Pacific Advanced Civil Engineering, Inc., "Newhall Ranch River Fluvial Study Phase 1, Final Draft" (March 2006; 2006a)

Newhall Ranch

River Fluvial Study

PHASE 1 | FINAL DRAFT

SANTA CLARA RIVER

Prepared for:

NEWHALL LAND
A LENNAR/LNR COMPANY

Prepared by:

PACE
PACIFIC ADVANCED CIVIL ENGINEERING, INC.

March 9, 2006 Revised
December 9, 2005 Revised
September 19, 2005 Revised
July14, 2005
#8197E

PACIFIC ADVANCED CIVIL ENGINEERING, INC.

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March 6, 2006

Ben Willardson
LACDPW
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900 South Fremont, 3rd Floor
Alhambra, CA 91803
(626) 458-6117

Re: Santa Clara River Fluvial Study, January 2006 #8197E

Dear Mr. Willardson;

Pacific Advanced Civil Engineering, Inc. (PACE) is pleased to provide the following responses to the Los Angeles County Department of Public Works for the above-referenced project. The responses from PACE are as follows:

General Comments

1. *The HEC-RAS models approved by the separate hydraulic model review should be the only models used in this study. The only exception will be the data used for SAM, which is converted from the approved HEC-RAS data. The SAM data however must also be based on the approved HEC-RAS models. The calculations should be carried consistently through all tables, charts, text, and figures. All referenced models should be included in the report and on the CD in Appendix 4.3. The models must include the Existing and Proposed Conditions for the n=0.025 and n=0.085 models using the Capital Flood in the mixed flow regime. The two-year Proposed Condition, n=0.085 should also be included in the report and CD to verify the bottom width column of Appendix Ch 6.2.*

   PACE Response:
   Calculations in the present draft of the report are based on the approved HEC-RAS model. SAM numerical modeling is converted from the approved model. All models utilized in this report are included in the CD-ROM in the Appendix.

2. *All relevant general comments from the Castaic Creek review that affect the body of text need to be included in the Santa Clara River report.*

   PACE Response:
   Comments from the previously reviewed Castaic Creek First Phase Fluvial Study were reviewed and comments that pertained to the present report were included here.

Technical Comments

1. *PACE response to Comment 3 from the previous review, no changes were observed in the text on page 2. The comment still applies. All of the other previous comments have been adequately addressed.*

   PACE Response:
   The text has been updated to include the previous response.

2. *Page ii, the third sentence of the second paragraph states that the 2004 Sikand study relied on previous work conducted by SLA. PACE response to previous Comment 4 states that the "HEC-6 Sediment Transport Analysis..." was conducted by Sikand not SLA. Then in Section 2.1 the last sentence of the first paragraph states that the [2004] Sikand study relied on previous work conducted by Sikand. Rectify the apparent discrepancy.*

   PACE Response:
   The text has been updated to adequately differentiate the Sikand and SLA studies.

3. *Page ii, the ninth line of the third paragraph states that the average D50 value for all the SCR samples was 1.12 mm. This is not correct, the average of the D50 values is 1.18 for the 18 SCR samples or 1.09 mm for all 23 samples. According to Figure 3.2B the D50 of the average gradation is more like 0.79 mm by observation. Please note that an average of the individual D50 values will not give a valid D50 for the average gradation. The average of individual D50's and the D50 of the average gradation do not represent the same value. Calculating the D50 of the average gradation requires a geometric mean since the values are averaged on a logarithmic scale.*

   PACE Response:
   Based on conversations with LACDPW personnel (B. Willardson, February 22, 2006) Geometric mean calculations were determined not to be the appropriate method for determining average D_{50} values. In previous versions of this report, D_{50} was determined by averaging the values provided by Seward Engineering Geology. In this draft of the report, D_{50} is read directly from the semi-log plots presented in Chapter 3. The values in the text and tables have been updated to reflect change in methodology. It is important to note that the change in values was small in every case and did not require changing the transport function selected to determine transport potential.

4. *Page iii, the thirteenth line of the second paragraph states that the County approved the Sikand project. As stated previously, the County did not approve the Sikand project and models. The models have been significantly altered by PACE and are under final review for approval.*

   PACE Response:
   The text has been updated as per instructions given in the Castaic Creek Fluvial Study Phase 1 Final Draft.

5. *Page 4, last sentence of the first paragraph, clarify according to Comment 2 above.*

PACE Response:
The text has been updated to adequately differentiate the Sikand and SLA studies.

6. *Page 7, Table 3.1, update the D50 values according to Comment 3 above. According to the SAM output data the D50 values for the reaches are as follows: A,B 0.523; C 0.976; D 1.042; E 1.072. Also add another column called "Used for SAM Reach" that will show for which reach the sediment data was applied to in the SAM analysis.*

PACE Response:
The D_{50} values have been updated based upon the response to Comment 3. Additionally, Table 3.1 indicates the reaches where the respective gradation data is applied.

7. *Page 17, Table 4.3, SRB2, for Delta (ft) does not add up, see General Comment 4 above.*

PACE Response:
The table has been updated to resolve any round-off issues. Please see response to general Comment 4.

8. *Page 19, Table 4.4, the 1/11/06 submittal did not include any of the recent changes in calculations either for SAM on 1/6/06 or EC n=0.025 on 1/11/06. Update Existing Conditions LACH&SM column according to changes submitted on 1/11/06. Update SAM columns according to changes submitted on 1/6/06.*

PACE Response:
The table has been updated according to the latest SAM data.

9. *Page 21, Tables 5.1A-B, include the 1963 Area in the 1947 column with footnote for SRA1 according to previous discussions.*

PACE Response:
The table has been updated to reflect this comment.

10. *Page 22, eighth line of the first paragraph, replace "overbanks" with "sides" or similar wording because the left bank is 35' high and cannot be overtopped. Also add discussion about the loss of significant bank material in 2005 of the Magic Mountain parking area as shown in Figure 5.2A (150' lateral migration). If there is other bank armoring besides the treatment plant, please add the information.*

PACE Response:
Based on phone conversations with LACDPW (B. Willardson, February 22, 2006) the developed area is now referred to as banks. Additional information is provided discussing the loss of parking area at the theme park.

11. *Page 23, first sentence of the second paragraph, the "spike at station 200" is not evident to the reviewer. Please add more discussion to clarify.*

PACE Response:
A spike in the1999 topography is present from station 200 to station 300. Because the spike is in the 1999 topography, the reference has been removed. As noted in personal communication with County personnel (B. Willardson, February 22, 2006) the radar sampling technique used in creating the 1999 topography has difficulty in discerning the difference between dense woody brush and solid ground. The feature addressed in this comment, as well as similar comments, are a result of the surveying technique. The text has been updated in several locations to address where dense vegetation has been misinterpreted in the sampling.

12. *Page 23, the fourteenth line of the second paragraph states that the poor quality of the 1930 topography "renders a direct comparison difficult." If the topography is too poor to make a comparison it should not be included. If it does contribute some value, then the inaccuracies or shortcomings must be discussed further to show the reader what confidence is given to the data. This is true for any questionable data.*

PACE Response:
This data is included in the report based on a previous request by the County to include the complete record. Based on personal commutation with County personnel (B. Willardson, February 22, 2006) the text has been updated to improve readability.

13. *Page 24, second paragraph, discuss the presence of berms in the 2004 and 2005 data and the problems with the 1930 data for section 23000. More discussion is needed on how the canyon tributaries "may have played a role."*

PACE Response:
The text has been updated to the following:

> **Sections 23000 (SRC4) and 20845 (SRD1) are the first historically aggradational sections analyzed (Figure 5.2J and 5.2K, respectively). Section 23000 is adjacent to the Chiquito Canyon Creek and Long Canyon Creek tributaries at the west end of the proposed Landmark development and between two historic agricultural production areas. Section 20845 is downstream of the proposed Landmark site and the left overbank has historically been used for agriculture. Both banks of section 20885 are tree-lined. Both sections are relatively wide and straight with braided channel beds. Both sections have aggraded over the period of historic record: 1.9 and 1.4 feet, respectively. In the most recent short term, however, section 23000 has aggraded 0.7 feet while section 20845 has degraded 0.5 feet. Section 23000 shows some incising below the 1930 historical bed although the average bed elevation is higher now than in the past. The dominant change in bed elevation between 2004 and 2005 at section 20845 occurred to the left of station 2600, while**

the remaining portion remained stable. It is not clear why this occurred, although agricultural practices or high discharges from the Chiquito and Long tributaries may have played a role. Agricultural practices may have stabilized the bank position and height while the creeks may influence the bed by discharging high volumes of water and sediments that have the dual ability to erode or deposit at this location. It should be noted that the topographic artifact between station 2600 and 3000 in the 1999 topography is a function of topographic sampling. As noted above, the dense brush in this and other woody sections may make the topography appear to be at a higher elevation than is actually present and results from the aerial survey technology used to create the topography.

14. *Page 24, last sentence of the second paragraph, the large inaccuracy in the 1999 data for section 20845 cannot be left as-is and explained only as a function of topographic conversion. This data appears inconsistent with the cross-section used in the HEC-RAS analysis. Similar to Comment 12 above, if the data is bad it should be thrown out or fixed. If it is good, the presence of this mound only in the 1999 topography needs to be explained. If an assumed cross-section was used it should be explained why this value should be accepted as reliable.*

PACE Response:
The text has been updated to reflect this comment. Please see response to Comment 13.

15. *Page 24, third paragraph, more discussion is needed on the four cross-sections. Section 14315 appears very active over the period of record. Sections 16305 &12195 both show a 1.1 foot average degradation between 2004 and 2005 as mentioned; only two other subreaches degrade more. The first sentence makes it sound like the general trend is for an inactive area, but it is observed to have pretty dramatic oscillations and rearrangements of sediment up to 8-feet plus of elevation difference. Mention should also be made of the diversion through sections 16305 and 14315 to the north near the 126 highway.*

PACE Response:
The text has been updated to the following:

Sections 18650 (SRD2), 16305 (SRD3), 14315 (SRE1), and 12195 (SRE2) all exhibit very mild long-term degradation (one foot or less) between 1947 and 2005 (Table 5.1). Additionally, short-term adjustment for all of these sections ranges between -0.6 and -1.2 feet between 2004 and 2005. Sections 16305 and 12195 exhibit 1.2 and 1.1 feet of degradation, respectively, and are among the five highest single season changes in bed elevation of the sections examined. Sections in SRA3 and SRB1 degrade significantly more with -2.3 and -1.7 feet, respectively. All of the sections from 18650 to 12195 are recovering from the 1928 dam break event, the sections low elevations, and all sections exhibit oscillations in bed elevation over the historic record (Figure 5.2L though 5.2O, respectively). These sections have in common a relatively wide, straight and braided bed. Grande Canyon Creek and Potrero Canyon Creek confluence with the River at near section 17000. The influence of the confluences is not immediately evident but may include some of the observed fluctuations in bed elevation as well as affecting the wide historic meandering

between the north and south bank (Figure 5.1). The observed features in the 1999 and 2004 topographies in section 16305 at stations 425 and 850 appear to be the south and north low-flow banks, respectively. Several of the features in the 1999 bed at section 14315 appear to correlate to the presence of vegetation on the bank and relate to surveying methodology, as noted above.

16. Figure 5.2B, add more discussion of the 800' of bank migration from 1963 to1999.

PACE Response:
The text has been updated to the following:

Section 42215 (SRA2) appears to have greatly down cut and widened since 1947, degrading an average 8.1 feet along the section. Some of the observed long-term change may be related to the presence of the theme park and water treatment facility on the bank at this location. In recent years (1999-2005), the creek appears to have become relatively stable: area has increased from 17946 to 17101 over the period (Figure 5.2B). The River is relatively wide at this location although a bend is present. Development has occurred on both banks with agricultural development on the north bank and the Magic Mountain theme park on the south bank. Historical development may have led to the observed degradation, although at present the bed appears to be stable or degrading only slightly. The impacts of woody vegetation in this section may have played a role in the recent degradation. Finally, the 2004-2005 winter was very wet and high flows were present on the River. During the heavy storms of December 2004 and January 2005, approximately 4.4 acres of the south bank was lost to the Santa Clara River. Some of the single-season degradation may possibly be attributed to this event. The features located at station 775 and 1325 in the 1999 topography are expected to be related the aerial surveying methodology, as noted above.

17. Figure 5.2C, discuss the apparent berms/hills at stations 775 and 1325 in the 1999 topography, and the movement of the thalweg adjacent to the south bank.

PACE Response:
The text has been updated to the following:

Similar to the other sections in Reach A, section 40825 (SRA3) is also degrading. The section has degraded 5.2 feet on average over the period of record (Table 5.1B). The 1963 data is insufficient in this section as indicated by the flat portions of the section, although the other years sufficiently indicate the trend. The 2005 thalweg is at the approximate elevation of the 1930 thalweg, although the present channel is more incised than the historic channel. The presently observed channel widening may possibly be attributed to recent high discharges, and migration of the channel may be related to these discharges. Features in the 1999 topography at stations 775 and 1325 are expected to be related to the aerial surveying methodology, as noted above.

18. *Figure 5.2E, correct the stationing between 0 and 200. Include discussion of any existing bank stabilization for the trailer park in this reach.*

    PACE Response:
    The figure has been updated to reflect this comment.

19. *Figure 5.2J, show assumptions for the northwest bank on all data sets. If there is a defined bank beyond the limit of the viewport expand the view to include it. The area for 2004 should end at the berm at station 1325, if there is a reason for not doing this state it, similarly with the berm in the 2005 data. The 1930 data does not show a thalweg, it continues to decline out–of-sight. It needs to be removed if the data is bad.*

    PACE Response:
    The viewport has been expanded to show a greater portion of the section.

20. *Figure 5.2M, discuss apparent berms in 1999 and 2004 data at stations 425 and 850.*

    PACE Response:
    The text has been updated to reflect this comment. Please see response to Comment 13.

21. *Figure 5.2N, discuss large migrations and sediment depositions according to Comment 14 above.*

    PACE Response:
    The text has been updated to reflect this comment. Please see response to Comment 13.

22. *Figure 5.2P, discuss the apparent berms in the 1999 and 2004 data at station 625.*

    PACE Response:
    The text has been updated to reflect this comment.

23. *Page 27, the twenty-fifth line makes a comparison between the existing and proposed conditions for total adjustment. This needs to be presented in tabular format as a new table or an addition to 7.1B & D.*

    PACE Response:
    As per personal communication with County personnel (B. Willardson, March 3, 2006) a reference has been added to refer to Appendix 6.1 and Table 8.

24. *Page 30-32, Tables 7.2A-D, add another column to show the difference between the two methodologies, a negative value corresponding to LACH&SM governance.*

PACE Response:
The table has been updated to reflect this comment.

25. *Page 30, second to last line, clarify the "existing" minimum bed elevation. It is assumed this is not the "Existing Conditions" bed which is based on the 1999 topography, but rather the 2005 topography.*

PACE Response:
The text has been updated to reflect this comment.

26. *Figures 7.2A-D, currently the downstream end of the toe-down elevation data is shown as ascending to meet the model bed at the county line. Since Newhall Ranch is responsible for levees all the way to the county line, the toe-down should continue at the depth of the final cross section and parallel to the model bed.*

PACE Response:
The figure has been updated to reflect this comment.

27. *Figures 7.3A-D, the 1999 minimum model bed does not match the same for Figures 7.2A-D near section 31000. Also, change to design toe-down as discussed in the January meeting.*

PACE Response:
Both figures employ the same data to create the model bed representation. The line types have been changed in an attempt to have the figures represent the bed data in a more uniform manner.

28. *Page 34-35, section 8, update section as previously discussed to include the more conservative method between the LACFCDDM and the LACH&SM with SAM calculations for general scour. Also include a new figure in Section 8 similar to Figure 7.3 that will show the most conservative toe-down, the 1999 minimum (model bed) and the 2005 minimum bed elevations.*

PACE Response:
The text has been updated so that the deeper of the LACFCDDM and the LACH&SM methodologies is used for total toe-down.

29. *Table 8, update toe-down depths and elevations to show the hydrology manual standard practice, including the LACFCDDM. This change is in accordance with discussions at Public Works between PACE, the County, and Newhall Land. Also as discussed move the old version to the appendices. The new Table 8 will be used to check levee elevations during the Tentative Tract Map review and possibly final design, depending on the Phase 2 study.*

PACE Response:
The table has been updated to reflect discussions between the County, PACE and Newhall Land.

Formatting Comments

1. *The memorandum should be proof-read for typographic errors that were not caught by this review.*

   PACE Response:
   Additional proof-reading has been completed for the text, tables and figures.

2. *Many small errors were observed in the tables, apparently as a result of rounding decimals not shown in the table. For example 13.1 – 5.1 = 8.1. As previously discussed with Ben Willardson of the County, figures should be truncated to the level of confidence. If the data is only good to the nearest tenth, then any calculations done with that data can only be good to the nearest tenth (and maybe less). All tables should be corrected to calculate and show significant figures. All values in a table should be consistently rounded to the same decimal place.*

   PACE Response:
   In previous drafts of this report, all tables used the appropriate number of decimal places. In the present draft, the tables have been edited to remove any rounding errors.

3. *Verify the measurement scale of all maps, even reduced maps must have a scale corrected for the reduction factor.*

   PACE Response:
   Previous map scales were applied correctly; however, some maps were printed at half scale. The present drafts include scales based on the print size.

4. *Where references are made to an appendix, use the full appendix designation. For example Appendix Chapter 3.2 not Appendix Chapter 3.*

   PACE Response:
   Appendix references have been updated.

5. *Fully justify the whole body of text.*

   PACE Response:
   The formatting of the report has been updated to reflect this comment.

6. *Figure 1, the Q_{cap} labels are of the old LADPW flow rate. Revise to show the new flow rates used to develop the mapped floodplain. (This error was also observed in the HEC-RAS study map).*

   PACE Response:
   The figure has been updated to reflect this comment.

7. *Page iii, a typo in the first line of the third paragraph, delete "form."*

   PACE Response:
   The formatting of the report has been updated to reflect this comment.

8. *Page iii, a typo in the third line of the fourth paragraph, delete "presented in," which occurs twice.*

   PACE Response:
   The formatting of the report has been updated to reflect this comment.

9. *Page iv, first through third lines of the page, all of the maximum and minimum adjustment values need to be updated to reflect changes in their respective tables (8 values in total).*

   PACE Response:
   The formatting of the report has been updated to reflect this comment.

10. *Page iv, fifth line of the second paragraph states that all of the cross sectional areas were used to calculate the average change in bed elevation over time. In fact, only the 1947, 2004 and 2005 areas were analyzed and only the 1947 and 2005 data were used to determine the long-term degradation.*

    PACE Response:
    The text has been updated to reflect this comment.

11. *Page v, the first paragraph lists the components of other scour but then presents the data in a confusing manner. Rearrange the sentences to follow the order that the subcategories are listed in. Include the results for the bend scour in existing conditions. Update the maximum value for bed form height to be consistent with the calculated values in Appendix 6.*

    PACE Response:
    The text has been updated to reflect this comment.

12. *Page v, last line of the first paragraph, replace "creek crossings" with "river crossings."*

    PACE Response:
    The text has been updated to reflect this comment.

13. *Page v, a typo in the second line of the second paragraph, "LACH&SM" is misspelled.*

    PACE Response:
    The text has been updated to reflect this comment.

14. Page v, sixth through ninth lines of the second paragraph, reports the findings of the general bed adjustment. These figures need to be corrected for updates to Tables 7.2 A-D (8 values in total).

PACE Response:
The text has been updated to reflect this comment.

15. Page v, a typo in the tenth line of the third paragraph, "adjustment" is misspelled.

PACE Response:
The text has been updated to reflect this comment.

16. Page v, third sentence of the third paragraph, state whether the referenced calculations for SRC2 are proposed or existing conditions.

PACE Response:
The text has been updated to reflect this comment.

17. Page v, fifth line of the last paragraph, the freeboard values need to be corrected for updates to Tables 7.3A-D.

PACE Response:
The text has been updated to reflect this comment.

18. Page vi, third line, the toe-down values need to be corrected for updates to table 8.

PACE Response:
The text has been updated to reflect this comment.

19. Figure 1.1, clarify the subreach boundaries graphically, especially at the end of SRE3, the beginning of SRA1, and the SRA1/SRA2 interface. Use "SRA1" labels in place of "RA1." Graphically depict which cross-sections were used in the long term analysis. Graphically depict which cross sections were used in the SAM analysis. Show approximate locations of sediment samples. Fix the scale.

PACE Response:
The figure has been updated to reflect this comment. Also, please see response to formatting Comment 3.

20. Page 4, first sentence of the second paragraph, spell out "Simons, Li and Associates", (SLA).

PACE Response:
The text has been updated to reflect this comment.

21. *Page 4, a typo in the second sentence of the second paragraph, should read "quantitative ~~and~~ analysis."*

PACE Response:
The text has been updated to reflect this comment.

22. *Page 5, delete last line of the first paragraph, "The text has been updated to reflect this."*

PACE Response:
The text has been updated to reflect this comment.

23. *Page 7, second line of the second paragraph, 18 samples were collected on the river and 23 total including the tributaries. Correct the text which says "17 samples."*

PACE Response:
The text has been updated to reflect this comment.

24. *Page 7, Table 3.1, the first station should read "37135 ~~8~~".*

PACE Response:
The text has been updated to reflect this comment.

25. *Page 8, second paragraph, update all D50 values according to Technical Comment 3 above.*

PACE Response:
The text has been updated to reflect this comment.

26. *Page 8, a typo in the seventh line of the third paragraph, "…variation ~~of~~ in..."*

PACE Response:
The text has been updated to reflect this comment.

27. *Figures 3.1A-E, update D50 values according to Technical Comment 3 above. Also clean up stray lines near No. 4 line and between Nos. 8 & 16, and add dashed lines for Nos. 30 & 50.*

PACE Response:
The figure has been updated to reflect this comment.

28. *Figures 3.2A, clean up stray lines, label the same sieve sizes as Figure 3.1, cleanup the axes. Also make a reference to the fact that reaches A & B use exactly the same data.*

    PACE Response:
    The figure has been updated to reflect this comment. Also, please see response to technical Comment 6.

29. *Figure 3.2B, clean up stray lines as above, update D50 value according to Technical Comment 3.*

    PACE Response:
    The figure has been updated to reflect this comment.

30. *Page 17, second line of the second paragraph, update range of proposed conditions general adjustment.*

    PACE Response:
    The text has been updated to reflect this comment.

31. *Page 17, Tables 4.2A-B, a typo in the heading, "Conditions" is misspelled.*

    PACE Response:
    The table has been updated to reflect this comment.

32. *Figures 4.1A-B, delete "Outside Curved Reach" from the heading because there is no "inside" figure and the distinction is not necessary. Eliminate the first point of each series because it does not represent actual data. Change the symbol for one of the series to a filled, solid symbol making the two series easier to distinguish visually.*

    PACE Response:
    The figure has been updated to reflect this comment.

33. *Page 20, fifth line of the first paragraph, revise to say "…creating contour lines ~~of equal ground surface elevation~~…"*

    PACE Response:
    The text has been updated to reflect this comment.

34. *Page 20, a typo in the thirteenth line of the first paragraph, "STA 42215."*

    PACE Response:
    The text has been updated to reflect this comment.

35. *Page 21, Tables 5.1A-B, increase the font of the footnotes to make them more legible. Also fix the rounding errors according to Formatting Comment 2 above.*

    PACE Response:
    The table has been updated to reflect this comment.

36. *Pages 22-24, update the references to Figures 5.2 A-P according to their reordering. Also, as in the Castaic Creek study, a differentiation must be made between the longitudinal and cross-sectional stationing for all of Long-term Degradation, Section 5.*

    PACE Response:
    The text has been updated to reflect this comment.

37. *Page 23, first line of the second paragraph, update "SRB1" to "SRA4".*

    PACE Response:
    The text has been updated to reflect this comment. "As applied to…" is added.

38. *Page 23, fourth line of the second paragraph, insert "degraded" to read, "the section has degraded 3.2…"*

    PACE Response:
    The text has been updated to reflect this comment.

39. *Page 23, ninth line of the second paragraph, insert words to read, "single season degradation may be possibly attributed to the woody nature…"*

    PACE Response:
    The text has been updated to reflect this comment.

40. *Page 23, a typo in the sixteenth line of the second paragraph, "considered"*

    PACE Response:
    The text has been updated to reflect this comment.

41. *Page 24, a typo in the second line of the third paragraph, "less_between."*

    PACE Response:
    The text has been updated to reflect this comment.

42. *Page 24, second to last sentence of the third paragraph, Grande Canyon confluences with the River near Section 17000 not 15335 as stated.*

    PACE Response:
    The text has been updated to reflect this comment.

43. *Figure 5.1, use "SRA1" labels instead of "RA1." Correct the scale.*

    PACE Response:
    The figure has been updated to reflect this comment. Also, please see response to formatting Comment 3.

44. *Figure 5.2K, expand the viewport to include both banks (at least to the top width line) and the proposed levee. Correct the 1999 data as stated in Technical Comment 14 above.*

    PACE Response:
    The figure has been updated to reflect this comment.

45. *Page 25, seventeenth line, update the ranges of SAM aggradation and degradation.*

    PACE Response:
    The text has been updated to reflect this comment.

46. *Page 25, a typo in the twentieth line, "is observed to have the opposite trend than that predicted…"*

    PACE Response:
    The text has been updated to reflect this comment.

47. *Page 26, typos in the second to last sentence of the last paragraph, "height ranges from 0.5 to ~~and~~ 9.1…" and "from 0.5 to ~~and~~ 8.3…" Also update the values in the last paragraph according to the appropriate tables.*

    PACE Response:
    The text has been updated to reflect this comment.

48. *Page 27, the second sentence states that SAM analysis represents a long-term trend. SAM is not a long-term analysis tool since it only utilizes one storm flow for calculations. Correct the text accordingly.*

    PACE Response:
    The text has been updated to reflect this comment. Punctuation is added to clarify the

meaning of the text.

49. *Page 27, discussion of the content found in Tables 7.1 A-D needs to be presented in the order in which the tables are presented to avoid confusion. Also references made on page 27 to these and other tables need to be updated based on the final approved models.*

PACE Response:
The text has been updated to reflect this comment.

50. *Page 27, nineteenth line, references to stations do not use the STA designation. Add it for consistency.*

PACE Response:
The text has been updated to reflect this comment.

51. *Page 27, twenty-second line update the range of degradation depths, and include STA 24795 which also has the same depth as STA 13030.*

PACE Response:
The text has been updated to reflect this comment.

52. *Page 27, a typo in the twenty-ninth line, "components ~~are~~ differ significantly…"*

PACE Response:
The text has been updated to reflect this comment.

53. *Page 28, Table 7.1A, a new table was not included with the 1/11/06 .pdf files. Make sure it is updated according to the changes in Appendix Chapter 6.1A.*

PACE Response:
The table has been updated to reflect this comment.

54. *Figures 7.1A-D, use points instead of lines to depict adjustments. Use symbols that are easily distinguishable. Remove the first data point near STA 9000 because it does not represent a real data point. Also on Figure 7.1A correct the typo "Bed Adjustment" on the Y-axis.*

PACE Response:
The figure has been updated to reflect this comment.

55. *Page 30, Table 7.1A, update the LACFCDDM values to reflect the most recent changes, especially SRA3, SRC1, SRD2, and SRE1.*

PACE Response:
The table has been updated to reflect this comment.

56. *Page 31, Table 7.1C, update the LACFCDDM values to reflect the most recent changes, especially SRC1, SRD2, and SRE1.*

PACE Response:
The table has been updated to reflect this comment.

57. *Page 32, fourth line of the first paragraph, update the range of values for LACFCDDM, from "8 ~~10~~ to 21," or as necessary according to the approved, updated models.*

PACE Response:
The text has been updated to reflect this comment.

58. *Figure 7.3C, The calculated toe-down including SAM needs to be updated according to the latest figures.*

PACE Response:
The text has been updated to reflect this comment.

59. *Page 34, sixth line of the second paragraph, specify the trend of general adjustment, aggradation or degradation.*

PACE Response:
The text has been updated to reflect this comment.

60. *Page 34, a typo in the tenth line of the second paragraph, "aggradation ~~iton.~~"*

PACE Response:
The text has been updated to reflect this comment.

61. *Page 34, sixth line of the third paragraph, update the range of general adjustment. Also, seventh line of the third paragraph, update the range of other adjustment to include the straight and inside curve values (4.9 minimum). Also, tenth line of the third paragraph, update the range of total toe-down to include the straight and inside curve values (7.5 minimum).*

PACE Response:
The text has been updated to reflect this comment.

62. *Page 34, a typo in the first line of the fourth paragraph, "four ~~three~~ subreaches."*

PACE Response:
The text has been updated to reflect this comment.

63. *Page 35, fifth line of the first paragraph, update the range of general adjustment. Also, eighth line of the first paragraph, update the range of other adjustment to include straight and inside curve values (3.9 minimum). Also, tenth line of the first paragraph, update the range of total toe-down to include the straight and inside curve values (4.5 minimum).*

PACE Response:
The text has been updated to reflect this comment.

64. *Page 35, eighth line of the second paragraph, update the range of other adjustment (-4.6 minimum). In the tenth line of the second paragraph, update the local scour of the bridge piers at section 15335, "12.7 ~~12.5~~ feet." Also, last line of the second paragraph, include section 18830 which has the maximum freeboard of 4.2 feet as well as section 19050.*

PACE Response:
The text has been updated to reflect this comment.

65. *Page 35, seventh line of the third paragraph, update the other adjustment to include straight and inside curve values (-4.7 minimum).*

PACE Response:
The text has been updated to reflect this comment.

66. *Appendix 4.1, include the most current and approved HEC-RAS output for the Existing Conditions model with n=0.085 and n=0.025.*

PACE Response:
The appendix has been updated to reflect this comment.

67. *Appendix 4.2, include the most current and approved HEC-RAS output for the Proposed Conditions model with n=0.085 and n=0.025.*

PACE Response:
The appendix has been updated to reflect this comment.

68. *Appendix 4.3, include the most current and approved HEC-RAS models for all relevant 'n-values'.*

PACE Response:
The appendix has been updated to reflect this comment.

69. *Appendix 4.4, update using the most current and approved HEC-RAS model and output. Also state which 'n-value' is being used for the output.*

PACE Response:
The appendix has been updated to reflect this comment.

70. *Appendix 4.6, Figures A4.6A and B update using the most current and approved HEC-RAS model and output. Convert this output again to HEC-2 and SAM input. Use comma delimiting for transport volumes to emphasize differences in magnitude. Make rounding consistent in the width column.*

PACE Response:
The appendix has been updated to reflect this comment.

71. *Appendix 6.1, Figures A6.1A-F, update according to the most current and approved HEC-RAS model and output. Include changes made to pier width for the proposed conditions. Revise the text under "general" heading which states that the maximum velocity allowed by the table is 20-fps. Many velocities are higher than 20. Also revise the typo "LAC<u>DPW</u> ~~DWP~~". Also update the pier widths and locations according to the approved proposed models.*

PACE Response:
The appendix has been updated to reflect this comment.

72. *Appendix 6.2, Figures A6.2A-B, update according to the most current and approved HEC-RAS model and output.*

PACE Response:
The appendix has been updated to reflect this comment.

If you have any questions regarding the above responses, please do not hesitate to contact us at (714) 481-7300.

Sincerely,
PACIFIC ADVANCED CIVIL ENGINEERING, INC. (PACE)

David A. Jaffe, Ph.D., P.E.
Project Engineer – Stormwater Division

DAJ/as

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PACIFIC ADVANCED CIVIL ENGINEERING, INC.

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December 9, 2005

Ben Willardson
LACDPW
Water Resources Division
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Alhambra, CA 91803
(626) 458-4974

Re: Newhall Ranch -- Santa Clara River Fluvial Study #8197E

Dear Mr. Willardson,

Pacific Advanced Civil Engineering, Inc. (PACE) is pleased to provide the following responses to the Los Angeles County Department of Public Works comment letter dated October 13, 2005, for the above-referenced project. The responses from PACE are as follows:

Previous Comments

4. *Page 7, discussion of sediment gradation size is included in both paragraphs. The bore logs from the Simons, Li, and Associates study show cobbles at certain depths. However, no cobbles are found in any of the gradations used for this study. Many of the cobbles were found below the depths sampled by Seward Engineering Geology. Large flow rates will carry cobbles and the reasons for not including cobbles in the gradations should be included in the discussion. (The upper foot of sediment is most likely not the active bed in the Santa Clara River as shown by Table 5.1. The bed elevation changed by 1 to 2 feet in the period from 2004 to 2005. The portion of the bed moving during peak flows may actually be much deeper. Although the second sampling set collected by Seward may be adequate for SAM analysis, there is some uncertainty in the gradation and distribution as shown by other studies. See comment 6 below.)*

   PACE Response:
   The County has noted that cobbles are present in the SLA study boring logs, which is true. Cobbles are not present in any of the grain size distribution curves in the SLA study (particularly in the Landmark study reach), however, and a careful review of the boring logs down to approximately 10 feet (approximately five times the SAM single event depth) notes only sporadic cobble observances, generally less than 5% and rarely as much as 10%. More importantly, is the fact that at sample location 11 (in the Landmark Village study reach), p. B.5, not until 8.5 feet are any cobbles observed. Because of the lack of cobble occurrence in the

both the boring logs and their depth below the SAM single event depth, taken here as the active depth, PACE believes that the sampling data collected by Seward is representative of the active bed. The text has been updated to reflect this comment.

Present Comments

1. *Page 2, the second set of bullets, number 1, indicates that field investigations were performed for the Santa Clara River. Were other field investigations conducted besides the bed sample collection? If so, the investigation needs to be added.*

   PACE Response:
   Photos of a previous field investigation are included in Appendix Chapter 3.

2. *Page 2, the second set of bullets, number 2, indicates cross-sections were determined to provide adequate representation of channel geometry. Was this done by PACE, or were the cross-sections based on the Sikand study and model?*

   PACE Response:
   An RMS file was provided by Sikand, which was exported to HEC-RAS. In addition to review of the Sikand base line HEC-RAS model, PACE prepared the proposed condition model geometry file modification to model the proposed bridges and bank protection associated with the proposed Newhall Ranch Project.

3. *Page 2, the second set of bullets, number 3, indicates a baseline hydraulic model. The year for the baseline needs to be specified.*

   PACE Response:
   The base topography is from 1999. The text has been updated to reflect this response.

4. *Page 4, the first paragraph states that Sikand relied on previous work conducted by Simons, Li, and Associates and submitted June 1998. Who was the SLA study submitted to?*

   PACE Response:
   The study in question, *HEC-6 Sediment Transport Analysis for ACOE General Permit on Santa Clara River (from Castaic Creek to Cottonwood Avenue) and San Francisquito Creek (from Santa Clara River to 15000' Northerly,* was prepared by Sikand Engineering, not by SLA. The text does not mention to whom the report was submitted. The text has been updated to reflect this comment.

