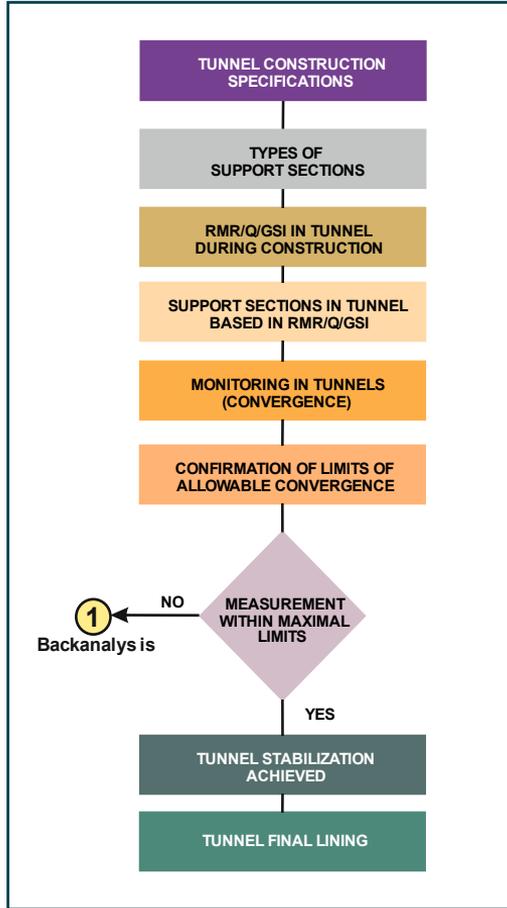
Phases de la méthode Carinthia



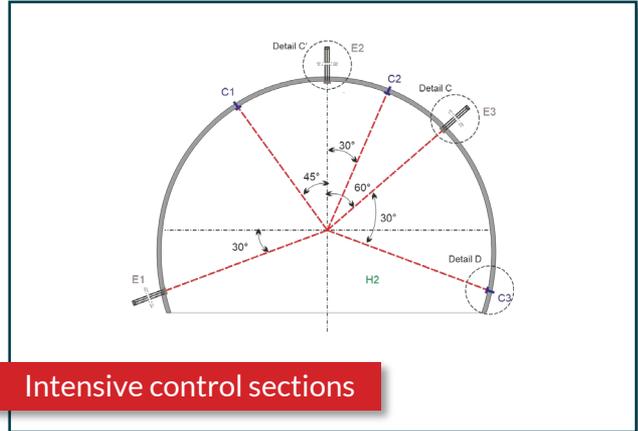


Phase 3

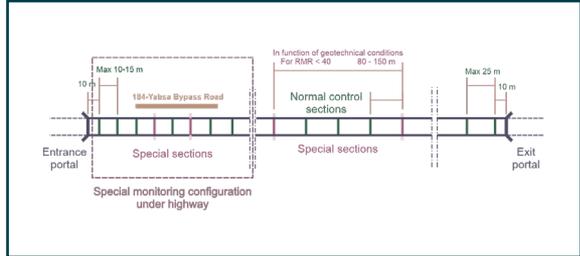
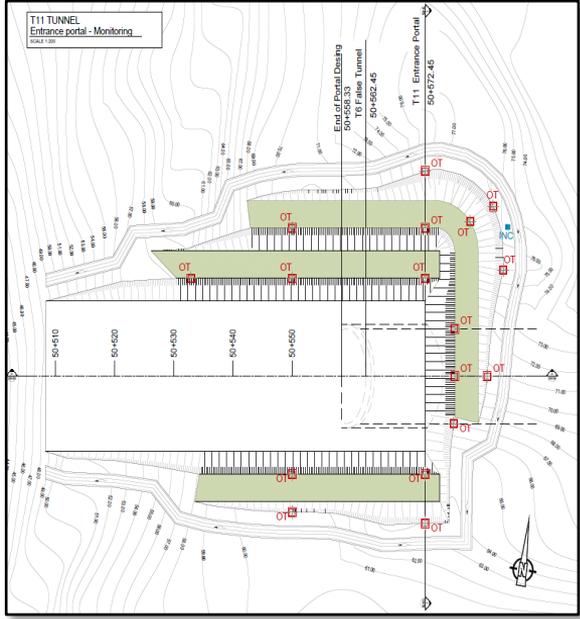
**Control d'ingenierie
pendant la construction**



