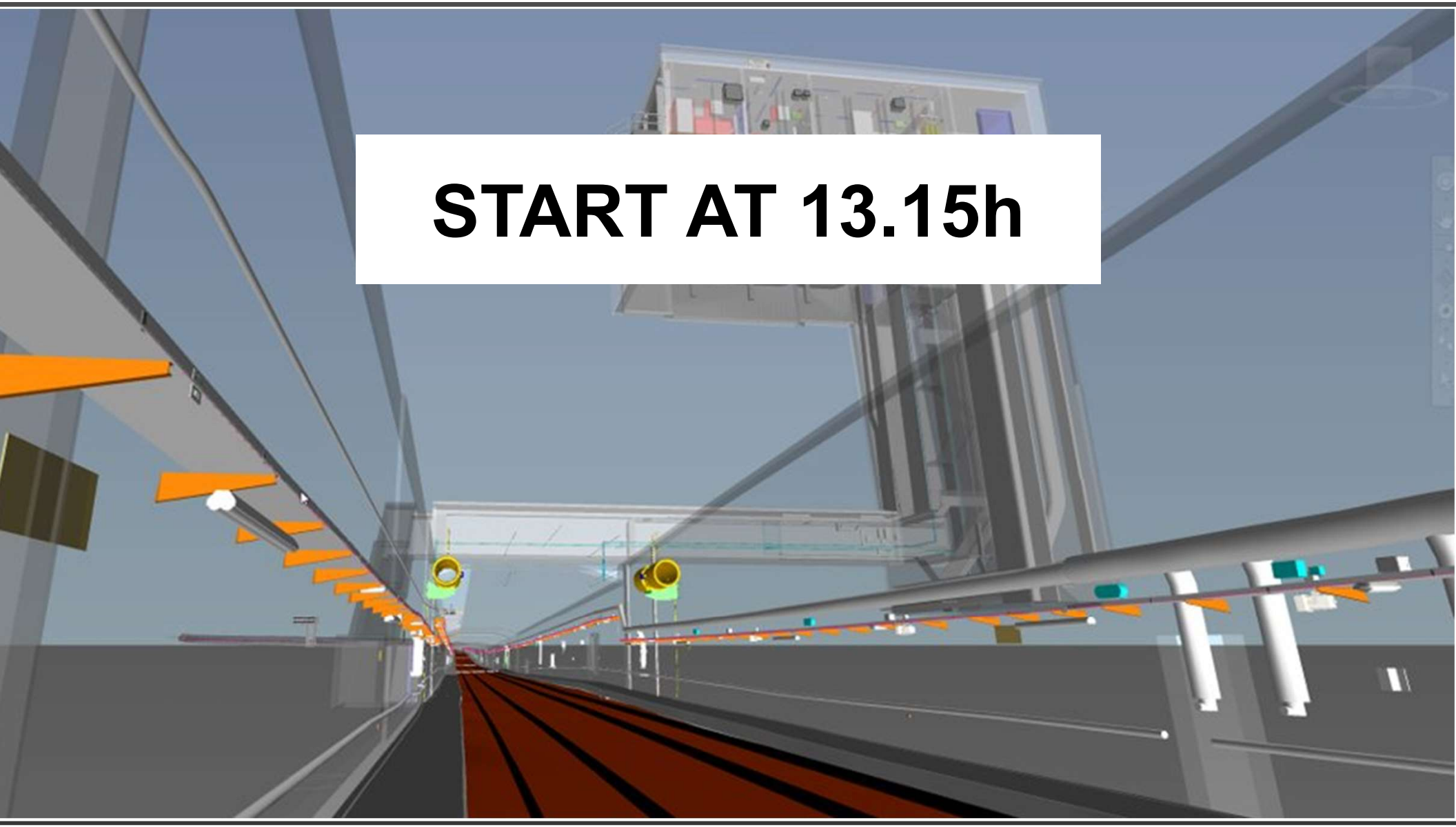
ABTUS BVOTS

Member of ITA-AITES

EUTF EUROPEAN UNDERGROUND & TUNNEL FORUM

Austria • Belgium • France
Germany • Italy • Portugal
Netherlands • Spain • Switzerland

3rd Tunnel Asset Owners Day – Sustainability Day



START AT 13.15h

6th of December 2024

Introduction

13h10 – 13h20

Introduction by Johan Mignon (president ABTUS-BVOTS)

&

by Wouter Casteels (Algemeen manager De Werkvennootschap (host))

Session 1

Vlaanderen is wegen en verkeer	Kris Van Boven
lantis	Filip Slagmulder
DE WERKVENNOOTSCHAP	Joos Dewulf
Wallonie mobilité infrastructures SPW	Amélie Callejon
BRUSSELS MOBILITY BRUSSELS REGIONAL PUBLIC SERVICE	Vincent Thibert (excused)
De Lijn / MIVB STIB / BRUSSELS MOBILITY BRUSSELS REGIONAL PUBLIC SERVICE	Erwin Joris (excused) Didier Delincé
TEC	Mathieu Cleremans (excused)
INFRABEL	Didier Van De Velde (excused)

13h20 – 14h20
Session 1 - Plenary session & debate

chair: Bart De Pauw & Joseph Ickmans

Overview tunnel projects AWV 2025

World Tunnel day, sustainability day
vrijdag 6 december 2024

AGENTSCHAP
WEGEN & VERKEER

wegenenverkeer.be

Overview

- Tunnelplan Vlaanderen
- Projecten 2025

- VTR

Vlaanderen
is wegen en verkeer

Tunnelplan Vlaanderen

Tunnelplan Vlaanderen

Scope

- Tunnels in Flanders;
- > 250 m in length;
- Managed by AWV or temporarily managed by third parties;
- With centralized monitoring, operation, and control.

Doelstellingen

- Bringing the safety and reliability of all tunnels in Flanders up to standard within a ten-year timeframe.
- Implementing professional asset management in accordance with ISO 55001.

Optimal balance

- Improving safety for users;
- Ensuring continuity within the network (mobility);
- Guaranteeing the availability of tunnels and reducing the risks of failure

Tunnelplan Vlaanderen

Totaalrenovaties

#	Tunnel	Basisscenario	Alternatief
1	Beverentunnel (R2)	2023-2024	
2	Vierarmentunnel (R0)	2030-2031	2025
3	Rupeltunnel (A12)	2025-2026	2026-2027
4	Jan De Vos tunnel (A12)	2029-2030	2027-2028
5	Craeybeckx (E19)	2028-2029	2028-2029
6	Waaslandtunnel	2031-2032	2030-2031
7	Bevrijdingstunnel (A12)	2031	2032
8	Tijsmanstunnel (R2)	2027-2028	2030-2031
9	Kennedytunnel (R1)	2032-2033	2032-2033
10	Zelzatetunnel (E34)	2032-2033	2033

Vlaanderen
is wegen en verkeer

Projects

Projects

- 2025
  - in preparation:
    - VIE renovation (tender)
    - RUP renovation (design)
    - JDV extension & renovation (design)
    - WAA, renewal of tunnel ventilation
    - TYS and ZEL, tunnel lighting
    - Various tunnels, high voltage, low voltage, emergency power systems
    - new AID system in various tunnels

  - in progress:
    - CRA, tunnel lighting, tunnel ventilation, high voltage, low voltage
    - RUP, tunnel lighting
    - LEO, renovation
    - BEV, renovation
    - Small interventions regarding tunnel safety in various tunnels.

Vlaanderen
is wegen en verkeer

VLaamse Tunnelrichtlijn (VTR)

Vlaamse Tunnelrichtlijn (VTR)

- Chapters published:
  - overzicht VTR

- Chapters coming (spring 2025):
  - classification en standard equipment
  - Classification, ADR Tunnel Categorization, and Criticality
  - Standard Equipment Packages
  - C200 - Lighting
  - C500 - Firefighting Equipment
  - C400 - Traffic management
  - C600 - Communication
  - Education, Training and Practice

*These timings are target objectives and purely indicative

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World Tunnel Day & 3rd Asset Owners day

Brussels - 06/12/2024

Lantis will be future owner of 6 tunnels as part of the Oosterweellink project

Six tunnels with a total lenght of approx. 10km, in total 25km of tubes.

- Schelde tunnel (TSCT)
- Kanaalzone tunnel boven (TKZB)
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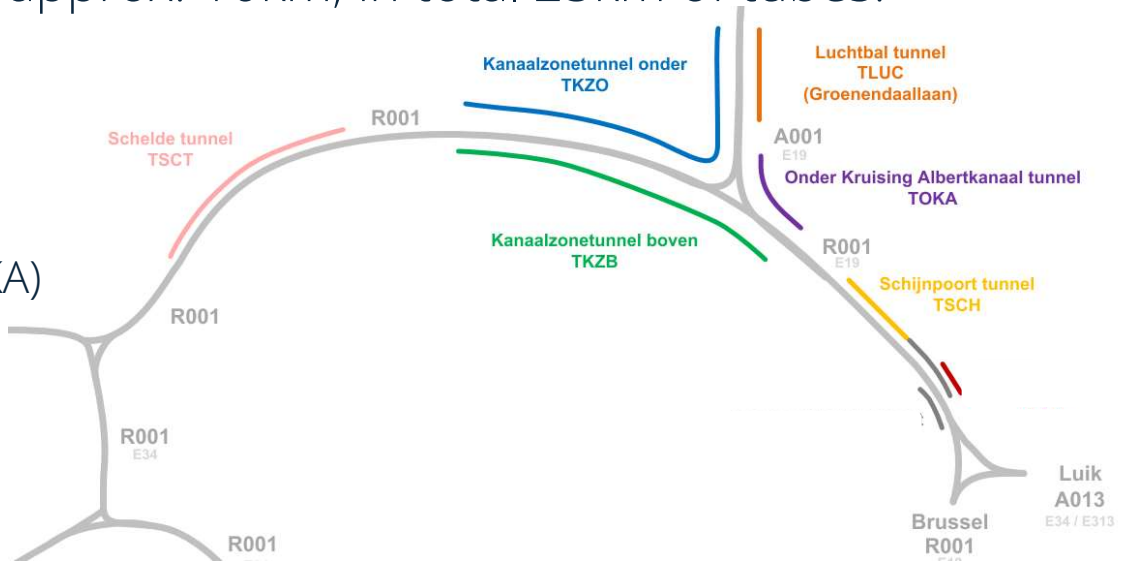
- Luchtbal tunnel (TLUC)
- Schijnpoort tunnel (TSCH)



Liefkenshoektunnel is operated by nv Tunnel Liefkenshoek, a subsidiary of Lantis.

lantis bouwen aan verbinding

Stacked Tunnels under the Canal

Oosterweel-Scheldetunnel

Extra Scheldt crossing capacity

2x3 Lanes

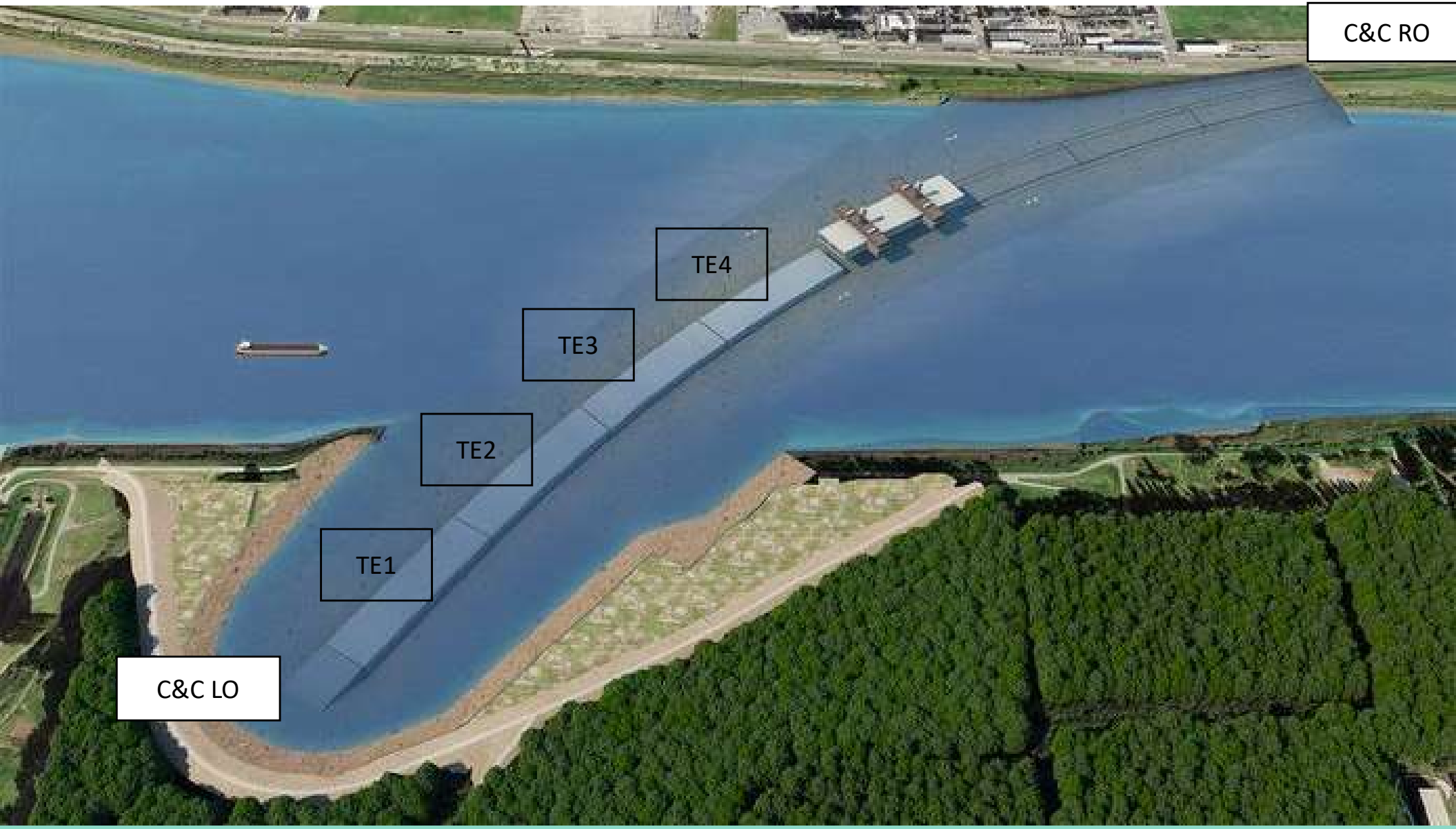
Length: 1,8 km

Immersed tunnel elements (8)

