

# MOVING BOUNDRIES WHILST CARING FOR THE ENVIRONMENT

with

## Wassara Water Powered Drilling Systems

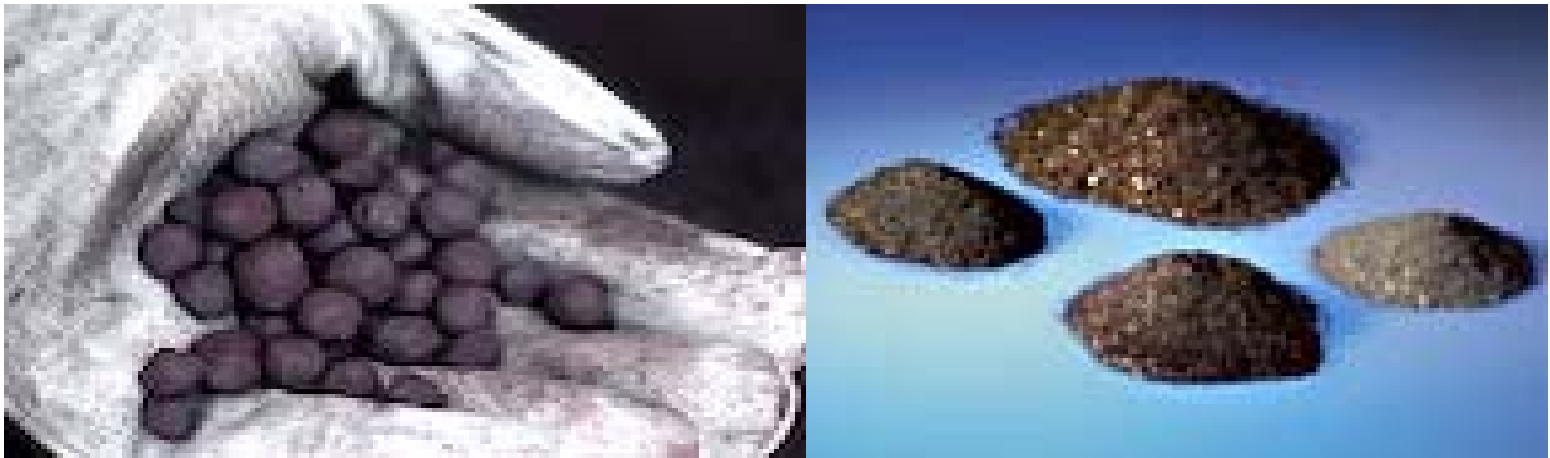
*Presented by:*

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## Wassara AB - background

- Wassara is 100 % owned by LKAB (Swedish State)
- LKAB is a world leading producer of upgraded iron ore products, and a growing supplier of industrial minerals
- LKAB is a world leader in underground mining
- **LKAB implemented the Wassara drilling system in their production drilling in 1995, and have since drilled nearly 14 million meters**



## *Company mission*

*Wassara offers the mining and construction industry complete systems for efficient drilling in soil and rock, based on our core competence in water powered drilling*

# MOVING BOUNDRIES

- **Drilling is critical to the mining cycle**  
**the most costly and critical component**
- **Drilling accuracy decides hole length and scale of the operation**  
**with significant effect on efficiency and profitability of mining operations**
- **Top Hammer is OK for short holes**  
**inefficient and inaccurate for longer holes.**
- **Air ITH has better efficiency and accuracy than Top Hammer**  
**high energy consumption, limitations in hole diameter.**
- **Water powered ITH is more energy efficient, constant percussive pressure, constant accuracy, also drilling smaller diameter holes efficiently**  
**for any hole length, any scale, limiting dilution and ore losses**

