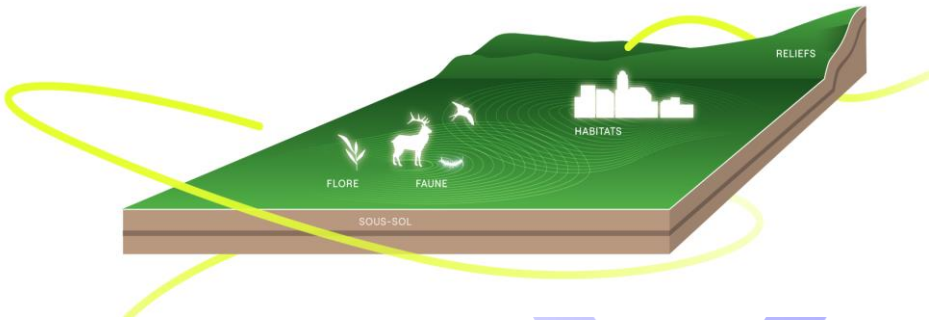
FCC: Environmental studies state of progress



FCC meeting.

San Francisco. 10-14 June 2024

D. Stagnara, R. Bonnet, M. Giuliani, A. Paillex, E. Zimmerman, A. Garand,
P. Laidouni, A. Mayoux, B. Arias Alonso, J. Gutleber

Objectives

In the context of the feasibility study, the objectives are:

- Establish a state of the current environmental conditions at the surface site locations
- Carry out the environmental impact studies for the geotechnical and geophysical investigations (i.e. boreholes and seismic lines)

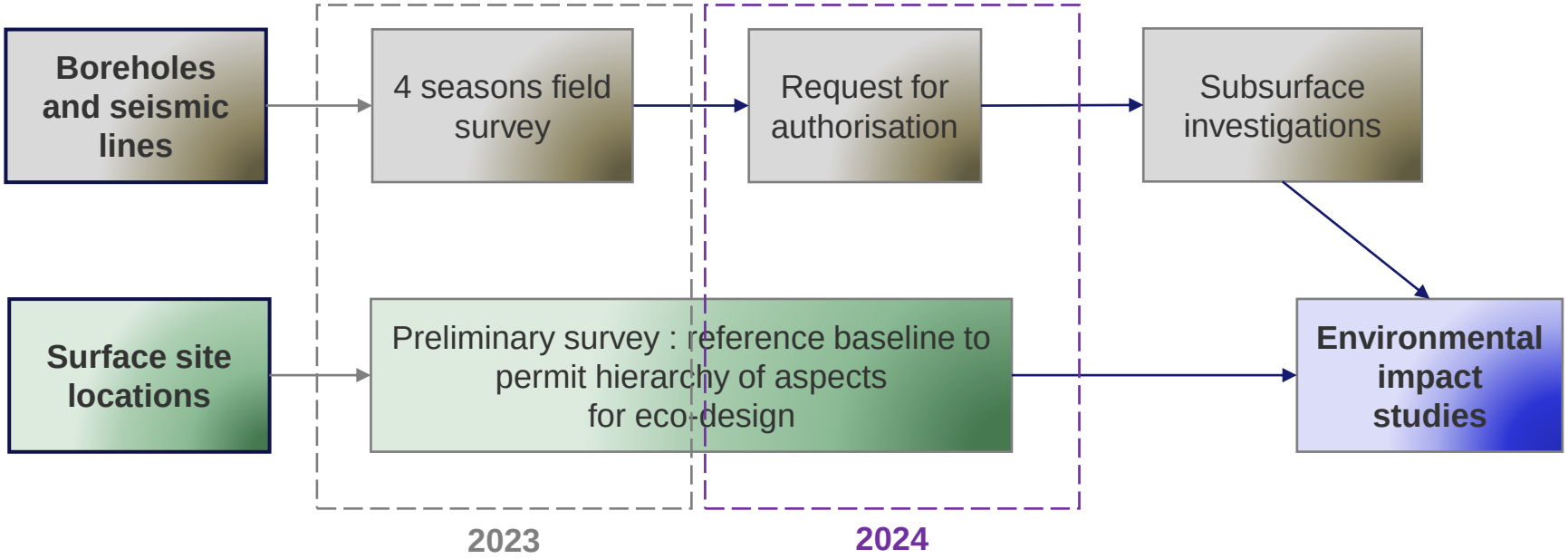
Example of a surface site in Versonnex (LHC point 6, France)

