Remediation of a NORM contaminated site in Lower - Austria

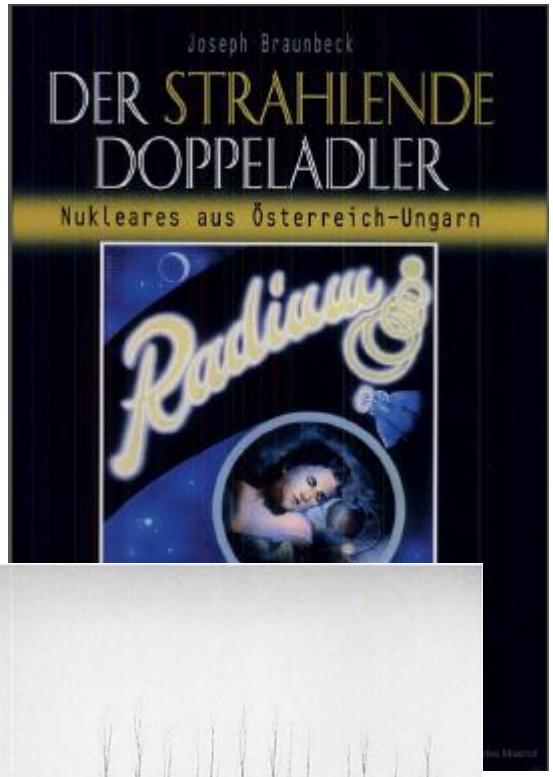
Michael Dauke and Christian Katzlberger

Austrian Agency for Health and Food Safety -
Competence Centre Radiation Protection and Radiochemistry

Spargelfeldstraße 191, A-1220 Vienna

Background: History

- 1907: Foundation of the „Chemical Plant Dr. Fischer & Co" in a Village near Vienna
- 1910: First reference of radium products
- 1910-1917: Manufacture of Radium containing products with materials from St. Joachimsthal (CZ) and bankruptcy in 1917.
- 1917-1923: Activities in chemical production, but it is unclear if Radium was further processed or not.
- 1925: Final Liquidation of the chemical plant.
- 1925 – 2007: Further use as weaving mill and finally as „construction yard".
- 2007: First investigations of the site, because of the references in the „Der strahlende Doppeladler"



Objectives:

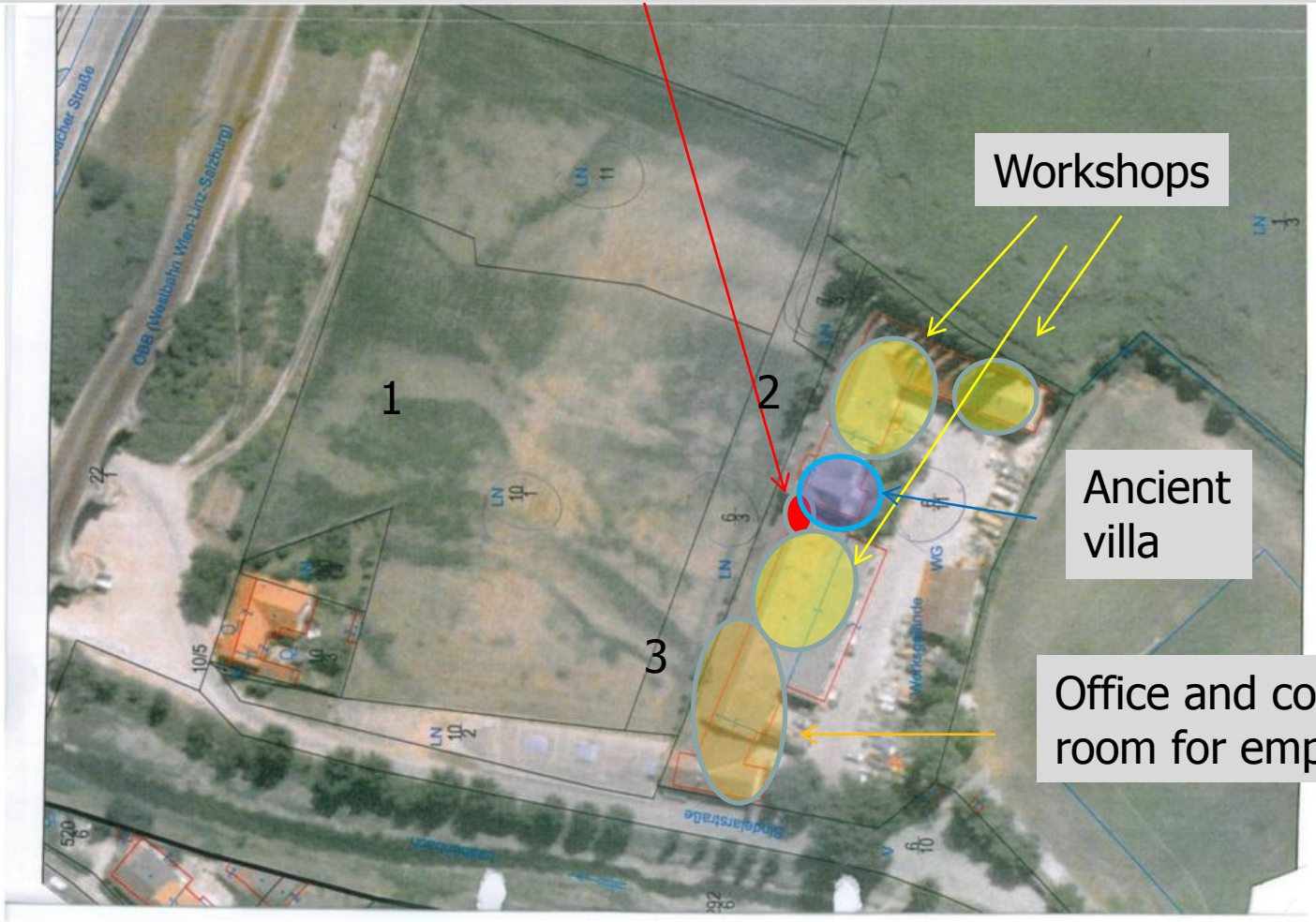
- Control of the remediated contaminated area between the ancient villa and the workshop.
- Examination of the site on harmlessness, including dose rates measurement, sample analysis and radon measurement.

Challanges:

- Time constraints, because of the planned erection of a school, in the vicinity of the contaminated area, in 2009.
- Optimisation of the costs for comprehensive remediation of the area

Situation in 2008

1st detection and remediation of superficial (2 m², 20 cm in depth) decontamination from Jan. to Feb. 2008.



Situation in 2008

March 2008:
1: Dose rate (100-250 nSv/h) and 15-23 Counts. 35 Soil samples for gamma measurement.
2: 6 local and superficial hot spots on concrete and bricks detected. Doserate between 250 -800 nSv/h and 200-800 Counts. Radon measurement devices installed.
3: No Hot spots detected. Slightly elevated dose rates between 160 – 320 nSv/h and 20 – 40 Counts. Radon measurement devices installed.

Preliminary results

- Identification of 6 superficial Hot Spots within the buildings (up to 40Bq/g Ra-226)
- No suspicious results in soil samples identified (Ra-226 within 20 – 35 Bq/kg)
- Mean Radon-222 results (pico-rad vials, short term measurements)
  - In office and group room buildings between 12000 and 20500 Bq/m³.
  - In Workshop buildings between 200 and 5000 Bq/m³
  - In storage building between 100 and 2000 Bq/m³