Convergence Measures. Normal Section



Intensive control sections



Tunnel T11 sous l'autoroute

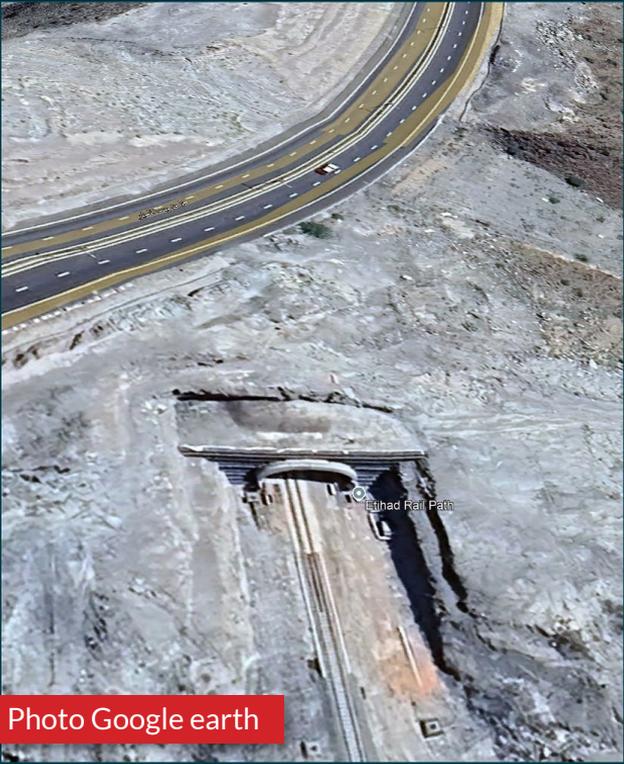
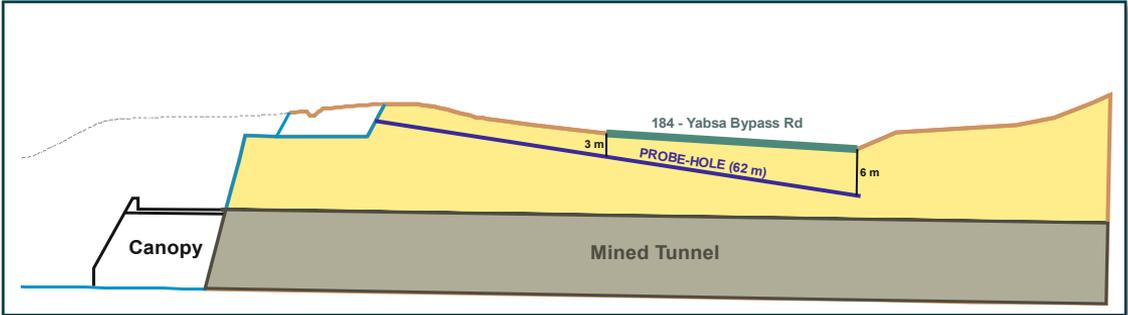
