

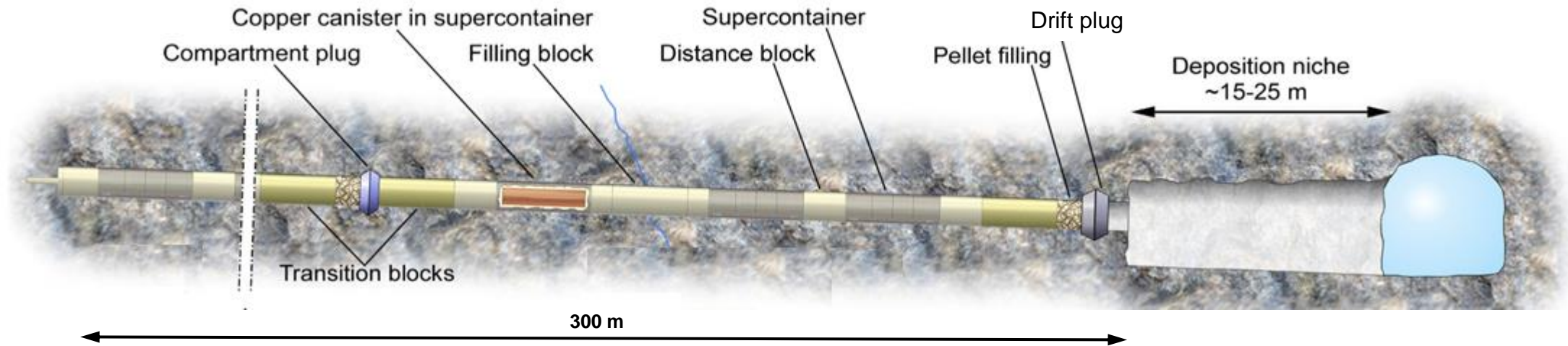
KBS-3H Installation and Closure LucoeX Workshop May 14th 2014, Äspö

Bo Halvarsson, Vattenfall

Contents

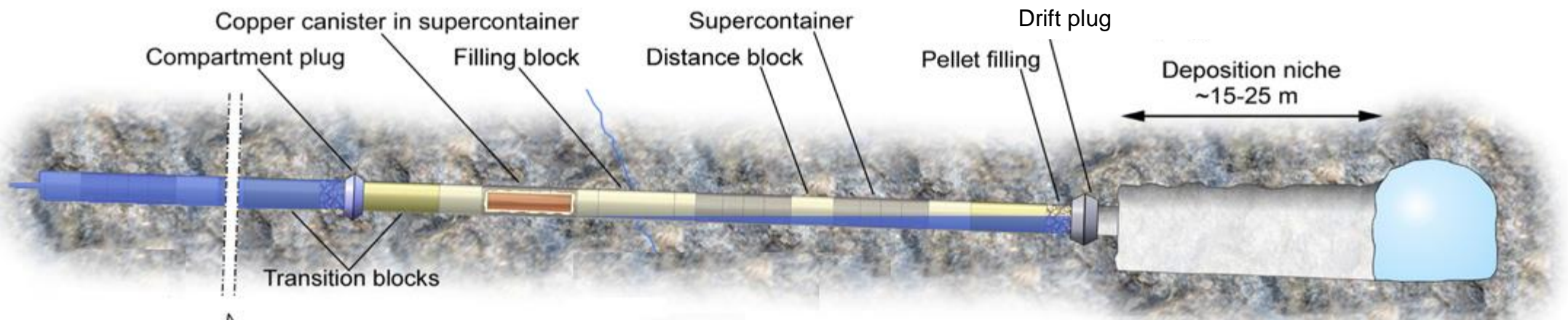
- KBS-3H reference design and key components
 - *Reference design, DAWE (Drainage, Artificial Watering and Air Evacuation)*
 - *Supercontainer, buffer- and filling components and plugs*
 - *Deposition equipment*
- Logistics
 - *Supercontainer assembly in reloading station*
 - *Installation/Deposition sequence*
 - *Plug installation*
 - *Installation/Deposition schedule*
- Operational and personnel safety

KBS-3H Reference Design



- Horizontal drift up to 300 meters long
- The drift is divided into two compartments

KBS-3H Reference Design

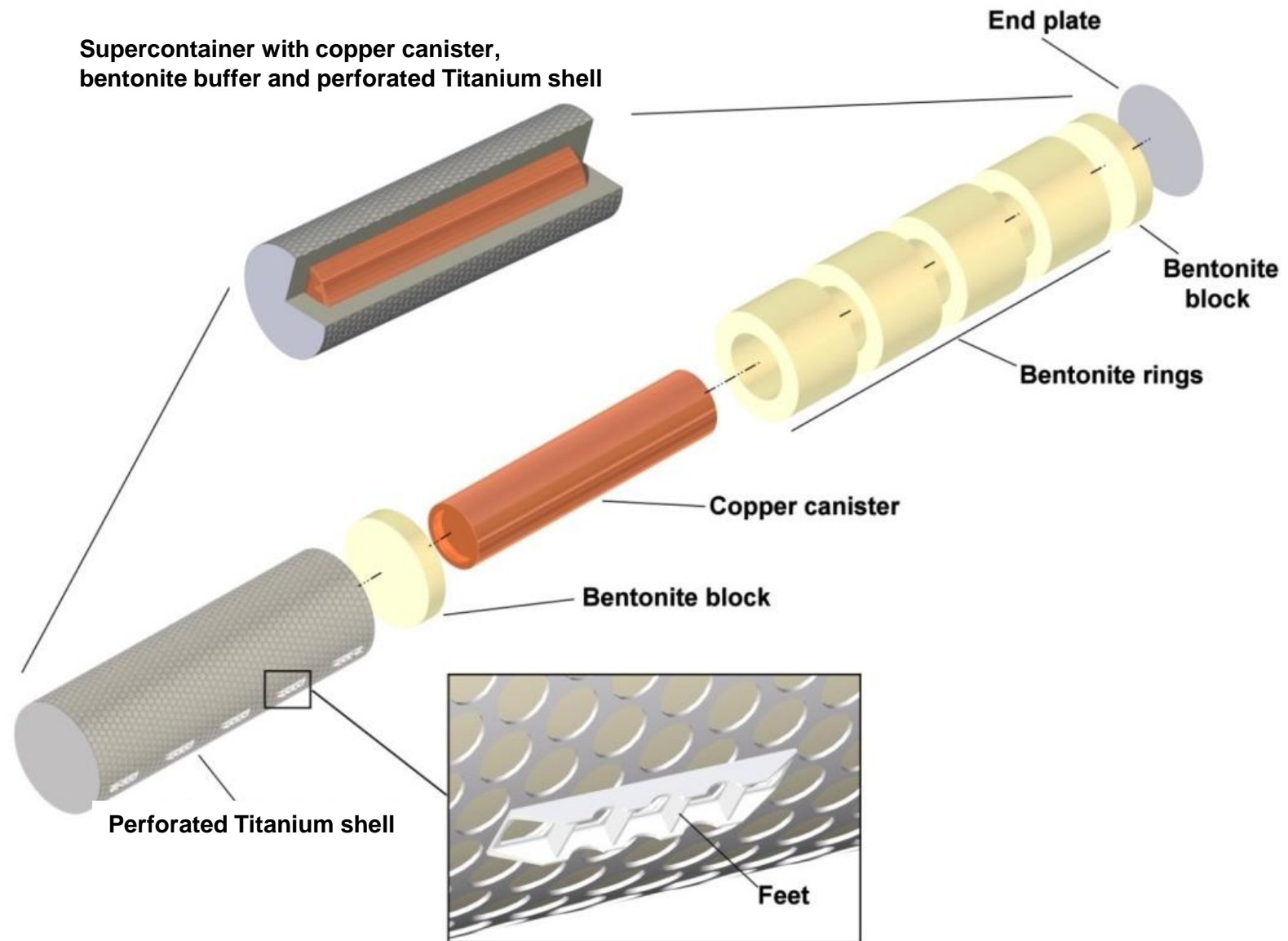


Schematic illustration of the DAWE filling procedure in the outer section, the inner is already filled with water.

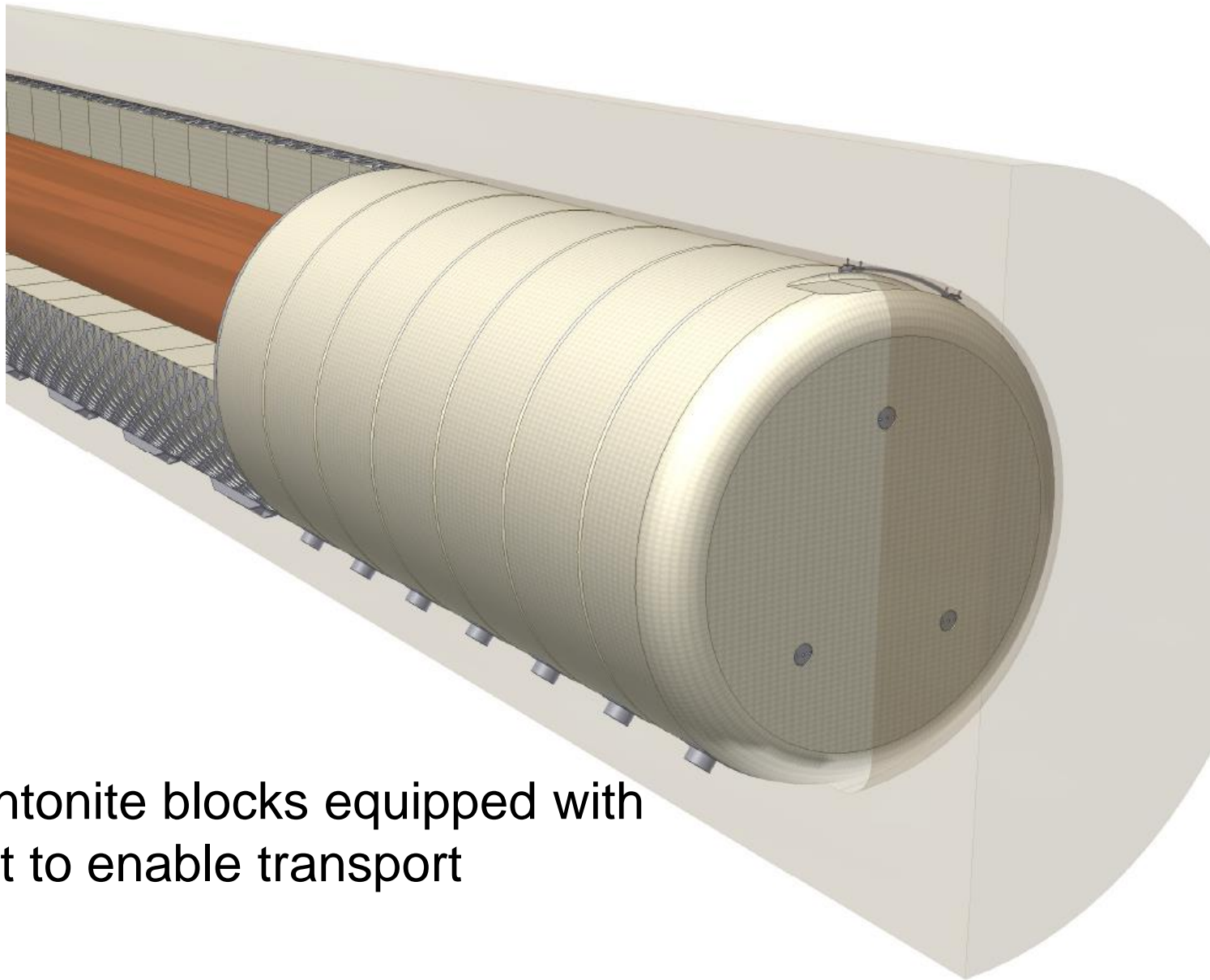
KBS-3H Key Components

- Supercontainer
 - Distance Blocks
 - Filling Blocks
 - Transition Blocks
 - Pellet Filling
 - Drift End Components
 - Compartment Plug
 - Drift Plug
- } Supercontainer Section
- } Filling Components

