

**Infill Drilling and Piezometer Installation Project: East Fork, Fred Burr, Martinsdale, Middle Creek and Tongue River Dams (RRGL Rank 80<sup>th</sup>)**

**The State (DNRC) owns numerous reservoirs that have high hazard dams:**

- Dams are classified as high hazard if there is the potential for loss of life if the dams fail.
- A critical mandate of dam ownership is to have an adequate seepage monitoring program.

**Five DNRC dams have been identified for additional investigation and monitoring** Each dam selected will benefit from additional drilling to provide geotechnical information and continued seepage monitoring. The proposed infill drilling project has been designed to provide information in zones that have been identified as a result of previous investigative drilling.

- East Fork Dam in Granite County, \*\*
- Fred Burr Dam in Ravalli County, \*\*
- Middle Creek Dam located in Gallatin County, \*\*
- Martinsdale Dam in Wheatland and Meagher Counties, and
- Tongue River Dam in Big Horn County.

(\*\*East Fork, Fred Burr and Middle Creek are located on National Forest Lands. The dams are State owned & are operated under Forest Service Special Use Permits.)

**Seepage Monitoring:**

- The primary goal of a seepage monitoring program is to identify potential problems in time to take corrective action.
- Seepage through a dam can create potentially serious problems in the dam's interior that can lead to dam failure if not addressed.
- Water level monitoring allows State Water Projects (SWPB) personnel to monitor the performance of the dam and determine if potential problems are occurring.
- The addition of the piezometers will greatly enhance monitoring capabilities, and allow for early detection of problems and significantly enhance overall dam safety.

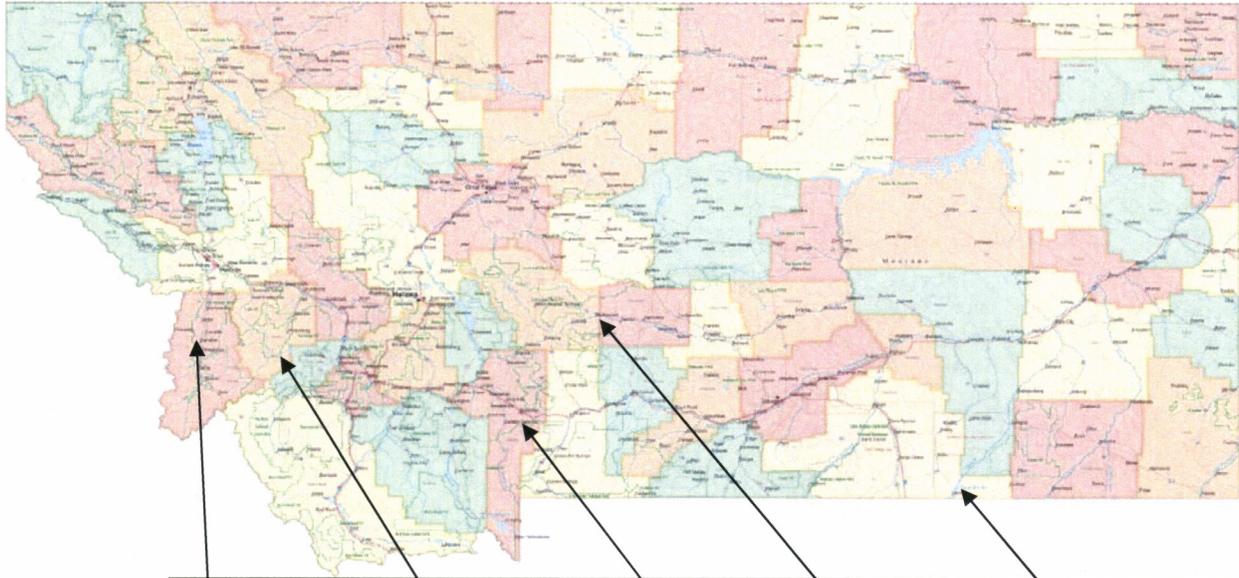
**Benefits:**

- The long-term public benefits, including enhanced public safety, and the preservation of critical irrigation and livestock-watering resources outweigh any minor, short-term, temporary and non-significant negative impacts.
- Failure to install the monitoring wells could potentially cause the risks to public health and safety to progressively increase over time.

**Grant funding will be used to contract with a well drilling firm(s) for drilling and installing ground water monitoring piezometers.**

<b>Proposed Project Budget</b>		
<b>Funding Source (grant/loan or cash reserves)</b>	<b>Amount</b>	<b>Fund Status</b>
RRGL Grant	\$95,580	Uncommitted
DNRC In-Kind Services	\$16,290	Committed
<b>Estimated Total Project Cost</b>	<b>\$111,870</b>	

**Location Map--Piezometer Installation Dam Sites**



Dam Site:	Fred Burr	East Fork	Middle Creek	Martinsdale	Tongue River
County:	Ravalli	Granite	Gallatin	Meagher & Wheatland	Big Horn

**Drilling and Piezometer Installation Details**

<i>Site</i>	<i>Boring Location</i>	<i>Drill Depth</i>	<i>Piezometer Depth</i>	<i>Reason</i>
East Fork	Left side on crest	1 @ 130 feet	one deep & one shallow	Determine geology on left side below embankment materials. Fill in coverage gap. Monitor left side seepage.
	Left Groin	1 @ 70 feet		
Fred Burr	Crest and Toe	5 @ 50-foot 2 @ 20-foot	at bedrock contact	No piezometers at site. Potential subsurface material movement.
Martinsdale North	Left Groin	1 @ 50 feet	at bedrock contact	Determine bedrock depth in left & right groins, monitor seepage in groin, and fill in coverage gap DS of seepage.
	Right Groin	2 @ 40 feet	1 in outlet channel & 1 US of right MH	
Martinsdale East	DS toe area, left of the spillway	1 @ 20 feet	at bedrock contact	Monitor above seepage areas in toe area. Fill in coverage gap.
Middle Creek	Upper right groin	1 @ 130 feet	at bedrock contact	Determine geology in right groin area, Fill in coverage gap.
	Lower right groin	1 @ 50 feet	at groundwater table	Determine geology in lower right groin area, Fill in coverage gap.
	Lower left groin	1 @ 60 feet	at groundwater table	Determine geology, Fill in coverage gap.
	Middle left groin	1 @ 100 feet		Determine geology, Fill in coverage gap.
Toe area left center of dam	1 @ 60 feet		Determine geology, monitor area below erratic wells	
Tongue River	Former Void Area	2 @ 50 feet	at bedrock contact	Replace DH-408 and 409.
	DS of former void area	2 @ 50 feet		Determine flow patterns between spillways; monitor DS former void area.
	L of primary spillway near gatehouse	1 @ 50 feet		Replace erratic reading piezometer, monitor flow at bedrock contact.