Construction of a geological model of southern Manitoba for groundwater modelling

L. H. Thorleifson
G. L. D. Matile
G. R. Keller
D. M. Pyne
Classifying drillers’ sediment description: (75,000 unique drillers’ descriptions were parsed down to 18 lithology items, and various other sediment characteristics, such as texture and colour).

**Step 1:** spell check

**Step 2:** word deletion, to remove words with no information (e.g. the, mostly, approximately)

**Step 3:** synonym and phrase substitution (e.g. hardpan = till, clay with stones = till, gumbo = clay)

**Step 4:** parse (break into components), move remaining terms into the appropriate newly created field in database

<table>
<thead>
<tr>
<th>DRILLERS DESCRIPTION</th>
<th>LITHOLOGY</th>
<th>WATER</th>
<th>SOLUTES</th>
<th>PRINCIPAL COLOUR</th>
<th>CARBONATE MODIFIER</th>
<th>TEXTURAL MODIFIER</th>
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LITHOLOGICAL LEGEND

- Fill
- Previous Well
- Soil
- Void
- Unclassified
- Peat/Organic
- Clay
- Silt
- Sand
- Sand and Gravel
- Gravel
- Clay Till/Diamict
- Silt Till/Diamict
- Sand Till/Diamict
- Till/Diamict
- Boulder(s)
- Undifferentiated Soil/Sediment
- Rubble
- Evaporites
- Carbonate
- Coal
- Red Shale/Mudstone
- Shale/Mudstone
- Sandstone
- Igneous & Metamorphic
- Undifferentiated Rock
Water Chemistry

Carbonate Aquifer 771
Sandstone Aquifer 206
Sampling sites
Total dissolved solids (TDS)
Density; kg/m³; from chloride
Historical Water Levels

Carbonate Aquifer 120
Current Water Levels

Carbonate Aquifer 141
Sandstone Aquifer 6
Flow Calibration: 1920
Flow Calibration: 1920

RMS = 7.22 m
Slope = 0.92
Intercept = 23.6
$R^2 = 0.75$
Flow History Match: 1999 data
Flow History Match: 1999 data

RMS = 10.4 m  
Slope = 1.13  
Intercept = -28.1  
$R^2 = 0.82$
Transport history match: 1999 data
Transport history match: 1999 data

Calculated concentration (g/L)

Observed concentration (g/L)

Calculated concentration (g/L)

Observed concentration (g/L)
Engineering Scenarios
Sustainability

Changes in head at 2019, assumed increased pumping from 1999 rates
• Water well lithology query
• Stacked geological map
• 3D Model