

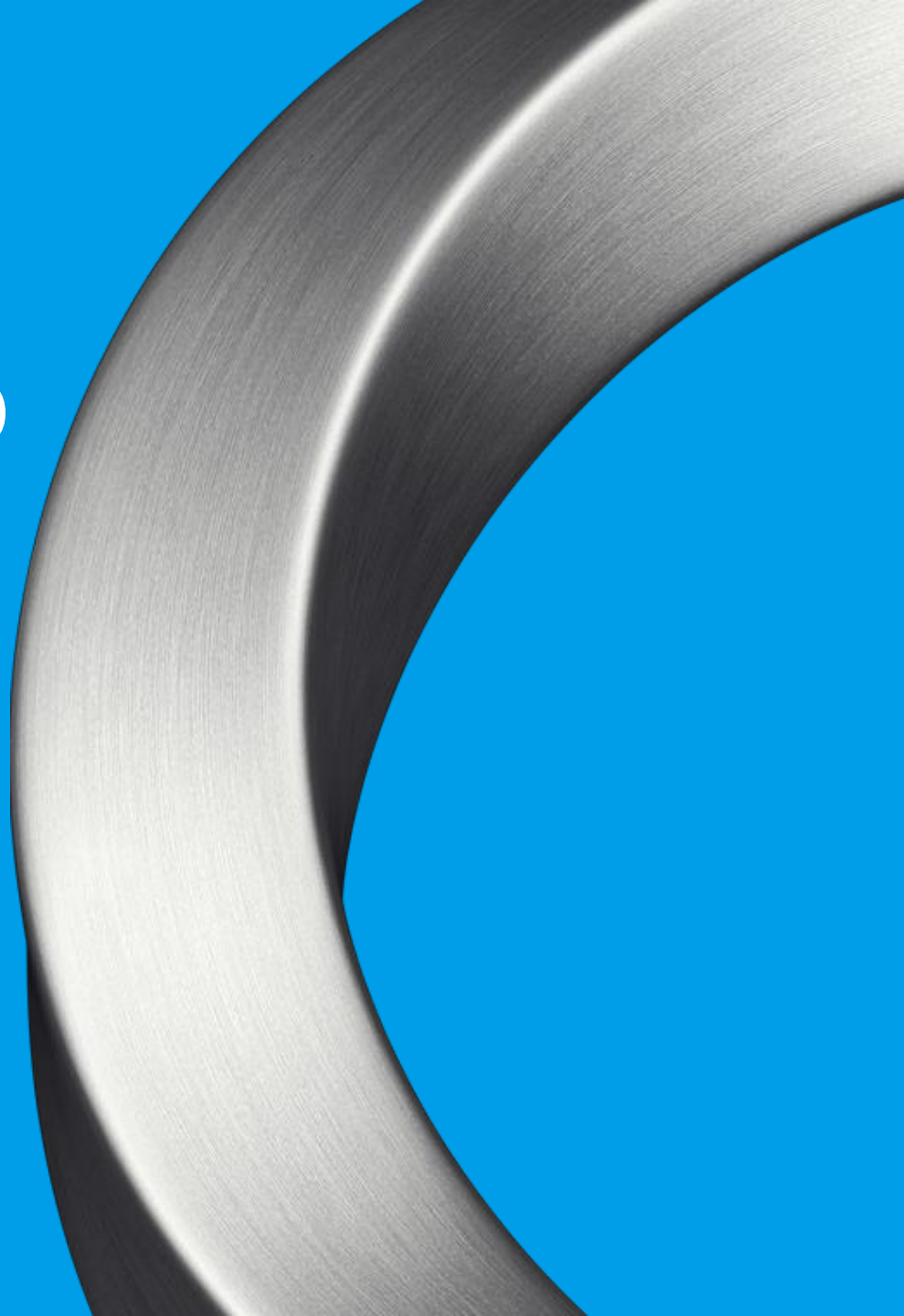
Investor Visit to Kemi Mine

Jyrki Salmi

Vice President – Kemi Mine

Outokumpu Ferrochrome, Kemi Mine

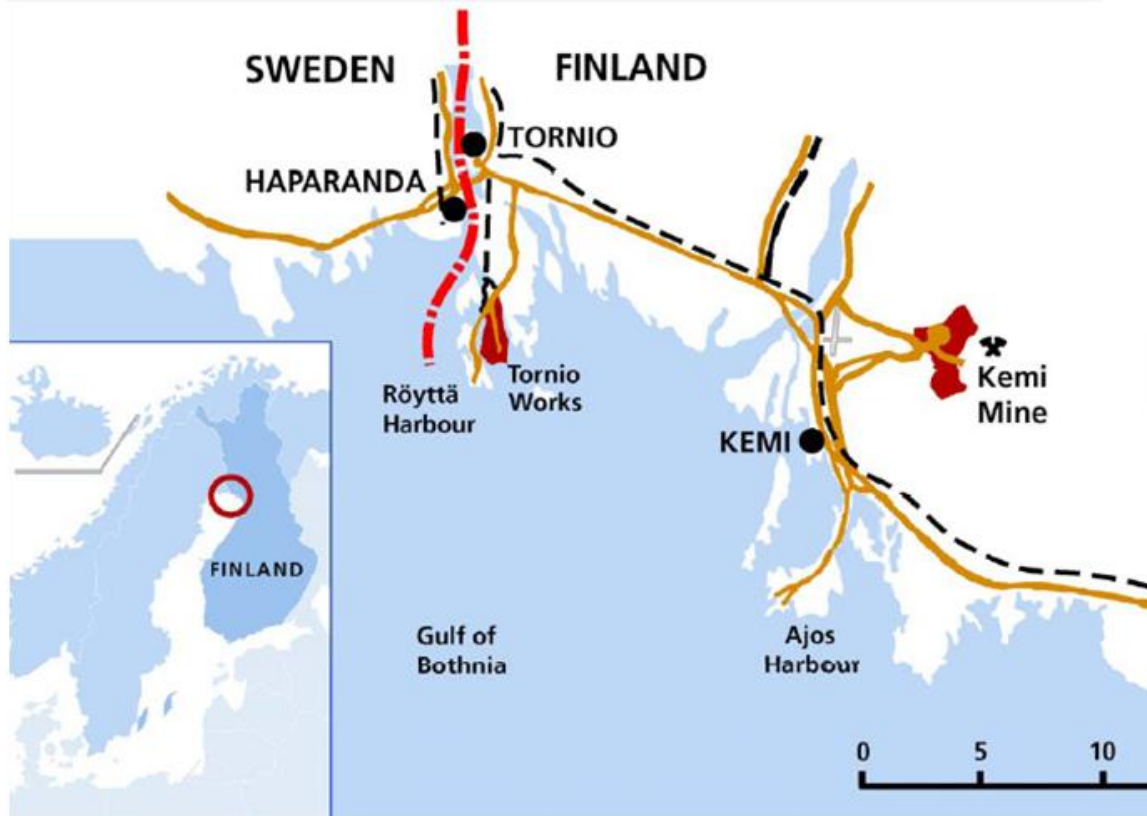
October 7th, 2015



Outokumpu Ferrochrome

Integrated ferrochrome business in Kemi-Tornio area

Location of Outokumpu's Chromium Mine and Ferrochrome Smelter in Kemi-Tornio area



Ferrochrome production
Key Facts

Target capacity: 530 000 tons
Employees: ~420 people,
whereof ~190 in
Kemi

Competitive advantage

- ✓ Integrated, world class operation
- ✓ World class chrome deposit in EU
- ✓ Stable, cost efficient electricity
- ✓ Excellent cost curve position

Outokumpu Ferrochrome

Integrated operating model



- 2,7 Mt ore
- 850 kt FinCon
- 400 kt Lumpy ore

- 530kt FeCr
- 370MNm3 CO-gas
- 625kt slag product

- ~410kt internal
- ~120kt external

Cromite ore mined underground and concentrated above ground

Safe, secure, cost efficient and high Cr content concentrate to FeCr production

Fine concentrate pelletized and together with lumpy ore fed to 3 furnaces => FeCr

Safe, stable, cost efficient FeCr production

FeCr is sold as liquid to Tornio melt shop #1 or casted and crushed to be sold. CO gas sold in Tornio

High FeCr inventory turn with best possible external effective price

Chrome makes the steel stainless.