5. *Page 4, the second to last paragraph states that 1500 cfs was required to generate sediment transport. This number is too high since sediment transport has been observed at much lower flow rates. This number should be compared to measured sediment transport data from the USGS. Sediment transport at lower rates may affect braiding and low flow channel armoring.*

   PACE Response:
   USGS data (*Sediment Discharge in The Santa Clara River Basin, Ventura and Los Angeles Counties, California*) notes in Table 3 that in 1971 at 1470 cfs 99% of the transport was silt at the County Line. It is important to note that PACE is citing the SLA study and not making the claim. PACE does not model silt in the present study since it is generally transported as wash load and is not pertinent to the present study's goals. The text has been updated to reflect this.

6. *Page 6, the sediment data represented in Section 3 are not the same as the data submitted in the previous version of the Santa Clara River Fluvial Study. As discussed in previous comment 4 from the previous review, the active bed is not one foot deep. The previous study from Seward, dated January 25, 2005, had sediment taken at depths of 25 feet below the surface. No discussion is made on why the February 25, 2005, sampling by Seward replaced the January 25, 2005, sampling. Both sets of data may be valuable and provide insight into the river behavior. More discussion needs to be added to the report on why the previous set of data was discarded if it was found to be inadequate. If not, both sets of data should be compared and analyzed.*

   PACE Response:
   A careful review of the data reveals that most of the sampling for the January report provided by Seward was for upland and tributary locations. Some of the samples in that report included River sample sites, however, only including single grabs. The February report includes multiple grabs at each sample location providing a much greater degree of confidence in the data in the form of being able to spot outliers (here in the statistical sense), and at several locations within the River bed. Because there is no way to independently determine the efficacy of the samples in the January report, the values were replaced with more verifiable data.

7. *Page 7, Section 3.3 discusses sediment characterization. The current study uses the same sediment gradation for both existing and proposed conditions. Modeling with HEC-6 will require that changes in sediment production also be considered. Some of these changes should be discussed in Section 5 that is looking at long-term historical trends.*

   PACE Response:
   As per a personal communication of 10/17/05 with Ben Willardson of the County, any and all HEC-6 related comments and responses will be delayed

until the second phase of the fluvial analysis following the approval of the Tentative Tract Map(s).

8. *Page 8, the reference to HEC-6 in this section should be removed as discussed in the response to comments from Castaic Creek. Other typographical errors in general sections of the fluvial studies can be corrected as discussed in the Castaic Creek comments from 08/23/05.*

   PACE Response:
   The text has been updated to reflect this comment.

9. *Page 10, the Sikand models discussed were modified significantly since they were developed. The reference should indicate that PACE has updated these models to meet Public Works standards.*

   PACE Response:
   The text has been updated to reflect this comment.

10. *Page 13, the second paragraph discusses outliers for sediment transport capacity calculations. More discussion needs to be added on how outliers are determined. The entire section should be updated as discussed in the Castaic Creek comments.*

    PACE Response:
    Outliers are values under analysis in a data set that reside far outside most other values in a data set. In this case, when the one of the results of a SAM.SED calculation that is three orders of magnitude or more different from the median, the data is excluded from analysis and noted as an outlier. The raw data is presented in Appendix Chapter 4.6. The text has been updated to reflect this response.

11. *Page 18, The HEC-6 study outlines for both Castaic Creek and the Santa Clara River should be similar. There are some differences in available data. These can be discussed once the SAM and long-term historic data are analyzed correctly and the tentative map approval is moving forward.*

    PACE Response:
    Please see PACE Response to Present Comment 7, above.

12. *Page 18, information needs to be provided regarding changes to sediment inflow based on the development of the watershed for the proposed conditions.*

    PACE Response:
    Please see PACE Response to Present Comment 7, above.

13. The HEC-6 studies need to include historic cross-sections for comparison during the model calibration phase.

PACE Response:
Please see PACE Response to Present Comment 7, above.

14. Table 5.1 is not the same in the Santa Clara River and Castaic Creek studies. The same methodology should be used for both. More analysis and discussion of the river system needs to be added. An example of this type of analysis is provided as a guide: Station 11015 mean elevations from 1930, 1947, 1960, 1999, 2004, and 2005 are respectively 827.8, 831.3, 828.4, 832.1, 832.8, and 832.3. This cross-section appears to be fairly stable over time. Station 25000 mean elevations from 1930, 1947, 1960, 1999, 2004, and 2005 are respectively 915.1, 912.7, 912.1, 911.8, 910.3, and 909.5. This cross-section appears to be degrading over time. The cause of this long-term degradation may be the installation of the dam on Castaic Creek in 1971. More of this type of analysis is required. Some portions of the river fluctuate over the time period studied, while others aggrade or degrade. The trends in the river are shown by the mean elevations. These trends may be impacted as sediment production from some of the major tributaries are restricted by development. These issues need to be analyzed and discussed. The analysis and discussions can be validated using the HEC-6 model during the next phase. An understanding of the river system and changes must be portrayed and related to the top-of-levee heights and toe-down depths determined for the tentative map.

PACE Response:
In the current draft of the report the historic thalweg analysis has been replaced with a historic cross-section analysis. The sections provide a more clear and complete picture of the trends of the creek bed in a given section. An analysis of the trends of the various sections is included in Chapter 5. This analysis separately considers the periods immediately following (1930) and later following (1947 and after) the failure of the St. Francis Dam in 1928. The data from the thalweg analysis is included for completeness in Appendix Chapter 5.

15. Page 21, the comments in the second paragraph should be checked against Table 5.1. These assumptions do not appear to be correct now that the calculation procedures have been corrected.

PACE Response:
Please see PACE Response to Present Comment 14, above.

16. Figure 5.4 and Table 5.5 should use mean bed elevations for comparison of changes in the time period between 2004 and 2005. Comparison of the 1999, 2004, and 2005 data may provide more information. All tables should have the same station order as the to facilitate comparison, i.e., 9042 to 46195 or 46195 to

9042. Again, general sections and comments in the fluvial studies for Castaic Creek and the Santa Clara River should be consistent. Both studies need to provide more analysis of data provided by the models. The analysis should include discussion on how the model results relate to toe-down, top-of-levee, and protection of other property owners.

PACE Response:
The purpose of the '04-'05 single season analysis is to illustrate bed changes that occur over a single season or single event. Including the 1999 data in this section does not offer any insight into the kinds of changes that occur during the '04-'05 rainy season or any other single event or season. Also, please see PACE Response to Present Comment 14, above.

If you have any questions regarding the above responses, please do not hesitate to contact us.

Sincerely,
PACIFIC ADVANCED CIVIL ENGINEERING, INC. (PACE)

David A. Jaffe, Ph.D., P.E.
Project Engineer – Stormwater Division

CC: Steve Sheridan/LACDPW
Mo Kajbaf/ LACDPW
Mark Subbotin/NLF
Glen Adamick/NLF

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PACIFIC ADVANCED CIVIL ENGINEERING, INC.

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August 10, 2005

Mo Kajbaf
LACDPW
Land Development
900 South Fremont, 3rd Floor
Alhambra, CA 91803
(626) 458-4974

Re: Santa Clara River Fluvial Study

Dear: Mr. Kajbaf

Pacific Advanced Civil Engineering, Inc. (PACE) is pleased to provide the following responses to the Los Angeles County Department of Public Works for the above-referenced project. The responses from PACE are as follows:

1. *Page 4, the reference to the Sikand Study for the Santa Clara River should indicate that the results were not accepted by Public Works. The comments on the last review of the study in 2004 were not addressed.*

   PACE Response:

   The text was updated to reflect this comment in a previous partial draft sent to Public Works.

2. *Page 5, the Simons, Li, and Associates study references sediment gradation data and boring logs that are available in the copy of the report provided to PACE and available at LADPW Headquarters Technical Library.*

   PACE Response:

   The text has been updated to reflect the D_{50} for the two gradation curves in the SLA study and in the present study reach. While the boring logs are present, no map of the location of the borings is present in the PACE copy of the study. If a map showing the locations of the borings becomes available, PACE will further update the report to account for the boring data.

3. *Page 7, the second paragraph refers to Figures 3.2A-E, but only 3.2A and 3.2B are included in the report.*

   PACE Response:

   The text should refer to Figures 3.2A-B. The text has been updated to reflect this correction.

4. *Page 7, discussion of sediment gradation size is included in both paragraphs. The bore logs from the Simons, Li, and Associates study show cobbles at certain depths. However, no cobbles are found in any of the gradations used for this study. Many of the cobbles were found below the depths sampled by Seward Engineering Geology. Large flow rates will carry cobbles and the reasons for not including cobbles in the gradations should be included in the discussion.*

   PACE Response:

   Seward sampling was conducted on approximately the upper foot (recently active layer) of the bed. To be conservative no armoring layer (cobble layer) depth is assumed in sampling which allows the bed to fluctuate freely in numerical modeling. Additionally, the true armoring layer has not been observed in field measurements including Seward field studies and SLA boring logs. This study assumes that the grab sampling at the surface represents the below-surface bed. While the SLA boring logs do show vertical variation of in grain size distribution, a consistent grain size vertical distribution is not evident.

   The text has been revised to reflect this comment.

5. *Page 10, section 4.1.2, discusses correlation between hydraulic parameters and location along the channel. River stationing does not necessarily determine hydraulic parameters. Correlation between flow or velocity at a location, and the parameters such as depth, width, and slopes is more reasonable. Several different relationships were used for the reaches (A-F) to determine sub-reaches. Correlation of one hydraulic variable with a fairly constant correlation variable would make more sense. A few of the correlation calculations show velocity versus hydraulic parameters, but this is only done for approximately 20% of the analyzed reaches. No explanation is provided on why either of these methods was used.*

   PACE Response:

   SAM modeling is based on channel subreaches determined by correlating hydraulic characteristics with longitudinal cross-section location to preserve the along-stream character of the flow. The hydraulic parameters examined are discharge, energy slope, bed slope, Froude number, top width, hydraulic velocity and flow area based on the 100-year discharge. First, correlation coefficients are calculated for each station against the hydraulic parameters. The hydraulic parameter that produces the greatest correlation is plotted against cross-section location. Subreaches are then selected in a manner that preserves the trend of the hydraulic parameter as well as produces approximately equal subreach lengths, which are generally 1000 feet long. This methodology seeks to maintain continuity of analysis by producing similar length subreachs while analyzing the hydraulic parameters that largely control sediment transport.

   The text was updated to reflect this comment in a previous partial draft sent to Public Works. The correlation calculations for velocity versus hydraulic parameters produced low correlation relative to channel position and have been removed from the text.

6. Pages 11-13, references to the MPM method that are spelled out should be written as Meyer-Peter and Muller, rather than Meyer, Peter, and Muller.

PACE Response:

This typographical error has been corrected in the text.

7. *Pages 11-14, more discussion needs to be added on why the MPM method was chosen for modeling sediment transport in the study area. MPM is a gravel transport equation. Although the sediment transport capacity appears reasonable for a zero dimension model, the measured transport through the downstream reach exceeds the transport specified by MPM at lower flows.*

PACE Response:

The MPM equation was found to be the representative transport equation for all subreaches for the existing and proposed conditions. This is because transport estimates based on other transport equations (i.e. Yang), when used to estimate general adjustment and transport, produced values in excess of both historical values of general adjustment (as much as approximately 15 feet) and values of general adjustment that might be physically expected during a single event (over approximately 20 feet). In other cases some transport equations (i.e. Brownlie D_{50}) estimated sediment transport that produced general adjustment calculations much smaller than expected (as little as approximately 1 foot).

The text was updated to reflect this comment in a previous partial draft sent to Public Works.

8. *Pages 21-22, these pages discuss the long-term trends in the river. The earliest topography is 1930, two years after the St. Francis Dam failure. This event released a flood wave with a peak flow of 1.3 million cfs measured 1.4 miles downstream of the dam. This flow made its way down San Francisquito Canyon and into the Santa Clara River. It seems that this flow may have created the river channel shown in the 1930 topography. The scour from this flood wave may have resulted in the lower elevations in 1930. It appears that areas with 1930 elevations higher than the elevations shown in other years are near the outlets of major watersheds, such as Castaic Creek. The channel in the last 50-years may be reworking itself to reach a more stable state than that caused by the dam failure. Inclusion of the 2005 topographic data will provide valuable insight into the channel response since the events of the last storm year were very significant for sediment transport.*

PACE Response:

It is important to note that the failure of the St. Francis Dam in March, 1928, is likely captured in Figure 5.3. The 1930 thalweg generally represents the lowest bed elevation over the period of record except between STA 30000 to STA 32000 (Castaic Creek confluence). The scour resulting from the flood wave progression is believed account for the lower than average bed elevations observed in the historical topography. The high point at Castaic Creek may represent the sediment transport from the Creek into the River in the period following the Dam failure.

The text was updated to reflect this comment. Topography from 2005 had become available to PACE within the last week. Analysis of the 2004-2005 water year

events bed change and a continued historical evaluation with this data will be included in the final draft of the report once the data has been analyzed.

9. *In general, most of the technical background work is in place. More discussion needs to be added on the methods followed so that future readers can understand the processes and procedures used to develop the results for this study.*

   PACE Response:

   PACE will continue to work closely with Public Works to update the discussion in the text. These updates will be available in the final draft of the report.

Items Completed After Meetings and Phone Conversations

1. The SAM sediment input gradation data was incorrect for several sub-reaches due to a data conversion process error. The data have been corrected and the models have been re-run to provide correct information and figures.

2. Calculations for whether the channel was aggrading or degrading were reversed. The previous calculations showed that if transport capacity upstream was more than the transport in the reach downstream, the bed degraded. This is backwards based on the volume continuity equation $I - O = \Delta S$. If inflow (sediment transport capacity from upstream) is greater than the outflow (transport capacity in the reach downstream) the change in storage is positive. Positive storage is aggradation, negative storage is degradation. These calculations have been updated by PACE.

3. Reach D of the proposed conditions from HEC-2 did not match the data in SAM. This was corrected when the model was run with the sediment gradation corrections.

If you have any questions regarding the above responses, please do not hesitate to contact us at (714) 481-7300.

Sincerely,
PACIFIC ADVANCED CIVIL ENGINEERING, INC.

David A. Jaffe, Ph.D., P.E.
Project Engineer – Stormwater Division

DAJ

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Newhall Ranch
Santa Clara River

DRAFT

March 6, 2006

Prepared For Submittal to:

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On Behalf of:

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#8197E

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Executive Summary

This technical study provides an evaluation of the existing and proposed fluvial characteristics and long-term stability of Santa Clara River between Interstate 5 and an area generally west of the Los Angeles/Ventura County line in the vicinity of the Newhall Ranch Specific Plan. Development along the River within the study area has the potential to modify the fluvial mechanics of the River. The proposed buried soil cement bank protection on both the north and south banks of the River is intended to provide long-term erosion protection from lateral migration of the bank and flood protection for the adjacent proposed development areas. This analysis evaluates impacts from build-out of Newhall Ranch from (1) fluvial modifications of the river bed from single hypothetical storm events, and (2) changes in the floodplain fluvial operation over the long-term.

Three sediment transport studies were previously conducted within the study reach in the last 25 years. The first study conducted by Sikand Engineering (June 2000, and revised November 2004) was to provide HEC-6 sediment transport analysis for the Santa Clara River and to determine the possible effects of the Newhall Ranch Development on river bed stability. The study relied on previous work conducted by Simons, Li & Associates (SLA) (June 1998). The second study, produced by SLA (November 1990), sought to provide information for flood and fluvial process management in the Santa Clara River. The SLA report was reviewed in detail by LADPW and response to comments made, however, the report was not revised to obtain final LADPW approval. The final study was conducted by USGS, whereby the study collected sediment data from 1967 to 1975 at three sites in the Santa Clara River basin including the Los Angeles-Ventura County line. The study estimated long-term sediment discharge by applying the sediment and water discharge relationship observed from 1967 to 1975 to long-term records of water discharge (1928-1975).

Sediment data collection for the Santa Clara River along the study reach was conducted by Allan E. Seward Engineering Geology Inc. Eighteen samples were collected at six different locations positioned along River subreaches. All sampling was conducted using grab samples of the upper foot of the active or recently active portion of the bed. No fine material is included in the sediment analysis because fine material is generally transported as wash load. A review of the raw gradation curves indicates that most samples are comprised of poorly graded sands with gravels and silts. The D_{50} values for all samples ranged from 0.25 to 4.67 mm with an average of 0.8 mm. Additionally, previous studies noted above also found similar sandy characteristics. No cobbles are present in the Seward study and sampling was not conducted for cobble grain sizes. Cobbles are not present in any of the grain size distribution curves in the heretofore discussed SLA study (particularly in the Landmark study reach), and a careful review of the boring logs down to approximately 10 feet (approximately five times the SAM single event depth) notes only sporadic cobble observances, generally less than 5% and rarely as much as 10%. More important is the fact that at sample location 11 (in the Landmark Village study reach), p. B.5, not until 8.5 feet are any cobbles observed. Because of the paucity of cobble occurrence in the both the boring logs and their depth below the SAM single event depth, taken here as the active depth, PACE believes that the sampling data collected by Seward is representative of the active bed.

Modifications to the river bed are measured as bed adjustment in feet. Positive adjustment indicates aggradation and negative adjustment indicates degradation. Several types of adjustment are considered in this study including general adjustment, long-term adjustment, and other scour. General adjustment is scour that occurs in an individual discharge event and is calculated as the difference between sediment inflow and outflow of a given River reach. Long-term adjustment consists of fluvial processes that occur over several years. Other scour is made up of local scour, bend scour, low-flow incisement, and bedform formation.

General adjustment was estimated in this study using the US Army Corps of Engineers (ACOE) SAM steady-state zero-dimensional numerical model. SAM is utilized to provide a first approximation of sediment transport potential for subreaches within Santa Clara River. The SAM numerical model is built upon hydraulic and fluvial representations of the study bed. The hydraulic component includes representations of bed characteristics and discharge. The fluvial component includes representation of bed gradation and sediment transport functions. SAM's hydraulic component utilized average cross-section data imported from HEC-2 numerical models of the river converted from HEC-RAS numerical models. The conversion process modifies the original numerical model, as discussed in Chapter 4, so some differences in numerical models are created. Both the existing and proposed conditions HEC-RAS models were originally developed by Sikand Engineering in the *Newhall Ranch Santa Clara River HEC-RAS Study* (June 2000) and submitted as part of the Newhall Ranch Specific Plan. The HEC-RAS model that is the basis of the SAM modeling, and will be the basis for the HEC-6 model, has been refined by PACE and has been submitted (concurrently with this Fluvial Study) to LADPW for review and approval. The current model resembles the Sikand model but has been refined to address current LACDPW modeling standards and updated proposed project conditions. River subreaches that make up the SAM model are determined by examining the hydraulic parameters of the individual HEC-RAS cross-sections and identifying correlations between those hydraulic parameters and the longitudinal position in the channel.

Representation of sediment grain size distribution in SAM is percent finer data obtained from sieve analysis of channel sediment samples. At each sample location, multiple samples are collected and the average data is input into the model. Sediment transport equations used in all SAM modeling were chosen with the assistance of the Army Corps' SAM.AID subroutine. The SAM.AID subroutine determines the most representative transport function based on the hydraulic parameters and percent finer data by comparing model data with peer-reviewed sediment transport studies. The study found that Meyer-Peter and Muller (MPM) was the representative transport function for all subreaches for both existing and proposed conditions because it produced adjustment values within physical reason.

SAM was run for all River reaches and bed stability was estimated based on the change in potential transport between adjacent channel subreaches for the Q_{CAP} discharge. General adjustment based on SAM modeling is presented in Chapter 4. General adjustment was also calculated using the equation specified in the Los Angeles County Hydrology and Sedimentation Manual (LACH&SM). The LACH&SM general adjustment calculation is based only on flow mean velocity. In most circumstances, adjustment predicted by the LACH&SM is greater (more scour) than that predicted by SAM for both the existing and proposed conditions. SAM results

predict general adjustment from -2.9 to +2.3 feet for the existing condition, and -1.6 and +2.1 feet for the proposed condition. LACH&SM methodology predicts general adjustment from -2.1 to -8.1 feet for the existing and -1.8 to -7.6 feet for the proposed condition, both outside of curves (Table 4.4). In this report the outside of the curve values and inside of curve values are considered separately, as per LACDPW criteria, since outsides of curves tend to degrade while insides of curves tend to aggrade. It is not presently clear if the changes in general adjustment result from the alteration of the hydrology caused by full build-out, or from changes in the velocity in the River associated with specific individual project improvements. It is expected that various Newhall related impacts will be localized, and, with respect to implementation of the proposed improvements, that the River will continue to behave fluvially as it did prior to construction of these proposed improvements. Long-term changes to hydrology and sediment production are not addressed in the first phase report, but may be addressed in the second phase HEC-6 numerical modeling. Finally, the general trend in general adjustment for the study reach as indicated by SAM modeling is not apparent for either the existing or proposed condition.

Long-term adjustment was calculated based on historical records in the form of topographic data. Topographic data dating from 1930, 1947, 1963, 1999, 2004 and 2005, was digitized. Cross-sections were cut at the locations of select HEC-RAS sections for each historical topography. At least one cross-section was chosen for each subreach established in Chapter 4. Areas of the 1947, 1963, 1999, 2004 and 2005 sections are calculated and the areas of the 1947, 2004 and 2005 bed are used to calculate the average change in bed elevation over time. The 1930 topography is not used to calculate average change in bed because the trends in bed change that occurred during this year occurred immediately following the failure of the St. Francis Dam upstream of the project site. Several events within the available historical record (1930 to present) have had an impact on the River bed and fluvial mechanics. These events include failure of the upstream dam, construction of bridges spanning the River, agricultural infill along the River banks, and periodic burning of surrounding vegetation during forest fires. The most significant historical event in the formation of the present bed condition was the failure of the Dam. Within the project reach, the failure of the Dam appears to have resulted in the abrupt scour of the bed. The sectional analysis finds that some historical sections (SRD2, SRD3, SRE1, SRE2) show little change between 1947 and 2005 suggesting an approximate equilibrium state for these subreaches. Between 1947 and 2005, 0.5, 0.7, 1.0, and 0.8 feet, respectively, of cumulative degradation appears to have occurred on these sections. Upstream sections SRA1 to SRC3 show continuous degradation over the period of record from 1947 to the present. Three sections, SRC4, SRD1 and SRE3 aggraded cumulatively between 1947 and 2005 by 1.9, 1.4, and 3.1 feet on average, respectively. While it is unclear why the observed aggradation occurred, it is presently believed to be the result of the fires of the Summer of 2004 and the heavy rains of the 2004/2005 rainy season. This combination had the potential to produce high sediment runoff loading into the River. Degradation seems to be more prevalent on the upper half of the study reach while mild fluctuations about a mean are more apparent on the lower half. This appears to result from the relatively steep, narrow, winding upper portion of the study reach versus the relatively flat, wide, braided channel in the lower portion of the study reach of the River. Agricultural activities occurred, primarily in downstream sections but in upstream sections as well, so some of the observed channelization may have resulted from these activities.

Other scour considered in this study is comprised of four sub-categories: local scour, bend scour, low-flow incisement, and bedform height. Local scour occurs in the vicinity of flow obstructions including piers and abutments. Bend scour occurs because of velocity gradients around curves in fluvial systems. Three distinct bends are located in the study reach. Low flow incisement is included to represent thalweg or low flow channel depth. On-site inspection and review of historic data of this feature suggest a thalweg depth of approximately two feet. Finally, bedform height represents the dunes and anti-dunes that develop in active soft-bottomed channels during flow events. In this study, bedform height has been limited after Kennedy (1963). Local scour ranges from 0.0 to 17.4 feet in the proposed conditions at the various river crossings. Results of calculations of bend scour vary from 0.0 to 11.3 feet for the existing condition and 0.0 to 8.9 feet for the proposed condition. For both the existing condition and the proposed condition, the bedform height ranges from 0.5 to 8.3 feet. Changes between the existing and proposed conditions are a reflection primarily of the change in velocity brought about by the proposed condition.

General adjustment, long-term adjustment, and other scour are summed to determine total potential bed adjustment following LACH&SM methodology. For cross-sections where SAM modeling predicts aggradation, the general adjustment contribution to total bed adjustment is not included for degradation calculations. The existing condition is predicted to have a combined bed adjustment of approximately -6.9 to -19.7 feet for the outside of curved reaches and -6.2 to -15.4 feet for the inside of curved and straight reaches. Calculations in the proposed condition predict that the combined bed adjustment ranges from approximately -6.7 to -26.2 feet for both the outside of curved reaches and for the inside of curved and straight reaches.

A comparison of total bed adjustment estimated by both the summed methodology and the LACFCDDM methodology shows that the more intensive LACH&SM methodology using SAM for general adjustment and historical analysis for long-term adjustment predicts a shallower toe-down for both the existing and proposed conditions than does the LACFCDDM methodology except for sections in the vicinity of subreach SRA2, SRB1, SRC2, and SRE1. In subreach SRA2 section 43820, very high long-term adjustment causes LACH&SM calculations of this section to exceed LACFCDDM calculations by 1.4 feet for both outside of curved reaches and straight or inside of curved reaches in the existing and proposed conditions. In SRC2 section 29140, higher general adjustment and higher bedform height cause LACH&SM calculations of this section to exceed LACFCDDM calculations by 0.6 feet in outside curved reaches and 1.2 feet in straight and inside of curved reaches for the existing condition. In SRB1 section 36080 and SRE1 section 15125, the presence of proposed bridges causes LACH&SM calculations of this section to greatly exceed LACFCDDM calculations, by more than 10 feet. LACH&SM methodology utilizing SAM calculations predicts a deeper toe-down than does the LACFCDDM at these locations methodology because the LACFCDDM does not account for the effects of local degradation as effectively.

Freeboard is considered for the purposes of this report to be the additional height required above the top of a levee or other bank protection to prevent overtopping. Freeboard elevation is calculated in this study based on LACH&SM Chapter 5A-3, and includes LACFCDDM calculations. The freeboard for the River ranges from

approximately 2.5 to 5.2 feet for both outside of curved and straight or inside of curved reaches in the proposed condition. Maximum total toe-down, total freeboard, toe-down elevation and freeboard elevation are presented in Table 8.

Previous studies estimated that a toe-down of 12.5 feet would be required for adequate protection. The results of this study, however, suggest that a variable toe-down from approximately 5 to 27 feet based on SAM modeling, or 8 to 21 feet based on LACFCDDM. A large portion of this difference can be attributed to the difference in general adjustment. It is expected that HEC-6 modeling will be on the order of 1 to 5 feet general adjustment.

1 Introduction

The following technical investigation provides a detailed and focused evaluation of the fluvial characteristics and long-term stability of the Santa Clara River for the reach including all of Newhall Lands' proposed Newhall Ranch and Phase 1 Landmark Village development. The River study reach is located from Interstate 5 on the east and to a point directly downstream of the Ventura County/Los Angeles County line (Figure 1.1). This reach includes the Newhall Ranch Specific Plan and the proposed Entrada project. The first phase of the Newhall Ranch Specific Plan (Landmark Village) is bounded by the River on the south, State Highway 126 on the north, Castaic Creek on the east, and Grande Canyon on the west (Figure 1.1). The Santa Clara River fluvial system extends from Acton, California in the east to the Pacific Ocean, the River's natural terminus, in the west. Adjacent development along the River within the study reach has the potential to modify the fluvial response of the watershed through changes in the runoff and reduction in the sediment supply from the developed areas. The proposed buried soil cement bank protection on both the north and south banks of the River within the study reach is intended to provide long-term erosion protection from lateral migration of the bank and flood protection for the adjacent proposed development areas. These modifications to the river system have the potential to modify the fluvial operation of the floodplain and cause changes to the stream mechanics. The intent of this analysis is to evaluate these impacts from (1) fluvial modifications of the river bed from single hypothetical storm events, (2) changes in the floodplain fluvial operation over the long-term; and, (3) to determine the top and toe of the proposed bank protection.

1.1 Types of Adjustment

Modifications to the river system are measured as bed adjustment in feet. Positive adjustment indicates bed aggradation while negative adjustment indicates bed degradation. Several types of adjustment are considered in this study including general adjustment, long-term adjustment, and other scour. General adjustment consists of scour that occurs in an individual discharge event, and may be considered as the difference between sediment inflow and outflow. That is, if sediment inflow into a given reach is higher than sediment outflow for the same reach, aggradation will occur. In contrast, if sediment outflow exceeds inflow for a given reach, degradation in the form of scour will occur in the reach. Long-term adjustment consists of fluvial processes that occur over many rainy seasons and contribute fluctuation of bed elevation of a river or creek. Other scour is comprised of local scour, bend scour, low-flow incisement, and bedform formation. These are discussed in detail, below.

1.1.1 Study Objectives

The primary objective of this report is to develop the technical engineering analysis to assess river bed impacts from potential modifications of fluvial operation from proposed development west of Interstate 5, including the Newhall Ranch Specific Plan. The intent is to provide a comprehensive assessment of short- and long-term bed adjustment. This report provides technical analysis for (1) general adjustment, (2) long-term adjustment, (3) other scour, (4) study reach gradation, (5) SAM modeling and analysis, (6) HEC-6 modeling and

SANTA
CLARA
RIVER
LEGEND
LA COUNTY FLOODPLAIN BOUNDARY
(SCANNED FROM LADPW ML MAPS DATED
LA COUNTY FLOODWAY BOUNDARY
(SCANNED FROM LADPW ML MAPS DATED
SRA4
FLUVIAL ANALYSIS SUB REACH
NEWHALL RANCH SPECIFIC PLAN BOUNDARY LINE
PROPOSED BANK PROTECTION
(PER RMDP & NEWHALL RANCH SPECIFIC PLAN)
HEC-RAS MODEL CROSS SECTION
NEWHALL RANCH
FIGURE 1.1
PACE

analysis, and (7) total soil cement bank protection toe-down design. The objectives of the fluvial assessment for the proposed development project include the following:

1. Quantify the fluvial parameters that are representative of the river bed characteristics.
2. Model the existing and proposed conditions river bed and fluvial processes.
3. Provide preliminary assessment of the streambed stability through determination of the sediment transport capacities within different reaches of the floodplain.
4. Provide toe-down depth assessment throughout the study reach.
5. Provide freeboard height assessment throughout the study reach.
6. Determine any impacts to off-site properties.

A variety of engineering analysis and tasks were associated with both the different aspects of the watershed hydrology and floodplain hydraulics. A technical framework was developed to guide the analysis of the system. These major task areas of study reflected the various objectives of the study and included the following:

1. Floodplain field investigations – Perform field reconnaissance of the existing watershed conditions as well as ground photo survey along the entire existing creek system within the fluvial study boundary.
2. Baseline digital floodplain cross-section geometry – Layout appropriate spacing and location of cross-sections to establish the representative channel geometry. Digitally develop extremely accurate cross-section coordinate points using topographic digital terrain models (DTM) and CAD subroutines suitable for hydraulic model format. Adjust cross-section data to include horizontal variation of roughness and other attributes.
3. Baseline HEC-RAS hydraulic model – Prepare floodplain model in HEC-RAS based on the 1999 digital geometry and existing condition flowrates. Evaluation based on single storm event and steady flow conditions.
4. HEC-2 model creation – Conversion of HEC model formats for use in SAM and HEC-6 modeling.
5. Floodplain reach characterization and parameter estimation – Prepare an assessment of the hydraulic parameters and evaluate the statistics. Determine hydraulic subreaches based on hydraulic statistics. The analysis involves determining the average hydraulic properties for each reach and then applying the appropriate sediment transport relationship to each grain size fraction.
6. Sediment transport capacity analysis – Prepare steady state sediment transport capacity analysis through dividing the channel system into different reaches and comparing the capacity within each reach.

7. Analyze historic trends in river bed adjustment – Consider available historic data to gain insight into changes in bed characteristics throughout the period of record.
8. Analysis of local bed adjustment components – Study of the individual components of local bed adjustment.
9. Calculate toe-down depth – Calculate the total toe-down depth of proposed soil cement bank protection based on the analysis of individual bed adjustment components.

2 Previous Fluvial Analyses for Study Reach

2.1 Introduction

Three sediment transport studies have been conducted within the study reach between Interstate 5 and the Los Angeles/Ventura County line in the last 25 years. The first study conducted by Sikand Engineering was submitted in June 2000, and revised November 2004. The purpose of the Sikand study was to provide HEC-6 sediment transport analysis for the Santa Clara River to determine the possible effects of the Newhall Ranch Development on river bed stability. The Sikand study relied on previous work conducted by SLA which was submitted June 1998 in *HEC-6 Sediment Transport Analysis for ACOE General Permit on Santa Clara River (from Castaic Creek to Cottonwood Avenue) and San Francisquito Creek (from Santa Clara River to 15000' Northerly)*.

The second study produced by Simons, Li, and Associates and submitted November 1990, sought to provide information for flood and fluvial process management in the Santa Clara River from Soledad Canyon to Castaic Creek. The study included multiple tasks including data collection, quantitative analysis and mathematical modeling, alternatives evaluation and other assignments.

The final study was conducted by the United States Geological Survey and completed in August 1979. The study sought to determine the sediment discharge in the Santa Clara River Basin in Los Angeles and Ventura Counties using sediment trap (1968-1975) and historical data (1928-1975). Sediment data was collected for the period 1967 to 1975 at the Los Angeles/Ventura County line.

2.2 Sikand Engineering Associates, 2004

The Sikand study covers the portion of Santa Clara River from Interstate 5 to the Los Angeles/Ventura County line. The study utilized the ACOE HEC-6 model to assess how improvements in the River as part of the Newhall Ranch Development will alter sediment transport. The primary focus of the study was the long-term degradation of the river bed and the toe-down depth required for proposed improvements. Both the existing and proposed model conditions were developed in HEC-RAS and the only differences between the models was the incorporation of proposed levees. Soils data was taken from the SLA study in Chapter 4 of the Interim Report, Existing Conditions Data Collection. Grain size distribution plots indicate poorly graded sand with gravel and a D_{50} of approximately 1 mm in the vicinity of the Castaic Creek confluence. Only HEC-6 input files offer sediment information. The inflow sediment boundary condition and grain size distribution was also taken from the SLA study. Conversions from tons sediment per day to feet of scour was calculated by assuming a four day duration and sediment specific gravity of 2.65. Several discharges were run in the numerical modeling including the Capital and 100-year storm events. The report does not specifically note the discharge of either event.

The study found that for seven subreaches in the present condition, the bed is in steady state, but that the proposed conditions are expected to cause minimal degradation (an average of one foot) in some subreaches and minimal aggradation (an average of three feet) in some subreaches. The study also analyzed the historical record of gage data at the county line from 1953 to 1993, and determined that a 1500 cfs minimum discharge was required to generate sediment transport. By comparison, USGS data (*Sediment Discharge in The Santa Clara River Basin, Ventura and Los Angeles Counties, California*) notes in Table 3 that in 1971 at 1470 cfs, 99% of the transport was silt at the county line. It is important to note that PACE is citing the SLA study and not making the claim. PACE does not model silt in the present study since it is generally transported as wash load and is not pertinent to the present study's goals.