Elements built in Zeebrugge

Six meter wide bike tube

lantis bouwen aan verbinding

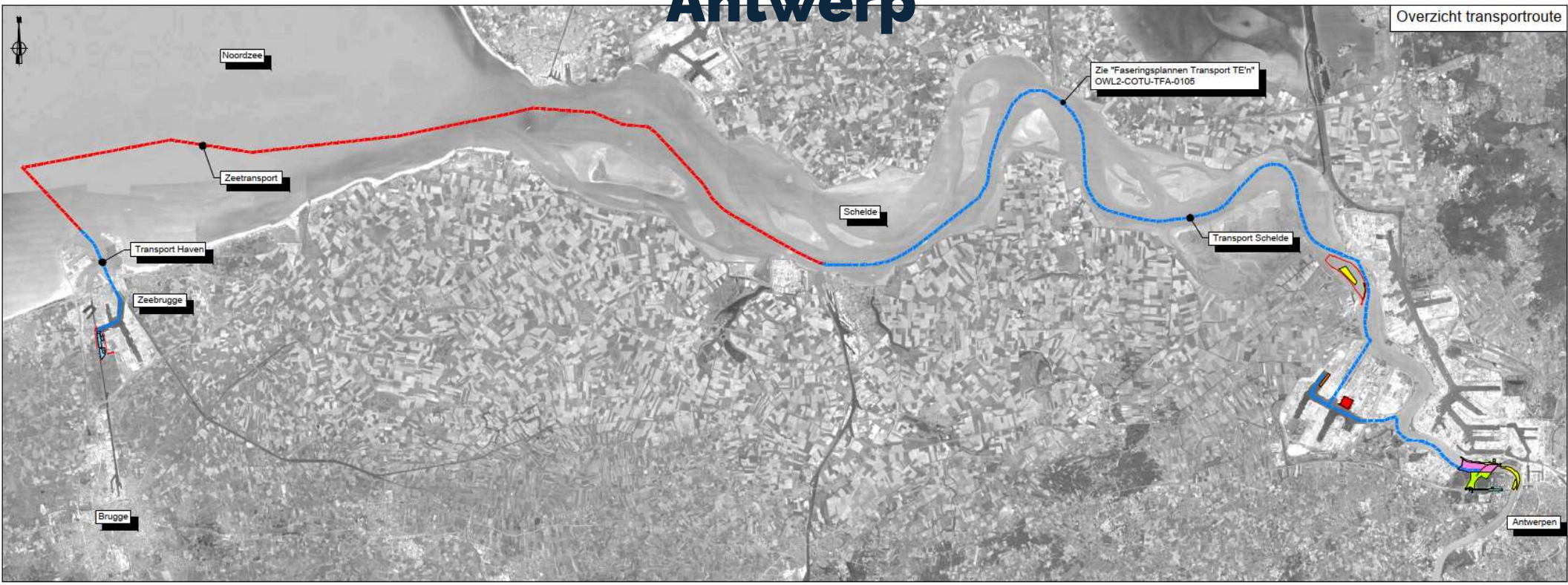

C&C RO
TE4
TE3
TE2
TE1
C&C LO

lantis bouwen aan verbinding

lantis bouwen aan verbinding

lantis bouwen aan verbinding

2025
Transport of the 8 tunnelelements to Antwerp



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Biggest challenges and opportunities towards a future role as tunnel operator

- Designing and implementing a future-proof tunnel system architecture involves the functioning of a "smart" operate and control framework, ensuring seamless connectivity within its broader environment. This forward-looking approach emphasizes adaptability and scalability, aligning with evolving technological landscapes.
- The pursuit of predictability in asset management is further augmented by the strategic application of new technologies. Proactive (preferably 'online') inspections and targeted maintenance interventions, contribute to high availability and minimize unforeseen technical disturbances.
  The ultimate target is to reduce downtime and enhance overall system reliability.
- By embracing emerging technologies and data-driven strategies, we pave the way for a future-proof asset management system that is resilient and adaptive to the demands of tomorrow.
- The technology of the future is expected to function as co-pilot in various aspects of operation and life cycle management. It will provide support, guidance and enhanced capabilities to the end-user.

lantis bouwen aan verbinding

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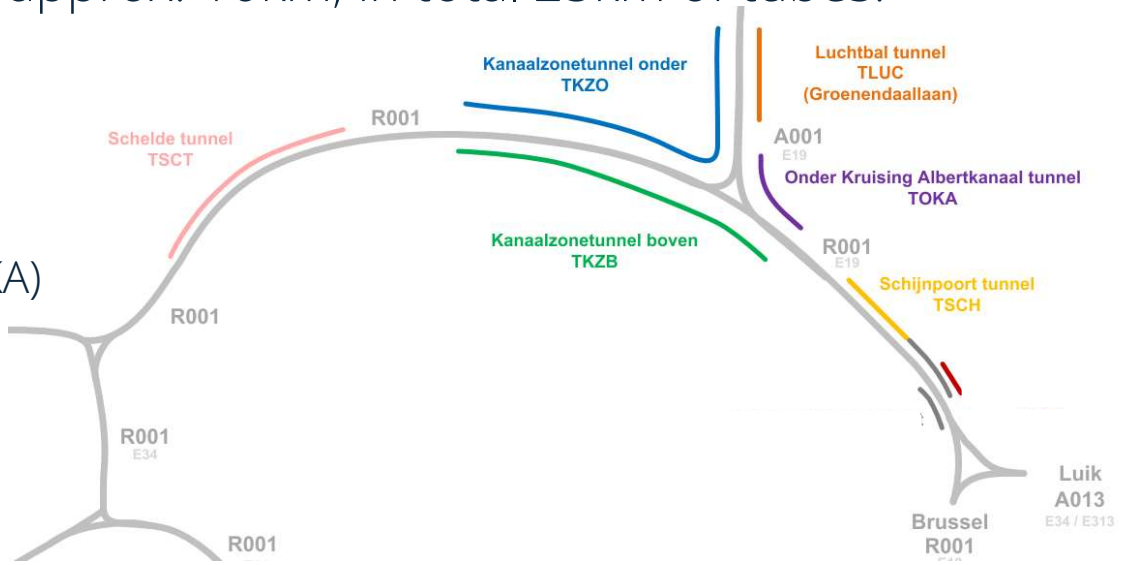

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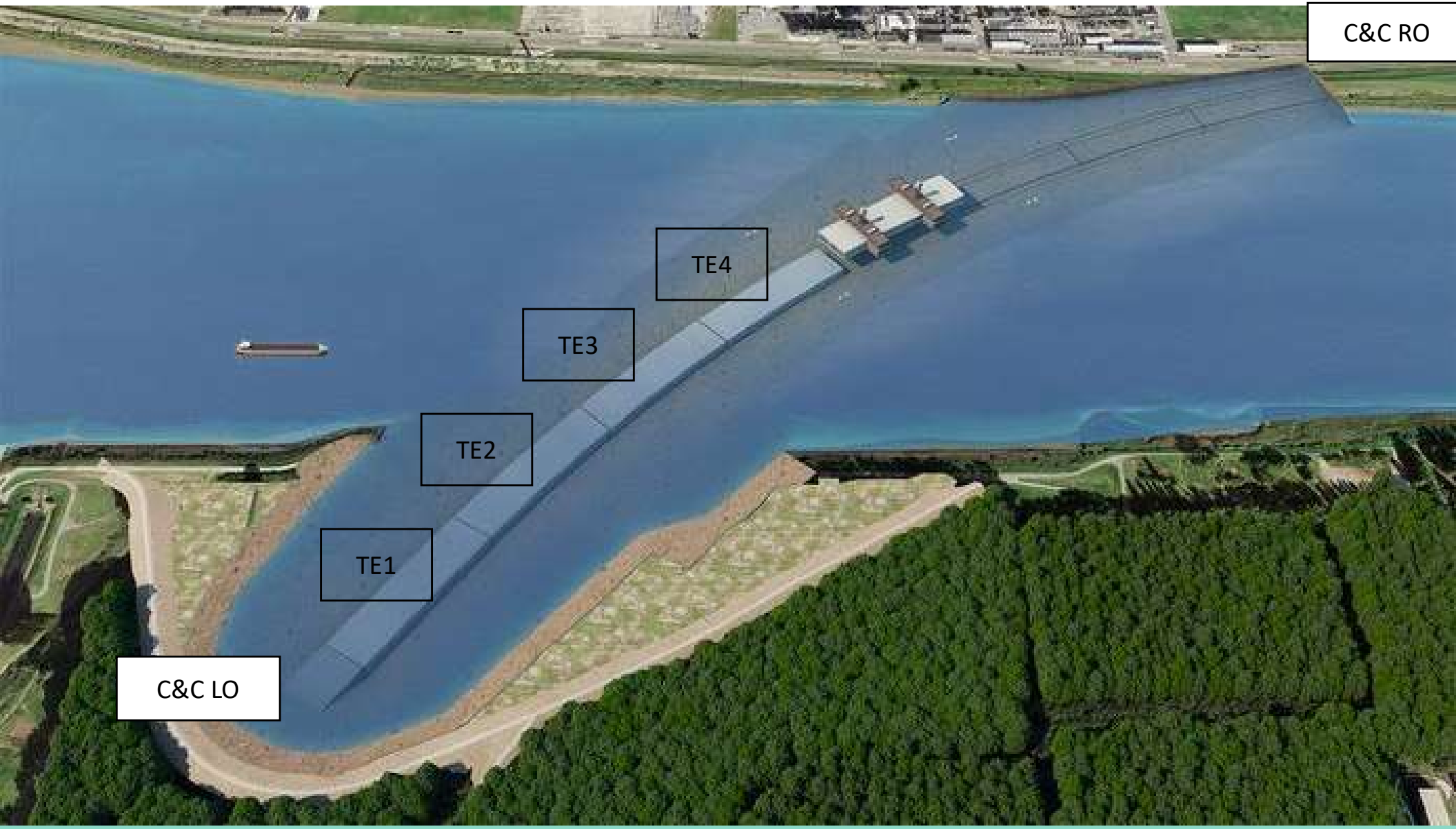
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TE4
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lantis bouwen aan verbinding

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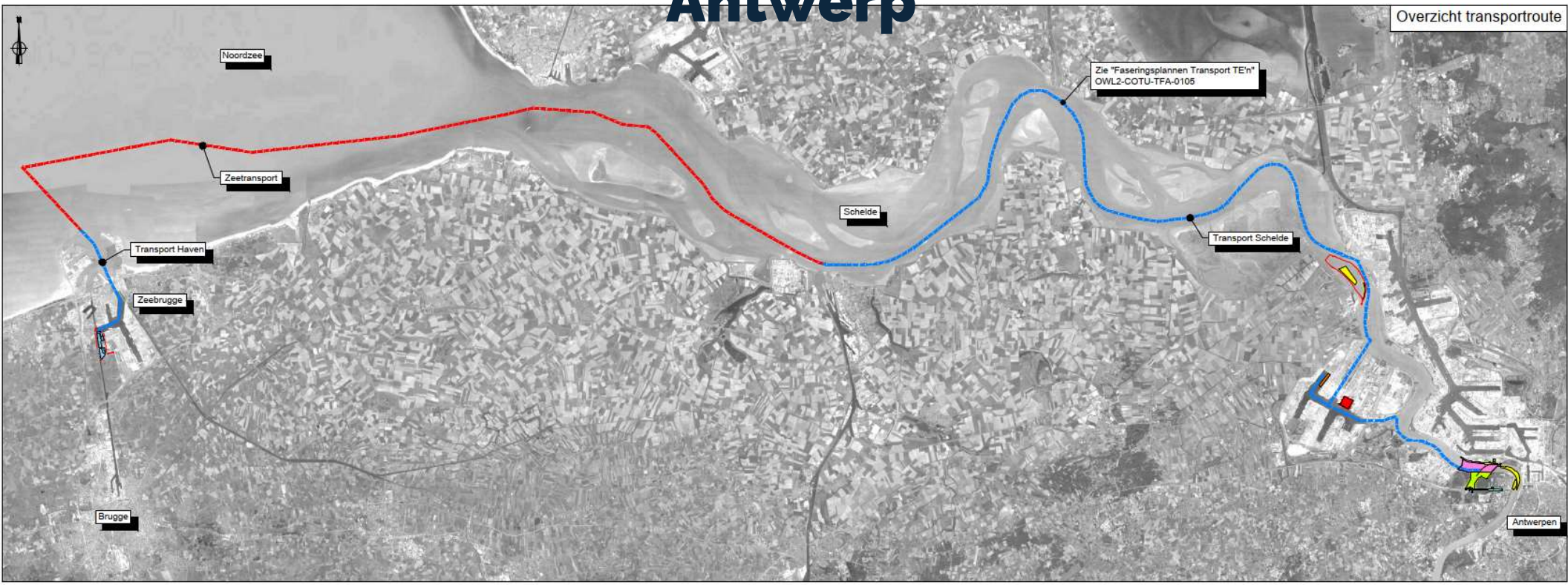