# Moving Boundaries



# IMPROVING THE ENVIRONMENT



- *Reduction of energy consumption by 80 %*
- *No oil in the ground*

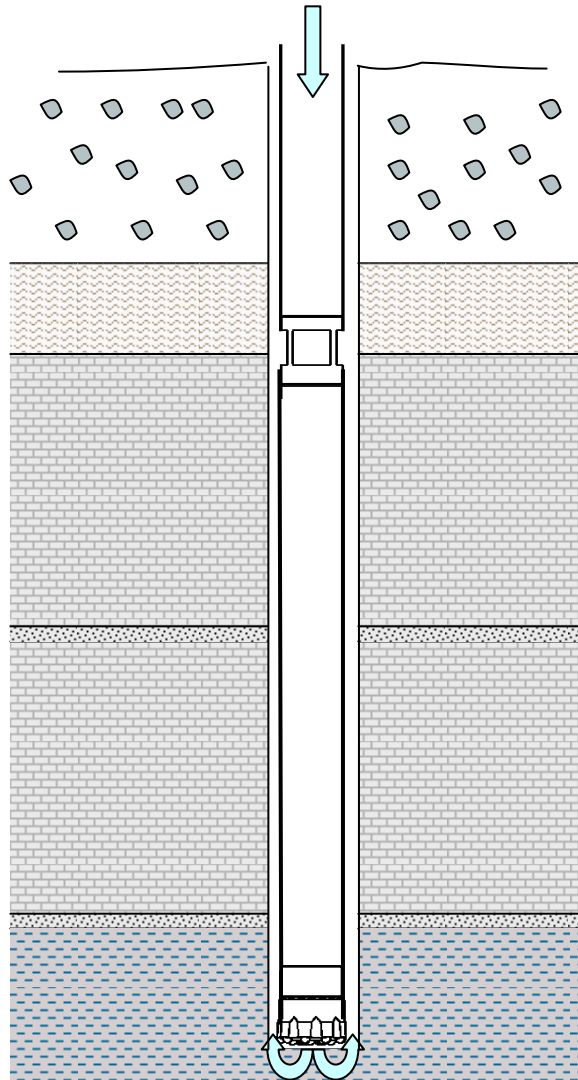
# CARING FOR THE *working* ENVIRONMENT

- *No oil mist in the air*
- *No dust*



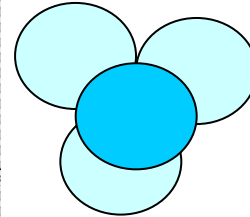
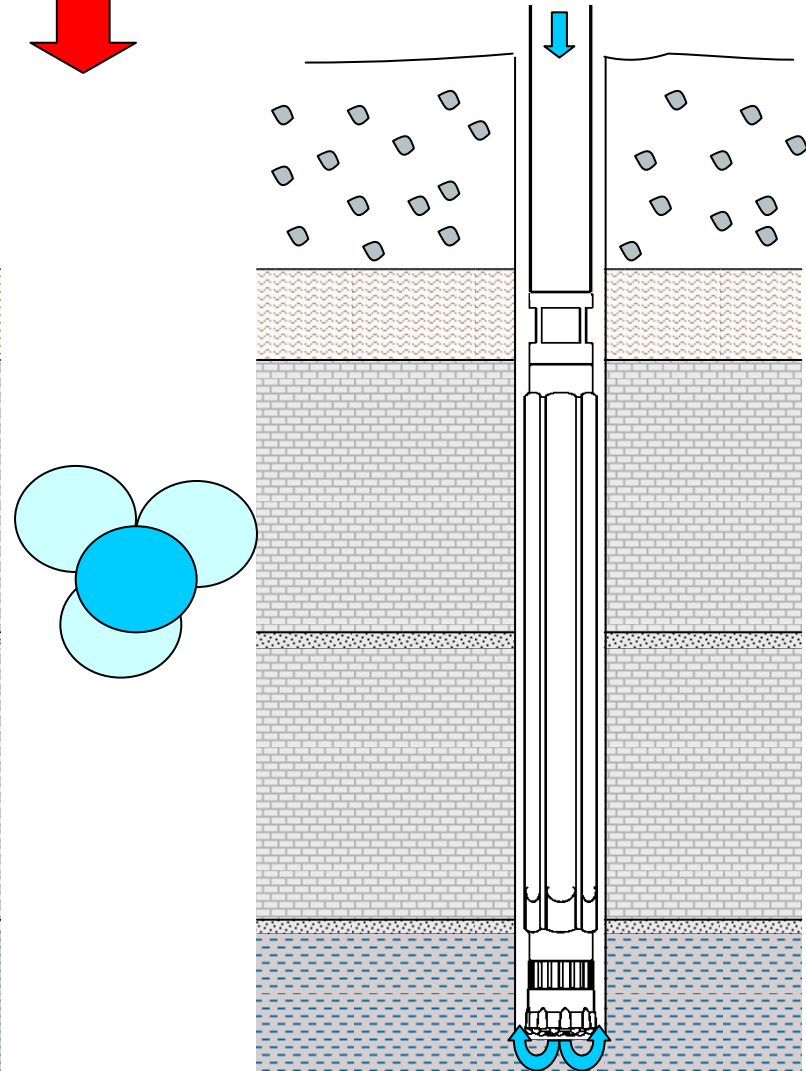
Air

