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SCIENCE & ENGINEERING
110 Prefontaine Place South, Suite 508
Seattle, WA 98104
206-521-3000

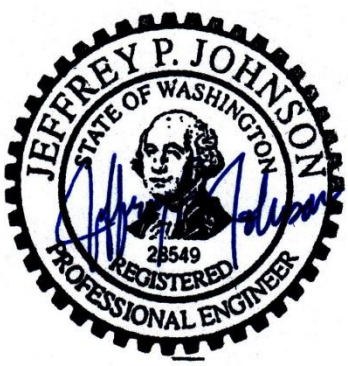
Memorandum

To: Kittitas County Public Works

From: Jeff Johnson, P.E.

Date: June 6, 2013

Re: Black Horse Subdivision – Flood Risk Review



Introduction

Watershed Science & Engineering (WSE) was asked by the Kittitas County Department of Public Works to provide an independent general review of potential flood risks that may impact the proposed Black Horse at Whiskey Creek residential subdivision development. The subdivision is located northwest of the City of Ellensburg on an undeveloped 80 acre parcel that is bordered by three county roads and an undeveloped parcel to the west (Figure 1).

The most obvious source of flooding for the subdivision is Whiskey Creek. The stream channel approaches from the northeast and intersects the eastern edge of the parcel approximately 1300 feet upstream from Bender Road (Figure 2). Here the stream turns south and follows an excavated channel to Bender Road where it passes through a 48-inch CMP culvert.

The site development engineering design team lead by ESM Consulting Engineers recognized that Whiskey Creek poses a significant flood risk to the southeastern corner of the subdivision and therefore, retained Anchor QEA to evaluate the risk and to assist with the design of countermeasures. Anchor QEA's investigations are summarized in two memorandums:

> Anchor QEA, March 14, 2012. "Whiskey Creek Floodplain Analysis", prepared for ESM Engineers.
>
> Anchor QEA, September 28, 2012. "Whiskey Creek Floodplain Analysis", prepared for ESM Engineers.

In addition to the specific analysis identified above, a series of general flood risk related questions were raised as part of the standard County SEPA review process. ESM prepared the following memorandum to provide answers to these questions:

> ESM Consulting Engineers LLC, November 19, 2012. "Black Horse at Whiskey Creek – Responses to SEPA". Submitted to Doc Hansen, Kittitas County.

WSE reviewed these memoranda, a partial plan set of the development dated March 29, 2013, and existing LiDAR data of the surrounding area and offer the following opinions and suggestions to further evaluate and reduce flood risk for the subdivision.

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1. On May 31, 2013 I examined the project site with County staff. While at the southeast corner of the development, County staff mentioned that the landowner downstream from Bender Road adjacent to the east stream bank is concerned that the development will increase flooding on his property. The site development plan calls for the existing 48-inch CMP culvert under Bender Road to be replaced by an 18-foot wide bottomless concrete culvert. The new culvert will be a significant improvement in that most flood water will pass under rather than over Bender Road. Anchor QEA conducted a simple hydraulic analysis to determine if the proposed changes would cause flood levels to rise or inundation limits to expand on the downstream property. It is not within our scope to conduct a detailed review of the analysis conducted by Anchor QEA, but in general the hydraulic modeling approach used is reasonable; although it is very simplistic. One recommendation is to ask Anchor QEA to include a table in their report that compares the predicted flood elevations to the elevation of the ground surrounding the structures. This would help clarify how high the structures sit above the predicted flood levels and would help to determine if they are at risk. Models of the type used by Anchor provide reasonable estimates of water levels, but as with any model there are uncertainties and therefore, actual water levels could be slightly higher or lower than those computed by the model. If there is little freeboard at the structures, they may flood during a large event and the landowner may then point to the subdivision as contributing to the flooding. We recommend that Anchor QEA enhance their analysis to clearly explain and demonstrate why the subdivision will not impact the downstream property, or if this cannot be done, then some form of simple flood protection may be worth considering for the landowner.

2. A relatively large earthen berm will be constructed along the southeastern edge of the development to prevent Whiskey Creek from flooding portions of the subdivision. The following question was proposed to ESM as part of the SEPA review:

   > Where base flood elevation data has not been provided or is not available from another authoritative source, it shall be generated for subdivision proposals and other proposed developments and shall be noted on the final mylar.
   >
   > ESM responded with the following answer: "The 100-year floodplain line will be relocated to the back of the proposed lots [we assume due to the presence of the berm], therefore this condition does not apply."

