

Laramie, Wyoming
February 19, 2016

Albany County Commission
County Courthouse
Laramie, Wyoming 82070

Dear Commissioners:

This letter is one more attempt to distinguish “science” from “policy” regarding the Casper Aquifer. I am responding to various participants’ continuing comments that “the science is all contradictory”, “ask 10 geologists and you’ll get 15 different sets of facts”, “that’s just activist talk”, etc.

I propose to you that upon objective consideration, you will find that while policy assessments certainly differ among geologists and geochemists - just as with any group of interested citizens - the facts presented in various places and by various parties are actually in general agreement:

- 1) The basic “plumbing” of the Casper Aquifer requires that much of the substances added to groundwater in the recharge area eventually will show up in neighboring wells, including those supplying the city. Supporting research ranges from Morgan in 1947 to the most recent Laramie Water Master Plan (December 2015).
- 2) The routine activity of residential development on the aquifer has an impact on groundwater quality. This has been well documented within the development areas themselves and is reasonably anticipated in diluted concentration in “downstream” wells.

Here’s some history and hard data:

The folks who developed the East Grand subdivisions in the 1970s included a deed covenant with each lot that requires the owner to connect to central sewer (at their own expense) as soon as it becomes available. It seems pretty obvious that they anticipated the potential need for sewer as the subdivisions developed toward full density and they wanted that process to go smoothly.

In 1995, a nitrate concentration of 9.4 mg/l was reported for a well along East Grand Ave. by Weston Engineering (“Revised Report on Results of Honken Veterinary Clinic Well Drilling Program”). Septic systems to the east were the suggested source.

In 2001, nitrate concentrations from 14 to 29 mg/l were estimated for the Laramie Plains Subdivision by the Laramie/Albany County Environmental Commission based on the rate of nitrate loading from septic systems (no direct measurements) using the standard spreadsheet promulgated by Wyoming DEQ. These numbers and the calculations behind them are included in both the carefully reviewed Casper Aquifer Protection Plans (CAPP) adopted by the City (2008, Appendix K) and the County (2011, Appendix F).

The County CAPP also includes the report that, “Elevated nitrate values (4 - 10.6 mg/l) from drinking water samples within Zone 2 [of the recharge area] were detected during a Septic System and Water Quality Workshop offered to rural homeowners in January 2001.”

During the development of the 2008/2011 City and County CAPPs, there were strenuous objections that the direct monitoring of groundwater quality recommended in earlier versions of the CAPP had not been accomplished. The City undertook a voluntary sampling program of private wells in 2009 and 2010. The analyses for those samples were compiled in the 2010 “Report on the Summer/Fall 2009 Nitrate-Nitrogen Monitoring in the Casper Aquifer Protection Area” by city staff. The highest nitrate concentration measured was 19 mg/l, from a well in Laramie Plains.

For the 2013 East Laramie Waste Water Feasibility Study, Western Water Consultants (WWC) hired Tetrattech (a Denver-area consulting firm) to review the subdivision sampling data. Based on 115 private well samples analyzed by a certified laboratory, Tetrattech (Keith Thompson specifically, a hydrogeologist who did his 1979 masters thesis on the Casper Aquifer under Professor Peter Huntoon) summarized:

“Private septic systems east of Laramie do not pose a significant risk of nitrate contamination to the City of Laramie public drinking water supply wells at this time. However, there are residential areas east of Laramie that have groundwater nitrate concentrations above those typically considered as naturally occurring. In some instances the local groundwater nitrate concentrations are close to or exceed the Environmental Protection Agency maximum regulatory drinking water standard of 10 mg/l.”

and,

“Approximately 65% of the East Grand area wells that were sampled show nitrate contamination, with 4% of the wells exceeding the drinking water MCL.”

As far as I know, those data have not been credibly challenged; and that report is quoted in the October 15, 2014 Phase I Monitor Well Report for the City, of which I was a co-author.

Finally, a nitrate concentration of 8.7 mg/l was measured on city property in the Imperial Heights Park South monitor well in 2015, just off the northwest corner of the Sherman Hills Subdivision (“As-Built Construction of Phase II Project Monitor Wells”, 11/4/15). Like the many samples collected for the studies cited above, the samples from the 2015 Laramie Monitor Well project were analyzed using standard analytical techniques in certified laboratories. I am not aware of anyone credibly suggesting any of these values are significantly in error.

There has been much discussion about what goes on in a septic system (proper maintenance, biomats, soil buffering capacity, etc.), but please note that all of the numbers cited above were sampled from the aquifer. Whatever is happening in the septic systems, these are direct measurements of the results, in the aquifer.

Natural (“background”) nitrate concentrations are widely accepted as being less than 2 mg/l (see, for example, the 2013 WWC study, or the results from the 2015 city monitoring well project).