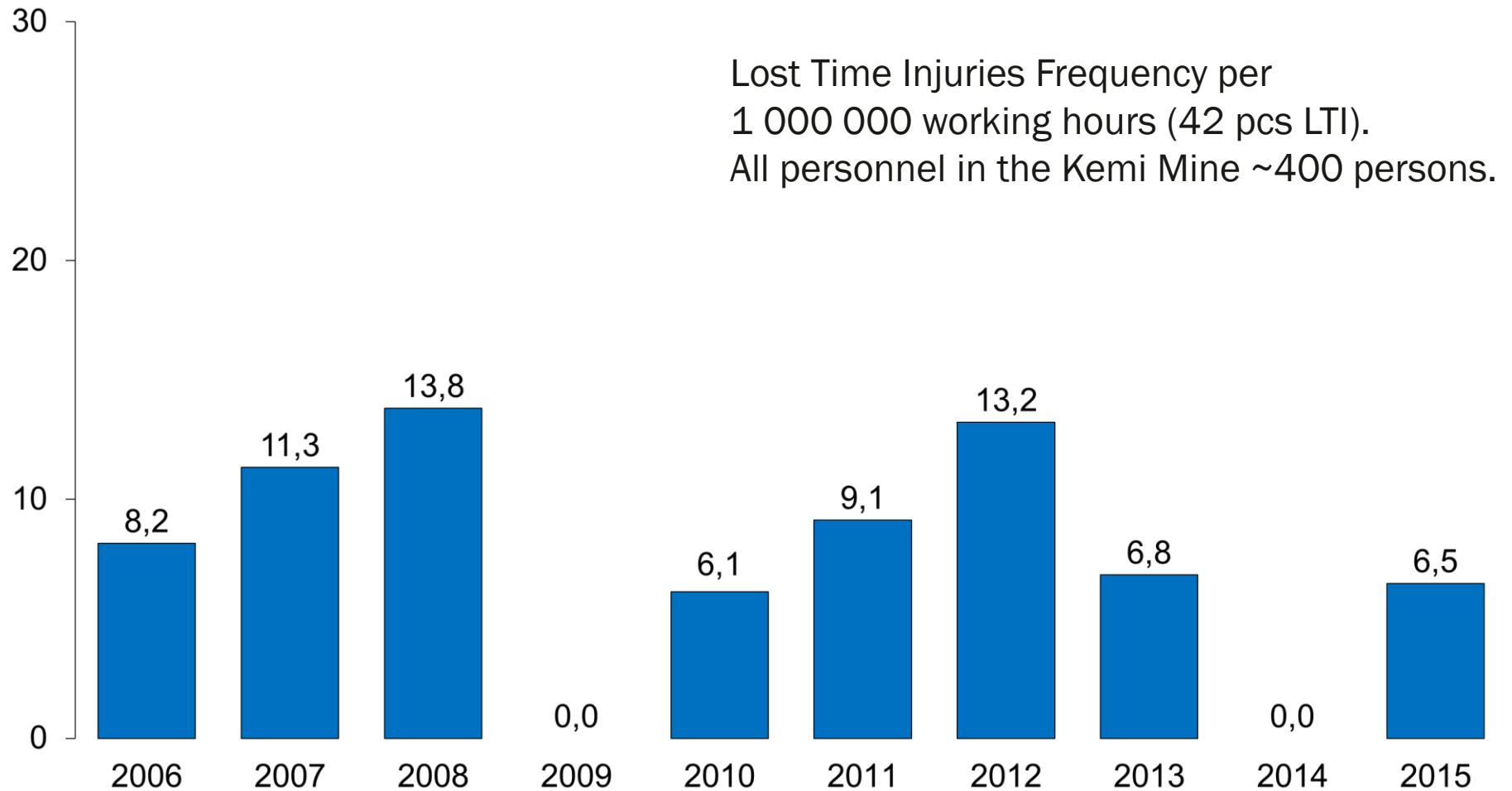
Kemi Mine

Mining the future

Part of the most integrated stainless steel production chain in the world.