lantis bouwen aan verbinding

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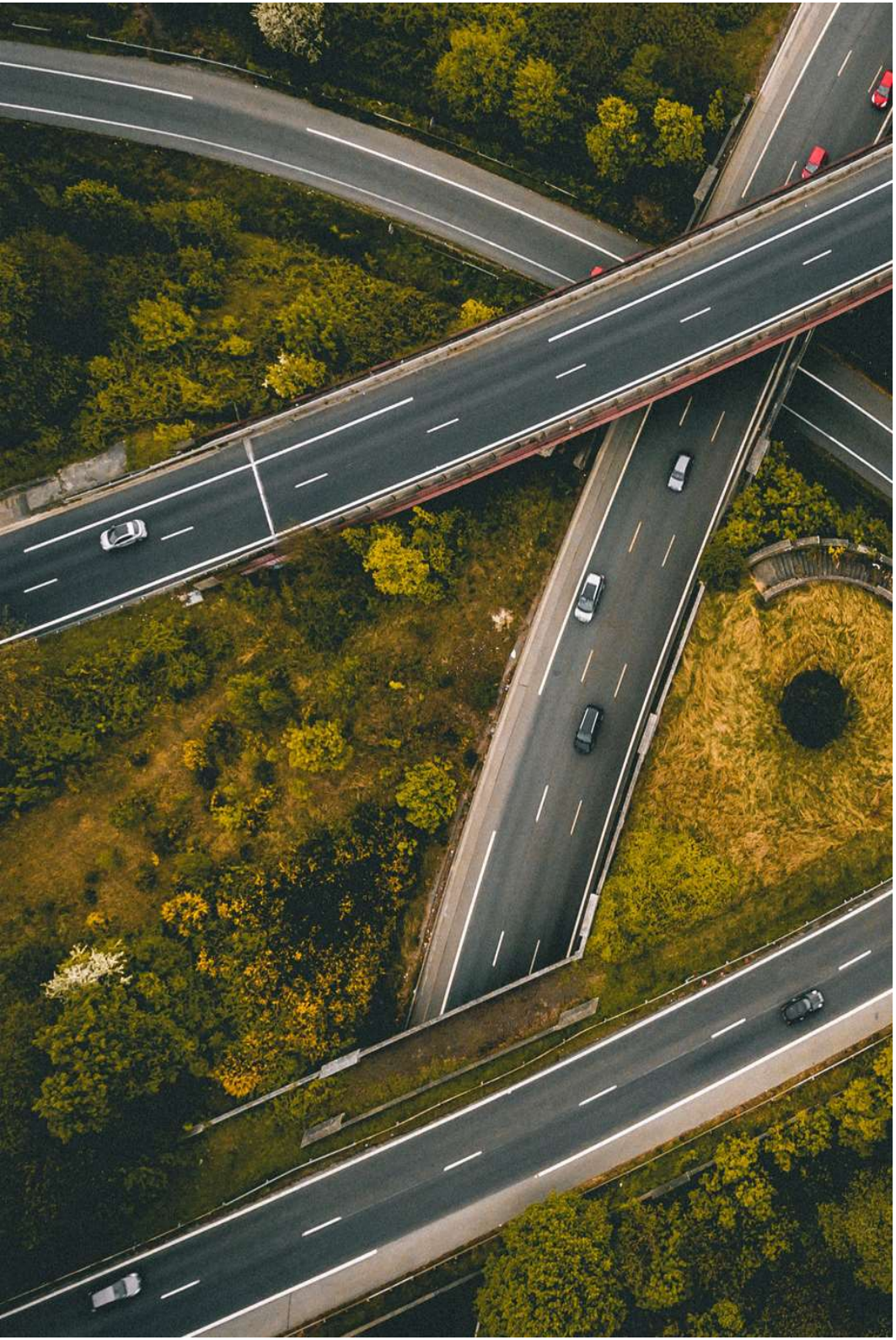


De Werkvennootschap

World Tunnel Day ABTUS-

BVOTS - Tunnel Asset

Owners Day

December 6st 2024

DE WERKVENNOOTSCHAP

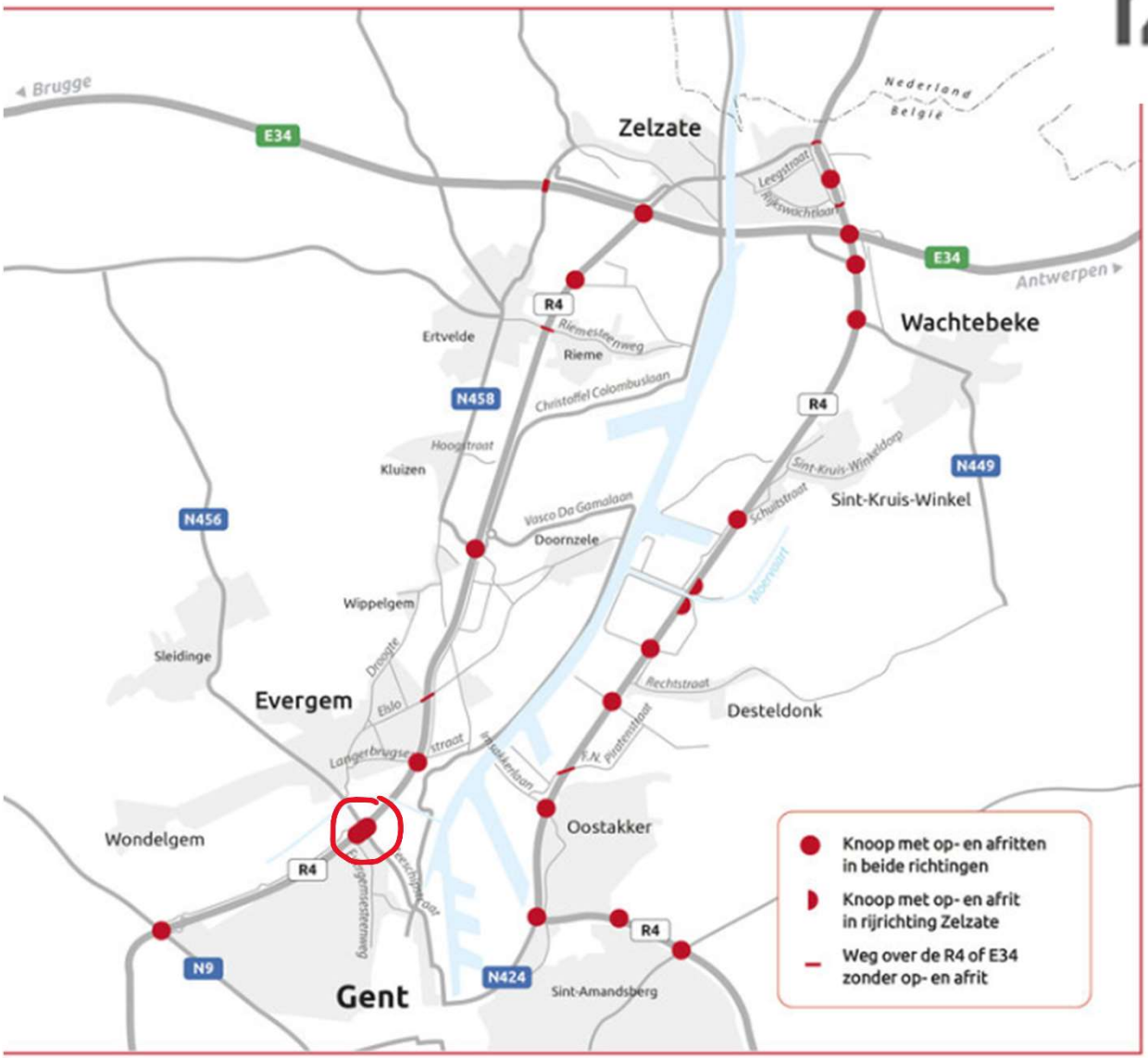
Tunnel
in scope

Overview of current projects

Overview tunnels in our scope

Disclaimer – planning/date

All schedules are subject to political decision-making & obtaining building permits