It is important to note that the results of this study were not accepted by Los Angeles County Department of Public Works, and the comments on the last review of the study in 2004 were not addressed.

2.3 Simons, Li & Associates, 1990

The SLA study is broad in reach and included use of the proprietary QUASED numerical model for fluvial analysis. At present, it is not clear if this model is still applicable or how it compares to other fluvial modeling software such as HEC-6. The study included a large volume of data analysis including flood flow frequency analysis, HEC-2 numerical modeling, historic photograph analysis, and sediment yield calculation. Supplemental design criteria are provided for subsequent studies. Sediment gradation data was presented in an interim report that indicates an average D_{50} of approximately 1.3 mm below Interstate 5. Boring logs are present in the SLA study. There is no apparent consistent vertical distribution of sediment grain size between boring logs.

The study suggests a 100-year return period discharge in the River of 47,100 cfs in the vicinity of the Interstate 5 bridge. For the portion of the River downstream of Interstate 5, the bed was found to be adjusting between -0.1 to +1.0 feet. The study notes that the River appears to be in "pseudo-equilibrium" and "shows no trend toward either aggradation or degradation and significant lateral migration of the channel is not apparent." QUASED modeling suggests that some reaches increase degradation potential as the result of encroachment by improvements as compared to the existing condition. For the portion of the River downstream of Interstate 5, some portions of the bed are expected to aggrade more, while others are expected to degrade more. Downstream of Mint Canyon on the River toe-down, design depth of 12.50 feet is recommended with a general scour of 2.68 feet, a bed form height of 4.92 feet, a low flow incisement of 2 feet, and a total scour of 7.14 feet (Table 3.20, p. 3-54).

The SLA report was reviewed in detail by LADPW and response to comments made, however, the report was not revised to obtain final LADPW approval.

2.4 USGS, 1979

The USGS study collected sediment data from 1967 to 1975 at three sites in the Santa Clara River basin including the Los Angeles-Ventura County line. The study estimated long-term sediment discharge by applying the sediment and water discharge relationship observed from 1967 to 1975 to long-term records of water discharge (1928-1975).

During the short-term period (1968-1975), total sediment discharge was 63.5 million tons, 59.5 million tons of which was carried in suspension. Coarse sediment accounted for 28% of the total sediment discharge (17.7 million tons). Transport of the majority of sediment occurred during only a few days of flood flow each year (55% of the total sediment within 2 days and 92% within 53 days).

Sediment deposited in reservoirs (Lake Piru and Pyramid Lake) resulted in a 6% reduction of sediment to the River basin during the historical period (1928-1975) and 12% during the period most affected by dams (1953-1975). Castaic Creek interception of sediment reduced the amount of sediment in the River by another 2% from 1928-1975 and 4% from 1953-1975. It is not clear how these reductions are directly related the completion of the Castaic Creek Dam because it was not completed until 1971.

3 Sediment Characterization and Analysis

3.1 Sediment Data Collection

To characterize the sediment of the river bed and by extension the possible bed load of sediment during discharge events, a sediment grain size analysis was conducted. The goal of the analysis is to gain a statistical representation of the size distribution of soil components of the river bed. Grain size distribution analysis is a powerful tool because the results can represent both a qualitative description of soil make up as well as quantitative input for further predictive measures, such as fluvial modeling.

Sediment collection for the Santa Clara River along the study reach was conducted by Allen Seward Engineering Geology, Inc. Eighteen samples were collected along the river with a total of 23 including samples taken at the tributaries. The relevant sampling locations are compiled in Table 3.1. All sampling was conducted using grab samples of the upper foot of the active or recently active portion of the bed. At least three samples at different locations within a sampling station were taken at each River sampling location. Sampling locations for the study are presented in a February 14, 2005 report, reproduced in Appendix Chapter 3.2.

Table 3.1: Santa Clara River Location and Average D_{50} of Sediment Samples

Reach	Station	Sample Number	Reach Average D_{50} (mm)[1]
A & B	37135	CB1	0.5
	37135	CB2	
	36515	CB3	
C	28500	HR1	0.95
	28500	HR2	
	28500	HR3	
	24115	LC1	
	24115	LC2	
	24115	LC3	
D	22195	AC1	1.0
	22195	AC2	
	22195	AC3	
D & E	15335	MC1	1.0
	15335	MC2	
	15335	MC3	

1: Reach average is the average of all samples I the reach.

3.2 Sediment Gradation Analysis

Generally, grain size distribution analysis is broken down into three distinct steps. The first step is to dry the samples. Drying is accomplished in a desiccator or similar apparatus. The second step is to sieve or otherwise

separate the sediment by particle size. Finally, fine material (smaller than standard mesh 200) is analyzed using hydrometric techniques. The sediment distributions are plotted on semi-log plots by percent finer for a given sample size. For this study, no fine material is included in analysis because fine material is generally transported as wash load, which is not of concern here. Distribution data has been averaged on a station by station basis. Averaging is accomplished by taking the mean of the three samples from a given station. Averaging provides a single representative sediment grain size distribution for a given station that can be used for numerical modeling or other analysis. Plots of the mean grain size distribution for each sampling station are presented in Figure 3.1A-E. Raw grain size distribution plots for the study are presented in the February 14, 2005 Seward report, reproduced in Appendix Chapter 3.2.

3.3 Sediment Characterization

A review of the raw gradation curves indicates that most samples are comprised of poorly graded sands with gravels and silts. The D_{50} values for all samples ranged from 0.25 to 4.67 mm with an average of 0.8 mm. A comparison with Figure 3.2A-B indicates that averaging retains the sandy character of the sampled soil. The averaged D_{50} values range from 0.5 to 1.0 mm. Additionally, previous SLA study noted above also found similar sandy characteristics, however, the average grain size was found to be approximately D_{50}=1.3 mm, somewhat more coarse that the current sampling.

Seward sampling was conducted on approximately the upper foot (recently active layer) of the bed, as noted above. To be conservative, no armoring layer (cobble layer) depth is assumed in sampling which allows the bed to fluctuate freely in numerical modeling. Additionally, the true armoring layer has not been observed in field measurements including Seward field studies and SLA boring logs. This study assumes that the grab sampling at the surface represents the below-surface bed. While the SLA boring logs do show vertical variation in grain size distribution, a consistent grain size vertical distribution is not evident.

The County has noted that cobbles are present in the SLA study boring logs, which is true. Cobbles are not present in any of the grain size distribution curves in the SLA study (particularly in the Landmark study reach), however, careful review of the boring logs down to approximately 10 feet (approximately five times the SAM single event depth) notes only sporadic cobble observances, generally less than 5% and rarely as much as 10%. More importantly, is the fact that at sample location 11 (in the Landmark Village study reach, p. B.5) no cobbles are observed until 8.5 feet. Because of the paucity of cobble occurrence in both the boring logs and their depth below the SAM single event depth, taken as the active depth, PACE believes that the sampling data collected by Seward is representative of the active bed.

LACDPW has noted that previous versions of this report included different sediment gradation data than is present currently. Careful review of the data reveals that most of the sampling for the January 2005 PACE draft report, compiled by Seward, was for upland and tributary locations, many at the proposed Landmark site. Some of the samples in that report included River

sample sites; however, only single grabs were included. The February 2005 PACE draft report includes multiple grabs by Seward at each River sample location providing a much greater degree of confidence in the data by being able to spot outliers (here in the statistical sense). Because there is no way to independently determine the efficacy of the samples in the January 2005 report, the gradation data was replaced with more verifiable data. The January 2005 data is not included in this draft.

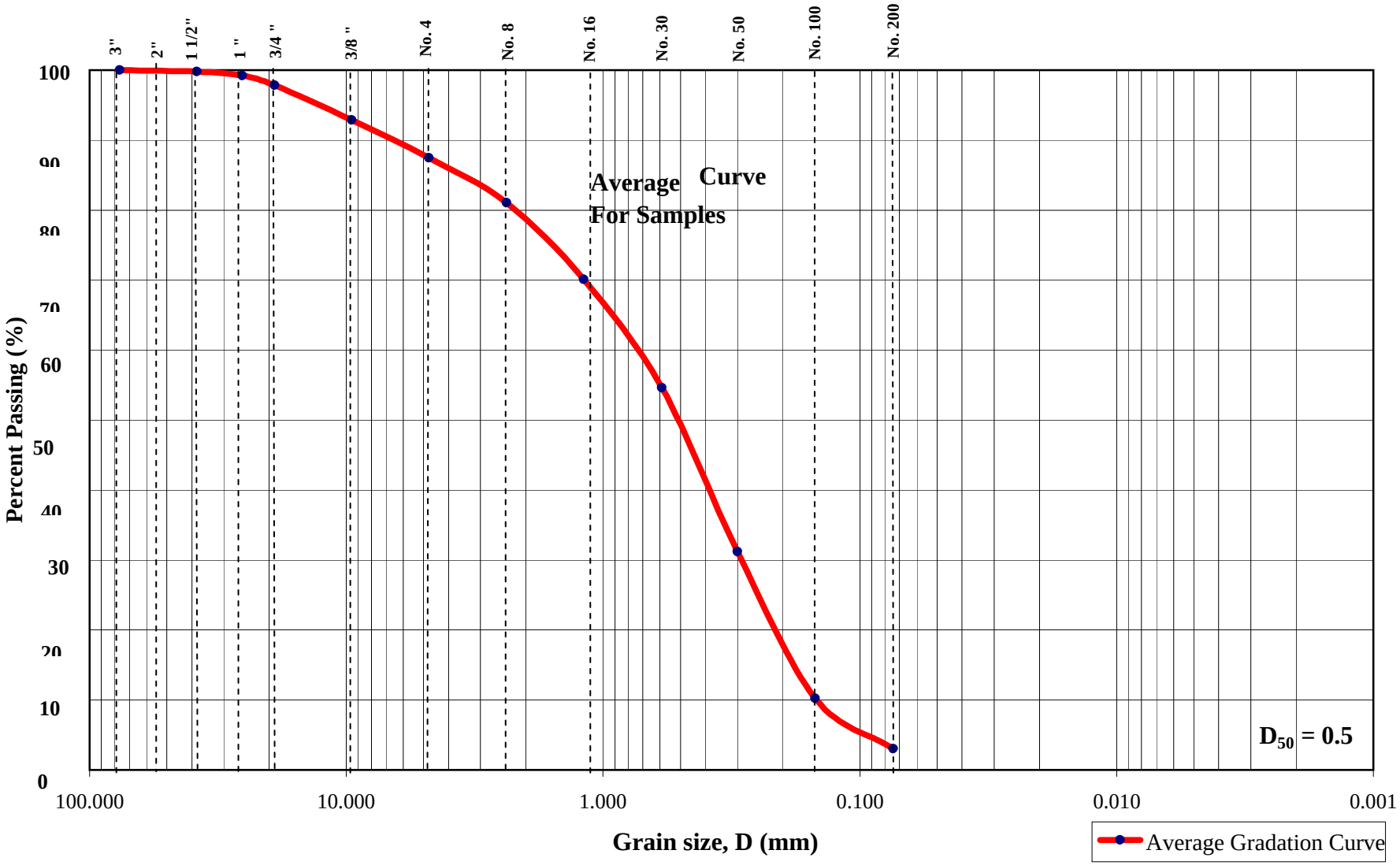


Figure 3.1A. Santa Clara River Reach A Average Gradation Curve

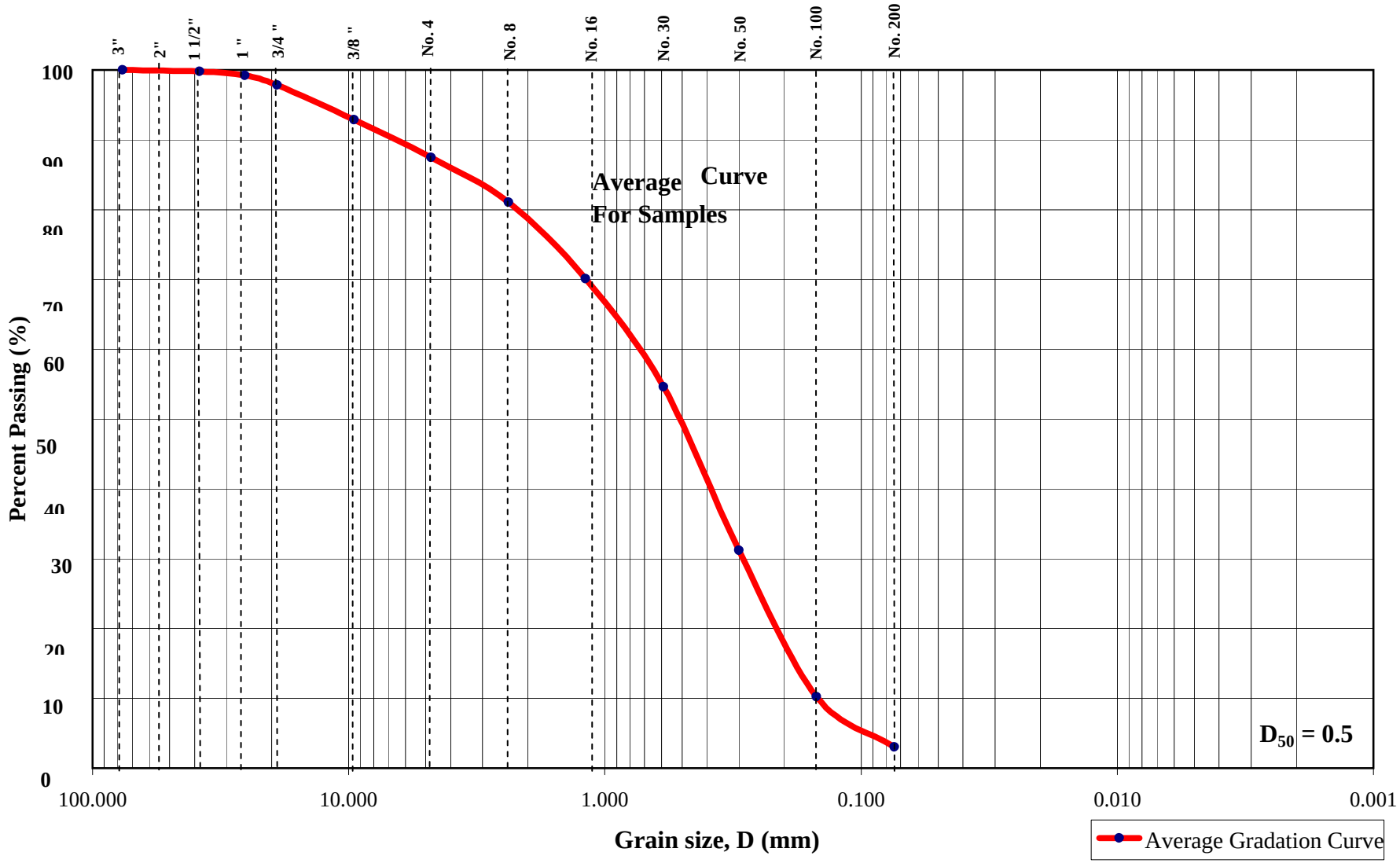


Figure 3.1B. Santa Clara River Reach B Average Gradation Curve

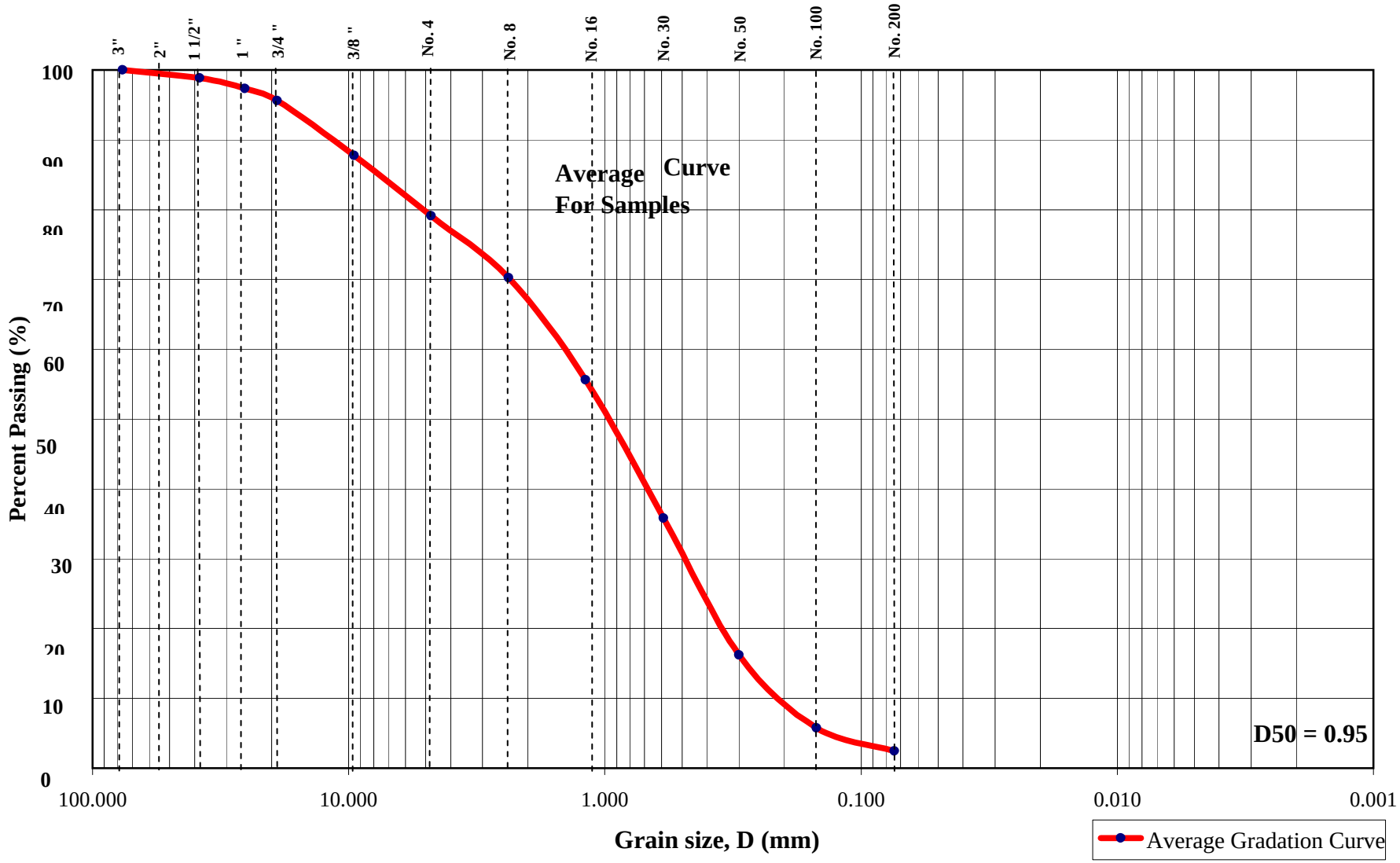


Figure 3.1C. Santa Clara River Reach C Average Gradation Curve

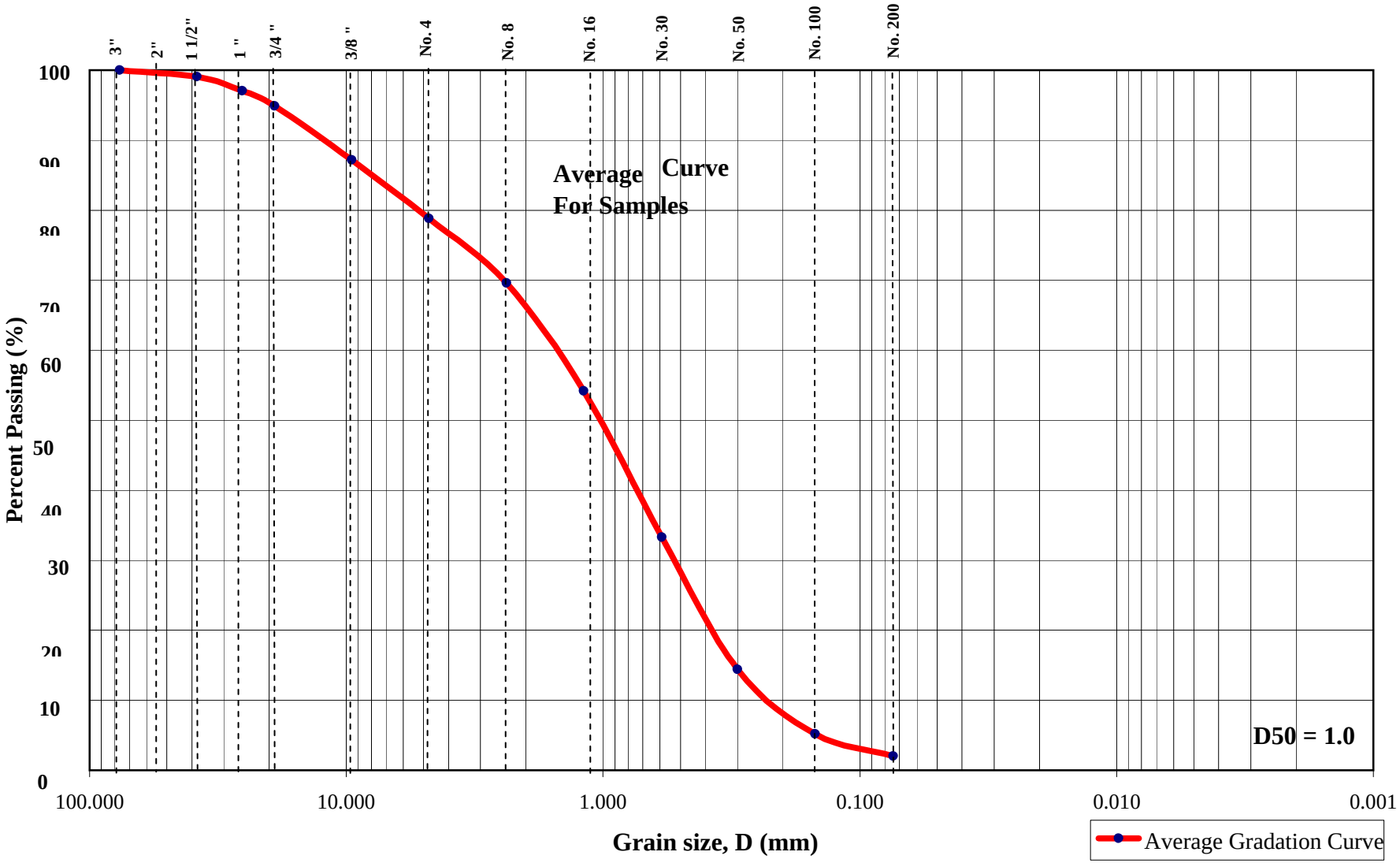


Figure 3.1D. Santa Clara River Reach D Average Gradation Curve

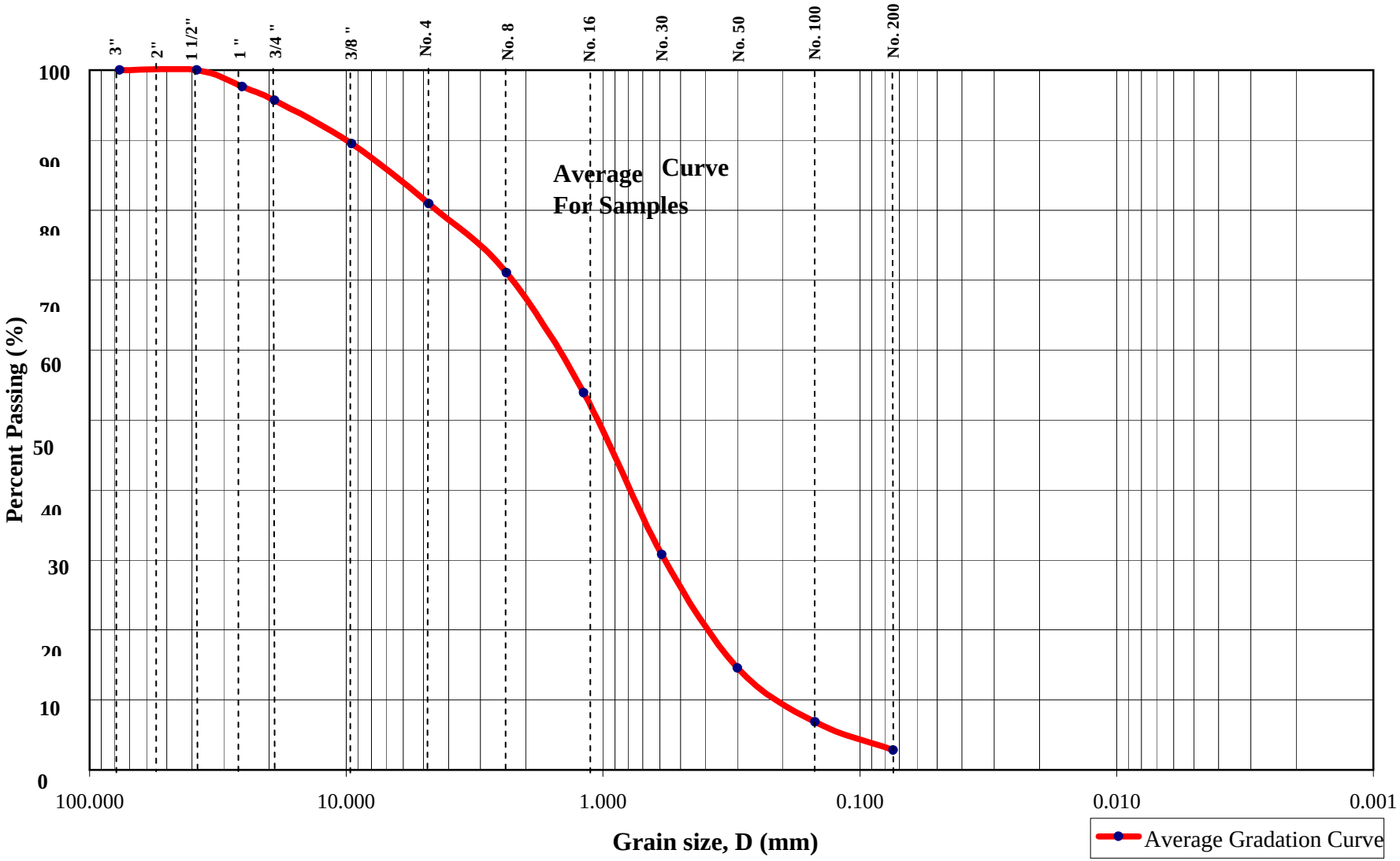


Figure 3.1E. Santa Clara River Reach E Average Gradation Curve

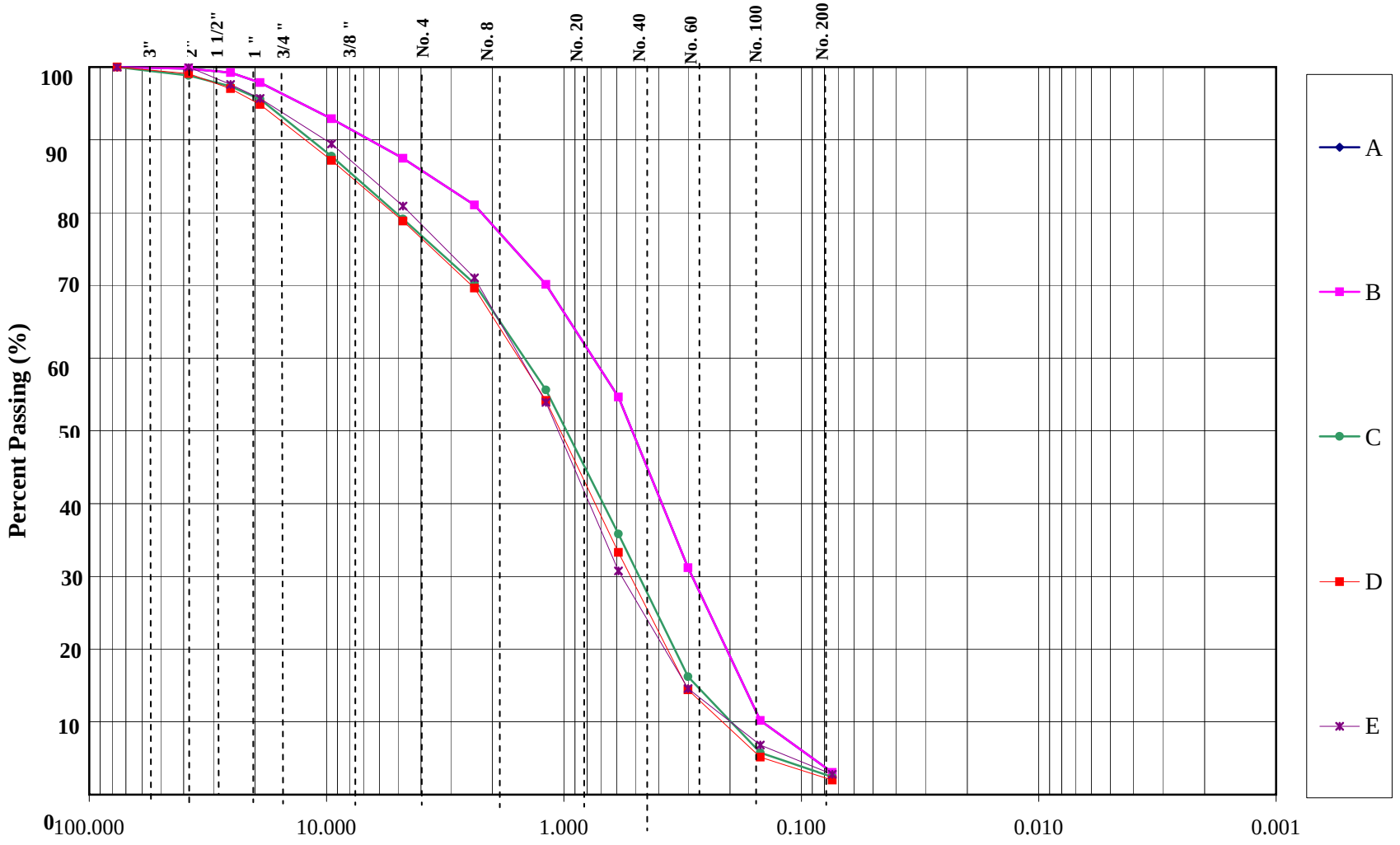


Figure 3.2A. Santa Clara River Streambed Grain Size

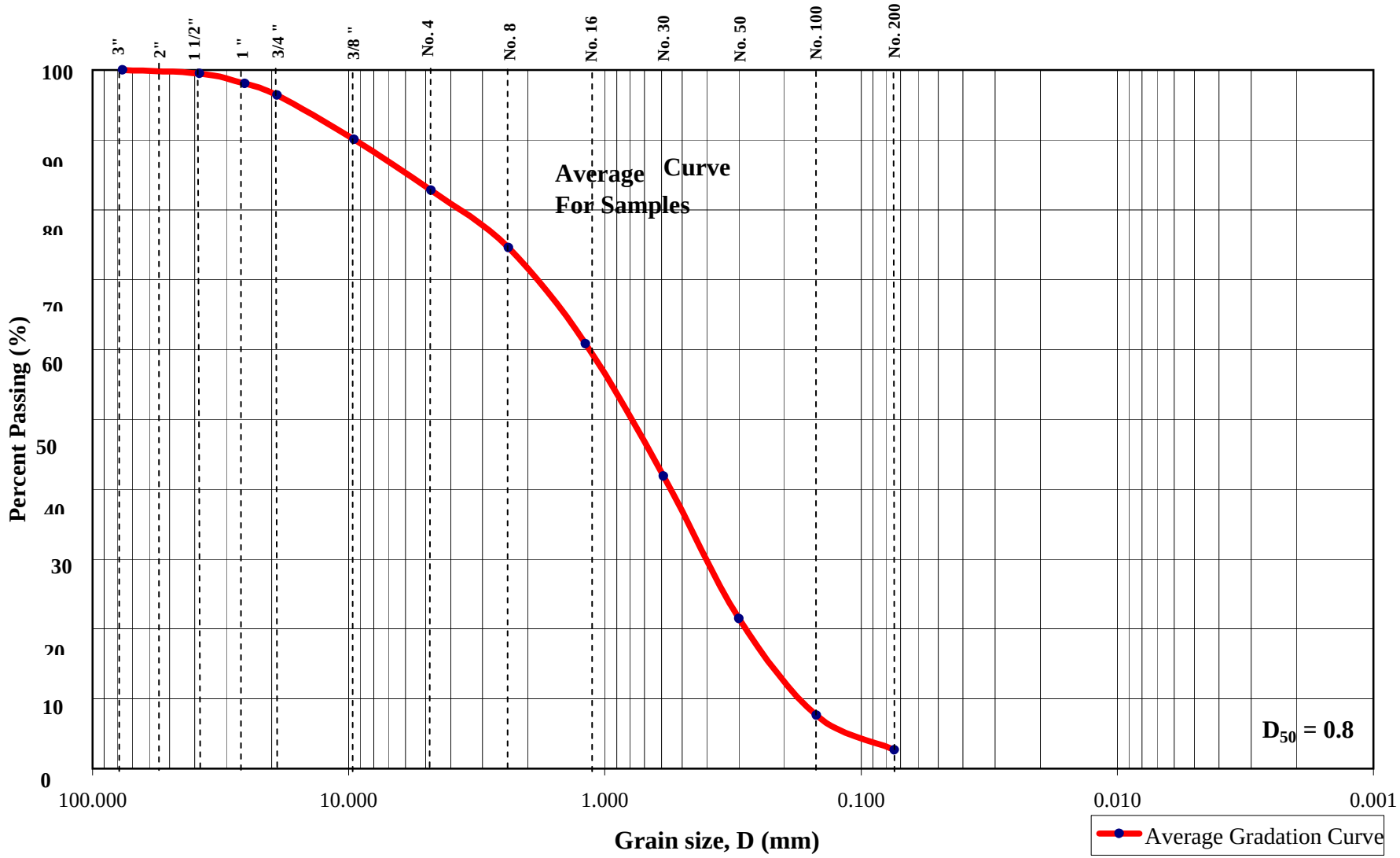


Figure 3.2B. Santa Clara River Average Gradation Curve

4 General Adjustment

4.1 SAM Model

General adjustment was estimated in this study using the US Army Corps of Engineers (ACOE) SAM steady-state numerical model. Here, SAM was employed to provide a first calculation of sediment transport potential for multiple subreaches within the Santa Clara River (SCR). The SAM Sediment Hydraulic Package is an integrated system of programs developed through the Flood Damage Reduction and Stream Restoration Research Program to aid in the analyses associated with designing, operating, and maintaining flood control channels and stream restoration projects. SAM combines the hydraulic information and the bed material gradation information to compute the sediment transport capacity for a given channel or floodplain hydraulic cross-section for a given discharge at a single point in time. A number of sediment transport functions are available for this analysis and SAM has the ability to assist in selecting the most appropriate sediment transport equation.