Accident frequency in Kemi Mine



Kemi Mine

The only chromite mine within European Union

- Chrome deposit found in 1959. Decision to open the mine in 1964.
- Production started from open pit in 1968. Underground mine was built during 1999 – 2003. All the ore production has come from underground since 2006.
- Proven ore reserves are 48 million tons. Depth of the formation and ore is unknown. Seismic measurements however indicate depth of several kilometers.
- Ore, concentrate and ferrochrome production figures are being doubled during 2013-2015. Annual mill capacity will be 2.7 million tons of ore which makes Kemi the biggest underground mine in Finland.
- Products are lumpy ore and fine concentrate. Annual production is 1.25 million tons at full speed. All concentrates are transported by trucks to ferrochrome works in Tornio as raw material for company's own ferrochrome production.



Kemi Mine Today

In Figures

SAFETY 2015

LTIFr =6,5 (3 pcs) TRIFr >15,1 (7 pcs)

ENVIRONMENT

Strengths: oxide ore, gravity concentration, closed water circulation
No environmental incidents

PERSONNEL

~200 outokumpus and ~200 contractors

Preliminary work for DeepMine

- Ramp to new main level 7 km
- Hoisting shaft to 1,5 km
- Ore handling premises and other infra, ventilation raises and maintenance premises

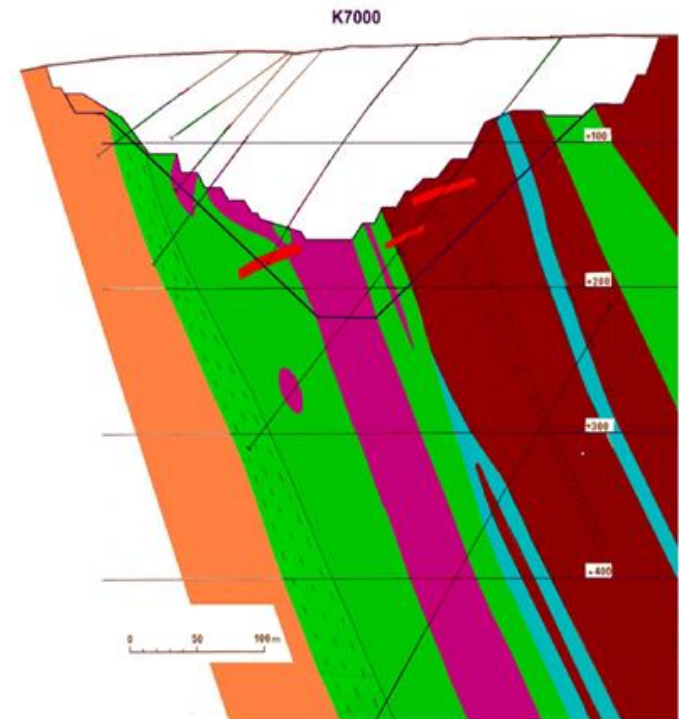
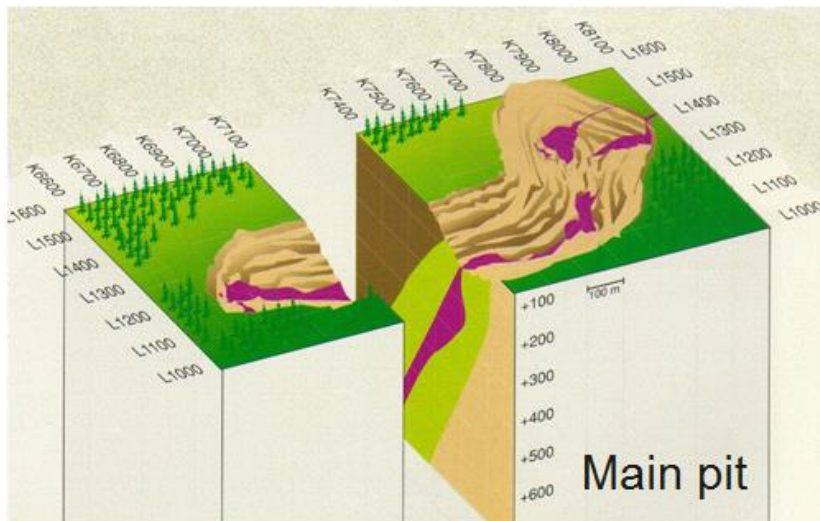
- Geological surveying 50 km
- Tunneling to production area 10 km

