Exploration and Evaluation of Hydraulic Fracturing Sand (Frac Sand)

Mark J. Zdunczyk
Consulting Geologist
Desktop Study

1. Gather Publications
2. Assemble Maps
   - Geologic
   - Aerial
   - County
   - Regional
3. Other Information
Initial Visit (Field Study)

- Locate or sample outcrops
- Do some geology?
- Locate drill holes
Subsurface Investigation

Test Pitting (Very Limited)
Slump (Cave – in)
Drilling

Use the right method for “representative” sample
Auger Method

Poor (limited) to retrieve a representative sample
Mud Rotary Method

Split Spoon Sampler
Air Rotary?

Limited to poor results

Non-representative
Roto-Sonic Method
Unconsolidated?
Roto-Sonic with Wire Line Core

Best?

Conventional Wire Line Method

Hard Rock Only
Geologic Log Sample

- Put Comments
- Tools
- Scale
- Hammer
- Shovel
- Hand Lens
Secure Sample For Testing
Testing Bulk Sample

1. Mix thoroughly
2. Dry
3. Break clay lumps
4. Split to 500 or 600 grams
5. Wash
6. Dry
7. Weigh
8. Screen
Laboratory Jaw Crusher
Laboratory Crusher
(Hammer Mill)
Oven
Putting It All Together
STOP
The Sand Mine
for Health, Safety, & Welfare Info see:
www.fracdallas.org/docs/sand.html
The 10 Facts of Frac

Frac Fact 1: There is a limited amount of mineable sandstone and unconsolidated sands that meet all specifications set forth by API.

Frac Fact 2: Geology plays a significant role whether the deposit will meet API specifications.

Frac Fact 3: Careful mine planning and geologic exploration of new and old (already mined) deposits may increase yields of necessary grain sizes.

Frac Fact 4: Some deposits or more specifically the quartz grains in the deposits can be upgraded to meet specifications by surface coating the grains.

Frac Fact 5: A cloudy crusted grain may correlate with fractures within the grain which causes brittleness and therefore weak grains.
Frac Fact 6: Most high content quartz (silica) deposits in the U.S. are known. Exploration should concentrate on these known deposits and their geologic equivalents.

Frac Fact 7: Processing sand sometimes causes size distribution problems when making other silica sand products.

Frac Fact 8: Geologically, older sandstones Cambrian – Ordovician of age seem to be the most suitable for frac sand.

Frac Fact 9: Unconsolidated quartzose sands generally cannot meet all API specifications.

Frac Fact 10: As energy consumption of the petroleum base fuels and natural gas increase, the demand for frac sand will also increase.
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<thead>
<tr>
<th>Location</th>
<th>Formation</th>
<th>Member</th>
<th>Equivalent</th>
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<tbody>
<tr>
<td>St. Peter</td>
<td></td>
<td>Schell's</td>
<td>Hickory Sandstone</td>
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<td>Chatfield, MN</td>
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<td>Wonowoc / Jordon</td>
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Mark J. Zdunczyk
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- Services to the Mining and Minerals Industry
- Exploration / Evaluation
- Quality/Quantity Studies
- Acquisition Due Diligence
- Mineral Evaluations/Appraisals
- Environmental Permitting
- Mineral Market Analysis
- Expert Testimony