Two ultimate goals:

Regulatory objective: obtain authorisation to carry out the subsurface site investigations

Environmental objective: identify the existing environmental constraints to verify the in-principle feasibility and to provide the basis for the ecodesign approach of the infrastructures and sites

Processes


Boreholes and seismic lines
4 seasons field survey
Request for authorisation
Subsurface investigations
Surface site locations
Preliminary survey : reference baseline to permit hierarchy of aspects for eco-design
Environmental impact studies
2023
2024

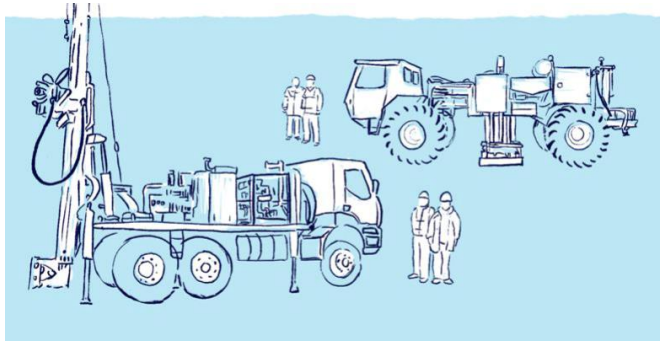
Subsurface investigations

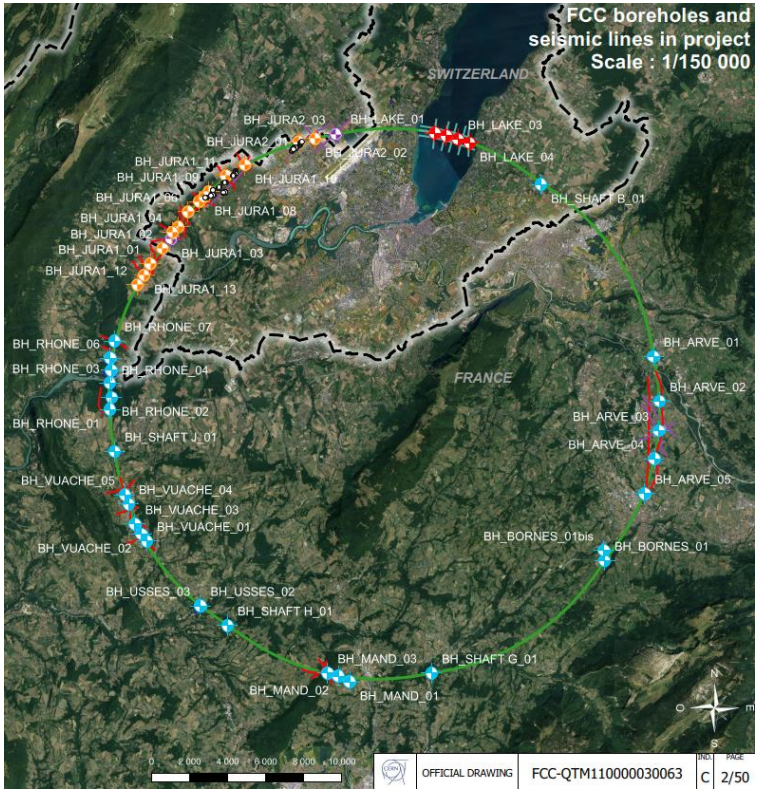
WHERE: In 9 areas with a lack of detailed geological knowledge