CONCENTRATE PRODUCTION per annum

- | | |
|--|---|
| <ul style="list-style-type: none">• New tunnels 9 km• Geological Surveying• Intensive Rock Support• Products<ul style="list-style-type: none">• Loaded and hoisted ore 2,4 Mt• Ore Storages (Stopes and Silos) for 21 days | <ul style="list-style-type: none">• Mill feed 2,4 Mt• Crushing, milling and 2-stage separation process• Products<ul style="list-style-type: none">• Lumpy Ore 290 kt• Fine Concentrate 790 kt• Concentrate Storages for 21 days |
|--|---|

Ore formation

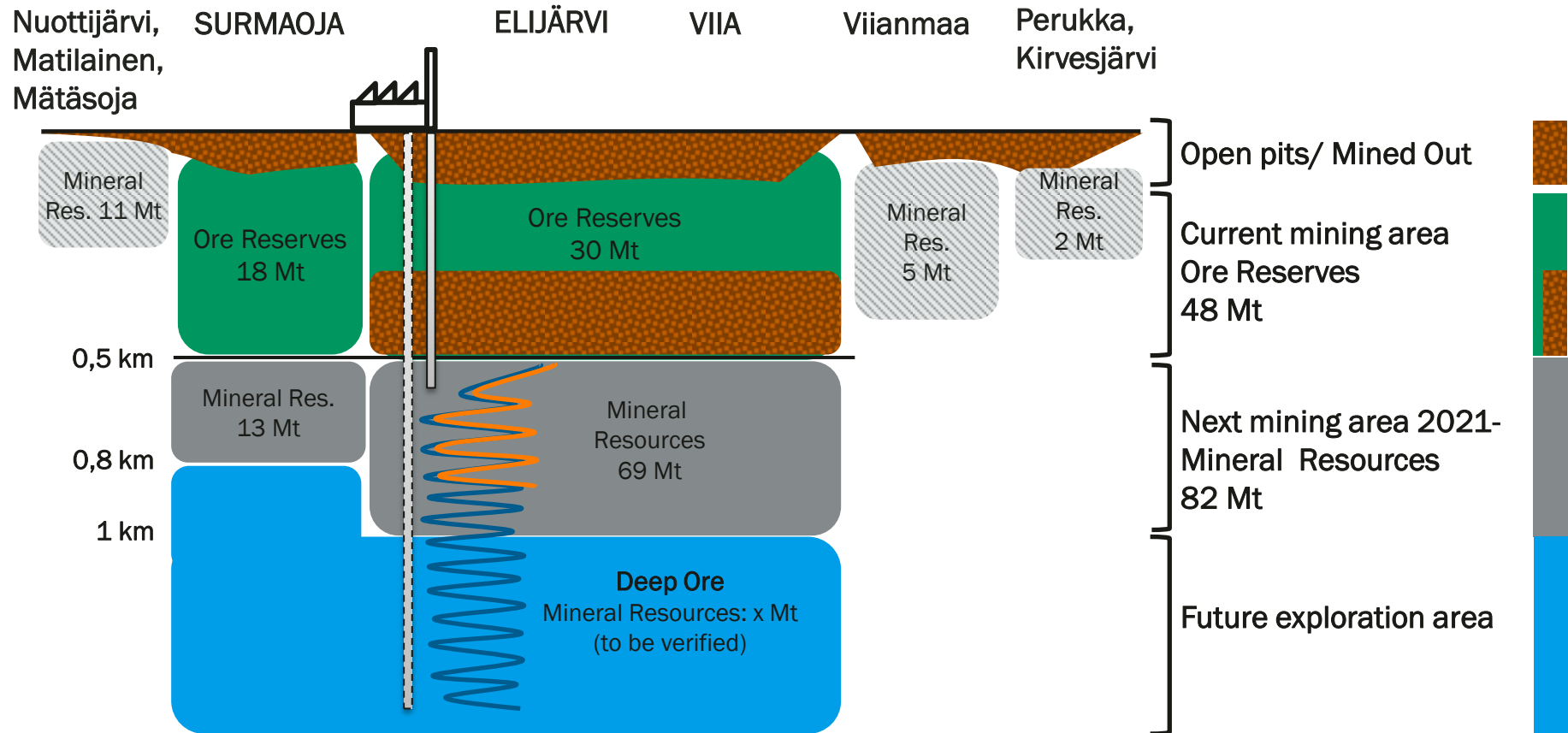
- Layered intrusion, 2440 M years old
- Consists of several ore bodies
- Dip 70° NW, average width 40 m
- Length 3 km
- Grade 29 % Cr₂O₃,
- Depth unknown



