

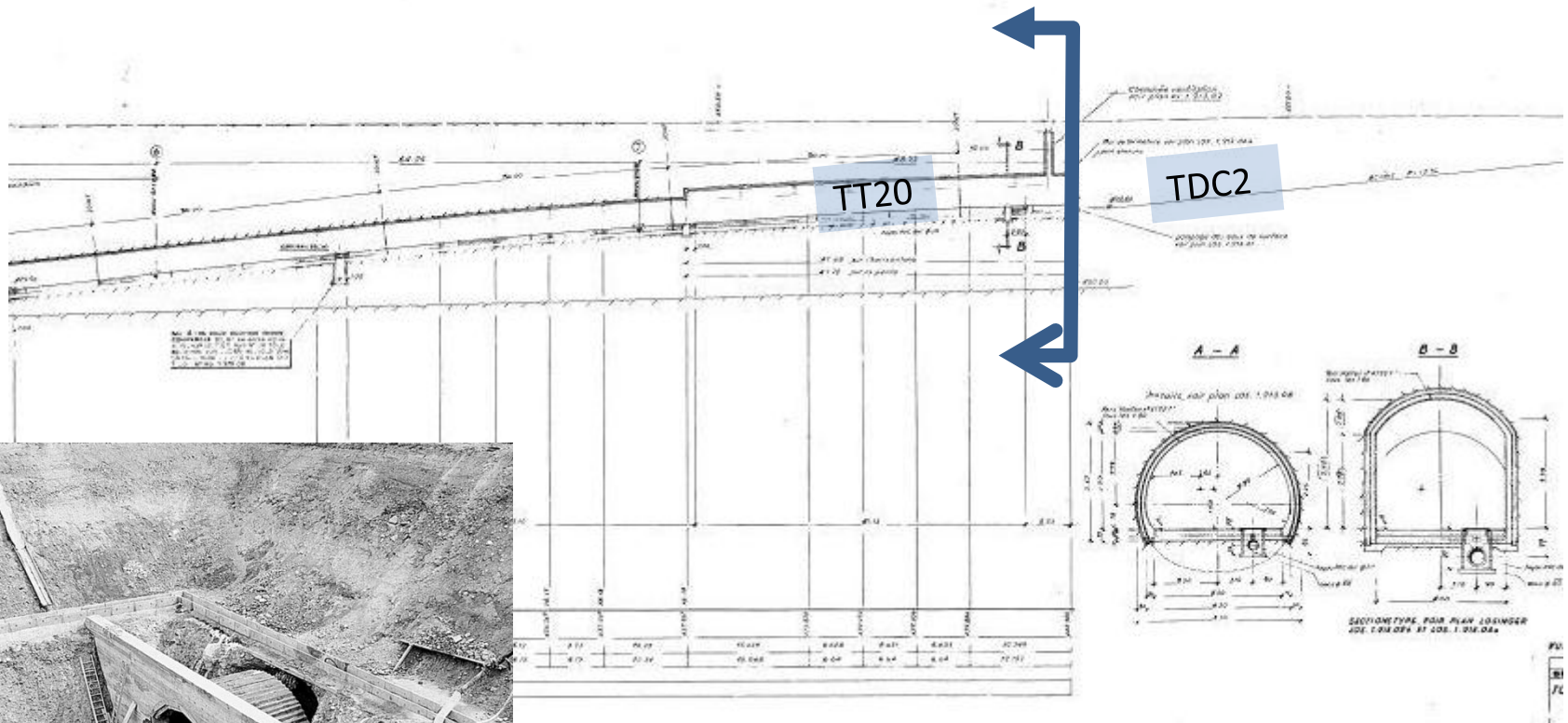
Civil Engineering for CENF

# TT20/TT26 Junction Cavern

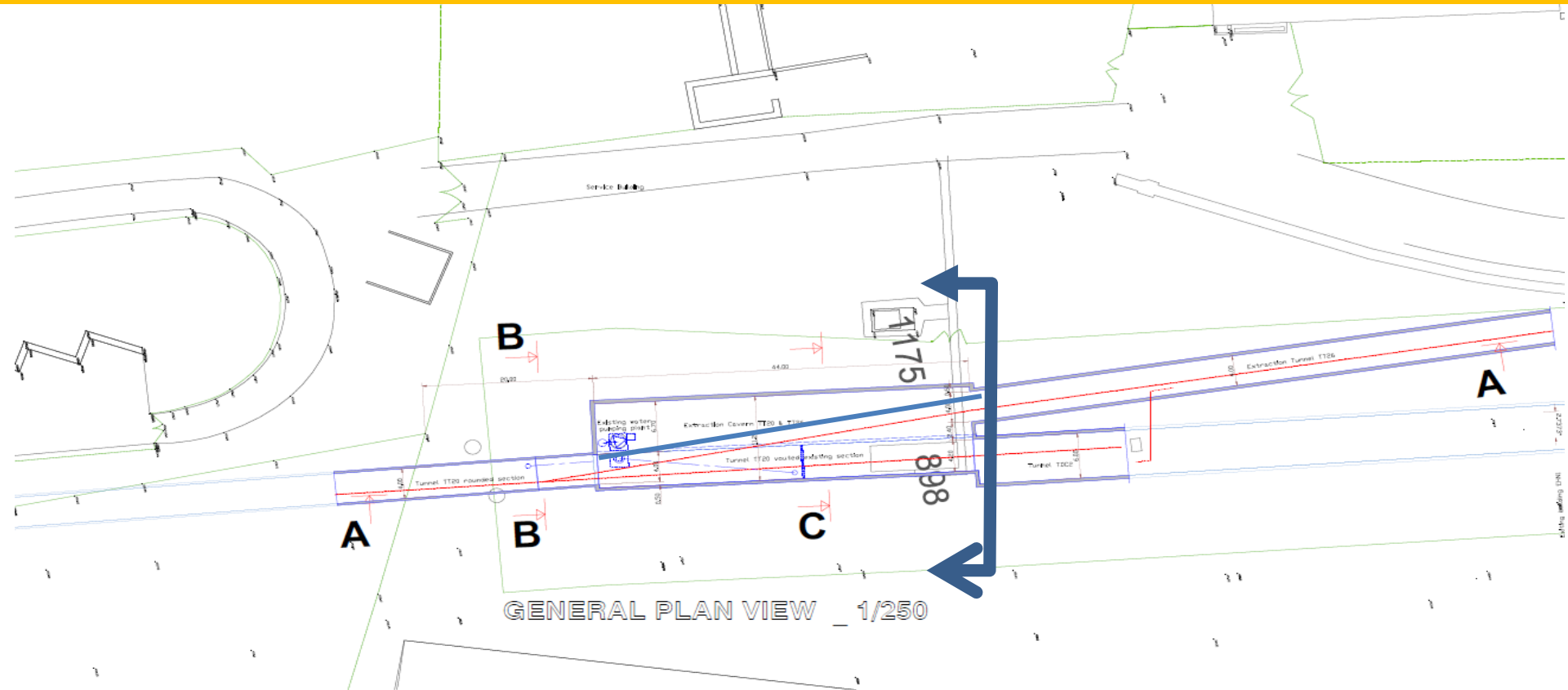
John Osborne GS/SE

March 2013

# TT20 was tunneled, TDC2 was 'open-cut'



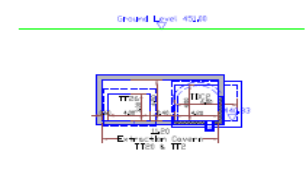
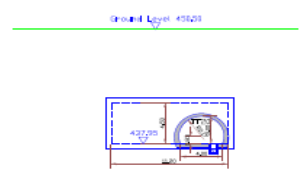
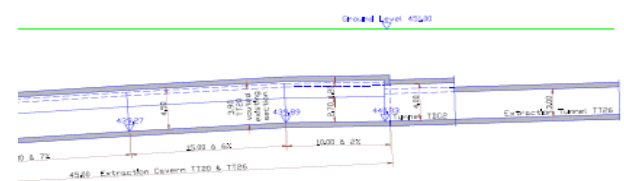
# Option 1 : Demolish TT20 / New Junction Cavern



