Appendix D. Restored Floodplain Velocity Case Study Analysis

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MEMORANDUM

To: David Wood, Tom Schueler

From: Jason Coleman, Drew Altland

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Subject: Restored Floodplain Velocity Case Study Analysis

RK&K performed an analysis to evaluate the velocity of 2 feet per second (ft/s) as an upper limit velocity for floodplain treatment above one foot of depth. Five floodplain restoration sites were evaluated hydraulically using HEC-RAS to estimate velocities at different depths in the restored condition. All sites used for this analysis removed legacy sediment to restore the floodplains and incorporate a small baseflow sized channel that accesses the restored floodplain area during most runoff events.

A range of discharges were entered into the model to produce a rating curve of depth versus velocity at each modeled cross section. Therefore, the discharges don't necessarily represent a yearly return interval. One cross section for each project reach was selected to assess the reach-wide representative depth and velocity. For each project comparisons are provided for the average floodplain velocity at 1' of depth, 3' of depth, and at the depth produced by the 100-year discharge. The results are summarized in the following table:

Project	Valley Slope	Ave. FP Velocity @ 1' Depth (ft/s)	Ave. FP Velocity @ 3' Depth (ft/s)	Ave. FP Velocity @ 100-Year Depth (ft/s)	Notes	Recommended Treatment Depth (ft)
Israel Creek	0.21 %	0.41	0.84	2.31	3' depth occurs at ~1-yr discharge	3'
Furnace Creek	0.40 %	1.33	2.65	2.79	3' depth is between 50- and 100-yr discharges	~2'
Bens Branch	1.10 %	1.60	3.35	4.07	3' depth occurs at ~25 yr discharge	~1.5'
Talbot Branch Trib	1.50 %	2.45	n/a	2.72	100-year depth is ~1.3'	1'
Piscataway Creek Trib	6.00 %	n/a	n/a	2.93	100-year depth is ~0.5'	1'

All sites analyzed used a floodplain Manning's n roughness of 0.07 in the floodplain and 0.035 in the channel. Therefore, the velocity is primarily dependent on valley slope and depth. The floodplains with steeper slopes, such as the Talbot Branch Trib and Piscataway Creek Trib case studies, often produce higher velocities that exceed 2 ft/s. However, since these streams have smaller watersheds, the flow depths, even at the 100-year discharge, are minimal. In these conditions, it is expected that the filtering in the floodplain is enhanced due to the shallow flood depths and the increased contact with vegetation. As the valley slopes decreased, velocities generally decrease, and depth increases. As the velocity decreases, increased sediment trapping occurs along with the filtering.

Based on this case study analysis, the floodplain treatment to one foot of depth seems to be a reasonable default depth for all projects. Additionally, floodplain treatment up to three feet of depth also seems reasonable in settings where the energy slope is low and additional trapping can occur. The threshold of 2 ft/s seems to be a reasonable upper limit for velocity based on this case study analysis and observed deposition and filtering at these case study sites that have been constructed.