   A question for the County is whether the proposed berm will provide adequate and reliable protection to the sub-division. We assume that ESM is hoping that the limit of the mapped 100-year floodplain will coincide with the stream side of the berm and will not extend beyond the berm into the development. If this is the plan, then we assume someone will need to certify that the berm will provide protection from the 100-year flood. As I'm sure the County is aware, FEMA has been struggling for several years to determine how to recognize the protection provided by flood control levees and berms. In the past, FEMA has required certification by professional engineers that a levee system will remain secure and protect lands during the 100-year flood. Unfortunately, FEMA has yet to provide clear guidance to local communities as to what should or needs to be done to certify the protection provided by levees and berms. We suggest that the County contact FEMA to seek guidance on how to address this issue for the proposed berm.

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3. The large wetland that exists at the southeast corner of the development was constructed to provide compensatory storage for floodwater displaced by the proposed site grading. When we visited the site on May 31, 2013, the graded area was nearly full of water. Was this water accounted for in the compensatory storage calculations or was it assumed that the graded area would be dry at the time that a 100-year flood occurs on Whiskey Creek? Further documentation or evaluation of this issue is recommended.

4. The focus of the flood mitigation work for the development has been on the risks Whiskey Creek poses to the southeast corner of the development. It appears however, that there may be an under-appreciated flood risk to the portion of the development that borders Reecer Creek Road. The design calls for a relatively small ditch to be constructed between Reecer Creek Road and the subdivision. We are concerned that the ditch may be too small to convey the volume of water that may enter the area during a major flood. We are also concerned that there does not appear to be a large culvert to carry the ditch under 29th Avenue, the entrance road into the subdivision from Reecer Creek Road. Our concern arises from examining the LiDAR hillshade image presented in Figure 2, the partial subdivision plan set, and from observations made by County staff during previous floods.

    a. As shown by the blue arrows in Figure 2, it appears that that flood water can leave Whiskey Creek just downstream from the Cascade Irrigation Canal and flow overland to the west, bypassing the Bowers Road Whiskey Creek crossing. This water will eventually be intercepted by the Bowers Road fill and directed west toward the intersection of Bowers and Reecer Creek Roads. At the intersection the water will over top both Reecer Creek Road and Bowers Road. The water that overtops Bowers Road will enter the road side ditch between the development and Reecer Creek Road. The volume of water entering the ditch could be large and may overwhelm the proposed ditch. This could result in flooding of the proposed sediment/detention ponds, 29th Avenue, low lying home lots that border Reecer Creek Road, etc.

    b. Flood waters may also originate from the Cascade Irrigation Canal. During floods, irrigation canals of this type intercept and convey flood water. During large storms, canals often do not have the capacity to convey all of the flood water and a portion of the flow overtops or breaches through the embankment that contains the canal. If this were to occur upstream from the subdivision, large quantities of water may enter the ditch along Reecer Creek Road. This may be an unlikely event, but it is a risk and therefore should be examined.

    c. According to the County, during the May 2011 flood, a large volume of water was conveyed along the subdivision side of Reecer Creek Road. To reduce flooding during the event, the County removed several gravel driveways that provided access into the Black Horse development site from Reecer Creek Road.

    d. The flood water that is conveyed along the subdivision side of Reecer Creek Road will enter the Town Ditch at the southwestern corner of the development. It is unclear how this would impact the Town Ditch and areas downstream along the ditch, or the adjacent portion of the subdivision.

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Based upon the points above, it is our opinion that the flood risk along Reecer Creek Road has not been adequately evaluated. We recommend that a thorough investigation of flood risk be undertaken to determine if design revisions are needed to provide adequate flood conveyance facilities along the subdivision side of Reecer Creek Road. This investigation will need to include a thorough field inspection of potential overflow routes from Whiskey Creek and an assessment of the risk posed by the irrigation canal.

5. One additional issue that should be considered is whether flood water can leave Whiskey Creek downstream from Rasmussen Road and flow overland into the northeast portion of the subdivision (see orange arrows in Figure 2).