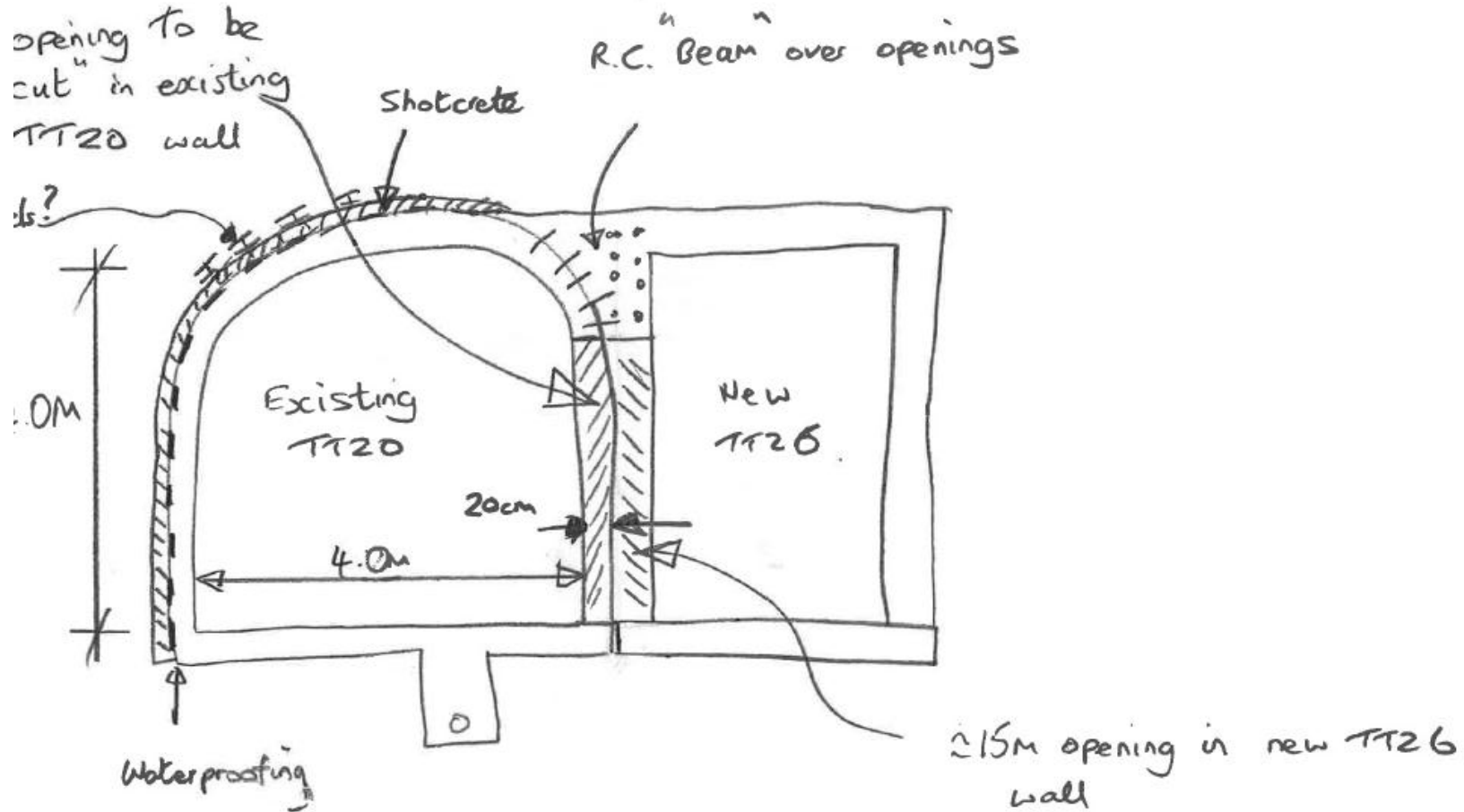
CROSS SECTION "A-A"  $\frac{1}{250}$

CROSS SECTION "B-B"  $\frac{1}{250}$

CROSS SECTION "C-C"  $\frac{1}{250}$



# Option 2 : New TT26 'runs alongside' TT20 with openings created later



TT20 / TT26 Junction Cavern

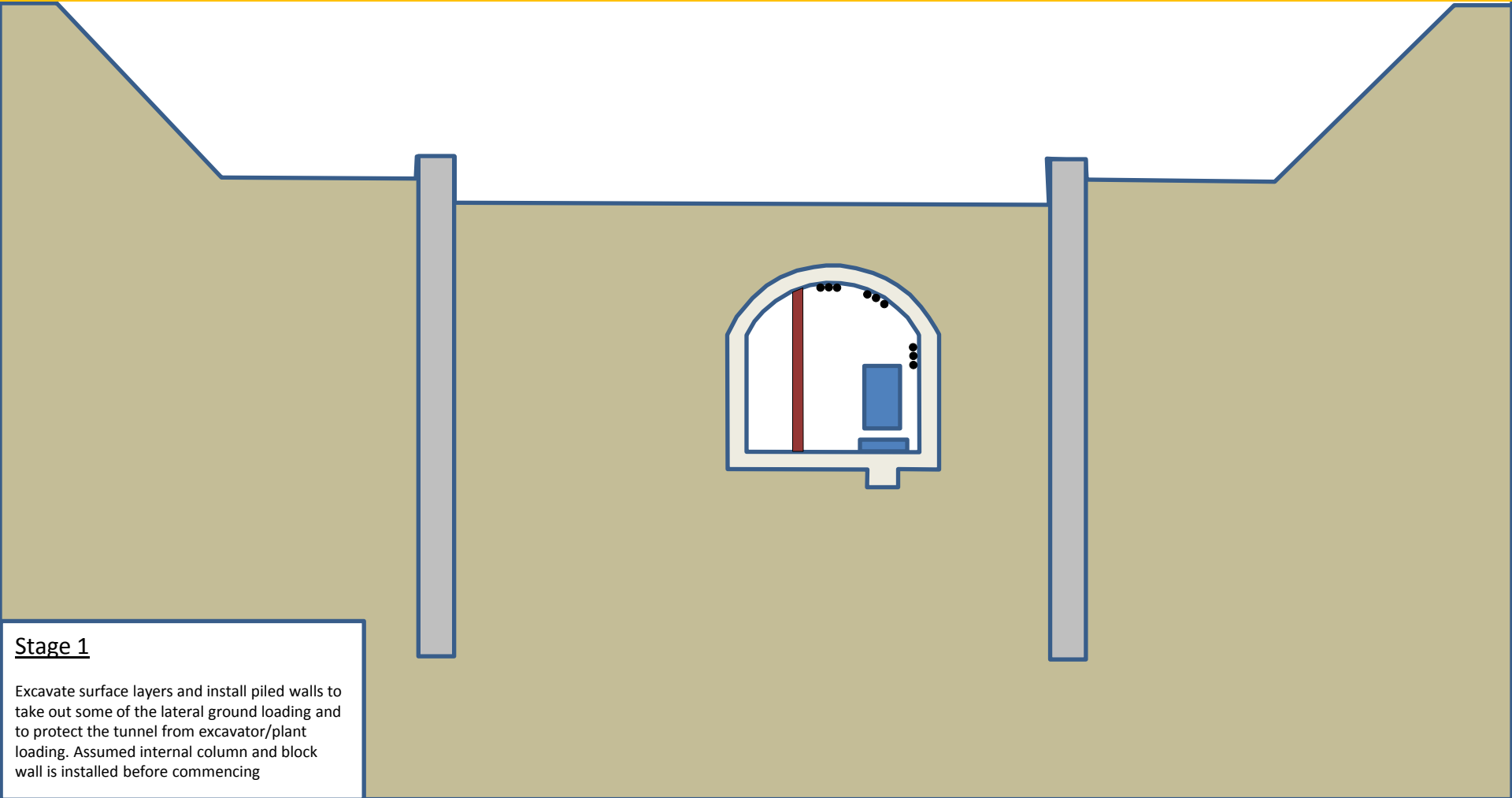


Area where side-wall will be  
'removed'