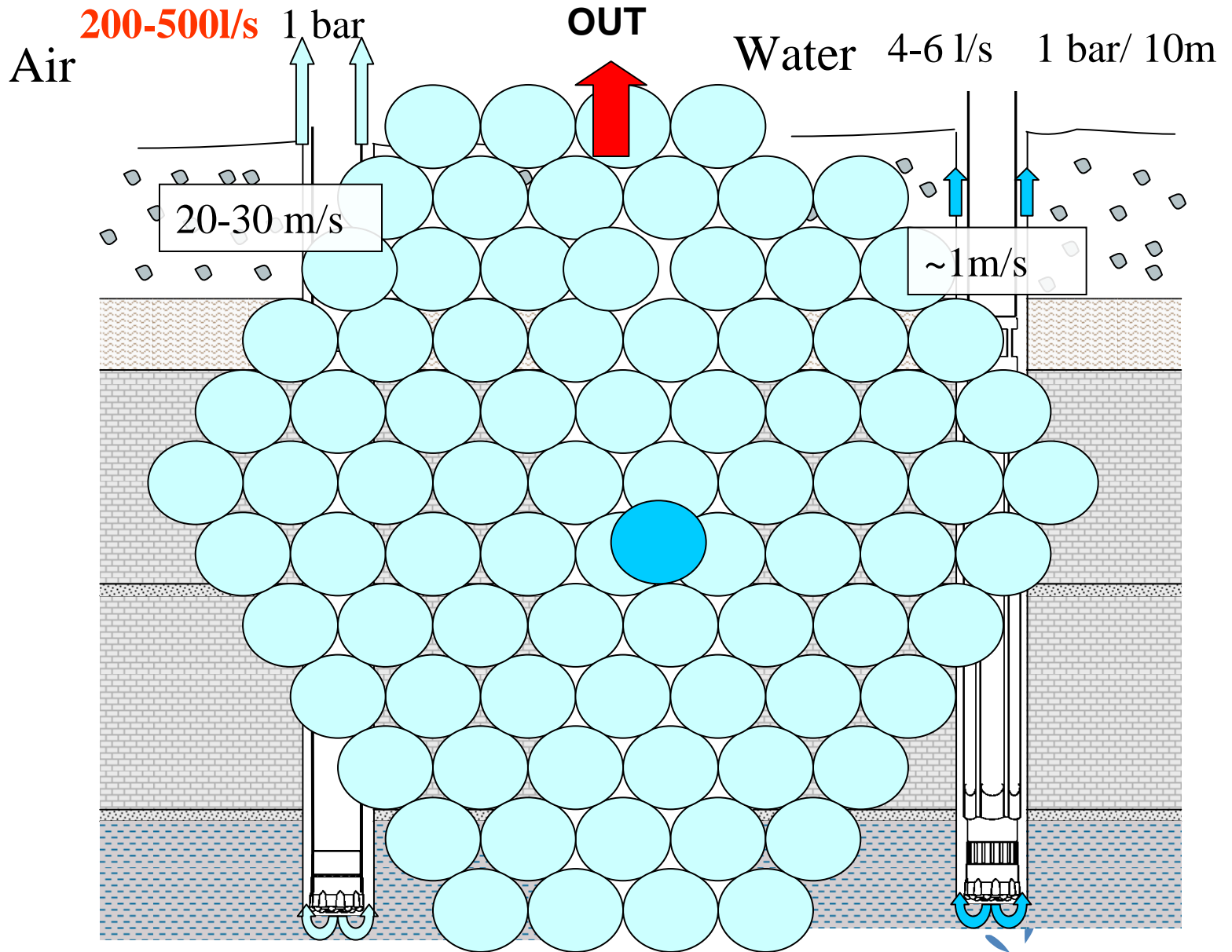
15-20 l/s 12-25 bar



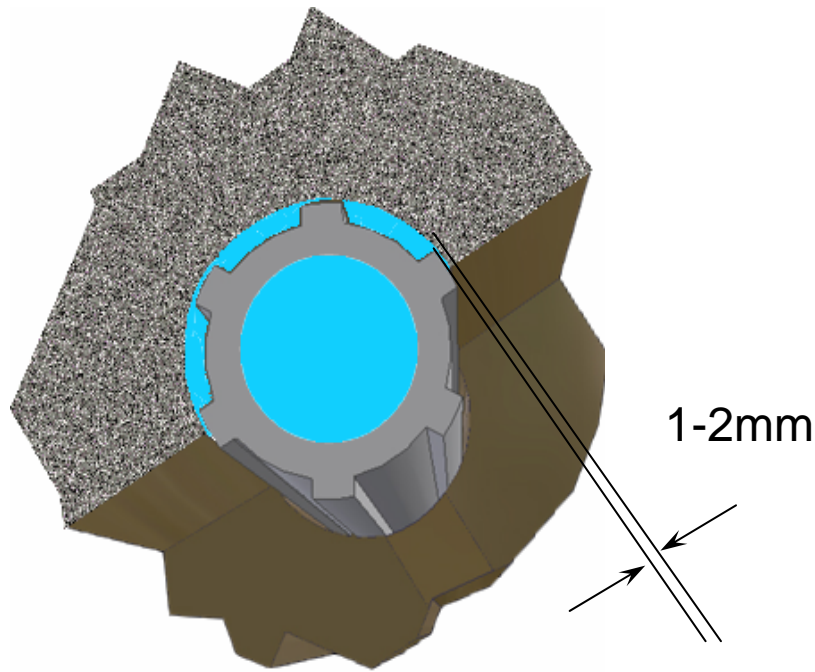
IN  
↓

Water 4-6 l/s 120-180 bar





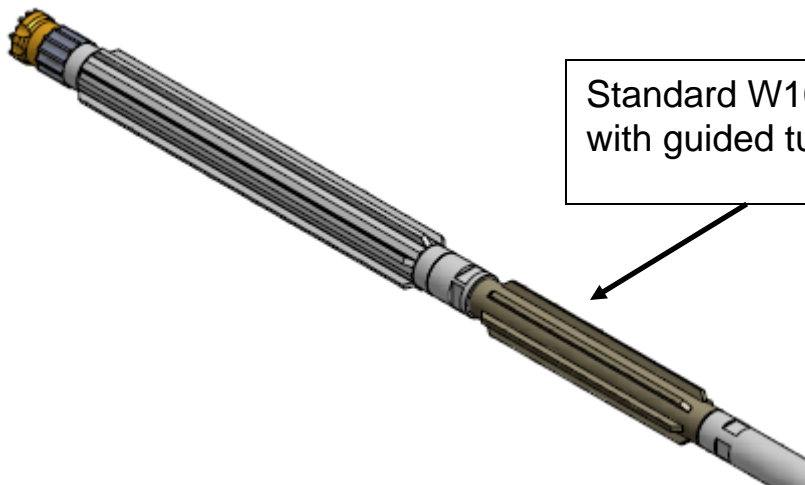
# Guided hammer casing for straight drilling



