Swiss centre of competence for deep geothermal energy for power and heat production

GEO ENERGIE SUISSE

FUTURE MULTI-STAGE EGS PROJECTS IN SWITZERLAND

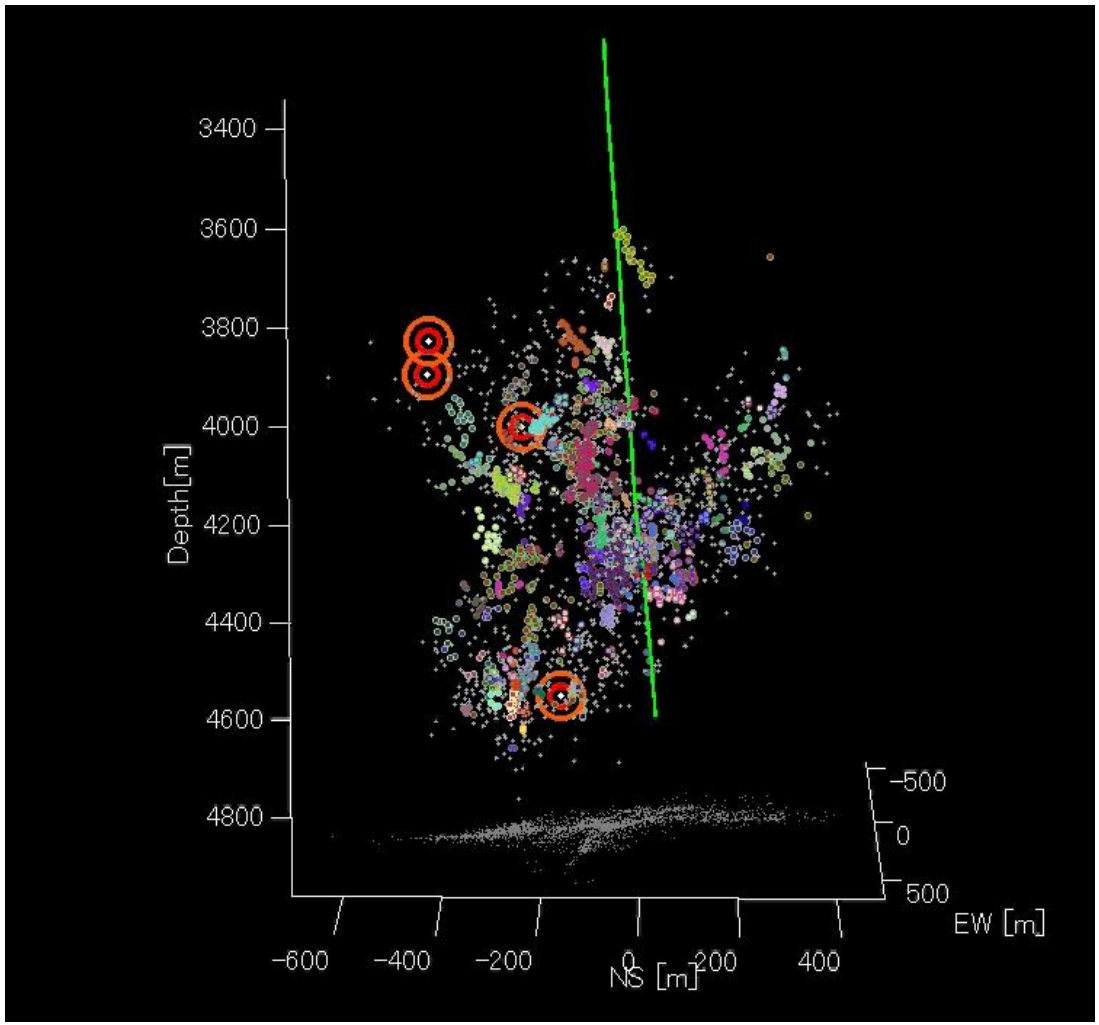
PETER MEIER, CEO

FALKO BETHMANN, DIETER OLLINGER, OLIVER ZINGG, FRÉDÉRIC GUINOT, FLORENTIN LADNER

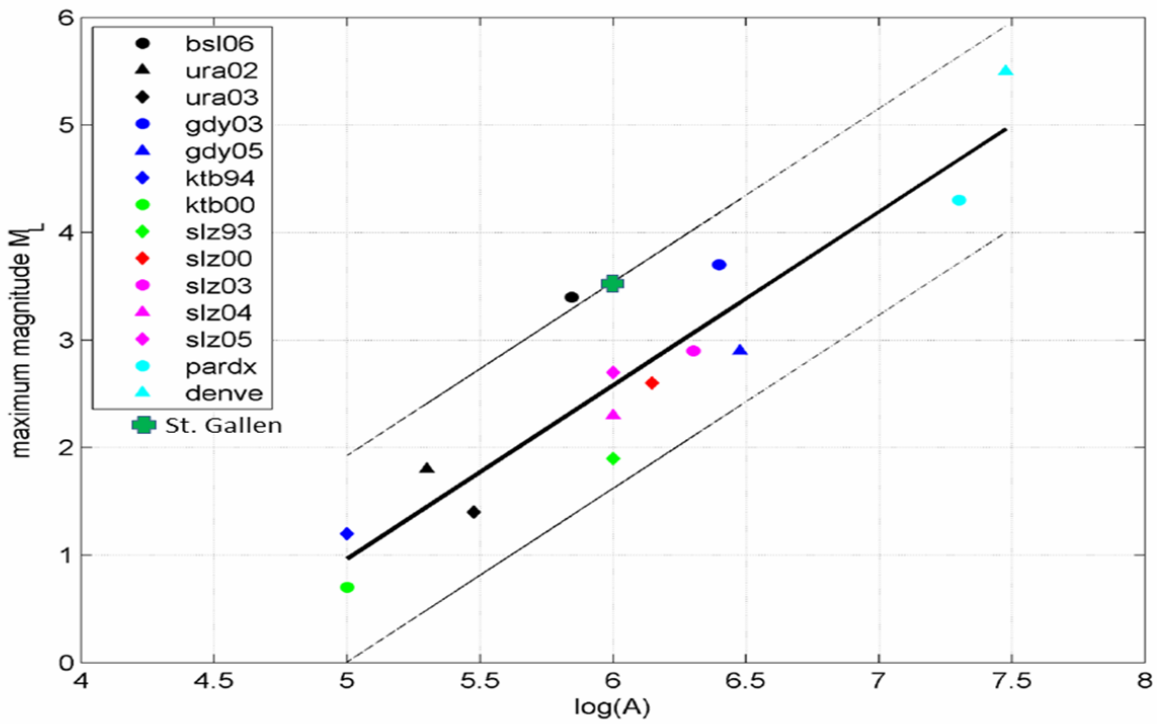
INDUCED SEISMICITY WORKSHOP, DAVOS SCHATZALP, 13.3.2015

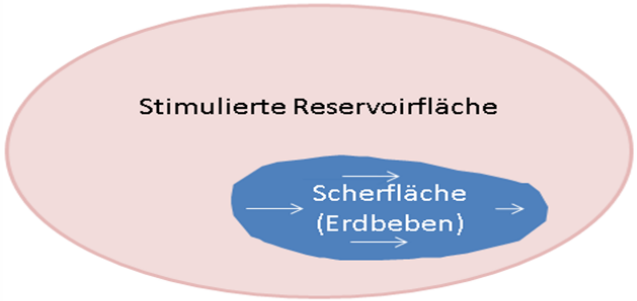
aet ebl EOS HOLDING ewb ewz Die Energie GVM Gasverbund Mittelland AG IWB

Basel reservoir:
IS too strong, Permeability too weak



Key findings seismicity (Serianex, 2009): Magnitude of induced seismicity increases with stimulated reservoir area