Key Components – Supercontainer

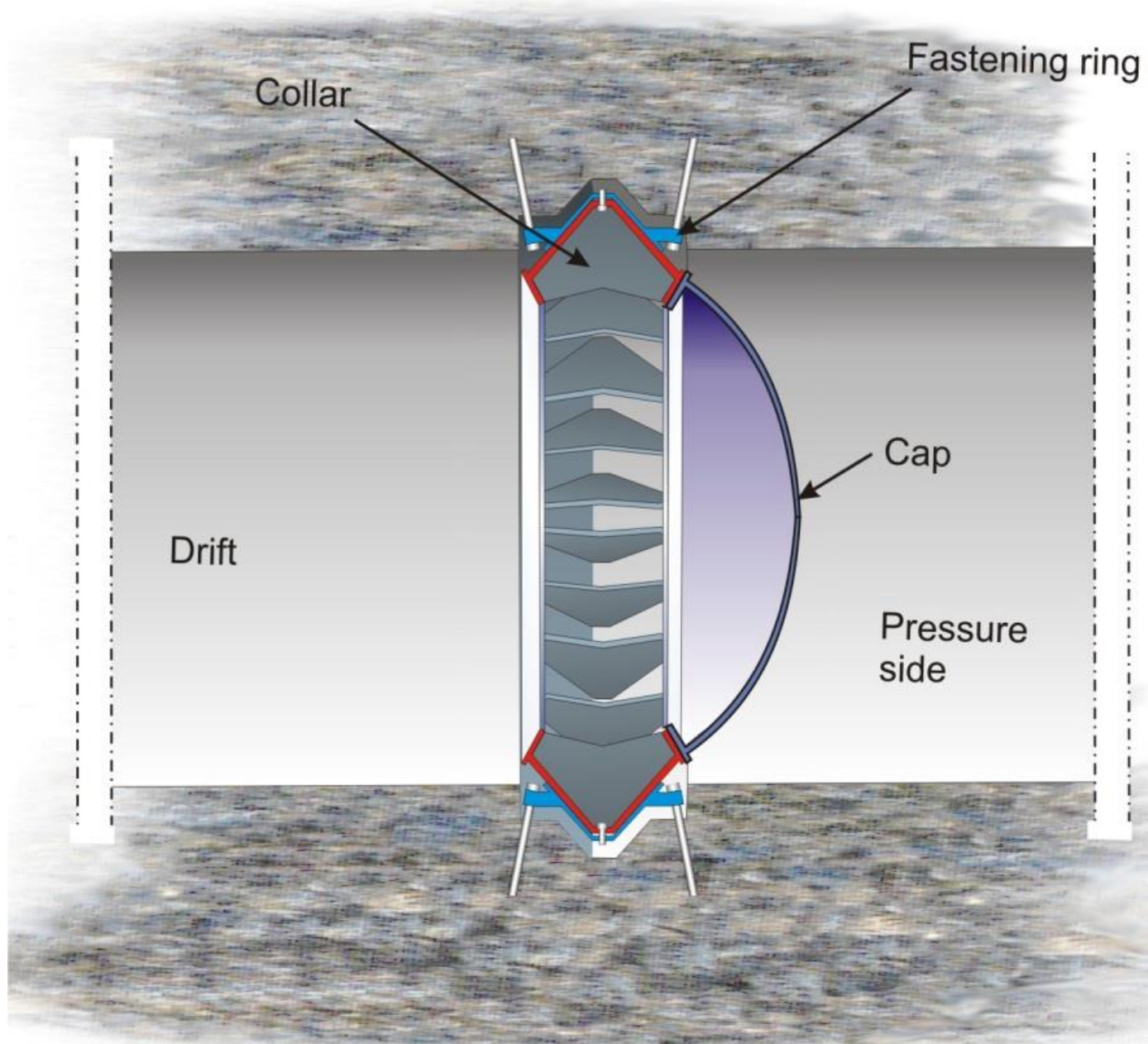


Key Components – Distance/Filling Blocks

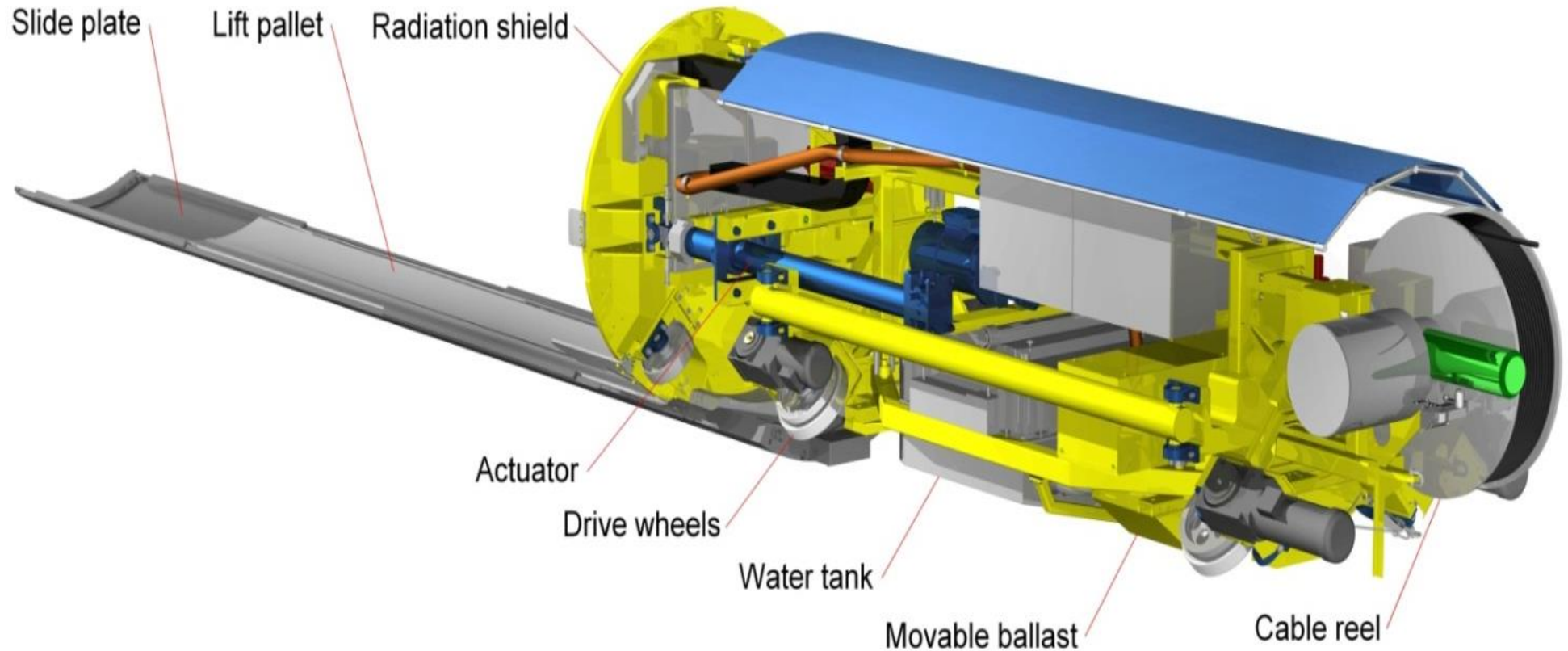


Bentonite blocks equipped with feet to enable transport

Key Components – Compartment/Drift Plug

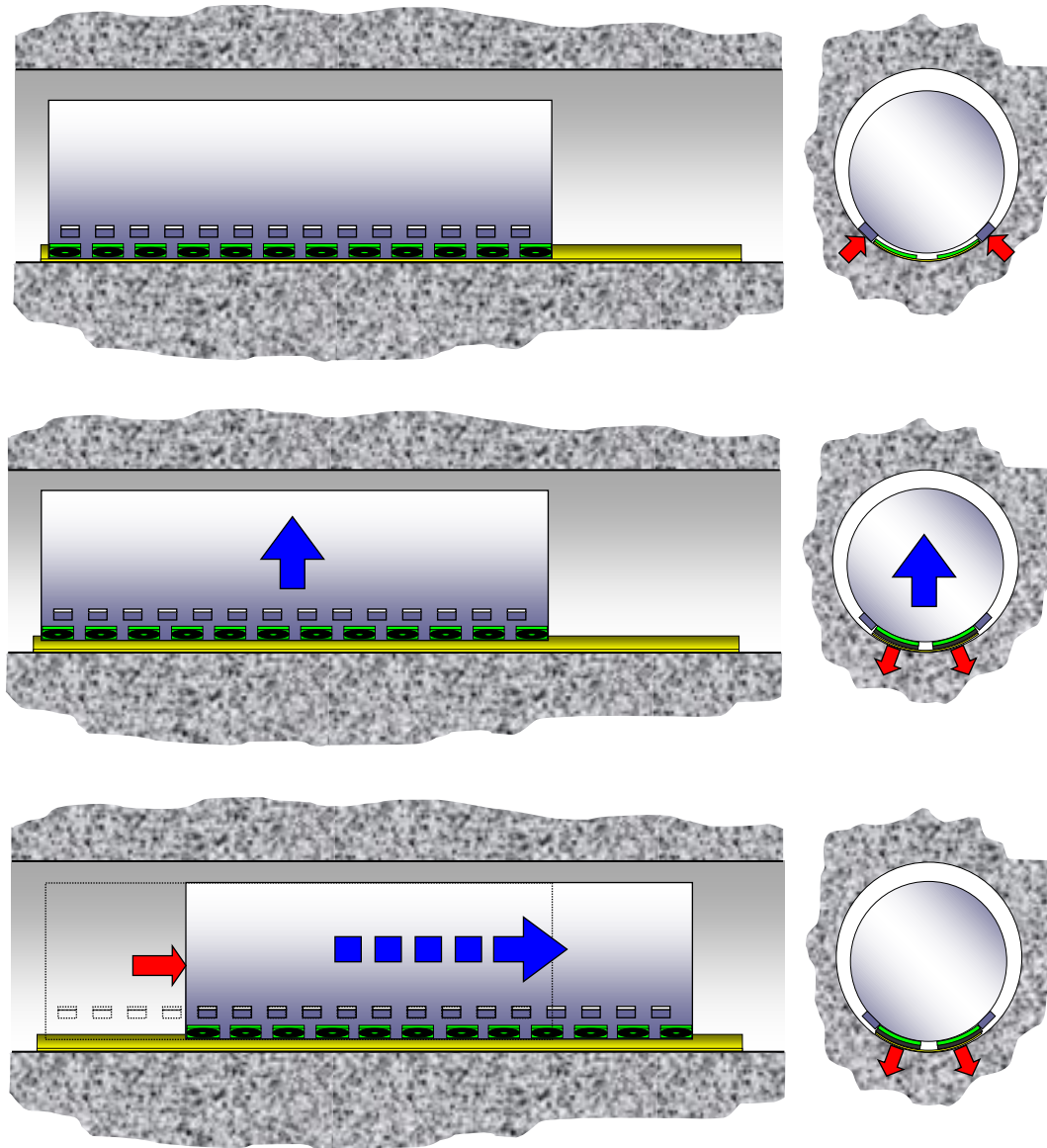


Deposition Equipment



The development and demonstration of the deposition machine was included in the ESDRED program

