

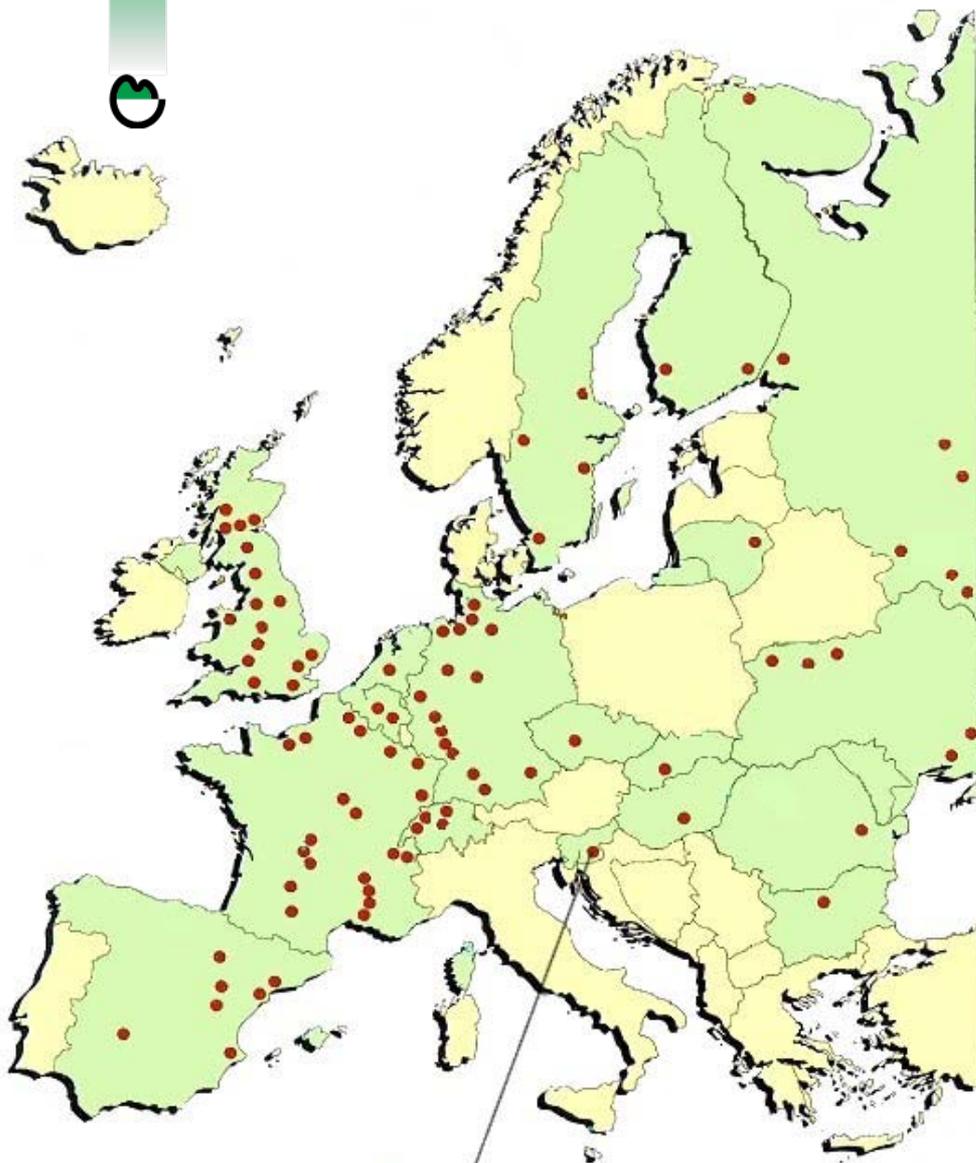


Clean-up of Fuel Trasfer Canal Sump

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Cambridge ISOE Symposium 2010