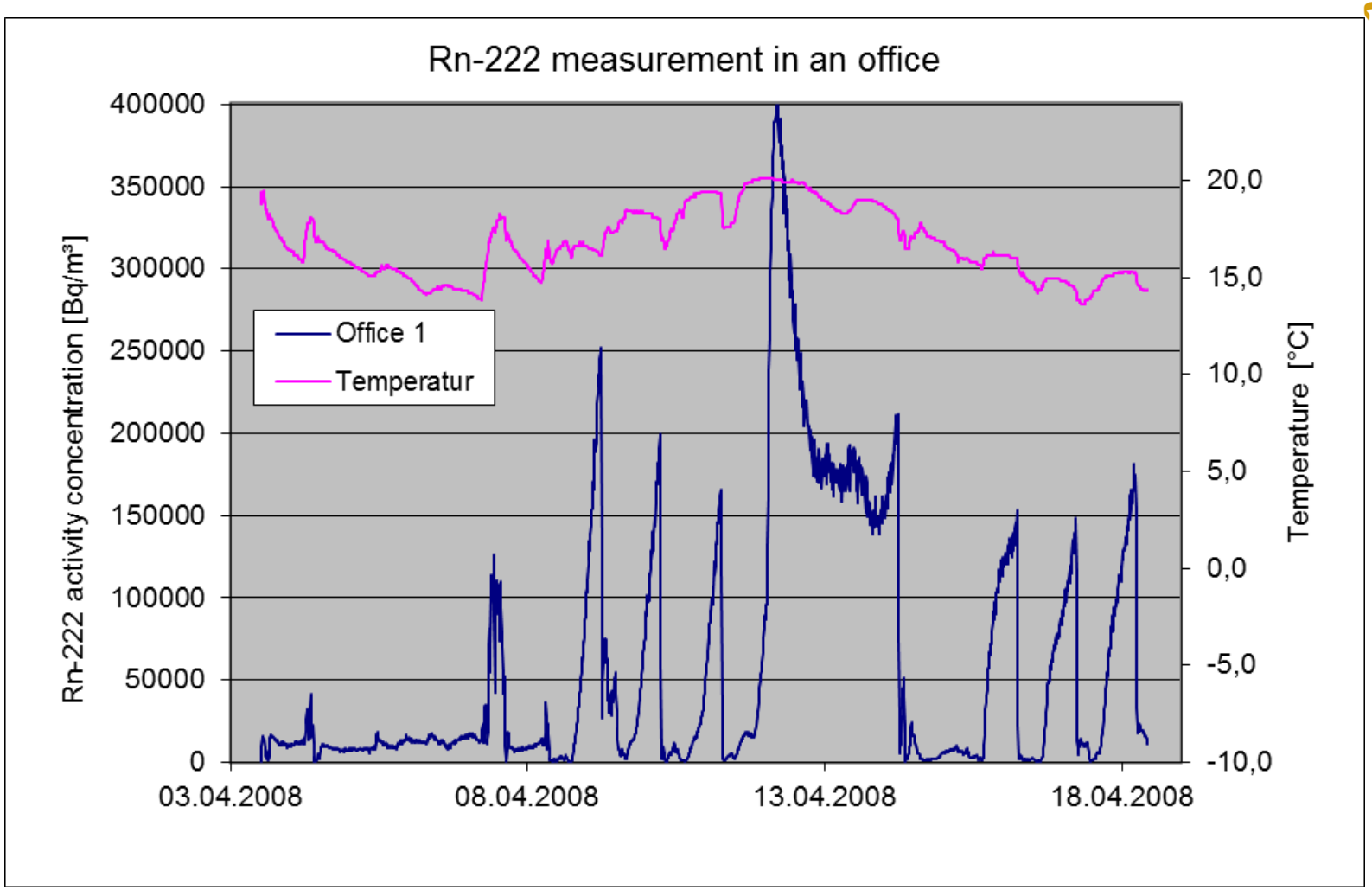
Consequence

- Rough dose estimate, based on short term radon measurements.