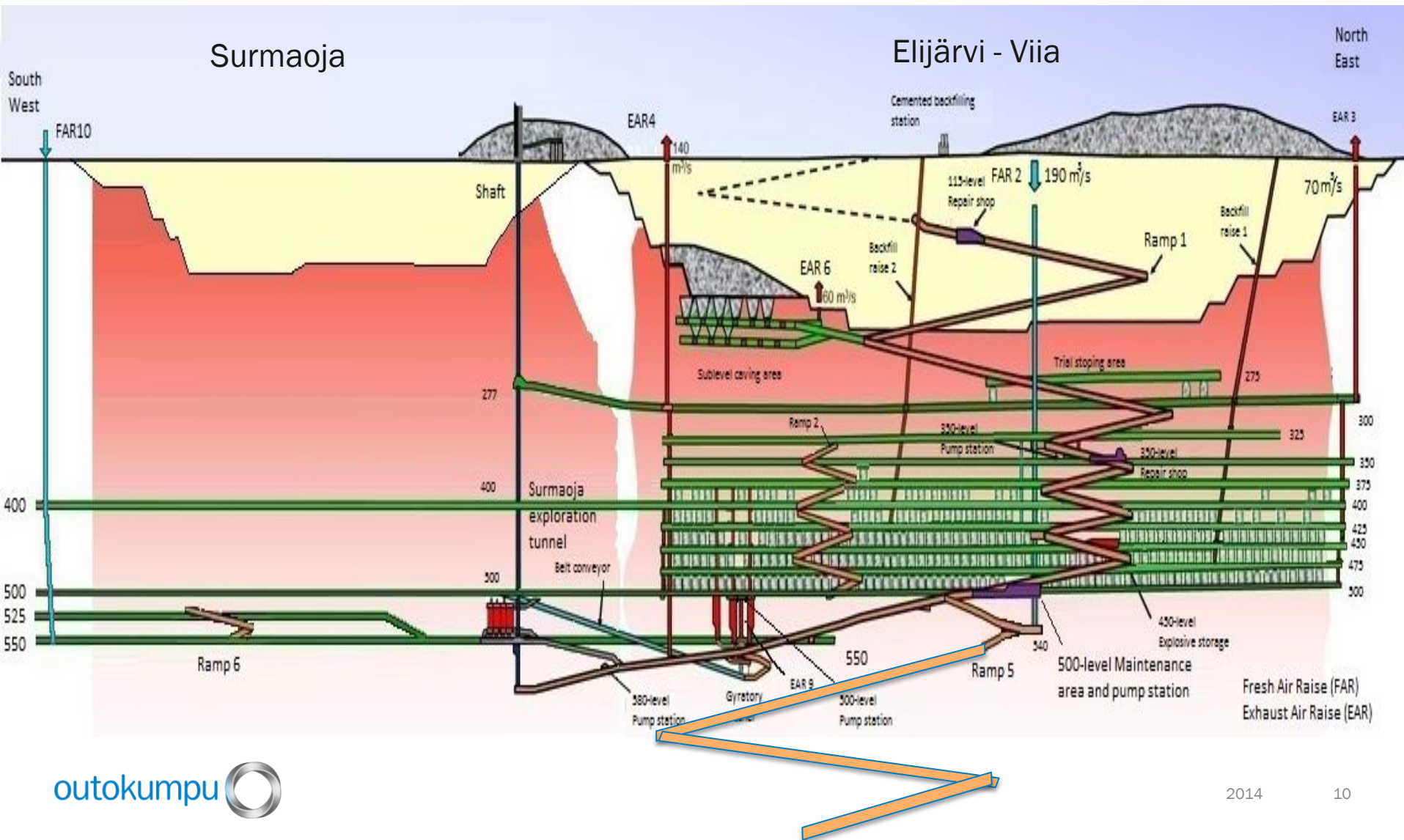
- Granite
- Talc carbonate
- Ore

Kemi Mine - Ore bodies

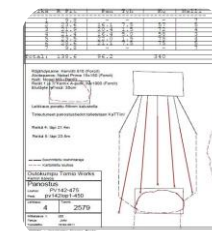
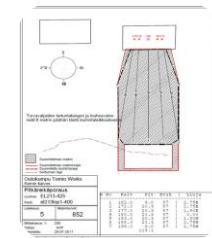