WHY: To determine the position of:

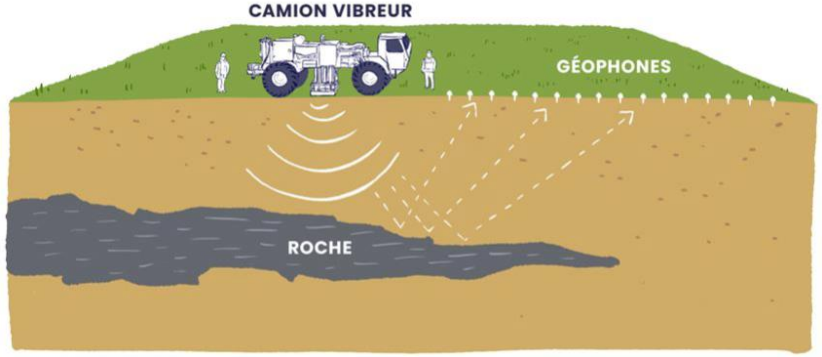
- the base surface of Quaternary deposits in depression zone
- the roof of Cretaceous karstified limestones

to get a better understanding of the technical risks and costs of the civil engineering works and to determine the optimal depth of the tunnel





Subsurface investigations

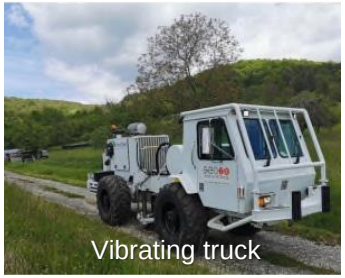


GEOPHYSICAL INVESTIGATIONS

- 53 seismic lines (31 in France, 18 in Switzerland (including 8 on Lake Geneva) and 4 overlapping both countries)
- With a length between 200 m and over 4 000 m
- Using of different techniques depending on site constraints and geological context:
  - Seismic reflection:

    High resolution using a vibrating truck
    Very high resolution using a wheelbarrow
    (off-shore for the Lake Geneva)
  - Seismic refraction

    Falling weights or explosives depending on the sensitivity of the sectors


Vibrating truck


Wheelbarrow

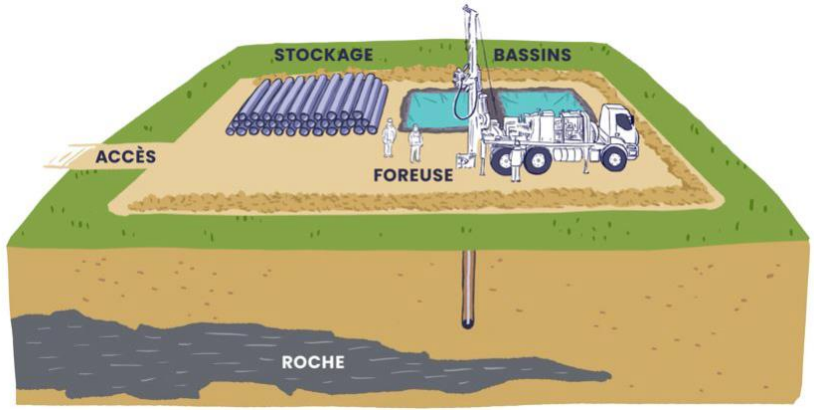

Falling weight

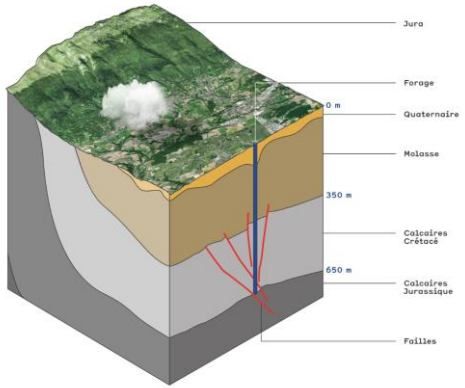

Explosive

Subsurface investigations

GEOTECHNICAL INVESTIGATIONS

- 46 boreholes (31 in France and 15 in Switzerland including 4 on Lake Geneva)
- With a depth between 100 m and over 400 m