Concrete shielding and propping

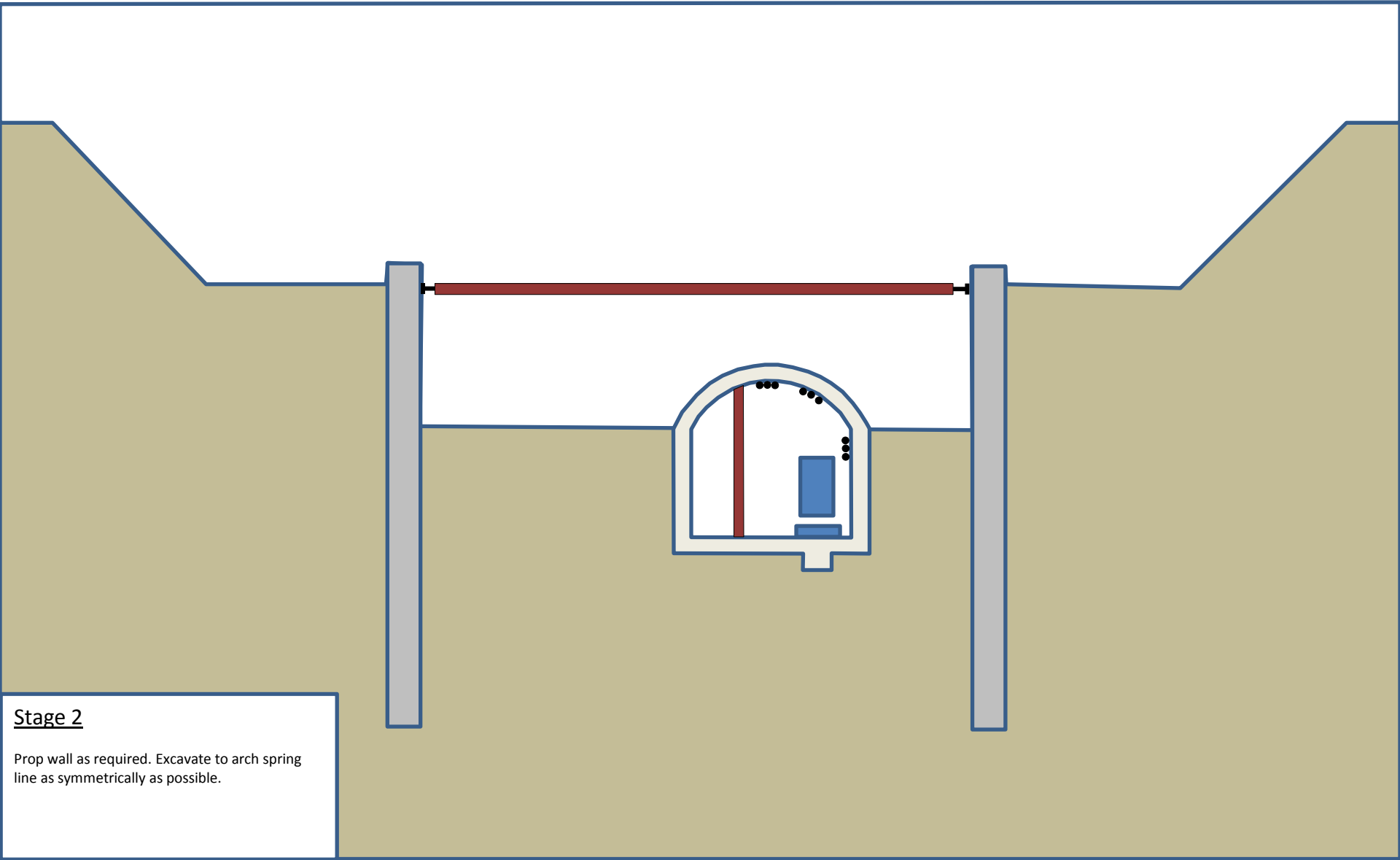


# ***Option 2*** : ARUP UK have developed a methodology to maintain TT20



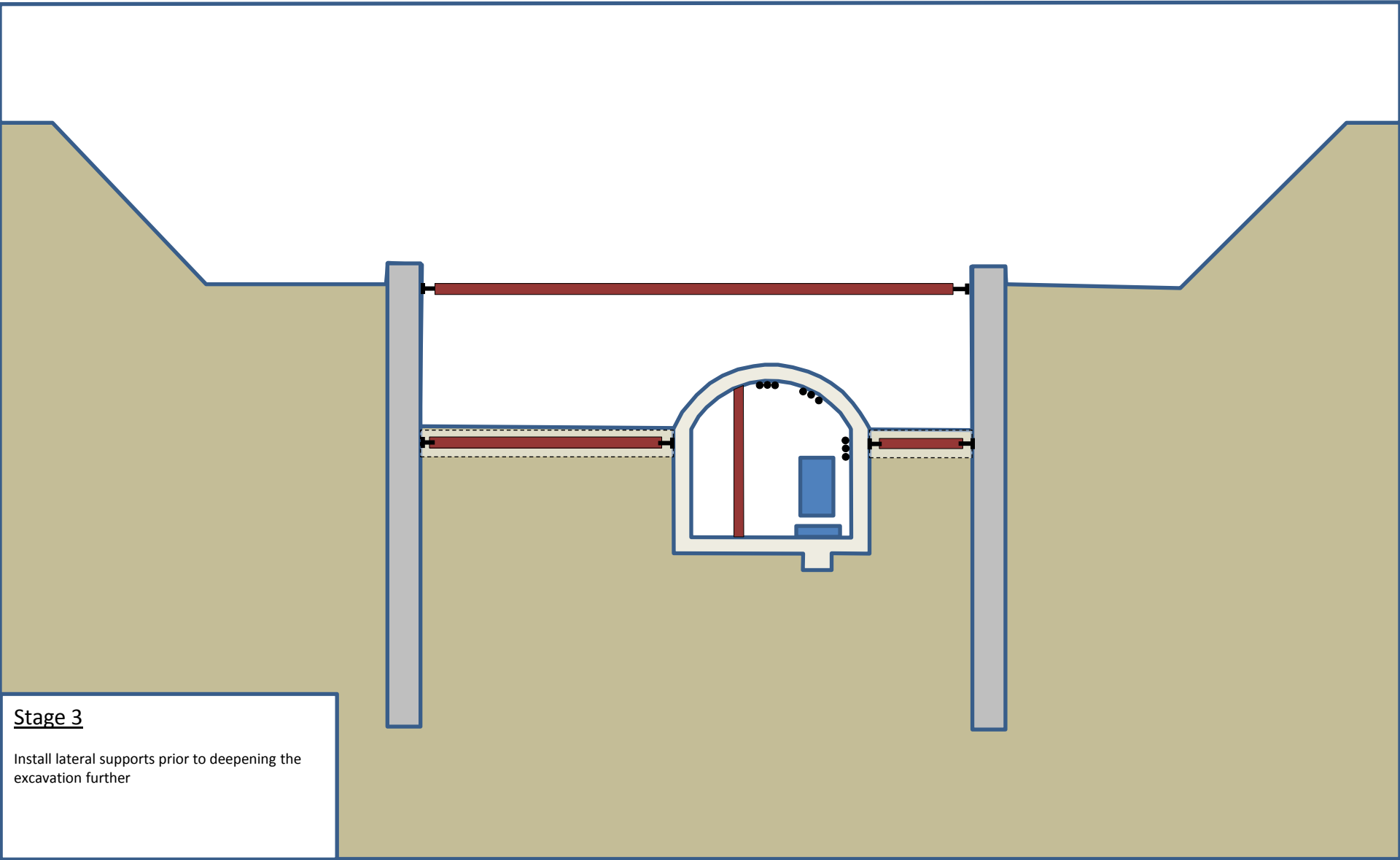
## Stage 1

Excavate surface layers and install piled walls to take out some of the lateral ground loading and to protect the tunnel from excavator/plant loading. Assumed internal column and block wall is installed before commencing



Stage 2

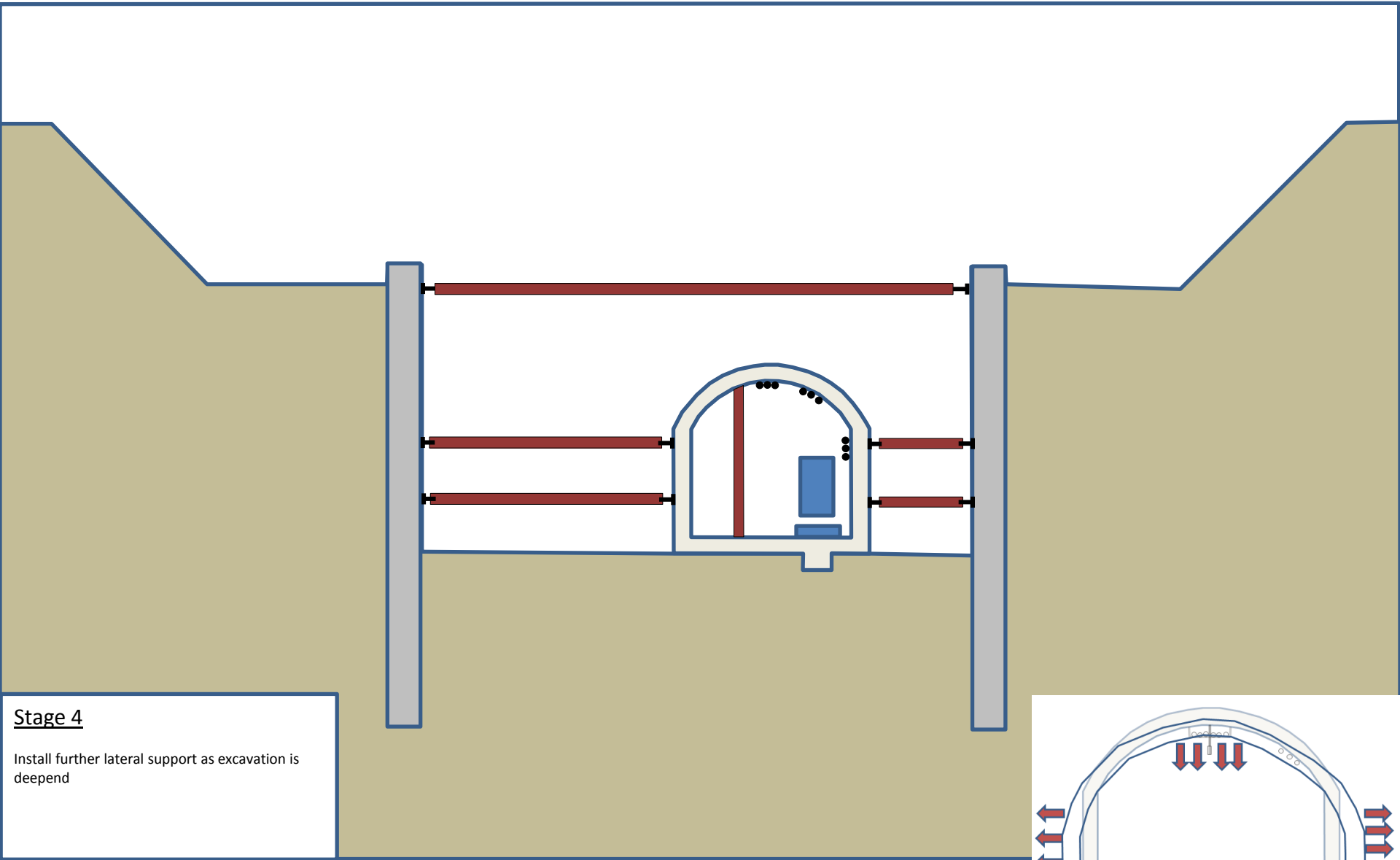
Prop wall as required. Excavate to arch spring line as symmetrically as possible.



Stage 3

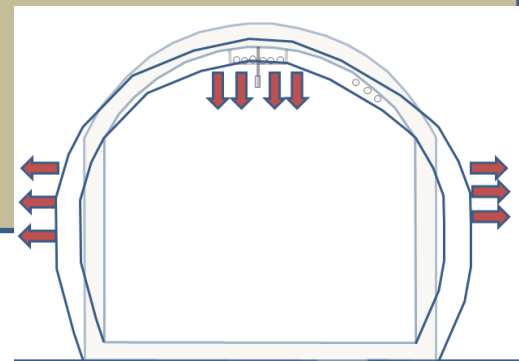
Install lateral supports prior to deepening the excavation further