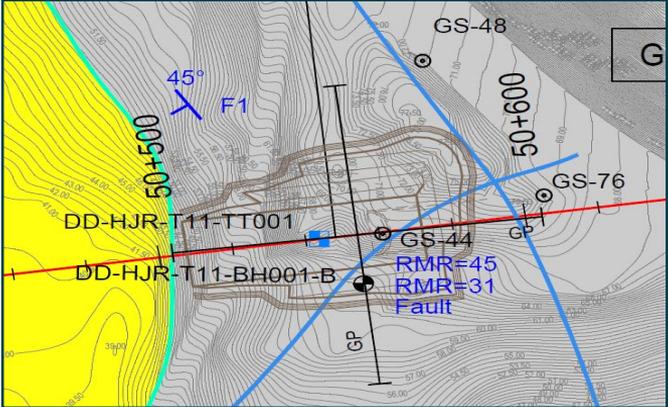
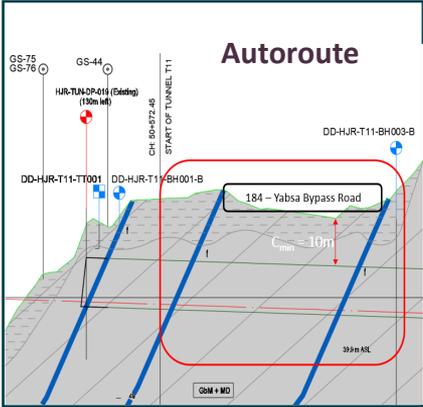
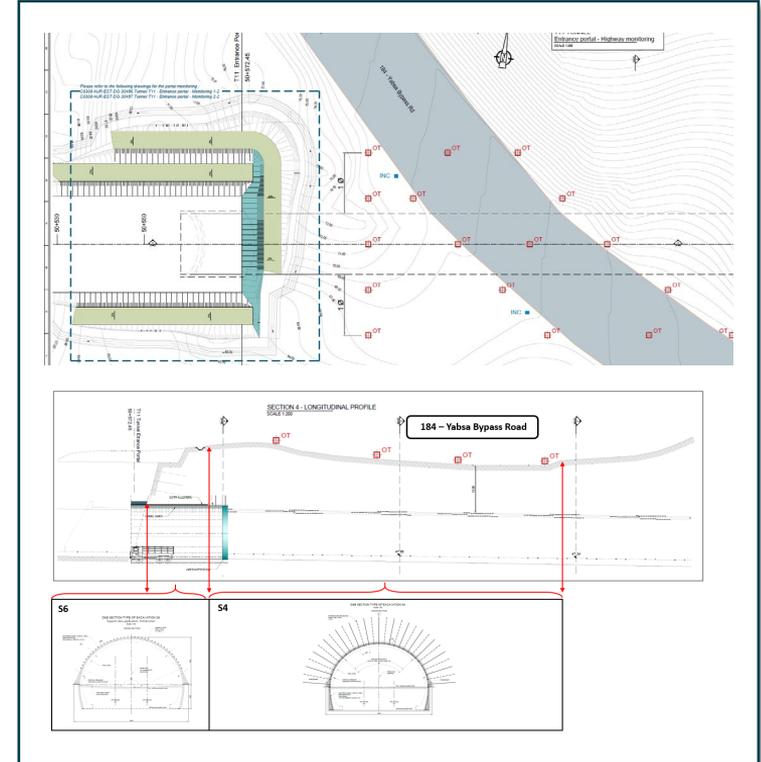
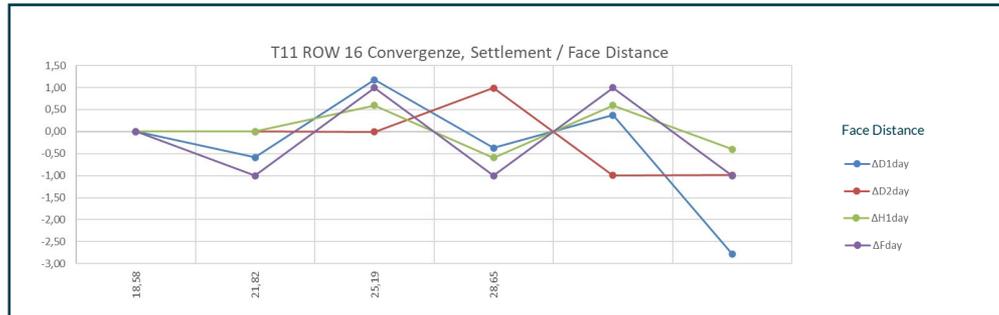