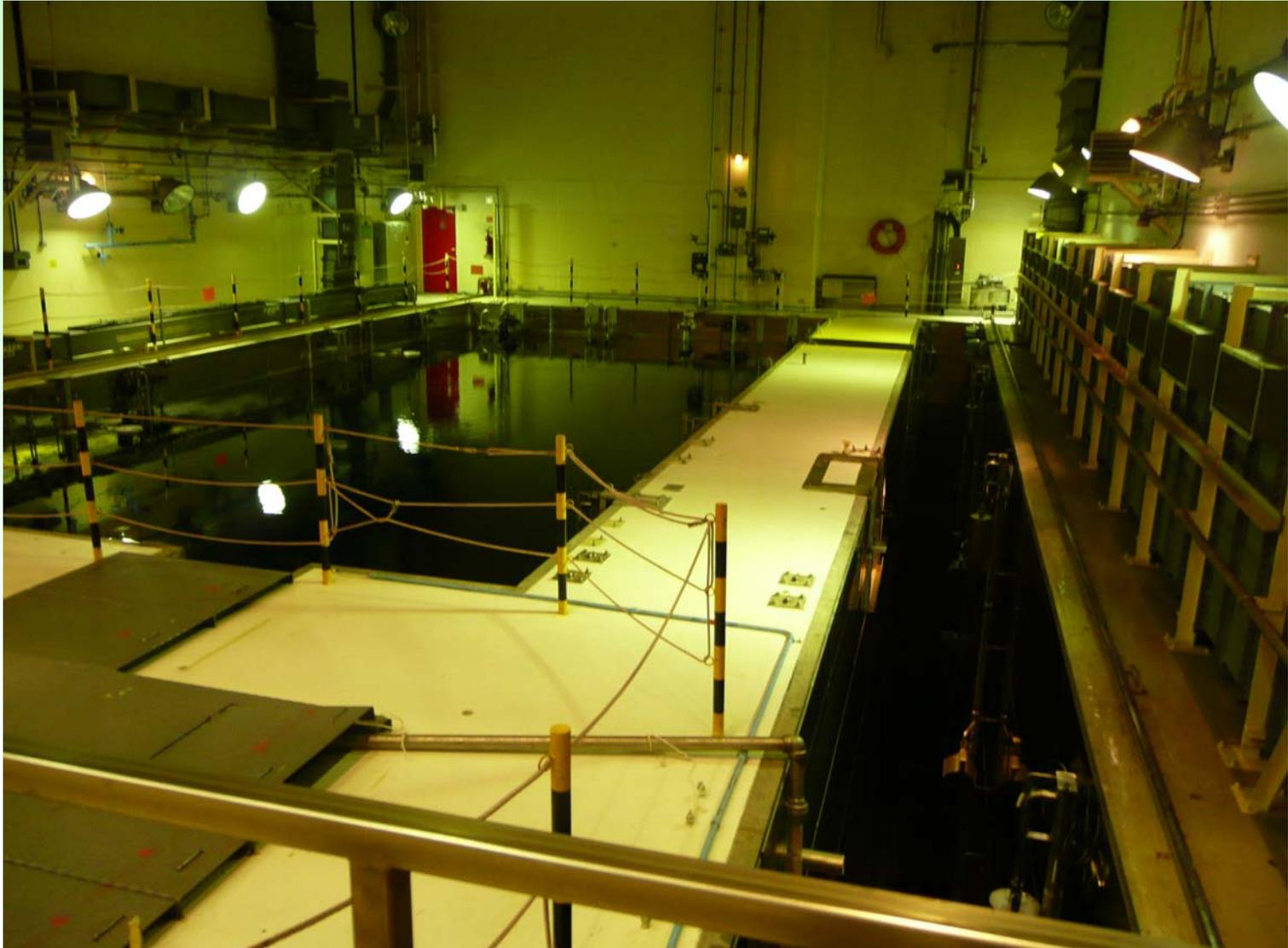
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Fuel handling building



A LEAKAGE PROBLEM



Minor continuous leakage was detected from the liner

Inspection/helium test was expected to show the critical spots in the sump.