Deposition Equipment – Transport Principle



Water cushion
technology with
step wise
movement

KBS-3H Deposition Equipment

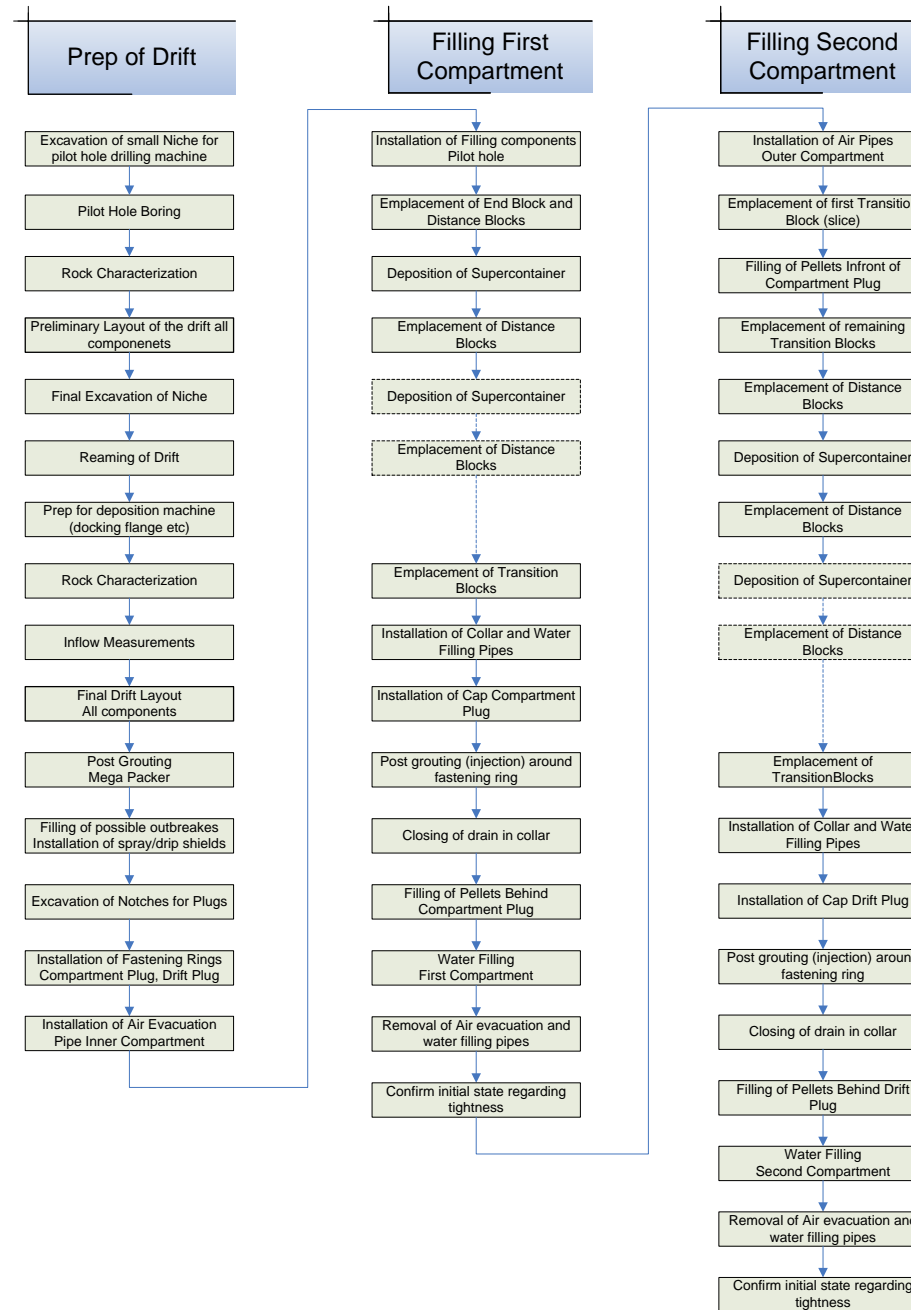


- Setup of the equipment at Äspö -220 level

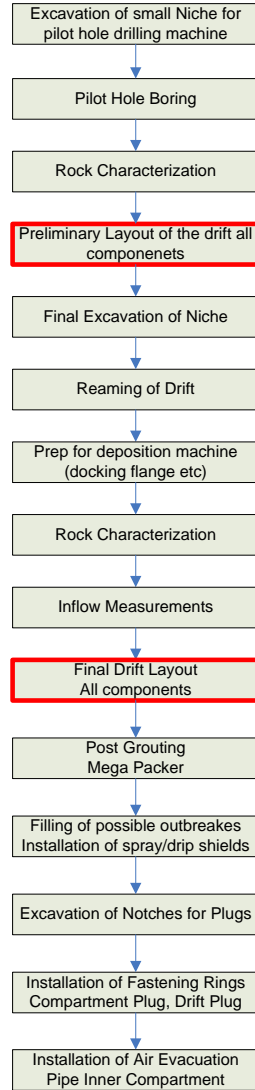
Installation and Closure – Main Steps

- Preparation of Drift
- Filling and Closure First Compartment
- Filling and Closure Second Compartment