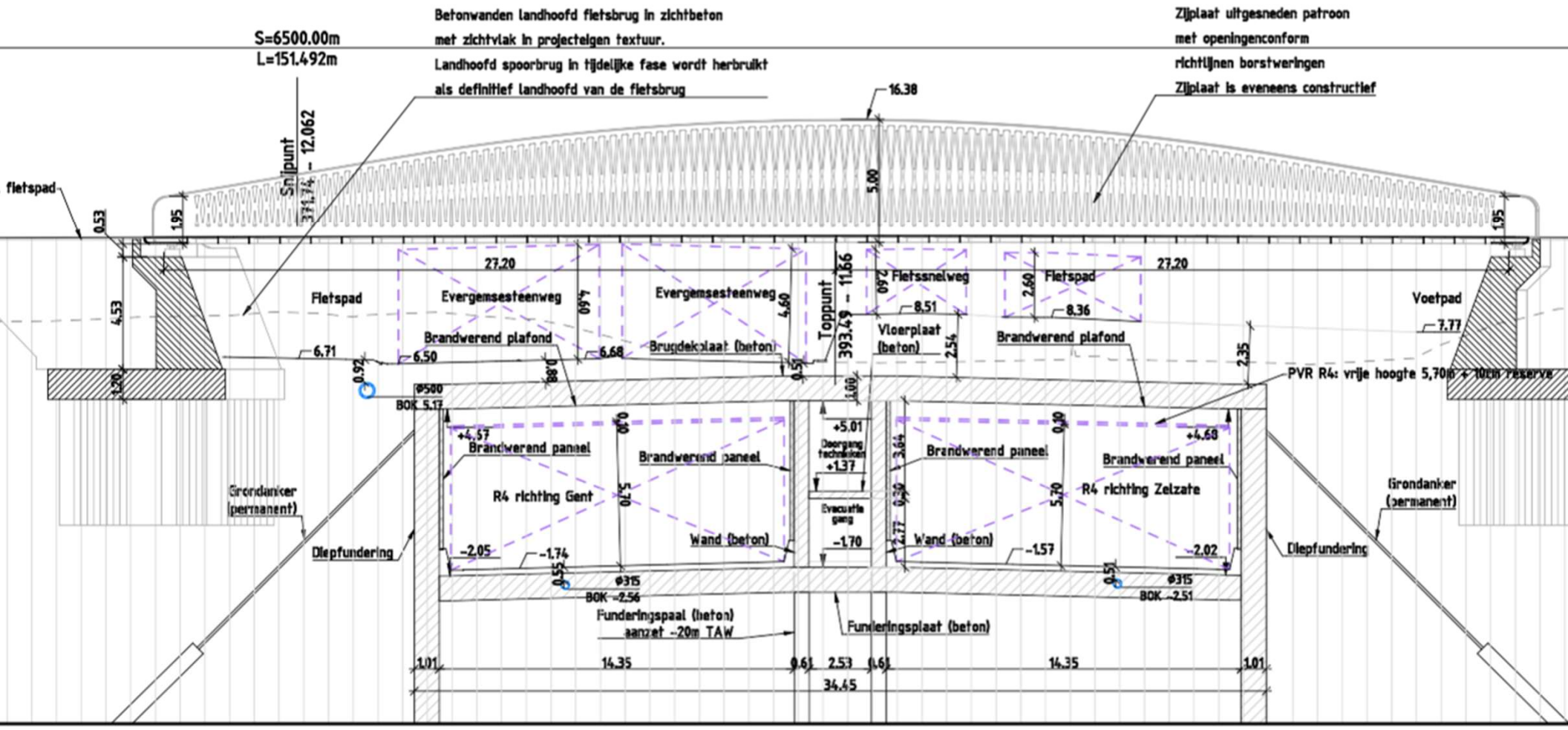


estimation of total contract value of the project, VAT excluded - 750mio €

W9

Tunnel R4 - Ghent

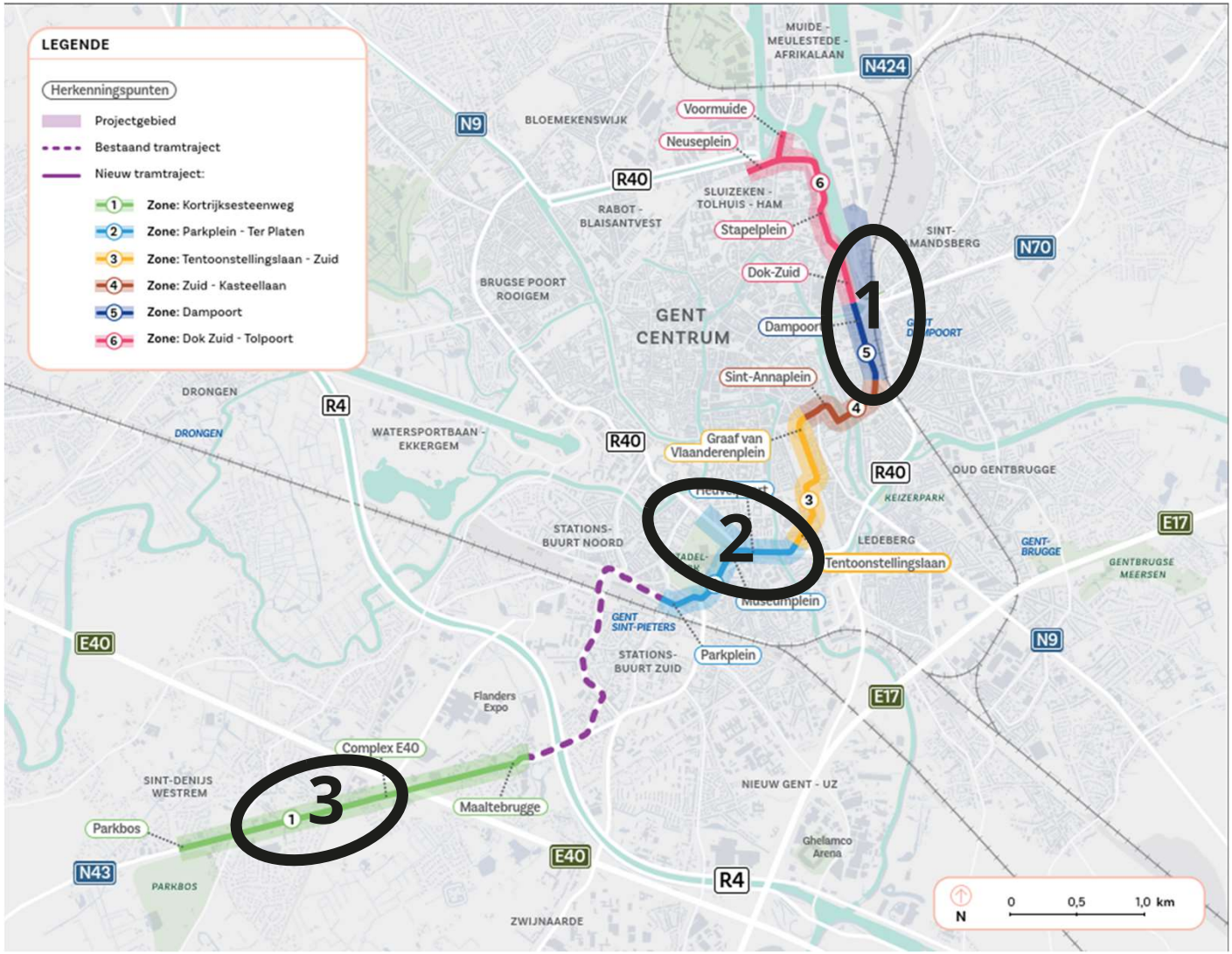
Facts	R4 Ghent
Design phase	Execution Design
Length	330m
Lanes	2x (2 lanes + emergency lane)
ADR	A
Construction method	C&C
Start tender	accomplished
Ventilation	yes
Max. traffic heigth	5,7m
Start construction	1/8/2025
Evacuation strategy	Central tunnel


S=6500.00m
L=151.492m
Betonwanden landhoofd fietsbrug in zichtbeton
met zichtvlak in projecteigen textuur.
Landhoofd spoorbrug in tijdelijke fase wordt herbruikt
als definitief landhoofd van de fietsbrug
Zijplaat uitgesneden patroon
met openingenconform
richtlijnen borstweringen
Zijplaat is eveneens constructief
Snijpunt
371.74 - 12.062
16.38
5.00
fietspad
0.53
1.95
4.53
1.20
27.20
Fietspad
Evergemsesteenweg
Evergemsesteenweg
Toppunt
393.49 - 11.66
Fietssnelweg
Fietspad
27.20
Voetpad
7.77
6.71
6.50
6.68
Brandwerend plafond
Brugdekplaat (beton)
8.51
8.36
Vloerplaat
(beton)
Brandwerend plafond
PVR R4: vrije hoogte 5,70m + 10cm reserve
Ø500
BOK 5.17
+4.57
Brandwerend paneel
Brandwerend paneel
+5.01
Doorgang technieken
+1.37
Brandwerend paneel
Brandwerend paneel
+4.60
R4 richting Gent
R4 richting Zelzate
Evacuatie gang
-1.70
Grondanker
(permanent)
Grondanker
(permanent)
Diepfundering
Diepfundering
Wand (beton)
Wand (beton)
-2.05
-1.74
-1.57
-2.02
Ø315
BOK -2.56
Ø315
BOK -2.51
Funderingspaal (beton)
aanzet -20m TAW
Funderingsplaat (beton)
1.01
14.35
0.61
2.53
0.61
14.35
1.01
34.45

Gentspoort

Vertrammen, vernieuwen, verbinden

1. Dampoort (>500m – partially STROSS – city traffic lane 2x1)
2. Heuvelpoort (DODO – partially STROSS – city traffic lane 2x1)
3. *Kortrijksesteenweg (modification existing bypass – expansion of bicycle tubes)*



Gentspoort
Vertrammen, vernieuwen, verbinden

Tunnels Gentspoort - Ghent

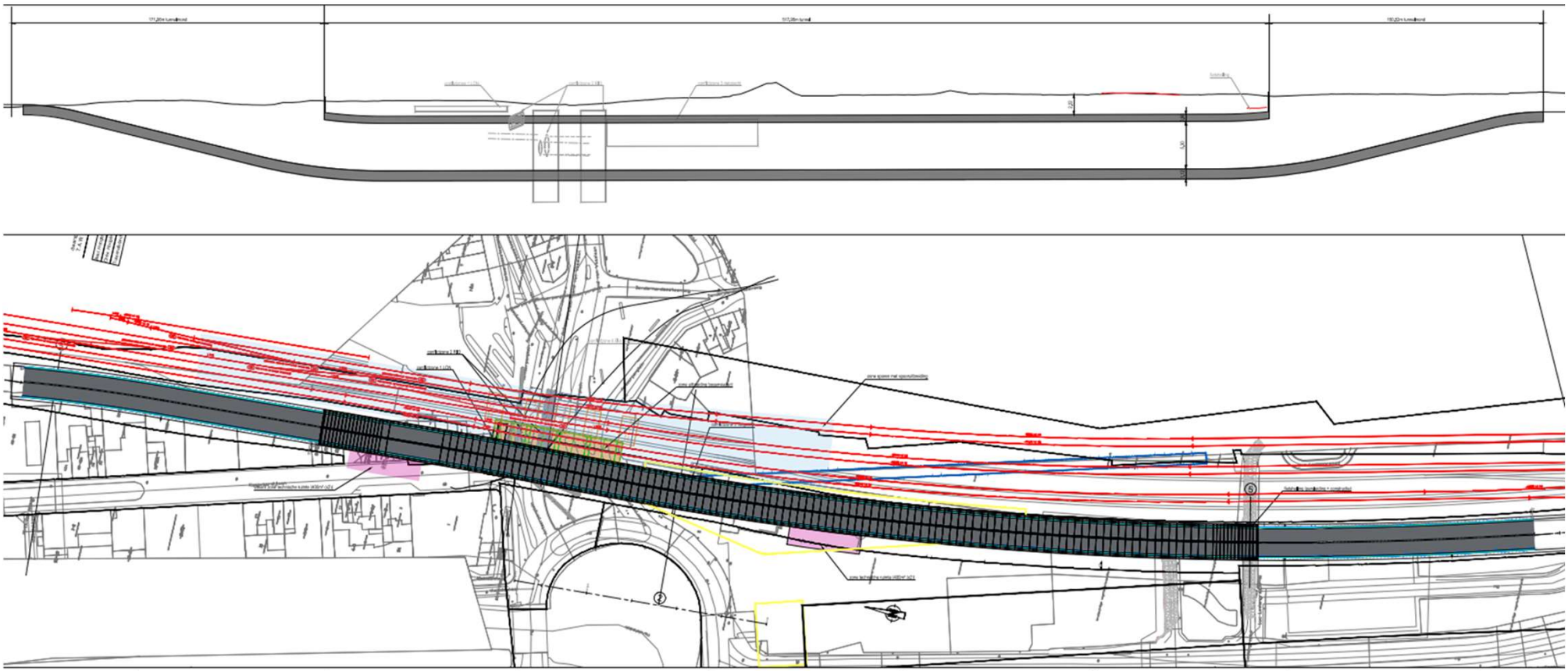
Facts	Dampoort
Design phase	Preliminary draft
Length	515 m
Lanes	2x (1 lane + emergency lane)
ADR	/
Construction method	C&C – partialy stross
Start tender	2026 (selection 2025)
Ventilation	yes
Max. traffic heigth	4,3 m
Start construction	(2028)
Evacuation strategy	Central tunnel

Facts	Heuvelpoort – DODO – no real tunnel
Design phase	Preliminary draft
Length	205 m (+ 100 m) + 40 m
Lanes	2x1 lane + emergency lanes
ADR	/
Construction method	C&C – partialy stross
Start tender	2026 (selection 2025)
Ventilation	no
Max. traffic heigth	4,3 m
Start construction	(2028)
Evacuation strategy	/

Gentspoort

Vertrammen, vernieuwen, verbinden

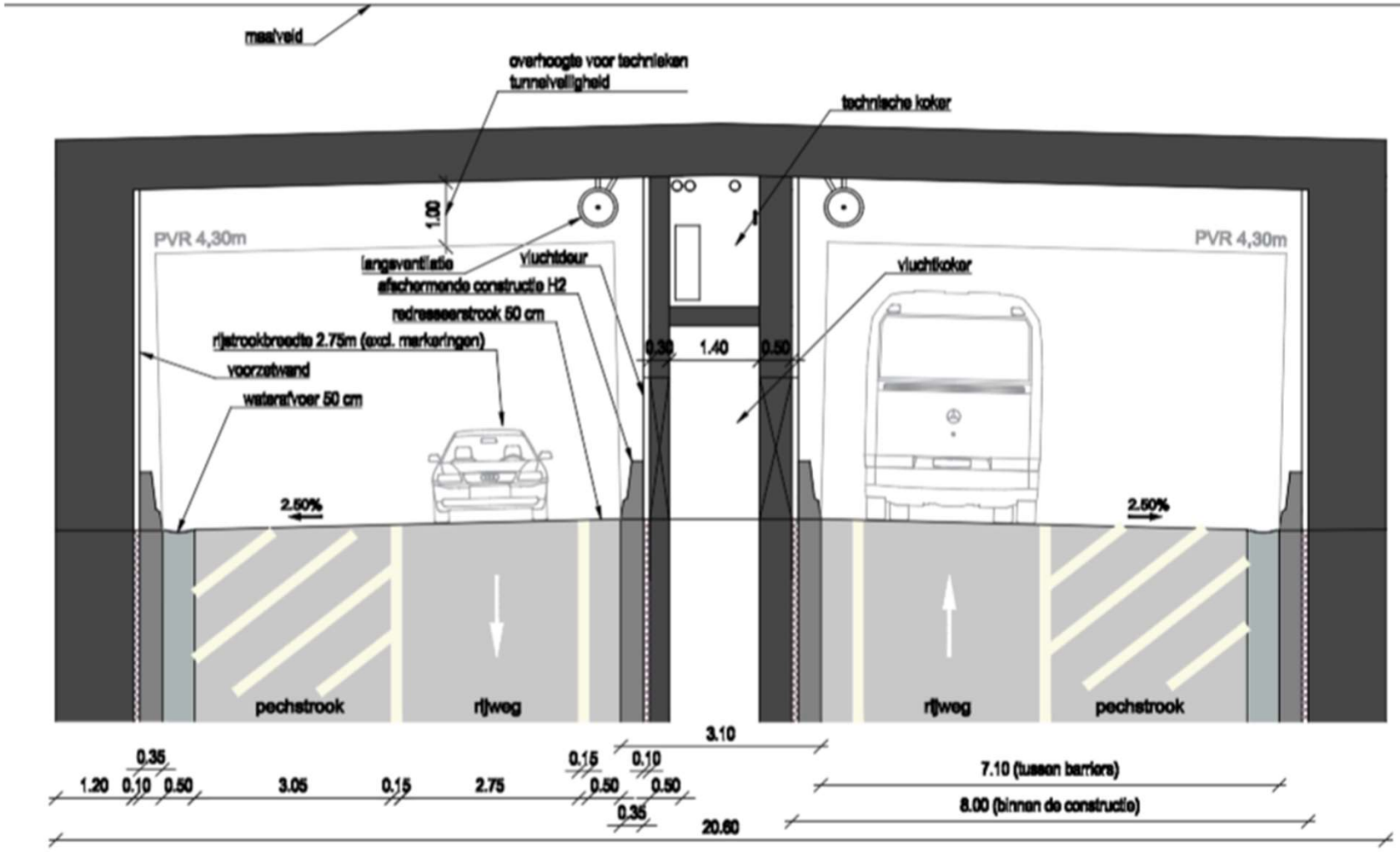
Tunnel Dampoort – Lengteprofiel en grondplan