The three primary fluvial components of SAM are SAM.HYD, SAM.SED and SAM.AID. SAM.HYD provides a steady state, normal-depth, one-dimensional representation of channel hydraulics. The SAM.SED module combines the hydraulic parameters with the bed material gradation curve to compute bed material discharge rating curves by size classification. The SAM.AID module provides the user with recommended sediment transport equations based on the best matches between hydraulic parameters and grain size distribution of the study reach with parameters of from widely accepted and published research.

4.1.1.a SAM Model Theory and Limitations

The SAM numerical model is built upon hydraulic and fluvial components. The hydraulic components include representations of river bed characteristics that are input into an analytical procedure. The fluvial component includes representation of bed gradation as percent finer statistics and a selection of up to twenty sediment transport equations. SAM's hydraulic component will accept either average reach parameters or cross-section data imported from HEC-2/HEC-6 models. Hydraulic modeling is based on a uniform flow equation where discharge is the dependent variable such that,

$$Q = f(D, n, W, z, S)$$

where Q is discharge in cfs, D is flow depth in feet, n is the Manning's number, W is bottom width in feet, z is the channel side slope, and S is the energy slope. The bottom width is representative of the total moveable bed width of the channel and Manning's number is a composite value. Normal depth is calculated using Manning's equation, and effective values of width and depth are calculated following normal depth calculations. In cases where HEC-2 cross-sections are used for modeling, as in this study, the

effective depth and width are calculated from the cross-section data based on the channel hydraulics.

The fluvial component is based on sediment transport functions to calculate the bed portion of the sediment discharge-rating curve.

The sediment transport equations are of the form,

$$GS_i=f(V, D, S_e, B_e, d_e, \rho_s, G_{sf}, d_s, i_b, \rho_f, T)$$

where GS_i is the transport rate for sediment size class i; the hydraulic terms V, D, S_e, and B_e, are the average velocity, effective flow depth, energy slope, and effective flow width, respectively; the sediment particle parameters d_e, ρ_s, and G_{sf} are the effective particle size, particle density, and grain size shape factor, respectively; the sediment mixture properties, d_s and i_b are the geometric mean particle size of sediment class i and fraction of class i in the bed, respectively; and the fluid properties ρ_f, and T, the water density and temperature, respectively. Twenty well known, published, peer-reviewed transport equations are available including Ackers-White, Colby, Laursen-Copeland, Laursen–Madden, MPM, Toffaleti, Yang, Van Rijn and others. Once the data assembly is complete, the SAM.SED module can be used to create a sediment discharge-rating curve based on grain size distribution. The reader is referred to the SAM user's documentation for further reference.

It is important to note that the SAM model is a zero-dimensional computational package that is only based on a single cross-section at a particular point in time. As such, SAM simulations can only represent a reach average during a steady state discharge. Because SAM applies sediment transport to a point, no variability in size distribution in either space or time is calculated. With these limitations in mind, in this study SAM is intended to provide a first approximation to sediment transport to which other more sensitive calculations can be compared.

4.1.1.b SAM Model Assembly

In this study, hydraulic representation of the river bed is accomplished in several distinct steps. First, the HEC-RAS numerical model (1999 base topography) is thinned to no more than 100 stations per cross-section using HEC-RAS's cross-section points filter. Second, the HEC-RAS geometry is converted to HEC-2 format using the Army Corps RAS2UNET software. Next, the HEC-2 model deck is arranged to run in sub critical mode and all features, such as ineffective flow areas and levees, are added. Once the HEC-2 model is complete, it is re-imported into HEC-RAS and compared to the original model. Any cross-sectional differences between the RAS and 2 models are resolved. Once the original and re-imported models match, the HEC-2 model is run to

produce the Army Corps' T95 binary hydraulic simulation output file. Next, the T95 file is then read directly into SAM using the SAM model's M95 subroutine using the reach length option. Sections are chosen based on the reach characterization described below. A comparison of output and discussion is presented in Appendix Chapter 4.4.

This conversion methodology is powerful because it ensures that data created for, and analyzed using HEC-RAS and HEC-2 hydraulic software, is fully compatible with, and implemented in, SAM fluvial analyses. Copies of the HEC-RAS and HEC-2 models for both the existing and proposed conditions are included in Appendix Chapter 4.3. A table comparing the velocity and depth of the different models used in each phase of the project described previously is also included in Appendix Chapter 4.4. Both the existing and proposed conditions HEC-RAS model were originally developed by Sikand Engineering in *Newhall Ranch Santa Clara River HEC-RAS Study* (June 2000) and submitted as part of the Newhall Ranch Specific Plan. The Sikand model was further modified by PACE to create a model that was reviewed and accepted by LACDPW. The newest model Q_{CAP} discharge was approved by LACDPW for this study in 2005. Slight differences exist between the PACE and Sikand models in terms of discharge and stationing and have been made to meet LACDPW criteria, otherwise the models are the same. Otherwise, the only changes made to the HEC-RAS model occur in the proposed condition where the alignment of soil cement bank protection was revised to reflect the most current proposed condition, and the afore mentioned Q_{CAP} discharge. The current position of the bank protection avoids River jurisdictional areas and is further outside the River than the bank protection originally proposed in the Sikand model. The HEC-RAS model discharges in the present models were originally included in the Sikand model, except for the revised Q_{CAP} discharge, which was provided by LACDPW, as noted above. Finally, subreaches within the SAM model are specified and average hydraulic parameters are calculated for those subreaches. Subreaches are determined by examining the hydraulic parameters of the individual HEC-RAS cross-sections and identifying correlations between those hydraulic parameters and the longitudinal position in the channel of the individual cross-section. This process is presented in Appendix Chapter 4.5.

4.1.2 Reach-by-Reach Channel Hydraulic Characterization

Reaches are defined by changes in discharge within Santa Clara River. These changes occur at HEC-RAS sections STA 46195, STA 36080, STA 32265, STA 22195, and STA 15125, as shown in Figure 1.1. As noted above, SAM modeling is based on channel subreaches determined by correlating hydraulic characteristics with longitudinal cross-section location to preserve the along-stream character of the flow. The hydraulic parameters examined are discharge, energy slope,

bed slope, Froude number, top width, hydraulic velocity, and flow area based on the Q_{CAP} discharge. First, correlation coefficients are calculated for each section against the hydraulic parameters. The hydraulic parameter that produces the greatest correlation is plotted against cross-section location. Subreaches are then selected in a manner that preserves the trend of the hydraulic parameter as well as produces approximately equal subreach lengths, which are generally 1000 feet long. This methodology seeks to maintain continuity of analysis by producing similar length subreaches while analyzing the hydraulic parameters that largely control sediment transport. Correlation values typically vary from r=±0.25 to r=±0.82. In the case of the Santa Clara River, all subreaches have been defined based on locations of trend changes within the River. Subreaches are defined in Table 4.1A-B and shown in Figure 1.1. Both the existing and proposed conditions models employ identical subreach lengths and locations. However, because the HEC-RAS models were created separately by Sikand, slight differences in the model hydrology occur. These minor differences are not expected to significantly alter comparisons between the two models. The use of identical subreaches was employed for two reasons: to ensure consistency between existing and proposed conditions analysis, and because correlation values between sections and various hydraulic parameters for both the existing and proposed conditions are similar. Statistical analysis of the reaches for both the existing and proposed conditions is shown in Appendix Chapter 4.5.

Table 4.1A: Santa Clara River Existing Conditions Sub-Reach Stationing

Subreach	US Sta	DS Sta	Transport Equation[1]
SRA1	46195	44210	MPM
SRA2	43820	41460	MPM
SRA3	41280	38925	MPM
SRA4	33880	36265	MPM
SRB1	36080	29385	MPM
SRB2	33880	32605	MPM
SRC1	32265	29385	MPM
SRC2	29140	27155	MPM
SRC3	26990	25000	MPM
SRC4	24795	22415	MPM
SRD1	22195	20070	MPM
SRD2	19855	17785	MPM
SRD3	17510	15335	MPM
SRE1	15125	13190	MPM
SRE2	13030	11180	MPM
SRE3	11015	9025	MPM

1: MPM - Meyer, Peter and Muller, 1948

Table 4.1B: Santa Clara River Proposed Conditions Sub-Reach Stationing			
Subreach	US Sta	DS Sta	Transport Equation[1]
SRA1	46195	44210	MPM
SRA2	43820	41460	MPM
SRA3	41280	38925	MPM
SRA4	38710	36265	MPM
SRB1	36080	34090	MPM
SRB2	33880	32605	MPM
SRC1	32265	29385	MPM
SRC2	29140	27155	MPM
SRC3	26990	25000	MPM
SRC4	24795	22415	MPM
SRD1	22195	20070	MPM
SRD2	19855	17785	MPM
SRD3	17510	15335	MPM
SRE1	15125	13190	MPM
SRE2	13030	11180	MPM
SRE3	11015	9025	MPM

1: MPM - Meyer, Peter and Muller, 1948

4.1.3 Input Data and Selection of Transport Functions

Representation of sediment grain size distribution in SAM takes the form of percent finer data obtained from sieve analysis of channel sediment grab samples. At each sampling location, multiple samples are collected and analyzed, and the average data is input into the model. All sampling and sieve analysis was conducted by Seward Engineering Geology, and sample locations were chosen based on either the presence of recently active alluvium or the presence of adjacent/underlying older alluvium commonly incorporated into stream sediment load during major events. Environmental constraints on subsurface investigations in active drainages limited sampling locations in some instances, and in these cases the most representative, obtainable data is used as previously described in Chapter 3.

4.1.3.a SAM.AID Application and Theory

Sediment transport equations used in all SAM modeling were chosen with the assistance of the Army Corps' SAM.AID subroutine. The SAM.AID subroutine determines the most representative transport function based on the hydraulic parameters and percent finer data for each subreach by comparing model data with the results of 20 peer-reviewed and widely acknowledged sediment transport studies. This case-by-case transport equation selection is more likely to provide a robust representation of channel sediment transport than choosing an individual transport equation for all reaches.

Application of different transport functions to an individual channel reach may provide significantly differing model output. This is

because the parameters of a given study from which the function is derived, vary greatly. To accomplish the task of guiding the user in selecting an appropriate transport function, SAM.AID assumes that the function that best represents sediment transport in a gauged stream would also best represent transport in an ungauged stream with similar sediment and hydraulic characteristics. SAM.AID begins by comparing study parameters (V, D, S_e, B_e, D_{50}) with parameters in the transport function database. Comparison begins by determining if D_{50} falls within one of the ranges identified in the database. Once the initial matches have been made in the database, the three best-matched sediment transport functions for the study reach are listed along with the parameters that matched the data set.

Once the best transport equation matches have been determined by SAM.AID, the most representative equations are run in SAM.SED for each subreach. Yang (Yang, 1984) and MPM (Meyer-Peter and Muller, 1948) equations are added to all simulations where they are not explicitly matched by SAM.AID so that there is a continuity of comparison between subreaches. Following SAM.SED computations sediment transport potential for each subreach can then be estimated by reviewing the calculations from each equation and analyzing the results. Any SAM.SED calculation outliers are excluded and calculations of bed adjustment are made using mean estimate of transport potential. Outliers are values under analysis in a data set that reside far outside most other values in a data set. In this case, when one of the results of a SAM.SED calculation is three orders of magnitude or more different from the median, the data is excluded from analysis and noted as an outlier. The raw data is presented in Appendix Chapter 4.6.

The MPM equation was found to be the representative transport equation for all subreaches for the existing and proposed conditions. This is because transport estimates based on other transport equations (i.e. Yang), when used to estimate general adjustment and transport, produced degradation values in excess of both historical values of general adjustment (as much as approximately 15 feet) and values of general adjustment that might be physically expected during a single event (over approximately 20 feet). In other cases, some transport equations (i.e. Brownlie D_{50}) estimated sediment transport that produced general adjustment calculations much smaller than expected (as little as approximately 0.1 feet). The full summary of transport potential by subreach for the various transport equations for both existing and proposed conditions is provided in Appendix Chapter 4.6. Since the D_{50} for a given reach is the same for both the existing and proposed conditions models, the differences in transport function applicability is related to hydraulic differences between the two conditions.

4.1.4 SAM Bed Stability

Bed stability can be examined based on the change in potential transport between channel subreaches. Subreaches are readily determined from changes in hydraulic parameters, and frequently the most significant hydraulic parameter in terms of impact on stream stability is discharge (volume per unit time). If a channel subreach has equal potential transport both entering and exiting the reach, then the subreach is said to be in equilibrium. Frequently, however, channel subreaches are either in an aggrading or degrading condition. For the purposes of this study, aggrading reaches are those whereby the potential transport entering the reach (the potential transport of the subreach upstream of that under immediate consideration) is higher than the potential transport leaving the subreach (the potential transport of the subreach under immediate consideration). In degrading subreaches, the opposite is true and potential transport entering the reach is lower than that leaving the subreach. While it would appear that downstream subreaches would degrade constantly because discharge generally increases in downstream subreaches and in turn increases the transport potential as one moves downstream, other factors such as hydraulic depth, mean subreach velocity, hydraulic top width, and bed slope contribute significantly to potential transport.

Bed stability was determined by calculating the difference between subreach upstream and downstream sediment potential transport for the Q_{CAP} discharge. Transport potential for each reach is shown in Table 4.2A-B. The table shows no clear trend in transport potential as a function of subreach. The difference in transport potential, ΔTP (ton/day) between two cross-sections, was converted to bed adjustment, *GA* (feet), as:

$$GA = \frac{\Delta TP}{\rho bRL} day$$

where ρ is density in tons per cubic feet, *b* is channel width in feet, *day* denotes one day's time, and *RL* is reach length in feet. Density has been taken as 165.36 lb/ft^3. A summary of the adjustment for each reach is shown in Table 4.3.

General adjustment is based on SAM modeling presented in Figure 4.1A-B and Table 4.4A-B for the existing and proposed conditions, respectively. It is important to note that no apparent pattern of aggradation/degradation is apparent between cross-sections in the figure. General adjustment calculated using the equation presented in the Los Angeles County Hydrology and Sedimentation Manual (LACH&SM) is also shown in the figures. This latter calculation methodology is only based on flow mean velocity at a given channel section as computed by the HEC-RAS model of the system. In most circumstances, scour predicted by the LACH&SM is greater than that predicted by SAM for both the existing and proposed conditions except

at Commerce Center Bridge. It should be noted that scour predicted by the ACOE HEC-6 numerical model is expected to be approximately the same as or shallower than SAM predictions in terms of depth, although some longitudinal deviation from SAM results is expected.

The tables and figures indicate the general adjustment ranges from -2.9 to +2.3 feet for the existing condition, and -1.6 to +2.1 for the proposed condition. In Reach A (SRA1 to SRA4), the general adjustment does not vary by more than ±0.2 feet between the existing and proposed condition. SRA1 is predicted to have no change in general adjustment between the two conditions, and only SRA3 is expected to decrease degradation. The remaining sections are expected to decrease aggradation. In Reach B, either a minor increase in degradation between the existing and proposed general adjustment (0.1 feet ,SRB1) or minor increase in aggradation (0.2 feet, SRB2), is expected. In Reach C, no change between the existing and proposed condition is expected in SRC1 or SRC4, while SRC2 and SRC3 have 1.3 and 0.9 feet of decreased and increased degradation, respectively. No pattern of aggradation or degradation change in Reach D is observable. The subreaches in Reach D decrease degradation, increase aggradation, and increase degradation in subreaches SRD1 to SRD3 respectively. Reach E also has no pattern of aggradation or degradation change between the existing and proposed conditions ranging from 0.2 feet of decreased aggradation in SRE2 to 0.1 feet of increased degradation in SRE3. Finally, the general trend in general adjustment for the study reach as indicated by SAM modeling is not apparent for either the existing condition or proposed condition. It is not expected that short reaches (on the order of 500 feet) with minor lateral changes (on the order of 100 feet) in the positions of the proposed conditions improvements will affect these results significantly except where velocity changes are greater than approximately 25 percent.

Table 4.2A: Santa Clara River Existing Conditions Bed Stability

Subreach	US Sta	DS Sta	Trans Eq	Transport (ton)	Top Width (ft)	Depth (ft)	A/D	Grade Change (ft)
SRA1	46195	44210	MPM	403,938	525.6	0.6		0.6
SRA2	43820	41460	MPM	330,678	977.0	0.4	AGGRADE	0.4
SRA3	41280	38925	MPM	401,167	1,242.2	0.3	DEGRADE	-0.3
SRA4	38710	36265	MPM	343,735	952.0	0.3	AGGRADE	0.3
SRB1	36080	34090	MPM	483,359	1,389.0	0.6	DEGRADE	-0.6
SRB2	33880	32605	MPM	488,063	1,650.3	0.0	DEGRADE	0.0
SRC1	32265	29385	MPM	101,035	1,965.8	0.8	AGGRADE	0.8
SRC2	29140	27155	MPM	470,866	780.8	2.9	DEGRADE	-2.9
SRC3	26990	25000	MPM	558,797	1,492.1	0.4	DEGRADE	-0.4
SRC4	24795	22415	MPM	468,697	2,008.5	0.2	AGGRADE	0.2
SRD1	22195	20070	MPM	675,434	2,009.0	0.6	DEGRADE	-0.6
SRD2	19855	17785	MPM	241,344	1,936.3	1.3	AGGRADE	1.3
SRD3	17510	15335	MPM	623,943	1,812.5	1.2	DEGRADE	-1.2
SRE1	15125	13190	MPM	796,646	1,878.9	0.6	DEGRADE	-0.6
SRE2	13030	11180	MPM	307,423	1,372.4	2.3	AGGRADE	2.3
SRE3	11015	9025	MPM	624,904	1,390.6	1.4	DEGRADE	-1.4

Table 4.2B: Santa Clara River Proposed Conditions Bed Stability								
Subreach	US Sta	DS Sta	Trans Eq	Transport (ton)	Top Width (ft)	Depth (ft)	A/D	Grade Change (ft)
SRA1	46195	44210	MPM	403,938	525.6	0.6		0.6
SRA2	43820	41460	MPM	359,566	958.6	0.2	AGGRADE	0.2
SRA3	41280	38925	MPM	385,857	1,022.2	0.1	DEGRADE	-0.1
SRA4	38710	36265	MPM	370,217	797.6	0.1	AGGRADE	0.1
SRB1	36080	34090	MPM	534,683	1,376.0	0.7	DEGRADE	-0.7
SRB2	33880	32605	MPM	494,553	1,709.1	0.2	AGGRADE	0.2
SRC1	32265	29385	MPM	147,697	1,859.8	0.8	AGGRADE	0.8
SRC2	29140	27155	MPM	389,467	899.2	1.6	DEGRADE	-1.6
SRC3	26990	25000	MPM	633,550	1,159.3	1.3	DEGRADE	-1.3
SRC4	24795	22415	MPM	603,656	860.1	0.2	AGGRADE	0.2
SRD1	22195	20070	MPM	661,922	1,511.4	0.2	DEGRADE	-0.2
SRD2	19855	17785	MPM	319,200	1,431.8	1.4	AGGRADE	1.4
SRD3	17510	15335	MPM	620,768	1,274.3	1.3	DEGRADE	-1.3
SRE1	15125	13190	MPM	731,941	1,588.9	0.4	DEGRADE	-0.4
SRE2	13030	11180	MPM	291,031	1,375.5	2.1	AGGRADE	2.1
SRE3	11015	9025	MPM	635,705	1,399.4	1.5	DEGRADE	-1.5

Table 4.3: Santa Clara River SAM Existing vs Proposed Conditions Bed Stability					
Subreach	US Sta	Existing Conditions Grade Change (ft)	Proposed Conditions Grade Change (ft)	Delta (ft)	Result
SRA1	46195	0.6	0.6	0.0	NO CHANGE
SRA2	43820	0.4	0.2	0.2	DECREASE AGG
SRA3	41280	-0.3	-0.1	-0.2	DECREASE DEG
SRA4	38710	0.3	0.1	0.2	DECREASE AGG
SRB1	36080	-0.6	-0.7	0.1	INCREASE DEG
SRB2	33880	0.0	0.2	-0.2	INCREASE AGG
SRC1	32265	0.8	0.8	0.0	NO CHANGE
SRC2	29140	-2.9	-1.6	-1.3	DECREASE DEG
SRC3	26990	-0.4	-1.3	0.9	INCREASE DEG
SRC4	24795	0.2	0.2	0.0	NO CHANGE
SRD1	22195	-0.6	-0.2	-0.4	DECREASE DEG
SRD2	19855	1.3	1.4	-0.1	INCREASE AGG
SRD3	17510	-1.2	-1.3	0.1	INCREASE DEG
SRE1	15125	-0.6	-0.4	-0.2	DECREASE DEG
SRE2	13030	2.3	2.1	0.2	DECREASE AGG
SRE3	11015	-1.4	-1.5	0.1	INCREASE DEG

Figure 4.1A: Santa Clara River Existing Conditions General Adjustment

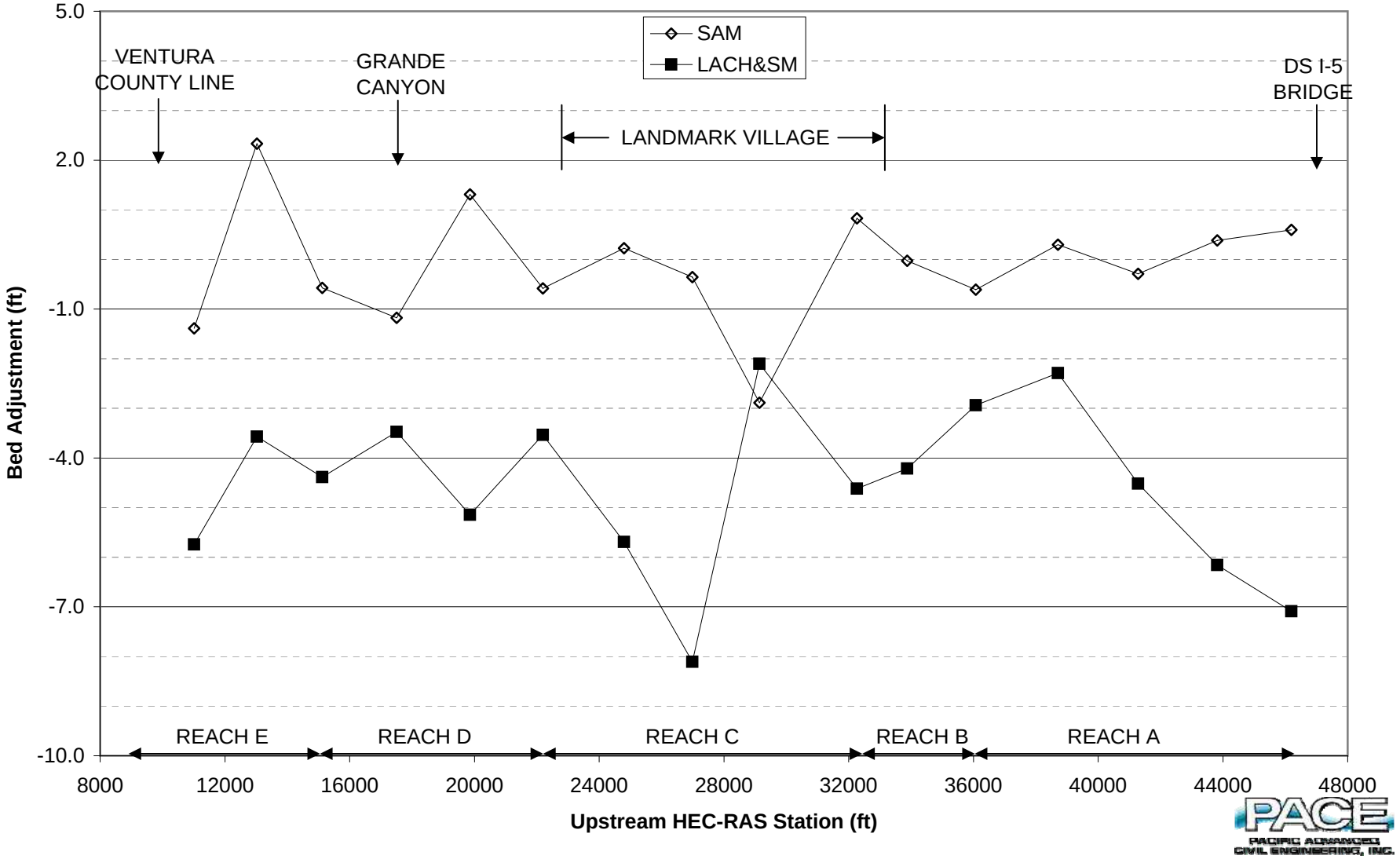


Figure 4.1B: Santa Clara River Proposed Conditions General Adjustment

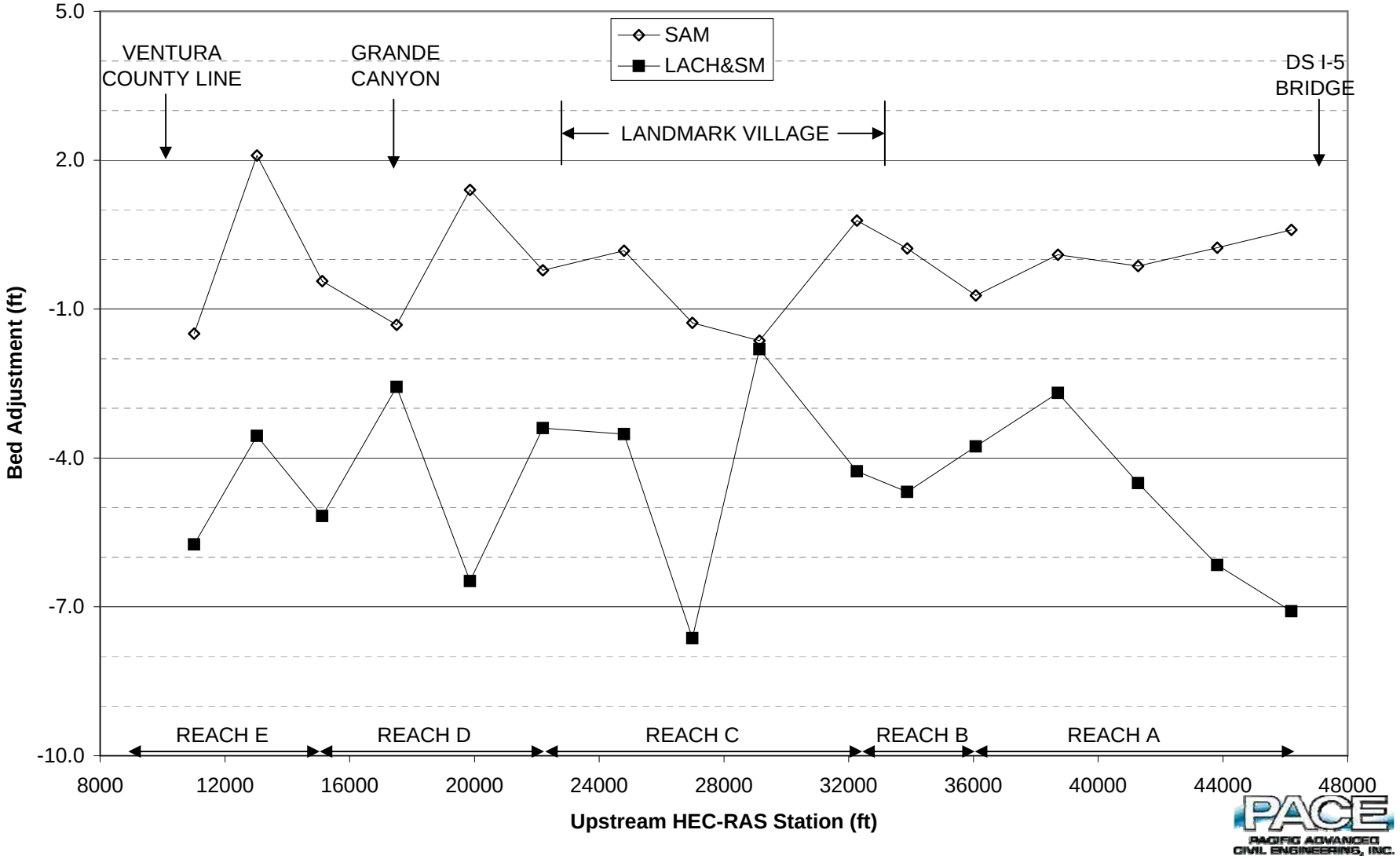


Table 4.4: Santa Clara River SAM & LACH&SM General Adjustment Comparison (ft)

Subreach	US Sta	Existing Conditions		Proposed Conditions	
		SAM[1]	LACH&SM[2]	SAM[1]	LACH&SM[2]
SRA1	46195	0.6	-7.1	0.6	-7.1
SRA2	43820	0.4	-6.2	0.2	-6.2
SRA3	41280	-0.3	-4.5	-0.1	-4.5
SRA4	38710	0.3	-2.3	0.1	-2.7
SRB1	36080	-0.6	-2.9	-0.7	-3.8
SRB2	33880	0.0	-4.2	0.2	-4.7
SRC1	32265	0.8	-4.6	0.8	-4.3
SRC2	29140	-2.9	-2.1	-1.6	-1.8
SRC3	26990	-0.4	-8.1	-1.3	-7.6
SRC4	24795	0.2	-5.7	0.2	-3.5
SRD1	22195	-0.6	-3.5	-0.2	-3.4
SRD2	19855	1.3	-5.1	1.4	-6.5
SRD3	17510	-1.2	-3.5	-1.3	-2.6
SRE1	15125	-0.6	-4.4	-0.4	-5.2
SRE2	13030	2.3	-3.6	2.1	-3.6
SRE3	11015	-1.4	-5.7	-1.5	-5.7

1: Sam calculations represent an entire subreach

2: LACH&SM calculations represent one cross-section

4.2 HEC-6

The ACOE HEC-6 model is a one-dimensional moveable bed open channel hydraulic and sediment transport model. The model was designed to simulate change in river bed profiles resulting from sediment scour and deposition over long periods of time. The model segments hydrograph data into a progression of steady flow events with varied discharge and duration. Every segment of flow is used to calculate a water surface profile and associated hydraulic parameters (e.g. velocity, depth, etc.). From the hydraulic parameters, potential sediment transport rates are estimated for each model reach and scour or deposition is next estimated so that cross-section shape can be updated. Sediment calculations are based on grain size distribution so that sorting and armoring can be considered.

A one dimensional energy approximation to the equations of motion is used for hydraulic calculations in HEC-6. Manning's equation is utilized to incorporate bed friction. The model also uses both an up- and down-stream boundary condition with internal conditions optional. Krone's method is for deposition of fines and Ariathurai and Krone's method is used for scour. Sediment transport functions are user selectable and 13 different equations are possible. Colby's method is used to adjust transport potential and armoring is simulated using Gessler's method. Sediment boundary conditions operate such that inflowing sediment load is a function of inflow discharge.

At this date the "T" enhancement of the HEC-6 program, created by Mobile Boundary Hydraulics, is expected to be used.

5 Long-Term Adjustment

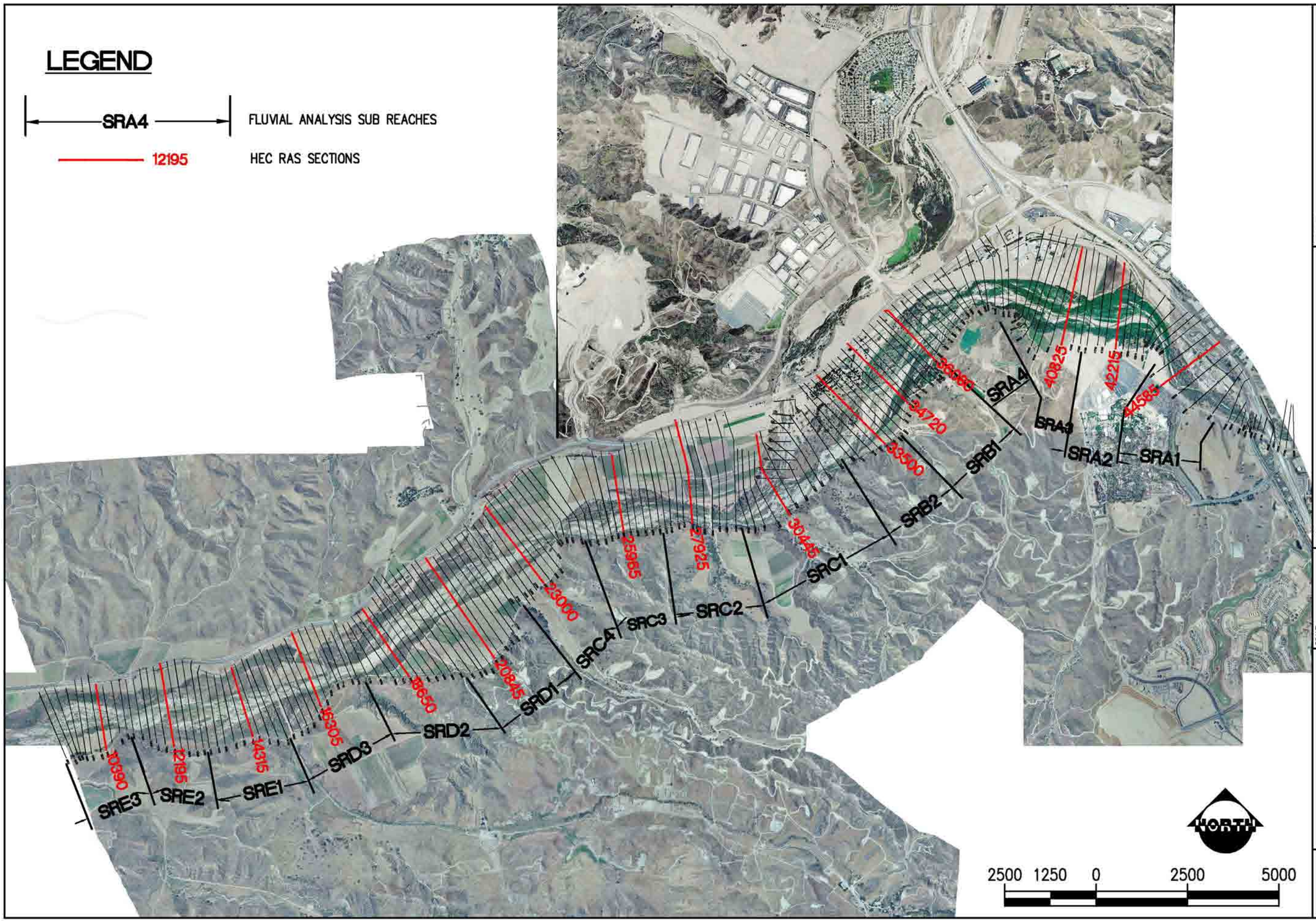
Long-term adjustment was calculated based on historical records in the form of topographic data. First, topographic data, provided by Allan E. Seward Engineering Geology dating from 1930, 1947, 1963, 1999, 2004 and 2005, was digitized (See Appendix Chapter 5.1). This was accomplished by determining a common coordinate system and creating contour lines within the study area. Topographic data was available in several formats including digital elevation maps (1999, 2004, 2005), topographic surveys (1963) and quad maps (1930, 1947). Digital elevation maps were only adjusted for horizontal location. Cross-sections were next cut at the locations of select HEC-RAS sections for each historical topography (shown in Figure 5.1). At least one cross-section was chosen for each subreach established in Chapter 4 based on engineering interest. The sections chosen are section 10390, section 12195, section 14315, section 16305, section 18650, section 20845, section 23000, section 25965, section 27925, section 30445, section 33500, section 34720, section 36080, section 40825, section 42215, and section 44585. Section 36080 is actually in SRB1 not SRA4, although it was chosen since it is directly upstream of a tributary and near the proposed Commerce Center Drive Bridge. Areas of the 1947, 1963, 1999, 2004 and 2005 sections are calculated and these areas are used to calculate the average change in bed elevation over time. The other topography (1930) is not used to calculate average change in bed because of the impacts of the failure of the St. Francis Dam in 1928, as discussed below. To calculate the area of a given cross-section the lowest historical point on the section is determined and the area of each vertical foot of the section in one-foot intervals is calculated, as shown in Figure 5.2A-P, for each topography. The area of a section is the sum of the one-foot area intervals, also shown in Figure 5.2A-P. All areas for a given section have a common toe and top from which the area is calculated. In cases where available topography ends abruptly, areas are calculated assuming a vertical wall at the end. The relative average change in depth for a given section and topography is calculated as the area divided by the top width, where the top width is taken as the width of the upper most one-foot area. The top width in this sense is not a hydraulic characteristic but a physical one, which along with the sectional area determines the maximum capacity of the section. Moreover, the calculated depth is a relative physical value based on the section area and represents an average physical characteristic of the section as a whole.