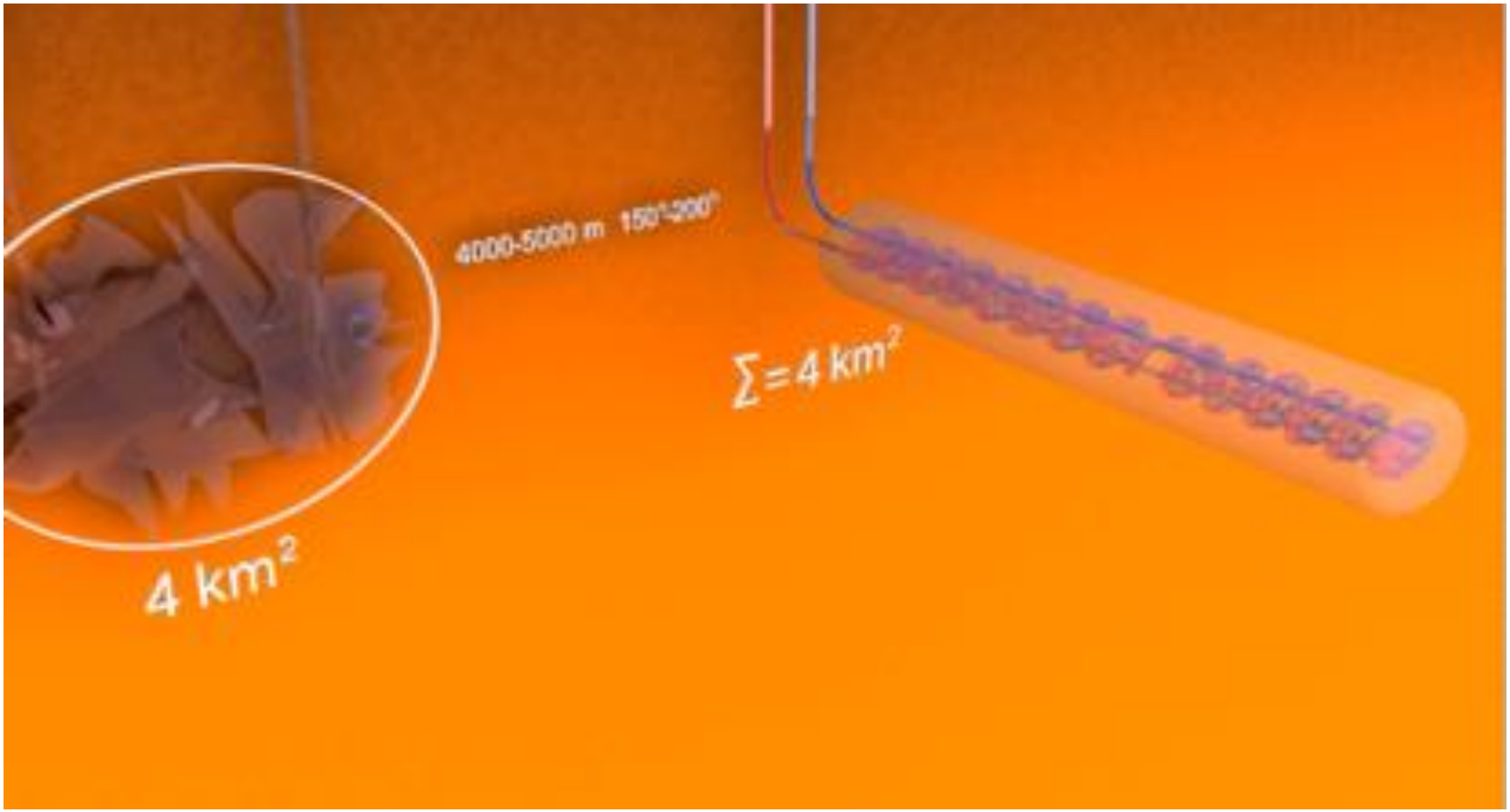


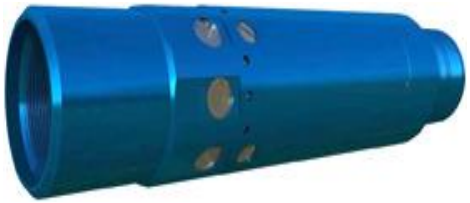


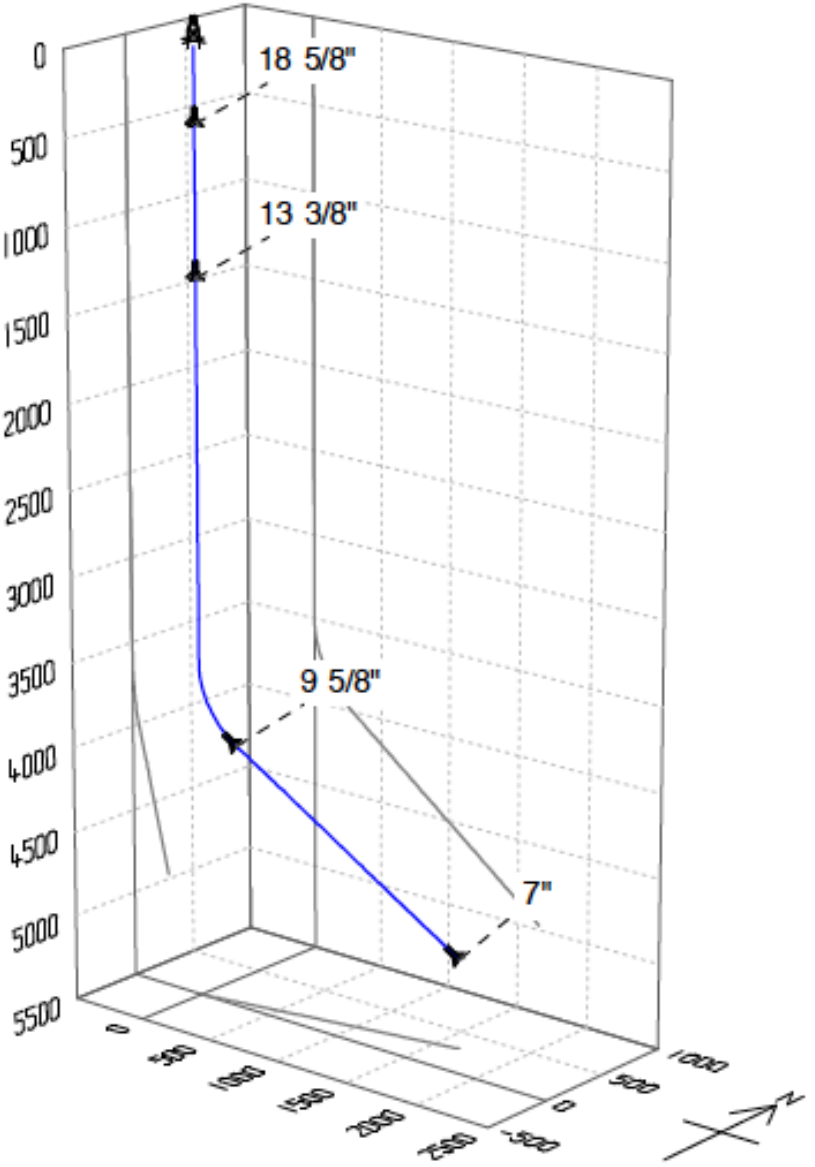
Nach St.Gallen: Stimmt unser Konzept?

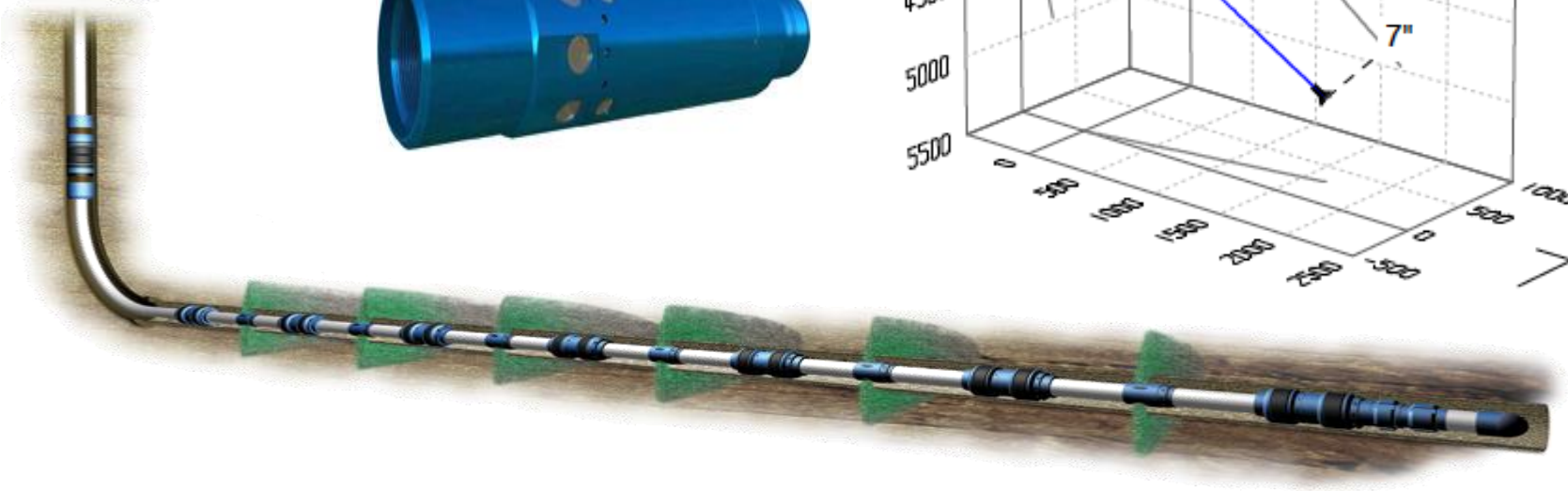
Detailed analysis of the Basel data set and numerical simulations corroborate this general relationship from many data sets worldwide. Also the project in St. Gallen follows this relationship.

Concept DHM Basel vs. „new“ horizontal multi-frac system

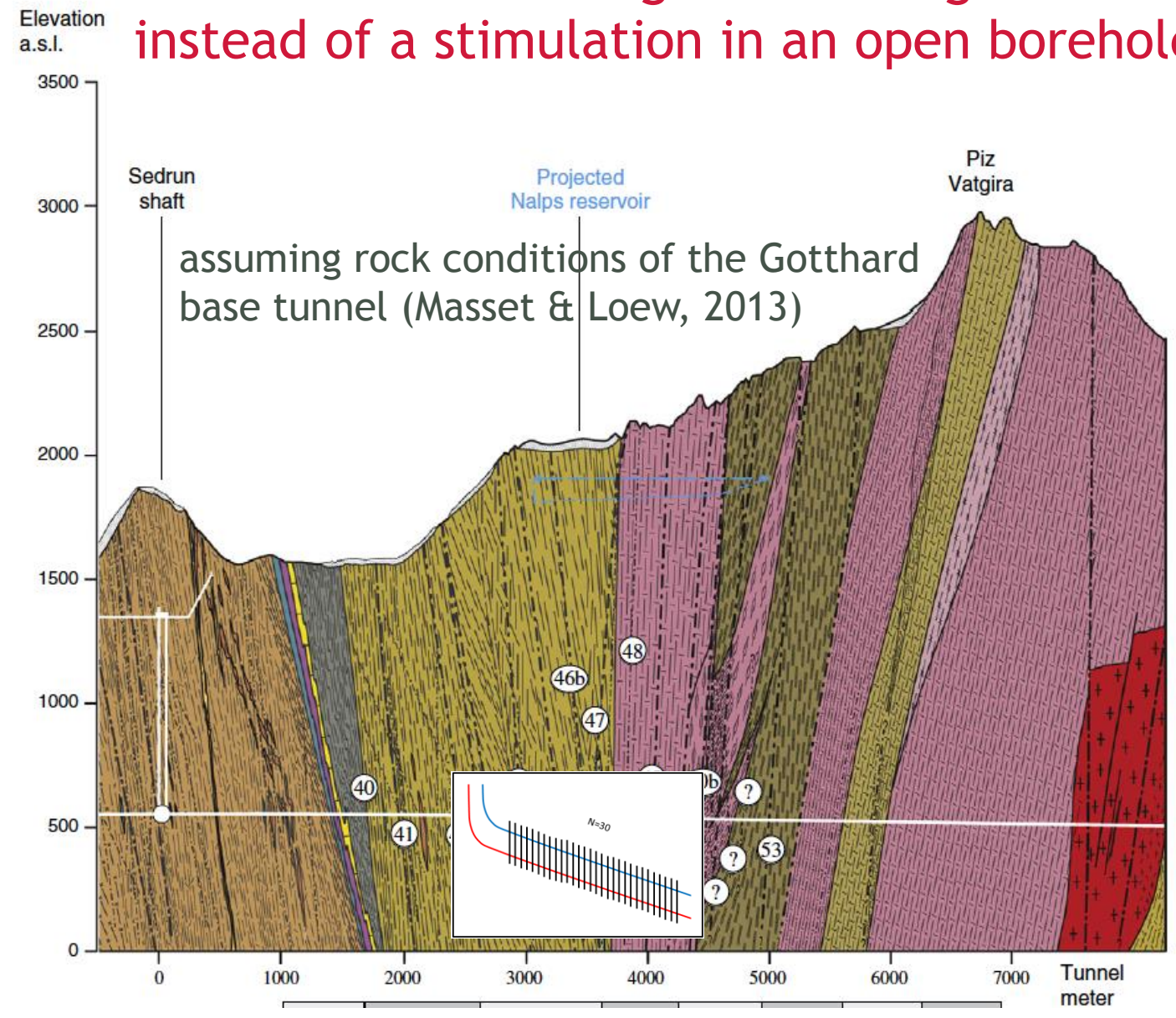


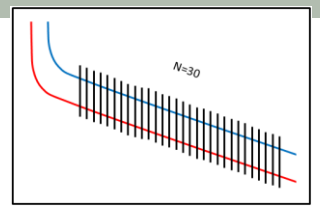


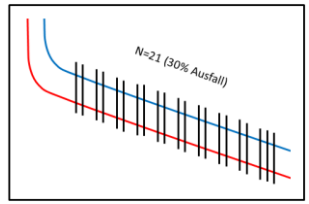

0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
18 5/8"
13 3/8"
9 5/8"
7"
N