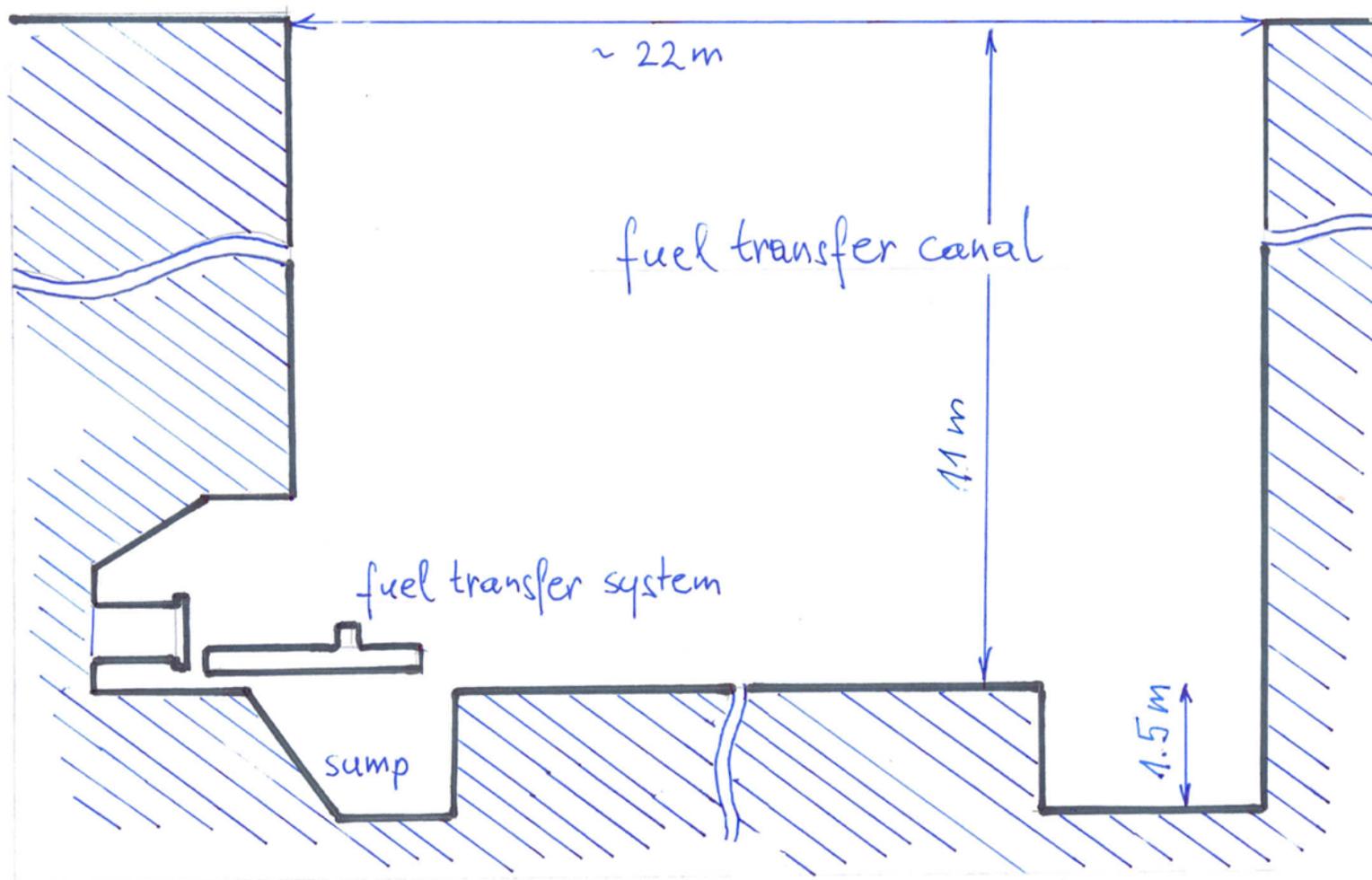


Fuel transfer mechanism above the sump





Vertical Cross-section of the Fuel Transfer Canal with the Sump



RADIATION PROTECTION

- **Dose rate at some spots from 1 to 2 Gy/h**
- **Inconvenient working area**
- **RP supervision stopped all the works**
- **It was impossible to easily remove the minor amount of high risk dirt...**



