Received from SFCJPA on July 1, 2014

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From: A.L. Riley
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cc: memo to file
Date: June 13, 2014

Subject: Review of modeling received on June 6 and related questions – *SFCJPA Responses in Red*

We have reviewed the modeling for Alternatives 1-4 from June 5, 2014 deliverable, as well as Alternative (Alt) 4+ provided by HDR on June 6, 2014.

Our first observation is that the degrading of the levee in the mudflats at the outer Faber Tract (or SF Bay levee degrade) and the setback levee alternatives have substantial benefit for lowering water surface elevations (WSEs) for a long distance upstream, even upstream of Highway 101. We are attaching a profile from the model that illustrates the WSEs (Attachment A). The attached profile uses data from the model labeled "large setback" and "larger setback". These terms are not clearly defined.

We cannot recreate these same results, as provided as part of this memo, using the June 6 HEC-RAS model. That supersedes results from the June 5 HEC-RAS model, which allowed overtopping into the Faber Tract and may have been used to develop the attached figure. Another possibility is that results for a lower flood event other than the 100-year event may have been used. Either of these possibilities overestimates the benefit of setback alignments currently being evaluated. Since overtopping into the Faber Tract will not be permitted, the June 5 HEC-RAS model should not be used moving forward; only the June 6 HEC-RAS model should be used.

When evaluating WSE profiles from the June 6 HEC-RAS model, there are limited water surface elevation benefits for Alt 4 (larger setback)—a 1 foot decrease around the Friendship Bridge—and the benefits gradually decrease as you travel upstream towards Hwy 101. Alt 4 (larger setback) does cause a WSE increase adjacent to the downstream lowest spot in the Faber Tract levee when compared to Alts 2 and 3. This rise is due to the severe pinching in of the channel back down to the existing channel width near station 14+00. See Figure 1 profile for results for Alts 2, 3, and 4 at 9,400 cfs at 7.1' as requested by RWQCB staff.

The description of geometry files and plans are not always clearly laid out in the "Description" section in the RAS and are not consistent between the two models. It is easy to lose track of different plans and combinations.

The Geometry "Description" could be updated to reflect a clearer description of the geometry. I concur that these are a bit out of date. However, the Plan "Description" provides a clear description of the overall model plan as described at the June 5th meeting among Regional Board, JPA, HDR and SCVWD staff as well as the model plan key that was provided at that meeting.

Therefore, we would like to request cross sections and WSEs for the stations used in the model from the vicinity of Friendship Bridge to the downstream stations for both Alt 3 and Alt 4 of June 5 and June 6 model runs.

It is understood that overtopping into the Faber Tract should not be permitted; therefore, Alt 4 of the June 5 model should not be considered. Cross sections and the WSEs can be provided for both Alt 3 and Alt 4 of the June 6 model only since the June 6 prevented all overtopping per the request of RWQCB.

Our main question relates to the setbacks shown in the model: how wide are these different setback assumptions (Alt 3, Alt 4, large setback, larger setback, etc.)?

Alt 3 (large setback) shifts the Palo Alto levee into the Palo Alto Municipal Golf Course approximately 50 feet more than the current 95% design, starting from the proposed Friendship Bridge Boardwalk abutment near station 28+00 and tying back into the existing levee alignment near station 14+00.

Alt 4 (larger setback) shifts the Palo Alto levee into the Palo Alto Municipal Golf Course approximately 150 feet more than the current 95% design, starting from upstream of Friendship Bridge near station 40+00 and tying back into the existing levee alignment near station 14+00.

The current 95% design proposed levee alignment already sets back the levee approximately 150 feet from the current levee alignment. Alts 3 and 4 setback widths of 50 feet and 150 feet, respectively, would be added onto the currently proposed 150 feet setback.

The SF Bay levee degrade and setting back the levees have a benefit throughout the entire reach except for a hydraulic jump at about 800 to 1,400 feet from the mouth of the San Francisquito Creek (see Attachment A). The model indicates that degrading the SF Bay levee is causing this hydraulic jump, not setting back the levee. One question is how do we smooth out the hydraulic jump at this location by running the model in the downstream area with a different regime of flow types (e.g., mixed flow as opposed to subcritical flow)?