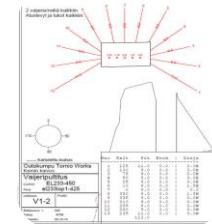
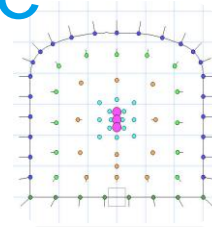
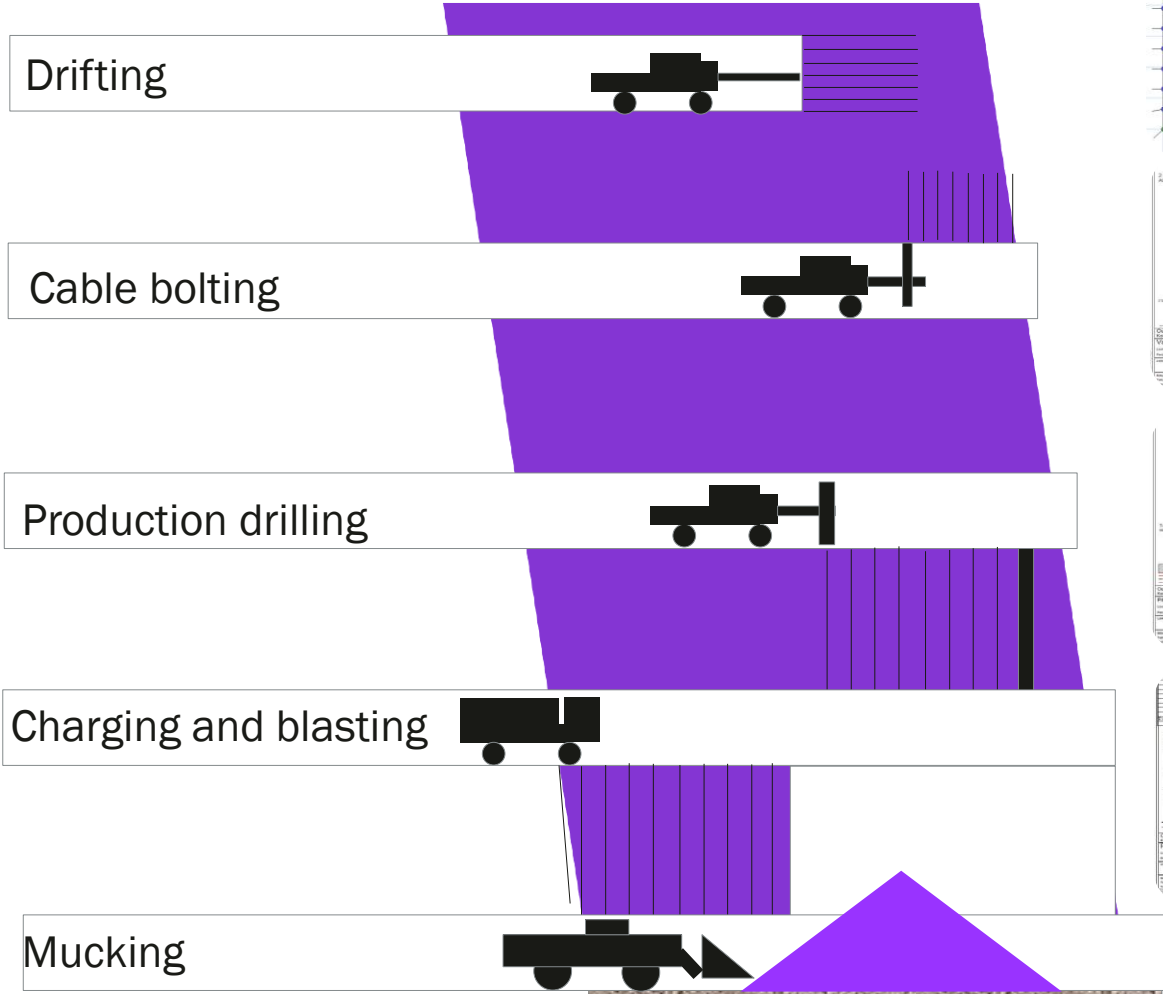
Reserves and Resources (1st January, 2015)