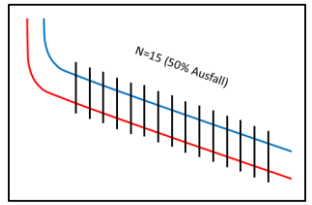


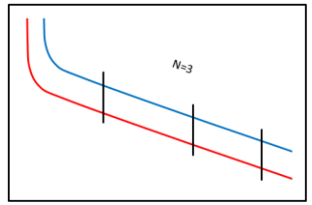
MC simulations demonstrate the improvement of circulation rates using a multi-stage stimulation system instead of a stimulation in an open borehole

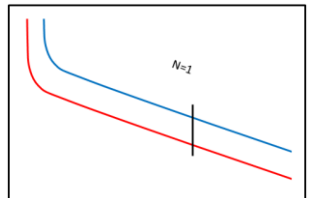




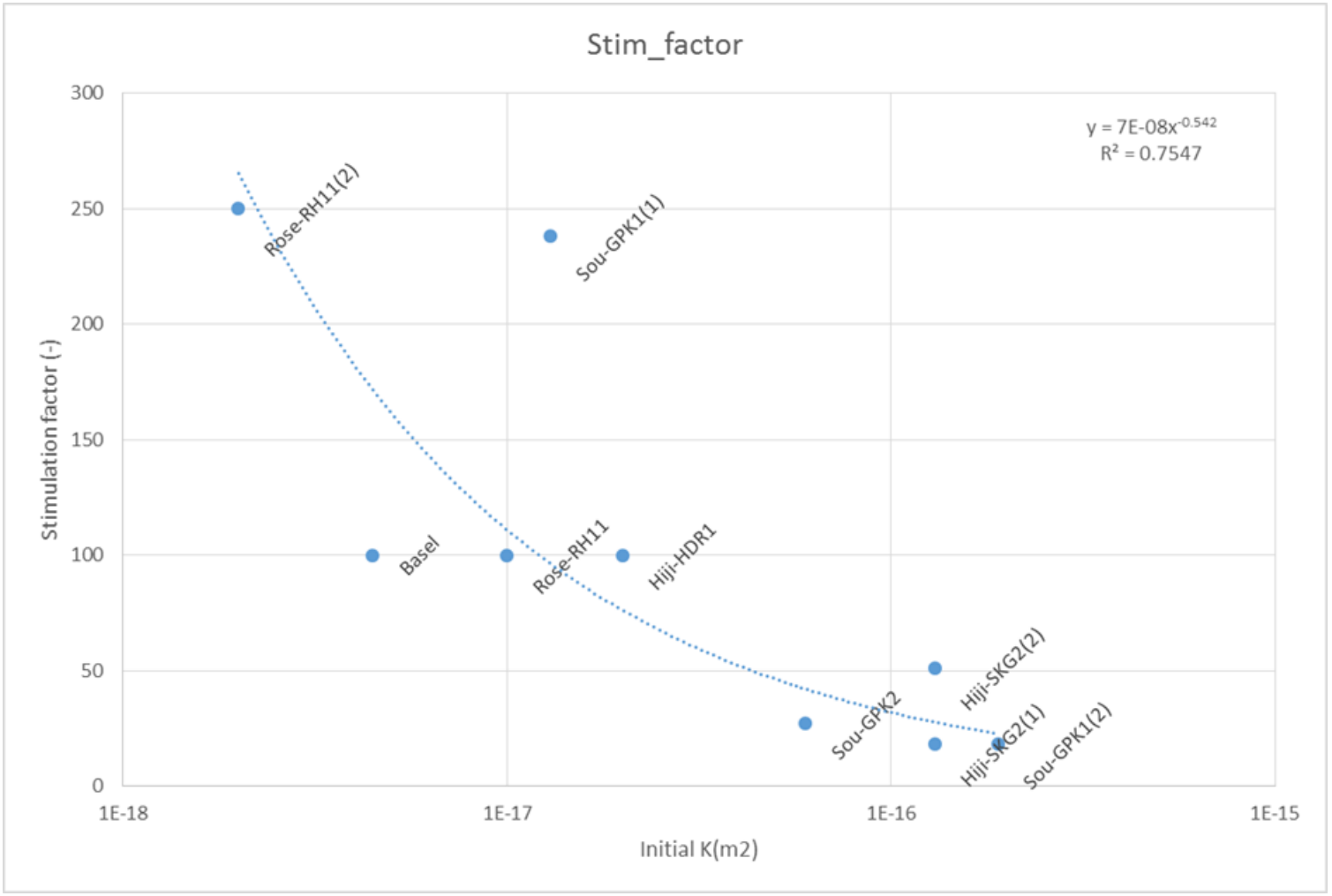




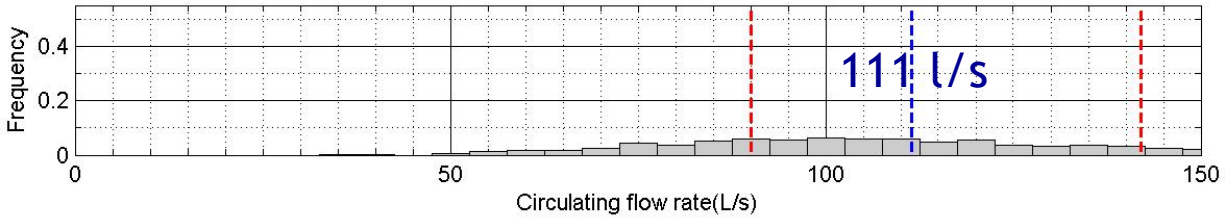


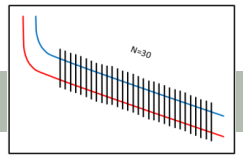


Stimulation factor (Evans, 2013)

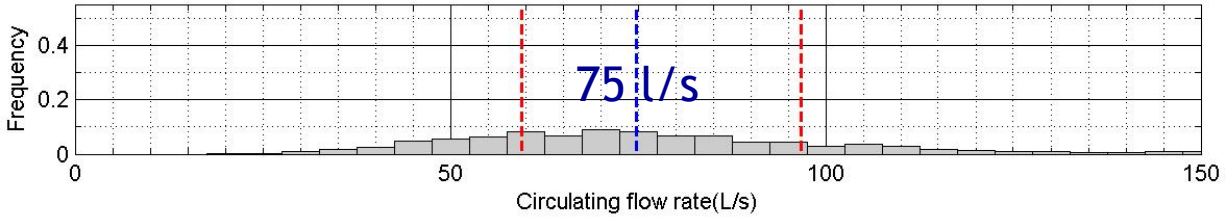


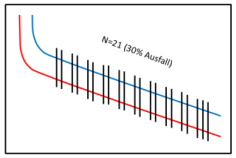
Flow rates from MC calculations for different numbers of successful stages versus open-hole stimulation