The above statement is not correct. The model results (see Figure 1) do show that both Alt 3 (large setback) and Alt 4 (larger setback) cause the water surface increase, decrease, and increase due to sudden expansion and contraction from the proposed setback alignments, however, a hydraulic jump is not occurring. This can be verified by looking at the results of the HEC-RAS model, especially the Froude number, which remains below 1.0. The sudden cross section contraction caused WSE to rise and therefore cause the velocities to increase. Once flow gets past the contracted section, the water expands back out and velocities decrease causing the WSE to rise again. The current 95% design has a longer transition back to the existing levee alignment and thus has less short-term effects on the WSE. In order to potentially smooth out the varying WSEs, the setback alignment would need to begin transitioning back to the existing alignment farther upstream of station 14+00. This is an iterative process that is usually completed as part of development of the design. Changing the modeling method would not change the water surface profile results.

The other key question is how do we avoid the fill of the inner Faber Tract levee to reduce impacts to the inner Faber Tract marsh and the clapper rails?

In order to prevent flood flows into the Faber Tract as required by RWQCB, the levee will need to be built up with fill material to an established elevation and then sloped back down to the existing Faber Tract Marsh elevation. The higher the elevation of the Faber Tract levee is required, the larger the amount of fill to be placed in the Faber Tract marsh. To reduce impacts to the Faber Tract Marsh, the levee elevation should be set as low as permitted.

Selection of appropriate values for roughness is very significant to the accuracy of the computed WSEs. Use of a low roughness coefficient would underestimate WSEs. Currently the model runs were based on 0.03 as the roughness coefficient, which is a typical value used for modeling concrete channel. Per our earlier request to increase the roughness coefficient, please use a minimum of 0.05 for the modeling assumptions in order to get a functional riparian-marsh plain environment between the levees.

The above statement is not correct. Manning's n value 0.03 is for a typical earth channel with little or no vegetation. The common concrete channel Manning's n value is 0.015, not 0.03. Please see the standard range of Manning's n values as included in the HEC-RAS manual. A Manning's n value of 0.03 is used for the low flow channel while 0.038 is used for the overbanks.

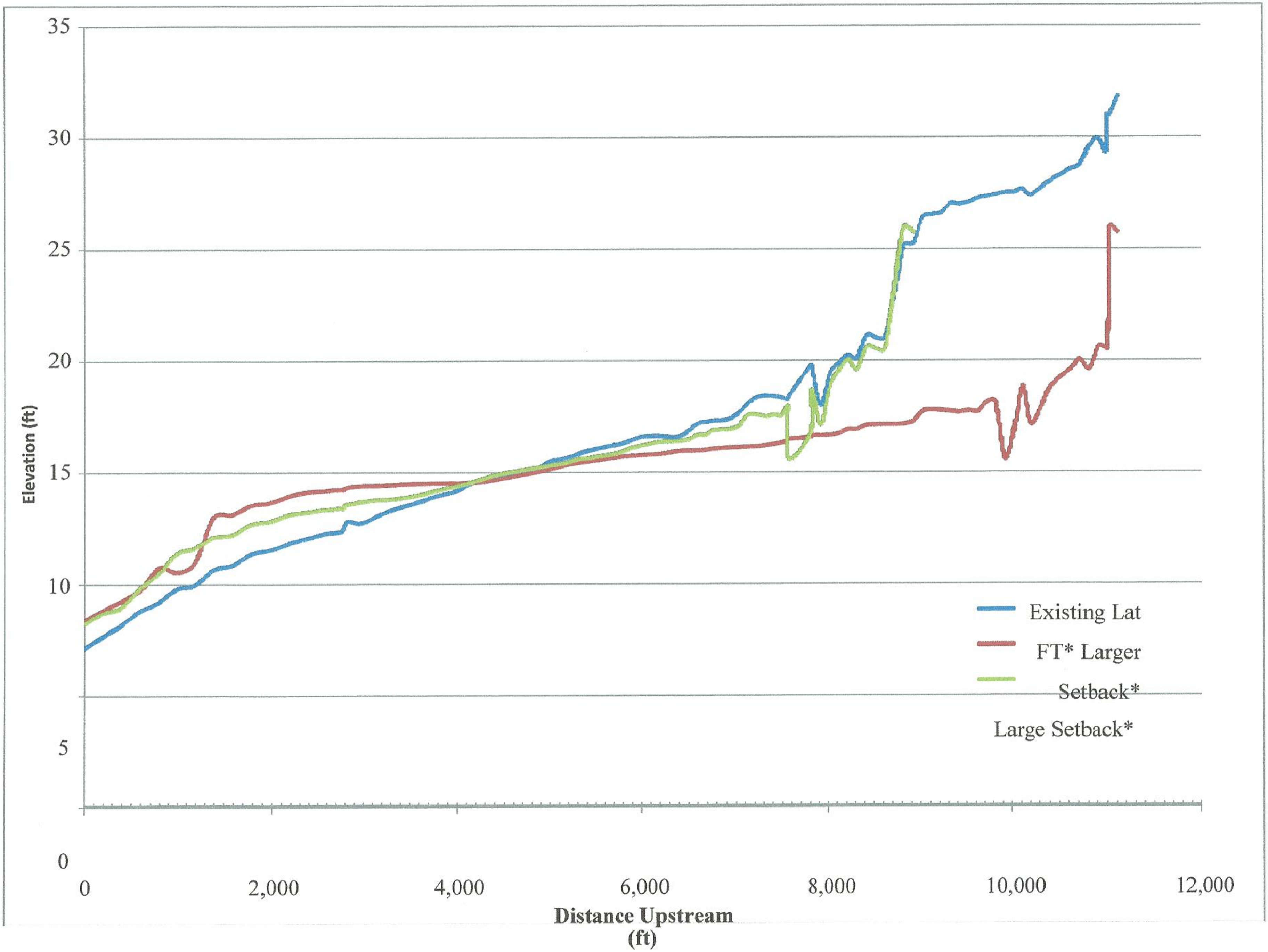
Another important consideration is that it is typical to use lower n values for high flood events, such as the 100-year event, because it is anticipated that the vegetation will lie down or be washed out when compared to a lower event where the vegetation behaves differently, causing a higher roughness. The purpose of this HEC-RAS model is to model the design condition, which is the 100-year event, and these n-values have been calculated appropriately for the conditions during that particular event.