*-low volume of water.  
(water is non-compressible)*

*-Minimized gap*

*-low water velocity,  
means minimum wear  
of steering ribs.*

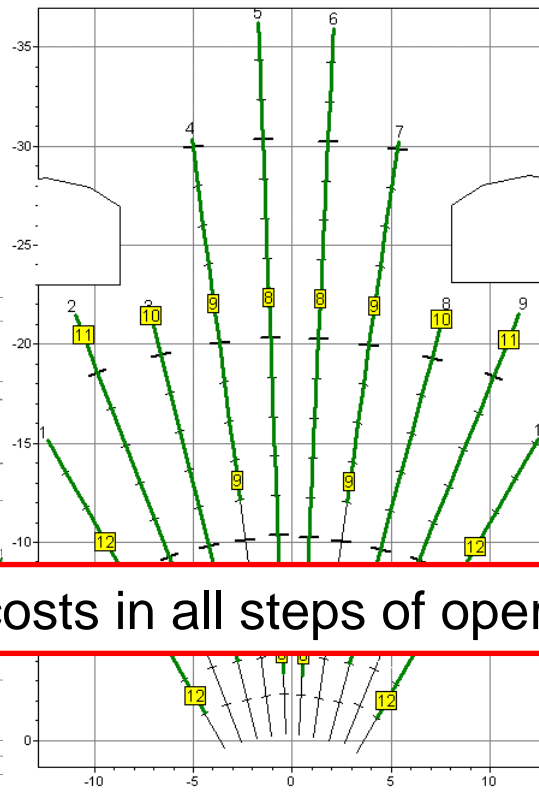


# Indirect cost reduction

Larger scale of operation,  
means lower cost per tonne

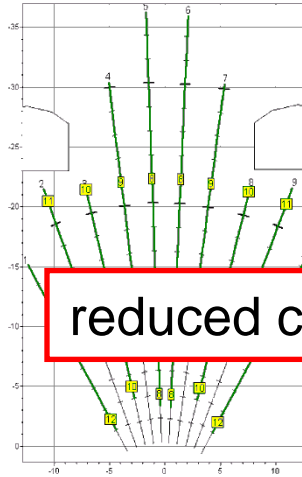