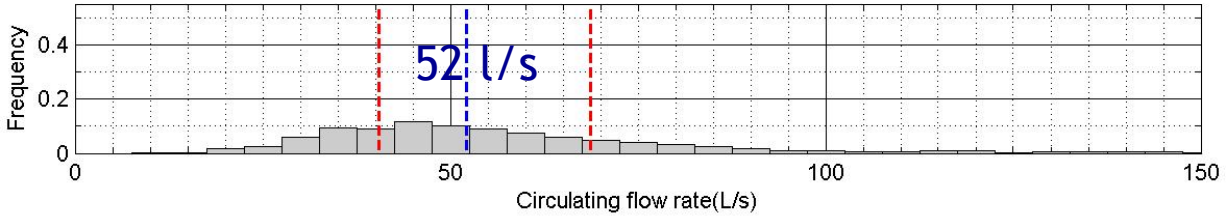


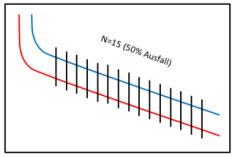
30 stages



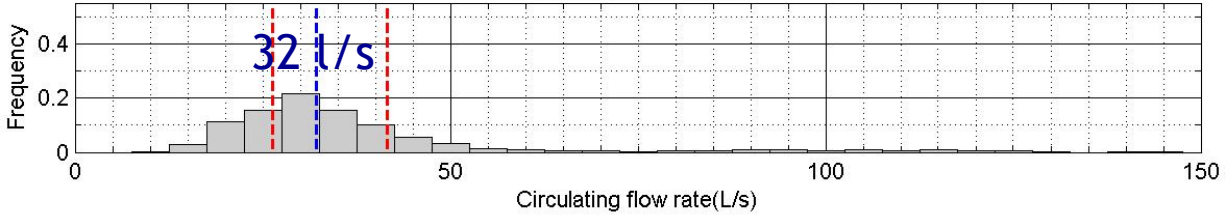


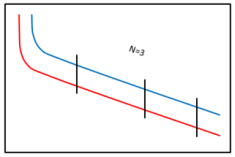
20 stages



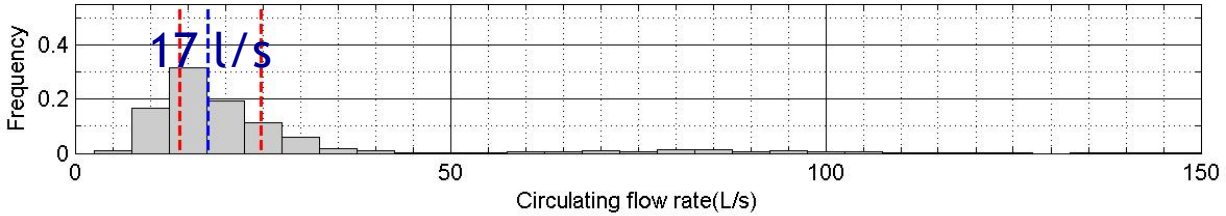


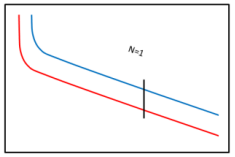
15 stages





Open-hole stimulation of 3 fractures

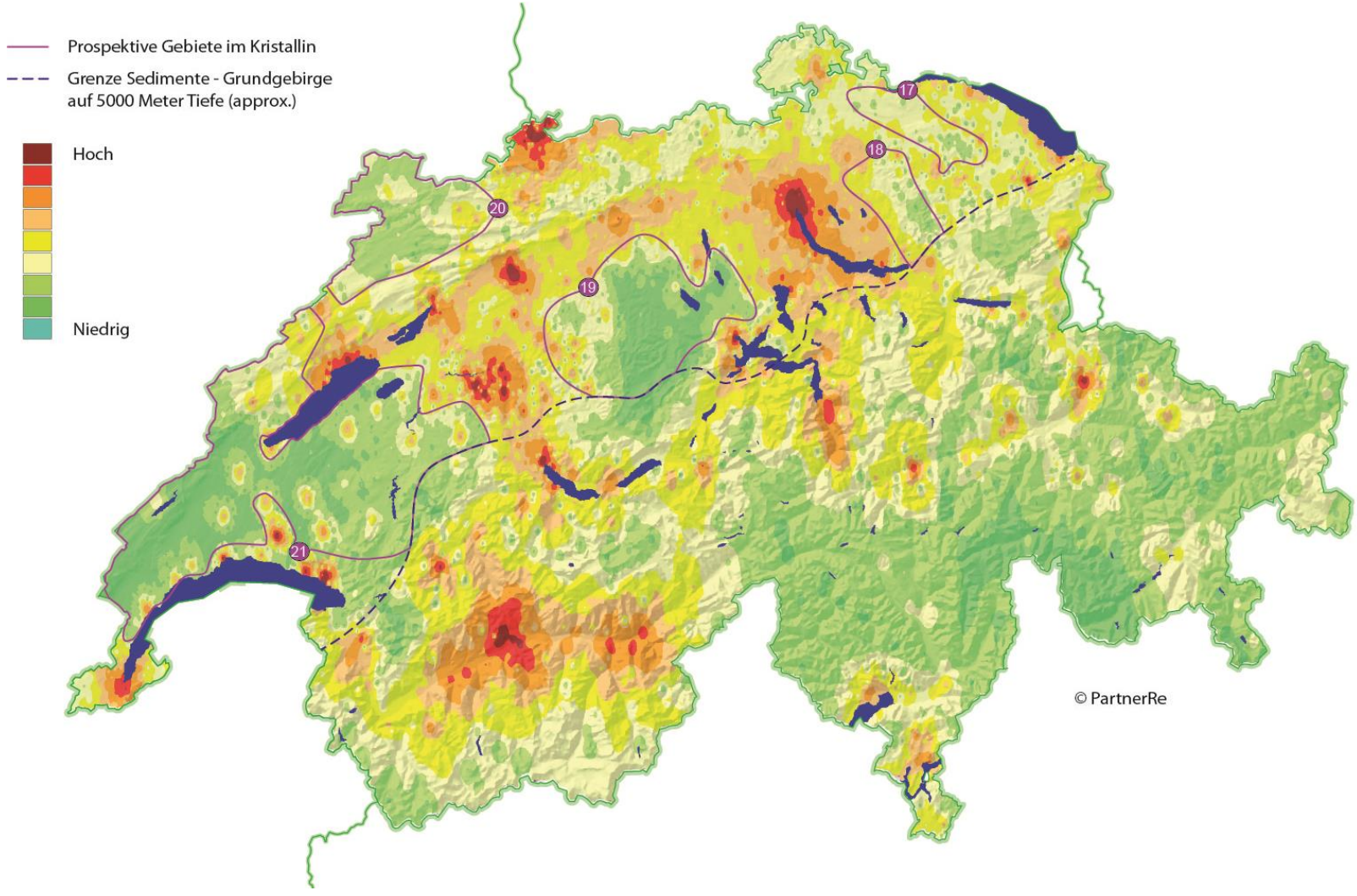




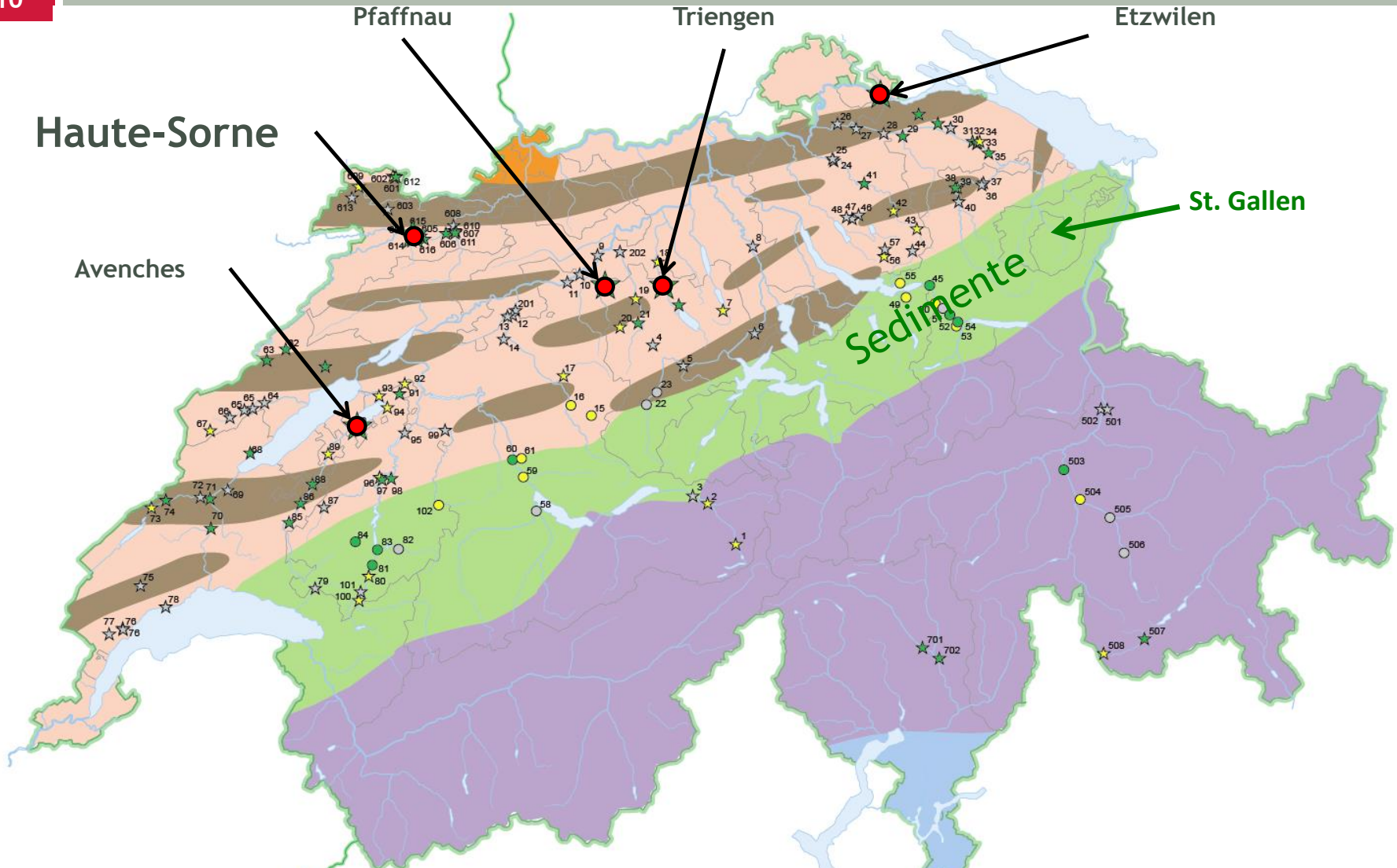
Open-hole Stimulation of 1 fracture

Medium Transmissivity (Gneiss, Masset & Loew 2013, Higher Bound K)

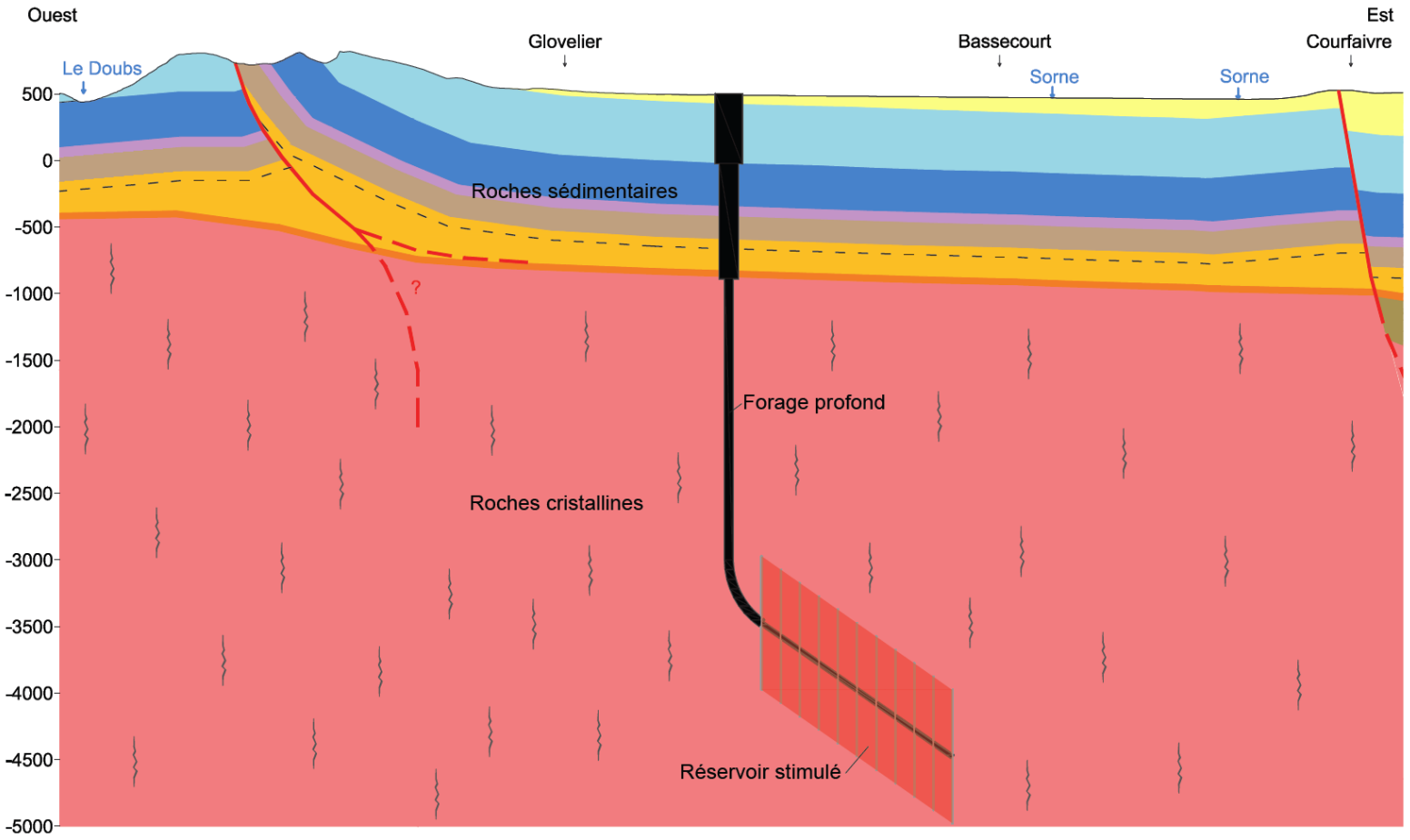
Low risk areas for first pilot projects and safety distance to large fault zones