Longitudinal section of the Kemi Mine



Mining Method in Kemi Mine



Natural concentration process

- Separation of waste rock particles from the ore is based on gravity
- No chemicals is used in the separation process. Only thickener is used in the water treatment.
- Specific gravity of the waste rock is 2.7 t/m³ and the ore has 3.45 t/m³.
 - Heavy Medium Separation for lumpy ore  
 - Spiral Concentration for fine concentrate 



The interaction between the mine and the surrounding environment

- Minimal impact to the nature and community due to
 1. oxide ore,
 2. gravity separation process and
 3. closed water circuit.
 - Chemicals are not required, so water bleeding off the basin match the quality of natural waters. Settling basins got healthy and dense fish population.
 - Load to the water system is measurable mainly right after the mine; further away the impact is very low. The most significant sources of water pollution factors in the water from the mining area are nutrients (N, P), iron and calcium.
 - The bleed-off water from the settling basin does not adversely affect the Iso-Ruonajoki -ditch, rather increasing flow in the river improve the water conditions, especially in the summer.



Products of the Kemi Mine

- **Upgraded lumpy ore**
 - 35,5 % Cr_2O_3
 - lump size 10 - 120 mm
 - annual production ~ 400 000 t
- **Metallurgical grade fine concentrate**
 - 45,0 % Cr_2O_3
 - average grain size 0,2 mm
 - annual production ~ 850 000 t



Next

Mine tour

- 500 meters
 - Office and canteen area for miners
 - Maintenance facilities for fixing mining machines
- Production area
 - Underground crusher for making ore boulders smaller
 - Drilling/bolting for rock support or ore production
- Mill
 - Rod mill for grinding ore to the fine concentration process
 - Spirals for separating particles in fine concentration process

Safety Instructions for Visitors

Your safety is important to us – please follow these guidelines



You have to be accompanied by your host.



Personal protective equipment must be used at all times.



Always follow the instructions of your host.



Photographing is not allowed.



Smoking is allowed only in special areas.



We operate a recording video surveillance system on the premises.



**In case of emergency
please call Kemi mine emergency number
+358 16 45 3737**

Our vision

**“A world that
lasts forever.”**