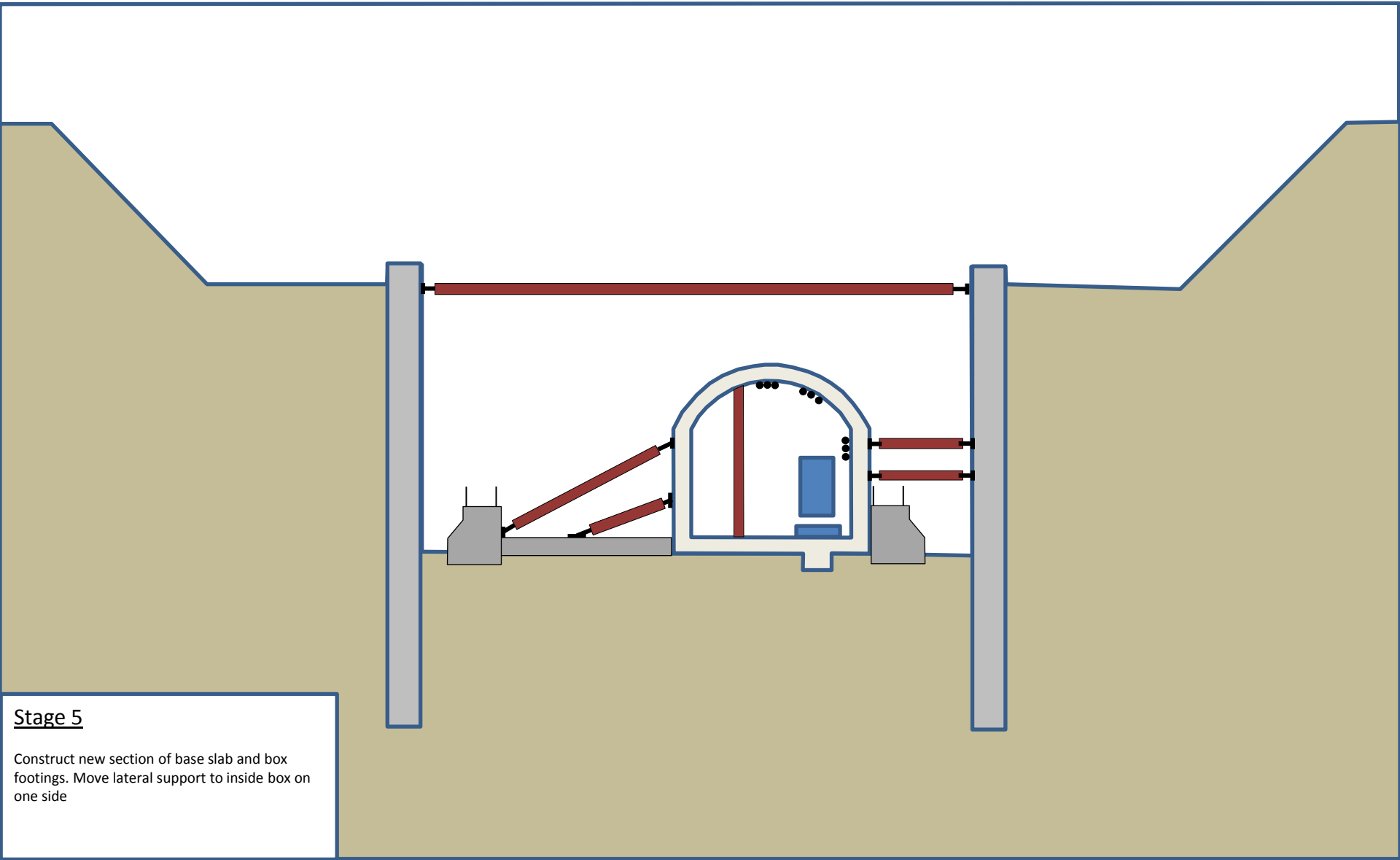




**Stage 4**

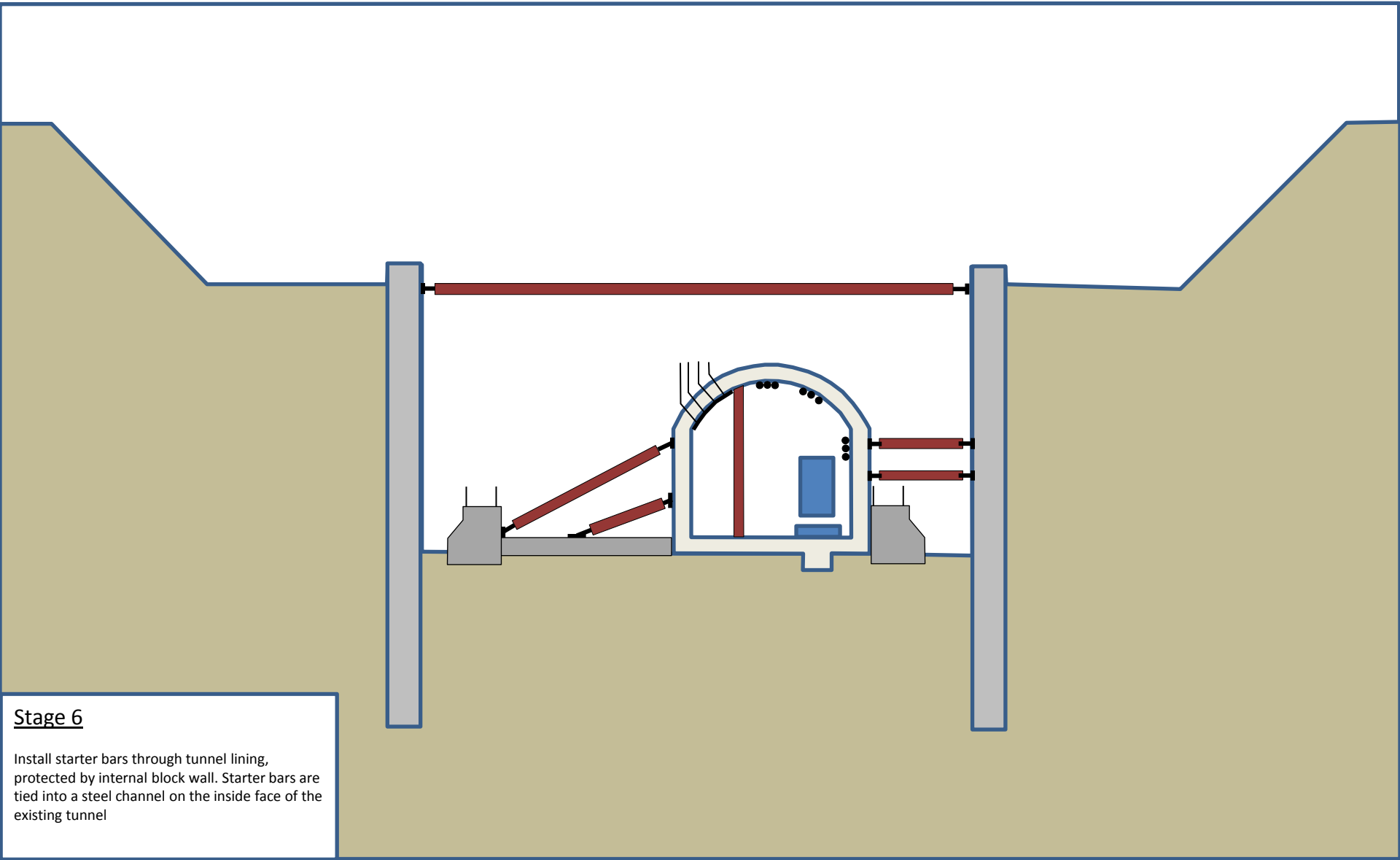
Install further lateral support as excavation is deepend





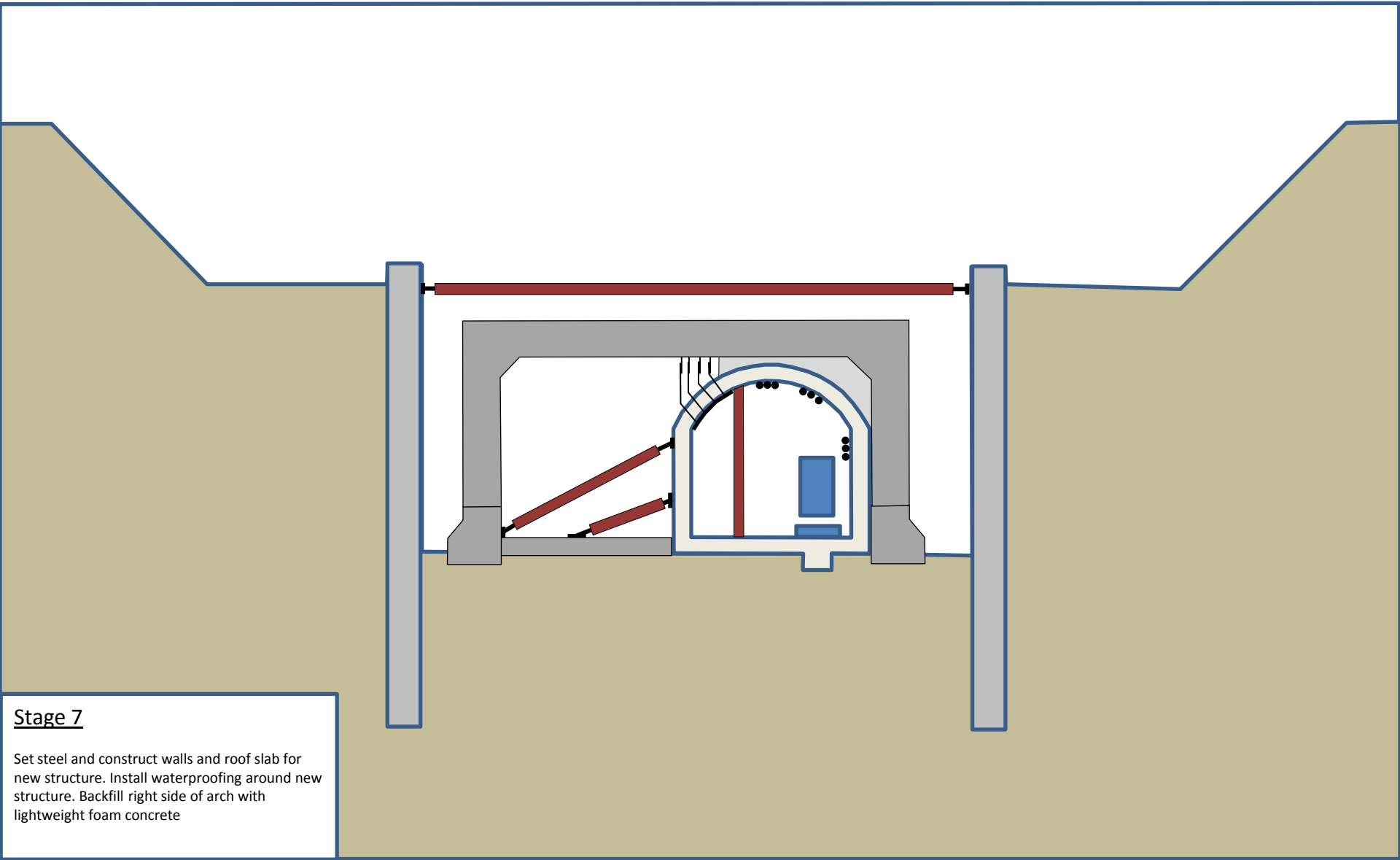
**Stage 5**

Construct new section of base slab and box footings. Move lateral support to inside box on one side



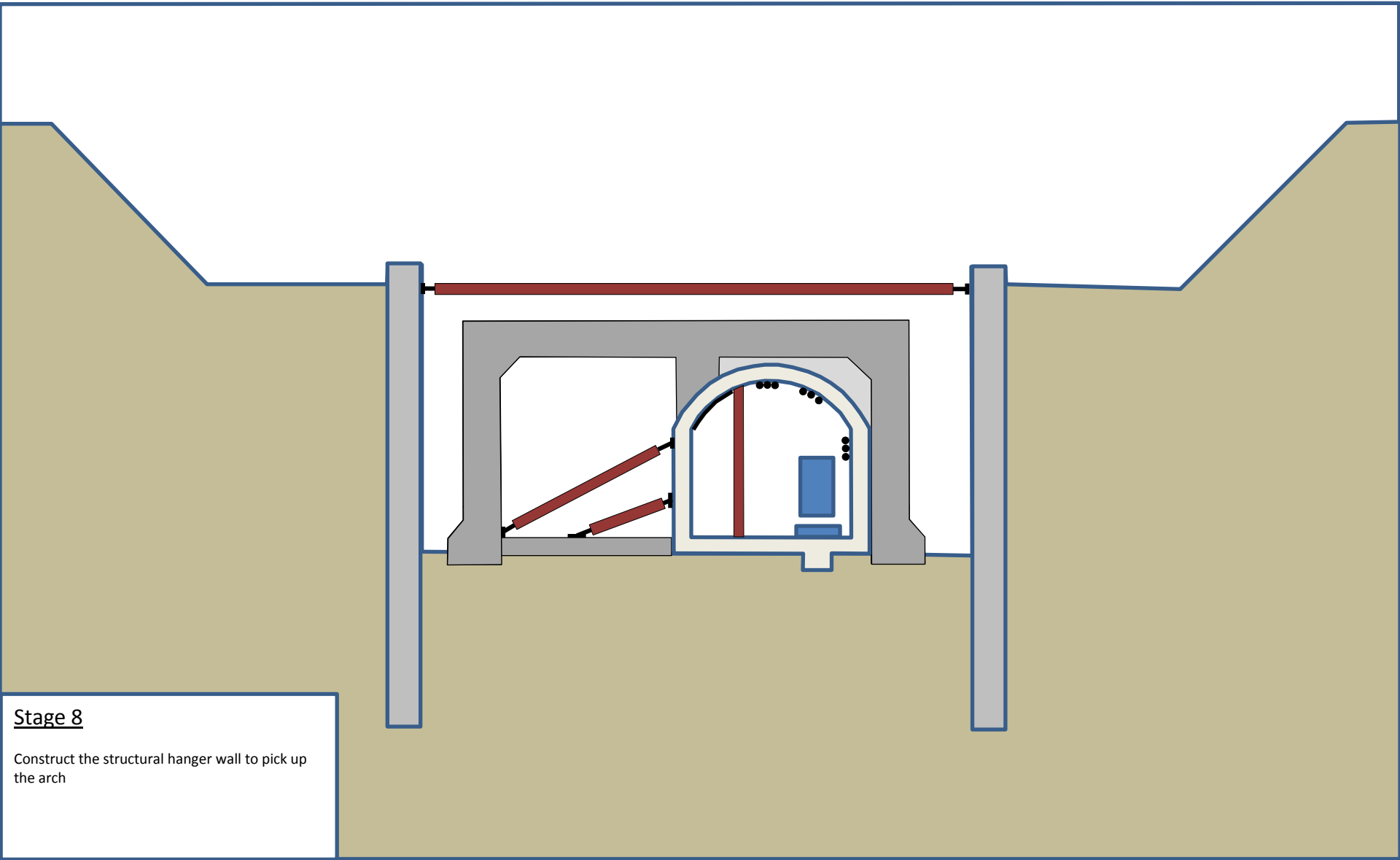
**Stage 6**

Install starter bars through tunnel lining, protected by internal block wall. Starter bars are tied into a steel channel on the inside face of the existing tunnel