1991, 22m

YZ-snitt KI-792-o2830-15



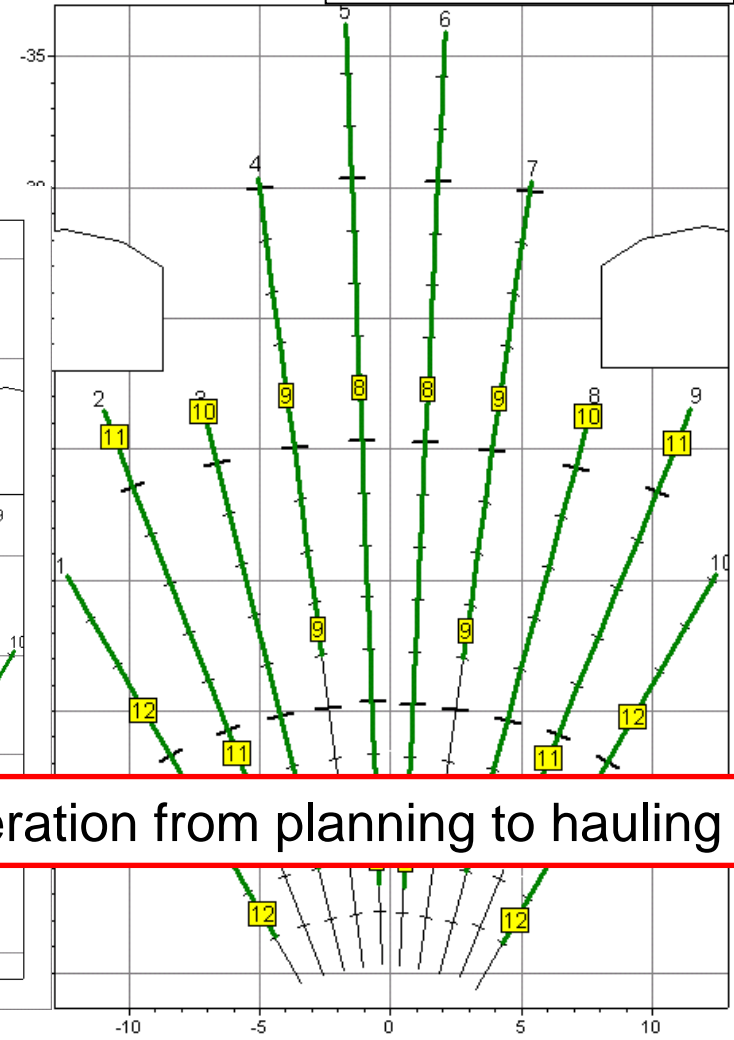
1985, 12m  
1.200 tonnes

YZ-snitt KI-792-o2830-15

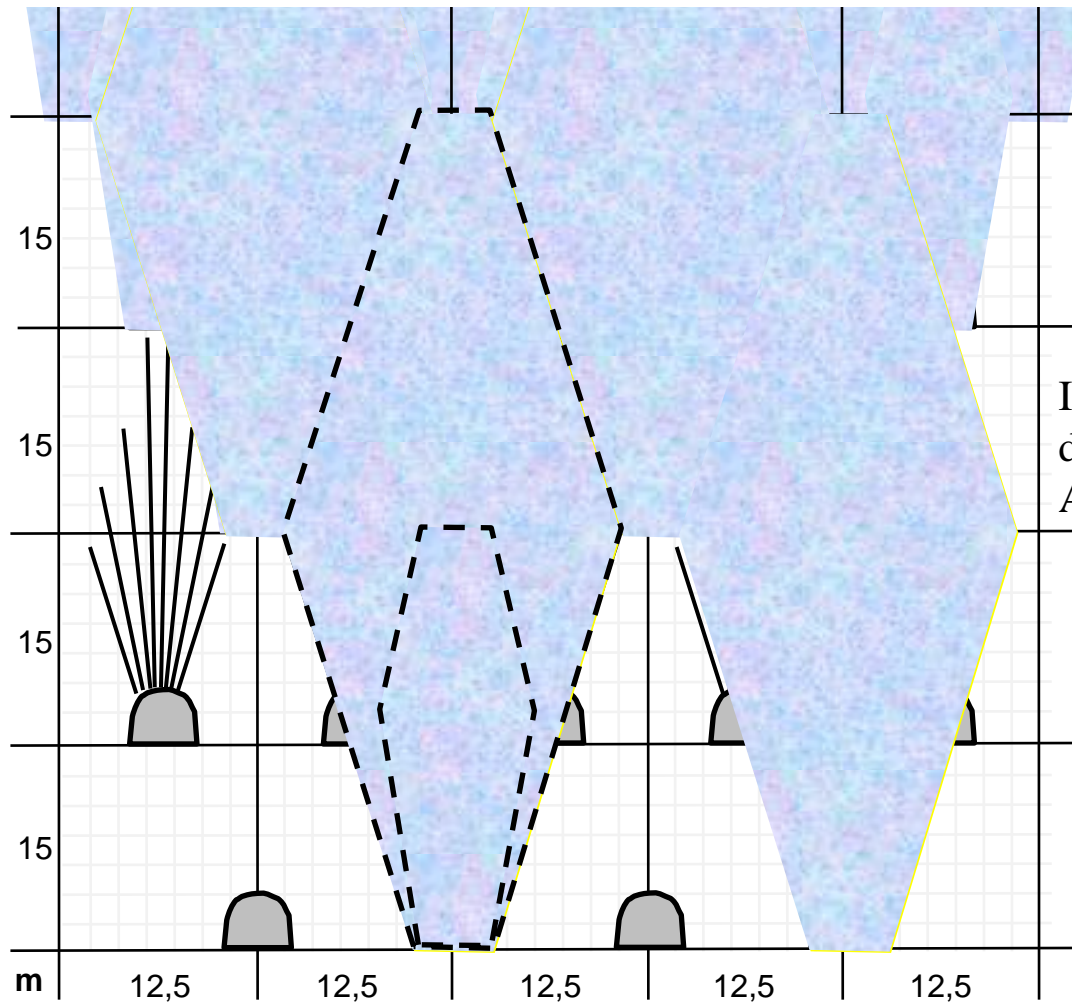


1995, 28m  
10.000 tonnes

YZ-snitt

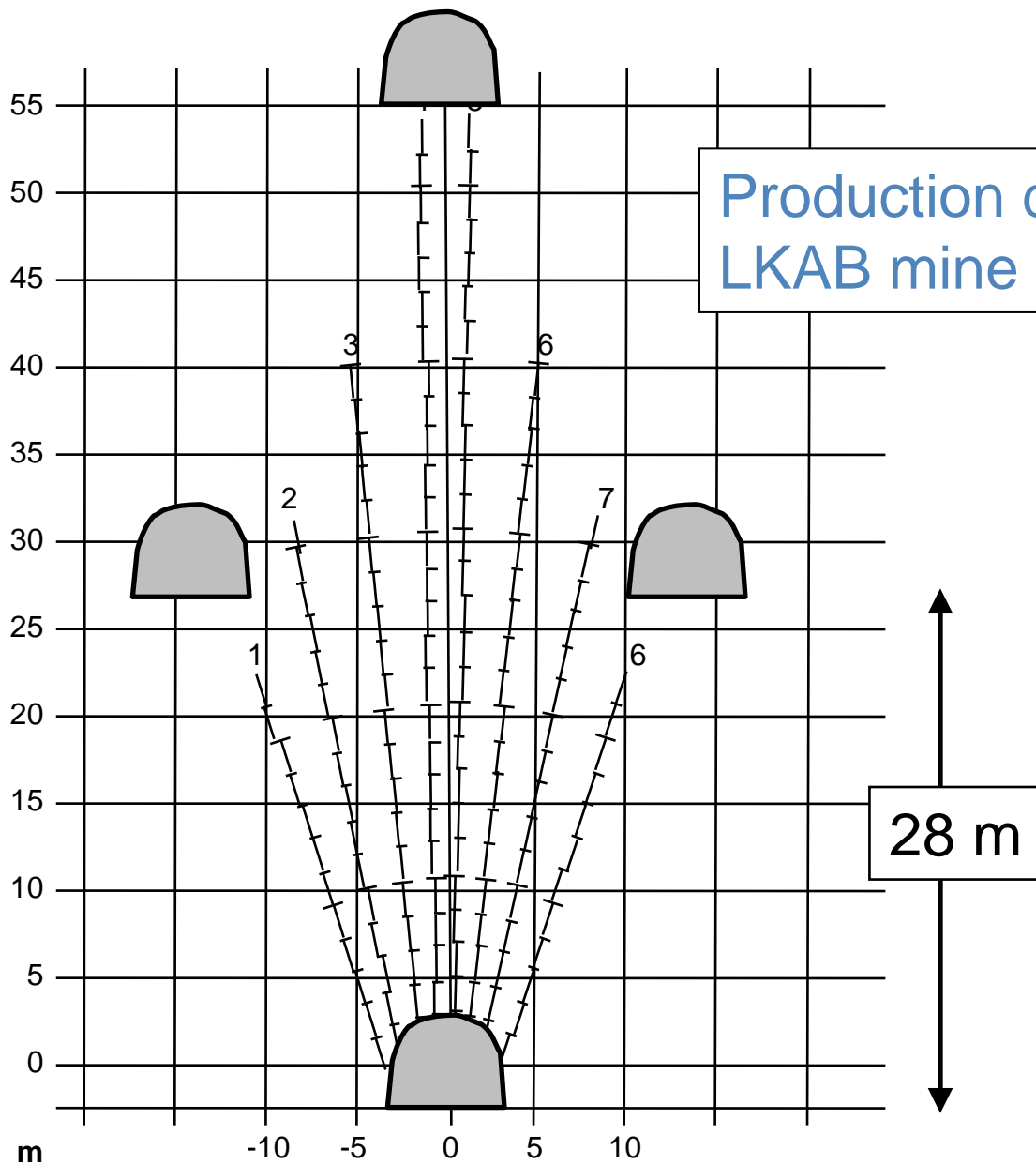


reduced costs in all steps of operation from planning to hauling