Gentspoort

Vertrammen, vernieuwen, verbinden

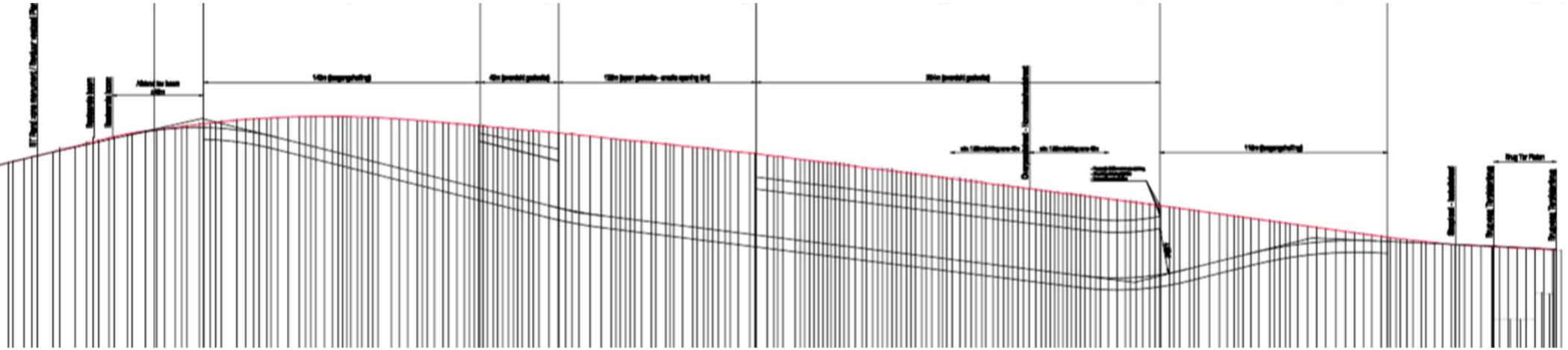
Tunnel Dampoort – Dwarsprofiel



Gentspoort

Vertrammen, vernieuwen, verbinden

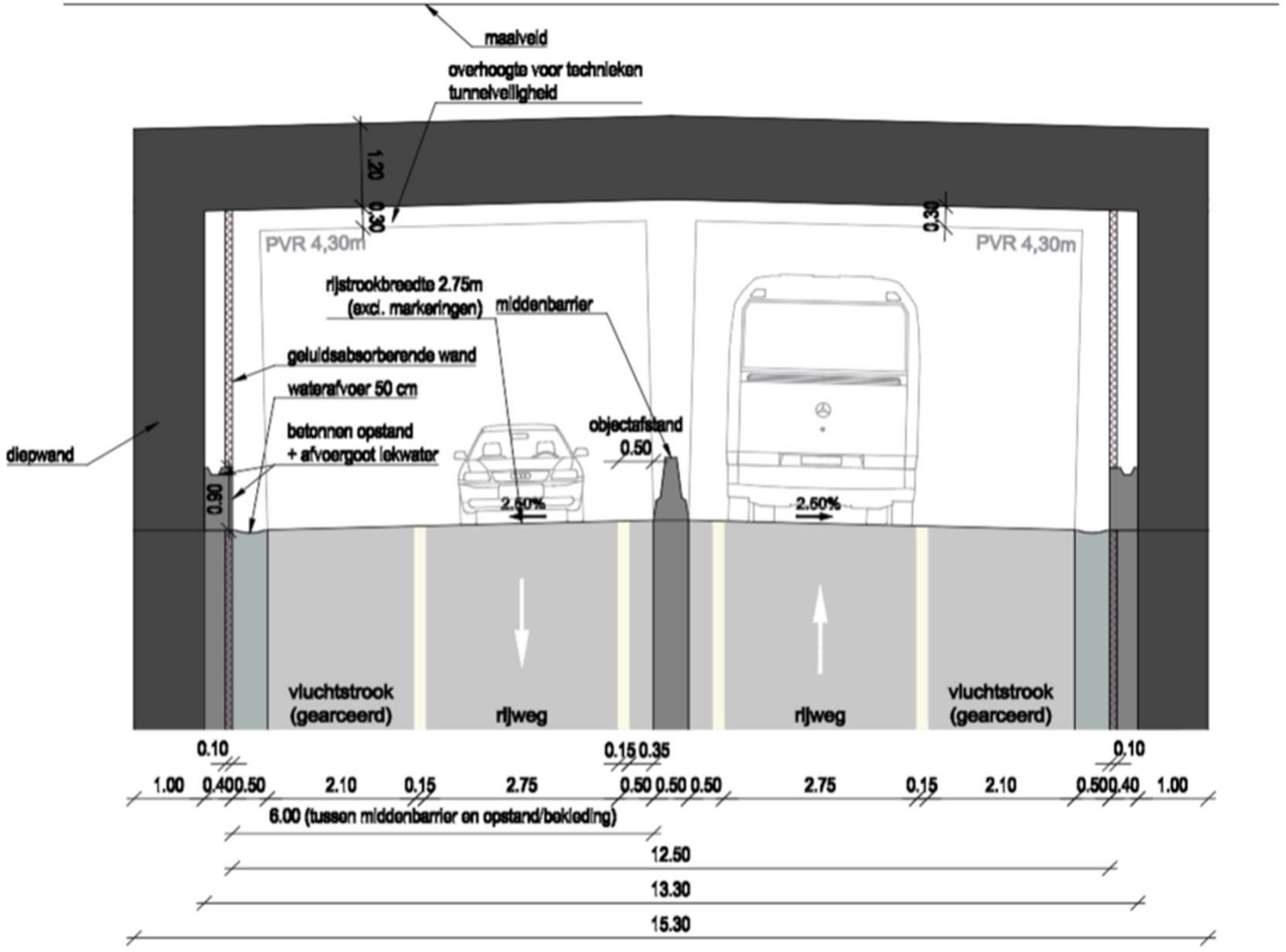
DOD Heuvelpoort – lengteprofiel en grondplan



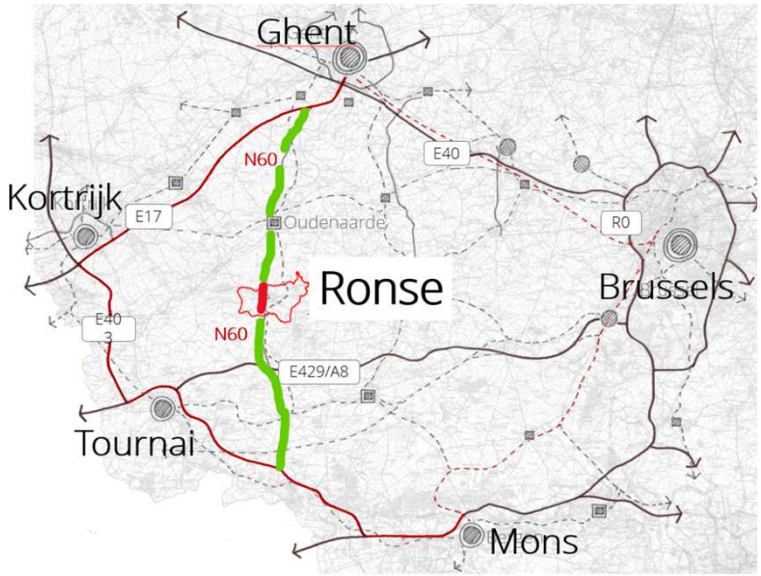
Gentspoort

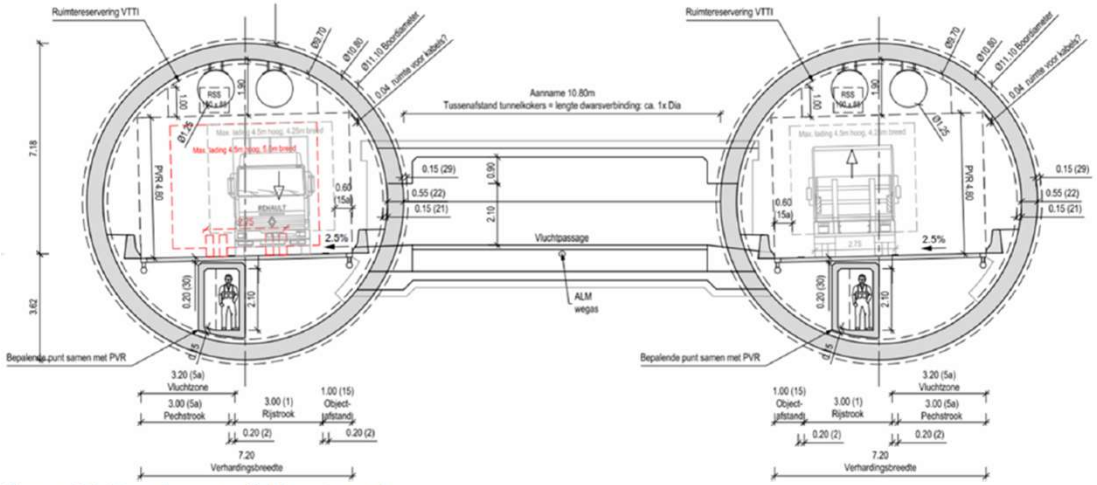
Vertrammen, vernieuwen, verbinden

DOD Heuvelpoort – typeprofiel gesloten gedeelte

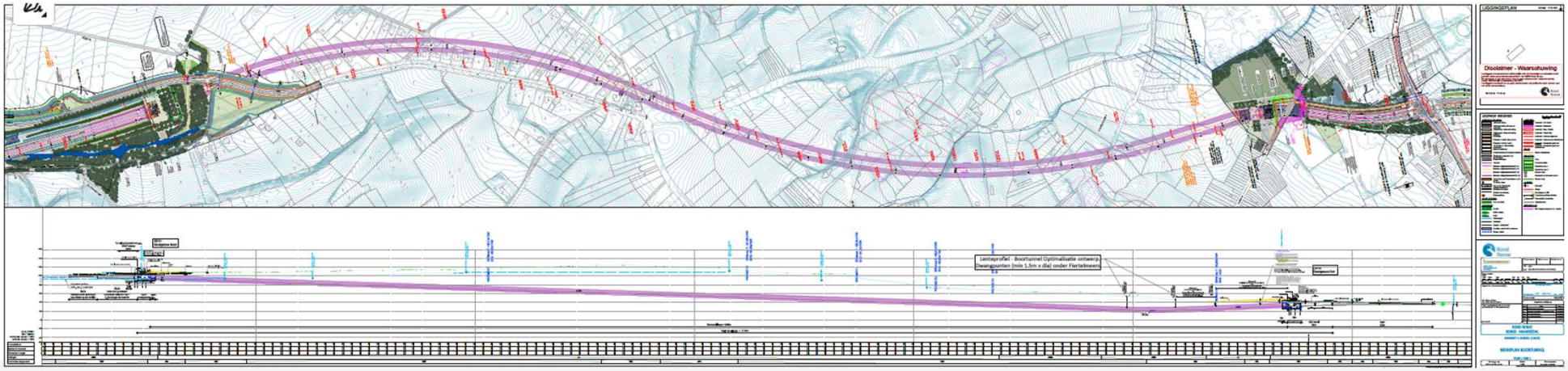


Rond Ronse





Figuur 17 - Typedwarsprofiel boortunnels



Rond Ronse

Tunnel Ronse

Facts	
Design phase	Reference design
Length	2700m
Lanes	2x (1 lane + 1 emergency lane)
ADR	C
Construction method	TBM
Start tender	Summer 2025
Ventilation	yes
Max. traffic heigth	4,7m
Start construction	Mid 2027
Evacuation strategy	Intersection – 250m