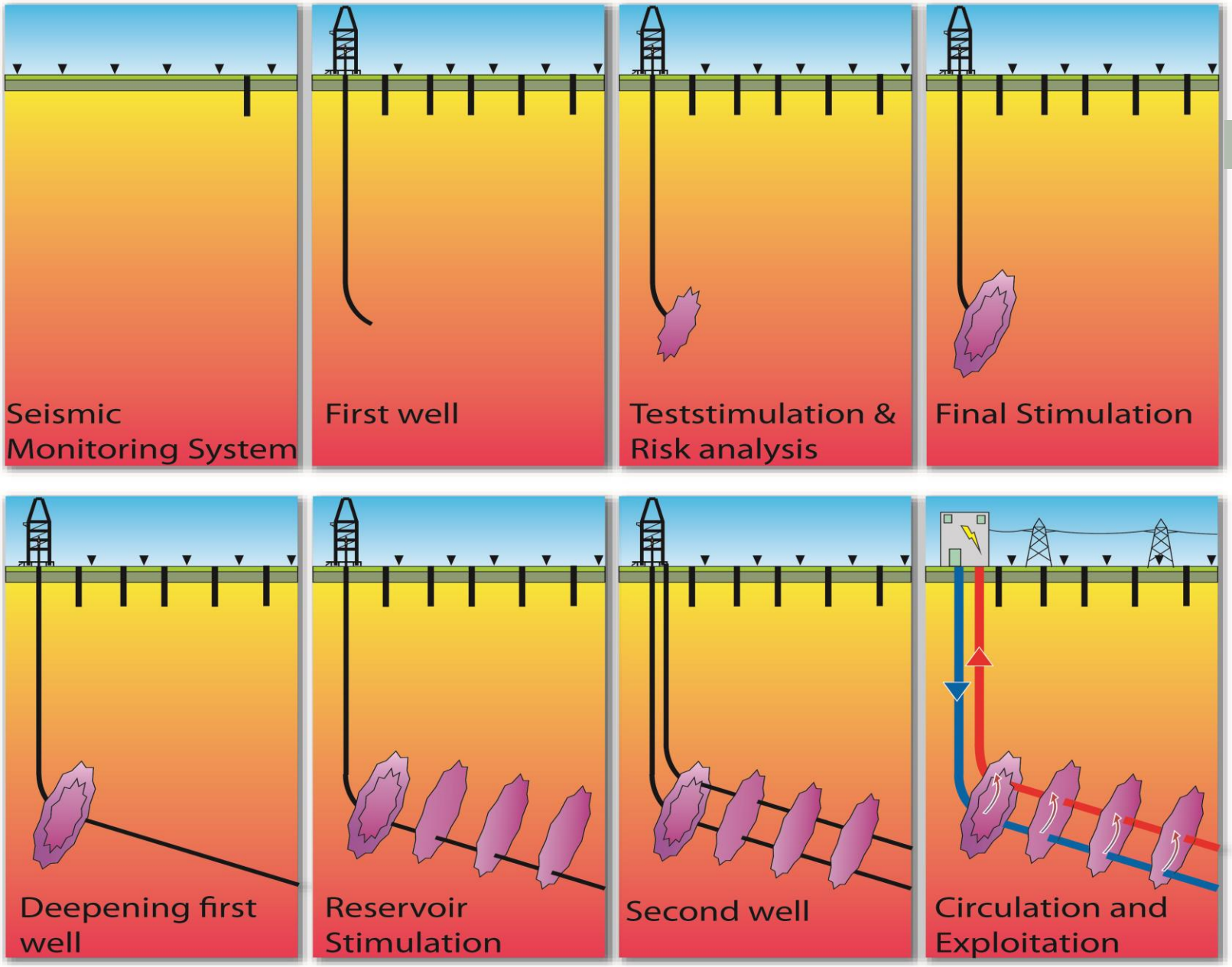
130 potential sites for pilot projects were evaluated within different plays within crystalline basement and sediments



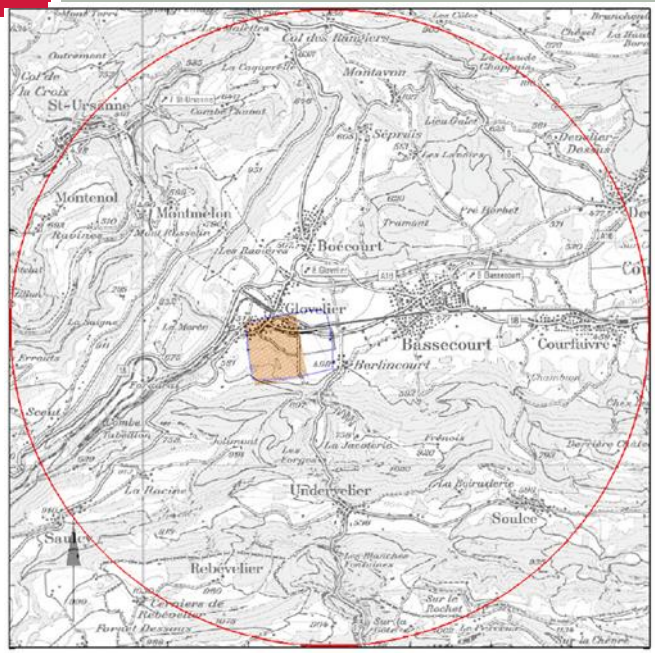
Geological cross-section with well and reservoir sketch