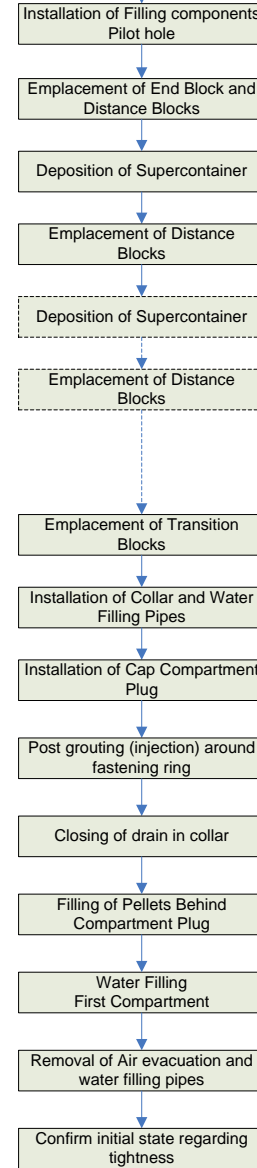
Flow Chart – Main Activities



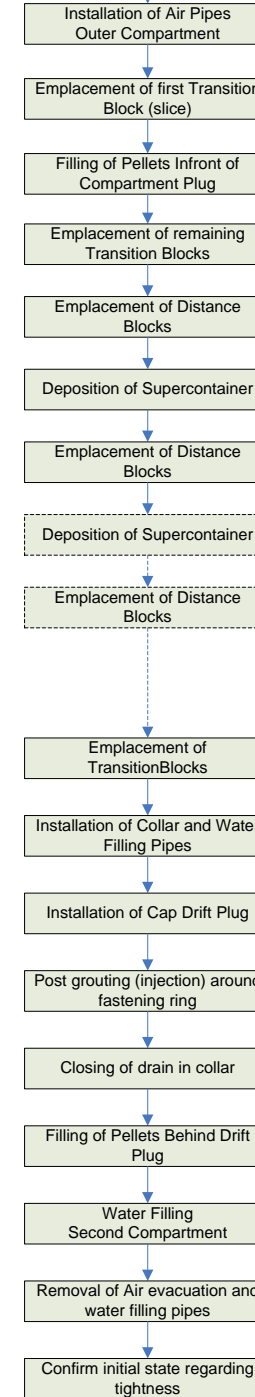
Prep of Drift



Filling First Compartment



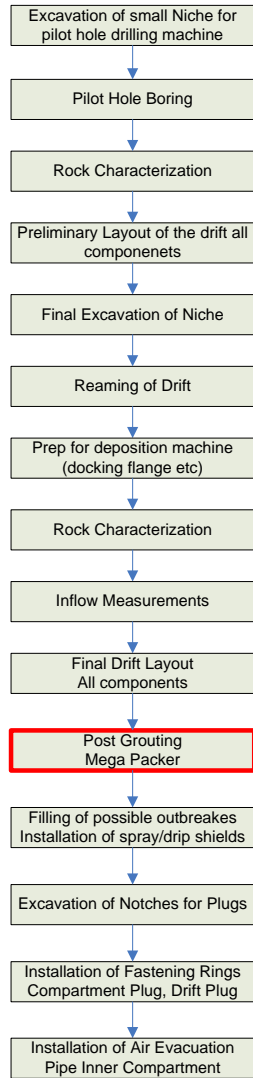
Filling Second Compartment



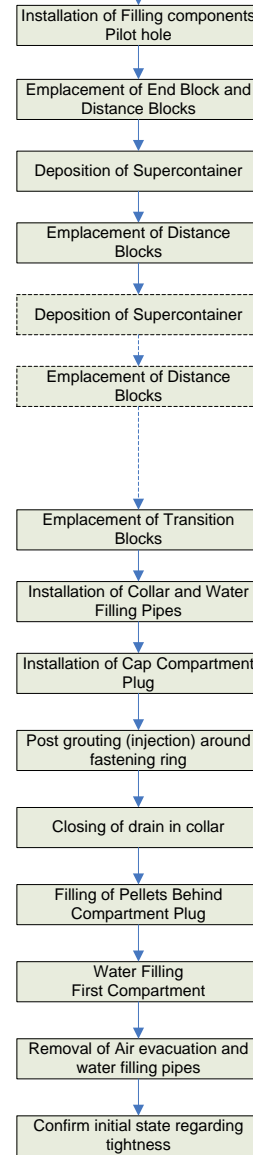
Preparation of Drift



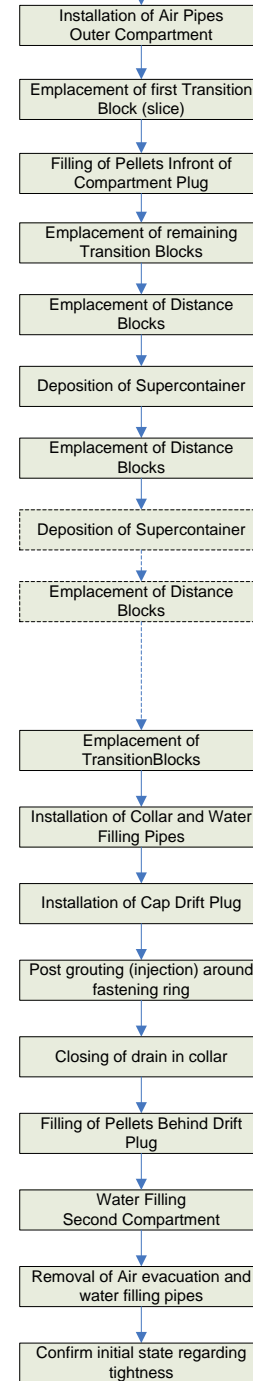
Prep of Drift



Filling First Compartment

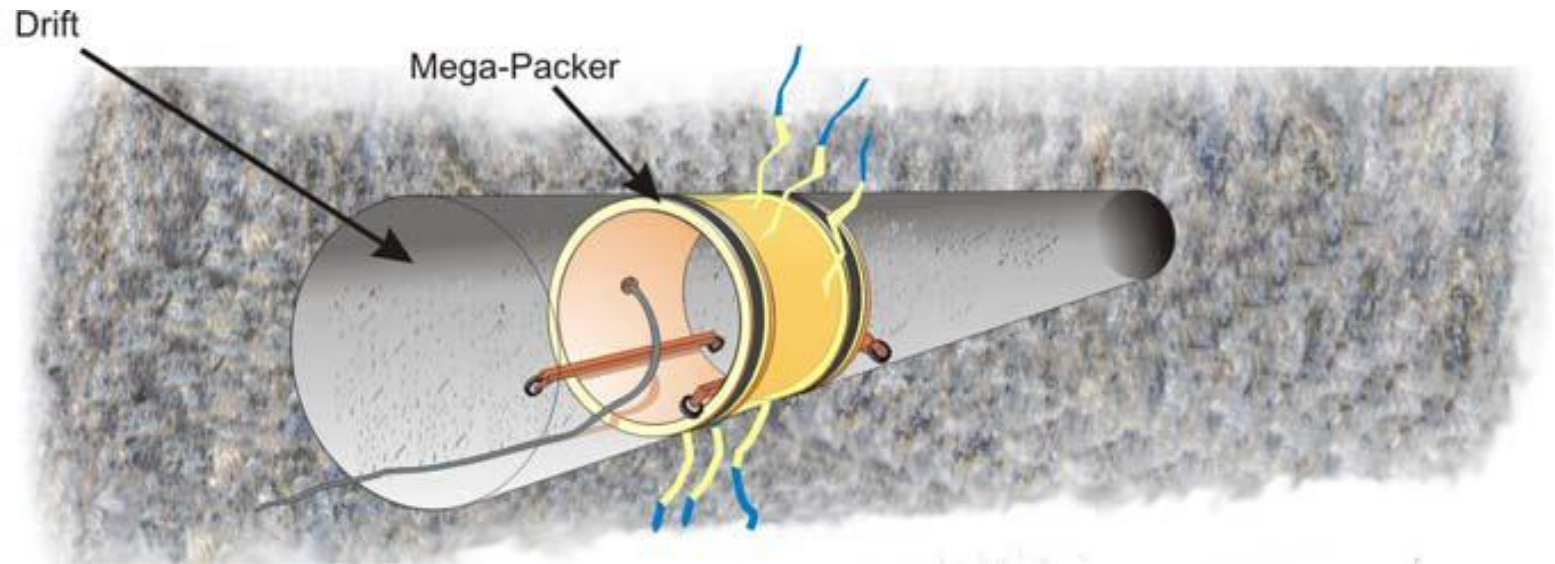


Filling Second Compartment

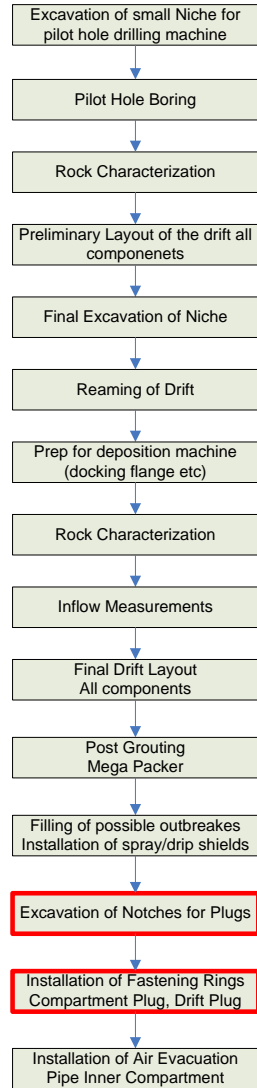


Preparation of Drift – Post Grouting

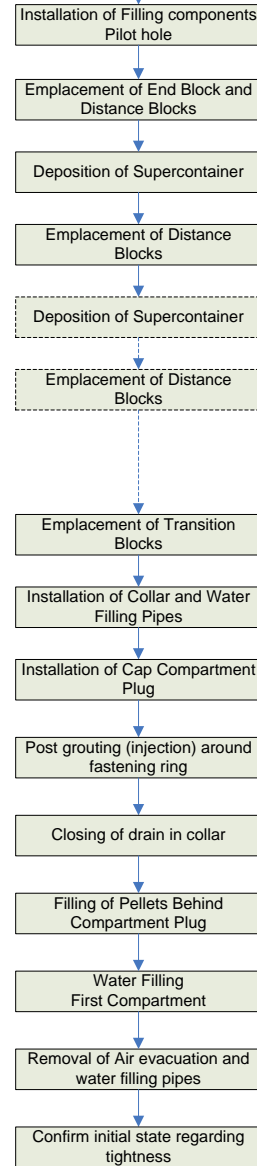
Post grouting
with Silica Sol



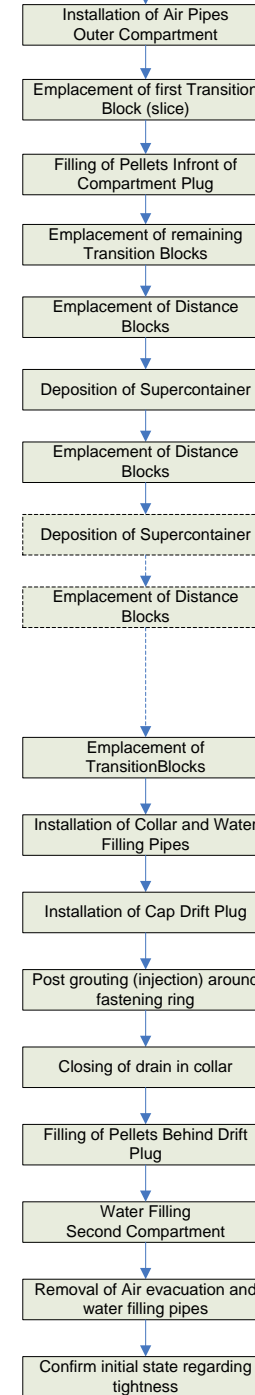
Prep of Drift



Filling First Compartment



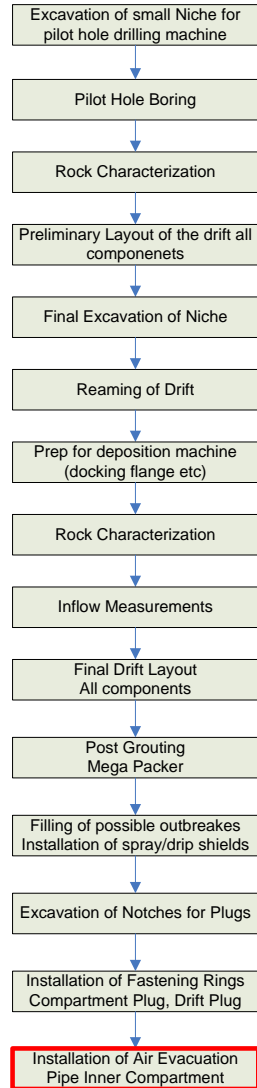
Filling Second Compartment



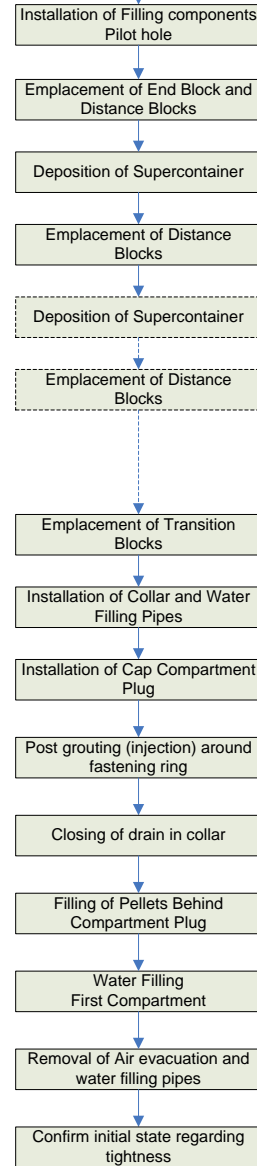
Preparation of Drift – Notches for Plugs



