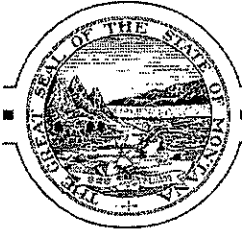


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January 22, 2010

Ms. Sue Shannon, Planning Director
Ms. Tiffany Lyden, Floodplain Administrator

Lake County Planning Department
106 4th Avenue East
Polson, MT 59860

RE: Engineering Technical Review of Johnson Creek Floodplain Studies

Dear Sue and Tiffany:

Per the request of Lake County, DNRC has provided on-going Engineering Technical Review services relating to the Johnson Creek Floodplain Studies, prepared for the Historic Kootenai Lodge Subdivision. Since 2007, the project has involved several review comment and response exchanges between DNRC, Lake County, River Run Associates; and their engineering consultants. Most recently, Larry Schock and myself attended a meeting in Polson (11/19/09) in which River Run Associate's consultants (Billmayer & Hafferman Inc. (BHI), Applied Water Consulting LLC (AWC), and Tri-Core Engineering P.C.(TCE)), presented new and amended flood study reports. The new reports provided River Run Associate's response to DNRC's June 19, 2009 review comments. Evaluation of these reports and the State's continuing role with this project are the focus of this letter.

At the 11/19/09 Polson meeting, you provided DNRC a copy of the *Settlement Stipulation and Release* (dated 9/18/08) outlining the terms and conditions to amicably resolve pending litigation between Lake County, the Swan Lakers, and the Milhous Group. Item #15 states "*the County has forwarded the delineation of the Johnson Creek Floodplain prepared by Milhous to the Montana DNRC for review and approval*". The State was not a party to this agreement and considering the language used, we feel it is necessary to clarify our role regarding the technical review process. DNRC's engineering technical review comments serve as professional recommendations to Lake County, not mandates or approvals from the State, and regardless to whether or not DNRC was a party to the stipulation. It is the County's responsibility to make the final determination regarding the sufficiency and adequacy of technical submittals to satisfy the local regulatory requirements.

DNRC has completed our technical review of the two floodplain study reports submitted to Lake County by River Run Associates at the Polson meeting on 11/19/09. The BHI report submitted is an amendment to their previous report (dated 4/6/09) and incorporates responses to DNRC's 6/19/09 review comments, as well as a flood routing analysis. River Run Associates employed the combined services of

AWC/TCE to perform an independent floodplain study. As stated in AWC's report (p.31), their analyses and recommendations are based on data obtained during a field investigation (10/20/09), documents provided by BHI, and documents and measurements made by Oasis Environmental.

As described in our 6/19/09 review comments, DNRC has been concerned with the hydrologic analysis completed by BHI and their selected 100-year peak discharge (Q_{100}) method. The basin-characteristic regression equation method yielded a Q_{100} of **353 cfs** (using BHI's 4/6/09 report data) however BHI selected the weighted channel-width equations which result in a lower and less conservative estimate, Q_{100} of **280 cfs**. This method is also statistically less reliable due in large part to the error associated with field measurements. Resolution of the hydrologic analysis is a key issue because the selected 100-year peak discharge directly affects the floodplain boundary delineation through the Kootenai Lodge Subdivision. Therefore, the focus of this review centered on the hydrologic analysis.

Based on the previous modeling completed by BHI, it appears that flows near the magnitude of **300 cfs** result in bank overtopping at some locations and a wider expanse of the floodplain. This issue was discussed during a meeting in Helena on 7/17/09, when BHI stated that in their professional opinion, they did not believe bank overtopping would occur for the 100-year flood discharge considering the physical nature of the channel characteristics and flooding history. To support this argument, BHI has selected the weighted channel-width regression equations instead of the basin-characteristics regression equations or weighted combination thereof, based on their assessment that unique geohydrologic conditions exist for the Johnson Creek basin. As previously stated, in this case the channel-width equations provide the lowest and least conservative estimate. Considering all the factors, DNRC recommended selection of the weighted method combining basin and channel characteristics; resulting in **329 cfs** (6/19/09 review comments; estimate determined using BHI determined variables).

In BHI's latest amended report, the 100-year peak discharge resulting from their routing analysis was **284 cfs**. However, it appears BHI has adopted and selected the results of AWC's analysis in lieu of their own (Section 2.2.4, p.10). We proceeded to review BHI's amended report with reservations since they decided to adopt the analysis of others. Overall, BHI's latest analysis fails to resolve the concerns we previously raised in our 6/19/09 comments regarding the hydrologic analysis. New information presented by BHI included groundwater infiltration and flood routing discussions. The groundwater information is generally anecdotal and does not provide quantitative influence effects to flood discharges for the Johnson Creek basin. Routing analyses are typically not justified for such small basins and wetlands, and little is usually gained from the level of effort. Furthermore, attenuation effects from small wetlands and beaver ponds are already inherently captured within the regression equations, since they are developed from stream gage records.