- *Rond Ronse - 2,5km – bored tunnel – 2 tubes – cross section each 250m*

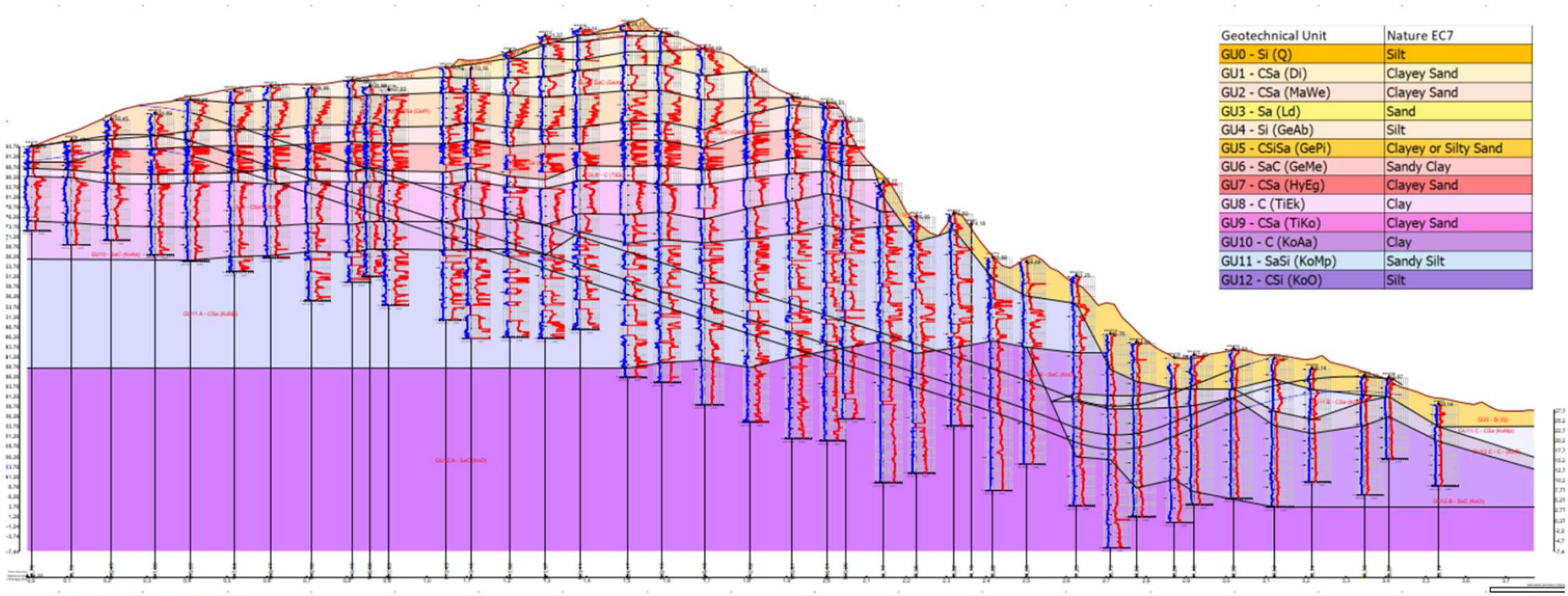
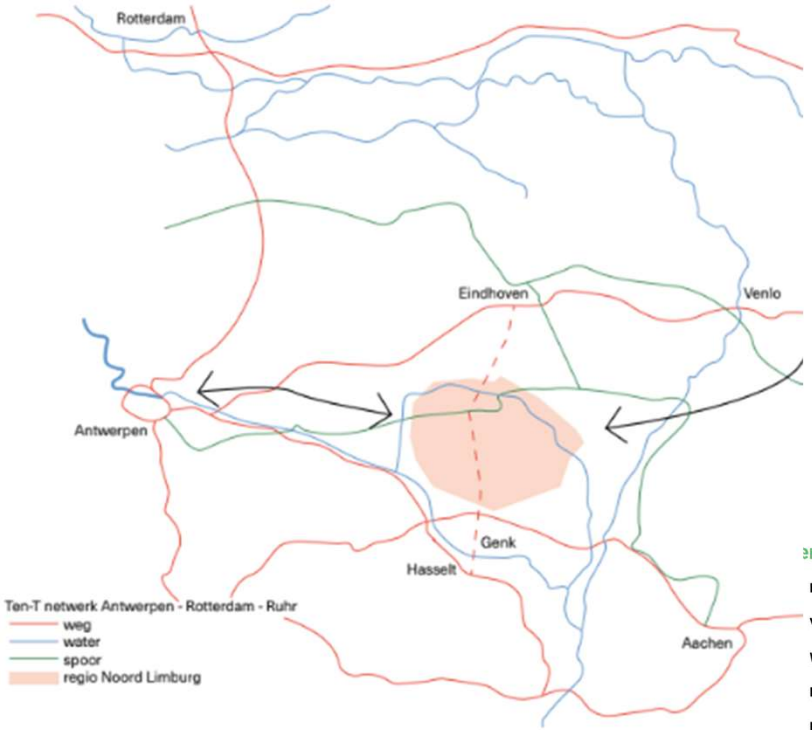
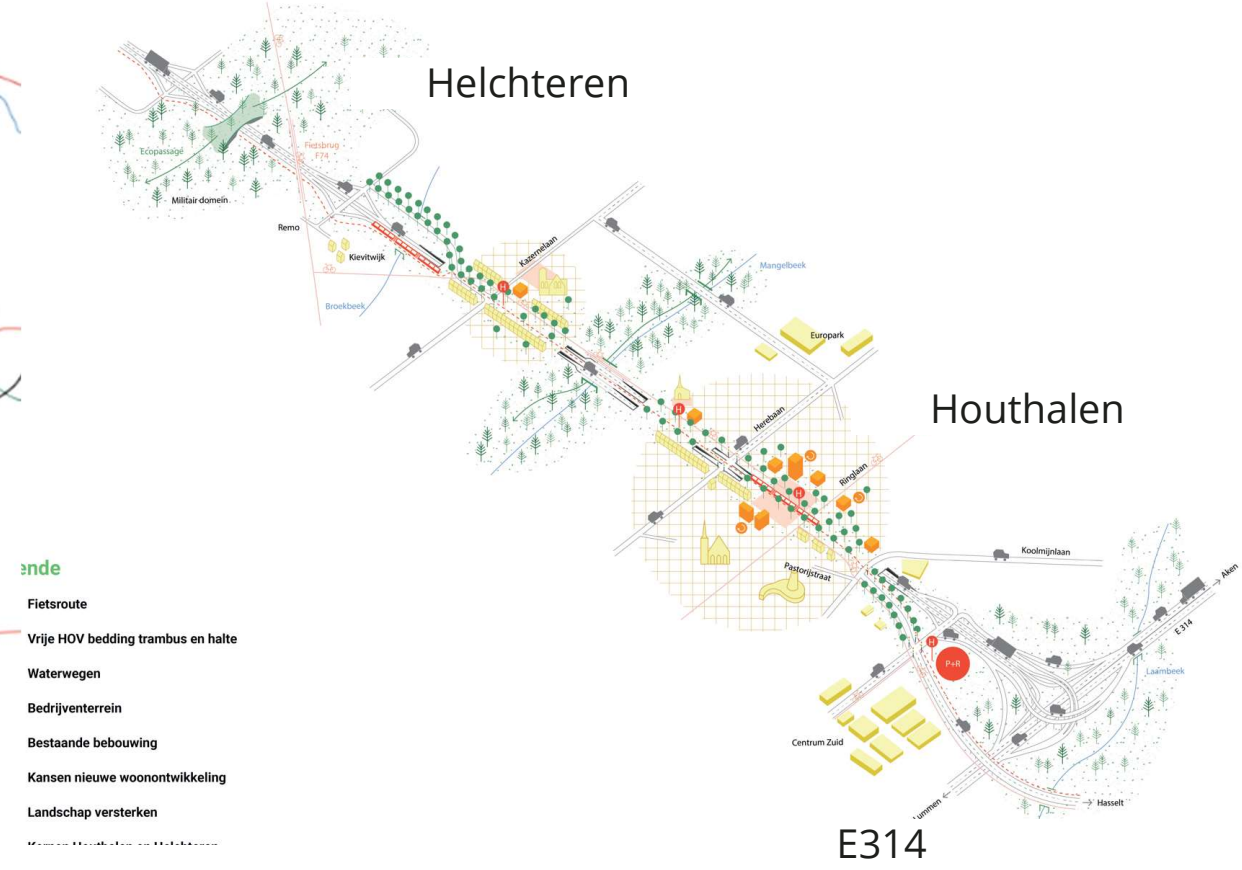


Figure 24 - Stratigraphy along the tunnel trajectory

VT607

Noord zuid Limburg – North - South Limburg





ende

- Fietsroute
- Vrije HOV bedding trambus en halte
- Waterwegen
- Bedrijventerrein
- Bestaande bebouwing
- Kansen nieuwe woonontwikkeling
- Landschap versterken

Tunnels North South of Limburg

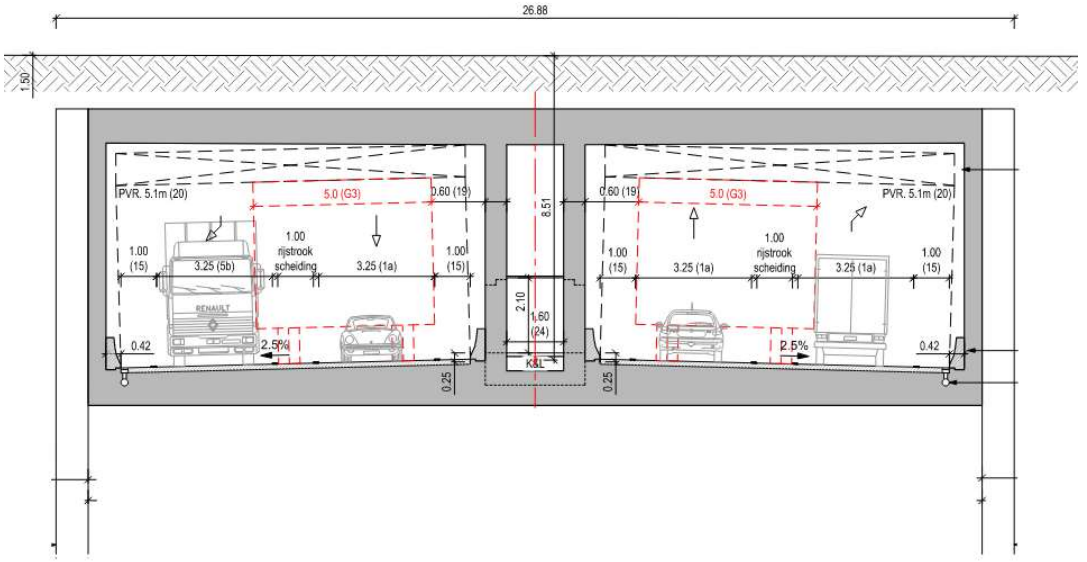
Facts	Houthalen
Design phase	Building permit
Length	2000m
Lanes	4x (2 lanes in each direction)
ADR	A
Construction method	C&C
Start tender	Spring 2025
Ventilation	yes
Max. traffic heigth	5,1m
Start construction	2027
Evacuation strategy	Central escape route

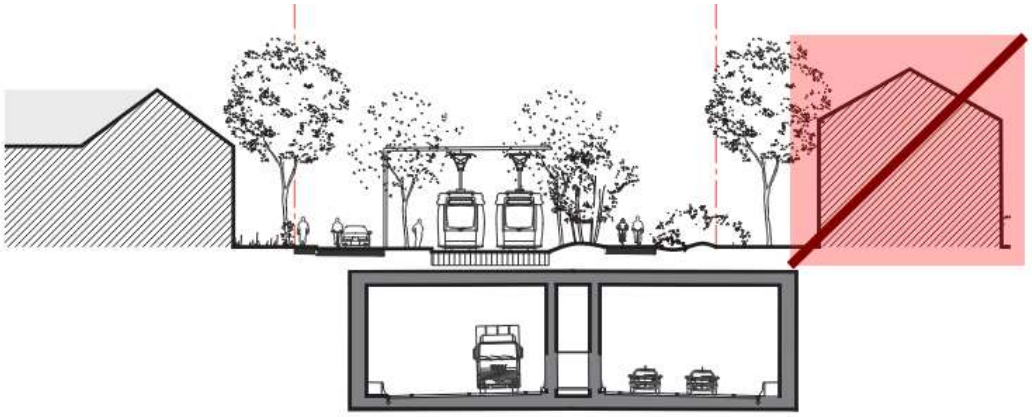
Facts	Helchteren
Design phase	Building Permit
Length	1800m
Lanes	2x (1 lanes + emergency lane)
ADR	A
Construction method	C&C
Start tender	Spring 2025
Ventilation	yes
Max. traffic heigth	5,1m
Start construction	2027
Evacuation strategy	Central escape route