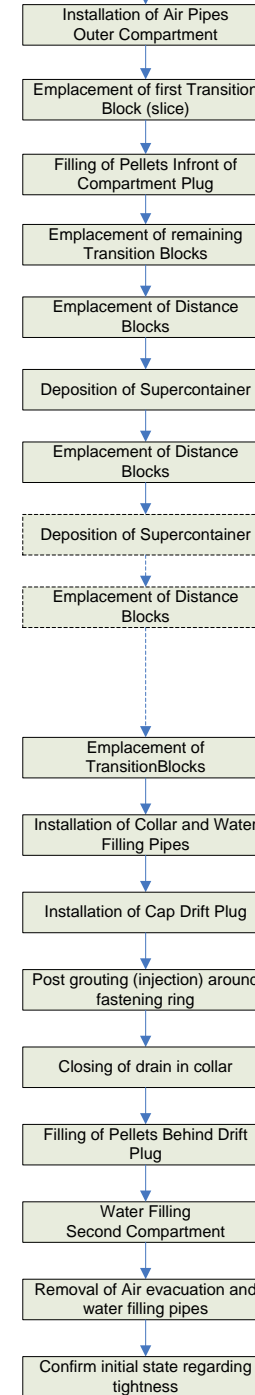
Prep of Drift



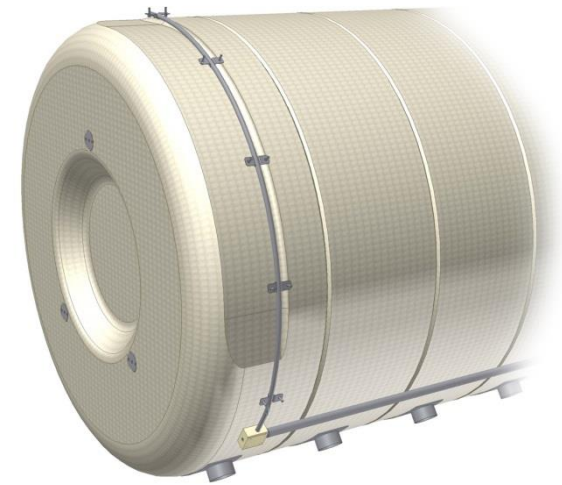
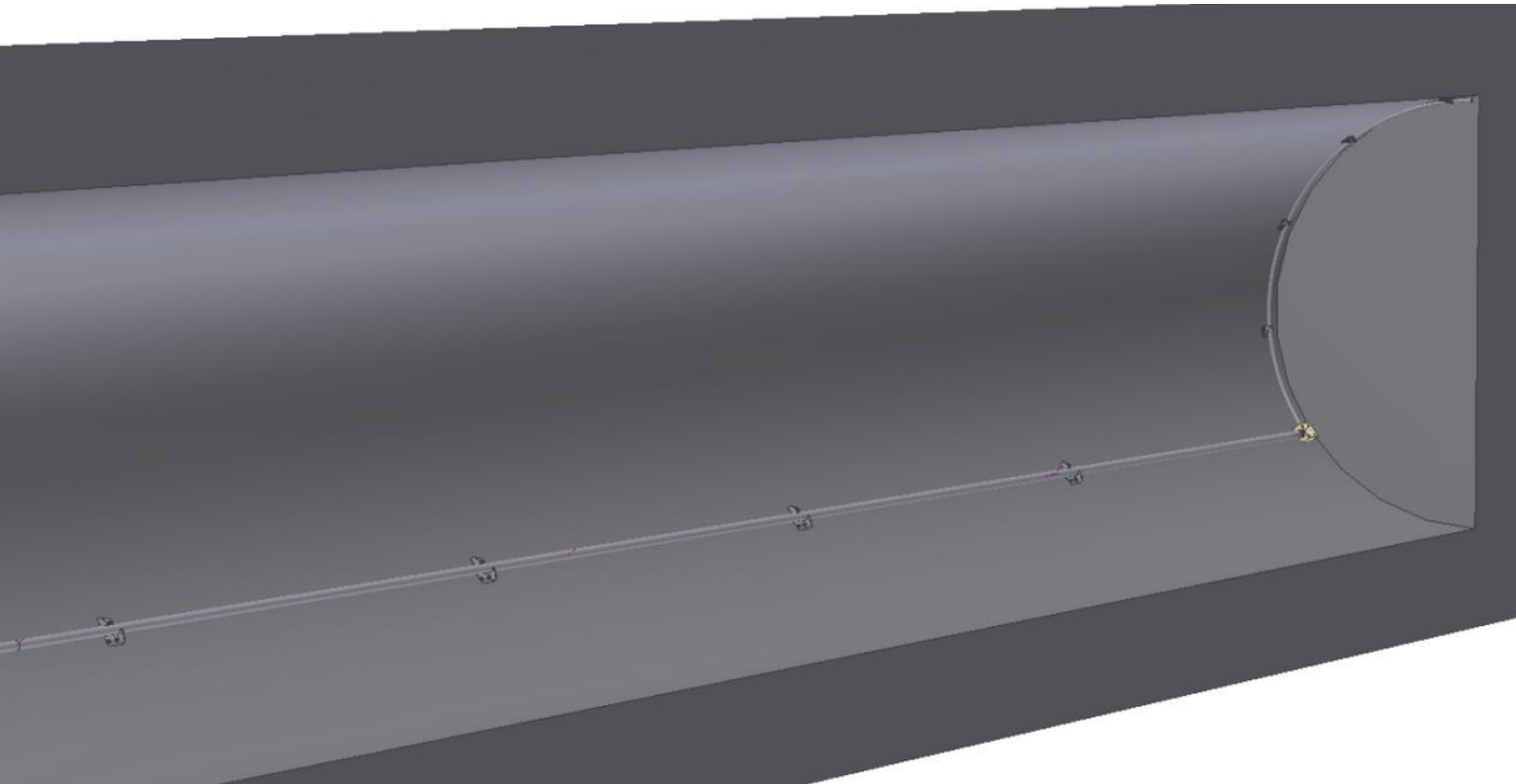
Filling First Compartment



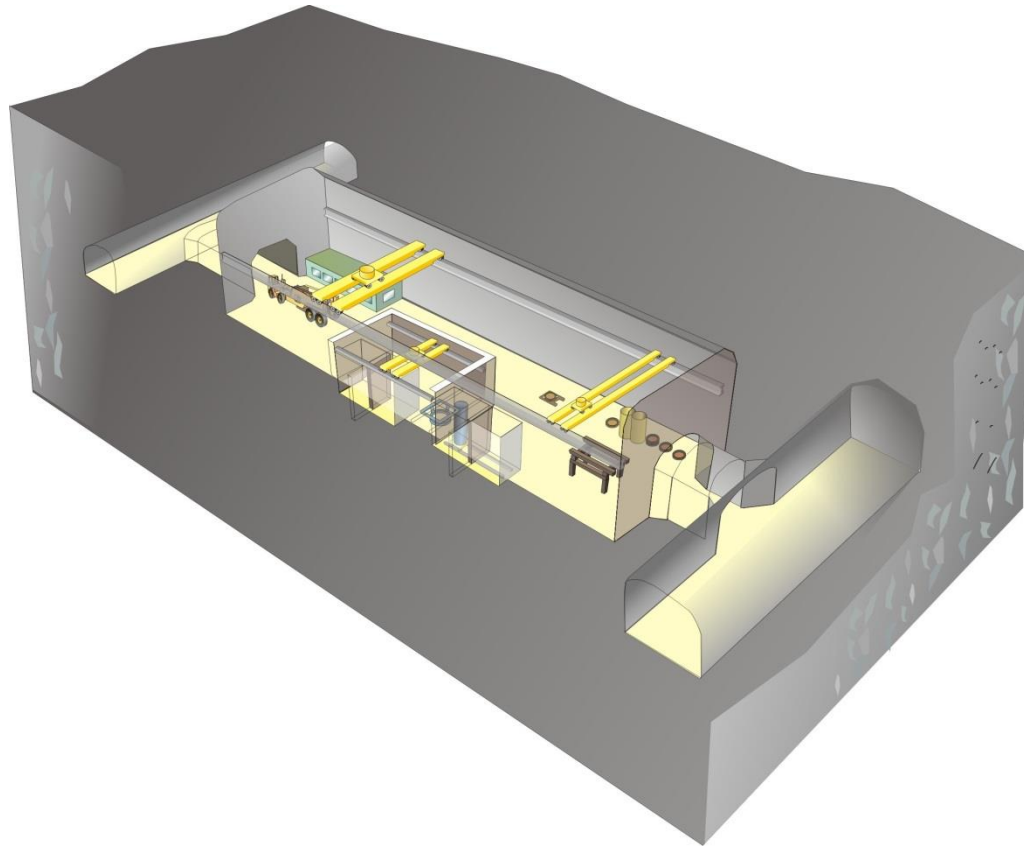
Filling Second Compartment



Preparation of Drift Installation of Air Evacuation Pipe



Assembly of Supercontainer (Reloading Station)



- [Reloading Station.mp4](#)