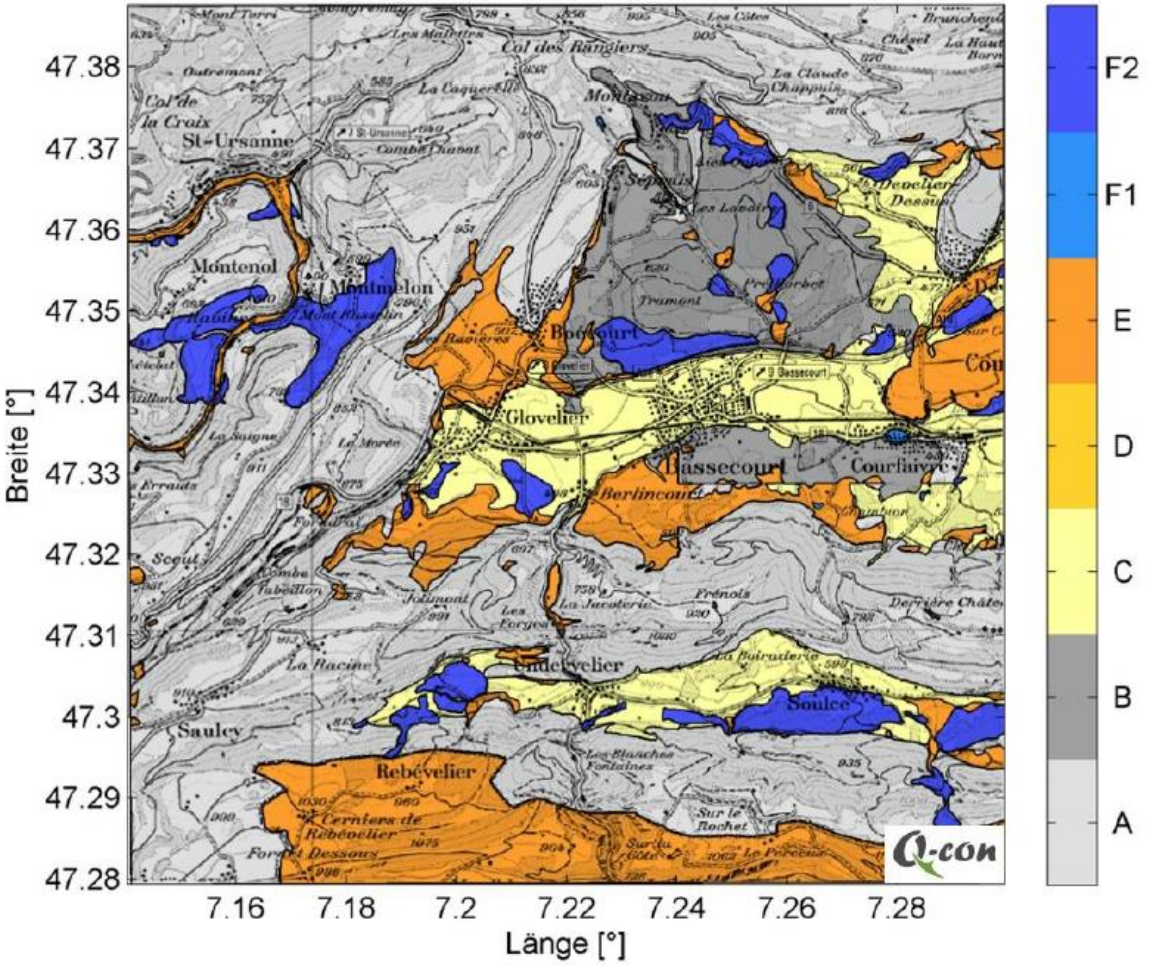
Conceptual design



Deterministic study (Q-con)
Numerical modeling of ground motions

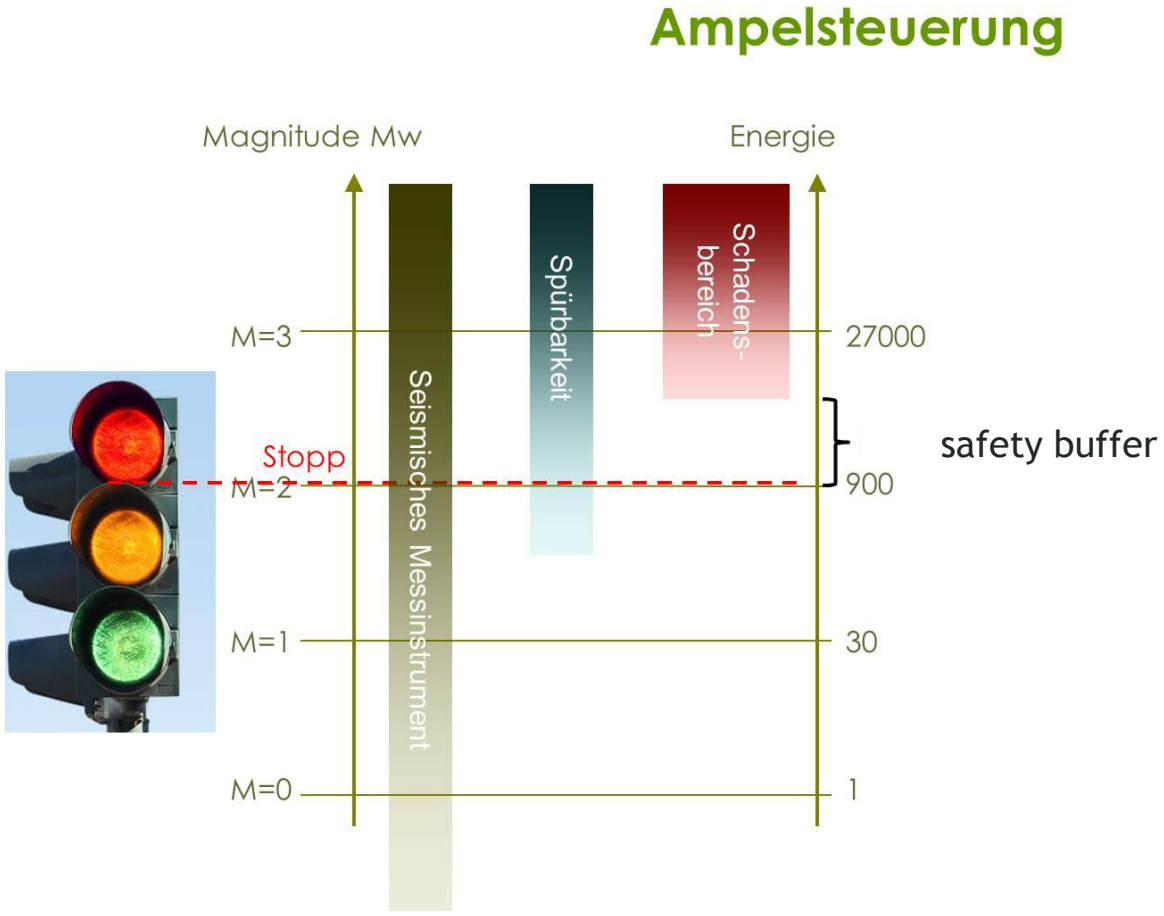


- Mw=2.6
- Damage < 5000 CHF

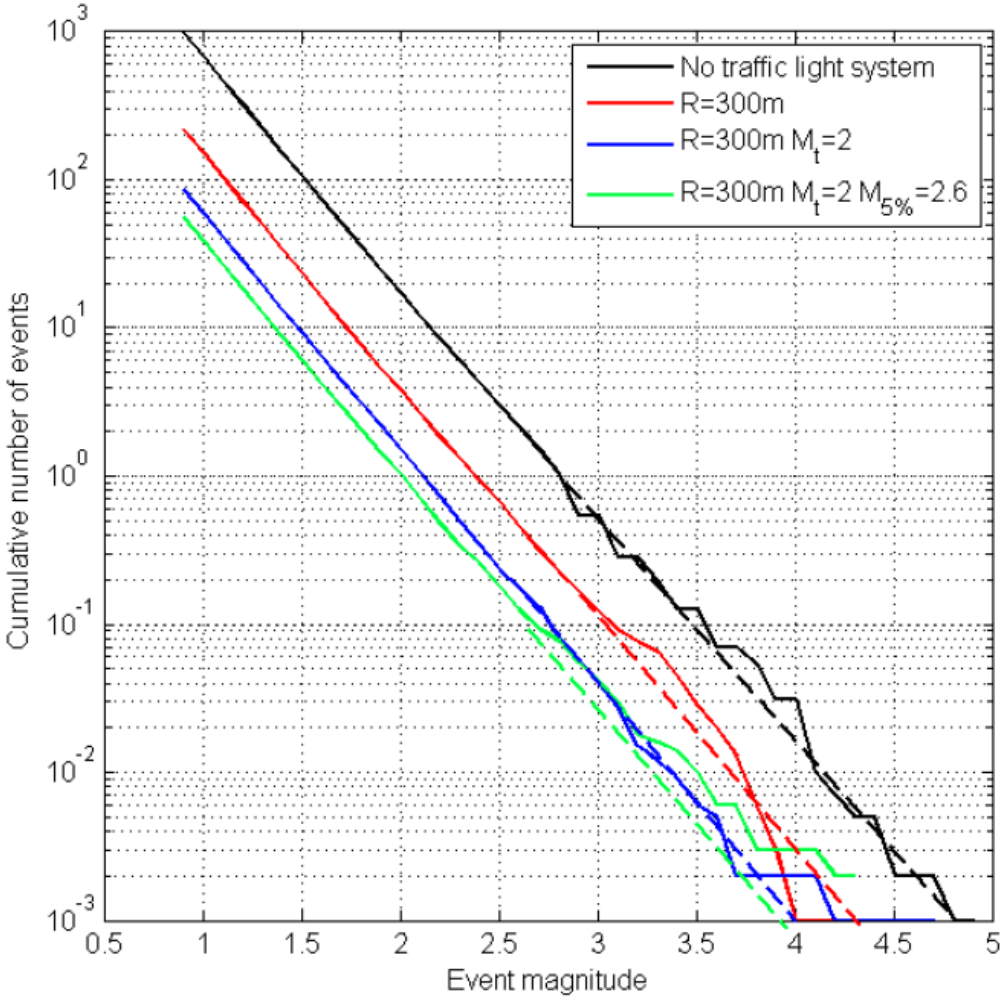


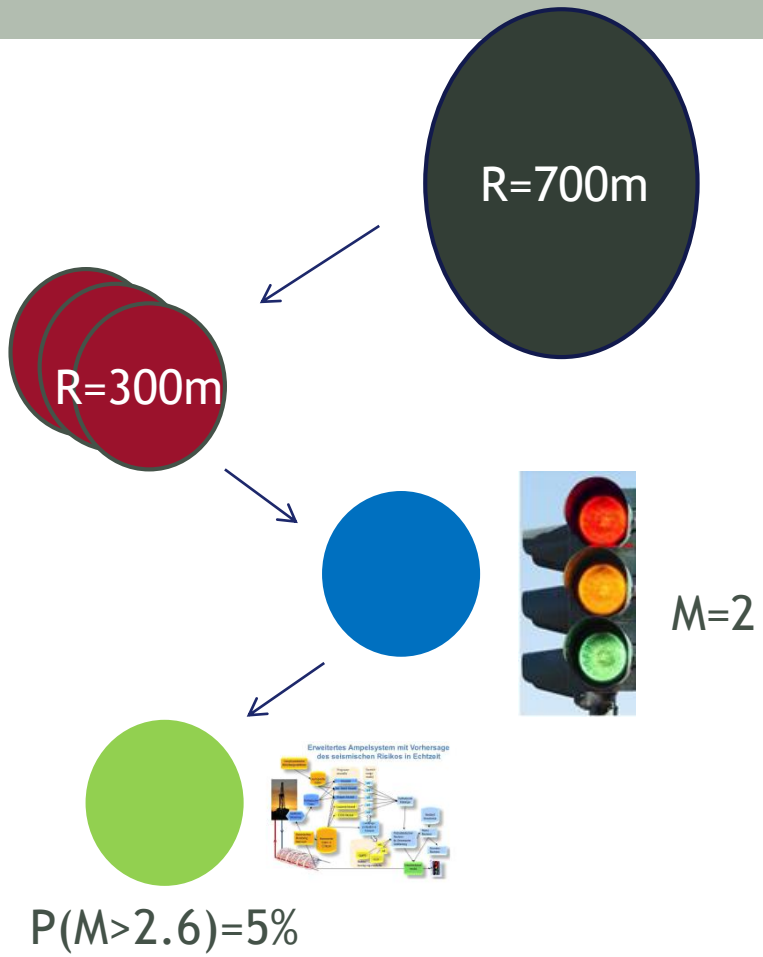
Traffic light system with lower thresholds

A system of predefined thresholds allows an automated stop before damage occurs

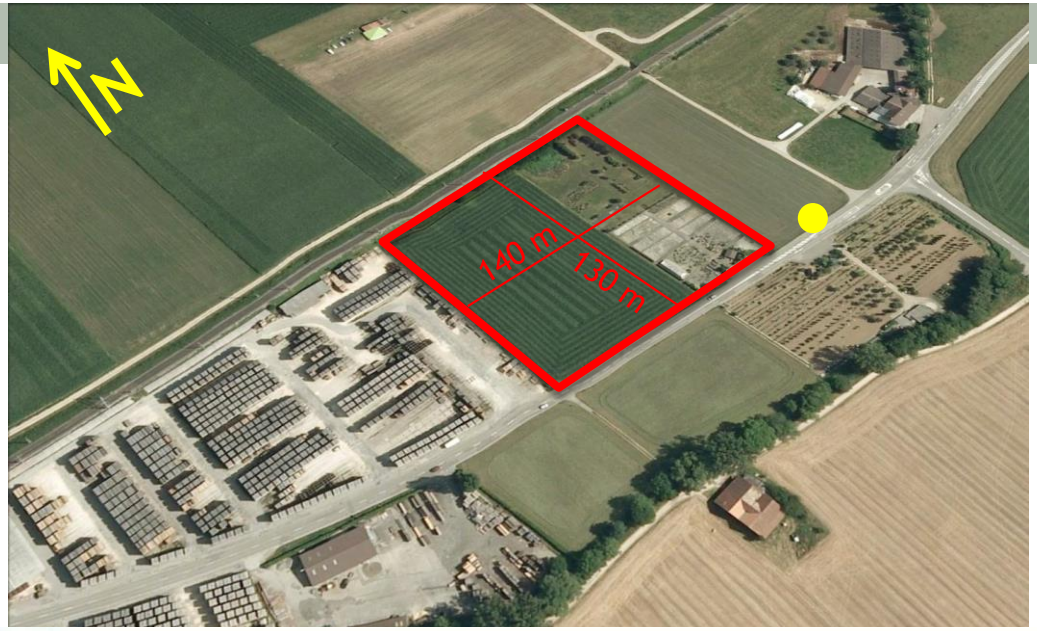


Probabilistic risk study according to SED philosophy & ATLS

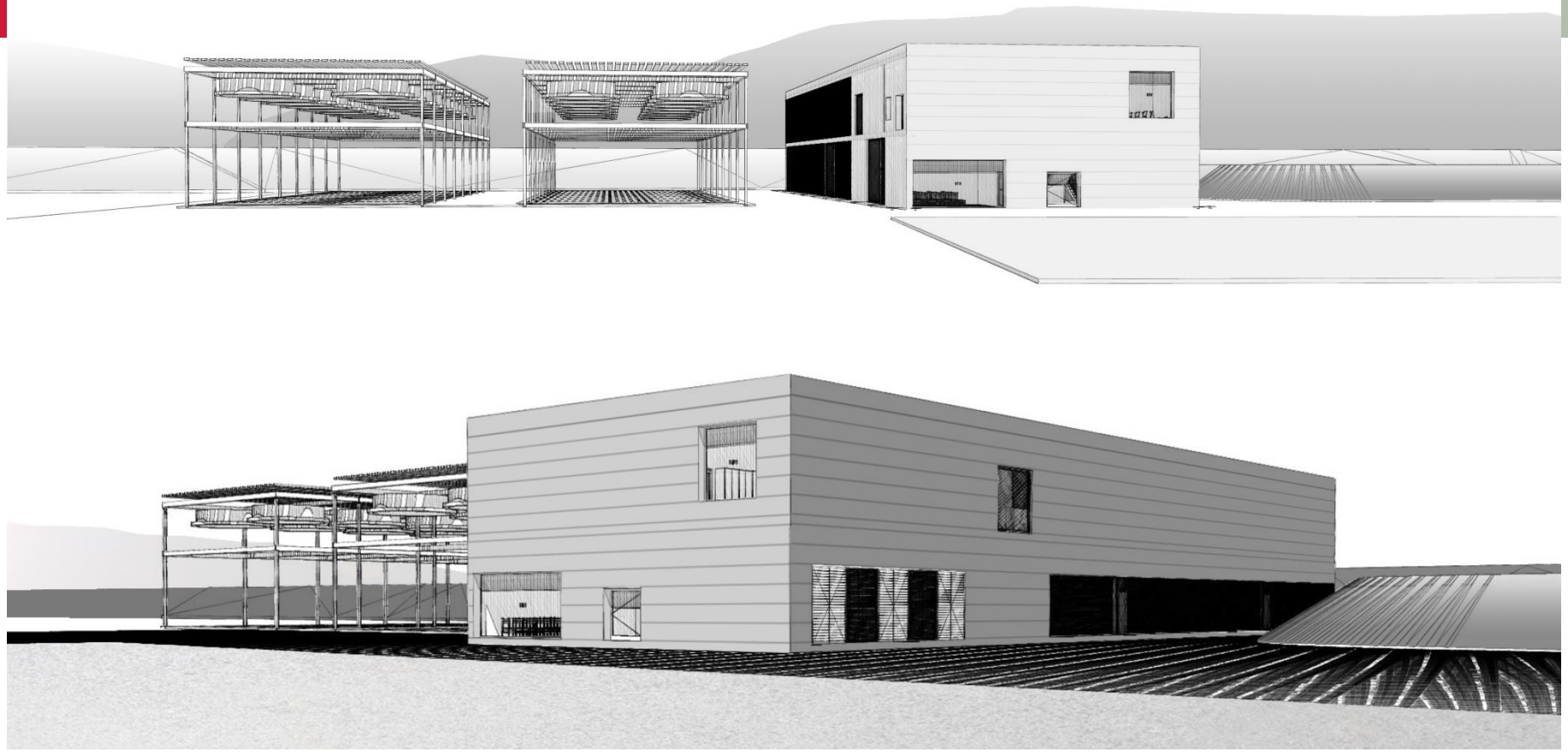




Project site Haute-Sorne



Power plant contruction permit: Pmax = 5 MW_{el}
Electrical Power will be sold to Swissgrid (KEV-waiting list)



plans: Kury&Staehelin

Accompanying Group

- Deliver detailed information to all stakeholders
- Communication relay with the population
- Project improvement driven by the group's feedback