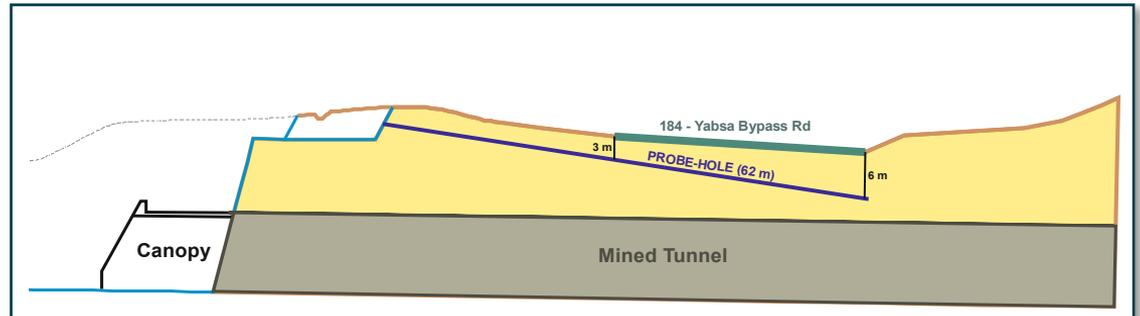
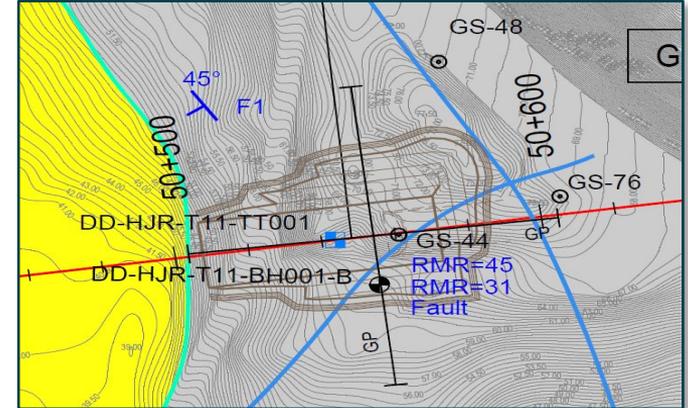
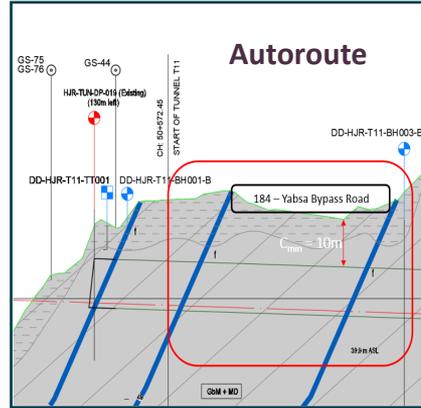
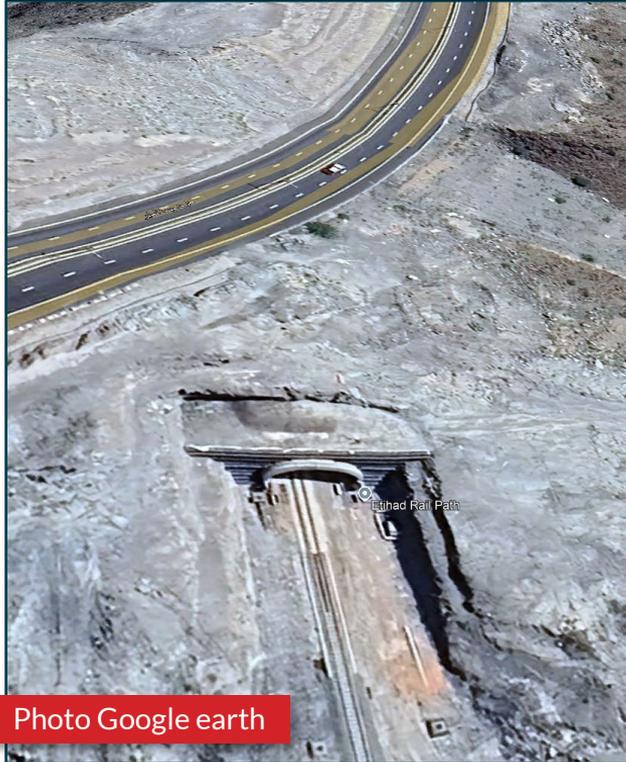
Photo Google earth