Reduction of drifts:  
Approximately 70 %

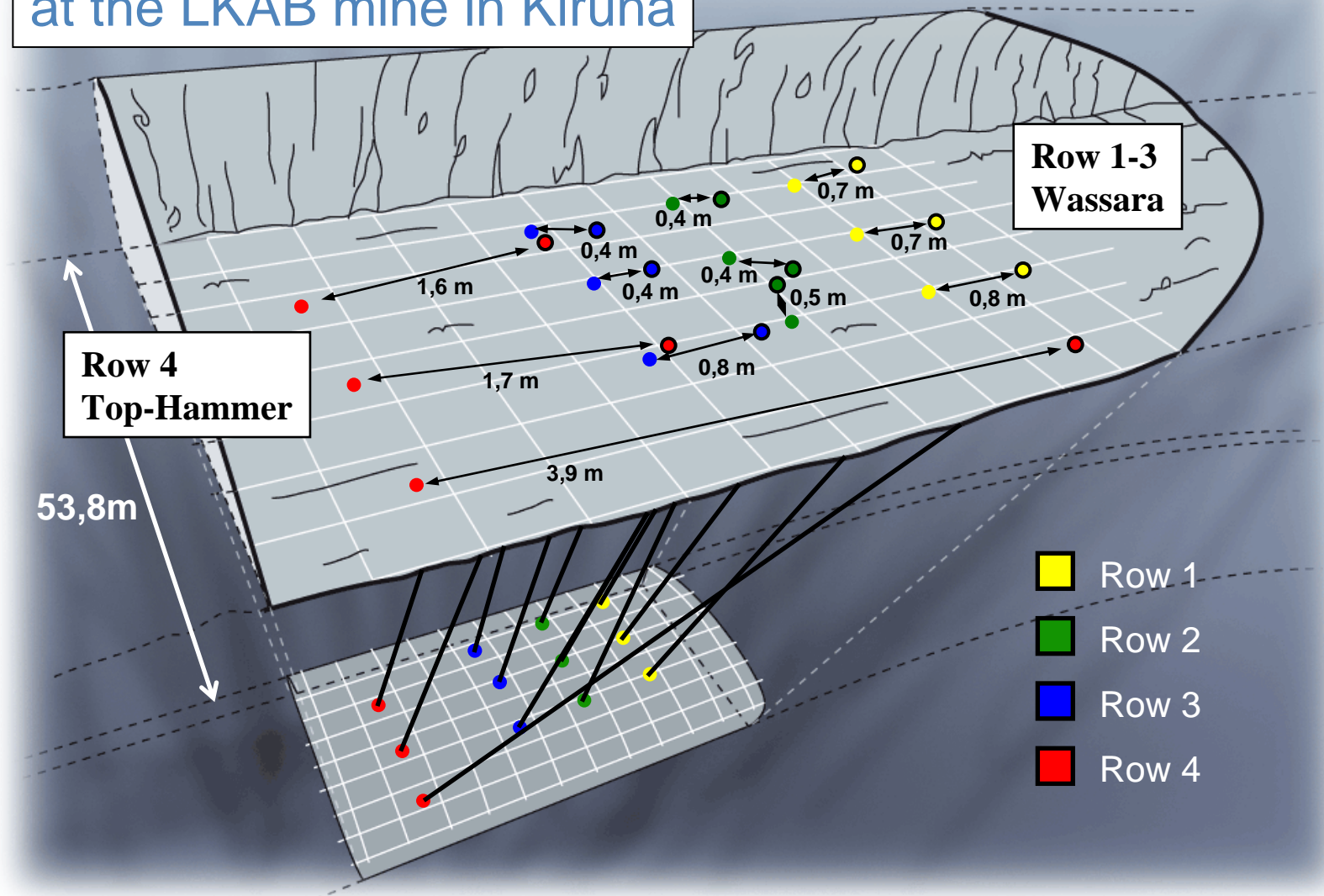
Increased volume per  
drilled meter:  
Approximately 500%



Production drilling at the LKAB mine in Kiruna

28 m

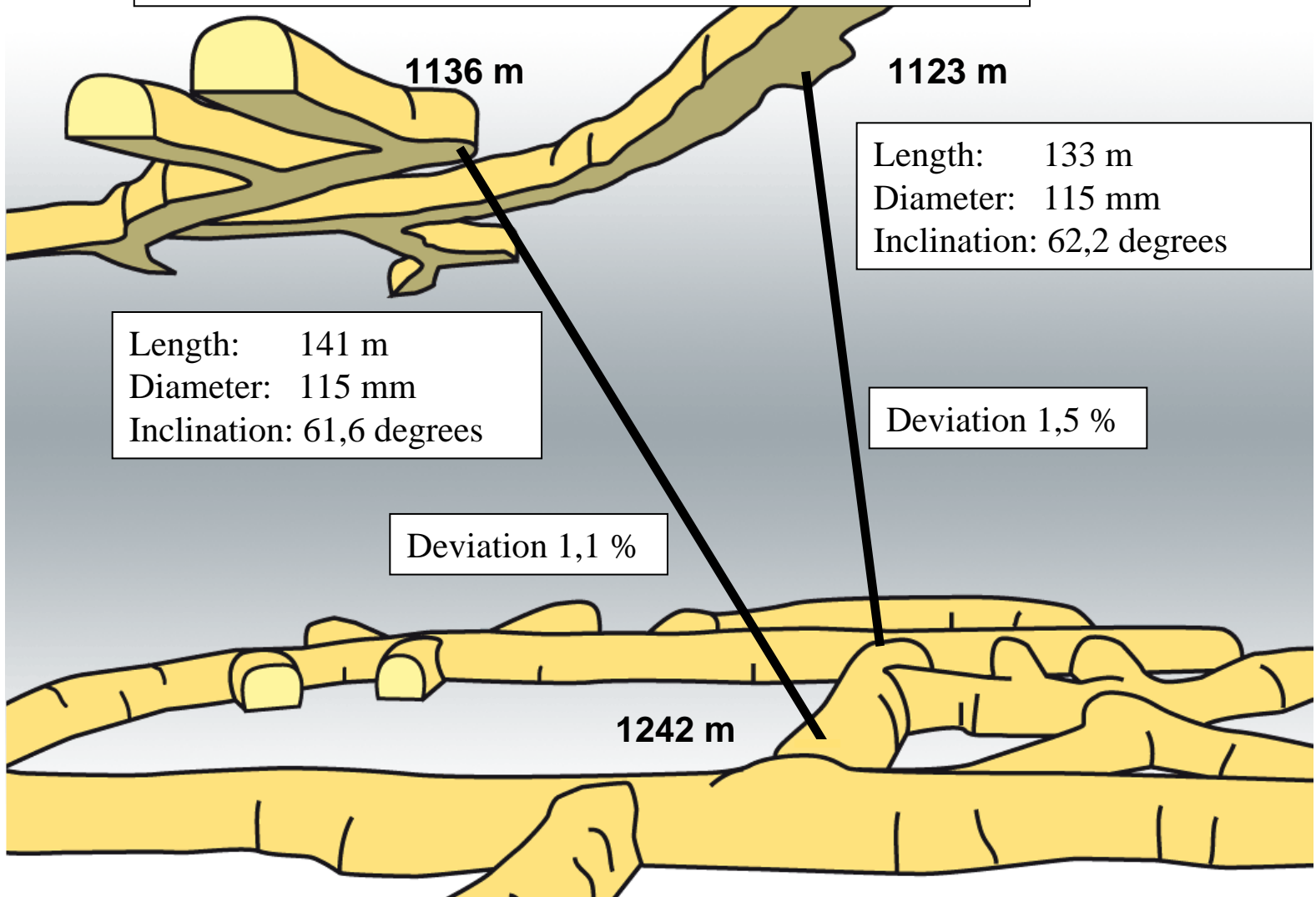
"Drill through test",  
at the LKAB mine in Kiruna