CONCERNS and REQUIREMENTS

- **Uncontrolled relocation of high active particles shall be prevented**
- **This task requires a decontaminator to install and control the pump and adjust cleaning tool position.**
- **High radioactivity in the sump shall be shielded by a layer of water.**
- **Facilitate any future tasks in this area**



RP Requirement

- **Collect high active dirt in the sump with a professional cleaning device designed to enable quick filter removal and shielding**
- **Provide a high level of radiation safety**

AVAILABLE OPTIONS

- **Vacuum cleaners**
- **Electrical water pumps**
- **High flow devices**



DESIGN OF NEW CLEANING DEVICE I.

- **Only air supply for the operation**
- **Air driven double diaphragm pump for a reliable operation and smooth flow**
- **The filters positioned in front of the pump**



Plant decontamination and RP engineers designed a new pumping skid with the help of mechanical engineers of a specialized company





Cleaning device skid

- Support for temporary flexible shield around the filter assembly.
- Dimensions are 1250 x 515 x 980 mm.
- 115 kg (or 145 kg together with plastic tubes)



DESIGN OF THE CLEANING DEVICE II.

- Two filters remove contamination before water flows through the pump
- The filter unit operates in negative pressure on the pump suction side; therefore leakage from this unit is not possible
- Filter covers are sealed by pressurized seals
No manual action required to open it
- The dose rate probe between two filters



Filter housing





DESIGN OF THE CLEANING DEVICE

III.

- The first filter cartridge uses the bag with a 200 micron pores and the second with a 25 microns pore.
- The assembly maintains stable flow conditions and collect the sludge up to the maximum of a few hundreds grams.
- Flexible tubes couplings avoid collection of contamination at their joints. They use venturi effect to accelerate the flow
- The reinforced tubes serve as an extension of a suction duct and for either recirculation or water transfer to another location.



Control panel

- pressure indicators to control air pressure and to show filter saturation.





Modes of operation

- **Water recirculation through the filters**
- **Water transfer by pumping through the filters or by-passing the filters**
- **Internal water recirculation to clean assembly components.**



Test operation

- The plastic tube at the distance.
- Two types of suction nozzles
- Extendable telescopic stick (2.5 m)