Even the publicity from the private property rights group, CapNet, cites 2.4 mg/l as the “maximum” background level. Words like “polluted” and “contaminated” have obvious negative connotations, but simple arithmetic shows that the nitrate concentrations measured in the subdivisions and in down-gradient wells are “elevated” relative to background conditions.

One potentially significant point of scientific disagreement has been the role of the Sherman Hills Fault in preventing groundwater impacted by septic-system effluent from moving into city wells. For example, the 2013 East Grand study suggested “flow patterns near the Sherman Hills Fault restrict northward movement of groundwater from the areas of highest septic system density”. That concept has, of course, been popular with those seeking to remove the East Grand area from discussion of water quality impacts on the city.

Fair enough; geologic interpretations in the absence of actual data may vary. But the City undertook a detailed examination of the above interpretation, including drilling, sampling, and pump testing, and found the fault does not prevent groundwater flow from the area beneath the subdivisions moving across the fault, i.e. toward city wells (Phase II Monitor Well Report for the City, of which I was a coauthor). That is how good science proceeds. Again, I am not aware of any data that contradict the conclusions of that study. If you are, you would serve the interests of open discussion and good science by sharing relevant reviews.

Another relevant fact: the EPA’s MCL (Maximum Contaminant Level) for nitrates is 10 mg/l. Concentrations below that level are considered “safe” under federal regulation and may be legally provided through public water supplies. Although the authors of the 2013 East Grand study offered the conclusion that the “risk” to the subdivisions is “significant”, the risk to the city wells was not considered “significant ... at this time.” The context of this statement indicates the authors meant “significant” with respect to the EPA MCL of 10 mg/l, a conclusion with which I expect most scientists would agree. At the city wellfields, the issue at this point is “non-degradation” more than impending exceedance of legal limits.

Finally, through simple multiplication of standard numbers, one can estimate the nitrate loading to the aquifer recharge area. For example, the 350 septic systems on the East Grand portion of the aquifer each generate about 300 gallons of effluent per day according to DEQ. That effluent leaves their leach fields with a nitrate concentration of approximately 40 mg/l (again, according to DEQ and many other studies). Just do the math and you get about 6 tons per year for this area. Dilution in the aquifer produces the nitrate concentrations measured in the various well samples cited above.

So what’s all the fuss?

1. The statement of the 2013 East Grand study with respect to the risk to city wells included the phrase “at this time”, and concluded there was a discernible (small) upward trend in nitrate levels in the Turner and Soldier city wells. Knowing that the natural gradients move water from the subdivisions toward the city wells, some folks are legitimately concerned that concentrations in the city water supply will increase over time.
2. The only water-quality parameter discussed here is nitrates, but clearly there are a host of other chemicals associated with septic systems and routine residential activity that will find their

way into the groundwater supply. Studies done elsewhere beneath areas of dense septic systems have found many other chemicals, some of which have legal limits (like for nitrates), and many of which do not. City and county residents are legitimately concerned about the potential presence of other chemicals - including pharmaceuticals, herbicides, and fertilizers - in their drinking water.

3. The experience of West Laramie is commonly cited to substantiate concerns with septic system contamination of groundwater. I don't know anything more about that situation than has been related by folks on the City Council, but I note an important difference between West Laramie and the aquifer recharge area: West Laramie groundwater does not flow into the City's municipal wells; Casper Aquifer recharge area groundwater does. The West Laramie situation was a local issue. The Casper Aquifer situation is a community-wide issue. And that "community" includes the city/county residents receiving water from municipal wells every bit as much as the county residents on the aquifer.

4. The Wyoming Constitution establishes all water resources to be the property of the state. This public resource is licensed for specific uses on private property, including washing, flushing, drinking, etc. It is not fair to ask, "Are the public property rights associated with this public resource being compromised by the exercise of private property rights to develop land at certain densities?"?

5. Many of your constituents believe the quality of our community water supply should be maintained as high as possible. For example, they believe that 1 mg/l nitrate is better than 5 mg/l is better than 8 mg/l is better than 15 mg/l. Many folks are alarmed that nitrate concentrations in portions of their recharge area are 2, 4, even 10 times "background" and that there are likely other contaminants present. Others believe that as long as the water quality remains legal under EPA regulations, there is no cause for concern, and describe the very same situation as "healthy" and the aquifer water quality as "high".

Opinions certainly differ. Ideally, the facts do not.

The Casper Aquifer is a complex system and the most objective scientists will never come to complete agreement on every detail, but the basic facts are not in serious dispute. If everyone - especially our elected officials - insist on waiting for perfect understanding or on simply believing what is most comfortable, that just avoids facing the facts and the important challenge of balancing differing political/personal interests. We need a well-informed vision for our community and decisions in conformity with that vision.

If I can be of any assistance in helping you sort the science from the policy, please don't hesitate to ask. We may not agree on the latter, but perhaps we can agree on the former.

Sincerely,

- Bern Hinckley