Several events within the available historical record (1930 to present) have had an impact on the River bed and fluvial mechanics. These events include failure of the upstream St. Francis Dam, construction of bridges spanning the River, agricultural infill along the River banks, and periodic burning of surrounding vegetation during forest fires. These different historical events can be placed into two categories: the St. Francis Dam failure in 1928, and those that occurred both prior to and following Dam failure. The most significant historical event in the formation of the present bed condition was the aforementioned failure of the Dam. The consequence of this event is tied to the River's recovery from the erosion caused by the extremely high flow of floodwater. Within the project reach, the failure of the Dam appears to have resulted in the severe scouring of the bed, detailed below. In its current state, the River bed appears to have mostly recovered from dam flood scour as evidenced by the cross-sections presented in this chapter. Placement of the bridges does not appear to have had a measurable impact on long-term bed characteristics, except for very local

LEGEND

SRA4 — FLUVIAL ANALYSIS SUB REACHES

12195 — HEC RAS SECTIONS



TITLE
SANTA CLARA RIVER
HISTORIC SECTIONS
ANALYSIS LOCATION MAP

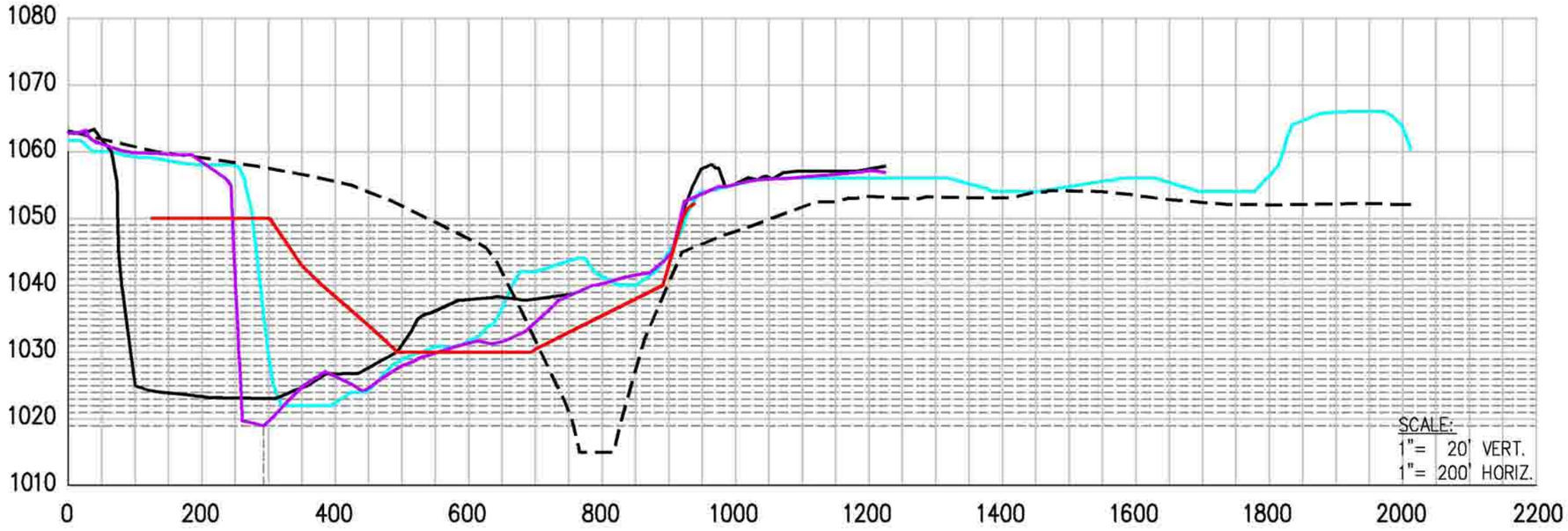
JOB
NEWHALL RANCH
SANTA CLARA RIVER
FLUVIAL STUDY
LOS ANGELES COUNTY CA

SCALE	1"= 2500'
DESIGNED	DAJ
DRAWN	DAD
CHECKED	D.J.
DATE	09/17/05
JOB NO.	8197E

PACE
PACIFIC ADVANCED CIVIL ENGINEERING
17800 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA. 92708
PH (714) 481-7300 FAX (714) 481-7299

FIGURE
5.1

P:\8197E\Engineering\GlobalExhibits\8197-EXH--02.dwg - Tab: 11x17 By: ddrahn on Mar. 14, 2006 at 04:10 pm



SUBREACH SRA1 SECTION 44585

LOOKING DOWNSTREAM

CROSS SECTIONAL AREAS AT STA 44585 (sf)					
ELEV	1947	1963	1999	2004	2005
1020.0	NA	0.0	0.0	25.2	0.0
1021.0	NA	0.0	0.0	48.3	0.0
1022.0	NA	0.0	0.0	58.2	0.0
1023.0	NA	0.0	83.5	68.1	0.0
1024.0	NA	0.0	102.1	78.5	124.2
1025.0	NA	0.0	141.9	100.6	228.6
1026.0	NA	0.0	154.8	146.6	266.3
1027.0	NA	0.0	165.8	197.4	293.6
1028.0	NA	0.0	176.8	234.9	350.0
1029.0	NA	0.0	191.6	257.0	369.4
1030.0	NA	0.0	213.6	282.0	388.9
1031.0	NA	212.3	248.9	313.8	402.9
1032.0	NA	243.0	298.2	370.3	411.2
1033.0	NA	274.0	318.5	417.1	419.4
1034.0	NA	304.8	329.7	435.2	427.0
1035.0	NA	336.3	344.1	446.8	433.5
1036.0	NA	368.0	351.4	458.4	446.7
1037.0	NA	399.7	357.9	469.9	471.9
1038.0	NA	431.4	363.6	480.9	500.6
1039.0	NA	463.1	369.0	500.5	645.2
1040.0	NA	494.8	374.5	523.6	693.5
1041.0	NA	517.3	422.7	558.1	728.9
1042.0	NA	530.4	463.2	598.0	769.2
1043.0	NA	543.6	528.6	628.9	800.6
1044.0	NA	555.1	568.3	641.8	813.9
1045.0	NA	564.8	613.8	652.1	824.5
1046.0	NA	574.6	621.8	658.1	830.6
1047.0	NA	584.3	629.2	661.0	833.3
1048.0	NA	594.1	636.3	663.9	836.0
1049.0	NA	603.8	642.2	666.8	838.6
1050.0	NA	613.6	646.7	669.6	841.2
Area	NA	9208.9	10358.4	12311.6	14989.6

LEGEND:

- 2005 TERRAIN
- 2004 TERRAIN
- 1999 TERRAIN
- 1963 TERRAIN
- 1947 TERRAIN
- 1930 TERRAIN

TITLE: HISTORICAL CROSS SECTIONS BY STATION

JOB: SANTA CLARA RIVER FLUVIAL STUDY

LOS ANGELES COUNTY CA

SCALE	AS NOTED
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DRAWN	DEP
CHECKED	MEK
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JOB NO.	8197E

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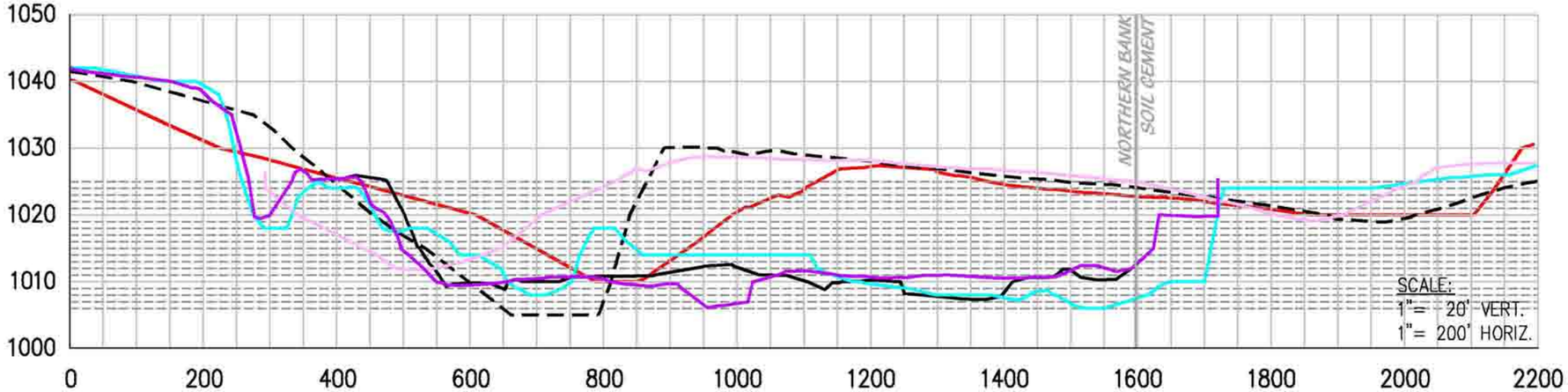
PH (714) 481-7300 FAX (714) 481-7299

FIGURE 5.2A

Dimscale = 200; LTscale = 0.5; PSltscale = 1; Acad Ver. = 16.2s (LMS Tech); Visretain = 1

P:\8197E\Engineering\GlobalExhibits\8197 Santa Clara River HEC Cross Sections and End Area Data.dwg — Tab: HEC 44585 – 5.2A By: ddrahn on Mar. 14, 2006 at 05:08 pm



SUBREACH SRA2 SECTION 42215

LOOKING DOWNSTREAM

CROSS SECTIONAL AREAS AT STA 42215 (sf)					
ELEV	1947	1963	1999	2004	2005
1007.0	0.0	0.0	58.7	31.4	0.0
1008.0	0.0	0.0	112.6	79.5	95.4
1009.0	0.0	0.0	370.2	95.4	148.4
1010.0	0.0	0.0	502.0	183.9	223.1
1011.0	0.0	80.5	641.6	412.8	588.7
1012.0	7.2	114.1	679.1	920.5	898.3
1013.0	86.6	146.5	709.3	1055.3	1028.1
1014.0	136.6	178.9	736.3	1093.5	1073.1
1015.0	181.3	211.3	1041.4	1115.8	1090.6
1016.0	222.4	243.5	1067.9	1129.1	1104.3
1017.0	254.2	274.7	1099.1	1134.2	1110.1
1018.0	286.0	305.7	1143.3	1140.1	1115.7
1019.0	317.8	336.6	1284.1	1146.4	1121.9
1020.0	395.8	367.6	1309.9	1159.8	1133.8
1021.0	509.5	692.9	1326.8	1263.7	1245.8
1022.0	601.5	843.7	1341.2	1301.3	1260.7
1023.0	700.1	1008.7	1357.4	1315.9	1275.2
1024.0	802.4	1236.4	1380.0	1329.3	1289.6
1025.0	1107.8	1398.5	1697.5	1342.9	1304.2
Area	5609.2	7439.6	17858.4	17250.9	17107.1

LEGEND:

- 2005 TERRAIN
- 2004 TERRAIN
- 1999 TERRAIN
- 1963 TERRAIN
- 1947 TERRAIN
- 1930 TERRAIN

TITLE
HISTORICAL CROSS SECTIONS BY STATION

JOB
SANTA CLARA RIVER
FLUVIAL STUDY
LOS ANGELES COUNTY CA

SCALE	AS NOTED
DESIGNED	DAJ
DRAWN	DEP
CHECKED	MEK
DATE	12/20/05
JOB NO.	8197E

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17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

FIGURE
5.2B

Xrefs: 8197 - 2004 CONTOURS.dwg; 8197 - 2005 CONTOURS.dwg; 8197 - 1999 CONTOURS.dwg; 8197 - 1963 CONTOURS.dwg; 8197 - 1947 CONTOURS.dwg; 8197 - 1930 CONTOURS.dwg; 8065-Lining.dwg; 8197-SANTA CLARA TITLE BLOCK.dwg; 7104E-COPY OF-7904-E-WRP soil cement bank (NEW 8-11-
Dimscale = 200; LTscale = 0.5; PSltscale = 1; Acad Ver. = 16.2s (LMS Tech); Visretain = 1
Dimscale = 200; LTscale = 0.5; PSltscale = 1; Acad Ver. = 16.2s (LMS Tech); Visretain = 1
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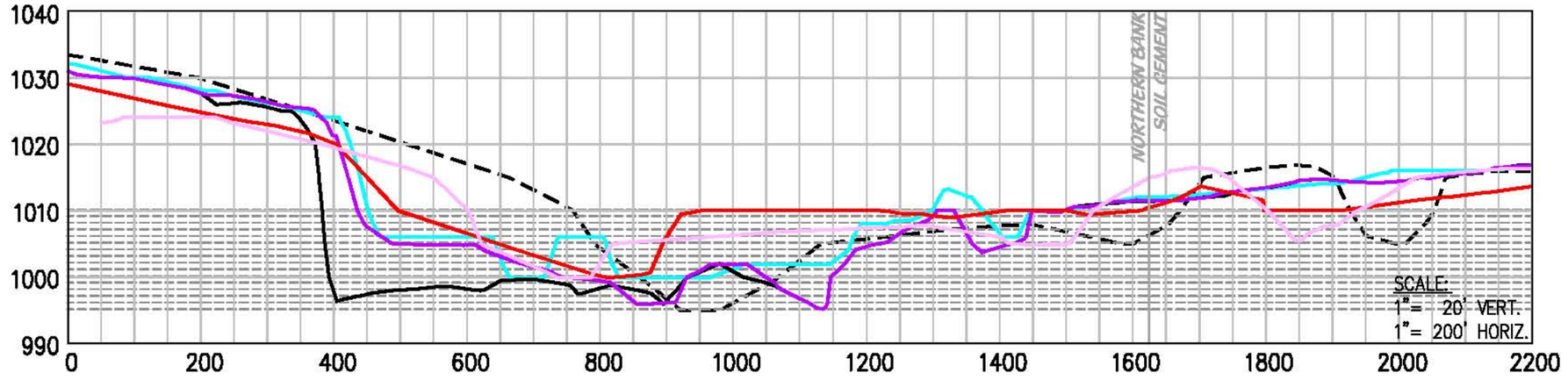

SUBREACH SRA3 SECTION 40825

LOOKING DOWNSTREAM

CROSS SECTIONAL AREAS AT STA 40825 (sf)					
ELEV	1947	1963	1999	2004	2005
996.2	0.0	0.0	0.0	9.7	12.9
997.2	0.0	0.0	0.0	69.9	67.0
998.2	0.0	0.0	0.0	86.7	188.6
999.2	0.0	0.0	0.0	103.3	456.3
1000.2	11.9	15.1	37.4	154.0	625.4
1001.2	70.2	98.4	217.6	218.8	708.1
1002.2	98.7	132.7	282.6	423.1	759.7
1003.2	128.3	167.0	414.0	510.9	783.1
1004.2	158.0	201.3	437.1	551.2	796.9
1005.2	214.6	235.7	454.0	674.5	863.0
1006.2	409.0	270.0	518.5	838.5	930.2
1007.2	639.8	304.0	749.3	880.3	958.5
1008.2	938.6	338.0	779.8	921.8	987.0
1009.2	1028.9	371.7	862.1	958.0	1016.8
1010.2	1063.6	695.0	918.3	1002.5	1056.7
Area	4761.4	2829.0	5670.9	7403.2	10210.2

LEGEND:

- 2005 TERRAIN
- 2004 TERRAIN
- 1999 TERRAIN
- 1963 TERRAIN
- 1947 TERRAIN
- 1930 TERRAIN

TITLE: HISTORICAL CROSS SECTIONS BY STATION

JOB: SANTA CLARA RIVER FLUVIAL STUDY — LOS ANGELES COUNTY — CA

SCALE	AS NOTED
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FIGURE 5.2C

Dimscale = 200; LTscale = 0.5; PSltscale = 1; Acad Ver. = 16.2s (LMS Tech); Visretain = 1

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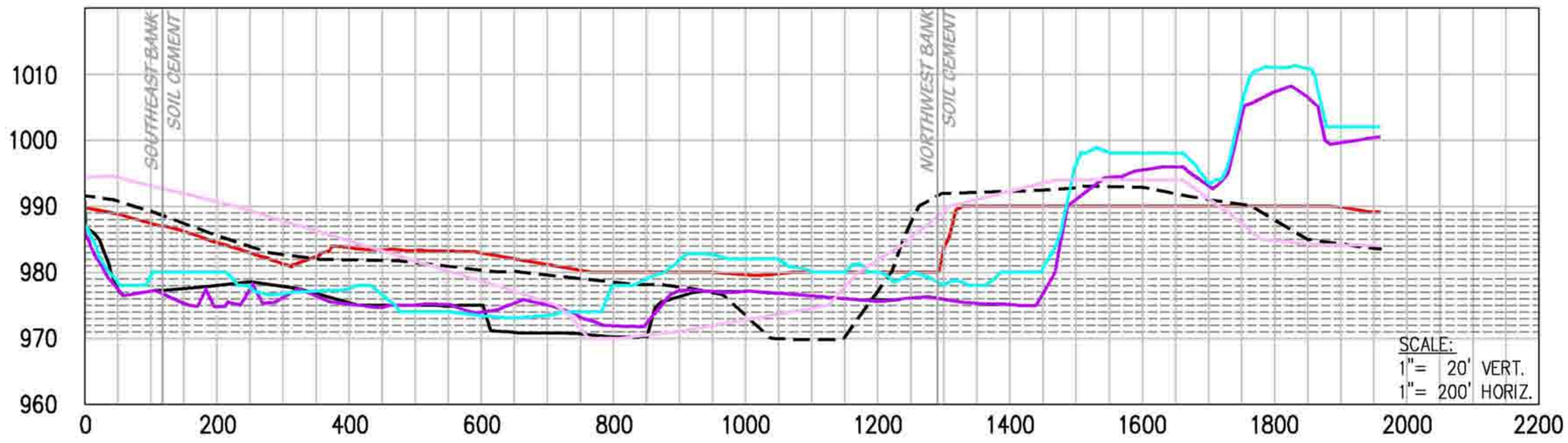

SUBREACH SRA4 SECTION 36080

LOOKING DOWNSTREAM

CROSS SECTIONAL AREAS AT STA 36080 (sf)					
ELEV	1947	1963	1999	2004	2005
971.0	93.7	0.0	0.0	0.0	91.0
972.0	174.6	0.0	0.0	10.6	239.1
973.0	239.8	0.0	0.0	82.2	246.8
974.0	307.3	0.0	102.4	115.5	252.5
975.0	377.1	0.0	304.6	222.6	263.0
976.0	430.9	0.0	324.4	671.8	605.5
977.0	468.8	0.0	354.8	1056.6	910.2
978.0	508.6	0.0	494.3	1374.2	1221.1
979.0	550.5	0.0	716.4	1418.3	1387.9
980.0	592.7	31.1	856.6	1431.8	1423.4
981.0	638.7	556.0	1187.3	1440.9	1430.6
982.0	687.7	651.4	1265.1	1448.5	1435.4
983.0	736.8	762.1	1397.2	1456.8	1441.2
984.0	785.7	978.5	1448.0	1463.4	1447.0
985.0	833.2	1103.9	1456.6	1469.3	1452.5
986.0	878.1	1137.3	1465.1	1473.5	1460.6
987.0	923.4	1171.0	1472.8	1476.4	1467.8
988.0	968.8	1217.1	1477.5	1479.2	1472.7
989.0	1014.1	1254.0	1480.3	1482.1	1477.6
990.0	1059.5	1281.8	1483.1	1485.0	1482.5
Area	12270.0	10144.3	17286.2	21058.6	21208.4

LEGEND:

- 2005 TERRAIN
- 2004 TERRAIN
- 1999 TERRAIN
- 1963 TERRAIN
- 1947 TERRAIN
- 1930 TERRAIN

TITLE: HISTORICAL CROSS SECTIONS BY STATION

JOB: SANTA CLARA RIVER FLUVIAL STUDY

LOS ANGELES COUNTY CA

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FIGURE 5.2D

Dimscale = 200; LTscale = 0.5; PSltscale = 1; Acad Ver. = 16.2s (LMS Tech); Visretain = 1

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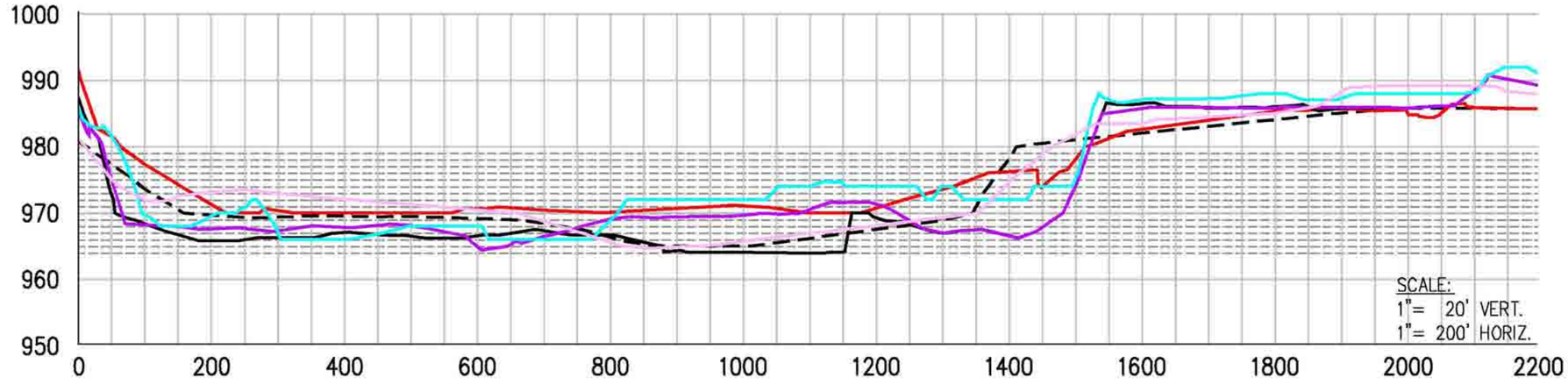

SUBREACH SRB1 SECTION 34720

LOOKING DOWNSTREAM

CROSS SECTIONAL AREAS AT STA 34720 (sf)					
ELEV	1947	1963	1999	2004	2005
965.0	9.7	0.0	0.0	10.3	231.3
966.0	168.0	0.0	0.0	65.0	303.0
967.0	282.7	0.0	271.2	135.7	634.9
968.0	401.3	0.0	351.3	398.2	1136.8
969.0	514.8	0.0	551.0	863.0	1275.0
970.0	628.3	0.0	609.6	1066.6	1366.9
971.0	750.5	597.2	679.8	1291.9	1426.6
972.0	885.8	1013.8	712.6	1369.9	1433.7
973.0	1075.3	1075.4	1046.2	1433.9	1440.6
974.0	1275.9	1129.0	1106.4	1441.5	1448.6
975.0	1340.0	1190.1	1370.2	1449.0	1455.7
976.0	1361.8	1247.1	1421.8	1456.0	1462.2
977.0	1382.1	1349.4	1429.3	1462.3	1468.0
978.0	1402.4	1401.4	1435.1	1468.7	1473.5
979.0	1422.7	1421.1	1441.6	1474.9	1479.0
980.0	1443.0	1440.7	1448.8	1481.0	1484.6
Area	14344.4	11865.3	13874.8	16867.7	19520.2

LEGEND:

- 2005 TERRAIN
- 2004 TERRAIN
- 1999 TERRAIN
- 1963 TERRAIN
- 1947 TERRAIN
- 1930 TERRAIN

TITLE
HISTORICAL CROSS SECTIONS BY STATION

JOB
SANTA CLARA RIVER
FLUVIAL STUDY
LOS ANGELES COUNTY CA

SCALE	AS NOTED
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17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

FIGURE
5.2E

Dimscale = 200; LTscale = 0.5; PSltscale = 1; Acad Ver. = 16.2s (LMS Tech); Visretain = 1
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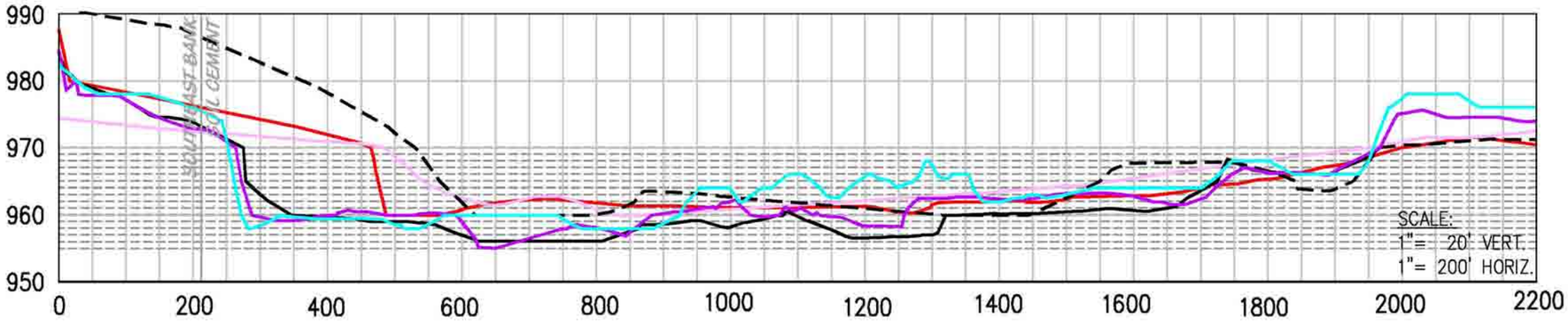

SUBREACH SRB2 SECTION 33500

LOOKING DOWNSTREAM

CROSS SECTIONAL AREAS AT STA 33500 (sf)					
ELEV	1947	1963	1999	2004	2005
956.1	0.0	0.0	0.0	41.8	0.0
957.1	0.0	0.0	0.0	82.3	240.8
958.1	0.0	0.0	9.0	155.0	418.0
959.1	0.0	0.0	197.7	297.4	554.4
960.1	4.4	6.4	392.5	452.2	853.2
961.1	140.8	138.3	656.4	807.3	1176.6
962.1	341.9	580.7	666.0	956.7	1345.8
963.1	613.6	1022.2	767.1	1103.1	1374.8
964.1	831.7	1194.0	932.7	1424.0	1404.0
965.1	980.6	1263.3	1230.8	1454.8	1433.7
966.1	1074.3	1339.2	1352.6	1469.8	1449.3
967.1	1154.5	1388.8	1565.6	1593.4	1454.5
968.1	1236.3	1440.9	1618.0	1651.7	1459.8
969.1	1329.6	1481.3	1697.5	1673.1	1671.6
970.1	1424.1	1517.7	1702.9	1694.4	1686.9
Area	9131.9	11372.7	12788.7	14857.0	16523.3

LEGEND:

- 2005 TERRAIN
- 2004 TERRAIN
- 1999 TERRAIN
- 1963 TERRAIN
- 1947 TERRAIN
- 1930 TERRAIN

TITLE
HISTORICAL CROSS SECTIONS BY STATION

JOB
SANTA CLARA RIVER
FLUVIAL STUDY
LOS ANGELES COUNTY CA

SCALE	AS NOTED
DESIGNED	DAJ
DRAWN	DEP
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DATE	12/20/05
JOB NO.	8197E

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PACIFIC ADVANCED CIVIL ENGINEERING
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FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

FIGURE
5.2F

Dimscale = 200; LTscale = 0.5; PSltscale = 1; Acad Ver. = 16.2s (LMS Tech); Visretain = 1
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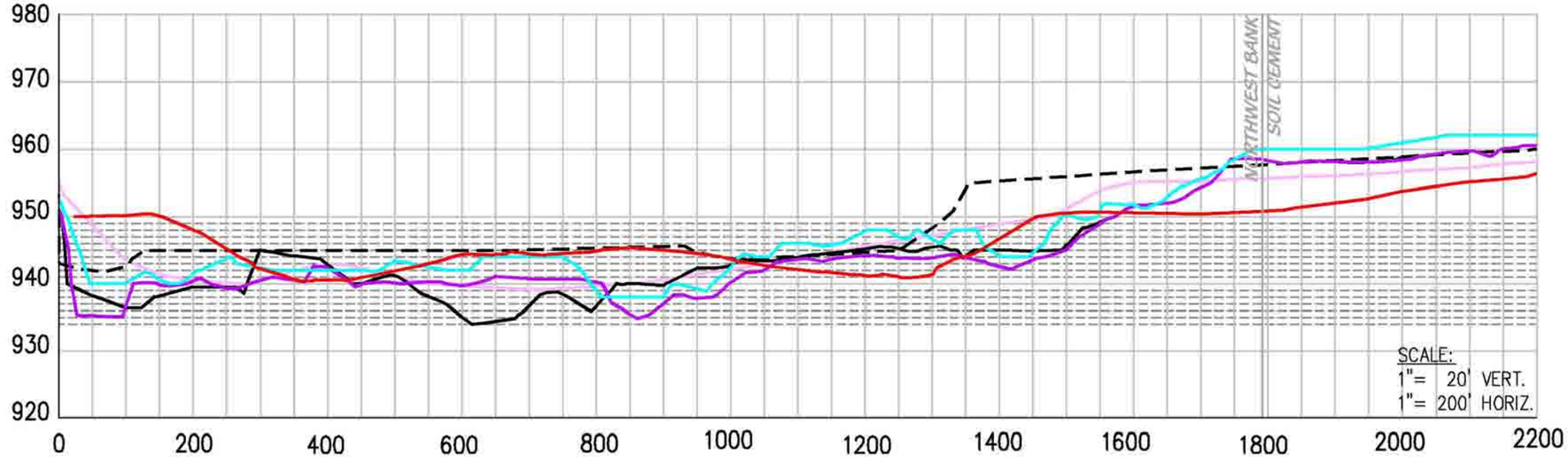

SUBREACH SRC1 SECTION 30445

LOOKING DOWNSTREAM

CROSS SECTIONAL AREAS AT STA 30445 (sf)					
ELEV	1947	1963	1999	2004	2005
935.0	0.0	0.0	0.0	0.0	43.9
936.0	0.0	0.0	0.0	82.0	90.9
937.0	0.0	0.0	0.0	133.4	149.9
938.0	0.0	0.0	97.2	166.4	247.4
939.0	0.0	0.0	142.4	241.3	367.5
940.0	139.1	0.0	190.2	313.7	518.4
941.0	399.9	46.1	303.6	707.6	703.1
942.0	551.9	274.3	146.9	964.2	785.1
943.0	712.0	473.6	667.1	1049.7	852.0
944.0	847.3	610.9	817.6	1187.7	943.5
945.0	916.0	849.6	1073.7	1450.1	1115.0
946.0	980.4	1114.6	1131.3	1490.5	1446.4
947.0	1048.6	1167.4	1261.1	1502.5	1499.6
948.0	1122.7	1201.3	1347.1	1518.1	1509.8
949.0	1189.5	1240.3	1461.8	1536.3	1526.3
950.0	1264.9	1280.2	1484.2	1554.1	1552.1
Area	9172.4	8258.3	10124.1	13897.6	13350.9

LEGEND:

- 2005 TERRAIN
- 2004 TERRAIN
- 1999 TERRAIN
- 1963 TERRAIN
- 1947 TERRAIN
- 1930 TERRAIN

TITLE
HISTORICAL CROSS SECTIONS BY STATION

JOB
SANTA CLARA RIVER FLUVIAL STUDY

LOS ANGELES COUNTY CA

SCALE	AS NOTED
DESIGNED	DAJ
DRAWN	DEP
CHECKED	MEK
DATE	12/20/05
JOB NO.	8197E

PACE
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17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

FIGURE
5.2G

Dimscale = 200; LTscale = 0.5; PSltscale = 1; Acad Ver. = 16.2s (LMS Tech); Visretain = 1

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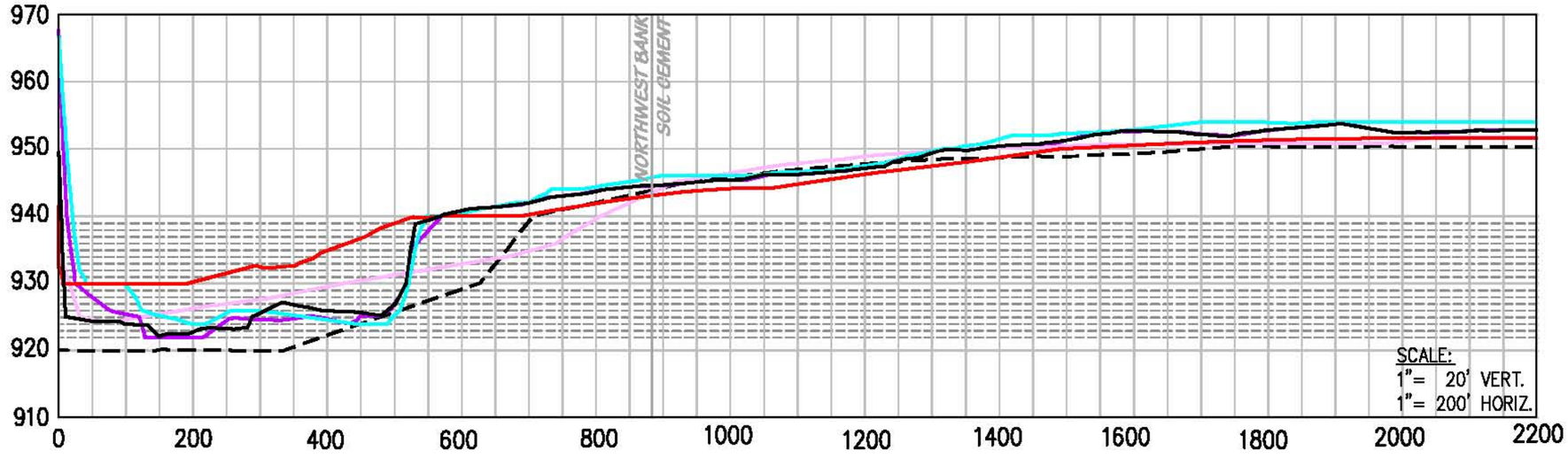

