The Nassereith Minewater explosion
(Tyrol 1999)
L. Weber, Vienna
The Nassereith Minewater explosion...

1. geological framework
2. mining history
3. the „minewater explosion“
4. technical solutions
5. lessons learnt...
The Nassereith Minewater explosion...
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conglomerates
The Nassereith Minewater explosion...

Glacial overburden (sand, silts and gravel)
Shales and (karstic) limestones
The Nassereith Minewater explosion... 

1. geological framework
2. mining history
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1. early 1700: first mining activities
2. 1763: construction of Anna-adit
3. 1881: holding of the mining rights only, no mining activities
4. 1939: change of ownership; some documents lost?
The Nassereith Minewater explosion...

1. geological framework
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1. Report 1932: Seepage of water from the collapsed mouth of the Anna-adit (ca. 2-3 l/s)

2. 27. July 1948: Water outburst (ca. 500 l/s)

3. First sanation under high risks !!


5. „Sanation“ (complete opening of the Anna-adit; construction of a drainage system with 118 concrete tubes, closing of the front entrance)
The Nassereith Minewater explosion...

Grube Feigenstein b. Nassereith.

Fundstollen, Heusstollen, Barbarastollen 1759-1270m SH

Mariabihilf stollen 1209m

wenig verfestigte Schotter und Sande

Anna St. 1016m

Nassereither Kongoformat

Water tubes
The Nassereith Minewater explosion...

Incomplete mine maps....
The Nassereith Minewater explosion...

Adapted „old“ Anna-adit

„New Anna adit“ collapsed since the early 20th century
The Nassereith Minewater explosion...  

Dewatering tubes in the former front entrance of the old Anna adit
The Nassereith Minewater explosion...

Heavy precipitation in autumn 1998 and spring 1999!
Mean precipitation Station Nassereith

<table>
<thead>
<tr>
<th>Year</th>
<th>Precipitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-6/97</td>
<td>392 mm</td>
</tr>
<tr>
<td>1-6/98</td>
<td>346 mm</td>
</tr>
<tr>
<td>1-6/99</td>
<td>705 mm</td>
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</table>
26. Juni 1999 00:17 „Mine water explosion“

„explosion“ of the collapsed front area of the new Anna-adit, outburst of > 2000 m³ water within a few minutes, outwashing of the canyon, additional mobilisation of debris mudflow of several 10,000 m³ damaging the valley below the adit.

great surprise: mine-water explosion affected the „new“ Anna-adit only
The Nassereith Minewater explosion...

location of the „old“ Anna-adit (with water tubes)
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blowed-out mouth of the parallel „new“ Anna-adit
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Permanent outflow of several hundreds l/s water
The Nassereith Minewater explosion...

www.bmwfj.gv.at

damages of the debris flow ...
The Nassereith Minewater explosion...

damages of the debris flow ...
The Nassereith Minewater explosion...

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damages of the debris flow ...
The Nassereith Minewater explosion...

Glacial overburden: rhythmic strata of sand and gravel with silty strata
The Nassereith Minewater explosion...

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Suffosion holes in glacial sediments due to seeping water, weakening the stability of the slope
Immediate safety measures

- Large scale restriction to access (remote) control of water outflow from the adit around the clock (quantity – opaqueness)

Further measures:
- Detailed documentation of springs
- First draft of a remediation project
Radio controlled water and mud registration)
1. geological framework
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Technical solution...

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Shotcret of the surface; construction of „open air“ steel support
Technical solution…

armed shotcrete

Support of the old Anna adit; heading step by step)…

careful control the water outflow of the parallel new Anna-adit for safety reasons…
installation of dewatering tubes to avoid uncontrolled water flows in the glacial sediments
Technical solution...

stabilisation of huge caves, caused by the minewater explosion
The Nassereith Minewater explosion...

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The Nassereith Minewater explosion...
Lessons learnt...

Mine water explosion was primarily induced by retention of water;

Ingressing water in the mine system: periodically higher than water outflow via drainage system:

Uncontrolled „natural“ dewatering causing suffosion and destabilisation of the glacial overburden...
Periodic rapid flow of water (several hundreds of l/s), causing blank bottoms of the adit...
Lessons learnt...

Periodic rapid flow of water (several hundreds of l/s), causing blank bottoms of the adit...

but
Lessons learnt...

Undersized drainage system, causing retention of water and flooding the parallel new Anna adit
Lessons learnt...

Careful checking of the mine maps for actuality and completeness...
Main consequences for closing down mine sites

Sufficient geological and hydrogeological knowledge is essential for any closing measures...

Need for representative qualitative (quantitative) water balances to compare inflow vs. outflow, periodical changes

In case of karst phenomena: free and controllable dewatering;

Careful check of the actuality of the mine maps...
Lessons learnt...

Closing of mines is expensive...

Unproper closing of mines is much more expensive...