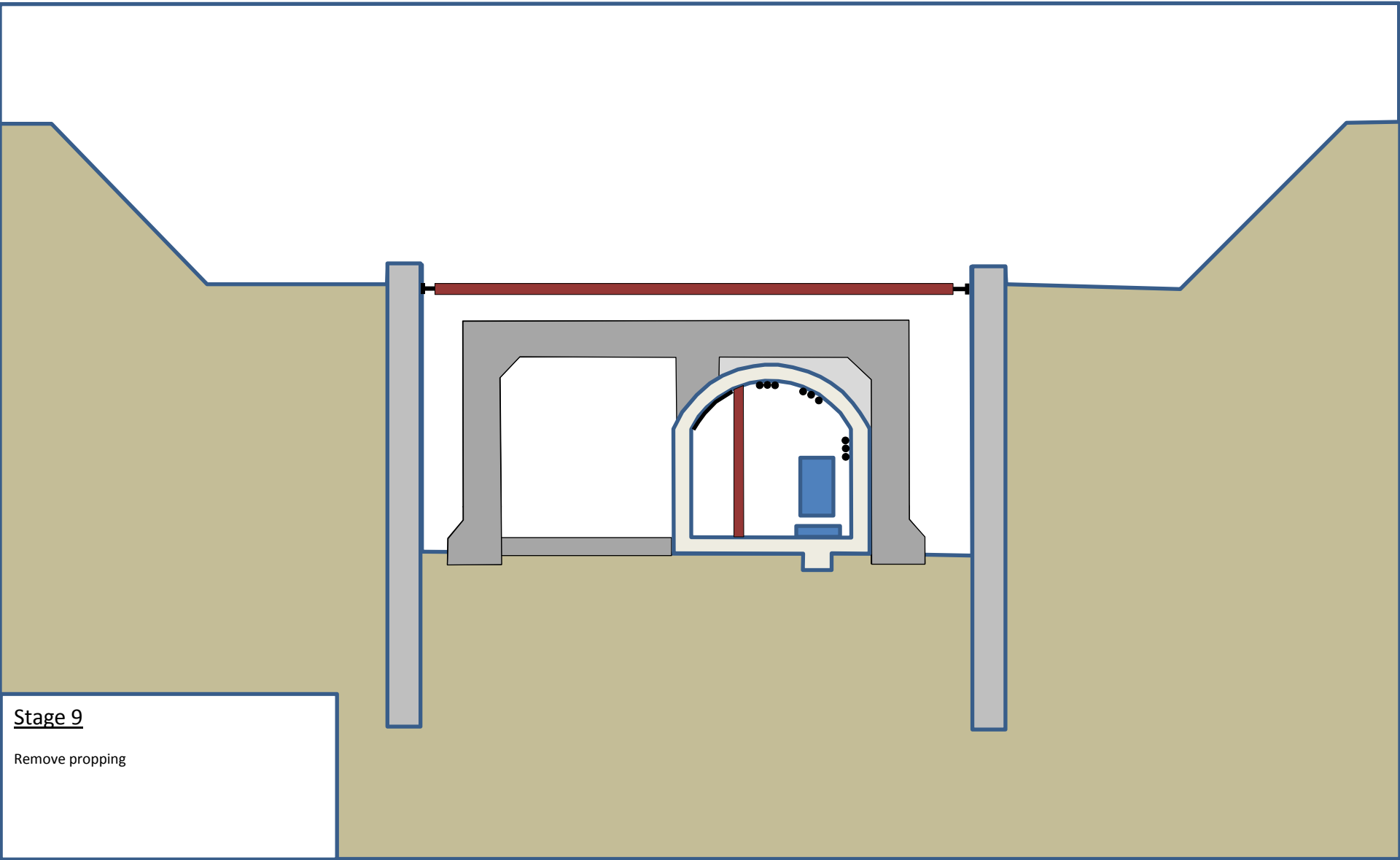


**Stage 7**

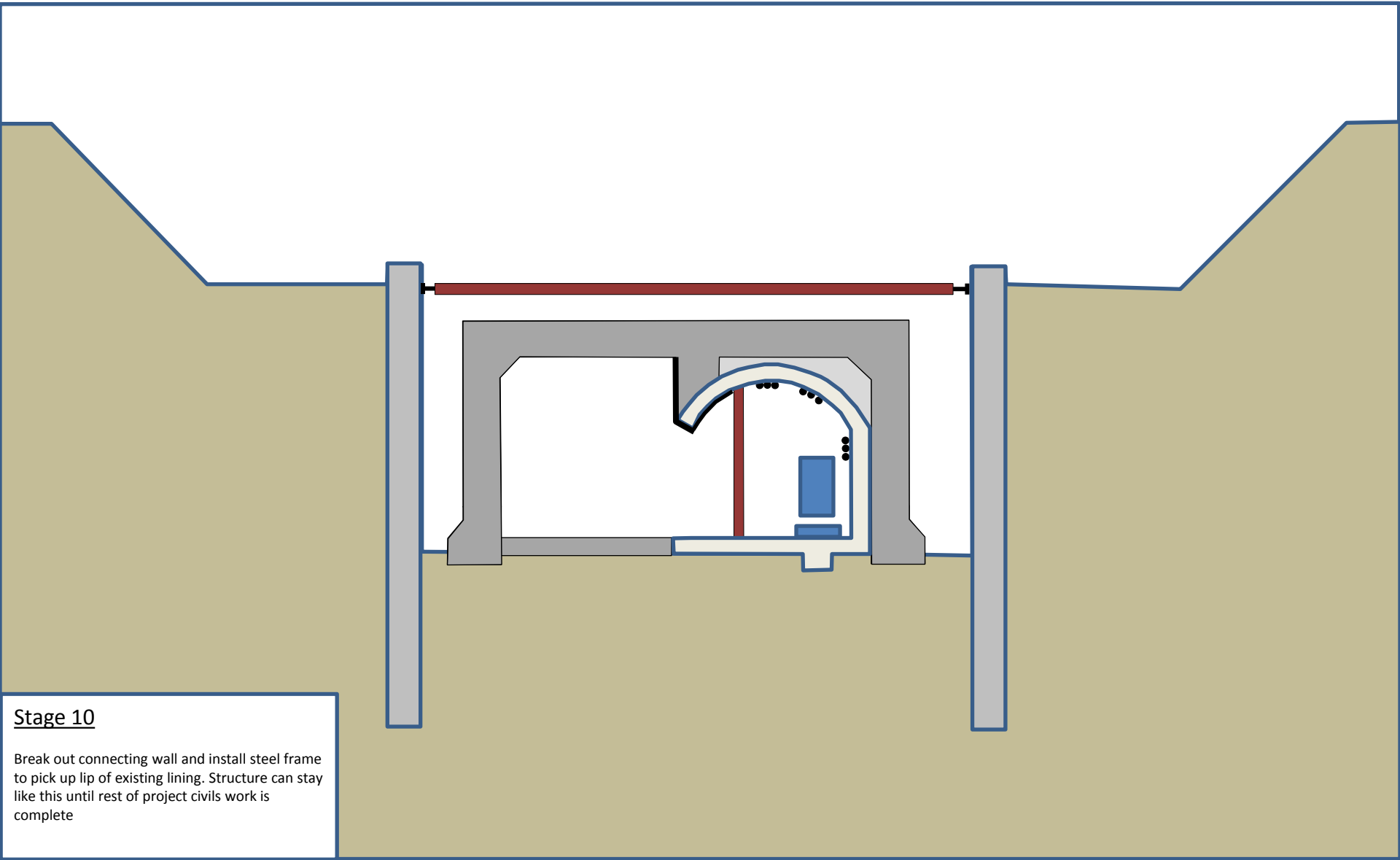
Set steel and construct walls and roof slab for new structure. Install waterproofing around new structure. Backfill right side of arch with lightweight foam concrete



**Stage 8**  
Construct the structural hanger wall to pick up the arch



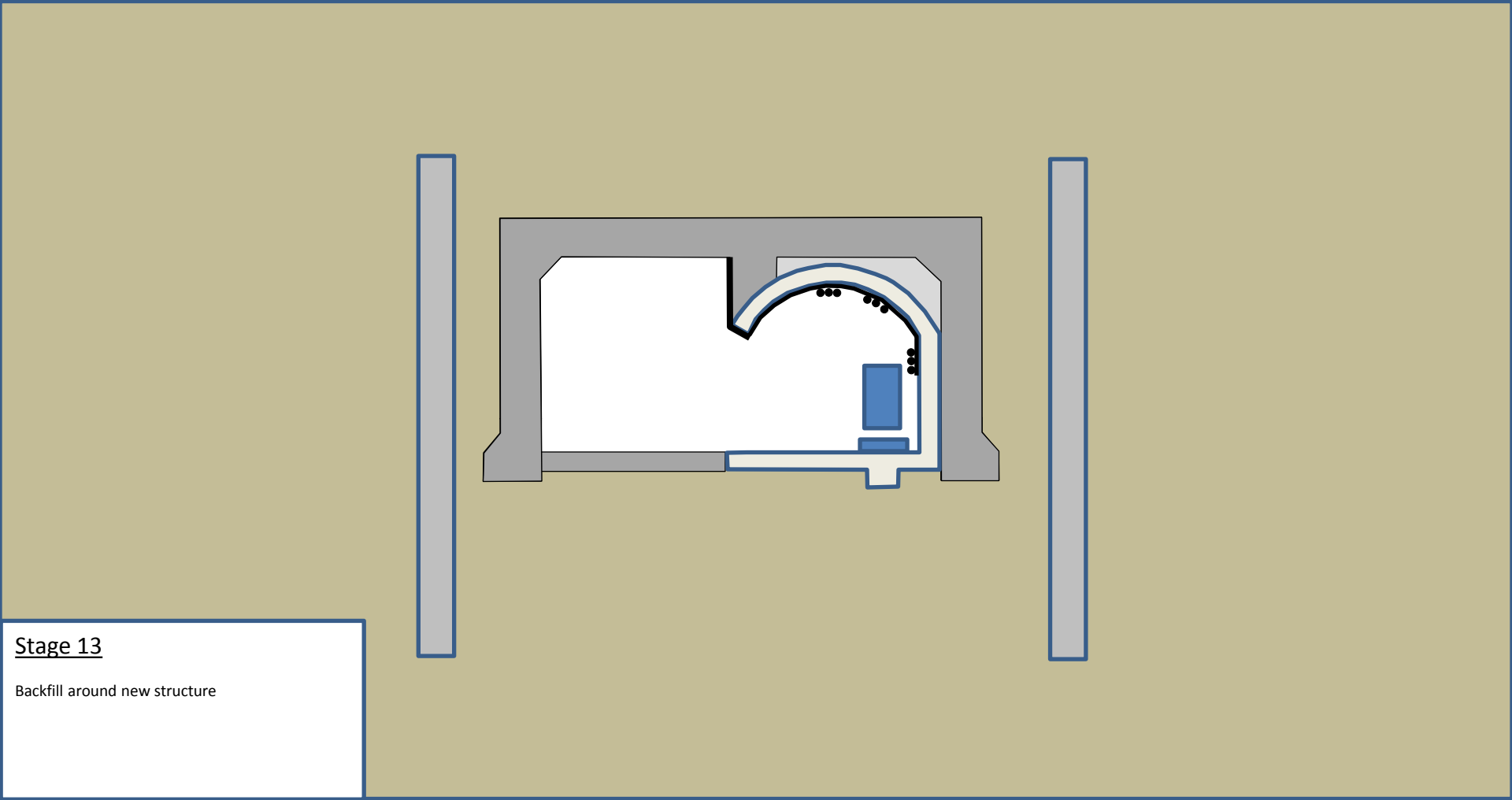
Stage 9  
Remove propping



**Stage 10**

Break out connecting wall and install steel frame to pick up lip of existing lining. Structure can stay like this until rest of project civils work is complete