Additionally, our review revealed several discrepancies and inconsistencies, along with insufficient documentation. Some of the issues identified during our review of the routing analysis include:

- Lower basin flood discharge calculations used 1.14 sm instead of 1.58 sm. This appears to be an error or oversight. Therefore, the Q_{100} should be 44 cfs instead of the reported 34 cfs. This increases the results of the routing analysis to **294 cfs**.

- Precipitation calculations for upper/lower basins incorrectly used the 1961-1990 precipitation map developed by Oregon State University, available on NRIS. In accordance with USGS WRIR 03-4308, average annual precipitation estimates should be estimated using the U.S. SCS 1981 map covering the period 1941-70.
- Unit-hydrograph duration does not appear to comply with the guidelines of USGS Water Supply Paper 2420.
- Routing methods and procedures, and derivation of variables, lack pertinent documentation to substantiate the analysis.

The process of correcting the deficiencies would result in another series of results from BHI. However, it is unlikely anything is to be gained by doing so because BHI adopted AWC's analysis and results. Considering the latest information presented, DNRC continues to disagree with BHI's judgments and conclusions.

The Applied Water Consulting LLC (AWC) report (Nov. 2009) includes an evaluation of the Johnson Creek watershed, hydrologic analysis, and floodplain delineation. It is our understanding that AWC sought the support of Tri-Core Engineering (TCE) to complete the hydrologic analysis and certify the results. Similar to BHI, AWC selects the weighted channel-width regression equation method with the argument that the Johnson Creek basin is a unique hydrogeologic watershed; such that application of the basin characteristic equations is inappropriate. AWC selected a $Q_{100} = 244$ cfs, which is concerning because it is significantly lower than any previous estimate presented by others.

We found AWC's hydrologic analysis to be incomplete and somewhat misleading. Five methods were applied, one was discounted, and results of the remaining four were presented in a comparison table (Table 9, p.23). The Basin Area Proportionality method presented is far outside the criteria parameters for correct application, and uses a superseded report. When using the current USGS report (WRIR 03-4308), the result would actually be 376 cfs. A more representative comparison with this method would be achieved using the nearby USGS gage data on the North Fork of Lost Creek (#12369650). DNRC presented this information in our 6/19/09 review comments, and the resulting $Q_{100} = 348$ cfs (or $Q_{100} = 344$ cfs using AWC's new basin area of 9.117 sm). The AWC report makes no mention of this information.

AWC's Basin Characteristics Regression method yielded a Q_{100} value of 346 cfs (table 9, p.23), which is slightly lower than BHI's previous estimate of 353 cfs. The difference lies in small variations between the regression variables used by each firm. It appears AWC used "*percent forest*" and "*annual rainfall*" data generated previously by Oasis Environmental, but completed their own drainage basin delineation. Backup information is missing from the report and is needed to verify the estimated values. AWC's basin area estimate is 9.1 mi²; which is slightly lower than BHI's previous estimate of 9.26 mi². DNRC's estimate is approximately 9.5 mi², however we are waiting to receive the Lidar contours to complete the delineation. AWC presents their primary reasons for not selecting the basin characteristics equations on Page 21. In response to the first reason concerning the average annual rainfall variable - USGS report WRIR 03-4308 includes the specific rainfall map to be used for developing average annual

rainfall estimates. As such, variability in rainfall estimates is not a valid reason to consider the method inappropriate. The second reason states that the variability in streamflow (described in the Synoptic Stream Survey section) nullifies use of the method, which is incorrect. In fact streamflows are not constant and variability is influenced by numerous factors which vary throughout the year, and from one year to the next.

AWC goes on to cite the USGS Report WRIR 03-4308 (Parrett and Johnson, 2004) which generally states that the channel-width equations may be more reliable than basin characteristic equations where unique, local geohydrologic of climatic features affect floods. A method missing from TCE's analysis is the weighted combination of the basin-characteristics and channel-width methods, which results in the best statistical reliability, and is the method recommended by DNRC. The lack of explanation or discussion regarding the exclusion of this method is considered a significant oversight.

DNRC has previously expressed concerns regarding the reliability of the channel-width regression equations for the section of Johnson Creek downstream of manmade structures, including the Sunburst Lane crossing. USGS Report WRIR 03-4308 also states "*channel-width equations for flood estimation may not be reliable for unique geologic conditions such as bedrock channels or streams where the channel has recently changed as a result of large floods. Designers and hydrologists required to make flood estimates at ungaged sites need to be aware of unique or recently changed conditions*". The old Sunburst Lane culverts were undersized, restricted flood conveyance downstream, and induced a backwater (ponding effect) upstream of the road during flood flows greater than the 10-year event (per BHI, 4/8/08). During a spring flood in 2005, water ponded above Sunburst Lane and overtopped the road causing overland flooding through the Kootenai Lodges Subdivision area. In the spring of 2009, the culverts were replaced with a large box culvert adequately sized to convey flood flows. However, the old culvert had a direct impact to the prevailing streamflow, flood regime, and sediment-transport conditions downstream. Therefore, a valid concern exists regarding the applicability and reliability of the channel-width equations. AWC did not identify or discuss this critical issue in their report. Although BHI looked at stream channel characteristics upstream of Highway 83, it is the downstream end of Johnson Creek (below Sunburst Drive) where representative measurements should be obtained for the basin. All of AWC's channel measurements were appropriately collected below Sunburst Lane, however their reliability is uncertain.