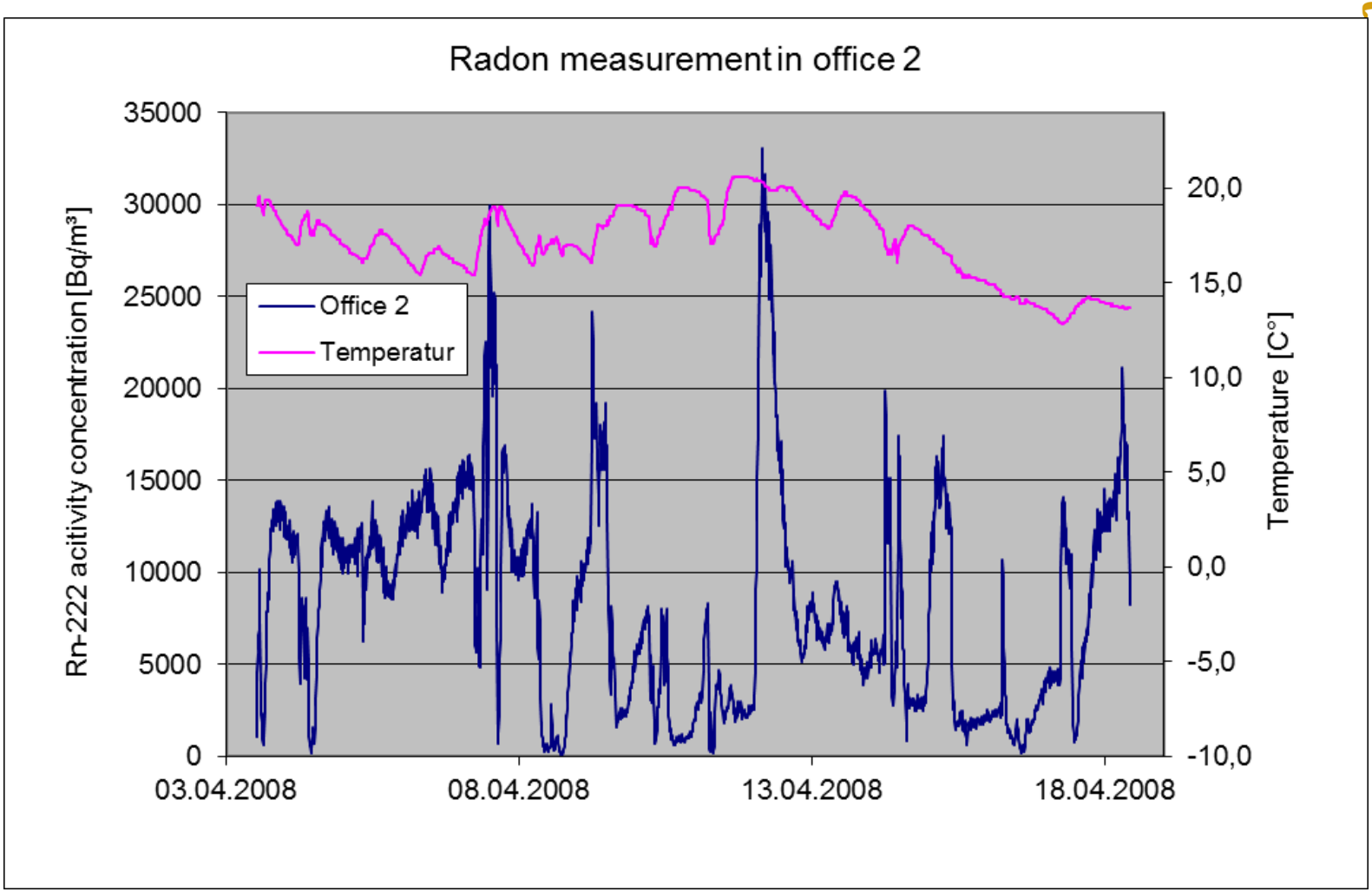
- Relocation of the offices into a container (based on Radiation Protection Law § 36, l interventions).

- Long term radon measurements with Alphaguards as a basis for detailed dose estimation.
  - Two employees received doses between 6 and 20 mSv/a (category A)

