15 July, 2012

Dear County Commissioners,

The purpose of this letter is to present some environmental, geological, and engineering concerns for your consideration as you and the Montana Department of Transportation guide the present studies and determine the future of the existing Maclay Bridge. I can offer some insight on these issues, with both a BA and an MS in geology from the University of Montana, as current owner and manager of a geological consulting business, and having lived near and observed Maclay Bridge since 1982. I was also involved in the 1992 to 1994 Environmental Assessment.

Attached to this letter are portions of air photos of the Bitterroot River taken in 1935 and 1961 by the US Forest Service, and air photos taken in 2003 and 2011 by the USDA. I have enlarged and rotated them to give you a better perspective on how these portions of the river near the bridge have changed over time.

The 1935 photo may have been taken in June or July 1935 (the two stereo USFS air photos are marked 6-35 and 7-35); the 1961 photo was marked May 19, 1961; the 2003 air photo was marked July 1, 2003, and the 2011 photo was marked November 21, 2011. The online service GoogleEarth also provides free public access to historic Missoula area air photos for the time period from 2002 to 2011. This 9 year sequence can be viewed separately at GoogleEarth's website. The photos reveal that since the 1930's, there has been loss of river bank land on the west side of the river immediately downstream of the bridge. There has also been a development of a large whirlpool in this same area. In addition, there have been changes in the stream morphology upstream of the bridge. These include increased sand bar development and lengthening of the north (downstream) end of the island.

The bridge is located on the upstream end of a broad meander in the Bitterroot River, where the river bends to the northwest, with the inside of the bend concave to the west. Typically, when a river "turns a corner" like this, the water slows down on the inside of the corner, has less energy, drops any sediment it is carrying, builds sand and gravel bars, and adds to the river bank. Thus the water should always be shallower and banks should grow on the inside of a river bend. This was clearly occurring at the west bridge abutment in 1935 when the air photo was taken, but is not happening now.

If you compare the 1935 photo to the 2011 photo, you can see just downstream of the west bridge abutment over time there has been significant erosion and loss of bank material for at least 100 to 200 feet. If you visit the site, especially during high flow periods, you can see the bank erosion appears to be related to a large whirlpool that developed under the main bridge span. The whirlpool also has created a deeply-scoured hole in the channel just under and downstream of the bridge.

Due to the fact that these channel changes appear in the photos after the present bridge was installed, it is my opinion the current bridge, with its piers and abutments and west end approach, likely caused or contributed to these unusual changes in the river channel. This is probably due to the fact the west

bridge approach and abutment and the center pier of the main bridge span cause a deflection and narrowing of the river, constricting it and making the water flow faster as it passes between them. This may have also caused the whirlpool and the scouring action. The construction and elevation of River Pines Road for the west bridge approach may be acting like a river levee, constraining and deflecting the flow, and also contributing to the changes.

The bridge's constriction of the river has somewhat slowed the water flow upstream of the bridge and may be causing the river to drop sediment there, adding to the sand bars and growth of the large island's north end. Again, a comparison of the 1935 and 2011 photos shows over time since the bridge was installed, the island and sandbars have grown from just upstream of the bridge in 1935, to at present where they extend under the bridge and downstream of it, particularly on the east side of the channel. In 1935, the center pier of the bridge was in the center of the river channel. At present, it is no longer in mid-river, rather now it is mostly surrounded by a long semi-permanent sand bar. The west main channel of the river appears to have been reduced in curvature (ie straightened) by River Pines Rd., which may be directing the river flow like a levee.

In summary, the present bridge since it was installed likely has had significant effects on the Bitterroot River channel and its environment. It was clearly never designed for its present site, and by all accounts, was a used bridge brought in from elsewhere. The bridge probably has caused and is causing loss of private property on the west side and may have expanded beaches and sand bars on the east side. It may have created the large deep scour hole that together with the sand bars invite bridge jumping, swimming, and recreation use, along with all of their public health, safety, and other problems. It should be noted the scouring action could also be undercutting and destabilizing the center bridge pier and west abutment.

These environmental and engineering concerns are significant. They should be studied further and included in the current analysis to assess the drawbacks of any bridge construction or rehabilitation at the present site. Please consider them in reaching your decision on the future of the current bridge. If you would like to obtain copies of the original photos I have referenced or need other information, please contact me.

Sincerely,

/s/ Michael Burnside

Michael Burnside
Missoula, MT 59804

1935 air photo Maclay Bridge (north to right of photo)

1961 air photo of Maclay Bridge (north to right of photo)

2003 air photo of Maclay Bridge (north to right of photo)

2011 air photo of Maclay Bridge (north to right of photo)