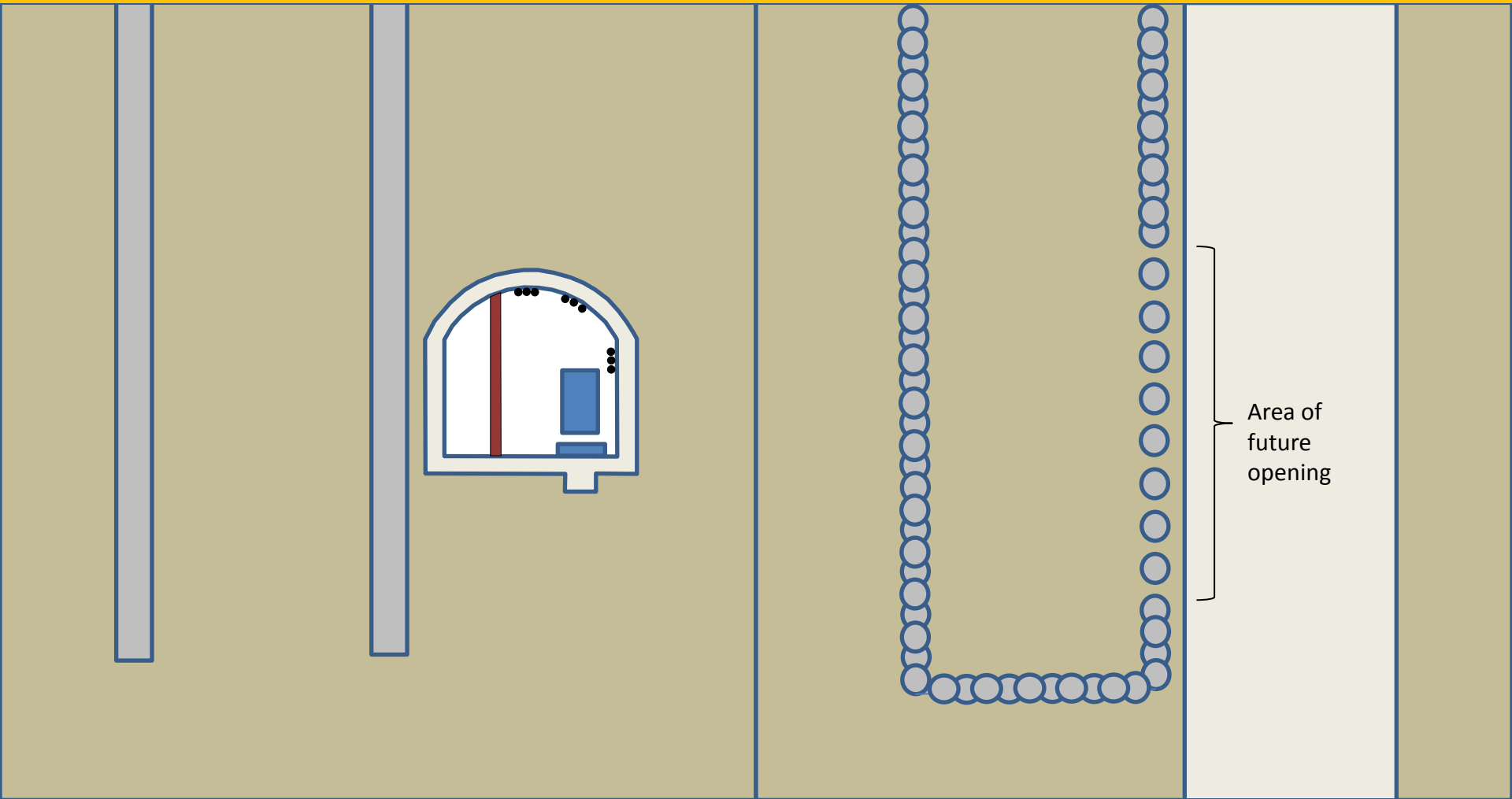




Stage 13

Backfill around new structure

# ***Option 3*** : No works in TT20 during LS1

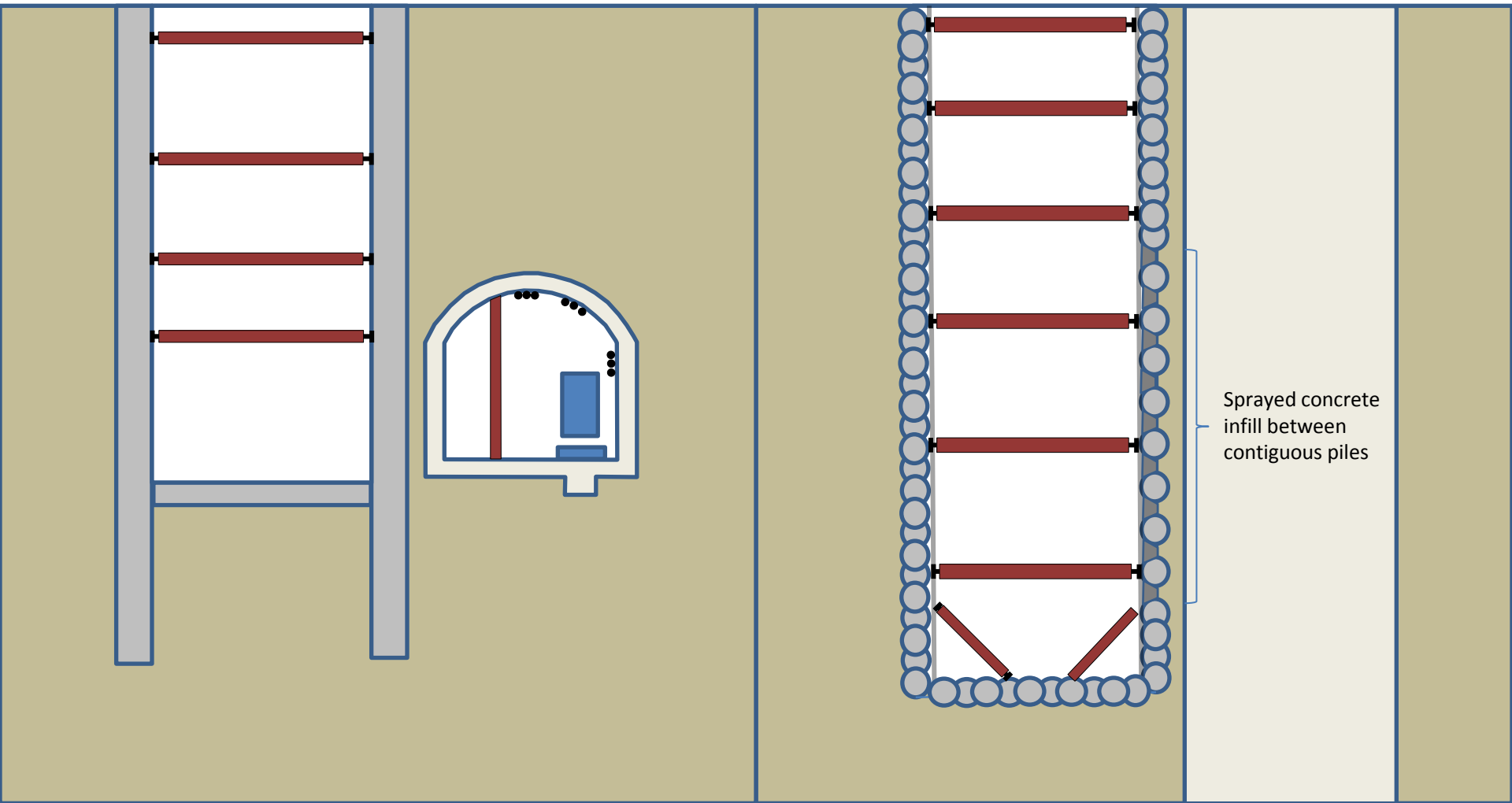


## Stage 1 – Piling

Install contiguous piles through area of opening, secant piles elsewhere

Section

Plan

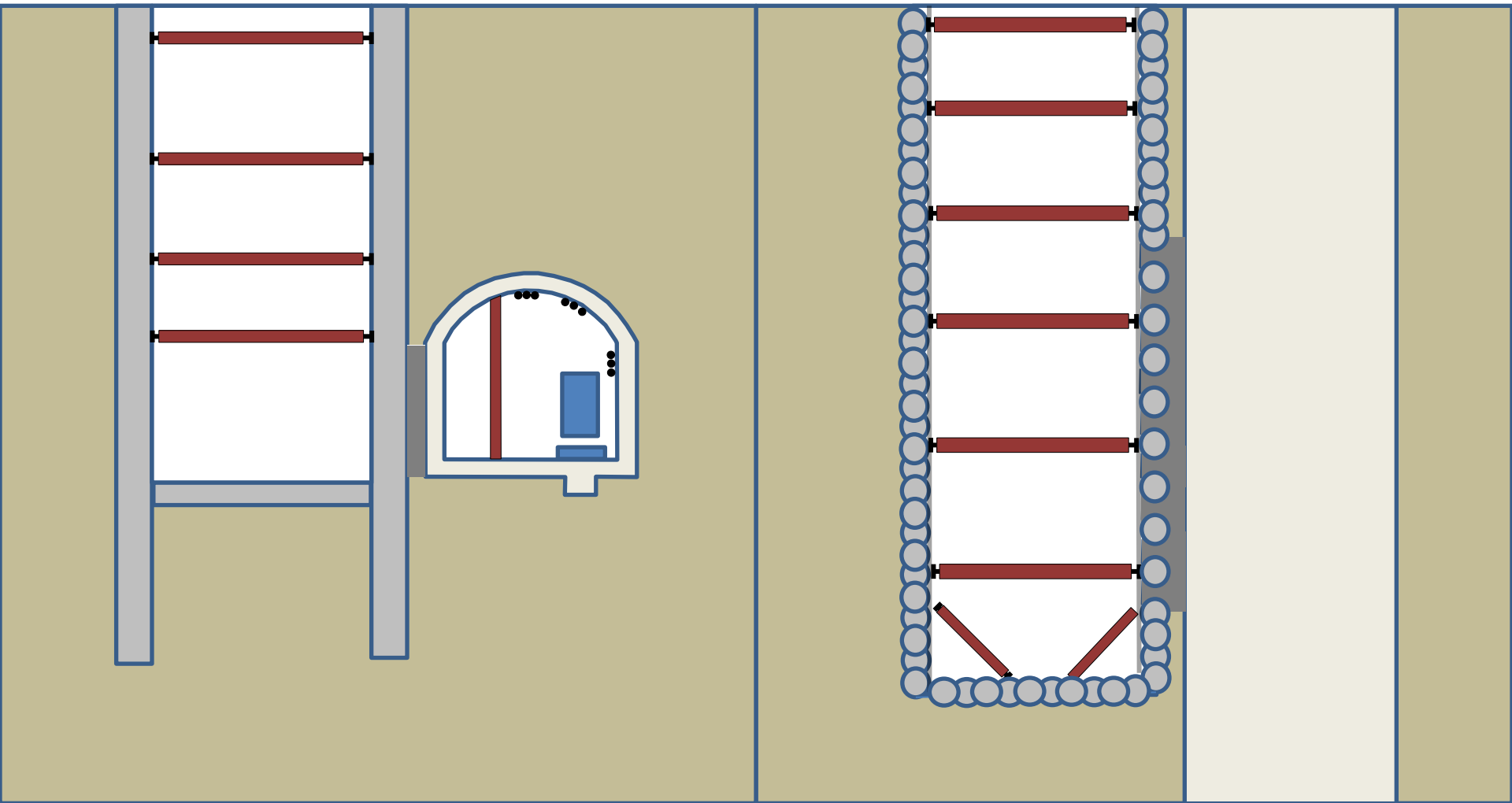


Stage 2 – Excavate open cut

Install temporary propping to limit wall deformation. Spray concrete between contiguous piles during excavation