Progress of authorization and permitting

INITIAL STATE ASSESSMENT PERFORMED

for each of the 53 lines and 46 borehole's sites, based on:

- bibliographic data collection
- fields survey

  Fauna and flora : 4-season investigations
  (149 flora species and 357 fauna species observed in total)
  Wetland investigations

Progress of authorization and permitting

CONFIRMED HIGH ENVIRONMENTAL STAKES

in some subsurface investigation areas and in particular :

- Marais de l'Etournel (Rhone sector): protected natural area with hydrological constraints
- Lake Geneva: some areas protected because of biodiversity and prehistorical heritage


Skylark


Prehistoric site


Yellow-bellied Toad


Beaver

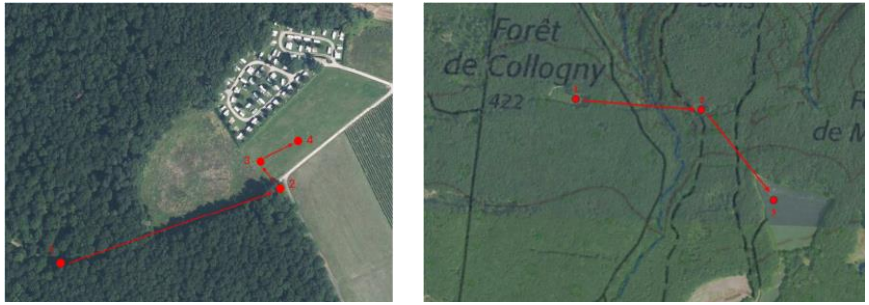
Progress of authorization and permitting

DESIGN OF DEDICATED ENVIRONMENTAL PROTECTING MEASURES

IMPLEMENTATION OF MEASURES

to **avoid** environmental impacts due to subsurface investigations:

- Optimisation of location of the works
- Optimisation of the techniques for the works (falling weights instead of explosives)



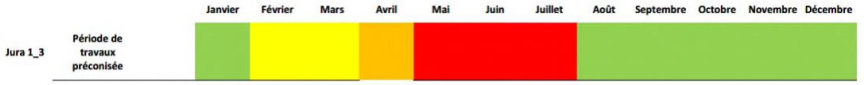
Alternatives for borehole's location

Progress of authorization and permitting procedures

IMPLEMENTATION OF MEASURES

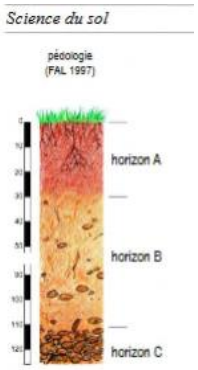
to **reduce** environmental impacts due to subsurface investigations:

- Adaptation of the operations schedule to avoid animal breeding periods
- Installation of anti-amphibian barriers and moving animals away from the site
- Laying geotextile under the platform to protect soils and avoid the mixing of different soil horizons
- Avoid direct discharge of drilling waters and installation of borehole-water treatment plants



Adaptation of the operations schedule

Anti-amphibian barriers



Water treatment

Environmental authorization processes

FRANCE

Both geophysical and geotechnical investigations considered as **one single authorisation package**

- Water law: “Dossier de declaration au titre de la loi sur l’eau”
- Natural habitats: “Evaluation des incidences Natura 2000”
- Protected species: “Dossier de demande de dérogation pour les espèces protégées”
- Subsurface: “Dossier de declaration au titre du code minier”

SWITZERLAND

Geophysical and geotechnical investigations **separately instructed** ; each **borehole requires a construction permit**