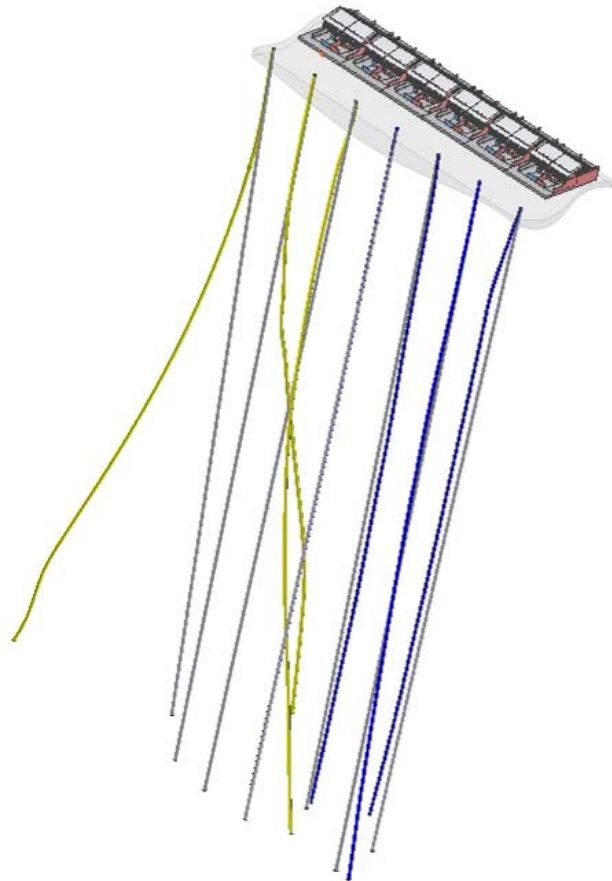
Average deviation for Wassara = 1,05 %



# Media holes in the Malmberget mine

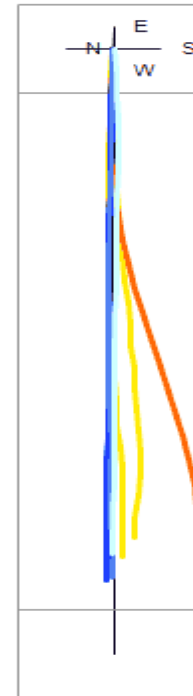


# Geothermal project in Stockholm



220 m

**Average deviation 19,2%**



**Air**

■ Hole 1

■ Hole 2

■ Hole 3

**Wassara**

■ Hole 4

■ Hole 5

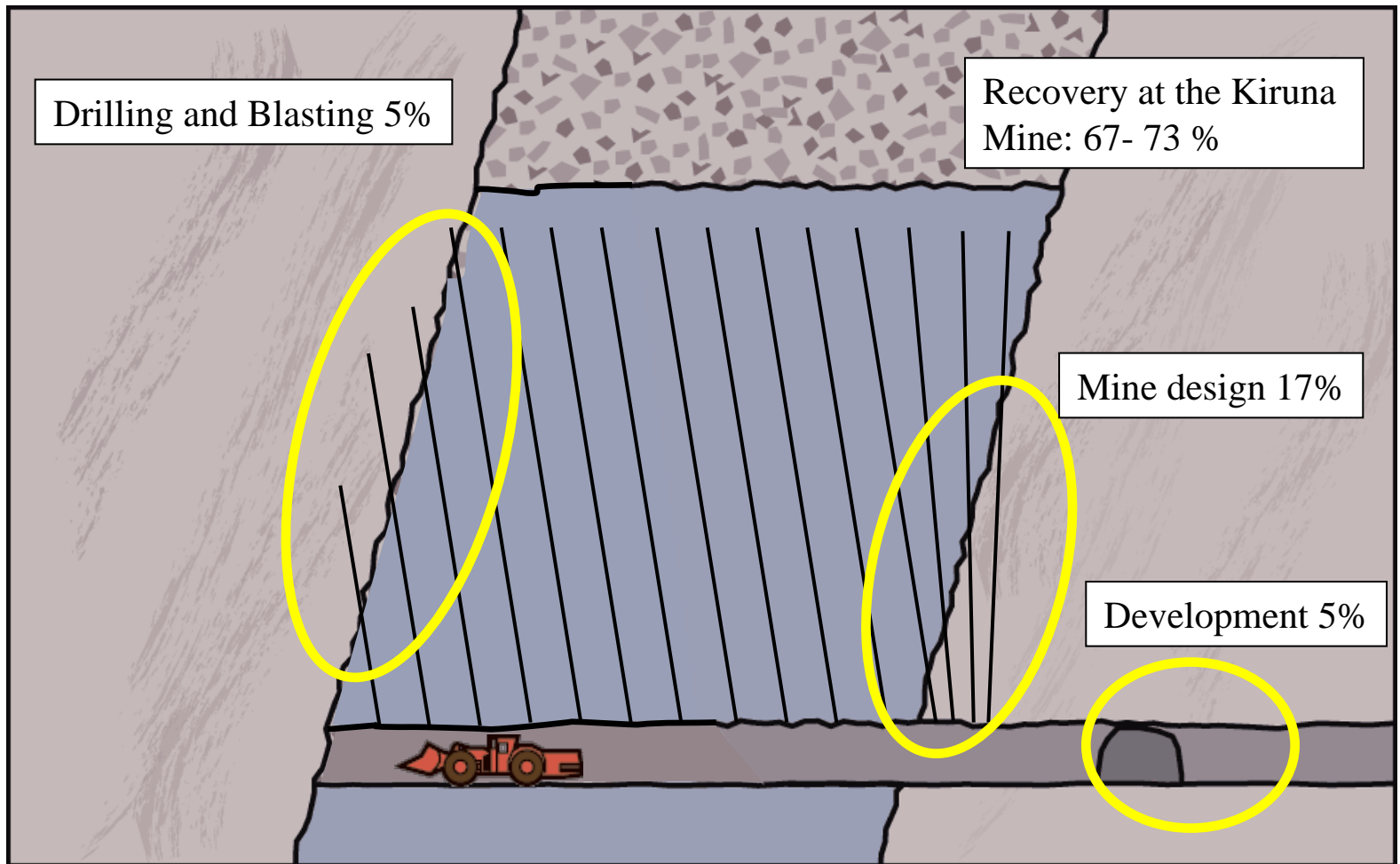
■ Hole 6

■ Hole 7

**Average deviation 1,3%**

# Indirect cost reduction

## Less dilution



# True cost comparison

When comparing costs for drilling systems, it is the actual cost per ton ore *on the ground*, that is important, and when drilling with Wassara, these parameters should be considered.

- ***Optimum scale*** - due to drilling accuracy, less development and more tonnes per round
- ***Less drill meters*** - lower costs due to more tonnes per drilled meter