GEOTHERMIE PROFONDE EN HAUTE-SORNE

No 1 octobre 2013

Bulletin d'information du groupe d'accompagnement du projet

Aux habitants des communes de Haute-Sorne et de Boécourt

GEO ENERGIE SUISSE
www.geo-energie.ch

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Etapes de réalisation des travaux
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Réseau de surveillance sismique
Page 4: Prise de position du canton
Protection des eaux souterraines

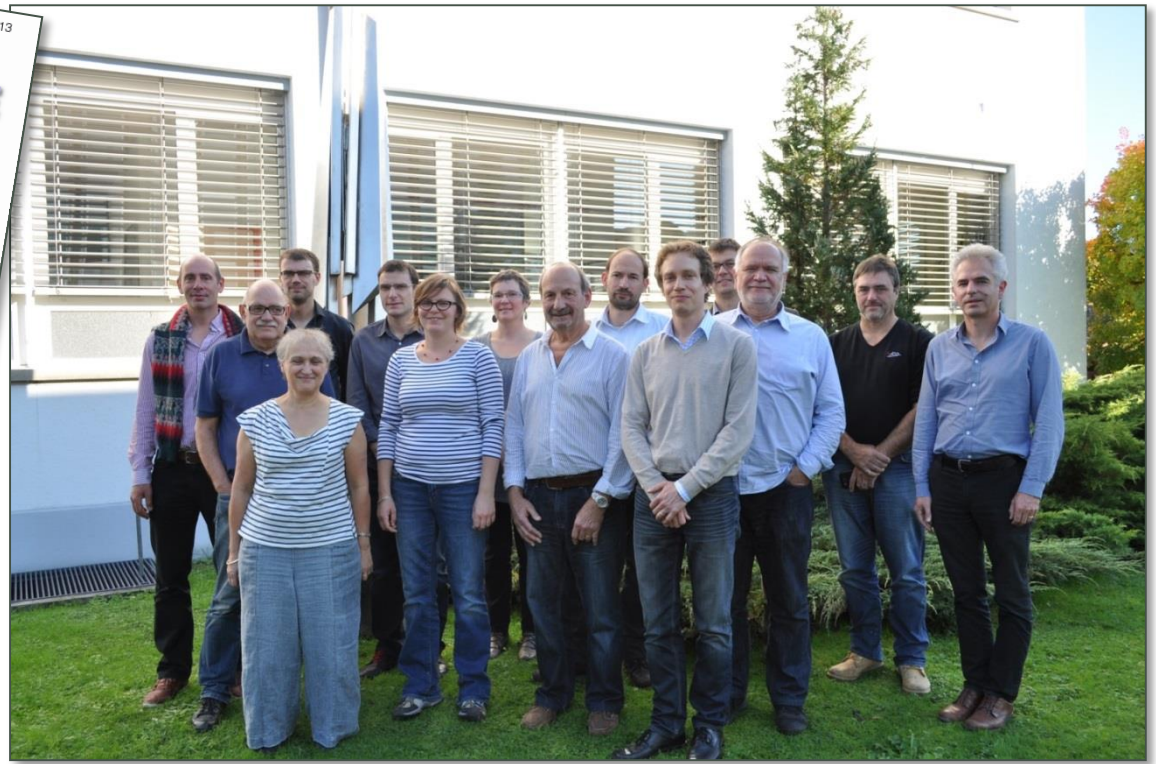
Le groupe d'accompagnement

Le groupe est composé de

geothermie@haute-sorne.ch

Présentation du projet

Boécourt
Bassecourt
Glovelier
Futur site de la centrale
Berlincourt



Time plan Haute-Sorne

2012

Preliminary impact and risk studies

2013

- Accompanying groups
- Application of construction permit and main environmental impact and risk studies