Conclusions

It appears that ESM and Anchor QEA have done a reasonable job to address flooding issues and to minimize flood risk at the southeastern corner of the development, although, as noted in this memorandum there are several issues that need additional attention.

It is our opinion that the flood risk along Reecer Creek Road has not been adequately evaluated and that there is sufficient evidence to suggest that the flood risk could be significant.

Flood risk to the northeast edge of the subdivision should be examined.

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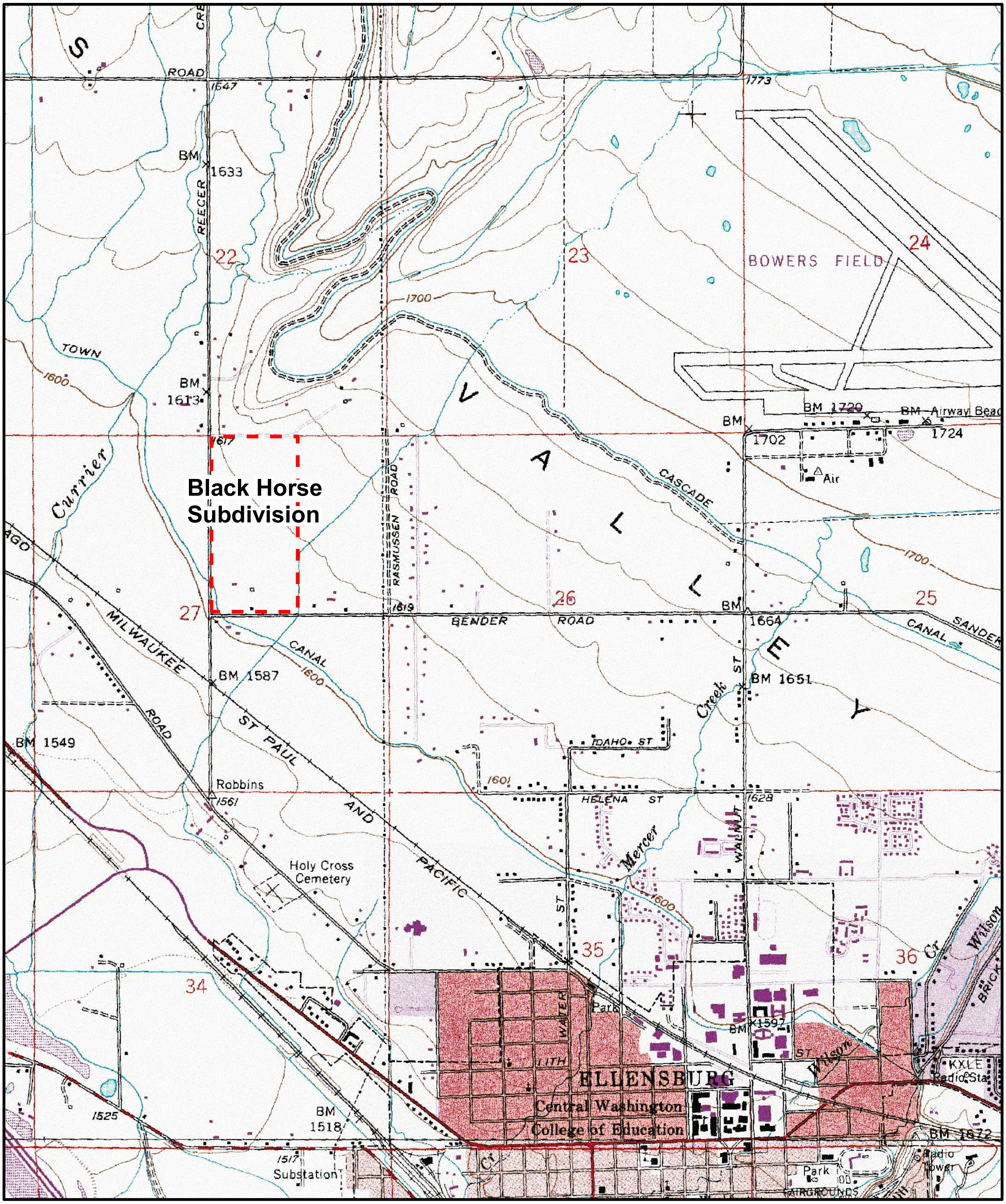