- Geotechnical investigations: “Requête en autorisation de prospection”
- Geophysical investigations: “Dossier d’autorisation de construire” for each of the 15 boreholes

→ Files currently being instructed by the relevant authorities

Permitting (rights to carry out works on plots)

FRANCE

- Geotechnical investigations: “Arrêté de pénétrer sur les parcelles privées”, obtained by CERN (T4 2023), which enables non-invasive works to be carried out
- Geophysical investigations: “Arrêté d’occupation temporaire”, obtained by CERN (T4 2023), which enables invasive work to be carried out (agreements with each landowner or user to be taken on a case-by-case approach)

SWITZERLAND

- Landowner and user's agreement required before any work

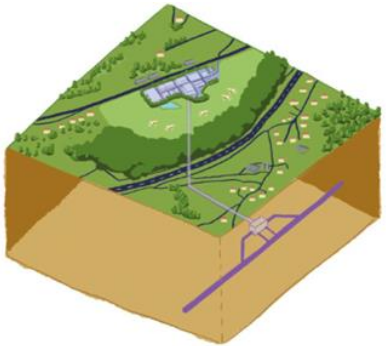
→ On-going exchanges with landowners and farmers who rent the plots (201 in France and 65 in Switzerland) and establishment of agreements including financial compensation for the nuisances with each person individually

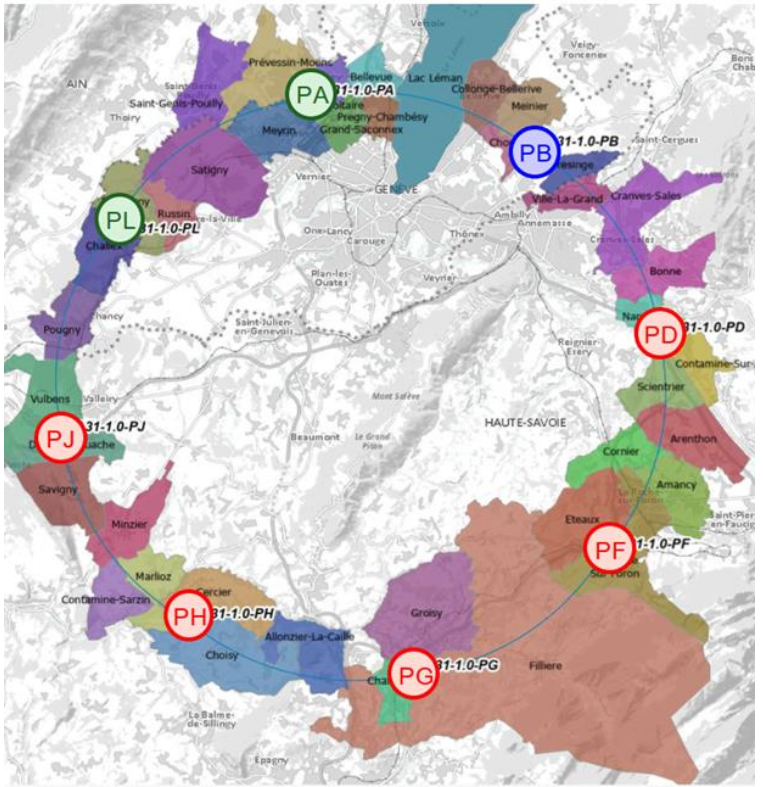
Surface sites

8 SURFACE SITES

- Evenly distributed around the tunnel
  - 1 site in Switzerland
  - 7 sites in France
- Each one with specific environmental constraints

→ A thorough report addressing all environmental themes has to be issued for all 8 sites





Analysis of all environmental thematic

- FAUNA AND FLORA
  - Collection of bibliographical data
  - 4-season field surveys concerning flora, birds, frogs, reptiles, bats, entomofauna, terrestrial mammals

→ 99 flora species and 331 fauna species observed in total (Status on 1st of June 2024) including several patrimonials species