We do not agree that the vegetation recommended as part of the current 95% design package will have a significant impact to the roughness during the 100-year design event.

We will be sharing the latest model and these questions with the CA Department of Fish and Wildlife hydraulic modeler.

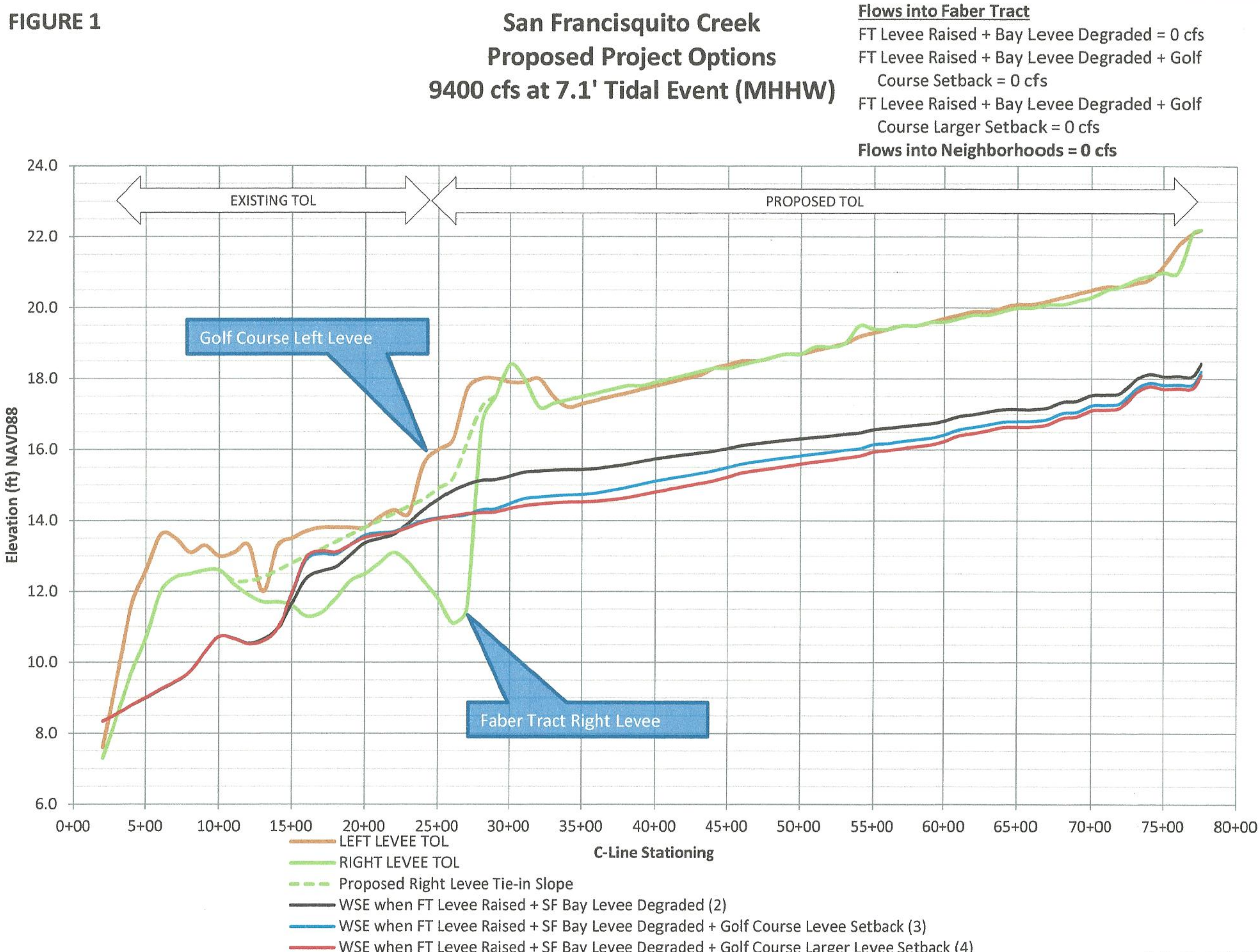
California Department of Fish and Wildlife do not have hydrologists on staff. If the RWQCB would like a third party opinion of the hydraulic modeling performed for the project and the determination of LEDPA, we recommend seeking that opinion from the US Army Corps of Engineers, the federal agency legally responsible for determining the LEDPA.