Black Horse at Whiskey Creek Subdivision

Location Map

0 1,400 2,800 Feet

N

Scale: 1:25,000
NAD 1983 StatePlane
Washington South FIPS
4602 Feet

06 Jun 2013

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Background Image: US Geological Survey Standard Series Topographic Map

Figure 1

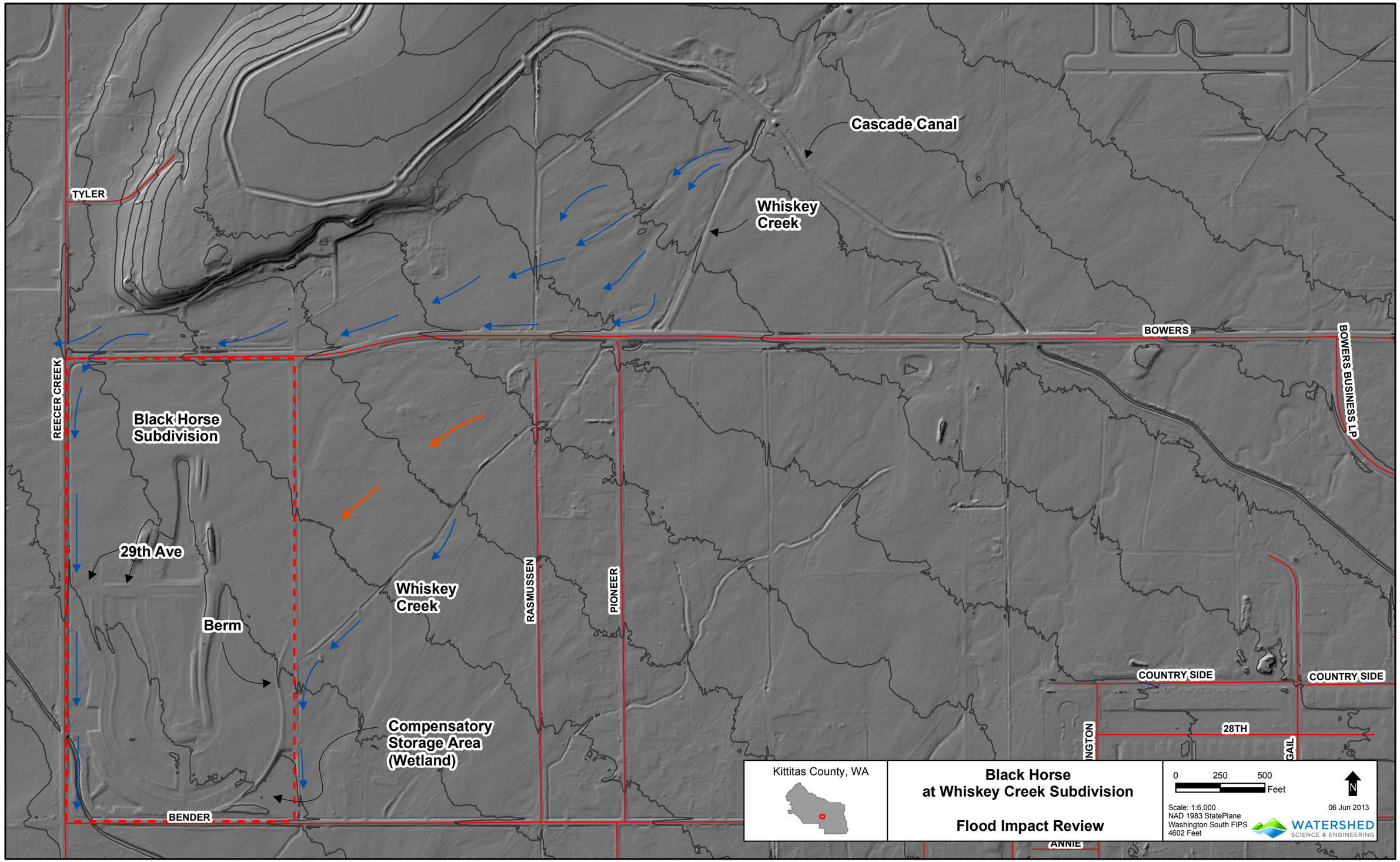

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Figure 2