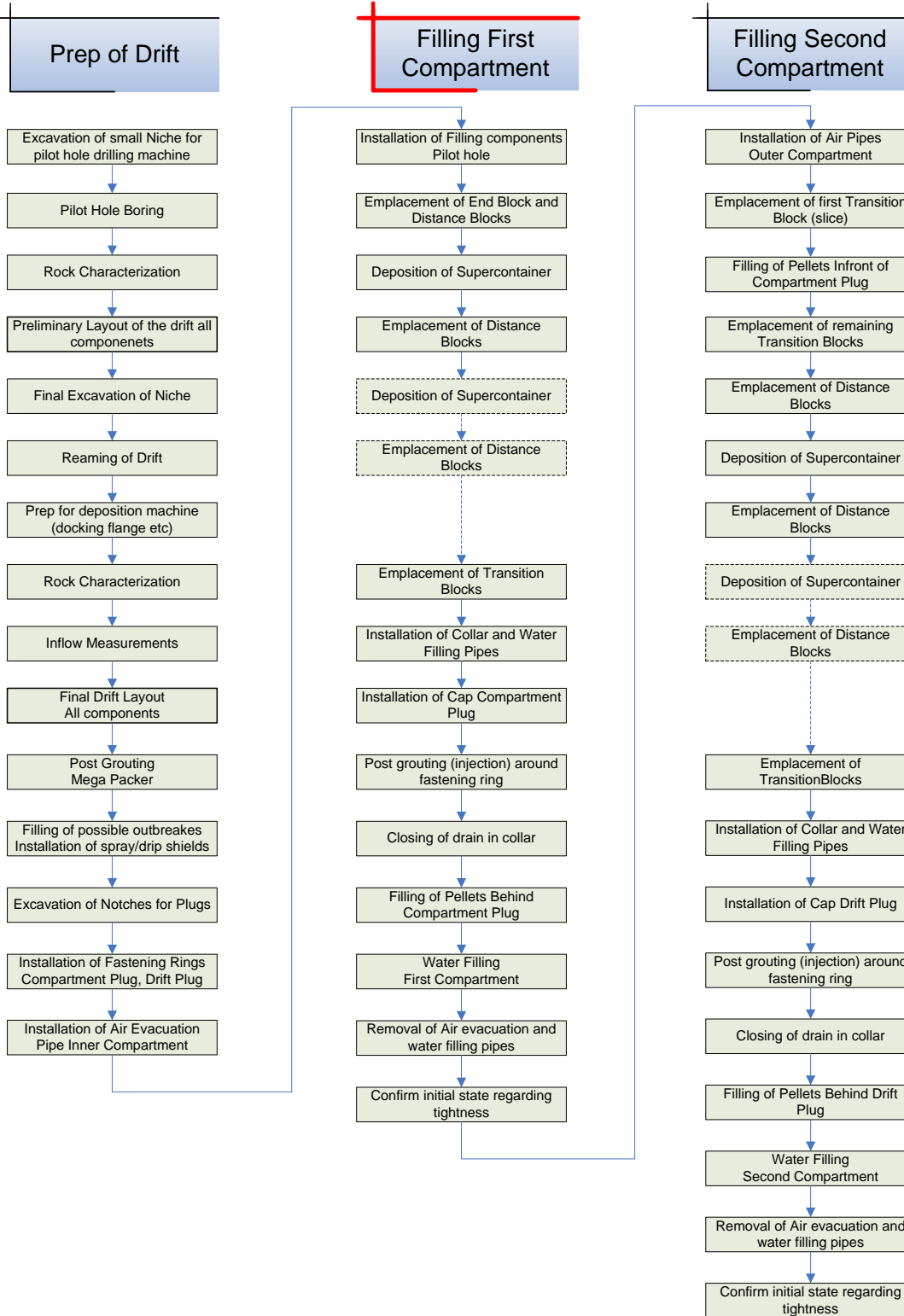
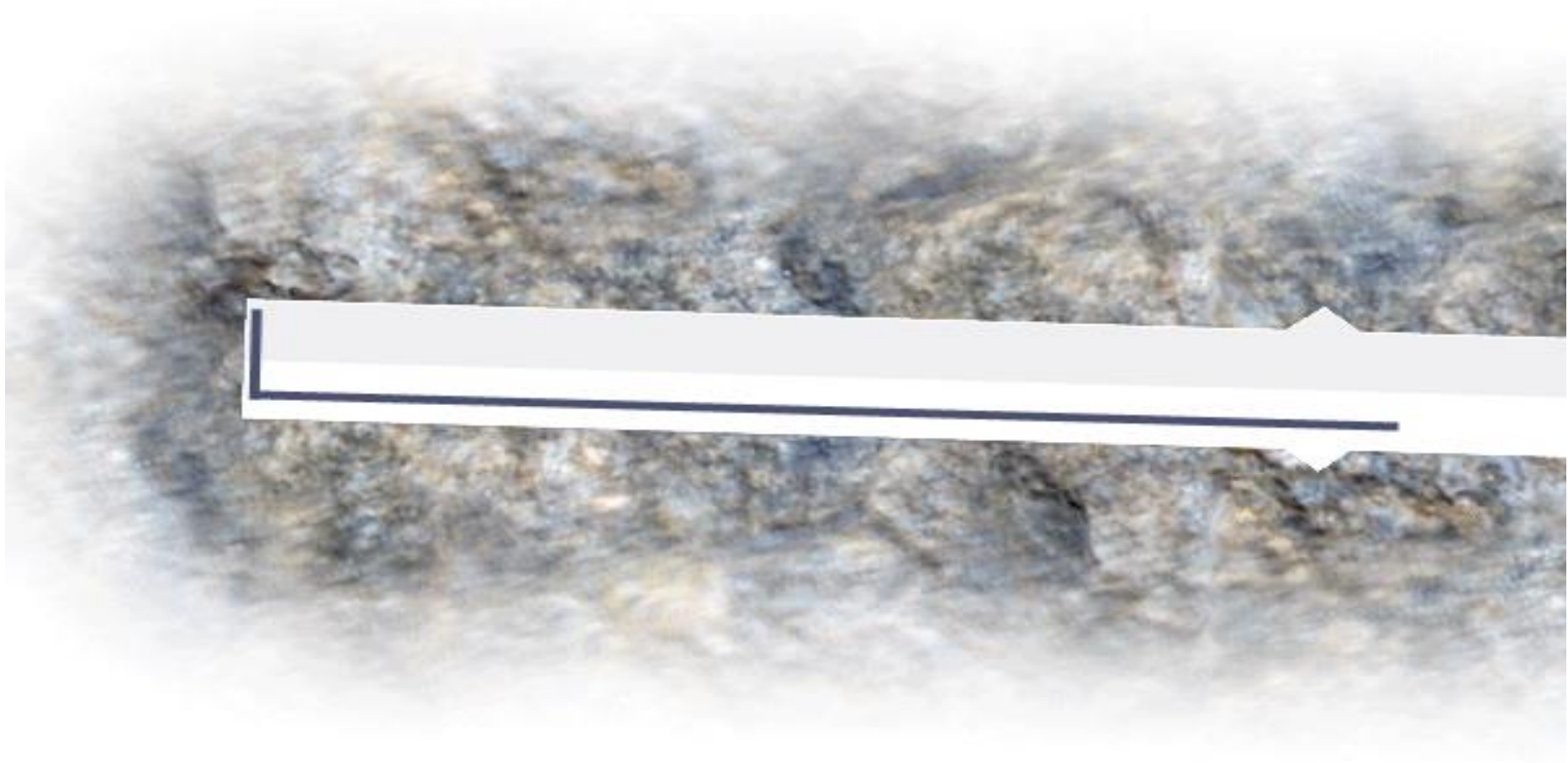
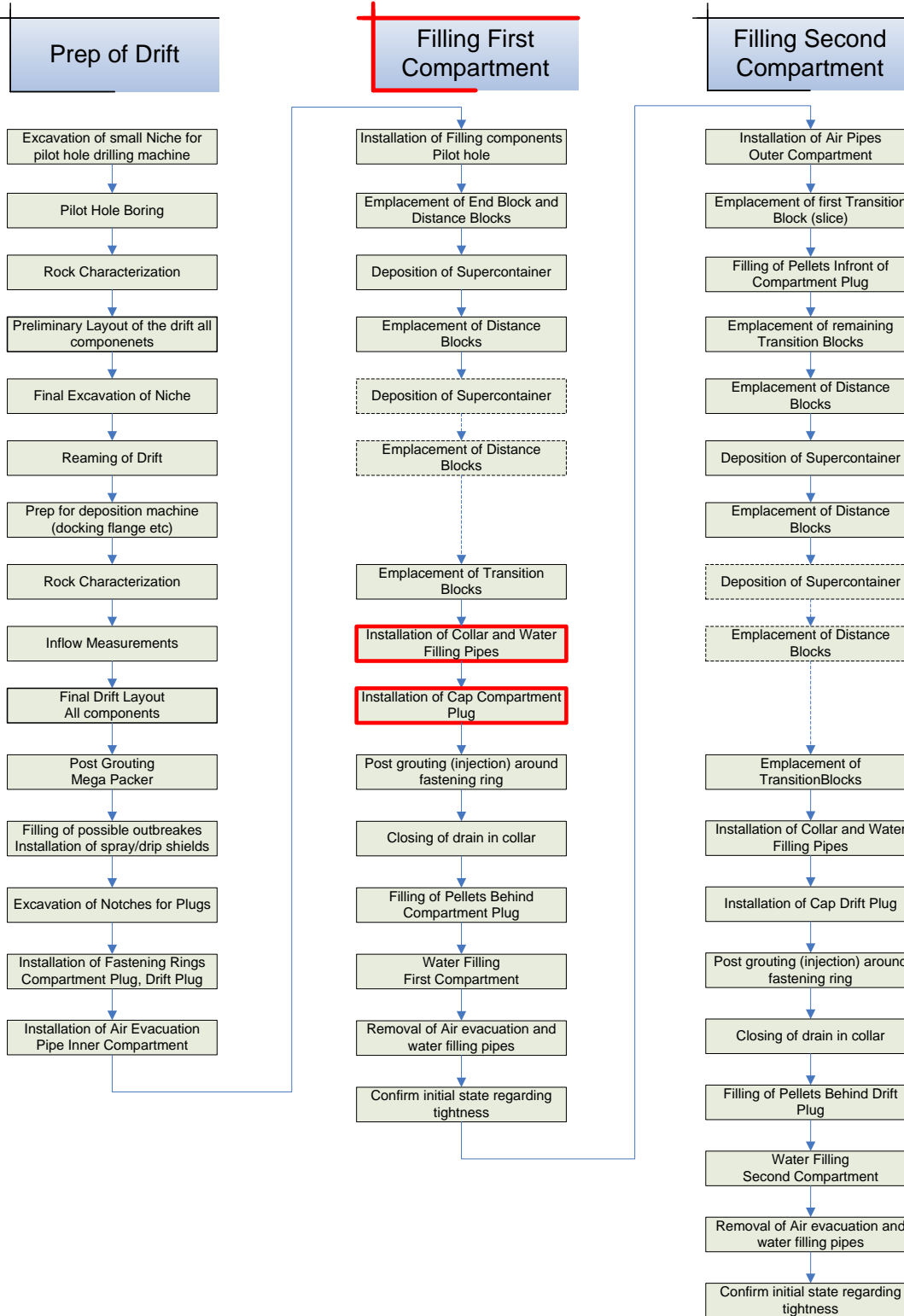