RWQCB generated profiles



* Plan names as extracted from HEC-RAS files provided by HDR

FIGURE 1



Submitted 6/6/14

HAESTAD METHODS

FLOODPLAIN MODELING USING HEC-RAS

First Edition

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Waterbury, CT USA

Table 5.7 Values of Manning's n for a variety of man-made and natural channels (cont.).

Type of Channel and Description	Minimum	Normal	Maximum
2. Random stone in mortar	0.017	0.020	0.024
3. Cement rubble masonry, plastered	0.016	0.020	0.024
4. Cement rubble masonry	0.020	0.025	0.030
5. Dry rubble or riprap	0.020	0.030	0.035
e. Gravel bottom with sides of			
1. Formed concrete	0.017	0.020	0.025
2. Random stone in mortar	0.020	0.023	0.026
3. Dry rubble or riprap	0.023	0.033	0.036
f. Brick			
1. Glazed	0.011	0.013	0.015
2. In cement mortar	0.012	0.015	0.018
g. Masonry			
1. Cemented rubble	0.017	0.025	0.030
2. Dry rubble	0.023	0.032	0.035
h. Dressed ashlar	0.013	0.015	0.017
i. Asphalt			
1. Smooth	0.013	0.013	
2. Rough	0.016	0.016	
j. Vegetal lining	0.030	...	0.500
C. Excavated or dredged			
a. Earth, straight and uniform			
1. Clean, recently completed	0.016	0.018	0.020
2. Clean, after weathering	0.018	0.022	0.025
3. Gravel, uniform section, clean	0.022	0.025	0.030
4. With short grass, few weeds	0.022	0.027	0.033
b. Earth, winding and sluggish			
1. No vegetation	0.023	0.025	0.030
2. Grass, some weeds	0.025	0.030	0.033
3. Dense weeds or aquatic plants in deep channels	0.030	0.035	0.040
4. Earth bottom and rubble sides	0.028	0.030	0.035
5. Stony bottom and weedy banks	0.025	0.035	0.040
6. Cobble bottom and clean sides	0.030	0.040	0.050
c. Dragline excavated or dredged			
1. No vegetation	0.025	0.028	0.033
2. Light brush on banks	0.035	0.050	0.060
d. Rock cuts			
1. Smooth and uniform	0.025	0.035	0.040
2. Jagged and irregular	0035	0.040	0.050
e. Channels not maintained, weeds and brush uncut			
1. Dense weeds, high as flow depth	0.050	0.080	0.120
2. Clean bottom, brush on sides	0.040	0.050	0.080
3. Same, highest stage of flow	0.045	0.070	0.110
4. Dense brush, high stage	0.080	0.100	0.140
D. Natural streams			
D-1. Minor streams (top width at flood stage < 100 ft)			
a. Streams on plain			
1. Clean, straight, full stage, no rifts or deep pools	0.025	0.030	0.033
2. Same as above, but more stones and weeds	0.030	0.035	0.040
3. Clean, winding, some pools and shoals	0.033	0.040	0.045
4. Same as above, but some weeds and stones	0.035	0.045	0.050
5. Same as above, lower stages, more ineffective slopes and sections	0.040	0.048	0.055
6. Same as 4. but more stones	0.045	0.050	0.060