Radon results in detail



Radon results in detail

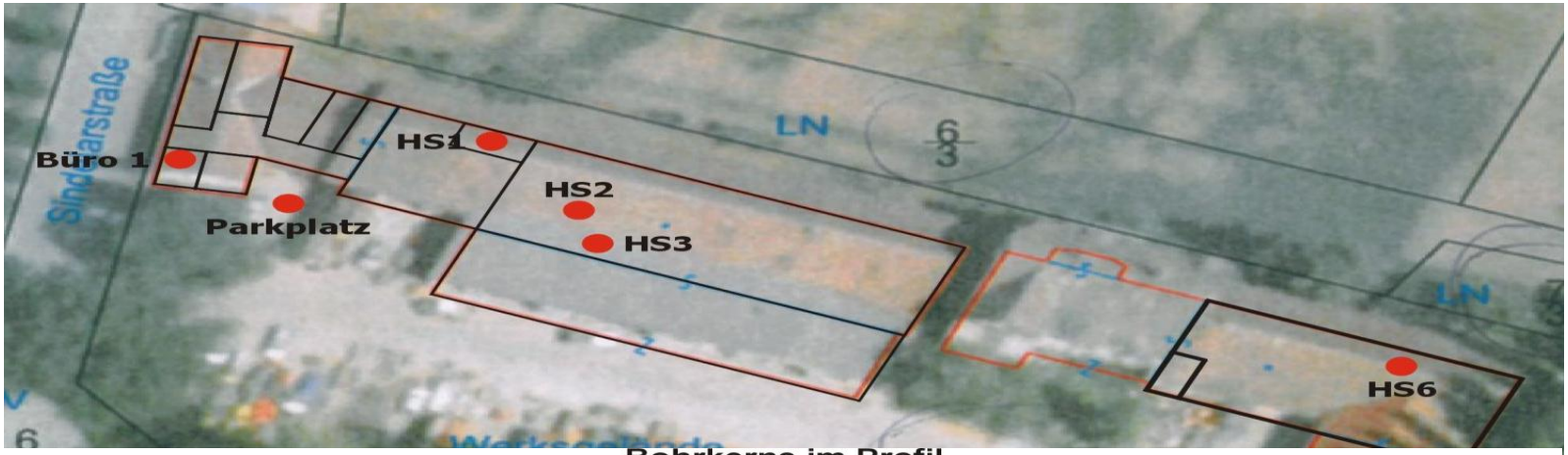


Objectives in 2008:

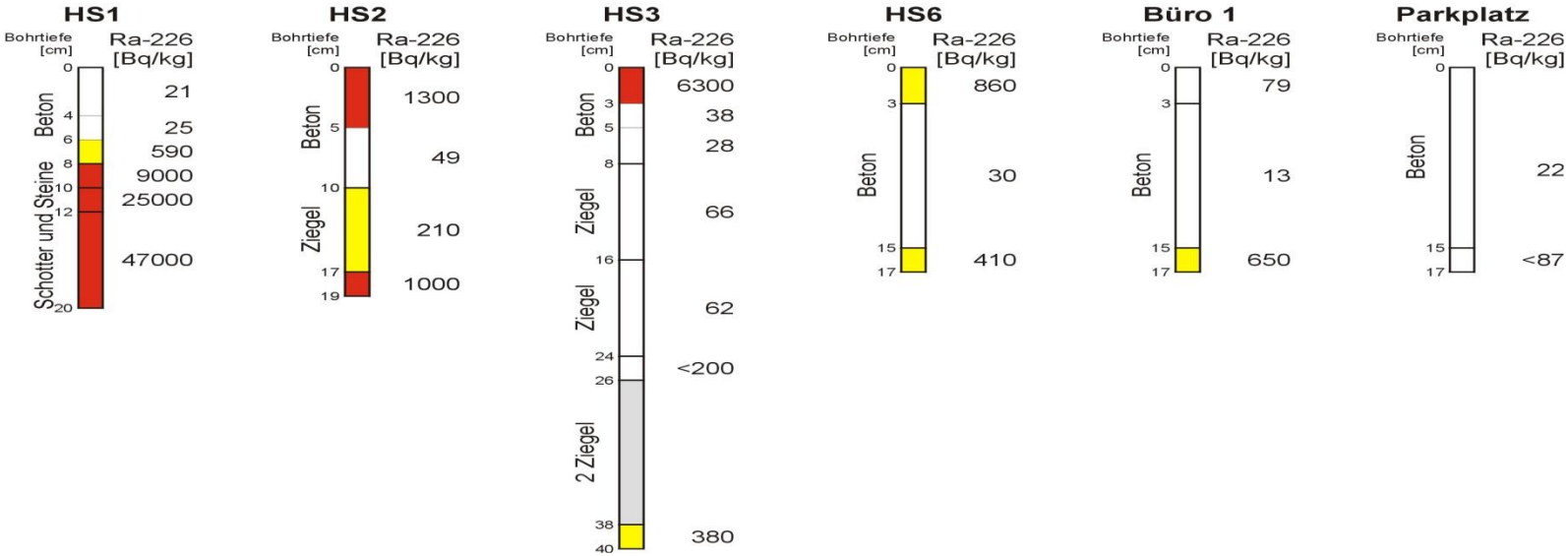
- Establishment of a plan for demolition of the non contaminated parts and for the contaminated parts of the building.
- On-site measurements during the demolition of the buildings and surveillance of the worker (Aerosol – measurements, personal dosimetry based on Radiation Protection Ordinance § 24).
- Near surface drilling into the building basement to characterise the contaminated spots.
- Remdiation of the contamintated spots.
- Stop of remediation during the winter 08/09