Tunnel T11 sous l'autoroute



Tunnel T11 sous l'autoroute

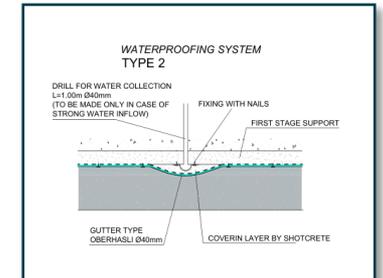
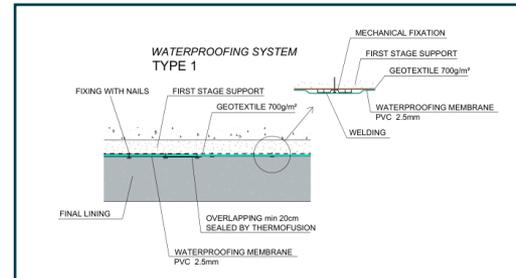
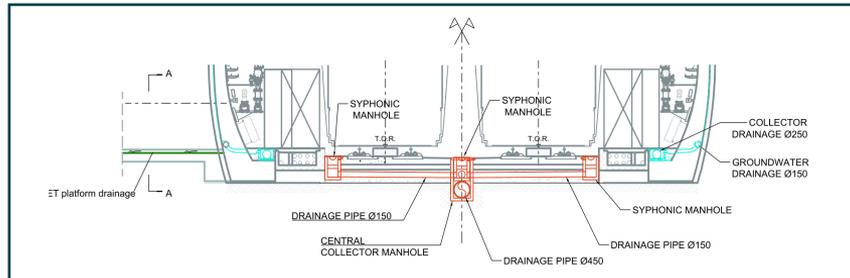
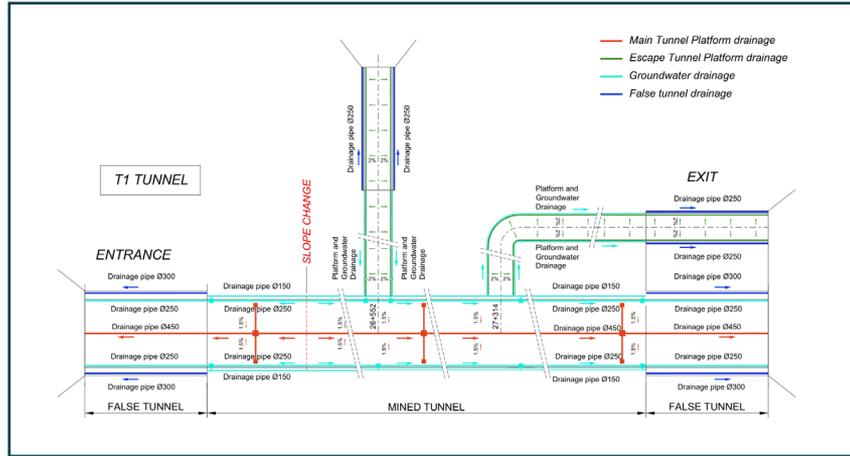