Section

Plan

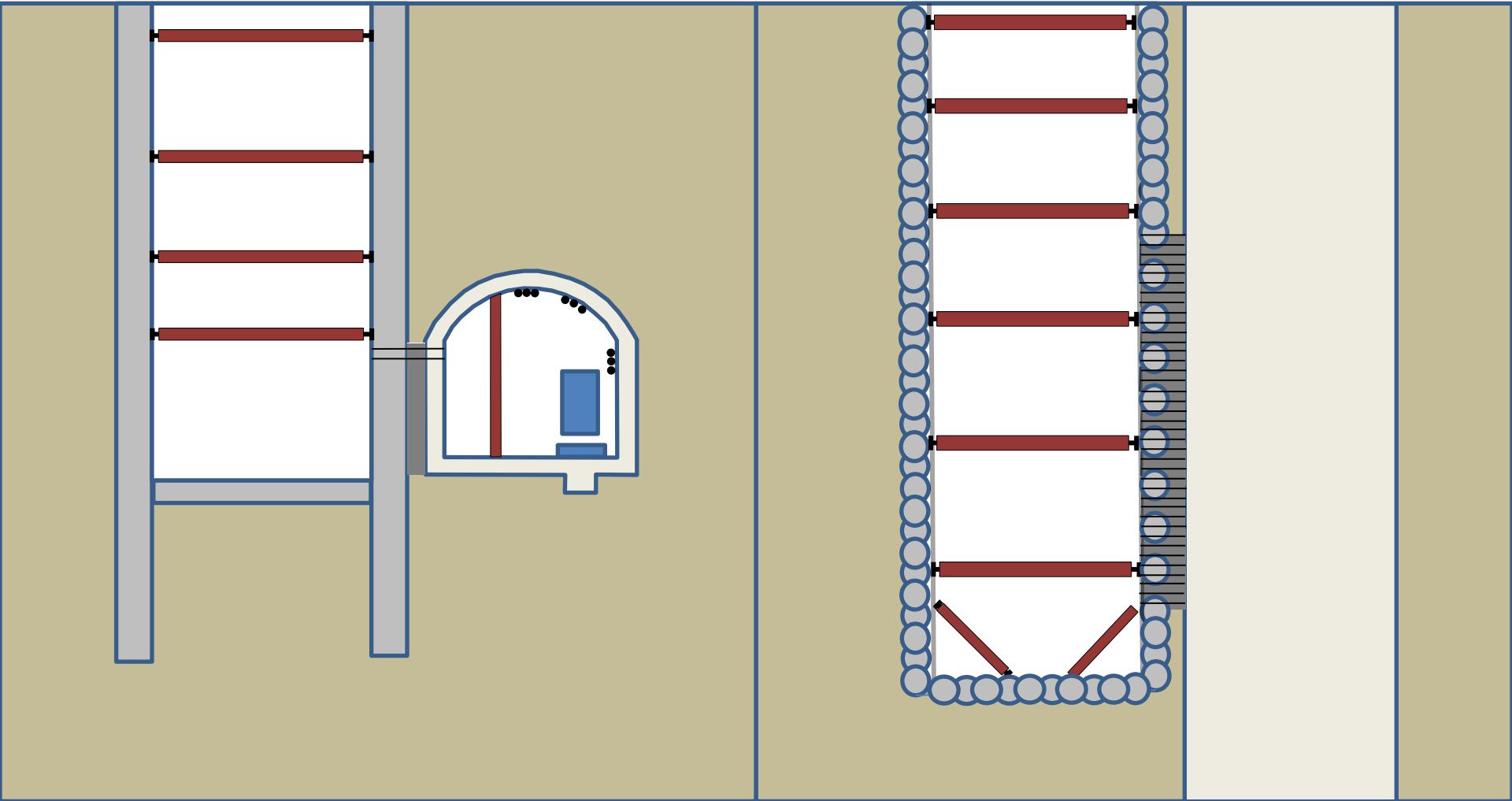


Stage 3 – Structural connection between pile and tunnel, part 1

Break out sprayed concrete between piles and infill between tunnel and pile incrementally

Section

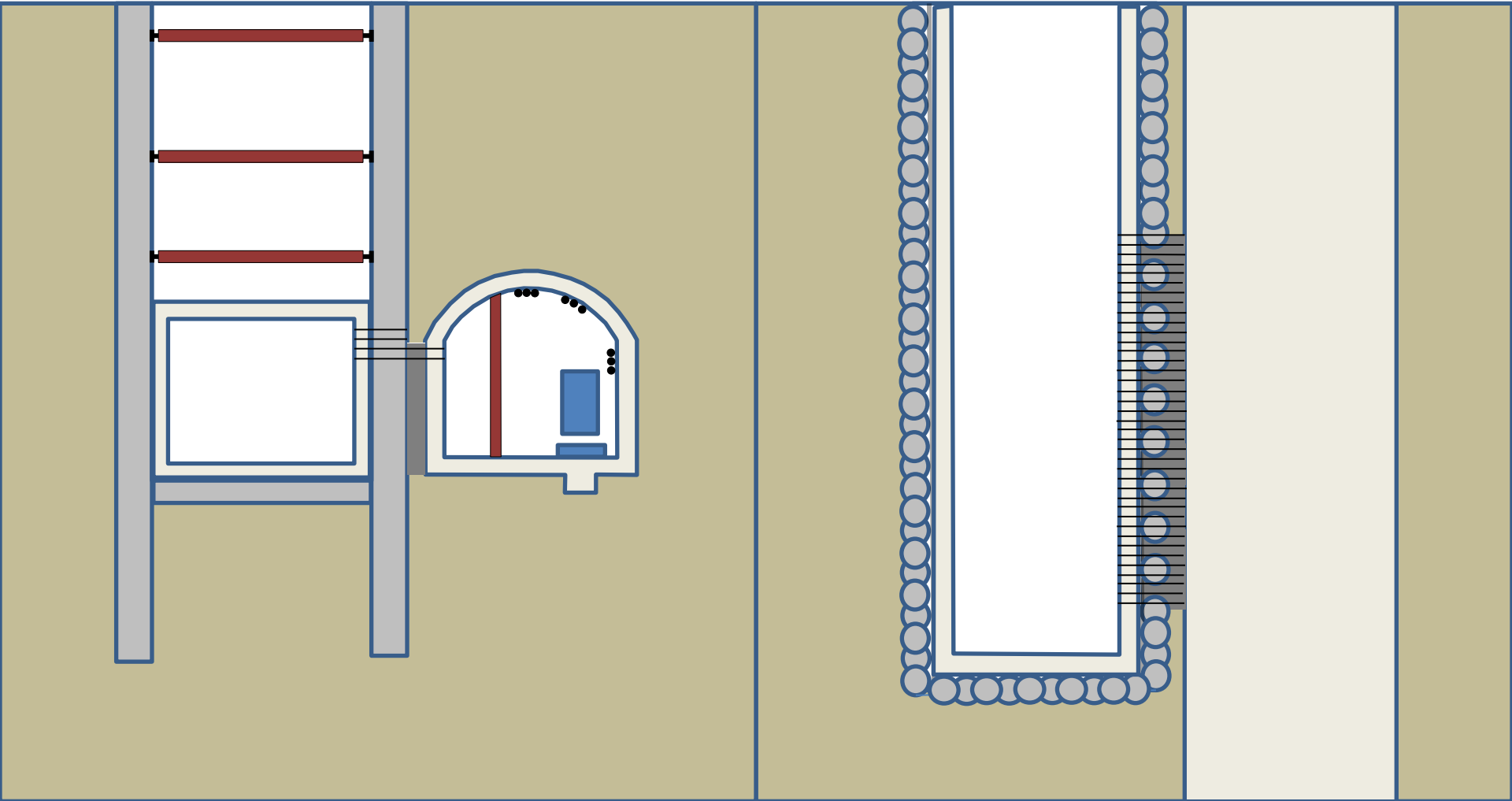
Plan



Stage 4 – Structural connection between pile and tunnel, part 2  
Install shear connectors between old tunnel and pile