Demolition work

Remediation of Hot Spots



Bohrkerne im Profil
Ra-226 Messwerte [Bq/kg]



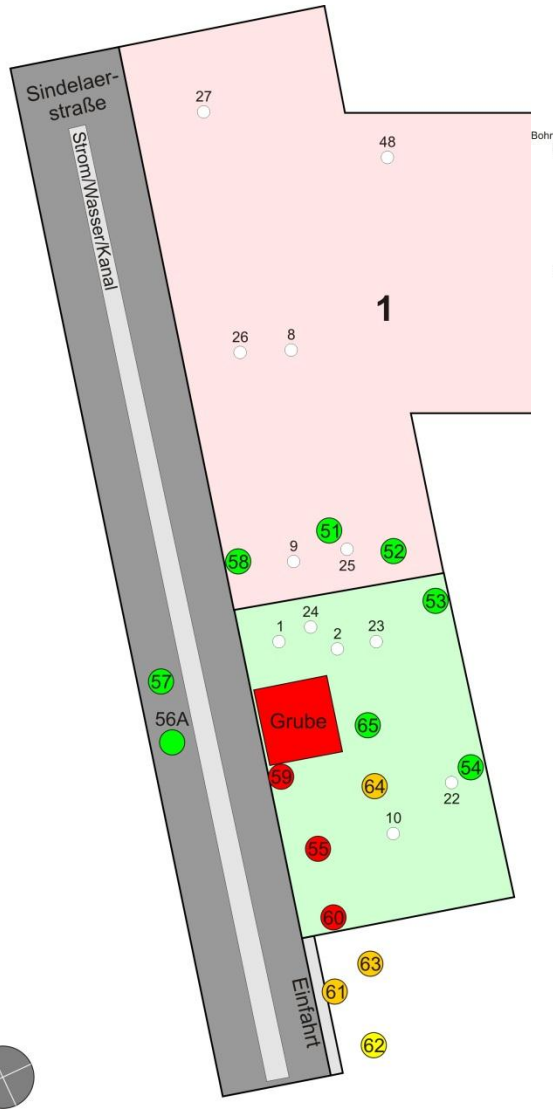
Remediation of Hot Spots

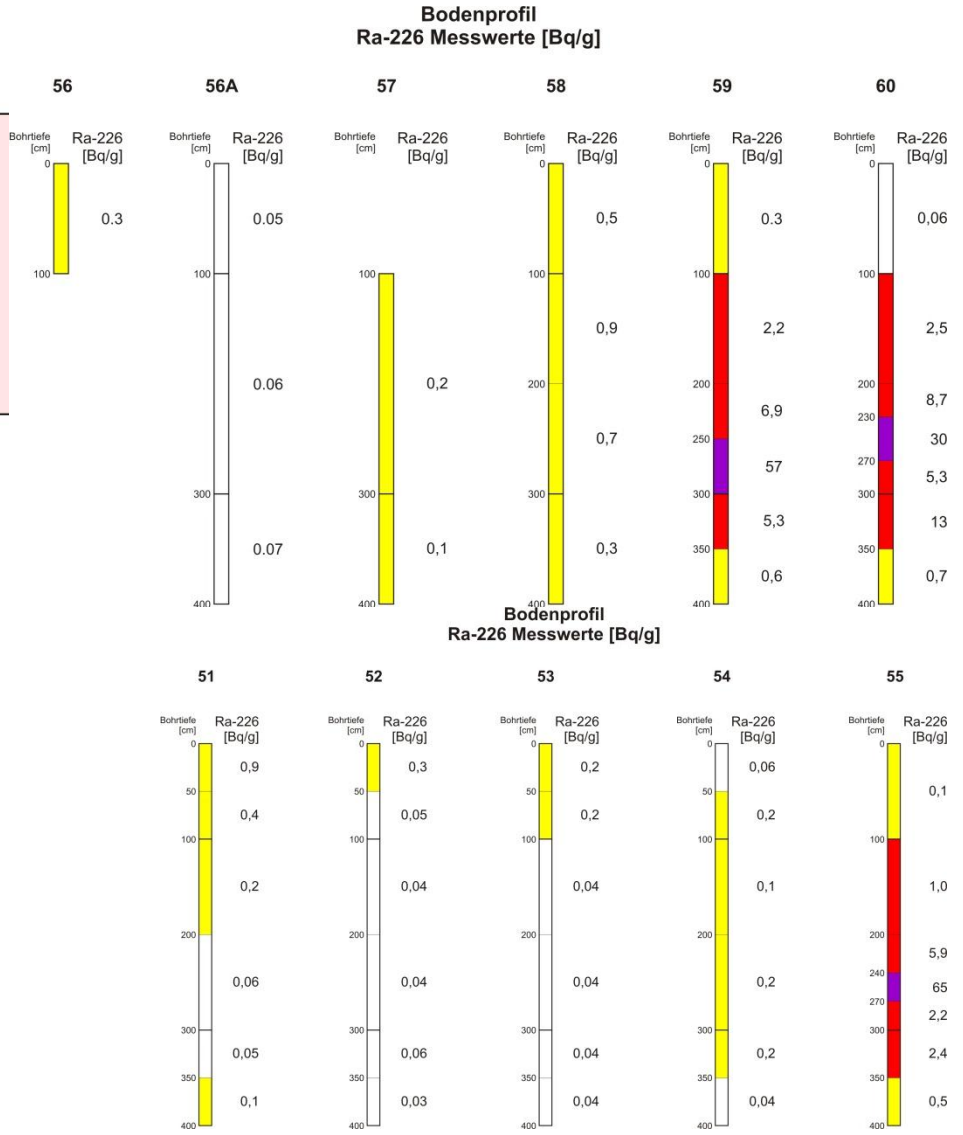
Objectives 2009

- Core drilling to identifying subsurface contaminations particulary around the office buildings.
- Characterization of the contaminated building materials and soil.
- Definition of clearance levels for radioactive waste, restricted release to dumping sites and onsite earth. (based on Radiation Protection Law § 36 b and c - for radioacitve waste, § 36 h – for the release of residues from surveillance)
- On site measurments during remediation work, by HPGe InSitu measurements of contaminated soil filled barrels.

Core drilling (1)

Core drilling (2)





Further objectives 2009

- Estimation of the expected amount of radioactive waste.
- Ongoing adaptation of the remediation plan.
- Further Surveillance of the remediation work and onsite decisions during remediation work.
- Simulation of possible disposal of slight contaminated soil (RESRAD) on dumping sites.
- Simulation of deep ground contamination through seepage water and groundwater
- Final inspection of the remediated site
- On going environmental monitoring till 2013

Regulatory framework I

- Initative based on Radiation Protection Law § 26 – orphan radioactive sources and unowned radioactive contaminated sites.
- Remediation of the small Hot-Spot as radioactive waste based on Radiation Protection Law § 36 b and c.