- ***Dilution*** - controlled ore quality (consistent)
- ***Fragmentation*** - controlled due to drilling accuracy
- ***Energy*** - lowered by >80 % due to drilling system efficiency
- ***Safety*** - improved due to drilling accuracy

# Product Program

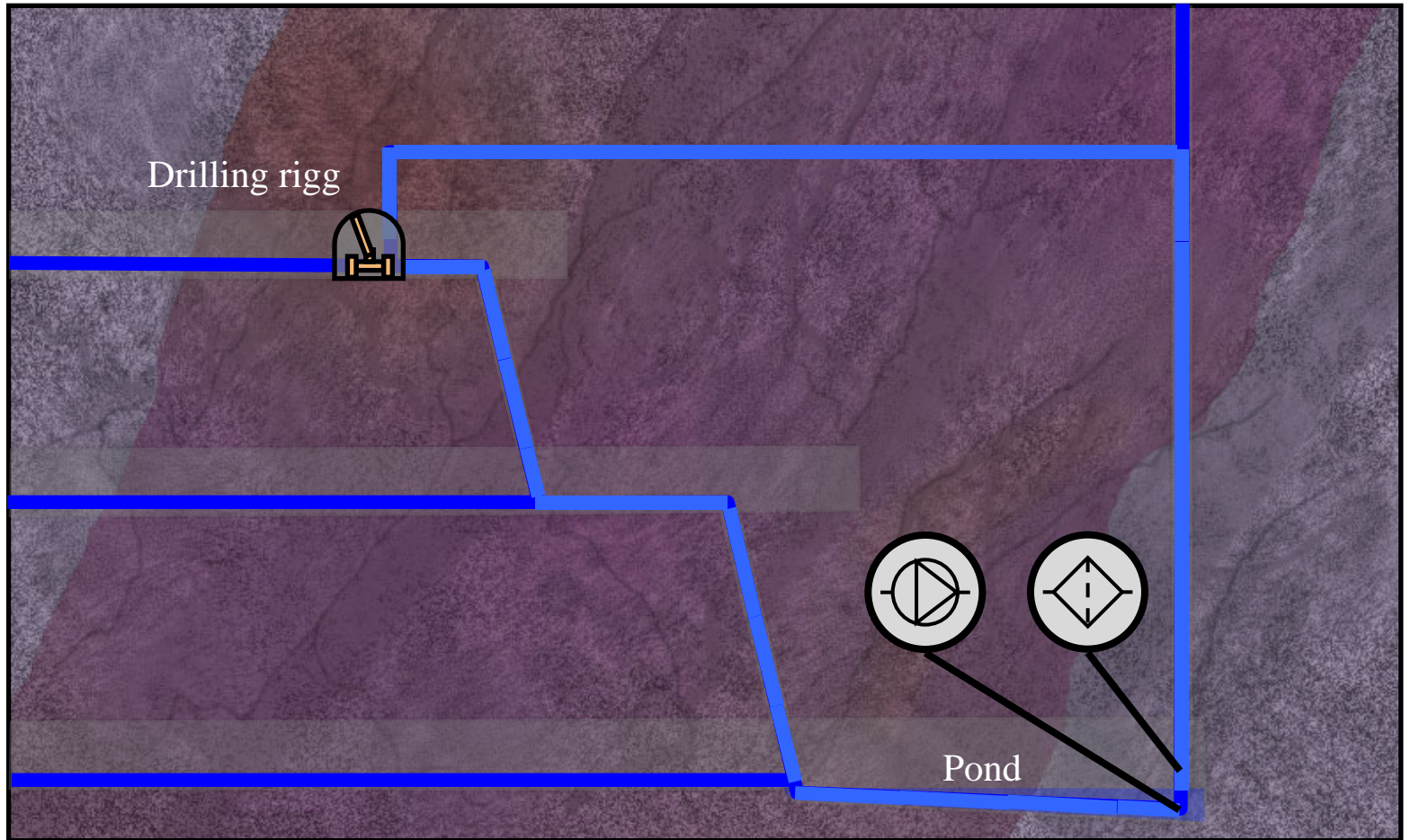
## Wassara Hammers, Drill Tubes & Bits



<u>Hammer</u>	<u>Drill bit dim. (mm)</u>	<u>Drill tubes (mm)</u>
W 50 (2")	54 – (65)	48,3
W 70 (3")	78 - 90	63,5
W 80 (3")	90 – (100)	76
W 100 (4")	108 – (130)	89
W 120 (5")	130 – (160)	102
W 150 (6")	165 – (215)	114/140+
W 200 (8")	225 – (254)	176



# Recycling Water System



# Purpose built rigs



# Conclusions

## ***Wassara Water Powered Drilling System***

***- Moves boundaries and improves the environment -***

# Thank you !

*Drilling with Wassara is not difficult,  
just different !*