Section

Plan

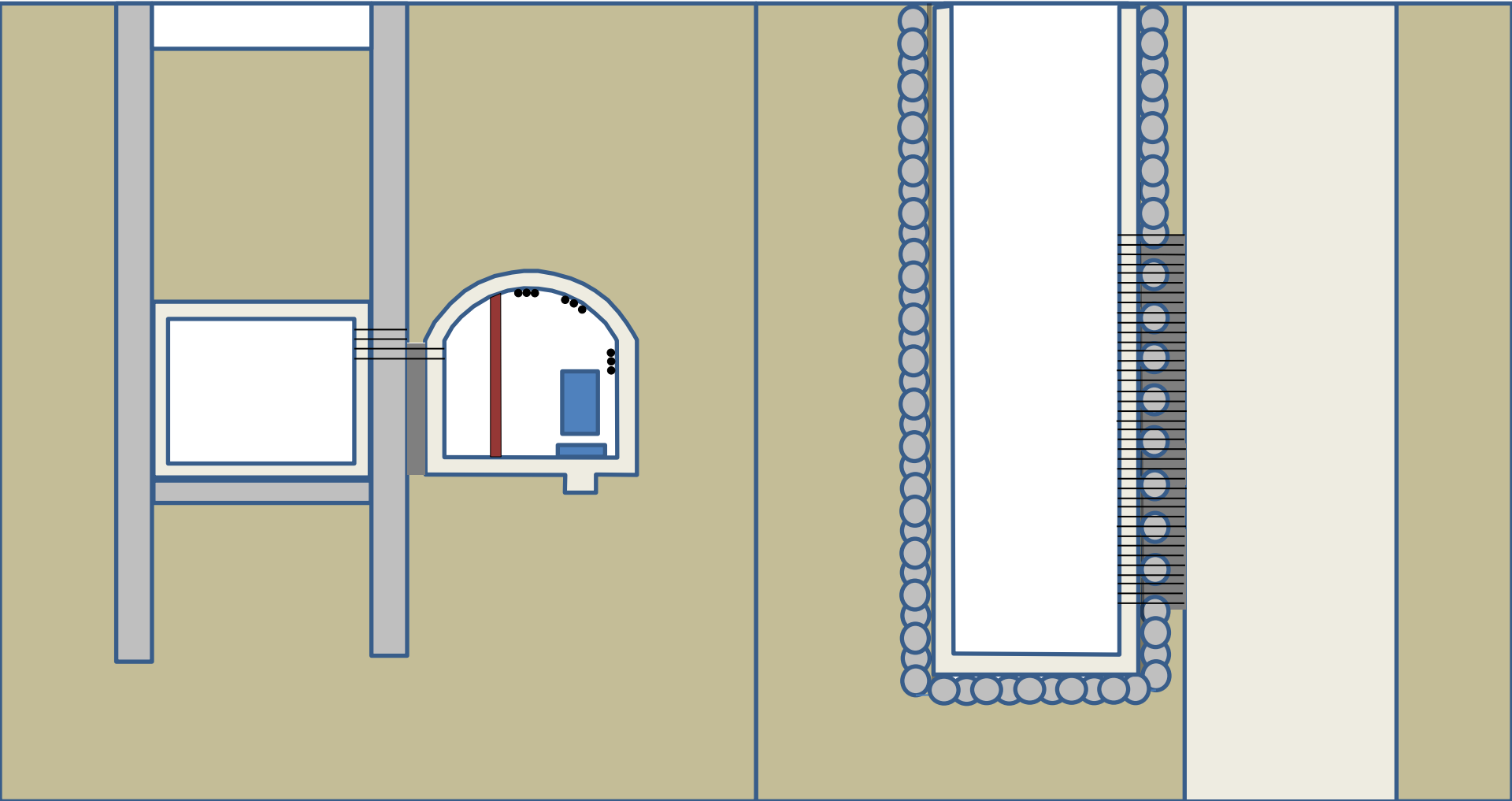


Stage 5 – Construct new tunnel box

Box extent dictated by programme, box tied into pile at future opening

Section

Plan

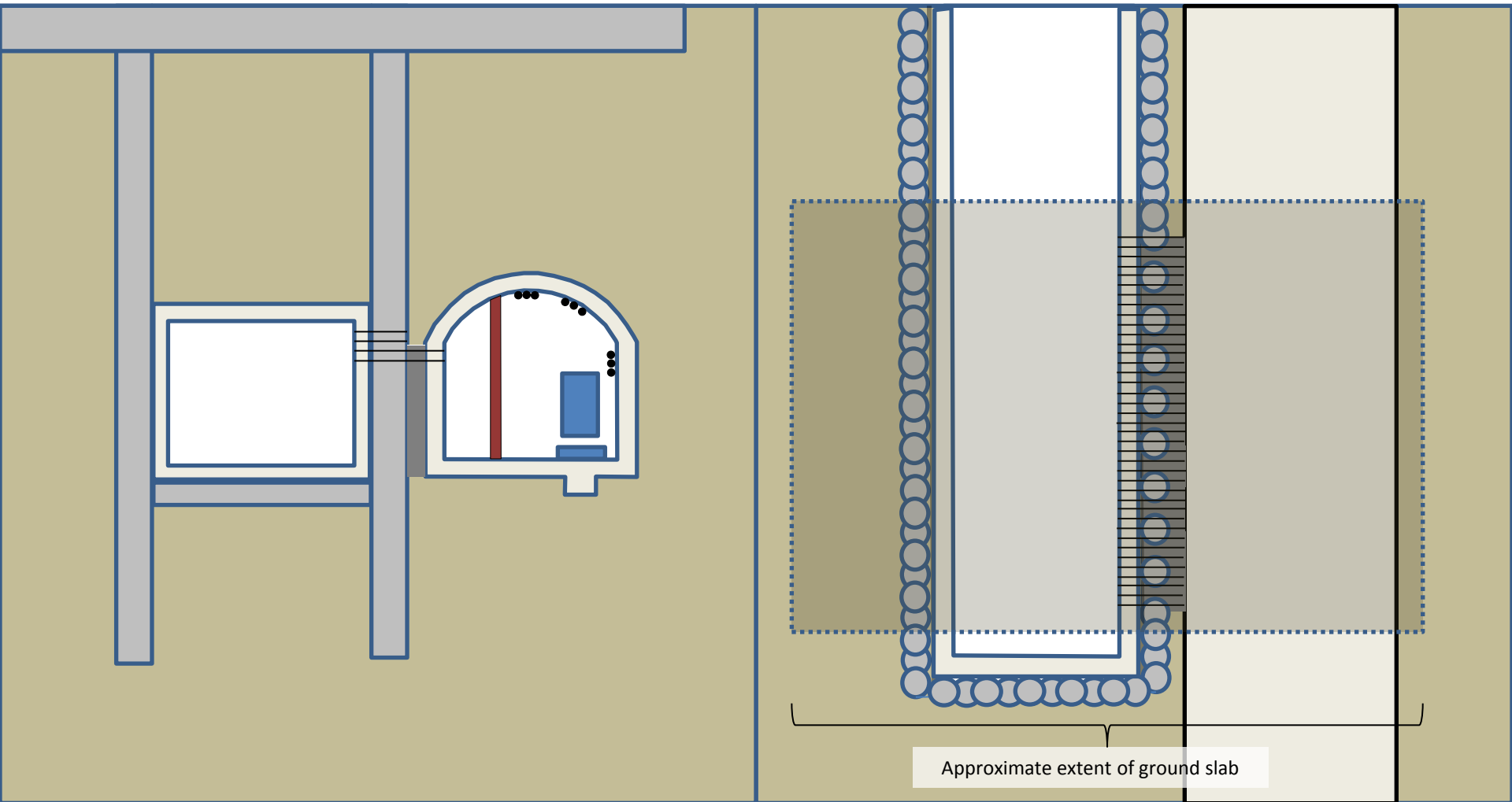


Stage 6 – Backfill to just below surface



Section

Plan

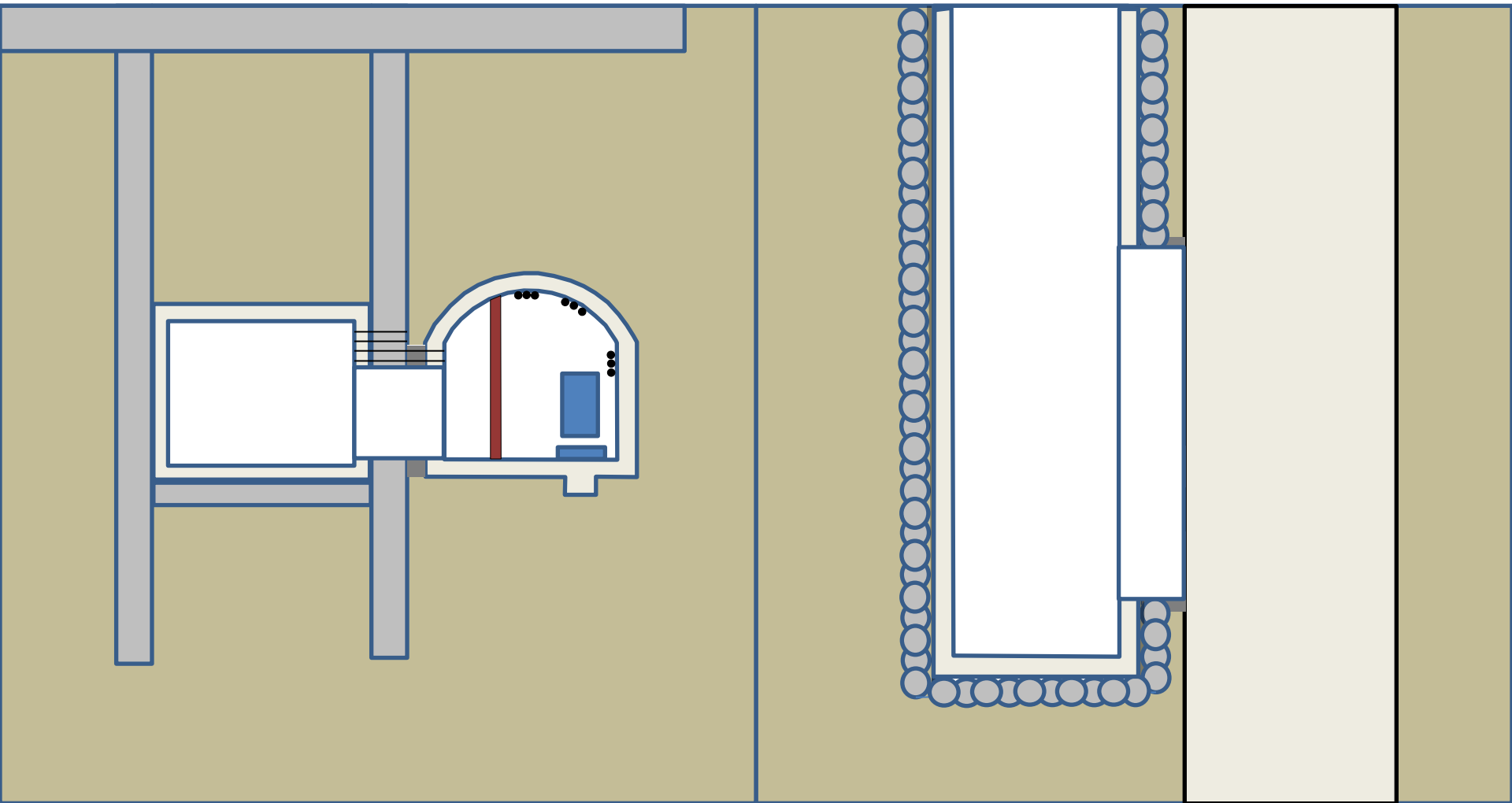


**Stage 7 – Construct ground slab**

Ground slab will be used to hang loads from new and old tunnel that are transmitted by the pile

Section

Plan



Stage 8 – Break out connection

Incremental break out of box, pile and old tunnel lining to form opening (with perhaps a second opening for transport)

# *Option 2&3* : Risks

- Unknown TT20 construction quality
- Stability of TT20 with 15m long opening
- Differential Settlements
- Differential loadings during excavation could lead to severe cracking of existing tunnel
- Water Ingress
- Temporary propping inside TT20 required
- Longer construction time required compared to Option 1

# CE Action List

- Price Enquiry for works issued for Site Investigation
  - Bidders conference this week - **8 March 2103 (fixed co-ordinates needed)**
  - Execution of works 25<sup>th</sup> March - 26<sup>th</sup> April (with two machines)
  - Geological report mid-May
  - Can we drill far detector cores in this period ?
- Order placed for Geological follow-up and detailed report
- An offer received from a very experienced design company for tender design / detailed design / site supervision (for Primary Beam and Near Detector). If order placed immediately, and CERN data available, tender dossier ready September ?
- Impact on existing services (ventilation chimney, water pumping stn, buried electrical cable on surface etc) to be better understood
- How much of TT26 needs to be built in first phase
- Urgent need for final lattice design to advance CE layouts :length of Junction cavern to be defined