Illustration of Installation

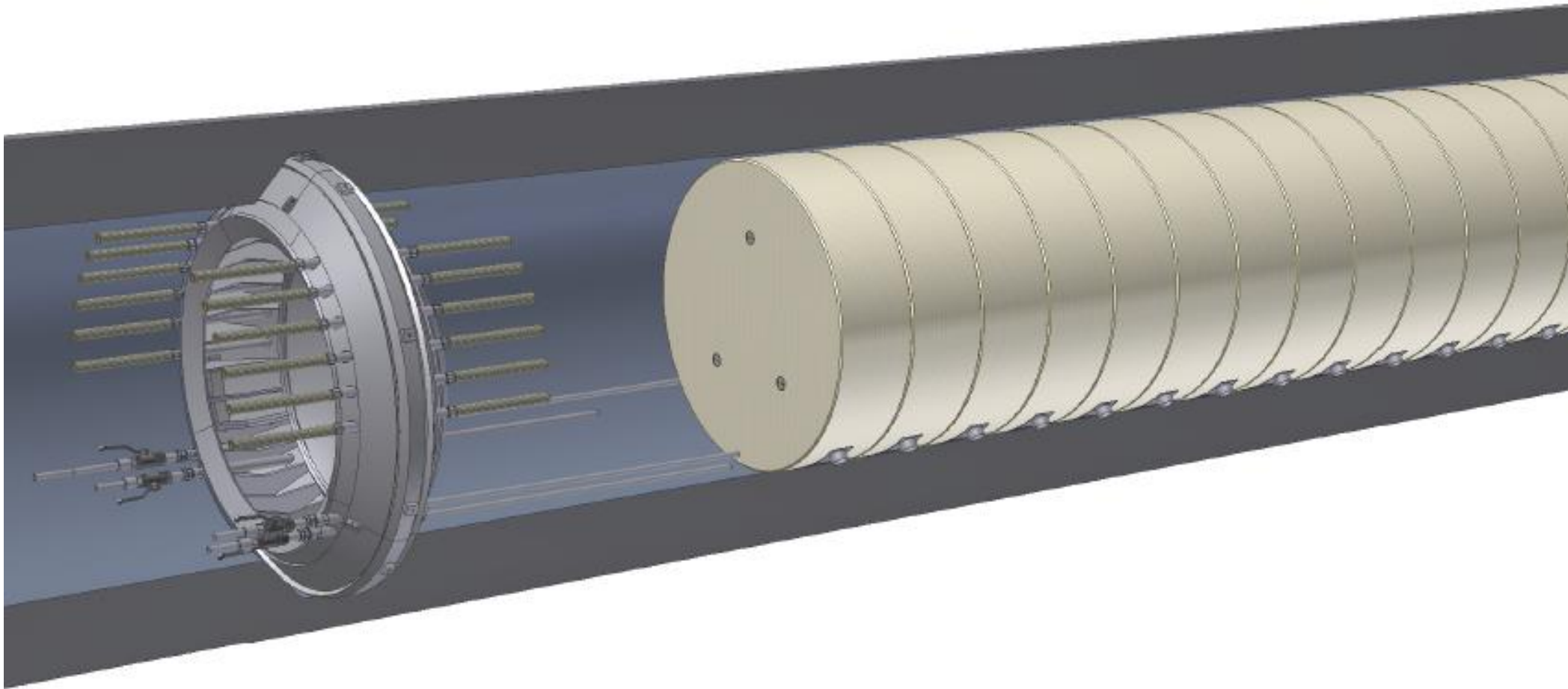




Installation of Plug

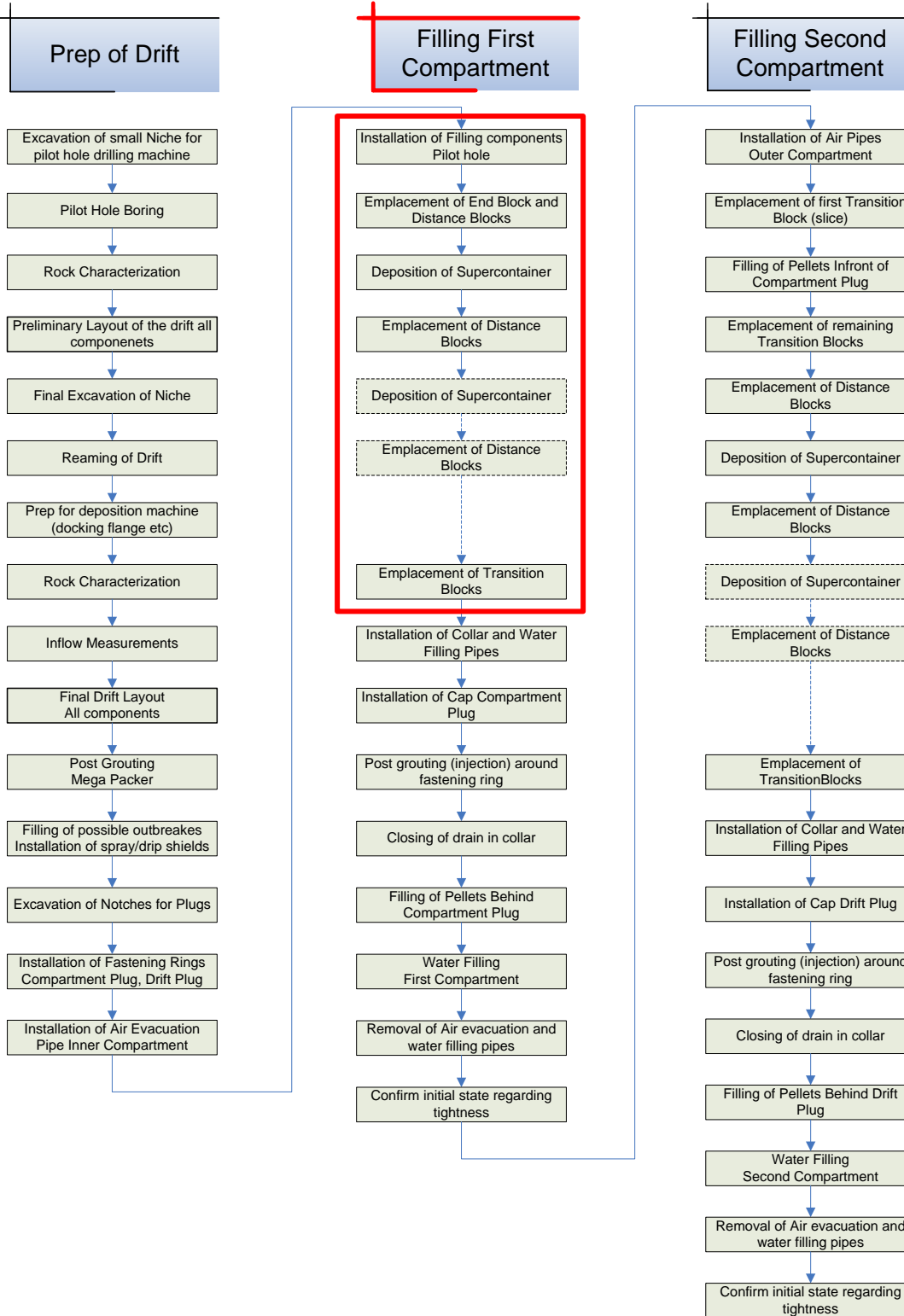


Installation of Plug and connection of pipes

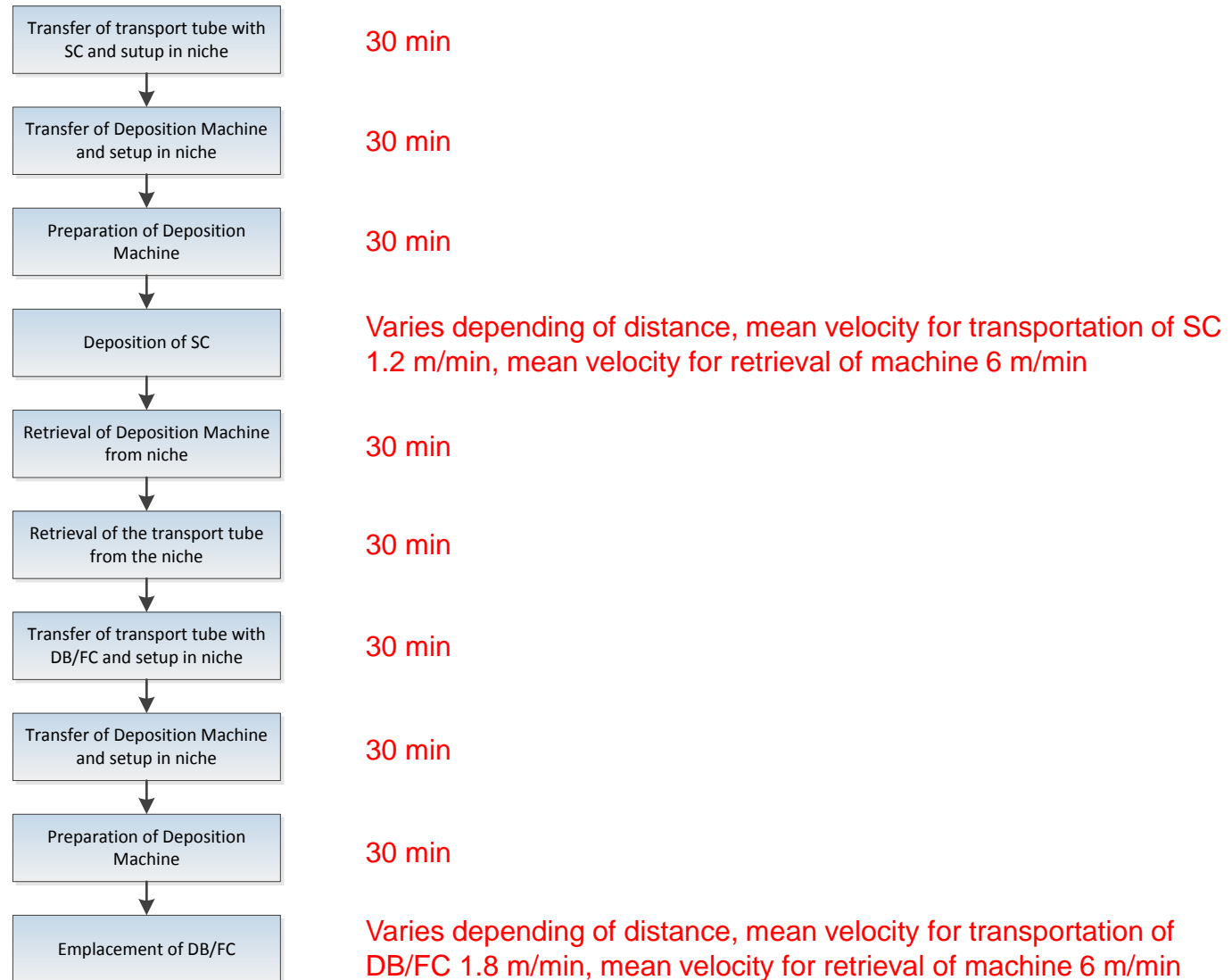


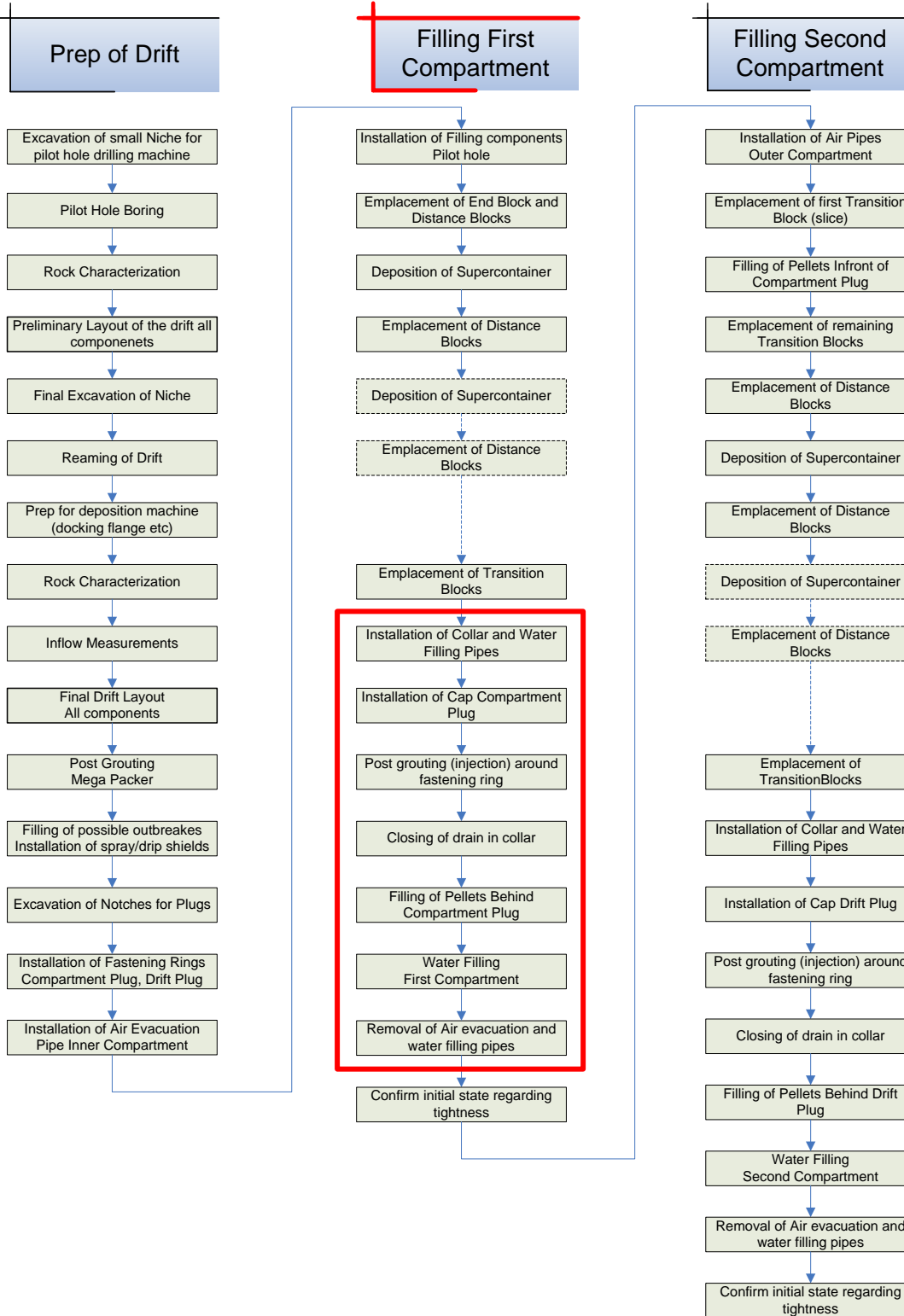
Estimation of installation time

- Main objective is to fill and seal the compartments as fast as possible. The overall time to fill and seal a compartment depends on a large number of activities that are constantly repeated. The assumptions that have been used are listed below and shows the minimum installation time.
 - All emplacements in one compartment will be carried out in continuous operating shifts and that there are no restrictions in the supply of SC and DB/FC.
 - The evaluation has been performed assuming the maximum amount of SC in each compartment according to the result from the layout adaptation, no lost sections in the drift.
 - As a maximum can 16 SC's be installed in the first compartment and 14 SC's in the second compartment assuming a 300 meter long drift with two compartments of each 150 meter.