Phase 4

**Drainage, Revêtement
et finalisation**

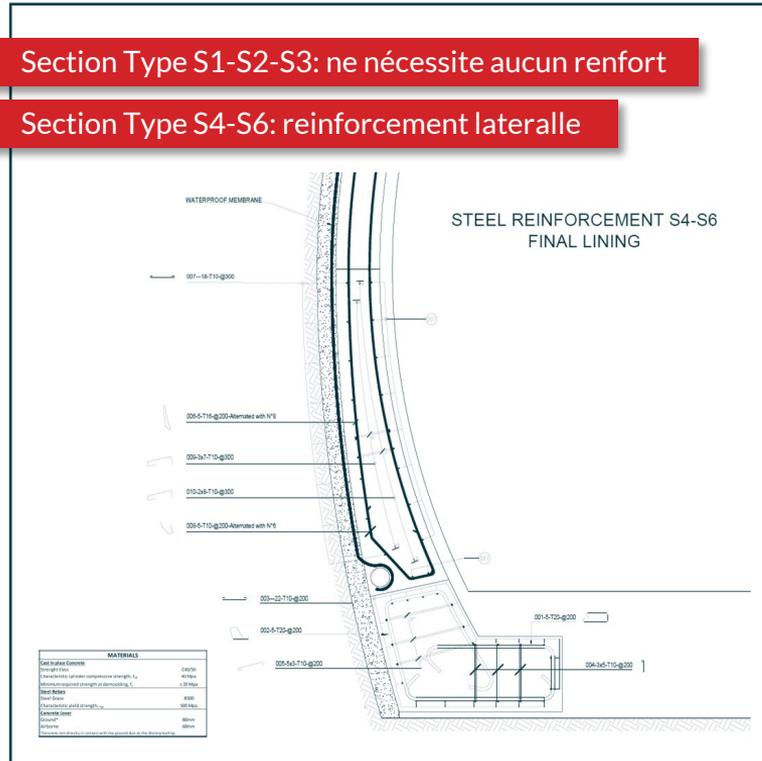
Drainage



Revêtement définitif

Section Type S1-S2-S3: ne nécessite aucun renfort

Section Type S4-S6: renforcement lateralle



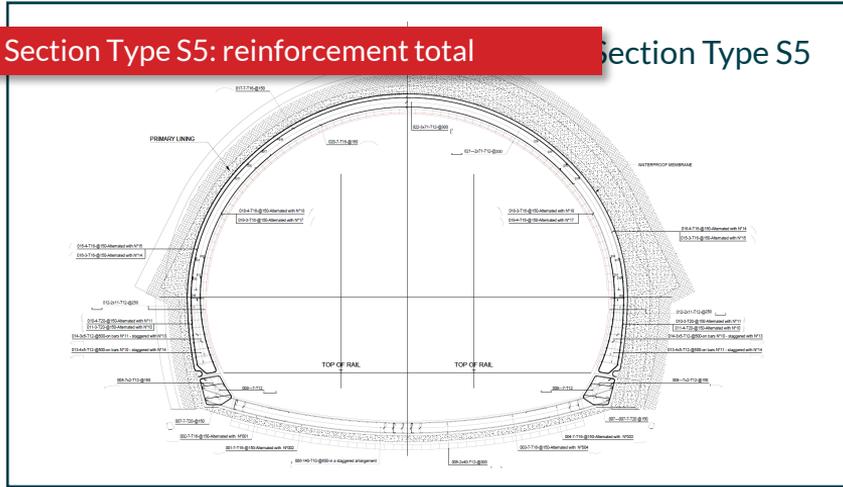
ACTIONS À CONSIDÉRER :

- Poids propre du tunnel (SW) - action permanente G
- Équipement de ligne aérienne (OHLE) - action variable Q
- Ventilateurs (VF) - action permanente G
- Services électromécaniques (S&E) - action permanente G
- Voie sur dalle et autre superstructure inversée (ST) - action permanente G
- Charge du train (EM360) - action variable Q
- Charge de roche (R) - action permanente G
- Retrait (SH) - précontrainte P
- Charge sismique (S) - action accidentelle A
- Explosion (EX) - action accidentelle A
- Déraillement (DE) - action accidentelle A
- Drain bouché (CD) - action accidentelle A
- Charge de feu (spalling) - action accidentelle A

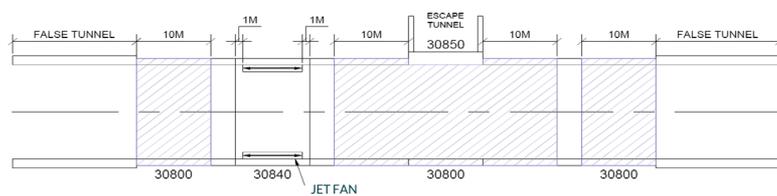
Revêtement définitif

Section Type S5: reinforcement total

Section Type S5



Mandatory use of Full Section Steel Reinforcement in hatched stretches

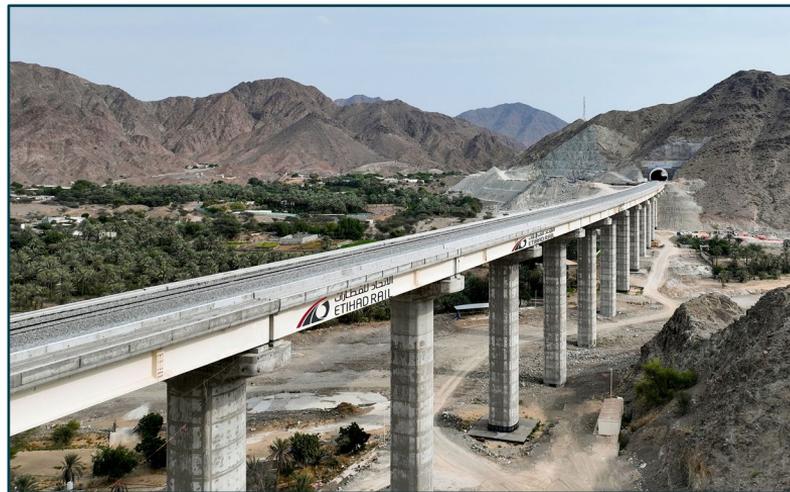




Détachement de blocs en calotte



Tassement « Terramesh » en raison de fortes pluies



SYSTRA



LA CONFIANCE TRANSPORTE LE MONDE