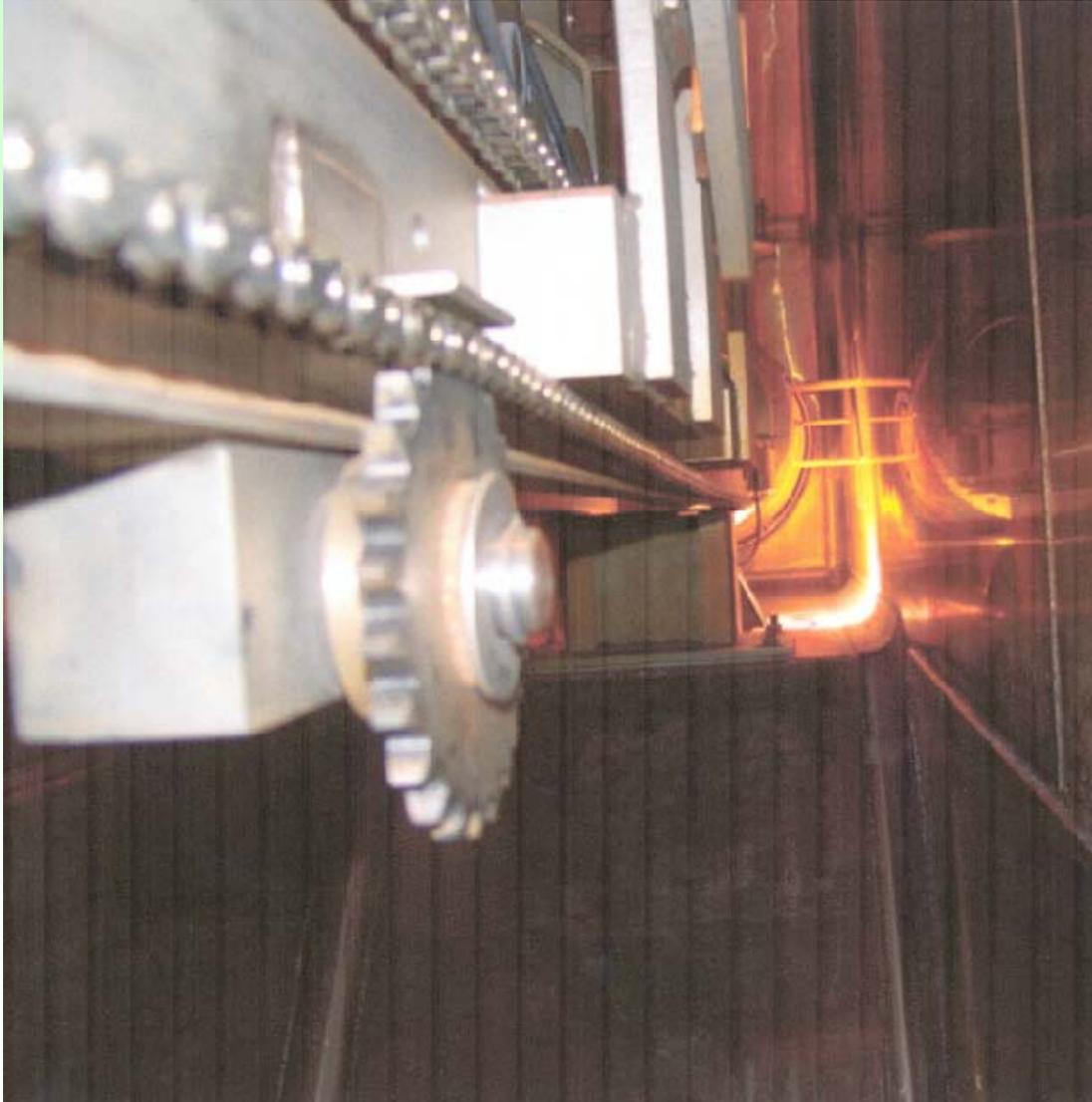
Removing of the filter





ALARA advantages

- **Water layer in the sump**
- **Hot particle detection with submersive probe from the top**
- **The new cleaning device with shields**
- **Distance from the sump**
- **Support team on the top**
- **Preparation time**
- **Positive pressure face masks**



The sump



ALARA disadvantages

- **Narrow canal (1.2 m) and the sump (2 m)**
- **Access to the sump**
- **Full face mask and protection against contamination**
- **Limited amount of shielding**
- **Vertical transportation of the crew and the materials**



Industrial safety

- **Heat stress (cooling vest + Gore-Tex PC)**
- **Oxygen measurement**
- **Approved lifting device for workers**
- **Emergency manual lifting option**