2014
2015

Examination by authorities
Risk guarantie BFE/Swissgrid

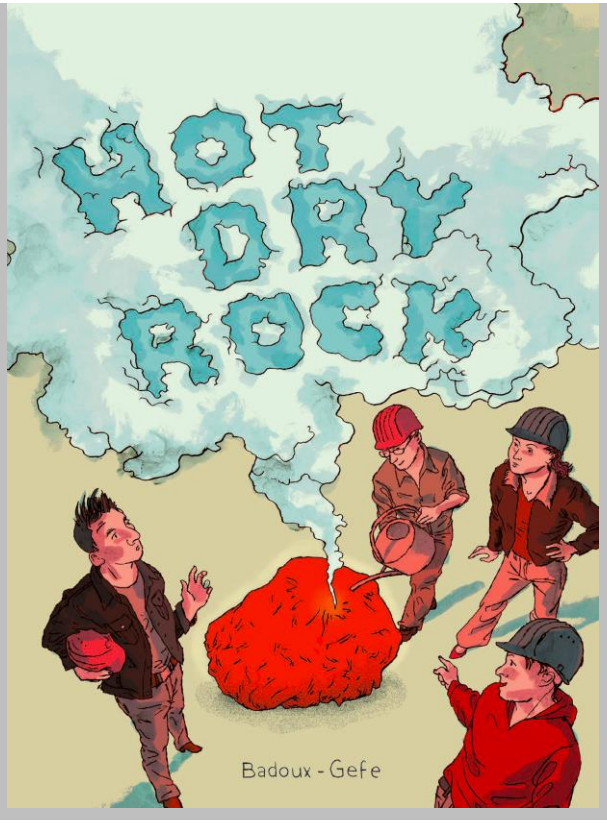
2017

Drilling

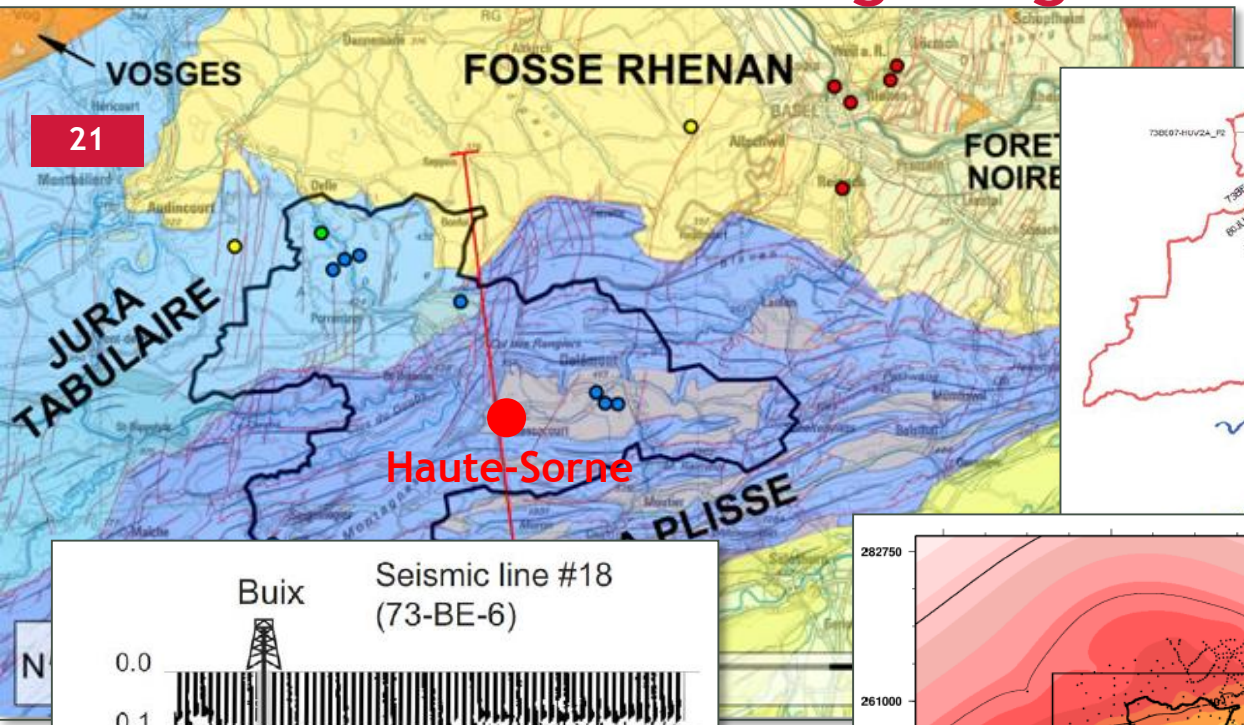
2020+

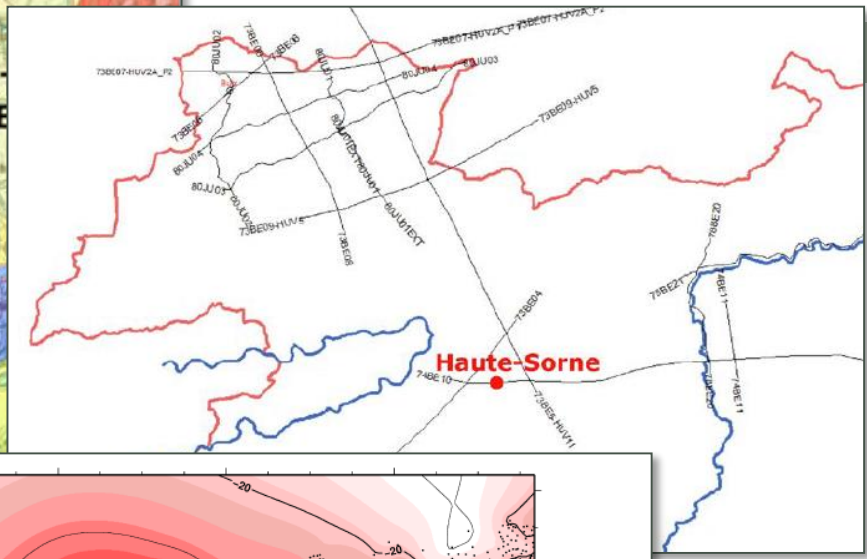
Power plant working

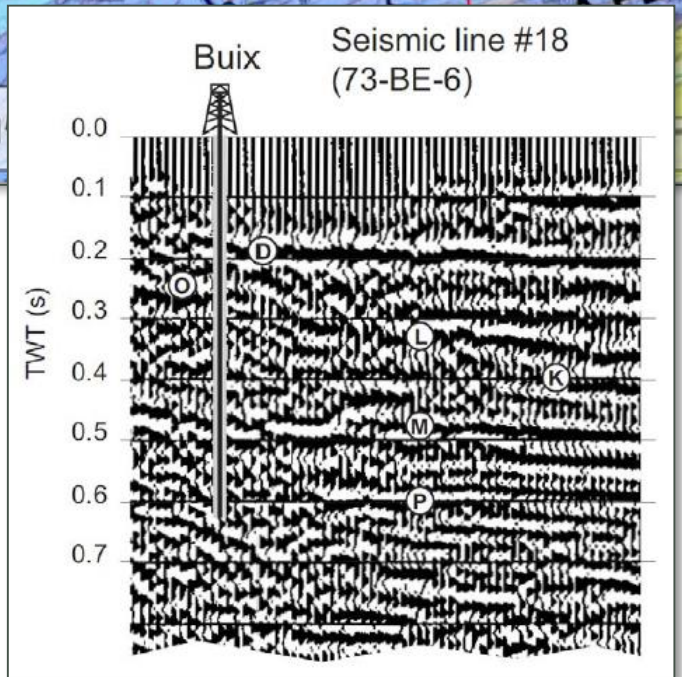
Geothermie - Aus gutem Grund

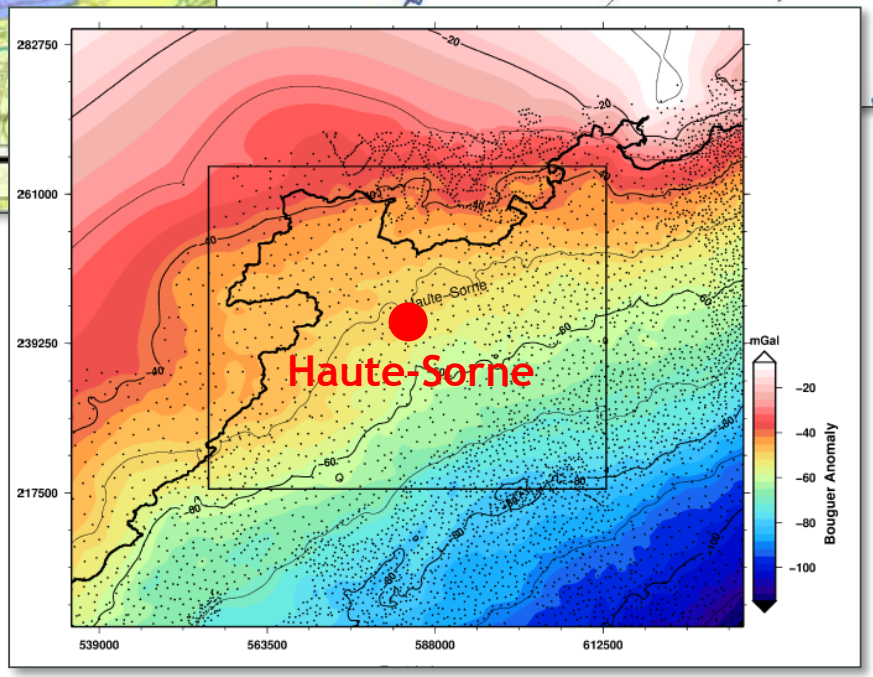


Regional geology
Construction of the geological model

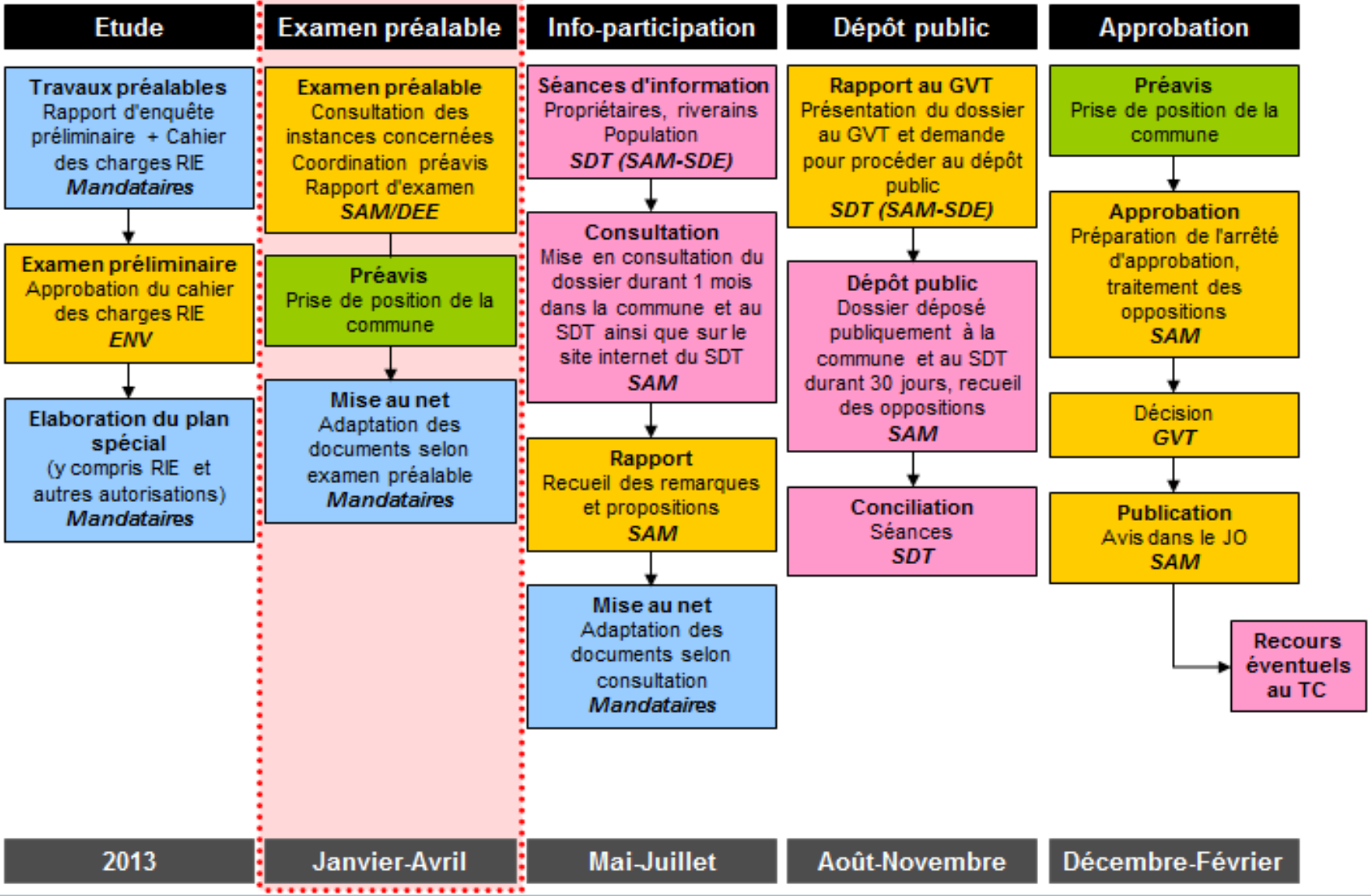








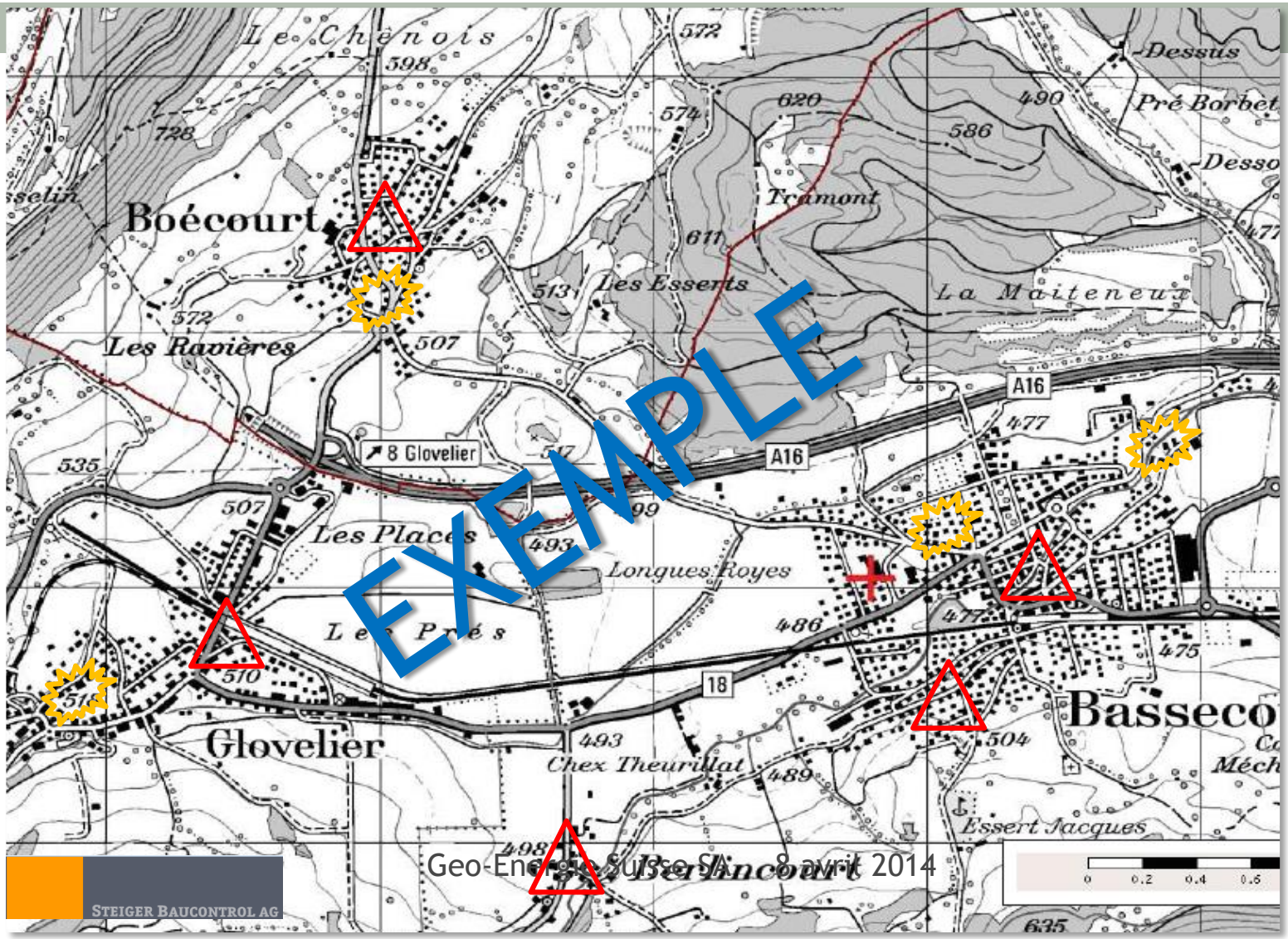
Plan spécial cantonal – procédure



Preservation of evidence

Groupes de bâtiments représentatifs

Objet individuels sensibles



STEIGER BAUCONTROL AG