Segment Houthalen

- 2 x 2 splitted lanes in tunnel
- 2000m

Segment Houthalen



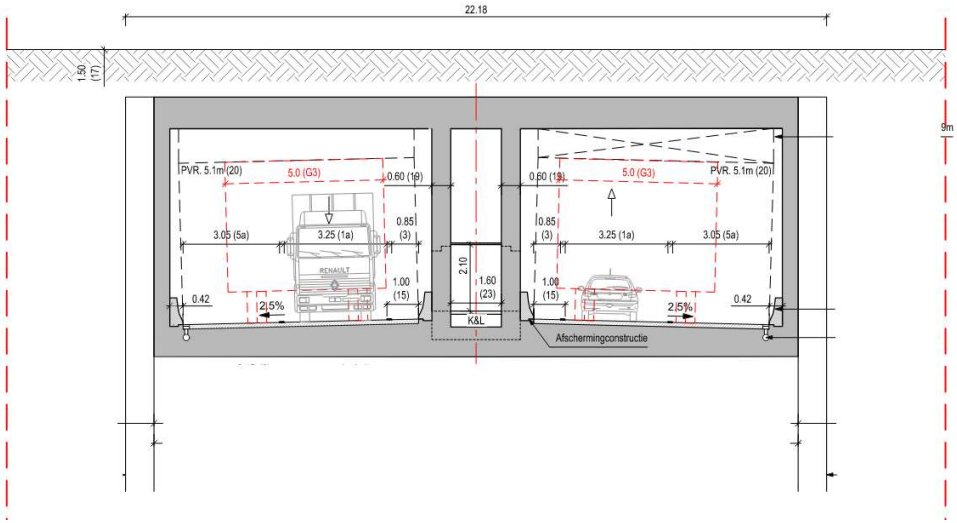


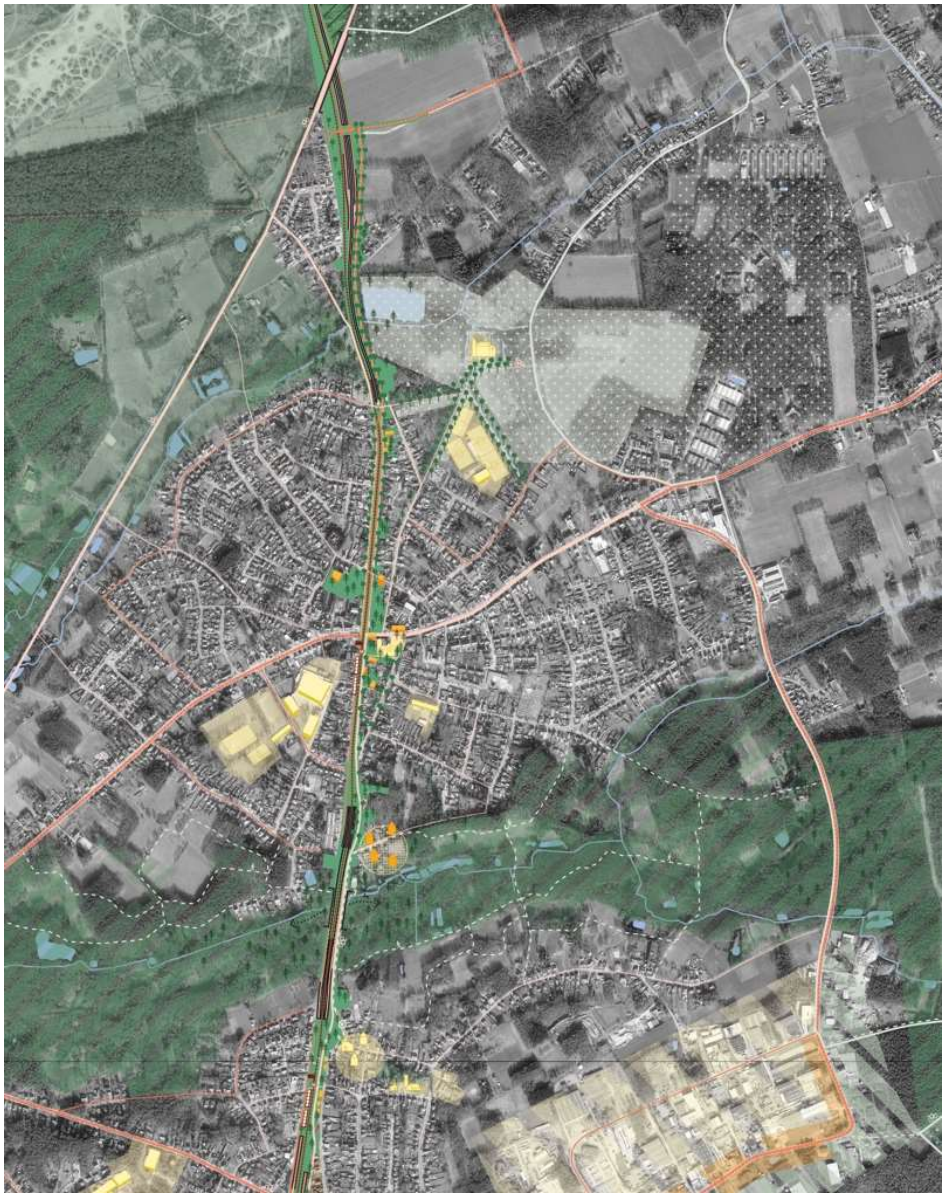
KW501 Zuid

Visualisatie

Segment Helchteren

- 2x1 lanes + emergency lane
- 1800m





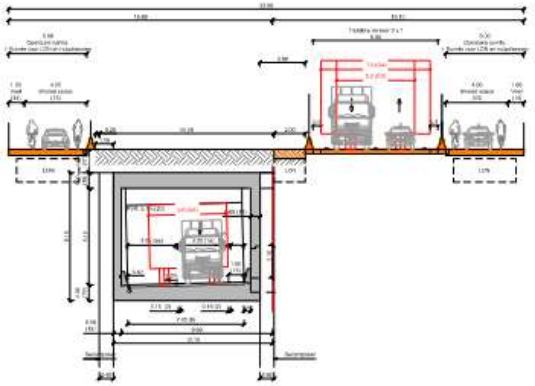
KW103 Ter Dolen

VISUALISATIES

Segment Helchteren

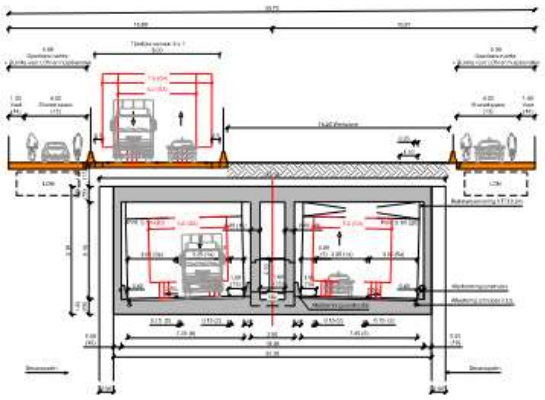
- Execution in 2 phases

Fase 1 =>



Functionele Dwarsprofiel FDP
Fase 1

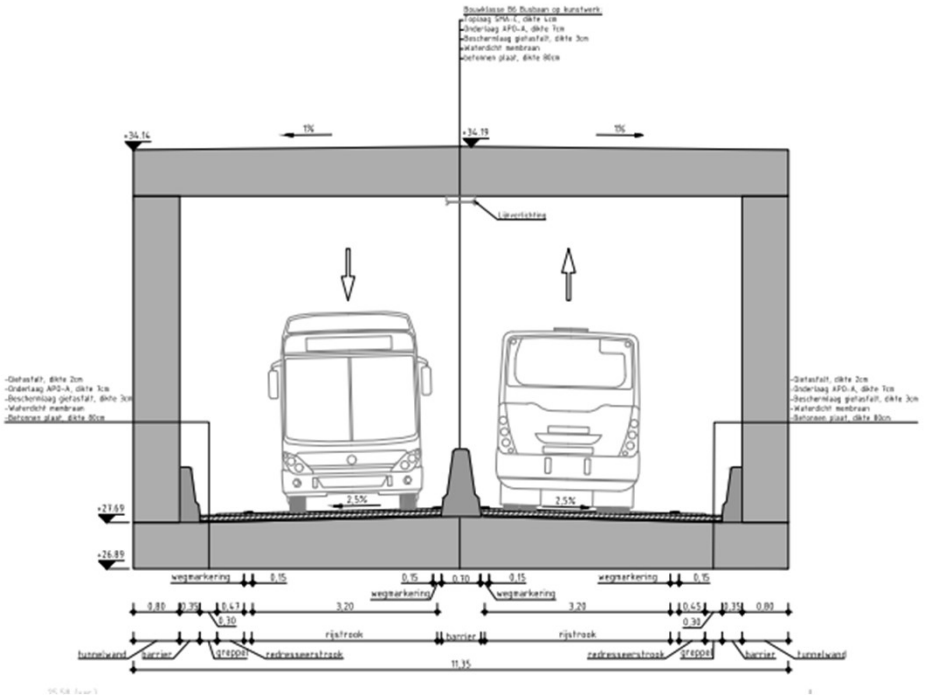
Fase 2 =>



Functionele Dwarsprofiel FDP
Fase 2

Werken aan de Ring: tunnel Ringtrambus

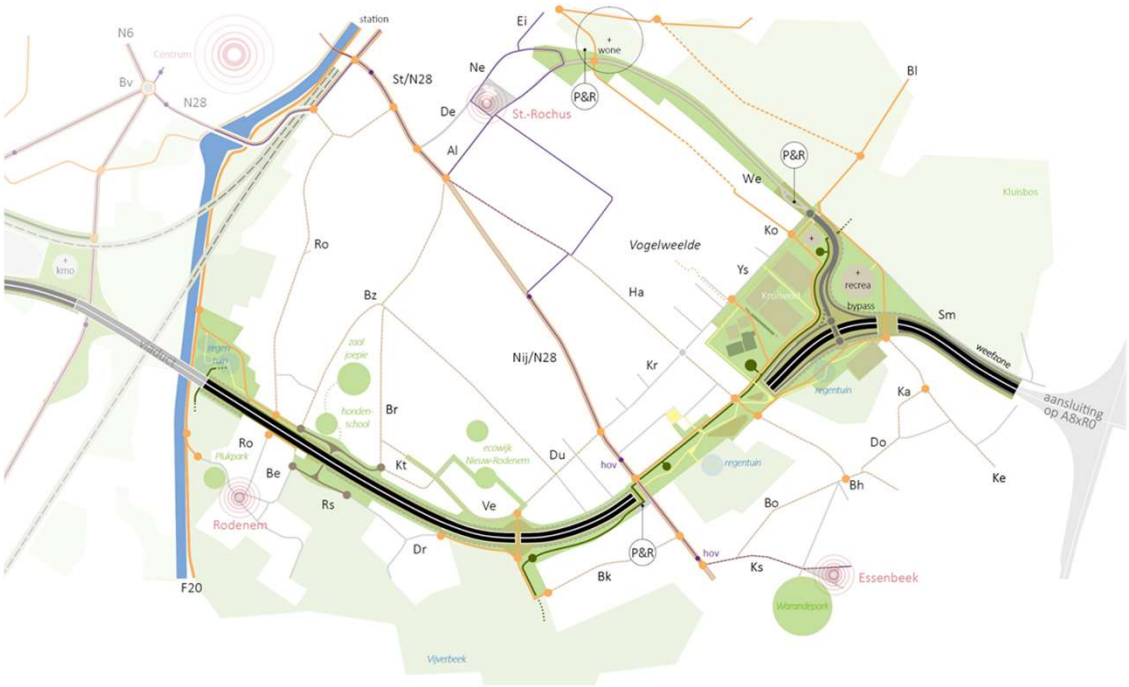
Facts	RTB
Design phase	Reference design
Length	273m
Lanes	2x 1 lanes
ADR	-
Construction method	C&C
Start tender	accomplished
Ventilation	no
Construction	2025-2026
Max. traffic heigth	6,3m



A8-Halle.be

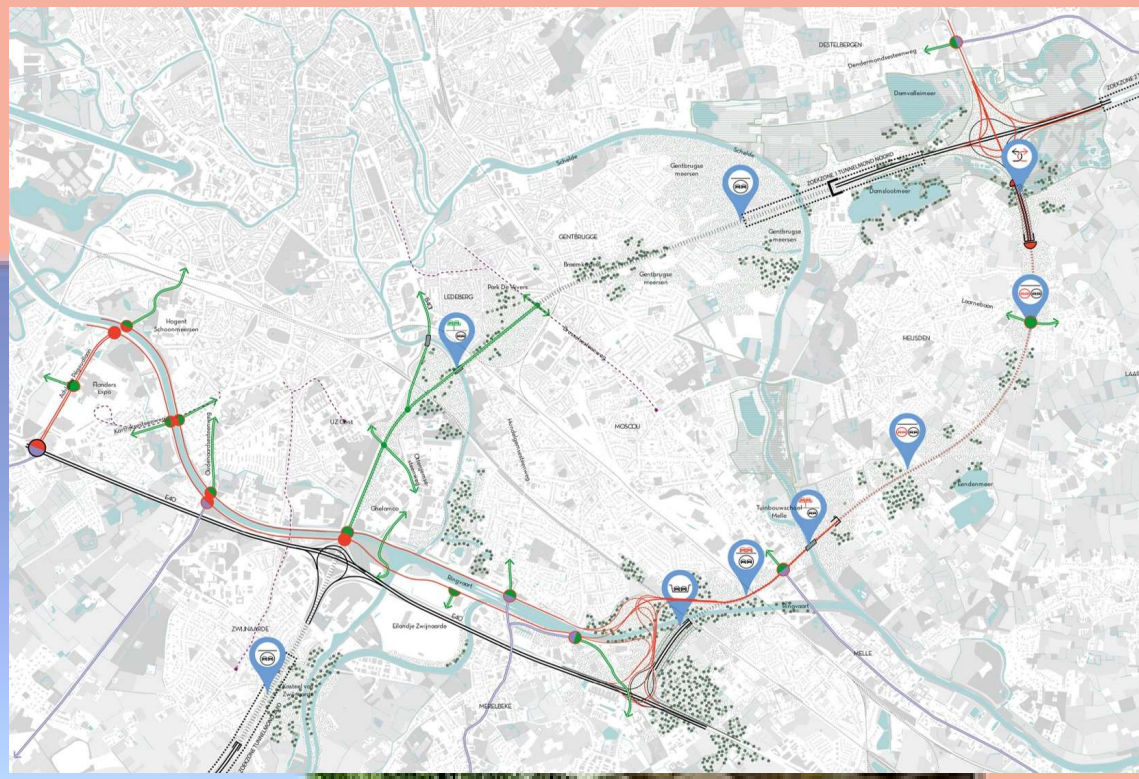
werken aan de ring

Werken aan de Ring – A8 in Halle



Facts	A8 Halle
Design phase	Execution Design
Length	540m
Lanes	2x (2 lanes + emergency lane)
ADR	A
Construction method	C&C
Start tender	accomplished
Ventilation	yes
Max. traffic heigth	5,7m
Start construction	2029
Evacuation strategy	Central tunnel

Complex Project Viaduct Gentbrugge



Alternatives research, with several scenarios with tunnels, going from short bypasses and cut-and-cover-tunnels to long bored tunnels (>10km)

Execution: > 2030

Wallonie
mobilité infrastructures
SPW

Walloon tunnels upgrading

3nd World Tunnel Day ABTUS-BVOTS

ing. Amélie Callejon

Contents

1. Tunnel plan (→ 2026)

Initial budget (2019) :

- **Major** communication networks : ***95.000.000 € HTVA***
- **Minor** communication networks : ***7.000.000 € HTVA***

Budget after floods (2021) :

- All the communication networks: ***140.000.000 € HTVA***

1. Tunnel plan (→ 2026)

2nd tunnel plan will follow the current plan (2026 <)

Objective : by 2039 all the Walloon tunnels upgraded

2. Future work 2025 → 2026

- Flémalle (Liège) : rehabilitation ELM + asbestos removal + passive protection
- Hocheporte (Liège) : rehabilitation ELM + passive protection
- Sainte-Marie / Louvrex (Liège) : rehabilitation ELM + passive protection
- Astrid (Mouscron) : rehabilitation ELM + concrete renovation + passive protection + fire divions of plant room

2. Future work 2025 → 2026

- Mayence (Charleroi) : rehabilitation ELM + concrete renovation + passive protection + fire divions of plant room
- Hiernaux (Charleroi) : tunnel upgrade according to priorities
- Hublinbu (Charleroi) : tunnel upgrade according to priorities
- Armée-Française (Charleroi) : tunnel upgrade according priorities

Thanks for your attention

BRUXELLES MOBILITÉ
BRUSSEL MOBILITEIT

SERVICE PUBLIC RÉGIONAL DE BRUXELLES
GEWESTELIJKE OVERHEIDSDIENST BRUSSEL

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METRO AND PRE-METRO OF BRUSSELS