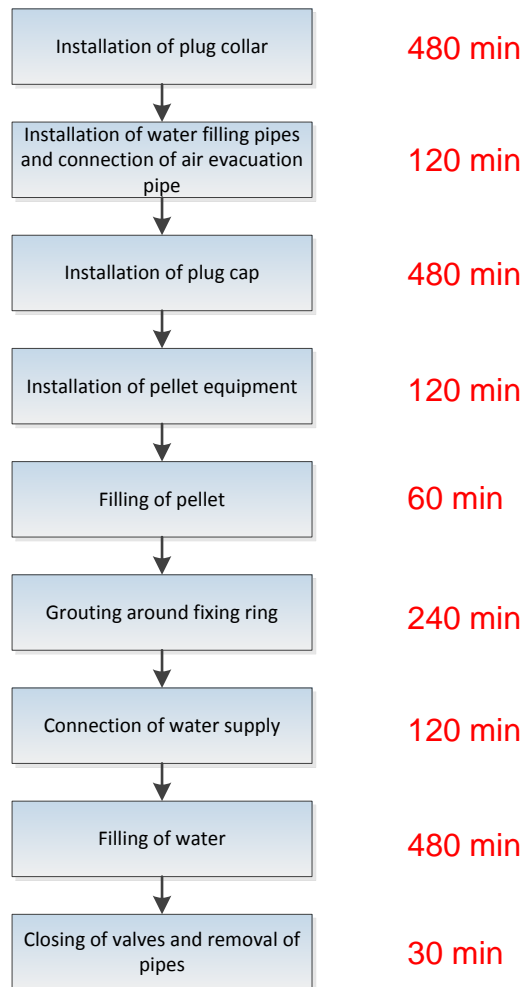


Deposition Sequence



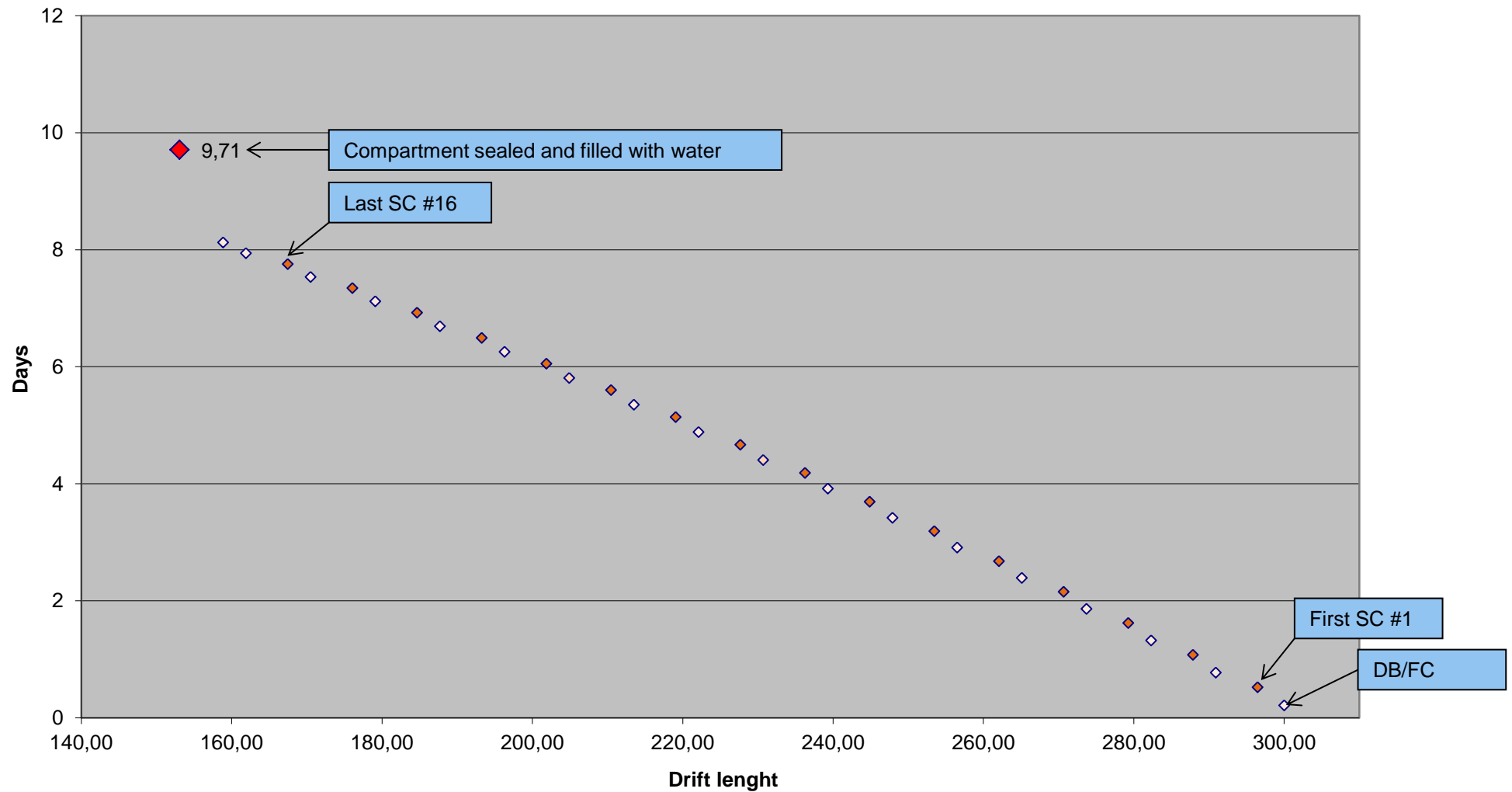


Closure – Installation of Plug and Water Filling Pipes



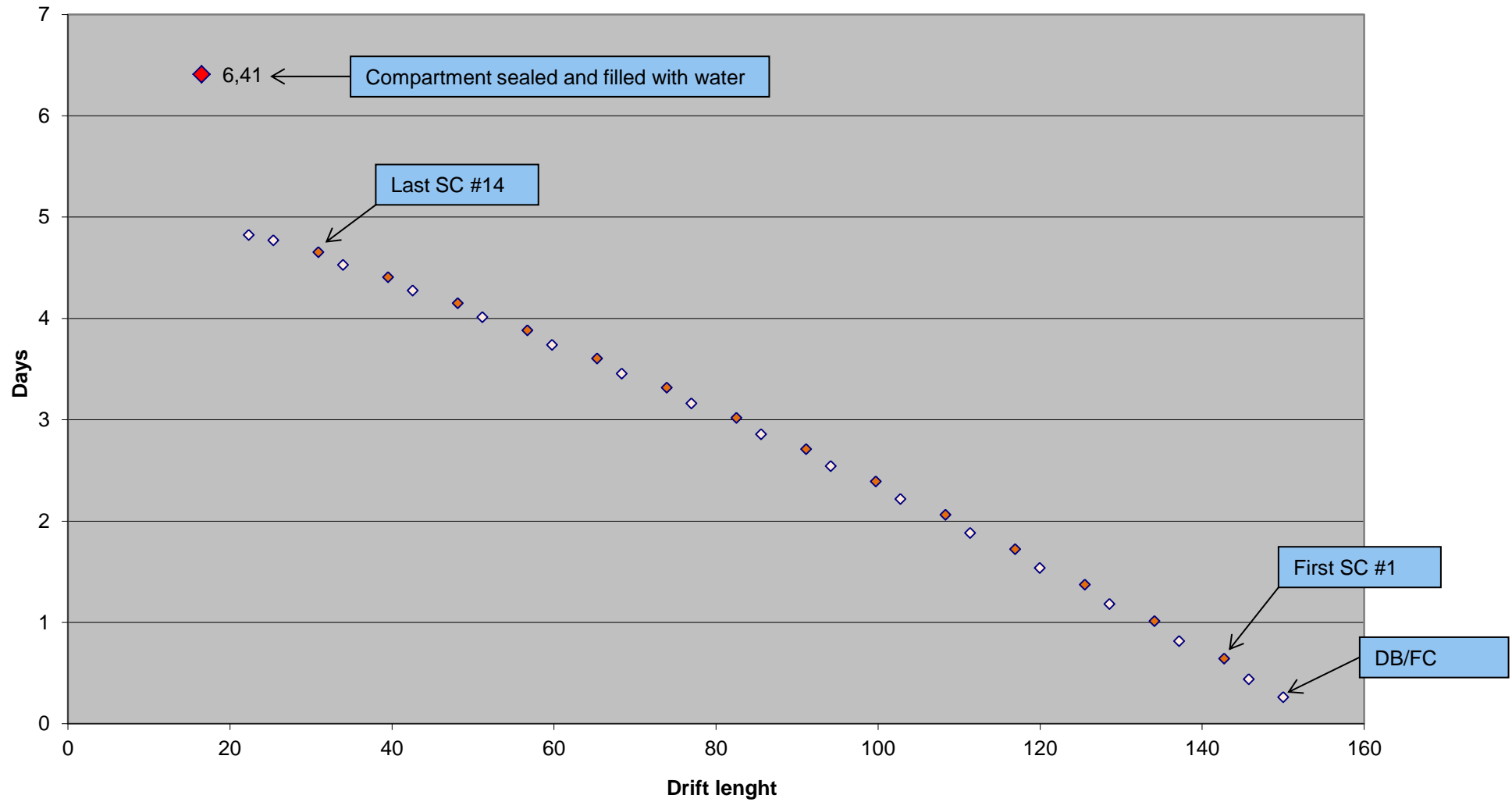
Time Estimation

Accumulated time to fill and seal the inner compartment of a 300 meter long drift



Time Estimation

Accumulated time to fill and seal the outer compartment of a 300 meter long drift



Operation and Personal Safety

- The small diameter of the drift makes it difficult to carry out correcting actions.
- Main operational risks is consequences of malfunction of the deposition equipment including fire.
- Main personal risks during deposition work are mostly connected to the installation of compartment plugs.