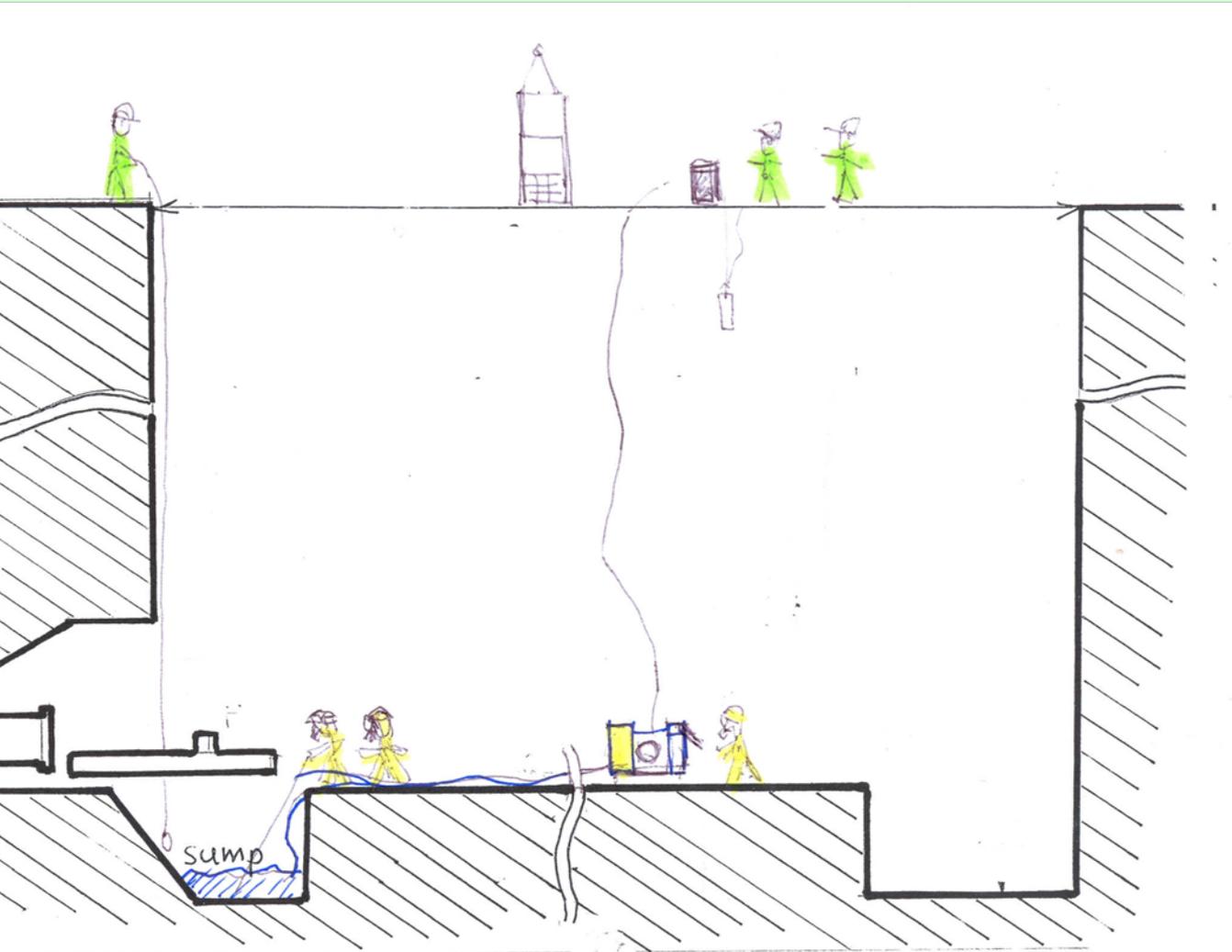


The team

- **The crew on the top of the canal: was monitoring the dose rate in the sump to locate high radioactive spot; and dose rate at the filters; its duty was also to arrange vertical transports and air monitoring**
- **The crew in the canal: two decontaminators and one RP technician**
- **The RP technician in the canal had control over in-situ dose rates. He was using a telescopic detector.**
- **The both groups had an audio link.**



ALARA work - I.



ALARA PLAN

Collective dose

6 man-mSv

Final result:

3 man-mSv



ALARA work - II.

- The sump work was performed in two days in about 5 hours
- The first-line decontaminator's ED maximum dose rate 36 mSv/h; received dose 1,2 mSv
- The RP technician's maximum dose rate 14 mSv/h; received dose 0,45 mSv



The sump after the cleaning



Background

from 2 to 3 mSv/h.

smear contamination

**5 up to 500 kBq/100 cm²
beta**

**20 to 1500 Bq/100 cm²
alpha.**



Gamma spectrometry

(Co-60 4.7 E10 Bq)