SUBREACH SRC2 SECTION 27925

LOOKING DOWNSTREAM

CROSS SECTIONAL AREAS AT STA 27925 (sf)					
ELEV	1947	1963	1999	2004	2005
922.9	0.0	0.0	0.0	93.2	24.2
923.9	0.0	0.0	0.0	110.4	116.8
924.9	31.0	0.0	116.9	153.2	224.6
925.9	116.8	0.0	265.7	369.4	307.0
926.9	181.8	0.0	383.0	424.8	430.6
927.9	259.0	0.0	396.4	445.0	491.4
928.9	322.5	0.0	405.9	464.7	500.1
929.9	375.5	0.0	416.7	482.0	505.7
930.9	433.3	181.2	475.3	493.3	509.8
931.9	498.0	244.8	488.5	495.7	511.7
932.9	562.7	308.8	494.8	498.4	513.5
933.9	627.2	368.6	498.3	501.2	515.3
934.9	689.3	388.8	501.7	504.0	517.1
935.9	730.7	413.1	505.0	511.1	519.0
936.9	745.7	441.0	508.7	521.1	521.1
937.9	761.4	464.1	512.9	531.0	523.2
938.9	778.5	485.0	518.0	541.1	525.4
939.9	795.6	514.3	524.0	551.2	545.5
AREA	7908.8	3809.7	7011.7	7690.7	7801.9

LEGEND:

- 2005 TERRAIN
- 2004 TERRAIN
- 1999 TERRAIN
- 1963 TERRAIN
- 1947 TERRAIN
- 1930 TERRAIN

TITLE: HISTORICAL CROSS SECTIONS BY STATION

JOB: SANTA CLARA RIVER FLUVIAL STUDY

LOS ANGELES COUNTY CA

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FIGURE 5.2H

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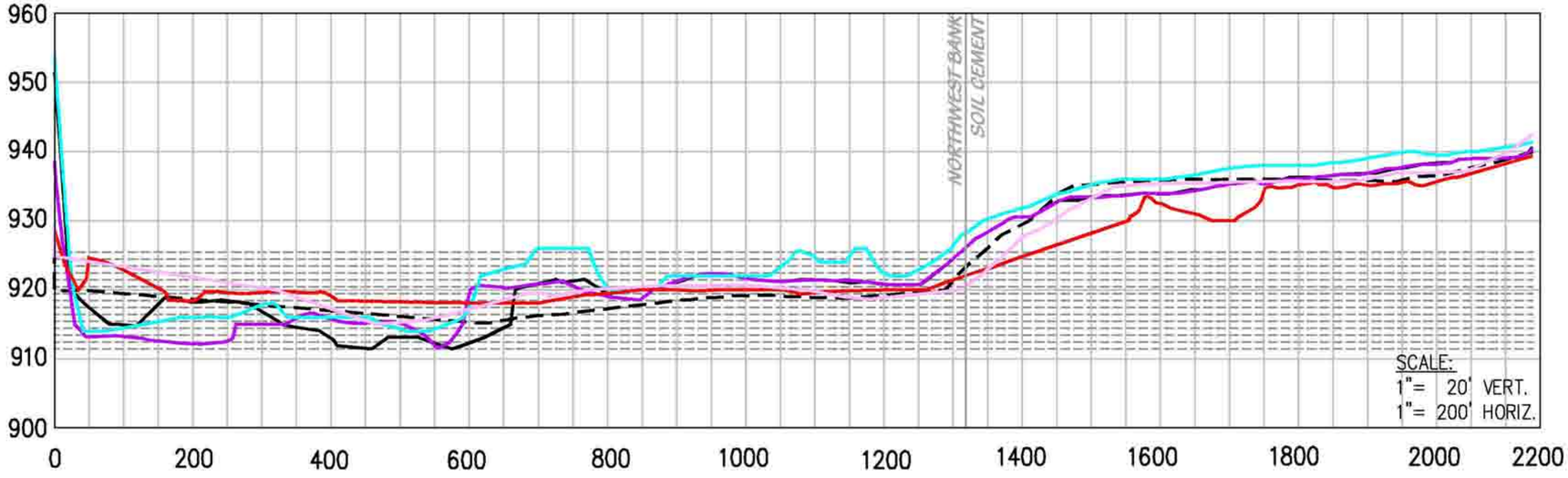

SUBREACH SRC3 SECTION 25965

LOOKING DOWNSTREAM

CROSS SECTIONAL AREAS AT STA 25965 (sf)					
ELEV	1947	1963	1999	2004	2005
912.5	0.0	0.0	0.0	26.8	76.8
913.5	0.0	0.0	0.0	174.7	177.5
914.5	0.0	0.0	42.0	278.4	257.8
915.5	16.2	0.0	174.6	366.4	347.7
916.5	113.4	0.0	358.1	522.6	408.7
917.5	183.8	0.0	511.8	566.9	449.5
918.5	250.0	84.3	557.3	572.3	504.1
919.5	384.0	396.2	577.2	619.3	662.5
920.5	689.2	884.8	615.7	690.5	722.9
921.5	1050.0	1150.5	669.2	915.0	893.2
922.5	1149.7	1199.2	778.9	1191.1	1195.9
923.5	1226.4	1249.5	947.5	1263.7	1261.5
924.5	1303.6	1304.0	1043.2	1278.3	1274.7
925.5	1367.8	1394.3	1121.5	1291.0	1286.5
Area	7734.2	7662.7	7397.0	9757.0	9519.2

LEGEND:

- 2005 TERRAIN
- 2004 TERRAIN
- 1999 TERRAIN
- 1963 TERRAIN
- 1947 TERRAIN
- 1930 TERRAIN

TITLE: HISTORICAL CROSS SECTIONS BY STATION

JOB: SANTA CLARA RIVER FLUVIAL STUDY

LOS ANGELES COUNTY CA

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FIGURE 5.21

Dimscale = 200; LTscale = 0.5; PSltscale = 1; Acad Ver. = 16.2s (LMS Tech); Visretain = 1

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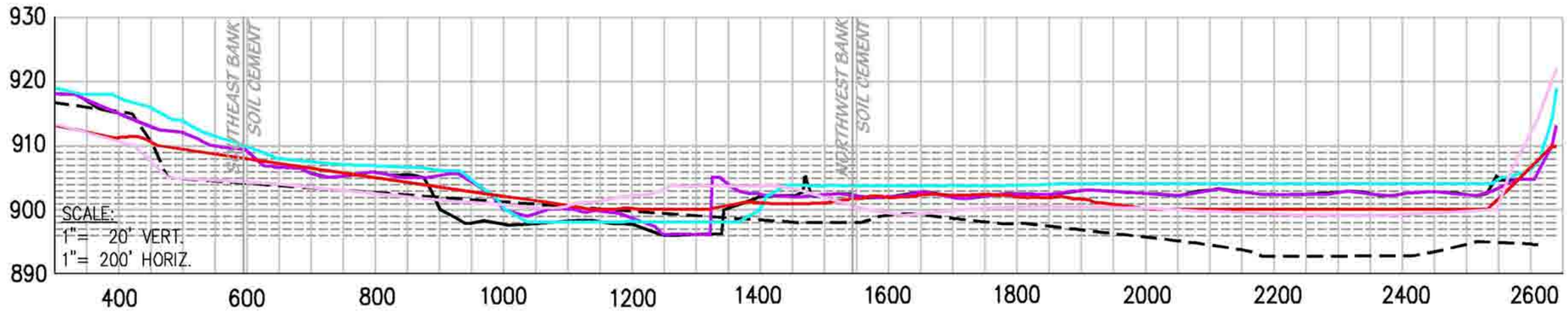

SUBREACH SRC4 SECTION 23000

LOOKING DOWNSTREAM

CROSS SECTIONAL AREAS AT STA 23000 (sf)					
ELEV	1947	1963	1999	2004	2005
896.9	0.0	0.0	0.0	61.7	89.1
897.9	0.0	0.0	0.0	89.8	153.8
898.9	0.0	0.0	313.2	116.0	381.3
899.9	302.5	0.0	377.5	156.1	430.9
900.9	926.6	725.1	402.7	319.0	456.6
901.9	1278.1	1110.9	415.2	339.4	489.5
902.9	1487.7	1518.6	436.0	909.3	558.9
903.9	1706.5	1663.0	468.2	1544.6	582.8
904.9	1990.7	1740.8	1540.7	1609.7	589.5
905.9	2094.6	1818.6	1634.9	1814.1	1822.6
906.9	2110.3	1896.4	1732.9	1946.9	1946.9
907.9	2125.8	1974.1	1903.3	2000.1	2000.1
908.9	2141.4	2051.6	1979.2	2016.7	2016.7
909.9	2156.9	2129.0	2008.1	2044.7	2044.7
Area	18321.2	16628.1	13211.7	14968.1	13563.3

LEGEND:

- 2005 TERRAIN
- 2004 TERRAIN
- 1999 TERRAIN
- 1963 TERRAIN
- 1947 TERRAIN
- 1930 TERRAIN

TITLE
HISTORICAL CROSS SECTIONS BY STATION

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FIGURE
5.2J

Dimscale = 200; LTscale = 0.5; PSltscale = 1; Acad Ver. = 16.2s (LMS Tech); Visretain = 1

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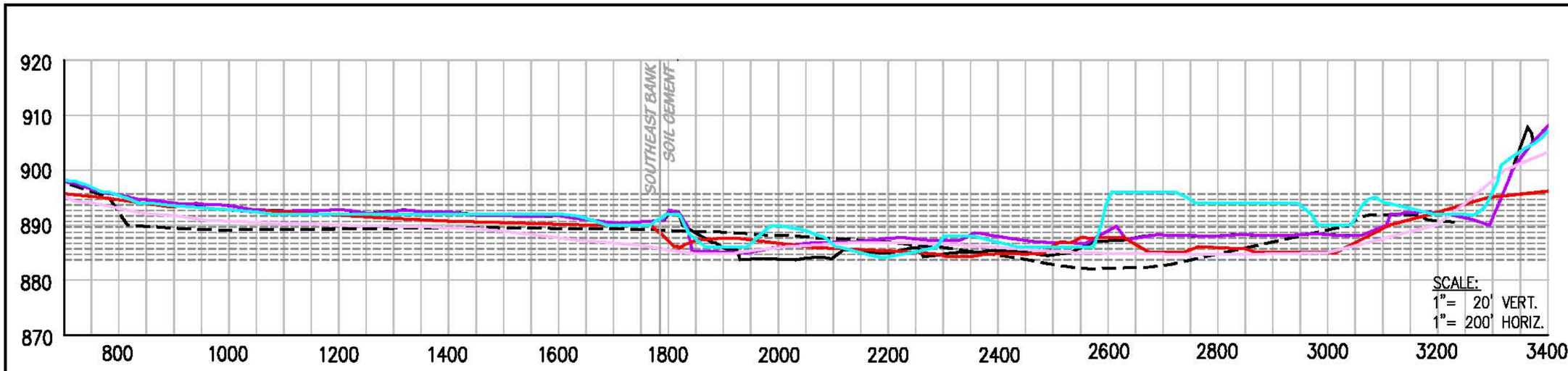

SUBREACH SRD1 SECTION 20845

LOOKING DOWNSTREAM

CROSS SECTIONAL AREAS AT STA 20845 (sf)					
ELEV	1947	1963	1999	2004	2005
884.7	0.0	24.3	19.2	0.0	150.4
885.7	452.5	415.1	108.7	73.4	442.9
886.7	691.1	825.4	339.0	171.1	658.8
887.7	1429.9	1056.2	496.3	461.1	733.8
888.7	1566.1	1284.4	615.1	956.0	1015.0
889.7	1707.6	1319.7	689.2	1235.6	1247.2
890.7	2042.6	1505.0	861.5	1298.3	1289.4
891.7	2272.0	1843.3	974.7	1484.4	1486.8
892.7	2377.0	2063.6	1499.5	1854.8	1853.7
893.7	2445.9	2286.8	1891.4	2282.6	2283.6
894.7	2514.1	2433.1	2192.5	2417.1	2427.1
895.7	2569.9	2558.2	2348.7	2502.7	2502.7
Area	20068.6	17615.1	12035.8	14737.0	16091.2

LEGEND:

- 2005 TERRAIN
- 2004 TERRAIN
- 1999 TERRAIN
- 1963 TERRAIN
- 1947 TERRAIN
- 1930 TERRAIN

TITLE: HISTORICAL CROSS SECTIONS BY STATION

JOB: SANTA CLARA RIVER FLUVIAL STUDY

LOS ANGELES COUNTY CA

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FIGURE 5.2K

Dimscale = 200; LTscale = 0.5; PSltscale = 1; Acad Ver. = 16.2s (LMS Tech); Visretain = 1

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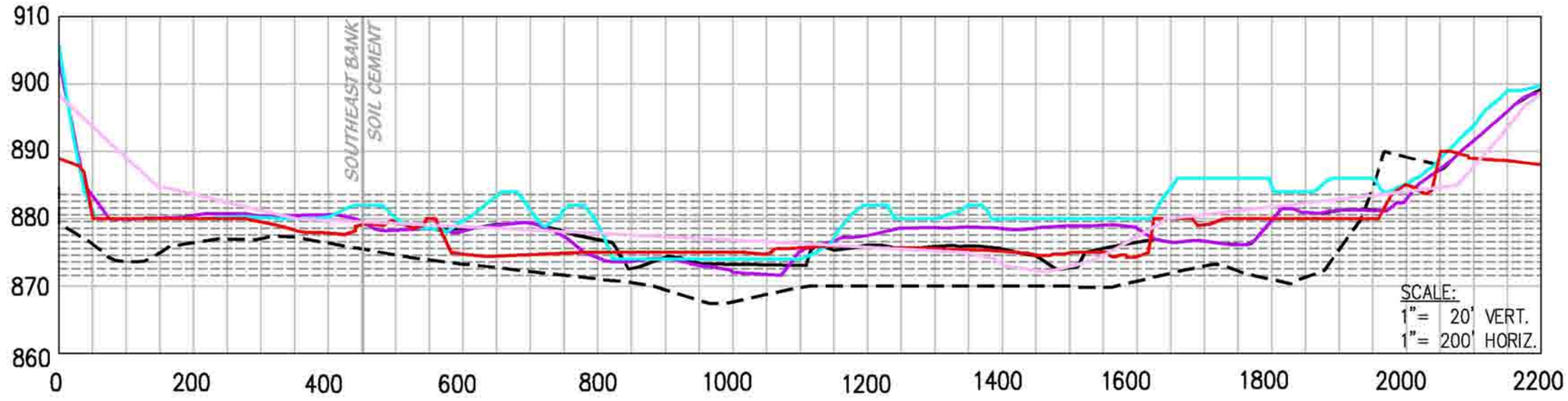

SUBREACH SRD2 SECTION 18650

LOOKING DOWNSTREAM

CROSS SECTIONAL AREAS AT STA 18650 (sf)					
ELEV	1947	1963	1999	2004	2005
872.6	14.7	0.0	0.0	63.6	1.7
873.6	102.7	0.0	0.0	133.2	134.8
874.6	158.5	10.7	180.4	265.4	310.8
875.6	247.2	556.7	307.9	322.1	405.3
876.6	441.9	1011.6	328.6	386.3	694.8
877.6	654.2	1048.1	340.5	566.5	980.3
878.6	869.6	1120.0	359.9	726.4	1064.1
879.6	1094.1	1248.2	443.3	1236.2	1285.5
880.6	1300.2	1706.9	906.3	1457.7	1456.8
881.6	1437.6	1915.9	1293.2	1805.3	1802.1
882.6	1569.2	1923.4	1474.1	1925.6	1925.6
883.6	1699.4	1930.9	1556.6	1949.4	1949.4
Area	9589.2	12472.3	7190.7	10837.7	12011.1

LEGEND:

- 2005 TERRAIN
- 2004 TERRAIN
- 1999 TERRAIN
- 1963 TERRAIN
- 1947 TERRAIN
- 1930 TERRAIN

TITLE: HISTORICAL CROSS SECTIONS BY STATION

JOB: SANTA CLARA RIVER FLUVIAL STUDY

LOS ANGELES COUNTY CA

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FIGURE 5.2L

Dimscale = 200; LTscale = 0.5; PSltscale = 1; Acad Ver. = 16.2s (LMS Tech); Visretain = 1

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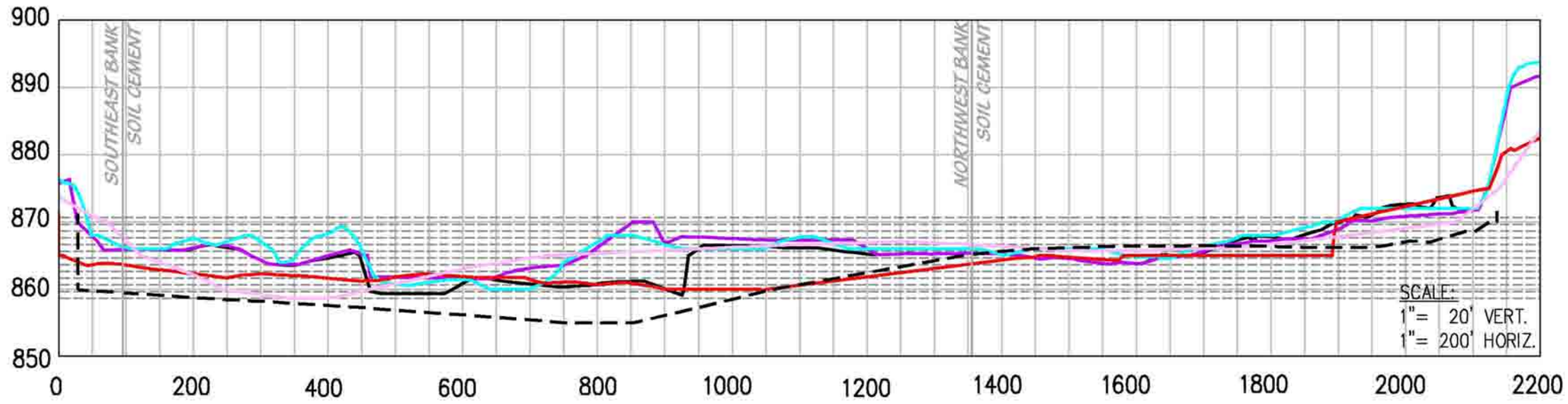

SUBREACH RD3 SECTION 16305

LOOKING DOWNSTREAM

CROSS SECTIONAL AREAS AT STA 16305 (sf)					
ELEV	1947	1963	1999	2004	2005
859.6	116.8	0.0	0.0	0.0	36.9
860.6	225.0	121.1	44.8	0.0	170.0
861.6	293.0	414.5	183.6	0.0	369.2
862.6	358.9	892.9	268.2	180.1	475.4
863.6	432.1	1172.9	282.0	243.7	481.4
864.6	521.6	1363.3	307.5	444.6	628.8
865.6	643.2	1755.6	434.3	778.8	966.6
866.6	1122.9	1892.0	921.7	1157.1	1432.7
867.6	1681.2	1893.0	1359.0	1424.1	1691.5
868.6	1833.9	1894.1	1668.7	1759.2	1796.9
869.6	1924.7	1895.9	1793.3	1820.6	1842.8
870.6	2005.0	1906.3	1846.8	1896.1	1880.2
Area	11158.2	15201.5	9110.0	9704.3	11772.3

LEGEND:

- 2005 TERRAIN
- 2004 TERRAIN
- 1999 TERRAIN
- 1963 TERRAIN
- 1947 TERRAIN
- 1930 TERRAIN

TITLE: HISTORICAL CROSS SECTIONS BY STATION

JOB: SANTA CLARA RIVER FLUVIAL STUDY

LOS ANGELES COUNTY CA

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FIGURE 5.2M

Dimscale = 200; LTscale = 0.5; PSltscale = 1; Acad Ver. = 16.2s (LMS Tech); Visretain = 1

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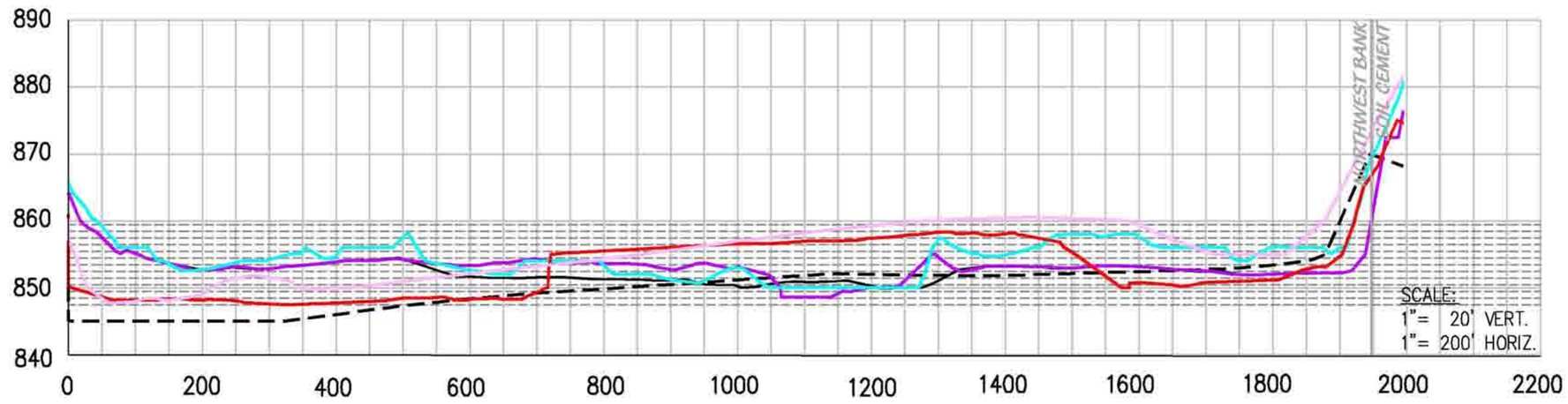

SUBREACH SRE1 SECTION 14315

LOOKING DOWNSTREAM

CROSS SECTIONAL AREAS AT STA 14315 (sf)					
ELEV	1947	1963	1999	2004	2005
848.5	43.7	241.8	0.0	0.0	0.0
849.5	153.8	650.6	0.0	71.9	0.0
850.5	237.3	718.0	107.7	143.8	55.0
851.5	384.3	892.6	274.1	193.5	347.3
852.5	556.7	998.3	398.1	286.3	800.8
853.5	659.2	1047.6	604.4	807.3	1273.6
854.5	758.3	1090.6	828.5	1592.4	1703.6
855.5	899.6	1132.2	1081.0	1830.5	1835.8
856.5	1065.8	1302.0	1398.1	1873.9	1873.9
857.5	1183.6	1555.3	1662.9	1886.2	1886.2
858.5	1301.7	1798.4	1792.2	1898.3	1898.3
859.5	1425.5	1918.4	1865.8	1915.1	1915.1
Area	8669.5	13345.8	10012.7	12499.2	13589.6

LEGEND:

- 2005 TERRAIN
- 2004 TERRAIN
- 1999 TERRAIN
- 1963 TERRAIN
- 1947 TERRAIN
- 1930 TERRAIN

TITLE: HISTORICAL CROSS SECTIONS BY STATION

JOB: SANTA CLARA RIVER FLUVIAL STUDY

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FIGURE 5.2N

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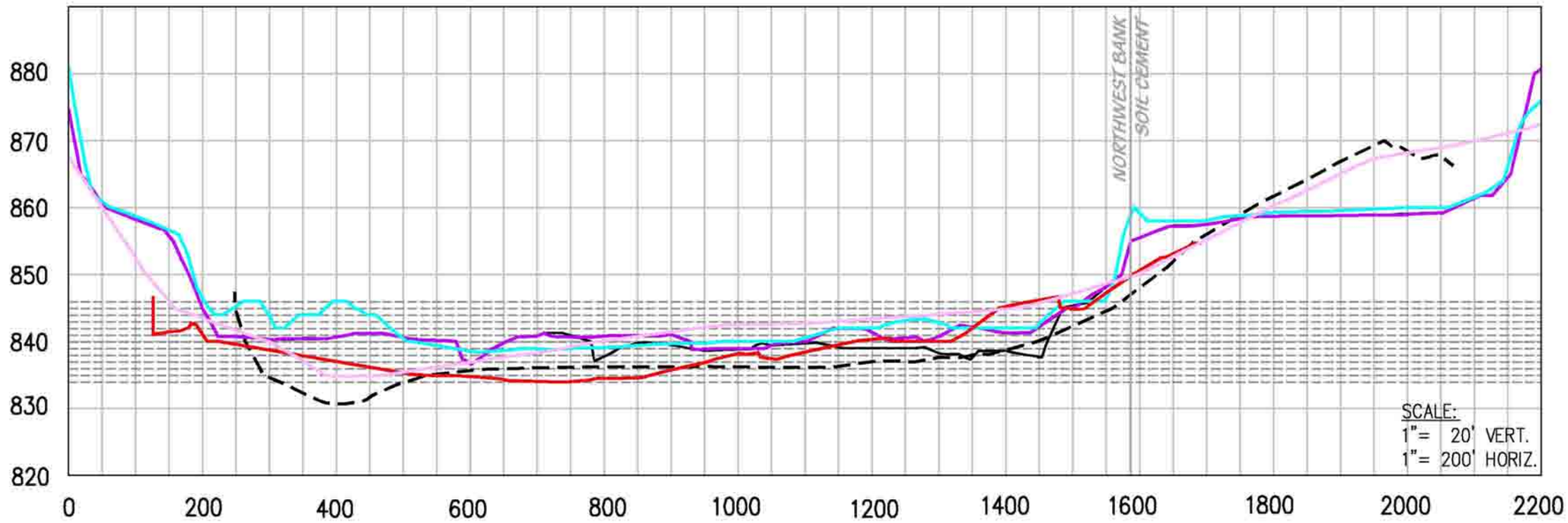

SUBREACH SRE2 SECTION 12195

LOOKING DOWNSTREAM

CROSS SECTIONAL AREAS AT STA 12195 (sf)					
ELEV	1947	1963	1999	2004	2005
834.9	0.0	158.7	0.0	0.0	0.0
835.9	119.1	387.7	0.0	0.0	0.0
836.9	204.3	492.5	0.0	1.0	1.0
837.9	289.0	605.3	0.0	22.5	35.3
838.9	375.4	768.6	25.4	41.9	183.8
839.9	450.2	884.2	300.2	179.4	571.9
840.9	533.1	1086.7	583.8	422.2	914.9
841.9	638.1	1143.6	641.8	923.4	1217.1
842.9	779.7	1205.6	881.3	1221.6	1258.1
843.9	1003.2	1232.1	1009.7	1258.5	1268.5
844.9	1167.2	1249.6	1127.4	1279.4	1279.0
845.9	1279.6	1280.2	1201.1	1307.6	1304.0
Area	6838.7	10494.9	5770.7	6657.4	8033.7

LEGEND:

- 2005 TERRAIN
- 2004 TERRAIN
- 1999 TERRAIN
- 1963 TERRAIN
- 1947 TERRAIN
- 1930 TERRAIN

TITLE: HISTORICAL CROSS SECTIONS BY STATION

JOB: SANTA CLARA RIVER FLUVIAL STUDY — LOS ANGELES COUNTY — CA

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FIGURE 5.20

Dimscale = 200; LTscale = 0.5; PSltscale = 1; Acad Ver. = 16.2s (LMS Tech); Visretain = 1
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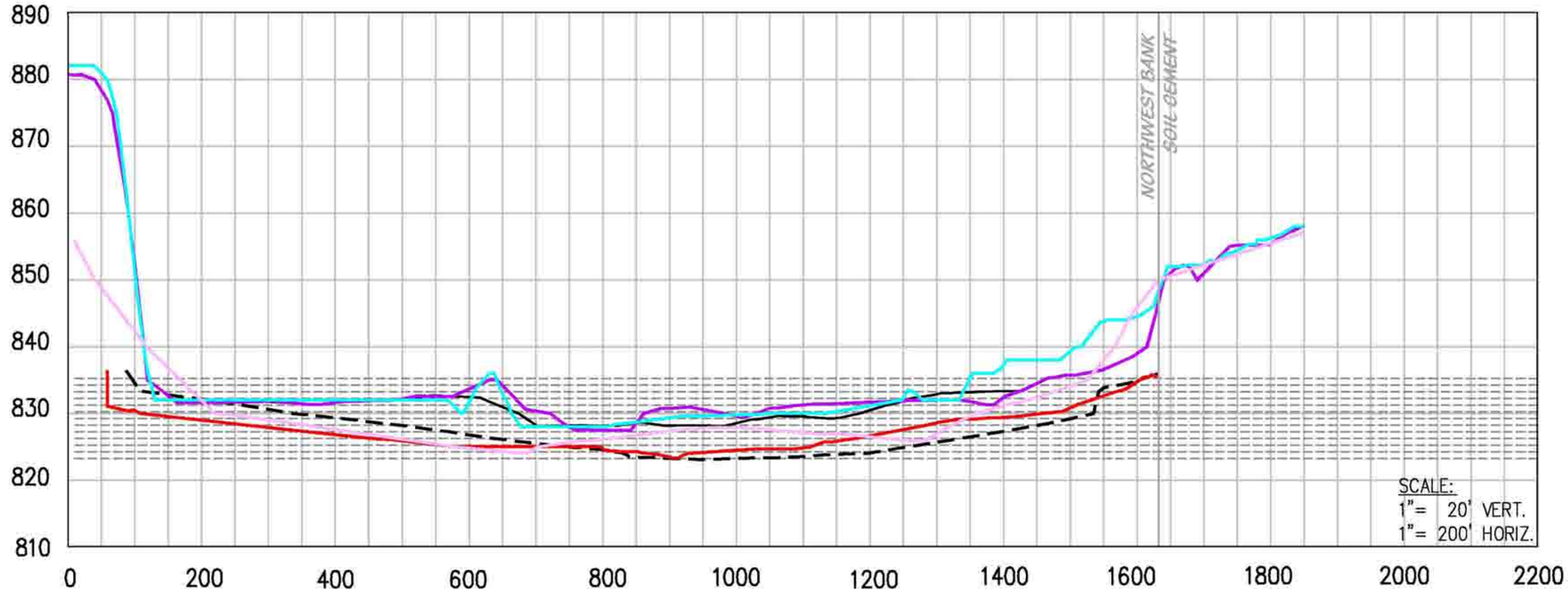

SUBREACH SRE3 SECTION 10390

LOOKING DOWNSTREAM

CROSS SECTIONAL AREAS AT STA 10390 (sf)					
ELEV	1947	1963	1999	2004	2005
824.3	3.9	43.1	0.0	0.0	0.0
825.3	94.2	315.5	0.0	0.0	0.0
826.3	252.1	633.1	0.0	0.0	0.0
827.3	533.3	801.6	0.0	0.0	0.0
828.3	853.0	945.9	36.7	73.0	24.6
829.3	1015.2	1093.0	184.0	114.7	306.3
830.3	1109.9	1302.8	345.4	169.4	475.5
831.3	1174.3	1422.9	529.3	332.7	554.3
832.3	1223.3	1464.8	739.8	793.6	816.8
833.3	1269.3	1494.6	1147.2	1159.9	1125.6
834.3	1308.6	1524.2	1180.8	1247.2	1296.9
835.3	1346.9	1541.5	1201.4	1314.9	1332.6
Area	10183.9	12582.9	5364.7	5205.4	5932.6

LEGEND:

- 2005 TERRAIN
- 2004 TERRAIN
- 1999 TERRAIN
- 1963 TERRAIN
- 1947 TERRAIN
- 1930 TERRAIN

TITLE: HISTORICAL CROSS SECTIONS BY STATION

JOB: SANTA CLARA RIVER FLUVIAL STUDY

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FIGURE 5.2P

Dimscale = 200; LTscale = 0.5; PSltscale = 1; Acad Ver. = 16.2s (LMS Tech); Visretain = 1

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characteristics. The Interstate 5 Bridge has not been outflanked by bed migration since its construction. Moreover, despite narrowing of the bed locally, bridge placement does not appear to have led to general bed degradation on the River as a whole. Periodic fires have burned the flora of the watershed historically, and as recently as the summer of 2004. Fires are important to changes of the River bed because these fires deplete vegetation stalks and root systems that hold soil in upland areas, thereby leading to increased erosion on slopes and increased sediment delivery to creeks and rivers. Agricultural fills are also important to the historic River fluvial mechanics because the fills limit the extent to which the River may migrate, and in turn cause vertical erosion of the creek bed. LACDPW has noted that lateral erosion of agricultural fill has occurred periodically although no data is presently available to date to gage the extent or depth of this erosion. Certainly, the volume of fill laterally eroded is not sufficient to prevent vertical bed erosion. As noted in Table 4.2 above, the River can transport over 730,000 tons (approximately 327,000 cubic yards) of sediment per day in some sections. LACDPW has indicated that the constraining of the lateral erosion at the agricultural infill locations may exacerbate or exceed background erosion downstream.

Table 5.1A shows the long-term historical cross-sections area from 1947 to 2005. The table lists the area for each historical section in a given subreach. The table also lists the difference between historical sections (e.g. 1947 section 23000 area – 2005 section 23000 area). Table 5.1B shows the historical cross-section average depth and average depth change by section and year. As noted above, the average depth is the area of a given section by year divided by the section geometric top width for that year. The difference between historical areas is also shown. It is important to note that the vertical elevation for each section is the same.

Table 5.1A: Santa Clara River Long-term Historical Cross-Section Area & Area Change 1947-2005

Subreach	Station	Area by Year (sf)			Δ Area by Year (sf)			
		1947	2004	2005	47-05	Change	04-05	Change
SRA1	44585 [1,3]	9209	12312	14990	-5781	DEGRADE	-2678	DEGRADE
SRA2	42215	5609	17251	17107	-11498	DEGRADE	144	AGGRADE
SRA3	40825	4761	7403	10210	-5449	DEGRADE	-2807	DEGRADE
SRA4	36080 [2]	12270	21059	21208	-8938	DEGRADE	-149	DEGRADE
SRB1	34720	14344	16868	19520	-5176	DEGRADE	-2652	DEGRADE
SRB2	33500	9132	14857	16523	-7391	DEGRADE	-1666	DEGRADE
SRC1	30445	9172	13898	13351	-4179	DEGRADE	547	AGGRADE
SRC2	27925	7909	7691	7802	107	AGGRADE	-111	DEGRADE
SRC3	25965	7734	9757	9519	-1785	DEGRADE	238	AGGRADE
SRC4	23000	18321	14968	13563	4758	AGGRADE	1405	AGGRADE
SRD1	20845	20069	14737	16091	3978	AGGRADE	-1354	DEGRADE
SRD2	18650	9589	10838	12011	-2422	DEGRADE	-1173	DEGRADE
SRD3	16305	11158	9704	11772	-614	DEGRADE	-2068	DEGRADE
SRE1	14315	8670	12499	13590	-4920	DEGRADE	-1091	DEGRADE
SRE2	12195	6839	6657	8034	-1195	DEGRADE	-1377	DEGRADE
SRE3	10390	10184	5205	5933	4251	AGGRADE	-728	DEGRADE

1 - Long-term change analyzed using 1963 data instead of 1947 data because 1947 data is unavailable at this section

2 - STA 36080 was chosen to represent sra4 because the downstream confluence is of particular engineering interest to that subreach

3- STA 44585 1947 area uses 1963 data since 1947 data is not available.