- Displacement of the municipal workers into containers based on Radiation Protection Law § 36 l – scope for the execution of interventions; Ordinance for intervention.

Regulatory framework II

- Surveillance of the worker and the site based on Radiation Protection Ordinance § 24.

- Radioactive waste based on Radiation Protection Law § 36 b and c.

- Slightly contaminated materials on dumping sites based on Radiation Protection Law § 36 h and NORM – Ordinance.

Let's have a look

Surprise – something new

Contaminated zone

Small pit – big pit

Final pit

Secondary school in 2010

Mass balance

- Around 2000 tons of slightly contaminated soil were unrecoverably disposed on a special dumping site (also because of inactive toxic contaminants, ~7 Bq/g Ra-226++).
- 200 barrels of radioactive waste (~ 8 to 500 Bq/g Ra-226++).
- Onsite contamination up to around 2 Bq/g are covered by 2-4 m fresh soil (recorded in the catastral register).
- Environmental surveillance since 2010 shows no further contamination (sediments of the nearby river, well-water analysis)

Unexpected moments

- Discovering of unkown parts of former building.
- Foundation stone ceremony in spring 2009.
- International sport event in summer 2009 next to the contaminated zone.
- The nearly-inudation ot the pit by the nearby river.
- The positive acceptance of the situation by the local population.
- Discovering of a human skeleton in the last 10 cm of the heavy contaminated zone in the pit.

Thank you

-

Questions?

Contact: michael.dauke@ages.at