AWC also refers to the data from USGS report 84-244 (Parrett and Hull, 1984) which identified Johnson Creek as having mean annual runoff flows substantially lower than a nearby measuring site. This information was previously presented by THI as their basis to consider the Johnson Creek basin as unique, and thereby discount the applicability of the basin characteristics equations. As DNRC has mentioned previously, the limited mean annual runoff data is not necessarily indicative of lower flood discharges, and any such extrapolation must define the relationship and be supported by conclusive scientific data and analysis. The geologic and soils investigation, synoptic stream survey, and other information presented in AWC's report fall short of establishing any relationship to flood discharges, and therefore DNRC disagrees with their conclusions. Other concerns were also identified including the significant differences between AWC and BHI's values for average bankfull channel width (W_{bf}), 11.82

feet and 15.3 feet respectively. Combination of the various discrepancies, increase the uncertainty and reduces the confidence in the analysis and conclusions.

In summary, the two reports submitted by River Run Associates do not resolve or satisfy our concerns regarding the hydrologic analysis, which were detailed in our comments submitted to Lake County on 6/19/09. As described above, the analyses in the reports contain numerous deficiencies and considerable oversights. We did not review information presented beyond the hydrologic analysis since it wasn't prudent to do so. Considering the information presented to date, DNRC continues to recommend selection of the **weighted method combining basin and channel characteristics**. This method has the best statistical reliability of all the methods, and is a reasonable selection considering uncertainties raised with the basin-characteristics and channel-width methods individually. The recommended method is not assessed to be overly conservative when considering the range of values from the various methods. The **basin-characteristics method** alone (not the weighted method recommended) has typically served as the standard hydrologic method for selection and is the method with the highest peak flow discharges in these analyses. Therefore, selection of the "basin-characteristics method" would be the most conservative choice, and the selection decision is ultimately the choice of Lake County. Since the States primary concern is the health, safety, and welfare of the public, we do not support selection of the least conservative method, as recommend by River Run Associates Consultants.

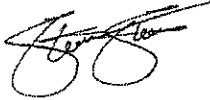
As all parties are aware, DNRC is currently in the process of completing a new detailed floodplain study for Johnson Creek. The Johnson Creek study is one of several new detailed floodplain studies being completed throughout Lake County as part of the countywide Digital Flood Insurance Rate Map (DFIRM) update; initiated in 2009. Project submittal deadlines for the new Johnson Creek detailed floodplain study are as follows: hydrologic analysis – 2/15/10; and hydraulic analysis – 9/15/10. These are the dates by which we must submit the analyses to FEMA for independent QA/QC review. Upon FEMA approval, they will become the best available data for the Johnson Creek floodplain. Any appeals to the completed floodplain delineation or analyses may be submitted during the formal 90-day appeal period once the Preliminary FIS/DFIRMs are released.

The on-going technical review services for the River Run Associates/Kootenai Subdivision project, coupled with the new detailed study being completed by the State and additional workload, are taxing DNRC's limited resources. Accordingly, it is necessary for us to prioritize and focus our efforts on completing the new Johnson Creek floodplain study. As discussed above, the latest report submittals from River Run Associates have not resolved issues previously identified by DNRC and we are in disagreement regarding their hydrologic analysis conclusions (including selected method and input data). Considering that a new analysis is underway by the State, we do not feel it is conducive to continue debating our differences and hereby forgo providing any further technical review services or resources regarding the Kootenai Lodges project. Beyond the recommendations herein, DNRC would suggest Lake County either wait for the new detailed study to be completed by the State or if necessary, solicit your own independent technical review services from the private sector to fill DNRC's technical review role for on-going exchanges.

January 22, 2010

Please contact me at 406.444.6664 directly if you would like to discuss these comments or have additional questions.

Sincerely,



Steve Story, P.E., CFM
State Floodplain Engineer

Attachment: DNRC 6/19/09 Review Comments

Cc: Laurence Siroky/DNRC Water Operations Bureau Chief
Larry Schock/DNRC Missoula Regional Engineering Specialist
Traci Sears/DNRC NFIP Coordinator
Celinda Adair/DNRC MapMod/RiskMap Program Coordinator
Fred Robinson/DNRC Water Operations Bureau Attorney