Table 5.1B: Santa Clara River Historical Cross-Section Average Depth & Average Depth Change Aggradation/Degradation Change 1947-2005								
Subreach	Station	Average Depth by Year = Area/Top Width (ft)			Δ Average Depth by Year (ft)			
		1947	2004	2005	47-05	Change	04-05	Change
SRA1	44585 [1,3]	16.0	18.4	17.8	-2.8	DEGRADE	0.6	AGGRADE
SRA2	42215	5.1	12.8	13.1	-8.0	DEGRADE	-0.3	DEGRADE
SRA3	40825	4.5	7.4	9.7	-5.2	DEGRADE	-2.3	DEGRADE
SRA4	36080 [2]	11.6	14.2	14.3	-2.7	DEGRADE	-0.1	DEGRADE
SRB1	34720	9.9	11.4	13.1	-3.2	DEGRADE	-1.7	DEGRADE
SRB2	33500	6.4	8.8	9.8	-3.4	DEGRADE	-1.0	DEGRADE
SRC1	30445	7.3	8.9	8.6	-1.3	DEGRADE	0.3	AGGRADE
SRC2	27925	9.9	14.0	14.3	-4.4	DEGRADE	-0.3	DEGRADE
SRC3	25965	5.7	7.6	7.4	-1.7	DEGRADE	0.2	AGGRADE
SRC4	23000	8.5	7.3	6.6	1.9	AGGRADE	0.7	AGGRADE
SRD1	20845	7.8	5.9	6.4	1.4	AGGRADE	-0.5	DEGRADE
SRD2	18650	5.6	5.6	6.2	-0.6	DEGRADE	-0.6	DEGRADE
SRD3	16305	5.6	5.1	6.3	-0.7	DEGRADE	-1.2	DEGRADE
SRE1	14315	6.1	6.5	7.1	-1.0	DEGRADE	-0.6	DEGRADE
SRE2	12195	5.3	5.1	6.2	-0.9	DEGRADE	-1.1	DEGRADE
SRE3	10390	7.6	4.0	4.5	3.1	AGGRADE	-0.5	DEGRADE

1 - Long-term change analyzed using 1963 data instead of 1947 data because 1947 data is unavailable at this section

2 - STA 36080 was chosen to represent sra4 because the downstream confluence is of particular engineering interest to that subreach

3- STA 44585 1947 area uses 1963 data since 1947 data is not available.

Section 44585 (SRA1) shows a gradual shifting of the thalweg toward the left (looking downstream) bank (Figure 5.2A) over the period of record. Topographic data is not available for this section for 1947, however, between 1963 and 2005, 2.8 feet of degradation has occurred (Table 5.1A-B), although the thalweg elevation increased between 1999 and 2005. Between 2004 and 2005, 0.6 feet of aggradation appears to have occurred (Table 5.1A-B) on the section as a whole. This portion of the River is narrower than most other portions and is slightly bent. Development has occurred on both banks, and this development along with the increased runoff from increased impervious area may have caused the observed degradation. A great deal of woody brush was present in the recent past, which may have rendered some portions of the bed more resistant to erosion, leading to some natural incising of the channel. It is also important to note that the dense brush in this and other woody sections may make the topography appear to be at higher elevation than is actually present. This difference results from the aerial survey technology used to create the topography, and is mostly evident in some portions of the 1999 topography.

Section 42215 (SRA2) appears to have greatly down cut and widened since 1947, degrading an average 8.1 feet along the section. Some of the observed long-term change may be related to the presence of the theme park and water treatment facility on the bank at this location. In recent years (1999-2005), the creek appears to have become relatively stable: area has increased from 17946 to 17101 over the period (Figure 5.2B). The River is relatively wide at this location although a bend is present. Development has occurred on both banks with agricultural development on the north bank and the Magic Mountain theme park on the south bank. Historical development may have led to the observed degradation, although at present the bed appears to be stable or degrading only slightly. The impacts of woody vegetation in this section may have played a role in the recent degradation. Finally, the 2004-2005 winter was very

wet and high flows were present on the River. During the heavy storms of December 2004 and January 2005, approximately 4.4 acres of the south bank was lost to the Santa Clara River. Some of the single-season degradation may possibly be attributed to this event. The features located at station 775 and 1325 in the 1999 topography are expected to be related the aerial surveying methodology, as noted above.

Similar to the other sections in Reach A, section 40825 (SRA3) is also degrading. The section has degraded 5.2 feet on average over the period of record (Table 5.1B). The 1963 data is insufficient in this section as indicated by the flat portions of the section, although the other years sufficiently indicate the trend. The 2005 thalweg is at the approximate elevation of the 1930 thalweg, although the present channel is more incised than the historic channel. The presently observed channel widening may possibly be attributed to recent high discharges, and migration of the channel may be related to these discharges. Features in the 1999 topography at stations 775 and 1325 are expected to be related to the aerial surveying methodology, as noted above.

Section 36080 (as applied to SRA4) borders the SRA4 and SRB1 subreaches. The section is adjacent to a local confluence in the River. The section shows consistent degradation over the period of record amounting to 2.7 feet, on average. The 1930 and 1963 topographies are insufficient in this section; however, widening of the channel in this location is readily apparent (Figure 5.2D). Little or no degradation is observed over the period of record, although a slight increase in the depth of the thalweg is observed during the 2004-2005 rainy season. Agriculture is present on the north overbank of the section although it is not clear how the history of farming practice may have affected the section.

The 1930 and 1963 topographic data of sections 34720 (SRB1) and 33500 (SRB2) is insufficient, as indicated by the long, straight portions of the section. Despite these difficulties, the data illustrate a clear degradational trend in the historic bed. Over the period of record, the section has degraded 3.2 and 3.4 feet, on average respectively, and 1.8 and 1.0 feet, on average respectively, during the 2004-2005 rainy season (Table 5.1). The River is broad and woody in this reach, with the northern end of the Travel Village development occupying the right overbank. It is unclear why a wide, straight portion of the River such as this would be subject to the observed degradation. Some of the long-term and single season degradation may possibly be attributed to the woody nature of the bed and the large recent discharges, respectively. It should be noted that the present thalweg appears to be at an elevation similar to the 1930 thalweg on section 34720, while the thalweg of the 2005 topography at section 33500 may or may not be lower than the 1930 topography. As with other portions of historic topography, features often present at the time of surveying are not highly resolved. When this occurs, historic topography is included for completeness. The degradation of these reaches may also be reflective of the large changes in development along the River upstream of the study area. This may apply to other sections considered as well, although currently it is not clear.

Section 30445 (SRC1) is downstream of two major tributaries, the larger being Castaic Creek, which is discussed in the companion Castaic Creek Fluvial Study, submitted separately. The section is also adjacent to a historic agricultural area and the proposed Landmark project. Historical analysis indicates 1.4 feet of degradation over the historic record, but 0.3 feet of aggradation during the 2004-2005 rainy season

(Table 5.1B). The aggradation appears to be the result of build up of sediments on the Castaic Creek side of the channel. If Castaic Creek contributed to the bed in this location, it may be the result of forest fires during the summer of 2004 and subsequent heavy rains of that winter, as discussed in the Castaic Creek report. It should be noted that some problems exist with the 1947 topography in this section below station 300.

At sections 27925 (SRC2) and 25965 (SRC3), the upstream degradational trends diminish and historic topographic data begin to indicate a bed that is fluctuating about a mean (Figures 5.2H and 5.2I, respectively). Section 27925 is quite narrow and adjacent to historic agricultural practice. The channel at this section is confined between steep bluffs on the left bank and tree-lined agricultural embankments on the right. Data in Table 5.1 indicate that the section has degraded 4.4 feet over the period of record and 0.3 feet during the most recent season. A relatively low-radius bend in the River is also present here. At section 25965, in contrast, the less narrow, although similarly confined and more gradually bending channel, takes an increasingly braided form with only 1.7 feet of degradation over the period of record. Data in Table 5.1 also indicate the most recent trend in this section is 0.2 feet of aggradation.

Sections 23000 (SRC4) and 20845 (SRD1) are the first historically aggradational sections analyzed (Figure 5.2J and 5.2K, respectively). Section 23000 is adjacent to the Chiquito Canyon Creek and Long Canyon Creek tributaries at the west end of the proposed Landmark development and between two historic agricultural production areas. Section 20845 is downstream of the proposed Landmark site and the left overbank has historically been used for agriculture. Both banks of section 20885 are tree-lined. Both sections are relatively wide and straight with braided channel beds. Both sections have aggraded over the period of historic record: 1.9 and 1.4 feet, respectively. In the most recent short term, however, section 23000 has aggraded 0.7 feet while section 20845 has degraded 0.5 feet. Section 23000 shows some incising below the 1930 historical bed although the average bed elevation is higher now than in the past. The dominant change in bed elevation between 2004 and 2005 at section 20845 occurred to the left of station 2600, while the remaining portion remained stable. It is not clear why this occurred, although agricultural practices or high discharges from the Chiquito and Long tributaries may have played a role. Agricultural practices may have stabilized the bank position and height while the creeks may influence the bed by discharging high volumes of water and sediments that have the dual ability to erode or deposit at this location. It should be noted that the topographic artifact between station 2600 and 3000 in the 1999 topography is a function of topographic sampling. As noted above, the dense brush in this and other woody sections may make the topography appear to be at a higher elevation than is actually present and results from the aerial survey technology used to create the topography.

Sections 18650 (SRD2), 16305 (SRD3), 14315 (SRE1), and 12195 (SRE2) all exhibit very mild long-term degradation (one foot or less) between 1947 and 2005 (Table 5.1). Additionally, short-term adjustment for all of these sections ranges between -0.6 and -1.2 feet between 2004 and 2005. Sections 16305 and 12195 exhibit 1.2 and 1.1 feet of degradation, respectively, and are among the five highest single season changes in bed elevation of the sections examined. Sections in SRA3 and SRB1 degrade significantly more with -2.3 and -1.7 feet, respectively. All of the sections from 18650 to 12195 are recovering from the 1928 dam break event, the sections low elevations, and all sections exhibit oscillations in bed elevation over the historic record (Figure

5.2L though 5.2O, respectively). These sections have in common a relatively wide, straight and braided bed. Grande Canyon Creek and Potrero Canyon Creek confluence with the River at near section 17000. The influence of the confluences is not immediately evident but may include some of the observed fluctuations in bed elevation as well as affecting the wide historic meandering between the north and south bank (Figure 5.1). The observed features in the 1999 and 2004 topographies in section 16305 at stations 425 and 850 appear to be the south and north low-flow banks, respectively. Several of the features in the 1999 bed at section 14315 appear to correlate to the presence of vegetation on the bank and relate to surveying methodology, as noted above.

Section 10390 (SRE3) illustrates 3.1 feet of aggradation from 1947 to 2005 and 0.5 feet of degradation between 2004 and 2005 (Table 5.1). In this subreach, the River is relatively very wide and braided. Little woody vegetation is observed on the banks and steep bluffs dominate both banks, although a small farm plot sets the bluff on the right bank back. Figure 5.2P indicates that the bed is recovering from scouring related to the 1928 dam break. The observed feature in the 1999 and 2004 topographies at station 625 appears to be the south bank of the thalweg.

Based on the above analysis and Table 5.1, sections above approximately 25965 appear to be degrading, while sections below appear to be stable or fluctuating around a mean elevation. This may be the result of historic development within the overbank areas or owing to the presence of the generally narrower, winding channel bed in the upstream portion of the study reach. The lower portion of the study reach is relatively flat, broad and straight. Data in Appendix Chapter 4.5 indicate that for reaches A through E the slope decreases as S_0=0.0061, 0.0060, 0.0055, 0.0055, and 0.0054, respectively.

5.1 Single Season Bed Adjustment

With historical topography from successive years, estimates of single-season change can be developed. This is a powerful tool because it can be used to determine the predictive accuracy of SAM modeling. The 2004-2005 rain season was wet on Santa Clara River with strong rain events occurring on already saturated soils both in December 2004 and January 2005. These events produced very high discharges on the River. Topography from before and after these events provides a tool to estimate the impacts of a single large discharge event, in general, and single season cumulative impacts. The 2004 and 2005 beds are described in Table 5.1 and Figure 5.2A-P. The table and figures illustrate that the bed elevations show alternating degradation and aggradation. Degradation ranges from 0.1 to 2.3 feet, on average, with most degrading sections changing less than one foot, on average. Aggrading sections change from 0.2 to 0.7 feet, on average. More sections degrade than aggrade. The pattern of aggradation and degradation over the single season does not appear to be a function of proximity to a river confluence. For comparison, aggradation predicted by SAM in the proposed condition (Table 4.2B) ranges from 0.0 to 2.1 feet, while degradation ranges from 0.0 to 1.6 feet. The values of bed change estimated by SAM vary similar to those observed in the topographic datasets. These differences can be attributed to the discontinuous nature of the zero-dimensional SAM model.

6 Other Scour

The calculation of scour depth for design of toe-down for structures is given in Chapter 5 of LACH&SM. The manual defines the toe-down depth as the sum of long-term adjustment, general adjustment, and five local effects that fall into the category of other scour. Other scour falls into four sub-categories: local scour, bend scour, low-flow incisement, and bed form height. Local scour occurs in the vicinity of flow obstructions including piers and abutments. Bend scour occurs because differential velocity gradients around curves in open channel flow. Three distinct bends are located in the River between Interstate 5 and the end of the study area near the Los Angeles/Ventura County line. These bends have radii of 9,000, 3,000, and 17,000 feet from east to west in the River, respectively. The bends can be seen in Figure 1.1. Low flow incisement is included to represent thalweg or low flow channel depth. On-site inspection and analysis of historic topographic data of this feature estimates the thalweg at approximately two feet. Finally, bedform height represents the dunes and anti-dunes that develop in active soft-bottomed channels during flow events. Because no observations are available, bedform height has been limited after Kennedy (1963).

Bend scour and bedform height have been calculated based on LACH&SM design curves in Chapter 5 and Appendix Q. Bend scour is based on equation Q-6A of the manual, given as (Zeller, 1981):

$$Z_{bs} = \frac{0.0685 Y V^{0.8}}{Y_h^{0.4} S_e^{0.3}} \left[1.59 \left(\frac{w}{r} \right)^{0.2} - 1 \right]$$

where Z_{bs} is the bend scour depth, V is mean velocity, Y is maximum depth of flow, Y_h is hydraulic depth of flow, S_e is energy slope, w is channel top width, and r is radius of curvature to the centerline of the channel. Bedform height is given by equation Q-8 of the manual, given as:

$$h = 0.027 V^2$$

where h is bedform height.

Results of calculations of other scour components are summarized in Table 6 as well as in LACH&SM calculations tables in Appendix Chapter 6.1 for both the existing and proposed conditions. Pier scour is zero in the existing condition and ranges from 0.0 to 17.4 in the proposed condition. The tables show that in the existing and proposed conditions bend scour ranges from 0.0 to 11.3 feet and 0.0 to 8.9 feet, respectively. Observed changes result from changes to river hydraulics in the study reach. For both the existing and proposed conditions, the table also shows that bed form height ranges from 0.5 to 8.3 feet in both the existing and proposed conditions.

Table 6: Santa Clara River Summary of Other Scour (ft)

Subreach	Section	Existing Condition		Proposed Condition		Δ Curved	Δ Straight
		Outside Curved Reach	Straight-Inside Curved Reach	Outside Curved Reach	Straight-Inside Curved Reach		
SRA1	46195	8.3	8.3	8.3	8.3	0.0	0.0
	46020	9.9	9.9	9.9	9.9	0.0	0.0
	45545	7.6	7.6	7.6	7.6	0.0	0.0
	45030	10.3	10.3	10.3	10.3	0.0	0.0
	44585	7.0	7.0	7.0	7.0	0.0	0.0
	44210	9.7	9.7	9.7	9.7	0.0	0.0
SRA2	43820	7.3	7.3	7.3	7.3	0.0	0.0
	43610	8.9	8.9	8.9	8.9	0.0	0.0
	43410	7.7	7.7	7.7	7.7	0.0	0.0
	43200	8.2	8.2	8.2	8.2	0.0	0.0
	42975	7.4	7.4	7.4	7.4	0.0	0.0
	42815	7.3	7.3	7.4	7.4	0.1	0.1
	42590	6.9	6.5	7.0	6.6	0.1	0.1
	42430	7.0	6.8	7.3	7.2	0.3	0.4
	42215	5.0	3.5	7.1	6.6	2.1	3.1
	41940	5.4	3.8	5.3	3.8	-0.1	0.0
	41730	5.2	3.9	5.1	3.9	-0.1	0.0
	41460	5.7	3.8	4.7	3.8	-1.0	0.0
SRA3	41280	5.7	5.7	5.6	5.6	-0.1	-0.1
	41080	7.3	7.3	7.4	7.4	0.1	0.1
	40825	6.9	6.4	6.9	6.4	0.0	0.0
	40585	6.3	5.9	6.3	5.9	0.0	0.0
	40335	5.9	3.7	4.9	3.5	-1.0	-0.2
	40130	6.5	3.7	5.0	3.7	-1.5	0.0
	39945	6.4	3.4	4.9	3.6	-1.5	0.2
	39755	6.7	5.2	5.7	5.7	-1.0	0.5
	39605	7.9	7.1	7.2	7.2	-0.7	0.1
	39310	6.7	5.5	5.9	5.7	-0.8	0.2
	39100	5.7	4.1	7.2	7.2	1.5	3.1
	38925	4.9	3.8	4.2	4.2	-0.6	0.4
SRA4	38710	4.2	3.5	4.0	4.0	-0.2	0.5
	38475	6.3	6.3	6.3	6.3	0.0	0.0
	38300	6.9	6.9	7.1	7.1	0.2	0.2
	38065	4.7	4.7	4.9	4.9	0.2	0.2
	37810	6.5	6.5	6.5	6.5	0.0	0.0
	37655	7.1	7.1	7.3	7.3	0.2	0.2
	37390	5.1	5.1	5.3	5.3	0.2	0.2
	37135	6.4	5.9	5.7	5.7	-0.7	-0.2
	36930	6.5	5.9	6.1	6.1	-0.4	0.2
	36735	5.9	5.0	5.5	5.5	-0.4	0.5
	36515	7.0	5.8	4.6	4.2	-2.4	-1.6
	36265	5.7	4.3	5.0	4.1	-0.7	-0.2
SRB1	36080	5.7	4.1	19.1	18.2	13.4	14.1
	35845	5.7	3.6	5.3	3.6	-0.4	0.0
	35725	7.0	4.9	6.8	5.0	-0.2	0.1
	35515	7.7	5.9	7.7	5.9	0.0	0.0
	35245	7.2	4.8	7.6	6.0	0.4	1.2
	35040	8.8	7.1	8.9	7.2	0.1	0.1
	34860	7.8	6.4	7.8	6.6	0.0	0.2
	34720	7.9	6.4	8.0	6.6	0.1	0.2
	34495	7.4	6.4	7.1	6.1	-0.3	-0.3
	34310	7.3	6.2	7.0	5.8	-0.3	-0.4
	34090	6.9	6.0	6.9	5.9	0.0	-0.1
SRB2	33880	6.5	5.3	6.9	5.7	0.4	0.4
	33710	6.9	5.7	6.5	5.2	-0.4	-0.5
	33500	6.9	5.4	7.1	5.5	0.2	0.1
	33310	7.5	5.4	7.5	5.4	0.0	0.0
	33115	6.7	5.3	5.6	3.4	-1.1	-1.9
	32795	6.3	4.0	6.6	4.3	0.3	0.3
	32605	6.1	4.7	7.1	4.8	1.0	0.1
SRC1	32265	8.2	5.8	7.9	5.4	-0.3	-0.4
	31875	6.9	3.6	7.1	4.1	0.2	0.5
	31585	8.6	5.7	6.6	3.6	-2.0	-2.1
	31360	6.3	3.3	6.3	3.4	0.0	0.1
	31060	5.6	2.8	5.5	2.9	-0.1	0.1
	30720	6.1	2.6	5.9	2.6	-0.2	0.0
	30445	6.0	2.5	5.9	2.5	-0.1	0.0
	30095	6.7	2.6	6.1	2.6	-0.6	0.0
	29815	7.1	2.8	5.7	2.8	-1.4	0.0
	29565	7.4	2.7	5.1	2.7	-2.3	0.0
	29385	7.8	3.0	5.0	2.9	-2.8	-0.1
SRC2	29140	7.8	3.4	4.4	3.1	-3.4	-0.3
	28895	8.8	7.2	7.5	6.8	-1.3	-0.4
	28695	10.0	10.0	9.0	9.0	-1.0	-1.0
	28500	8.8	8.8	8.8	8.8	0.0	0.0
	28280	7.9	7.9	7.6	7.4	-0.3	-0.5
	28080	7.7	7.7	3.9	3.7	-3.8	-4.0
	27925	6.3	6.3	4.3	4.3	-2.0	-2.0
	27725	7.7	7.7	6.9	6.9	-0.8	-0.8
	27545	8.6	8.6	9.0	9.0	0.4	0.4
	27335	8.0	8.0	8.2	8.2	0.2	0.2
	27155	8.6	8.6	6.9	6.9	-1.7	-1.7
SRC3	26990	8.1	7.6	7.9	7.7	-0.2	0.1
	26780	8.5	7.5	8.3	7.6	-0.2	0.1
	26575	12.8	7.5	12.7	7.6	-0.1	0.1
	26355	12.4	5.4	12.1	5.4	-0.3	0.0
	26170	14.1	6.4	13.3	5.9	-0.8	-0.5
	25965	13.7	6.3	13.8	6.5	0.1	0.2
	25785	14.2	7.2	13.4	6.8	-0.8	-0.4
	25600	16.0	7.6	12.6	6.6	-3.4	-1.0
	25425	16.1	7.4	11.8	6.5	-4.3	-0.9
	25215	13.9	4.8	10.7	4.7	-3.2	-0.1
	25000	16.6	6.1	10.4	4.3	-6.2	-1.8
SRC4	24795	17.7	6.9	10.3	4.7	-7.4	-2.2
	24550	17.6	7.4	10.4	5.1	-7.2	-2.3
	24335	15.0	4.8	11.0	6.5	-4.0	1.7
	24115	15.5	6.8	11.5	7.4	-5.0	0.7
	23975	14.6	6.9	11.9	7.8	-2.7	0.9
	23755	13.8	5.8	11.2	6.4	-2.6	0.6
	23565	14.1	4.8	12.5	7.5	-1.6	2.7
	23365	13.3	5.9	12.3	6.6	-1.0	0.7
	23180	13.5	4.3	13.8	8.3	0.3	4.0
	23000	11.0	3.1	11.0	7.6	0.0	4.5
	22790	11.0	3.2	24.8	21.0	13.8	17.8
	22600	13.0	3.7	12.8	7.3	-0.2	3.6
	22415	12.6	3.9	12.0	7.4	-0.6	3.5

Table 6: Santa Clara River Summary of Other Scour (ft) continued							
Subreach	Section	Existing Condition		Proposed Condition		Δ Curved	Δ Straight
		Outside Curved Reach	Straight-Inside Curved Reach	Outside Curved Reach	Straight-Inside Curved Reach		
SRD1	22195	11.8	4.7	11.1	4.5	-0.7	-0.2
	22010	13.6	5.5	13.1	5.5	-0.5	0.0
	21790	13.1	7.2	13.1	7.2	0.0	0.0
	21615	10.4	6.3	10.3	6.3	-0.1	0.0
	21440	13.4	6.8	11.9	6.1	-1.5	-0.7
	21225	16.9	7.1	14.1	6.4	-2.8	-0.7
	21020	12.9	6.4	10.4	6.9	-2.5	0.5
	20845	15.5	5.9	13.0	5.1	-2.5	-0.8
	20595	15.4	5.1	11.9	4.1	-3.5	-1.0
	20435	15.6	4.3	12.2	4.0	-3.4	-0.3
	20280	15.6	4.6	13.2	5.3	-2.4	0.7
	20070	13.3	6.6	14.6	7.0	1.3	0.4
SRD2	19855	14.2	6.3	12.5	7.1	-1.7	0.8
	19630	12.9	6.3	10.3	6.4	-2.6	0.1
	19440	12.8	3.9	10.2	4.3	-2.6	0.4
	19240	13.3	4.6	11.0	5.4	-2.3	0.8
	19050	12.7	3.6	12.1	6.8	-0.6	3.2
	18830	13.6	3.5	12.5	4.4	-1.1	0.9
	18650	13.5	3.3	12.7	4.0	-0.8	0.7
	18475	12.6	2.9	11.6	3.1	-1.0	0.2
	18290	12.9	3.0	12.1	3.3	-0.8	0.3
	18025	2.8	2.8	2.8	2.8	0.0	0.0
	17785	3.0	3.0	3.0	3.0	0.0	0.0
SRD3	17510	4.6	4.6	3.6	3.6	-1.0	-1.0
	17360	5.9	5.9	5.9	5.9	0.0	0.0
	17110	8.4	8.4	8.7	8.7	0.3	0.3
	16970	8.8	8.8	8.8	8.8	0.0	0.0
	16720	6.5	6.5	6.6	6.6	0.1	0.1
	16515	6.8	6.8	7.1	7.1	0.3	0.3
	16305	7.1	6.8	3.8	3.8	-3.3	-3.0
	16130	6.0	5.5	5.3	5.3	-0.7	-0.2
	15960	6.1	5.4	6.2	6.2	0.1	0.8
	15745	4.5	3.6	4.0	4.0	-0.5	0.4
	15540	4.6	3.6	3.5	3.5	-1.1	-0.1
	15335	5.1	4.2	5.5	5.5	0.4	1.3
SRE1	15125	5.5	5.5	23.7	23.7	18.2	18.2
	14900	4.9	4.9	6.9	6.9	2.0	2.0
	14720	6.0	5.8	6.5	6.4	0.5	0.6
	14480	5.0	4.7	6.5	6.4	1.5	1.7
	14315	5.2	5.0	5.0	4.6	-0.2	-0.4
	14090	4.7	4.6	4.9	4.8	0.2	0.2
	13850	5.4	5.3	4.3	4.2	-1.1	-1.1
	13635	5.2	5.2	5.3	5.2	0.1	0.0
	13425	6.3	6.0	6.2	5.9	-0.1	-0.1
	13190	4.3	4.0	4.3	4.0	0.0	0.0
SRE2	13030	4.9	4.7	4.9	4.7	0.0	0.0
	12835	4.4	4.4	4.4	4.4	0.0	0.0
	12615	4.1	4.1	4.1	4.1	0.0	0.0
	12395	4.0	4.0	4.0	4.0	0.0	0.0
	12195	3.5	3.5	3.5	3.5	0.0	0.0
	11995	4.2	4.2	4.2	4.2	0.0	0.0
	11780	4.1	4.1	4.1	4.1	0.0	0.0
	11605	4.7	4.7	4.6	4.6	-0.1	-0.1
	11405	4.3	4.3	4.3	4.3	0.0	0.0
	11180	5.7	5.7	5.7	5.7	0.0	0.0
SRE3	11015	6.9	6.9	6.9	6.9	0.0	0.0
	10835	7.4	7.4	7.4	7.4	0.0	0.0
	10575	5.7	5.7	5.7	5.7	0.0	0.0
	10390	6.4	6.4	6.4	6.4	0.0	0.0
	10225	6.3	6.3	6.3	6.3	0.0	0.0
	10000	5.0	5.0	5.0	5.0	0.0	0.0
	9820	6.7	6.7	6.7	6.7	0.0	0.0
	9595	4.9	4.9	4.9	4.9	0.0	0.0
	9385	5.5	5.4	5.5	5.4	0.0	0.0
	9220	5.8	5.6	5.8	5.6	0.0	0.0
	9025	5.5	5.4	5.5	5.4	0.0	0.0

7 Total Scour

To be conservative, general adjustment, long-term adjustment, and other scour are summed to determine total potential bed adjustment following LACH&SM methodology, as presented in Chapter 5 of the LACH&SM manual. SAM values represent general adjustment, and the long-term analysis presented in Chapter 5 represent long-term trends. Previous versions of this report used long-term analysis based on historical thalweg analysis. The presently employed cross-section analysis provides greater detail at individual sections and has replaced the thalweg analysis. The historical thalweg analysis is included in Appendix Chapter 5.2 for completeness. Individual and combined scour components are shown in Figure 7.1A-D and Table 7.1A-D, for the existing and proposed conditions. For cross-sections where SAM modeling predicts aggradation, the general adjustment contribution to total bed adjustment is not included. This conservative approach ensures that major trends are captured by the study but local or minor bed adjustments do not decrease total potential degradation. Long-term degradation values are taken as the larger of long-term degradation or two feet. The figure shows that total bed degradation on the outside bank of curved reaches ranges from approximately -6.9 to -19.7 feet in the existing condition at sections 38710/13030 and section 24795, respectively. In the proposed condition, total bed degradation outside of curved reaches range from approximately -6.7 to -26.1 feet at section 38710 and section 15125, respectively. In straight and inside bank of curved reaches in the existing condition, total degradation ranges from -6.2 to -15.4 feet at section 38710 and section 43820, respectively. In straight and inside of curved reaches in the proposed condition, total degradation ranges from -6.7 feet at multiple sections to -26.2 feet at section 15125, respectively. The largest adjustment for both conditions is in the vicinity of the Grande and Portrero confluences. The existing and proposed conditions closely match ($\Delta \leq 1.0$) at all subreaches except at SRC2, SRC4, and SRD2 where the proposed condition total adjustment is shallower than that in the existing condition, and at SRB1 and SRE1 where the proposed condition total adjustment is deeper than the existing condition. In the cases of SRB1 and SRE1, the total degradation in the proposed condition is deeper due to proposed bridges at these locations. In the other cases where total degradation in the existing condition is deeper, general adjustment and other components differ significantly between the existing and proposed conditions. It is important to note that the total toe-down is primarily a function of the large other components, which greatly exceed the general adjustment and long-term degradation components.