→ Field investigations still on-going

Analysis of all environmental thematic

- SOIL AND AGRICULTURE
  - Collection of bibliographical data
  - Field visits and soil surveys
  - Laboratory soils analysis
  - Interviews with farmers

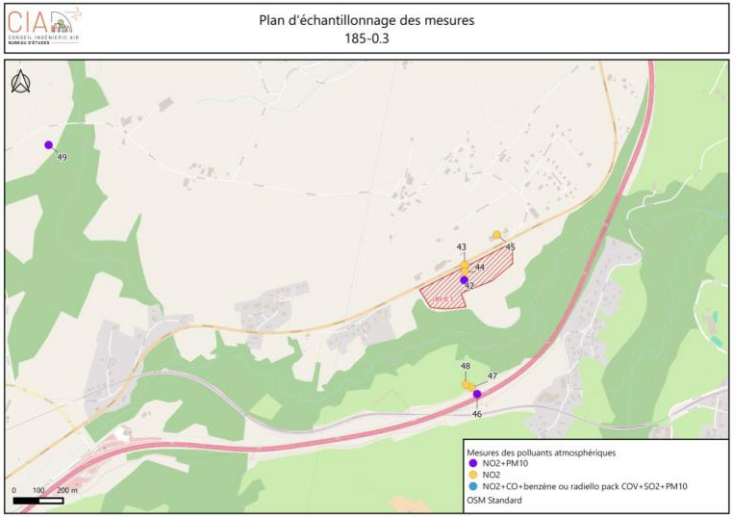
→ Agricultural land on all sites : 3 sites cultivated with annual crops and 5 sites occupied by temporary or permanent grassland

→ Laboratory soils analysis and farmer's interviews on-going

Analysis of all environmental thematic

- AIR AND CLIMAT
  - Collection of bibliographical data
  - On-site measurements over a 4-week period for different pollutants
    NO2, PM10 and closed to airport CO, benzene or COV, SO2, PM10
  - 61 measuring points

Planned in June 2024 and October 2024



Analysis of all environmental thematic

- NOISE
  - Collection of bibliographical data
  - On-site measurements over a 24h period
  - 47 measuring points

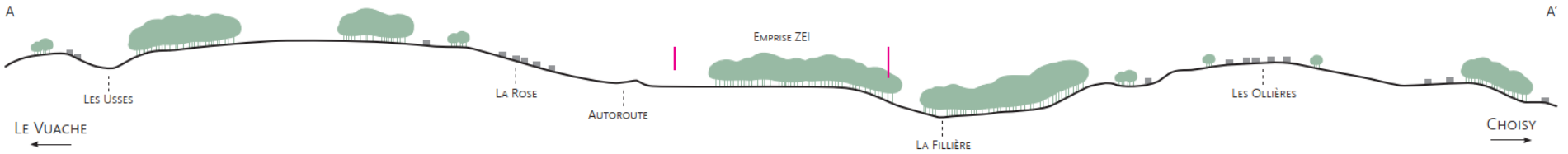
Planned in July 2024

Analysis of all environmental thematic

- LANSDCAPE
  - Field visit performed for each surface site perimeter
  - Landscape analysis of the area (5 km around the site)

→ low to medium landscape stakes: 5 sites

→ medium to high landscape stakes: 3 sites



Analysis of all environmental thematic

Also :

- WATER QUALITY
- TRAFFIC
- HUMAN ACTIVITIES
- FOREST
- LIGHT POLLUTION
- ARCHEOLOGICAL HERITAGE
- …

No project-blocking constraints identified at this stage

→ **ENVIRONMENTAL INITIAL STATE ANALYSIS (EISA) REPORT**

to be finalized by end of 2024

→ With these knowledge, next phase will be to **avoid** the impacts, or to **reduce** it, or to **compensate** it

