

November 18, 2015

Mr. Darren Parkin  
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RE: Review of the Site Specific Investigation Report for Southeast Corner of Beech Street and Boulder Drive, dated June 26, 2015 and the Addendum dated October 30, 2015, both prepared by the Trihydro Corporation.

Darren:

WWC Engineering and Hinckley Consulting, Inc. have reviewed the referenced Site Specific Investigation. We note that specific detailed development plans have not been developed for this location. The City should consider amending the SSI when specific plans are proposed.

WWC Engineering and Hinckley Consulting, Inc. concur with the report conclusion that the relationship of infiltration at this site to the Sherman Hills Fault zone and the site's receipt of surface runoff from developed/developing areas to the east and south may be problematic. Management of the existing property and development changes to the property should include further evaluation of this risk. The City should perform an in depth hydrologic and hydraulic review of the property, consider the thickness and condition of the Satanka Formation, and assess the depth-to-groundwater relative to the top of the Casper Formation.

Our reviews have identified a few technical issues or questions that are noted below, but the resolution of these will not change our general opinion on risk presented above.

#### WWC Engineering

The addendum describes the regional flood plain mapping approach and results. However, the addendum does not present discussion or a professional opinion about the flood delineation as it relates to the risk/vulnerability of the site being evaluated. The addendum only presents a map showing 100-year flood boundaries and reports the peak flow in Section 3.0. The professional interpretation of surface water risk (SSI Item No. 10) is only in the July SSI, prior to the 100-year flood delineation work of the addendum.

A second issue related to stormwater pertains to local drainage, originating from the site itself and from nearby offsite. The SSI and addendum both focus on calculating the 100-year flood that originates from the larger regional drainage basin in which the property parcel is situated. However, there is no discussion about how the site itself drains or is restricted at a local level and whether there is any risk concern regarding the local drainage. This local drainage issue would be more relevant if there was an actual development proposal, and on-site storm water management was being proposed.

On a 11/12/2015 site visit, WWC that the box culvert detention basin outlet is about 2 feet by 8 feet (16 square feet). The culvert outlet termination was not examined, but is believed to be a considerable distance away, currently fenced in or beyond the current High School construction site. The size of the crossing appears to be considerably less than necessary to accommodate the 100-year event peak flow, which would cause water to be detained in the detention basin. The flood plain delineation work presented in the Addendum does not appear to reflect the culvert hydraulics, and as such probably underestimates the area inundated by the 100-year flood.

The SSI makes reference, in several locations, to two drainage channels entering the detention basin. The hydrology presented in the addendum appears to account for the drainage basin south east of the subject property, but the flood mapping and discharge estimates on the addendum Figure 1 do not indicate that there is a contribution of water from this part of the basin.

Given the above observations, and the SSI identified concern for detention basin contamination near a major fault, a more detailed hydrogeologic/hydraulic evaluation of the drainage and detention basin should be performed for the existing conditions. The pond may be a candidate for lining and or contaminant monitoring if it is a planned regional detention basin that cannot easily be relocated away from the Sherman Hills fault.

#### Hinckley Consulting

p. 2-1; item 1 - The relevance of "The original path of the drainage" through the area is not clear (nor is its location on the referenced "Figure 1"). In any case, due to significant changes later than the base imagery for either Figure 1 or 2, both the upstream and downstream characteristics of this potentially important drainage could be more usefully presented. For example, whereas Figure 2 indicates little sign of a channel beyond Boulder Drive, the outlet from the subject property has now been piped beneath the High School property and there is a discernable channel, in which flow was observed in April, 2015, clear through to Spring Creek (at Garfield Street).

The literature search and "References" for this site should include the June 18, 2015 "Phase II - Laramie Monitoring Well Report" (which is included in the "References" section) as it presented additional information on the nature of the Sherman Hills Fault, which bisects the subject property. The finding that this fault is a "zone" rather than a single, linear feature is relevant to the calculation of offsets from vulnerable features.

P. 2-3 (and 3-1): SHFCA-2 is a poor choice to characterize the thickness of the Satanka Formation (“230 feet”). The Satanka is clearly thinner on the north side of the fault than on the south side due to the displacement (north side up) across the fault. Figure 2 is ambiguous about on which side of the mapped Sherman Hills Fault the well is located, and recent investigations at Imperial Heights Park demonstrate that this fault is not a singular offset, but a fault “zone” in any case. The Trihydro SSI for the proposed Spradley Barr Dealership (4/22/15) concluded the thickness of the Satanka on the lot immediately north of the present study property is 150 ft. Because the present study property extends further east, the Satanka can only be thinner than that at its northeast corner. The Trihydro SSI for the City’s “South Boulder Drive Property” (6/16/15) presents a Satanka thickness of 124 ft. from an LCCC well north of the subject property for the present report, at a stratigraphic position comparable to the middle of the present property.

While additional thickness of the overlying Satanka Formation is protective of the Casper Aquifer, the major disruption of strata along the Sherman Hills Fault is potentially as important. We concur with the study’s concern with the composition of surface water entering the property from east, north, and south and recommend an improved presentation of the upstream catchment and further review of the function of this depression in the detention and infiltration of potential contaminants.

Additional consideration of the hydraulic relationship between the Satanka and Casper Formations beneath the site is indicated. Specifically, concern with infiltration of contaminants would be reduced were the water table to occur within the Satanka Formation well above the top of the Casper.

P. 2-4; item 9 - The characterization of groundwater flow as being “generally from east to west” is poorly based on the provided contours (Figure 1). Those contours indicate flow into the site from the south and southeast. The source of these contours is unclear. The report states “generated based upon the water level data gathered from the Laramie Water Management Study”, but no control points are provided for that generation. The referenced study provides a groundwater elevation of 7295 ft. for the “SHFCA-2” well posted on Figure 1, but that point is contoured here at approximately 7283 ft.

Please let me know if you have any questions.

Sincerely,



Murray Schroeder, P.E.  
Branch Manager

MS:lw