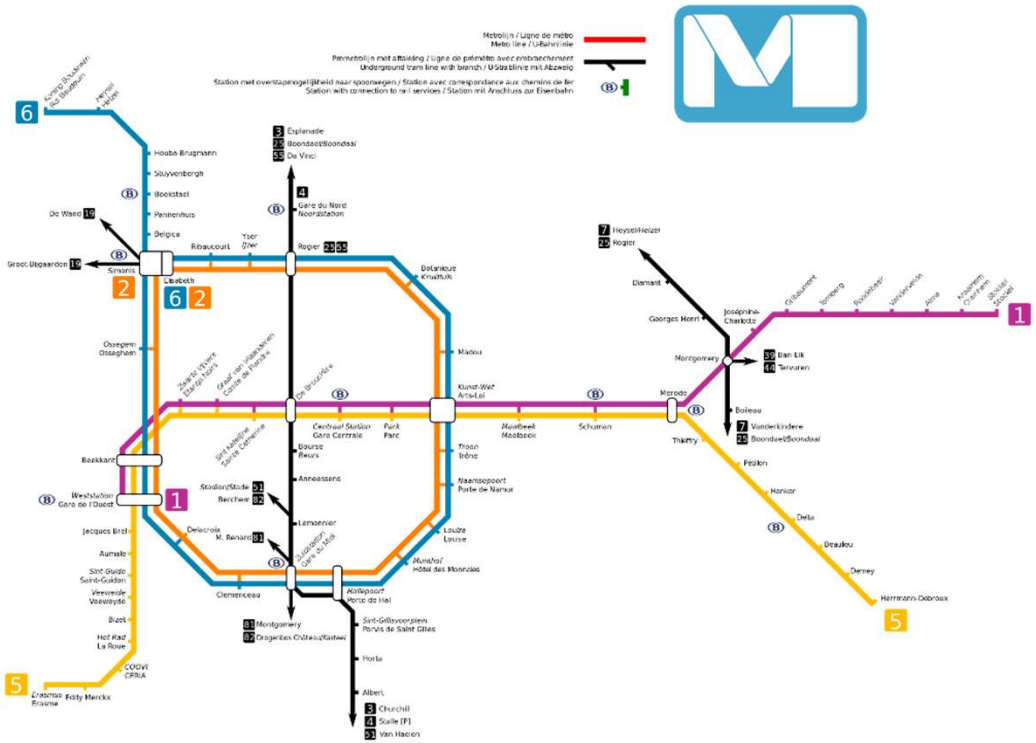
ASSET MANAGEMENT (UIAM)

Speakers : Didier Delincé, Denis Franquin

Contributors : Dimitri Kinnard, Eric Descamps, Jean-Philippe Pollak, Fabian Nisen…

Asset Management within UIAM : the team in the organization

Asset Management within UIAM : Scope : Metro and underground infrastructure



Tunnels : ~40 km
Stations : 69
Maintenance yard : Delta (metro/bus)

Estimated value : ~10.000.000.000 €

Owner : SPRB-GOB
Operator : STIB-MIVB

Asset Management : main activities

- Inventories with state assessment / Inspections
- PACSI's (sharing of responsabilities)
- Handover lists
- Technical referentials (Technical prescriptions)
- Management of plans and technical documentation

With limited financial & human ressources…

Asset Management's and maintenance costs : overview

Overall budget (SSE/SSD + DITP/DIOV, 2022) : ~172 millions EUR / year

- No(o)rd-Albert program (PNA, M3) : ~55 M€ / year
- Modernisation L1-5 (PMM) : ~13,5 M€ / year
- Escalators : ~9 M€ / year
- Improvement surface network (ARS) : 7 ~M€ / year
- Maintenance Civil Engineering : 5 ~M€ / year
- Equipments renewal : ~45 M€ / year
- Improvement infrastructure projects : ~30 M€ / year
- Varia : ~7,5 M€ / year

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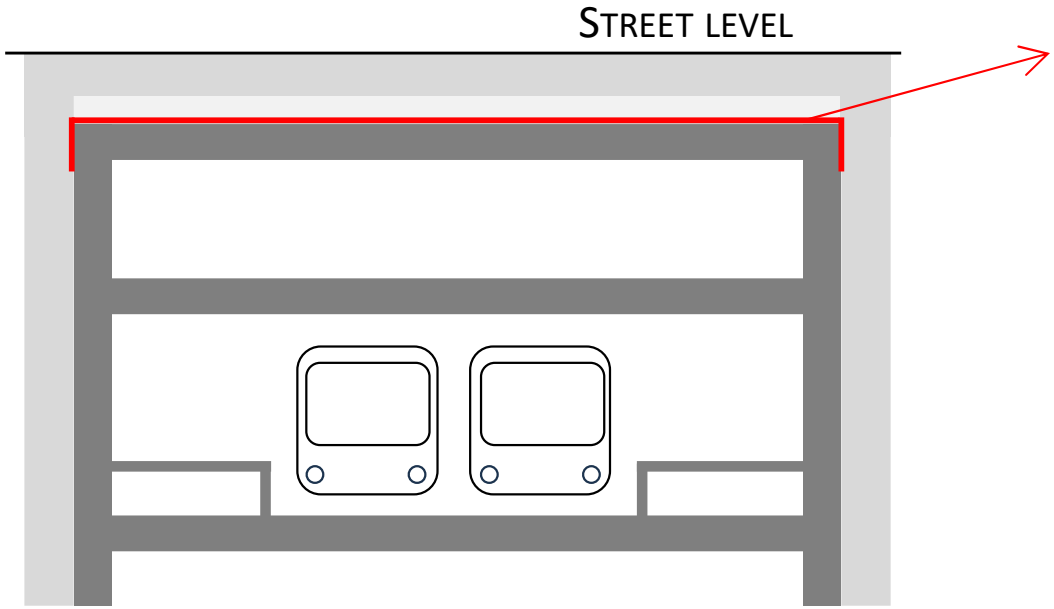
Asset Management : a few challenges…

- Watertightness of ceilings of metro stations and tunnels, with dependance on roads works above
- Ageing of concrete on « critical » works (with access limits and limitations of disturbance of trafic/transport)
- Fire safety in underground works, in particular with public access

Recent concern : assessment and renovation of watertightness layer above ceilings of tunnels and stations



Watertightness layer :
(butyl screed + bituminous glue ?)
lifetime duration
- theoretical : 20-30 years ?
- practical : 15-20 years ?

Surface estimation : 64 ha (0,64 km²)

Position of groundwater level !

Budget !

Coordination efforts !!!

Ongoing projects (civil works) : overview

- Project metro 3 No(o)rd-Albert: Albert
  (STIB-MIVB / Louis De Waele / in Advance)
- Project metro 3 No(o)rd-Albert: Tunnel Constitution / Grondwettunnel
  (STIB-MIVB / Jan de Nul / Besix / Franki)
- Central station (Gare Centrale / Centraalstation)
  (STIB-MIVB / Willemen / Franki)

- Project metro 3 No(o)rd-Bordet : with tunnel boring machine (Beliris / …)

Thank you for your attention !

Conclusions: questions & debate

1. CO2 Emissions: What specific strategies are in place to minimize CO2 emissions during tunnel construction and operation?

2. Resilience: How is your organization adapting tunnel infrastructure to withstand extreme weather events and climate change impacts?

3. Investment: Are you willing to allocate additional funds to sustainable initiatives, such as renewable energy integration and green building practices?

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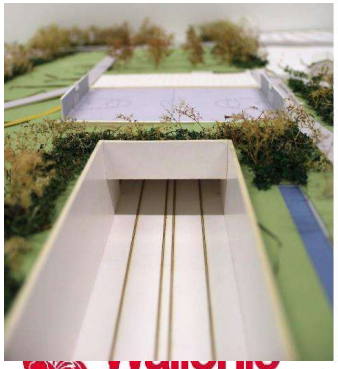
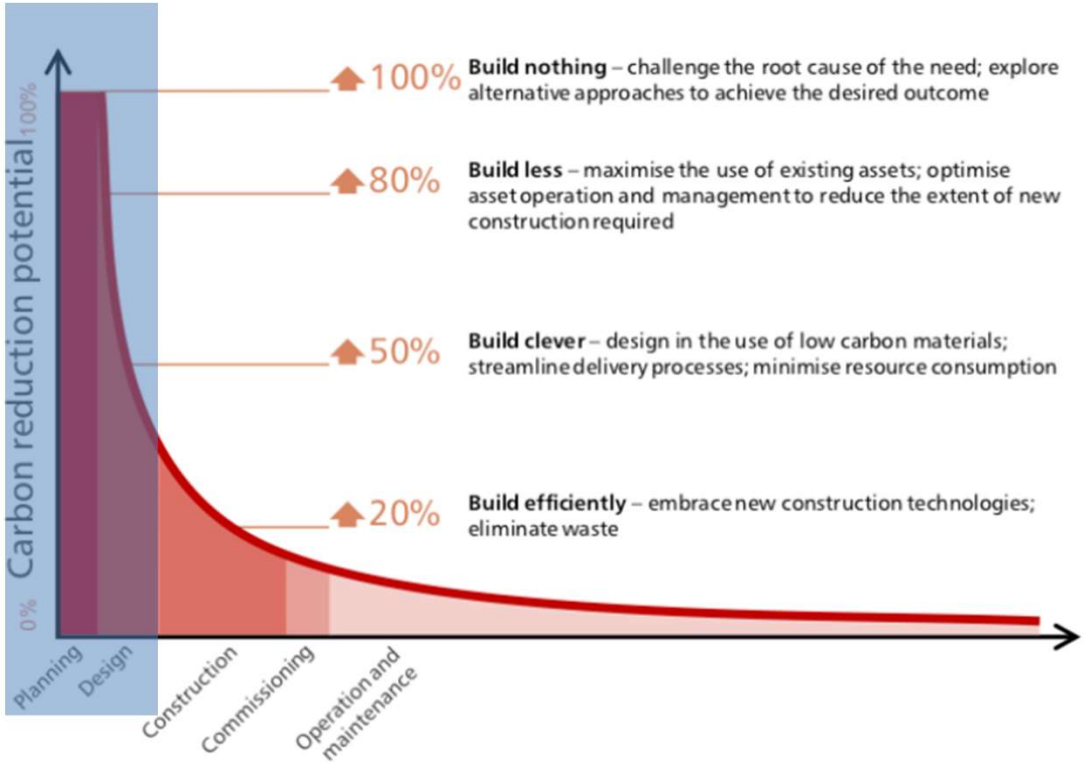
CO2 Emissions: What specific strategies are in place to minimize CO2 emissions during tunnel construction and operation?

- **Planning**
  - Tacle carbon early – project definition - EIA study – trade off alternatives
  - Considering whole life
  - Integral & multidisciplinary design - avoiding “single-use solutions” – combining ecological & social benefits





Source: Green Construction Board

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CO2 Emissions: What specific strategies are in place to minimize CO2 emissions during tunnel construction and operation?

- Construction:
  - Project EIA assessment
  - Case-by-case – additional requirement in contract regarding NOX-emission and impact on Nature2000-habitat (electrical equipment)
  - “CO2-prestatieladder level 5”-requirement in DBFM-contracts
  - Sustainability-goals in tender
    - Requirements
      - (PV panel, CO2-neutral - service buildings)
      - Re-use material onsite;
      - Transport over water & railways;
      - …
    - Awarding criteria.

Resilience: How is your organization adapting tunnel infrastructure to withstand extreme weather events and climate change impacts?

- Buffercapacity rain water
  - T100-scenario

Investment: Are you willing to allocate additional funds to sustainable initiatives, such as renewable energy integration and green building practices?

- Yes → if proven technology
- Innovation & new technology → dialogue phase with contractors to discuss before importing in contract
  - Monitoring is an issue

CO2 Emissions: What specific strategies are in place to minimize CO2 emissions during tunnel construction and operation?

From 2026, we will insert additional criteria in our public contracts for encourage companies to reduce their CO2 emissions.

Presently, SPW analyse how he might add value to the offer which have the lowest CO2 emissions.

Resilience: How is your organization adapting tunnel infrastructure to withstand extreme weather events and climate change impacts?

Before starting a tunnel renovation, we make a flood risk analysis.

If the risk exists, we try to find economic adjustments that minimize the risk.

Investment: Are you willing to allocate additional funds to sustainable initiatives, such as renewable energy integration and green building practices?

We are used to working by public contracts based on several criteria.

So, the low CO2 emissions criteria encourage these green initiatives.

ABTUS/BVOTS

activities / avantages

- **Journal T&ES (via AFTES)**

Abtus/bvots is represented
via Didier de Bruyn
(correspondente in editorial board)

Revue trimestrielle N°262
Quarterly magazine
Octobre/Novembre/Décembre 2017

www.aftes.asso.fr

Session 1 ITA – ABTUS-BVOTS Contract signing
30th of November 2024 - Genova

Session 1 ITA – ABTUS-BVOTS Contract signing
30th of November 2024 - Genova

Thank you for your support!

Johan Mignon — President of ABTUS-BVOTS

Bart De Pauw — Secretary of ABT

ITA AITES WTC 2027 ANTWERP 23-29 APRIL 2027

World Tunnel Congress 2027 – Antwerp (WTC 2027)

14:45 – 16:45 Session 2:
2 interactive sessions of 45 min. + plenary of 25 min.

First round ⇩

Theme	Papers	Room
Sustainability in Underground Infrastructure	• Opportunities of sustainable solutions in the underground structures of the Oosterweel connection - ***Lantis (Robrecht Keersmaekers)*** • The intersection of Sustainability and Fire Safety in tunnels – ***Nestaan nv (Pieter van Nes)***	Yellow room Host: Kang-Chi Ja
Sustainable Materials and Construction Practices for Underground Structures	• A sustainable material consideration for bicycle tunnels above groundwater level: in situ concrete vs galvanized corrugated steel plates – ***SBE (Joshua Marysse)*** • Efficient application of passive fire protection in concrete tunnels – ***Ghent University (Thomas Thienpont)***	Green room Host: Bart De Pau
Climate Change Adaptation and Resilience of Underground Infrastructure	• Transformation of (tunnel) earthworks into Léém's unfired building materials – ***BC Materials (Ken De Cooman)***	Plenary room

Break


lantis
bouwen
aan
verbinding
Promat
TUC RAIL
BELGIAN RAIL ENGINEERING
W&F
WAYSS & FREYTAG
INGENIEURBAU
DEME
INFRA
Everlux®
MEET HET
MEMBER OF ABO-GROUP
ABO
GROUP
ENVIRONMENT
DE WERKVENNOOTSCHAP

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16:45 – 16.50 Conclusions and next steps

16:50 – 18.20 Network drink

Thank you for participation!