Development of EISA report

CONTENTS

Non-technical presentation of the FCC motivation, study and a potential project

Presentation of the eco-development approach and high level strategy elements that need to be considered for further technical developments

Environmental analysis of perimeter:

- Climate, air, water, soil, geology, biodiversity, habitats, urbanism, mobility, economic activities, patrimony (cultural, architectural, archeological, natural) landscape, noise, vibration, artificial light pollution, radiation, natural risks, technical risks, potentially conflicting and synergetic projects
- Evolution of the territory without FCC


Futur Collisionneur Circulaire

Aspects environnementaux et état initial

Etat initial de l'environnement

INWORK

11 mars 2024

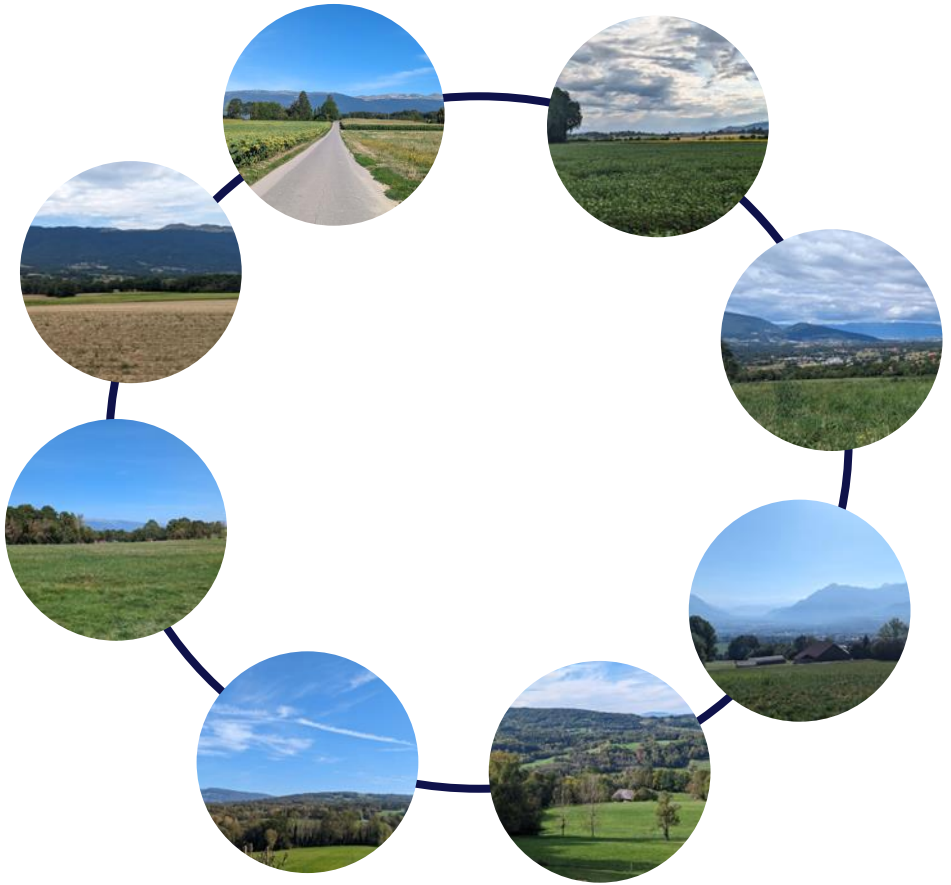
Take home message

CERN's commitment to environmental protection

→ many field investigations carried out and still on-going to gain precise knowledge of environmental constraints

→ a full report covering 15 environmental themes, to be attached to the feasibility study

→ no fewer than 17 environmental impact assessments for subsurface investigations to be submitted to French and Swiss government departments



Thanks

CERN

Co-authors

Cantonal services (Geneva, GESDEC)

Local authorities (Swiss and French)

Swiss authorities (FOEN)

French authorities (DDT/ DREAL)

Thank you for your attention