Story Mill Narrative Description for Future Fisheries Grant Application

Within the Story Mill Community Park project area the East Gallatin River is a perennial stream generally classified as a C4 stream type under the Rosgen stream classification system (Table 1); which equates to the Montgomery-Buffington Pool-Riffle channel class. Within the Triangle Parcel where the majority of the proposed work would occur, the East Gallatin River is classified as a Rosgen F3 stream type (Table 1). Note that existing dimensions of the East Gallatin River stream channel and substrate are provided in Table 1 for the four cross-sections completed for this project. The D_{50} for bed materials found within the Triangle Parcel is 72 mm (Table 1), which corresponds to a small cobble substrate size. The slope (0.76%) found in this reach is the steepest of the four cross-sections.

Table 1. Summary information for the East Gallatin River within the Story Mill Project Area. Bozeman, Montana.

Cross-section ID	Bankfull Channel Width (Feet)	Cross-sectional Area	Width / Depth Ratio	Slope (Percent)	Riffle Pebble Count D_{50} (mm)	Existing Rosgen Stream Type
North Parcel (101)	34.2	58.9	19.9	0.52%	51	C4
South Parcel (102)	41.3	57.0	30.2	0.42%	68	C3
South Parcel (103)	45.9	66.1	31.9	0.54%	40	C4
Triangle Parcel (104)	**29.3**	**53.2**	**16.2**	**0.76%**	**72**	**F3**

Causes of Existing Impairments

The East Gallatin River has been manipulated for agricultural, commercial, and residential purposes since white settlement in the Gallatin Valley. The area of the East Gallatin River upstream of the Story Mill Spur Trail crossing (i.e., the Triangle Parcel) was historically channelized and has become entrenched due to its increased slope/decreased sinuosity, and from fill placement in the adjacent floodplains. The channel on the Triangle Parcel has also been locked in place by a long stretch of concrete block type riprap along river right at the car shed (see attached photos). The railroad bridge and the bridge to the old slaughterhouse create hard constriction points to the river and its associated floodplain. Much of this reach is also dominated by invasive vegetation such as tansy and reed canarygrass.

Beyond the Triangle Parcel, but within the Story Mill project area, there has been a substantial amount of man-made debris (e.g., concrete rubble) used to stabilize East Gallatin River streambanks (see attached photographs). This material prevents or disrupts the natural erosion/deposition processes needed for the establishment and maintenance of aquatic habitat features important to fish.

Restoration Actions

The Story Mill project will address several of the existing impairments listed above that are relevant to the Future Fisheries grant program. For example, the project is designed to alleviate channelized conditions by removing fill from the left and right floodplain areas at the estimated 2-year flood elevation and by creating a reconstructed bank on river right. These areas would be seeded with a native wetland and riparian seed mixes and planted with native willows which will increase overhead cover and shading and improve native vegetative diversity in these areas. Removal of the bridges and re-meandering of the stream are currently not feasible from a cost or from an administrative standpoint for the railroad bridge.

Restoration of natural stream process will be accomplished through the removal of the man-made trash and debris from the streambanks and from the channel bottom on all three parcels. Removal of debris from most of the right bank along the South Parcel will not be completed since that bank is private property and is not included in the Story Mill project area.

Estimates of Design Discharges for the East Gallatin River

The bankfull bench on the right bank of the Triangle Parcel and the restored floodplain surface on the Triangle Parcel are being developed to be activated during the 2-year flood event. The 2-year flood event was determined based on two different methods – the gage transfer method and regression equations, both of which are described in Water Resources Investigation Report (WRIR) 03-4308 (Parrett and Johnson 2004). The results of these analyses are provided in Table 2. As shown, the two different methods provided very similar results for the predicted 2-year flood event, increasing our confidence in the estimate.

Table 2. Peak flow estimates for USGS gage #060480000, transfer of those results to East Gallatin River just upstream of Bozeman Creek, and results generated by regression equations for East Gallatin River just upstream of Bozeman Creek.

Peak Flow Recurrence Interval (yrs)	USGS 060480000* (cfs)	East Gallatin River just upstream of Bozeman Creek (Gage Transfer) (cfs)	East Gallatin River just upstream of Bozeman Creek (Regression Equation) (cfs)
2	549	387	390
5	860	633	707
10	1,100	828	973
25	1,450	1,120	1,364
50	1,740	1,360	1,689
100	2,050	1,620	2,040
200	2,400	1,920	2,410
500	2,910	2,360	2,950

*source: WRIR 03-4308. USGS 060480000 is a retired gage.

A reference reach is not being used because the channel is not being realigned. The proposed work will occur along the existing banks, channel and floodplain areas of the East Gallatin River.

Proposed and Future Land Use Activities

The three parcels that make up the Story Mill project area are being transformed into a community park in partnership with the City of Bozeman. Along the river the vegetation will remain intact and improved through control of noxious weeds and diversifying the plant communities through seeding and willow cuttings. Future land uses within the community park that occur near the East Gallatin River will consist primarily of recreational use such as walking, biking, and birding. Public access points to the river will also be developed, facilitating opportunities for fishing, wading, and outdoor education.

References Cited

Parrett, Charles and Johnson, D.R., 2004. Methods for Estimating Flood Frequency in Montana Based on Data through Water Year 1998: U.S. Geological Survey (USGS) Water-Resources Investigations Report (WRIR) 03-4308.

East Gallatin River – Photographs of Existing Conditions

Facing downstream at the floodplain encroachment by fill and car garage. (April 2014)

Facing downstream at the incised channel below the car garage on the Triangle Parcel. (July 2013)

Facing south, upstream at the area behind the car garage - note tansy in foreground. (July 2013)

Fill material dominated by weed species on the left bank floodplain of the Triangle Parcel. (April 2014)

Facing downstream at East Gallatin River cross-section 104 on the Triangle Parcel. (July 2013)

Facing east from left bank at cross-section 104 on the Triangle Parcel. (July 2013)

NOTE: We do not have a photograph specifically depicting a ruler next to a substrate particle, but several of the photographs in this series do show the substrate adjacent to other items useful for scale (e.g., people, survey rod, etc.). In addition, we did complete pebble counts and have provided the median particle size information (D_{50}) for each cross-section we completed on the East Gallatin River.

Facing west from right bank at cross-section 104 on the Triangle Parcel. (July 2013)

Right bank at cross-section 104 on the Triangle Parcel. (July 2013)

Concrete rubble on the right bank at cross-section 104 on the Triangle Parcel. (July 2013)

Surveying longitudinal profile in the East Gallatin River on the Triangle Parcel. (July 2013)

Facing downstream at concrete rubble in the channel of the East Gallatin River on the South Parcel. (July 2013)

Facing upstream, example of concrete rubble used for bank stabilization along the East Gallatin River on the North Parcel. (April 2014)

Concrete rubble used for bank stabilization along the East Gallatin River on the North Parcel. (July 2013)

Facing downstream at East Gallatin River cross-section 101 on the North Parcel. (July 2013)

Facing toward right bank at East Gallatin River cross-section 102 on the South Parcel. (July 2013)

Facing downstream at East Gallatin River cross-section 103 on the South Parcel. (July 2013)