Casper Aquifer Facts
What is an aquifer?

• An *aquifer* is a *geologic formation* that can contain and *transmit* water (water can flow)

• The classic model is sand or porous rock (water flows very slowly) covered by a protective layer of soil

• Our local example has *sparse protective soil* and is characterized by *open fracture systems* (water flows very quickly)

• The Casper aquifer supplies 60% of Laramie’s drinking water – 100% in a severe drought (2002)
Thickness and extent of the Casper formation

<table>
<thead>
<tr>
<th>Age</th>
<th>Formation</th>
<th>Thickness</th>
<th>Water Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUARTERNARY</td>
<td>ALLUVIUM</td>
<td>0 - 45</td>
<td>Contains small amounts of water</td>
</tr>
<tr>
<td>CRETACEOUS</td>
<td>UNDIVIDED</td>
<td>6500</td>
<td>Water yield depends on lithology. Majority of section is shale, and yields no water or small amounts of highly mineralized water. Some sandstones, notably in the Frontier formation and the Mesaverde Group, yield good water supplies to wells.</td>
</tr>
<tr>
<td></td>
<td>CLOVERLY</td>
<td>115 - 236</td>
<td>Sands contain highly mineralized water.</td>
</tr>
<tr>
<td>JURASSIC</td>
<td>MORRISON</td>
<td>135 - 220</td>
<td>Highly mineralized but potable water.</td>
</tr>
<tr>
<td></td>
<td>SUNDANCE</td>
<td>0 - 200</td>
<td>Contains water, but limited areal extent.</td>
</tr>
<tr>
<td>TRIASSIC</td>
<td>CHUGWATER</td>
<td>1100 - 1200</td>
<td>Sulfate-rich water. Used for irrigation water and for stock watering north and south of Laramie.</td>
</tr>
<tr>
<td>PERMIAN</td>
<td>FORELLE</td>
<td>9 - 25</td>
<td>Yields little or no water.</td>
</tr>
<tr>
<td></td>
<td>SATANKA</td>
<td>230 - 300</td>
<td>Sulfate-rich water used for stock watering.</td>
</tr>
<tr>
<td></td>
<td>CASPER</td>
<td>500 - 700</td>
<td>Most important aquifer in area. Supplies water to wells and large springs on west flank of Laramie Mtn.</td>
</tr>
<tr>
<td>PENNSYLVANIAN</td>
<td>FOUNTAIN</td>
<td>20 - 50</td>
<td>Included in Casper Aquifer.</td>
</tr>
<tr>
<td>PRECAMBRIAN</td>
<td>UNDIVIDED</td>
<td></td>
<td>Yields small amounts of water.</td>
</tr>
</tbody>
</table>

Legend:
- Sandstone - Siltstone
- Limestone
- Shale
- Dolomite
- Gypsum
- Igneous - Metamorphic
- Gravel
Aerial extent of the Casper formation
Cross section of Casper Formation/Aquifer

GENERALIZED GROUNDWATER FLOW DIRECTION IN THE CASPER AQUIFER

WEST LARAMIE BASIN

CITY OF LARAMIE

RECHARGE AREA

SPRINGS

SHERMAN GRANITE

City Municipal wells

EXPLANATION NOT TO SCALE

- SATURATED CASPER FM.
- UNSATURATED CASPER FM.

GENERALIZED CROSS-SECTION THROUGH THE VICINITY OF LARAMIE, WYOMING.
Blue area on map to left is the “recharge area”; it coincides with the bare bedrock seen on the right.
This area has been deemed by the City and the County to be highly sensitive with respect to development, due to vulnerability of the aquifer.
Recap – highly fractured, exposed bedrock/aquifer at surface
The Casper below the surface – also highly fractured

Highly permeable to water flow, susceptible to contamination
Photo showing fracture permeability in a city well
We already are seeing elevated nitrate in shallow Casper wells around development (background is <2 ppm)
Summary: why Laramie citizens are concerned about the recharge area east of town, based on geology and geography

Water is of very high quality and requires little treatment (this is the kind of water companies bottle and sell)

Lack of soil cover makes it highly vulnerable to contamination

Fractured nature makes for highly productive wells, but also makes potential contaminants highly mobile (conduits impossible to “map“)

Proximity of town and development to the vulnerable recharge area