Table 7.1A: Santa Clara River Existing Conditions Outside Curved Reach Summary of Degradation Components (ft)

Subreach	US Station	Z_{DEG}	Z_{GS} (SAM)*	Z_{OTHER}	Z_{TOTAL}
SRA1	46195	-2.8	0.6	-8.3	-11.1
SRA2	43820	-8.1	0.4	-7.3	-15.4
SRA3	41280	-5.2	-0.3	-5.7	-11.2
SRA4	38710	-2.7	0.3	-4.2	-6.9
SRB1	36080	-3.2	-0.6	-5.7	-9.5
SRB2	33880	-3.4	0.0	-6.5	-9.9
SRC1	32265	-2.0	0.8	-8.2	-10.2
SRC2	29140	-4.4	-2.9	-7.8	-15.1
SRC3	26990	-2.0	-0.4	-8.1	-10.5
SRC4	24795	-2.0	0.2	-17.7	-19.7
SRD1	22195	-2.0	-0.6	-11.8	-14.4
SRD2	19855	-2.0	1.3	-14.2	-16.2
SRD3	17510	-2.0	-1.2	-4.6	-7.8
SRE1	15125	-2.0	-0.6	-5.5	-8.1
SRE2	13030	-2.0	2.3	-4.9	-6.9
SRE3	11015	-2.0	-1.4	-6.9	-10.3

*Positive values in Z_{GS} represent aggradation

Table 7.1B: Santa Clara River Proposed Conditions Outside Curved Reach Summary of Degradation Components (ft)

Subreach	US Station	Z_{DEG}	Z_{GS} (SAM)*	Z_{OTHER}	Z_{TOTAL}
SRA1	46195	-2.8	0.6	-8.3	-11.1
SRA2	43820	-8.1	0.2	-7.3	-15.4
SRA3	41280	-5.2	-0.1	-5.6	-10.9
SRA4	38710	-2.7	0.1	-4.0	-6.7
SRB1	36080	-3.2	-0.7	-19.1	-23.0
SRB2	33880	-3.4	0.2	-6.9	-10.3
SRC1	32265	-2.0	0.8	-7.9	-9.9
SRC2	29140	-4.4	-1.6	-4.4	-10.4
SRC3	26990	-2.0	-1.3	-7.9	-11.2
SRC4	24795	-2.0	0.2	-10.3	-12.3
SRD1	22195	-2.0	-0.2	-11.1	-13.3
SRD2	19855	-2.0	1.4	-12.5	-14.5
SRD3	17510	-2.0	-1.3	-3.6	-6.9
SRE1	15125	-2.0	-0.4	-23.7	-26.1
SRE2	13030	-2.0	2.1	-4.9	-6.9
SRE3	11015	-2.0	-1.5	-6.9	-10.4

*Positive values in Z_{GS} represent aggradation

Table 7.1C: Santa Clara River Existing Conditions Straight-Inside Curved Reach Summary of Degradation Components (ft)

Subreach	US Station	Z_{DEG}	Z_{GS} (SAM)*	Z_{OTHER}	Z_{TOTAL}
SRA1	46195	-2.8	0.6	-8.3	-11.1
SRA2	43820	-8.1	0.4	-7.3	-15.4
SRA3	41280	-5.2	-0.3	-5.7	-11.2
SRA4	38710	-2.7	0.3	-3.5	-6.2
SRB1	36080	-3.2	-0.6	-4.1	-7.9
SRB2	33880	-3.4	0.0	-5.3	-8.7
SRC1	32265	-2.0	0.8	-5.8	-7.8
SRC2	29140	-4.4	-2.9	-3.4	-10.7
SRC3	26990	-2.0	-0.4	-7.6	-10.0
SRC4	24795	-2.0	0.2	-6.9	-8.9
SRD1	22195	-2.0	-0.6	-4.7	-7.3
SRD2	19855	-2.0	1.3	-6.3	-8.3
SRD3	17510	-2.0	-1.2	-4.6	-7.8
SRE1	15125	-2.0	-0.6	-5.5	-8.1
SRE2	13030	-2.0	2.3	-4.7	-6.7
SRE3	11015	-2.0	-1.4	-6.9	-10.3

*Positive values in Z_{GS} represent aggradation

Table 7.1D: Santa Clara River Proposed Conditions Straight-Inside Curved Reach Summary of Degradation Components (ft)

Subreach	US Station	Z_{DEG}	Z_{GS} (SAM)*	Z_{OTHER}	Z_{TOTAL}
SRA1	46195	-2.8	0.6	-8.3	-11.1
SRA2	43820	-8.1	0.2	-7.3	-15.4
SRA3	41280	-5.2	-0.1	-5.6	-10.9
SRA4	38710	-2.7	0.1	-4.0	-6.7
SRB1	36080	-3.2	-0.7	-18.2	-22.1
SRB2	33880	-3.4	0.2	-5.7	-9.7
SRC1	32265	-2.0	0.8	-5.4	-7.4
SRC2	29140	-4.4	-1.6	-3.1	-9.1
SRC3	26990	-2.0	-1.3	-7.7	-11.0
SRC4	24795	-2.0	0.2	-4.7	-6.7
SRD1	22195	-2.0	-0.2	-4.5	-6.7
SRD2	19855	-2.0	1.4	-7.1	-9.1
SRD3	17510	-2.0	-1.3	-3.6	-6.9
SRE1	15125	-2.0	-0.4	-23.7	-26.1
SRE2	13030	-2.0	2.1	-4.7	-6.7
SRE3	11015	-2.0	-1.5	-6.9	-10.4

*Positive values in Z_{GS} represent aggradation

Figure 7.2A-D presents a comparison of total bed adjustment for the summed methodology, presented previously, and the methodology based on the Los Angeles County Flood Control District's Design Manual (LACFCDDM), Table F-31. Calculations are shown in Table 7.2A-D. The LACFCDDM methodology is based only on velocity and does not account for any other river parameters. Generally, the

Figure 7.1A: Santa Clara River Existing Conditions Outside Curved Reach Summary of Degradation Components

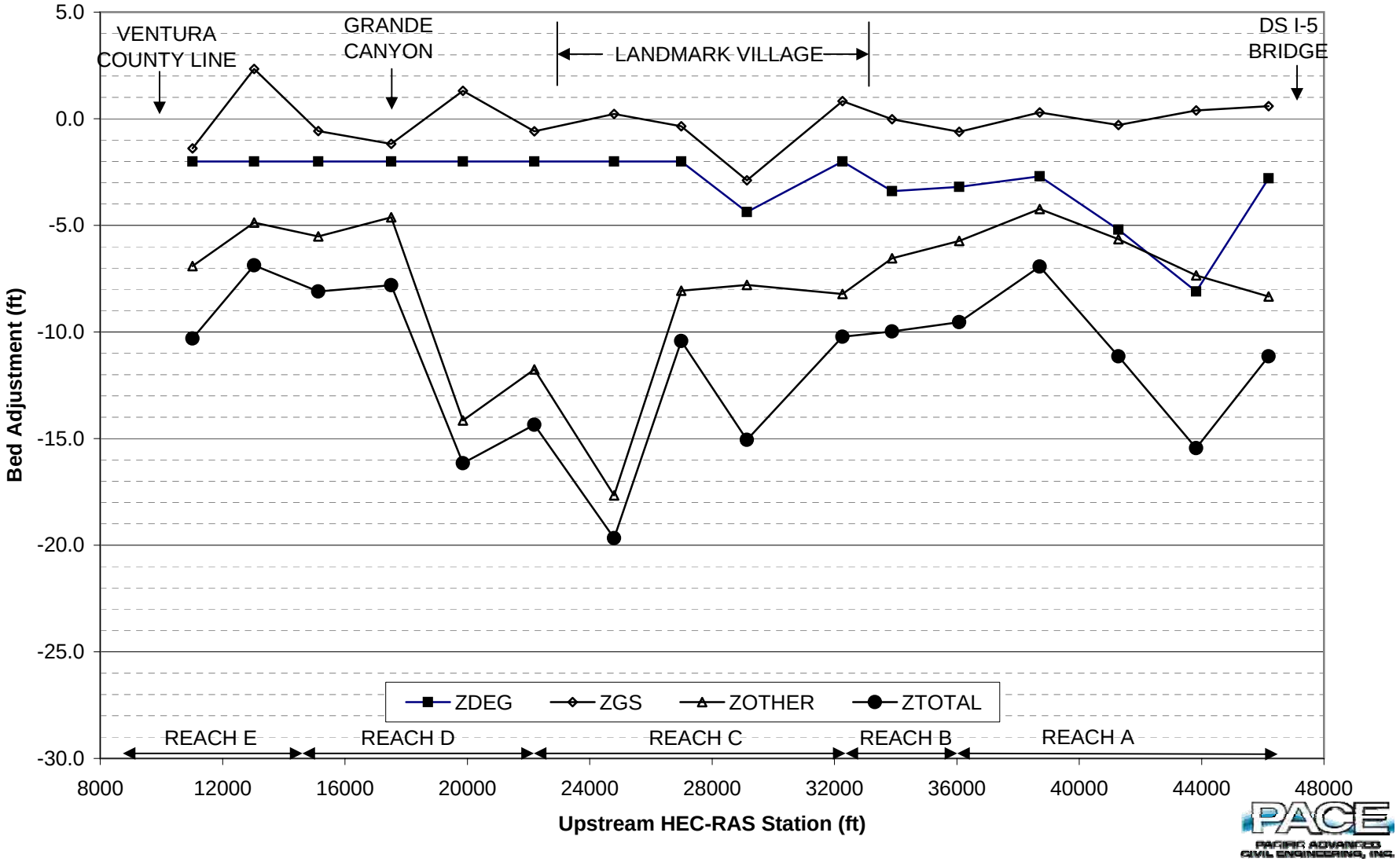


Figure 7.1B: Santa Clara River Proposed Conditions Outside Curved Reach Summary of Degradation Components

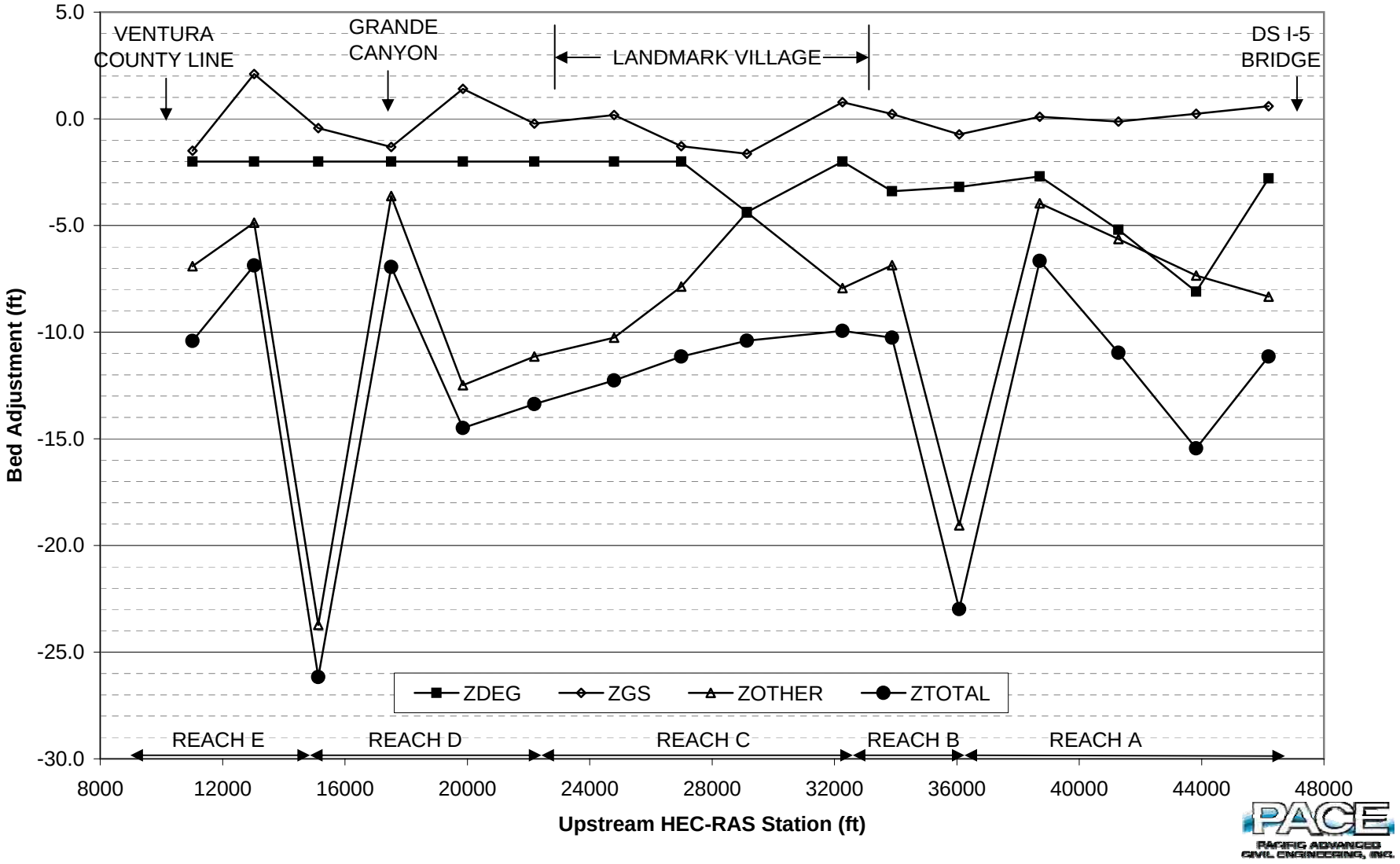


Figure 7.1C: Santa Clara River Existing Conditions Straight-Inside Curved Reach Summary of Degradation Components

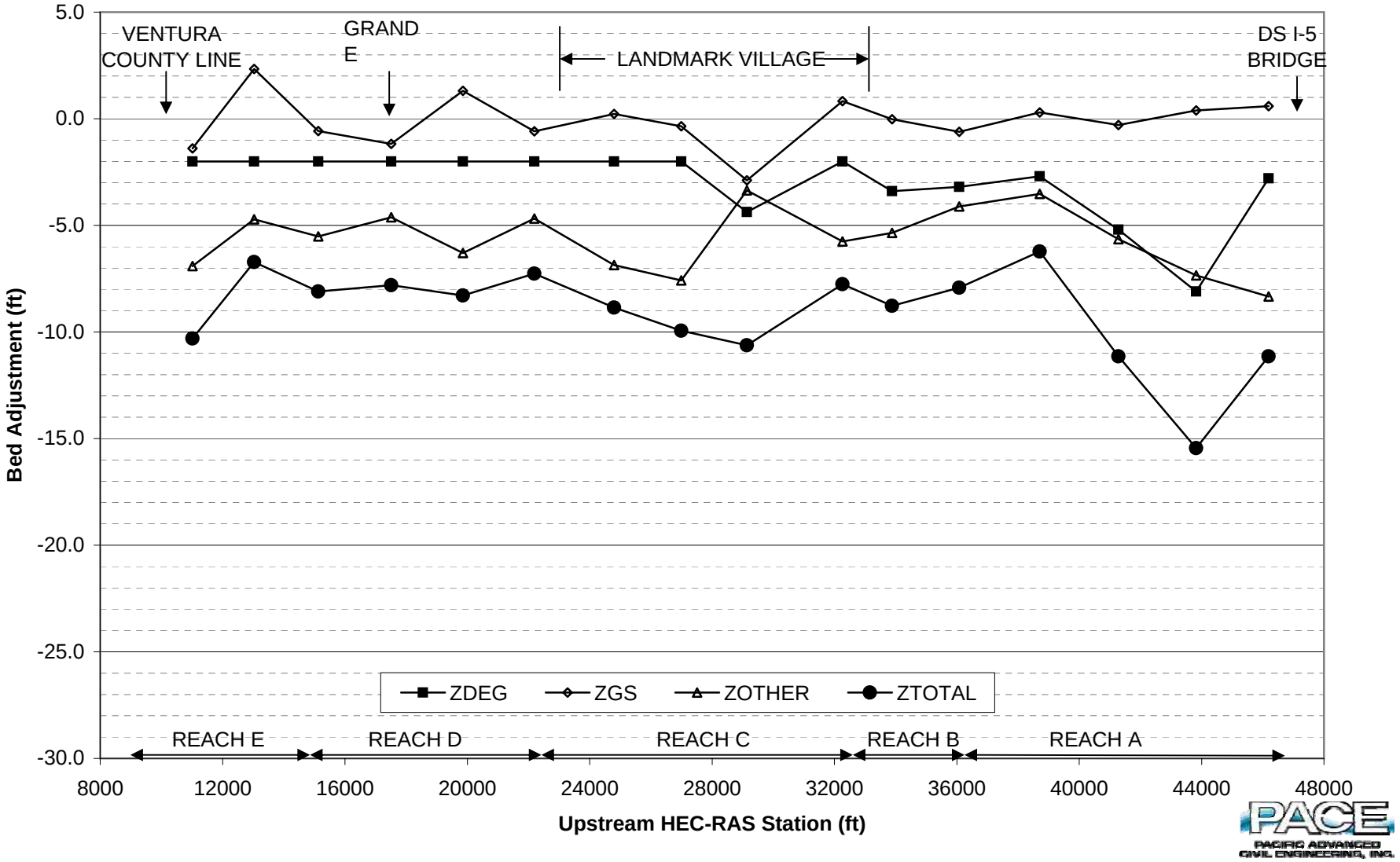
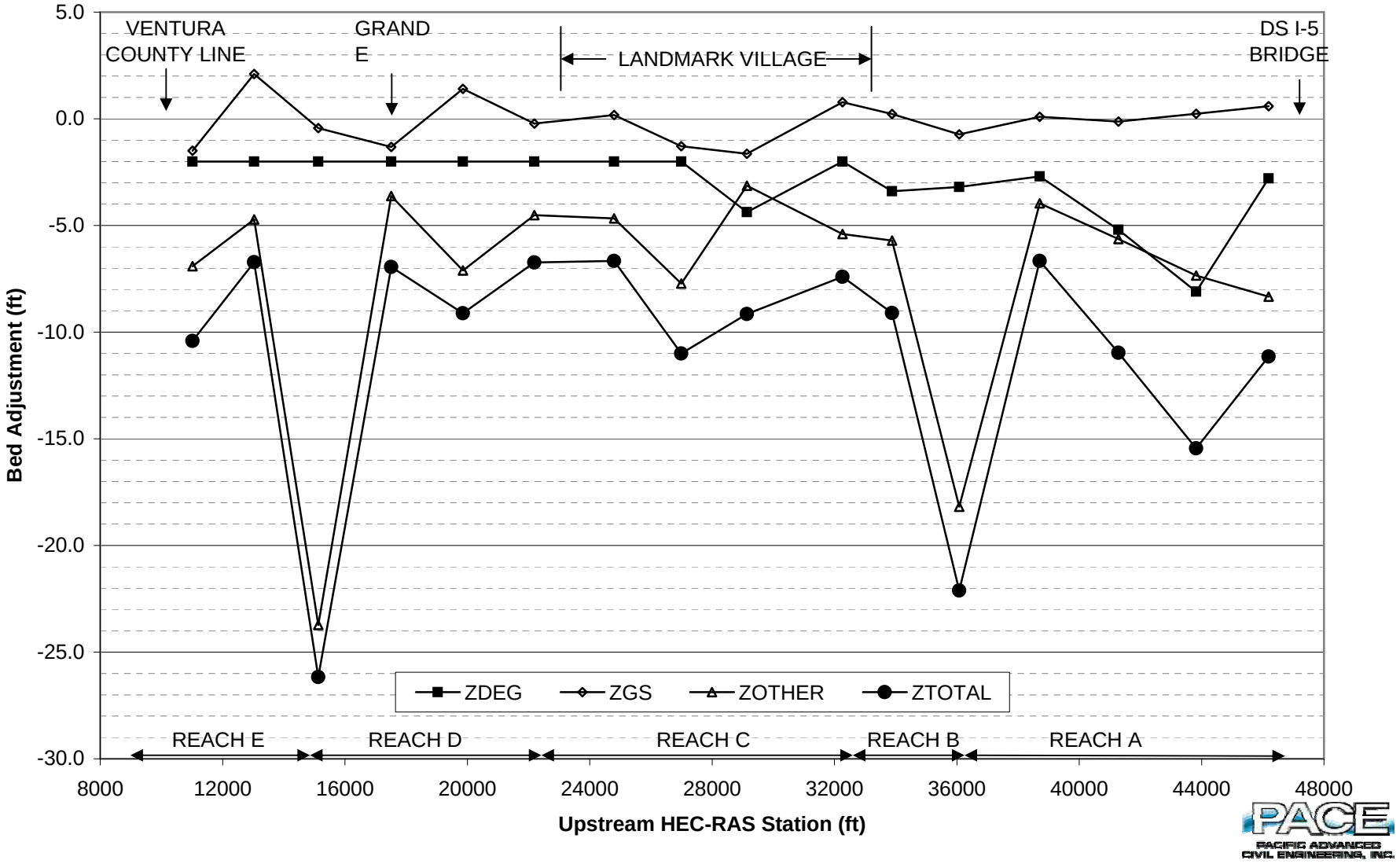


Figure 7.1D: Santa Clara River Proposed Conditions Straight-Inside Curved Reach Summary of Degradation Components



LACFCDDM is the most conservative among all total scour methodologies. Figure 7.2A-D shows that the more intensive LACH&SM methodology generally predicts a shallower toe-down in both the existing and proposed conditions than does the LACFCDDM methodology for most sections. At section 43820, LACH&SM predicts 1.4 feet deeper toe-down than does the LACFCDDM for both existing and proposed conditions and outside of curved and straight or inside of curved reaches because of very high long-term adjustment. At section 29140 in straight or inside of curved reaches for both existing and proposed conditions, LACH&SM predicts 0.6 and 1.2 feet, respectively, deeper toe-down than does the LACFCDDM because of higher long-term adjustment combined with moderate bedform height in this reach. At section 36080 and section 15125 in the proposed condition, LACH&SM predicts more than 10 feet deeper toe-down than does LACFCDDM due to proposed bridges at these locations. The LACFCDDM does not effectively account for the local degradation; therefore, the LACH&SM methodology utilizing SAM calculations predicts a deeper toe-down at some locations than does the LACFCDDM methodology. Figure 7.3A-D shows the 1999 (model) minimum bed elevation as previously discussed in Chapter 4, the existing bed minimum elevation (2005), and the calculated project toe-down from Figure 7.2A-D. Figure 7.3A-D shows that the calculated toe-down is below the 1999 model and existing 2005 minimum bed elevation at every section examined by approximately 6 to 26 feet, depending on the section.

Table 7.2A: Santa Clara River Existing Conditions Outside Curved Reach Toe-down Summary by Methodology (ft)

Subreach	US Station	HEC-RAS Model (1999) Elevation	LACH&SM (SAM)	LACH&SM Toe-down Elevation	LACFCDDM	LACFCDDM Toe-down Elevation	Δ (LACH&SM-LACFCDDM)
SRA1	46195	1034.6	-11.1	1023.5	-14.0	1020.6	2.9
SRA2	43820	1018.0	-15.4	1002.6	-14.0	1004.0	-1.4
SRA3	41280	1002.0	-11.2	990.8	-12.5	989.5	1.3
SRA4	38710	988.0	-6.9	981.1	-15.0	973.0	8.1
SRB1	36080	973.2	-9.5	963.7	-15.0	958.2	5.5
SRB2	33880	960.0	-9.9	950.1	-18.0	942.0	8.1
SRC1	32265	951.4	-10.2	941.2	-18.0	933.4	7.8
SRC2	29140	932.0	-15.1	916.9	-15.0	917.0	-0.1
SRC3	26990	920.0	-10.5	909.5	-21.0	899.0	10.5
SRC4	24795	908.0	-19.7	888.3	-21.0	887.0	1.3
SRD1	22195	894.0	-14.4	879.6	-15.0	879.0	0.6
SRD2	19855	880.1	-16.2	863.9	-18.0	862.1	1.8
SRD3	17510	868.0	-7.8	860.2	-10.0	858.0	2.2
SRE1	15125	854.0	-8.1	845.9	-12.5	841.5	4.4
SRE2	13030	843.3	-6.9	836.4	-15.0	828.3	8.1
SRE3	11015	832.0	-10.3	821.7	-14.0	818.0	3.7

Table 7.2B: Santa Clara River Proposed Conditions Outside Curved Reach Toe-down Summary by Methodology (ft)

Subreach	US Station	HEC-RAS Model (1999) Elevation	LACH&SM (SAM)	LACH&SM Toe-down Elevation	LACFCDDM	LACFCDDM Toe-down Elevation	Δ (LACH&SM-LACFCDDM)
SRA1	46195	1034.6	-11.1	1023.5	-14.0	1020.6	2.9
SRA2	43820	1018.0	-15.4	1002.6	-14.0	1004.0	-1.4
SRA3	41280	1002.0	-10.9	991.1	-12.5	989.5	1.6
SRA4	38710	988.0	-6.7	981.3	-10.0	978.0	3.3
SRB1	36080	973.2	-23.0	950.2	-15.0	958.2	-8.0
SRB2	33880	960.0	-10.3	949.7	-18.0	942.0	7.7
SRC1	32265	951.4	-9.9	941.5	-18.0	933.4	8.1
SRC2	29140	932.0	-10.4	921.6	-12.0	920.0	1.6
SRC3	26990	920.0	-11.2	908.8	-21.0	899.0	9.8
SRC4	24795	908.0	-12.3	895.7	-15.0	893.0	2.7
SRD1	22195	894.0	-13.3	880.7	-15.0	879.0	1.7
SRD2	19855	880.1	-14.5	865.6	-21.0	859.1	6.5
SRD3	17510	868.0	-6.9	861.1	-10.0	858.0	3.1
SRE1	15125	854.0	-26.1	827.9	-12.5	841.5	-13.6
SRE2	13030	843.3	-6.9	836.4	-15.0	828.3	8.1
SRE3	11015	832.0	-10.4	821.6	-14.0	818.0	3.6

Table 7.2C: Santa Clara River Existing Conditions Straight-Inside Curved Reach Toe-down Summary by Methodology (ft)

Subreach	US Station	HEC-RAS Model (1999) Elevation	LACH&SM (SAM)	LACH&SM Toe-down Elevation	LACFCDDM	LACFCDDM Toe-down Elevation	Δ (LACH&SM-LACFCDDM)
SRA1	46195	1034.6	-11.1	1023.5	-14.0	1020.6	2.9
SRA2	43820	1018.0	-15.4	1002.6	-14.0	1004.0	-1.4
SRA3	41280	1002.0	-11.2	990.8	-12.5	989.5	1.3
SRA4	38710	988.0	-6.2	981.8	-10.0	978.0	3.8
SRB1	36080	973.2	-7.9	965.3	-10.0	963.2	2.1
SRB2	33880	960.0	-8.7	951.3	-12.5	947.5	3.8
SRC1	32265	951.4	-7.8	943.6	-12.5	938.9	4.7
SRC2	29140	932.0	-10.7	921.3	-10.0	922.0	-0.7
SRC3	26990	920.0	-10.0	910.0	-14.0	906.0	4.0
SRC4	24795	908.0	-8.9	899.1	-14.0	894.0	5.1
SRD1	22195	894.0	-7.3	886.7	-10.0	884.0	2.7
SRD2	19855	880.1	-8.3	871.8	-12.5	867.6	4.2
SRD3	17510	868.0	-7.8	860.2	-10.0	858.0	2.2
SRE1	15125	854.0	-8.1	845.9	-12.5	841.5	4.4
SRE2	13030	843.3	-6.7	836.6	-10.0	833.3	3.3
SRE3	11015	832.0	-10.3	821.7	-14.0	818.0	3.7

Figure 7.2A: Santa Clara River Existing Conditions Outside Curved Reach Toe-down Depths by Methodology

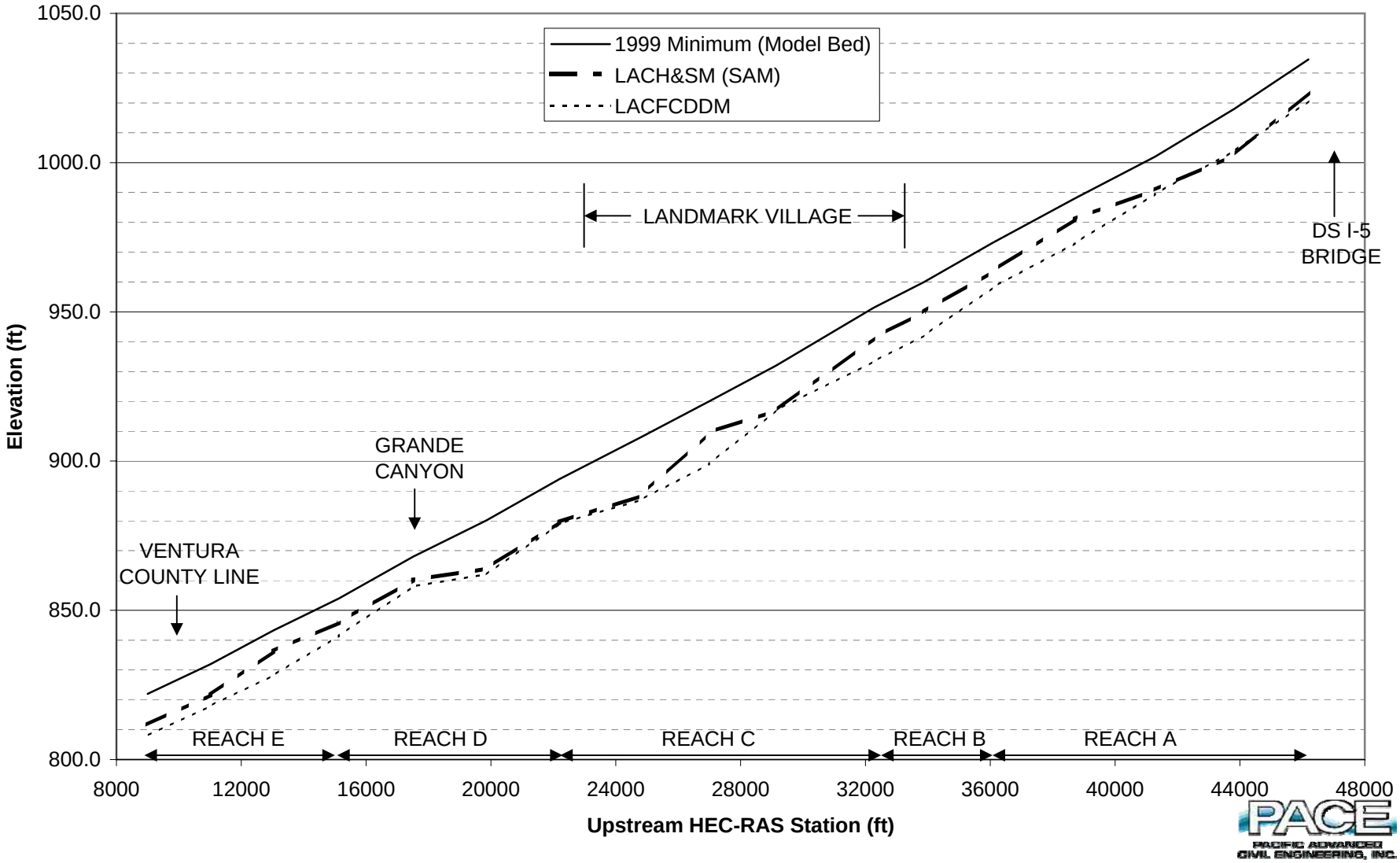


Figure 7.2B: Santa Clara River Proposed Conditions Outside Curved Reach Toe-down Depths by Methodology

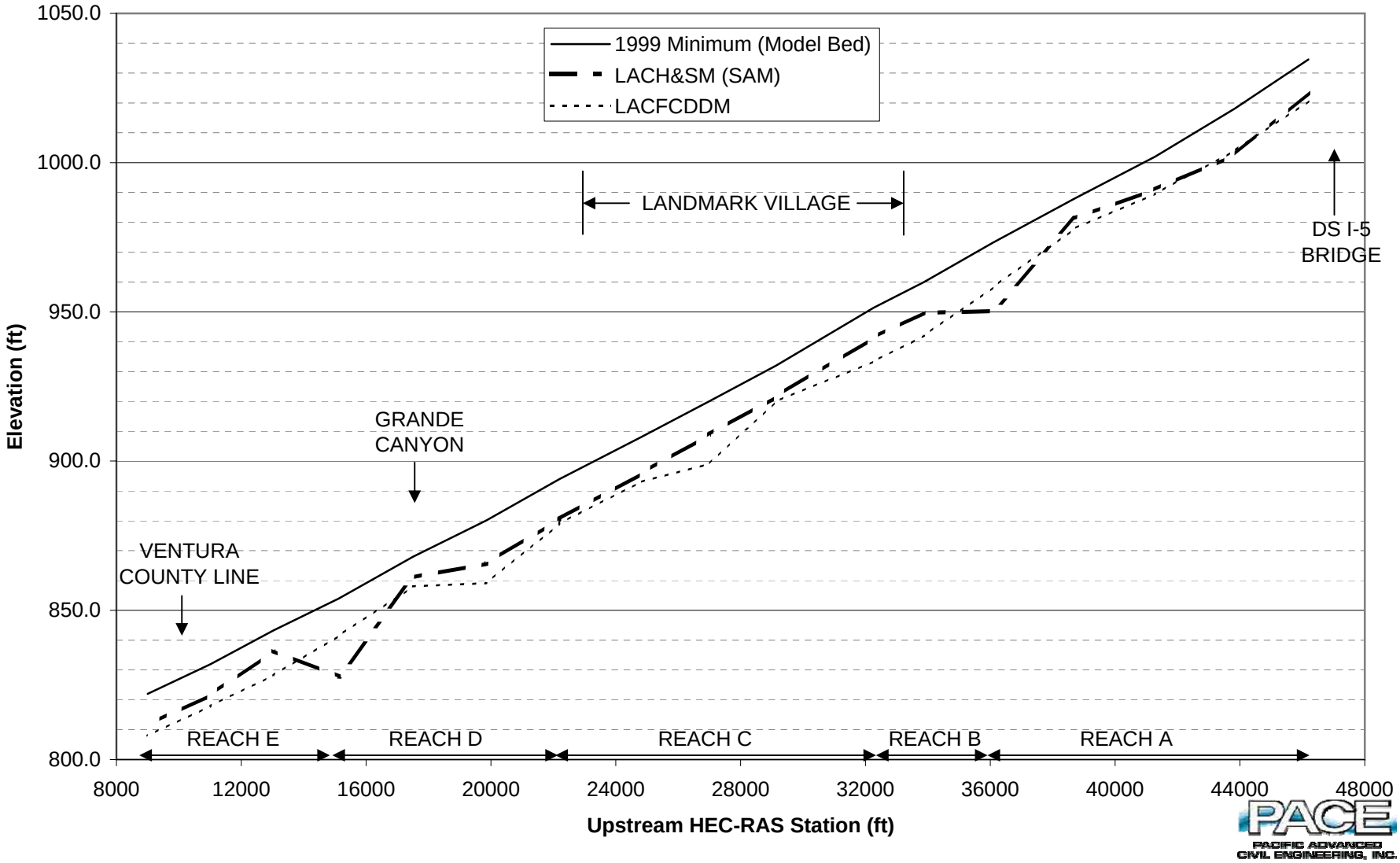


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Figure 7.2C: Santa Clara River Existing Conditions Straight-Inside Curved Reach Toe-down Depths by Methodology

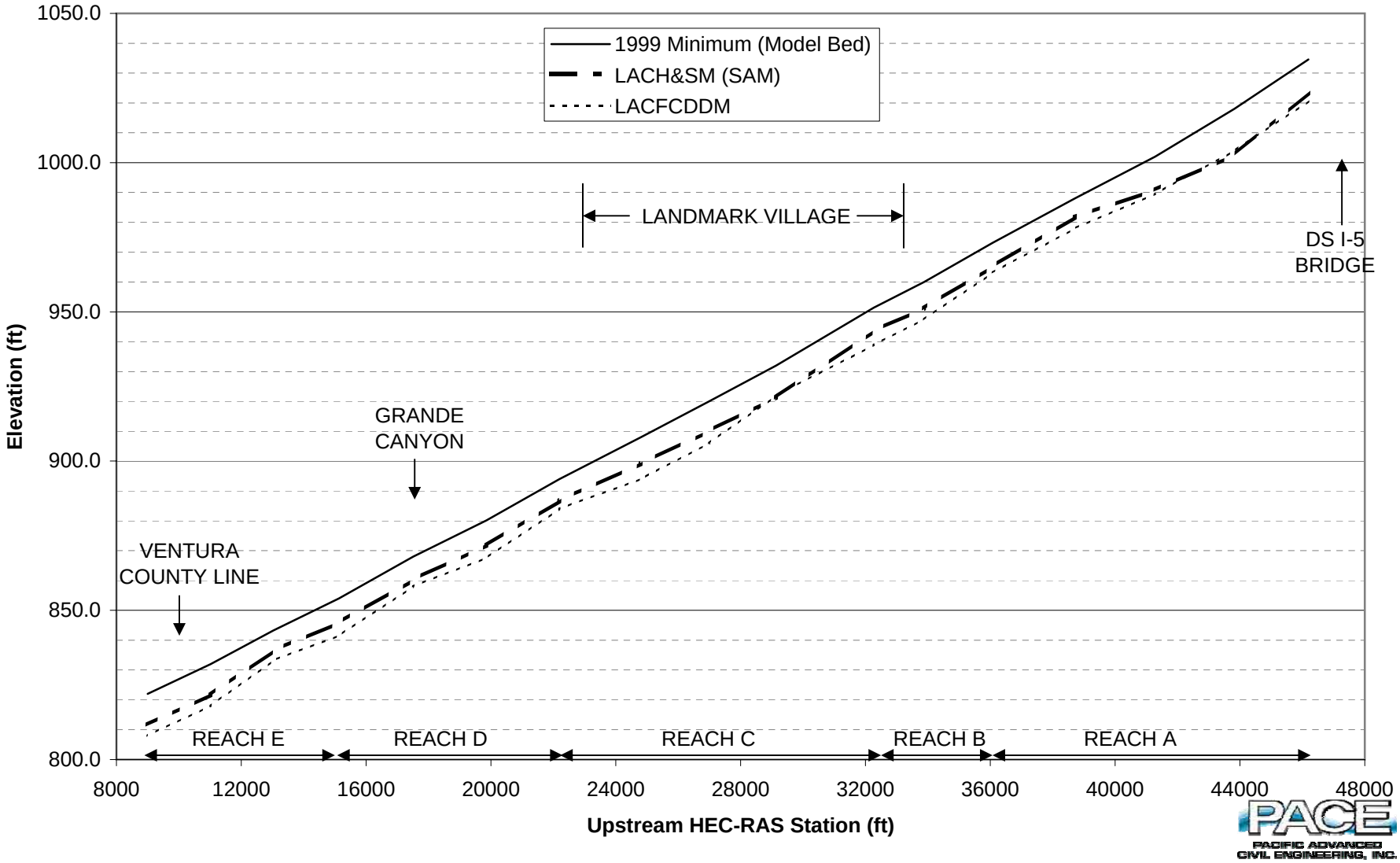

Figure 7.2D: Santa Clara River Proposed Conditions Straight-Inside Curved Reach Toe-down Depths by Methodology

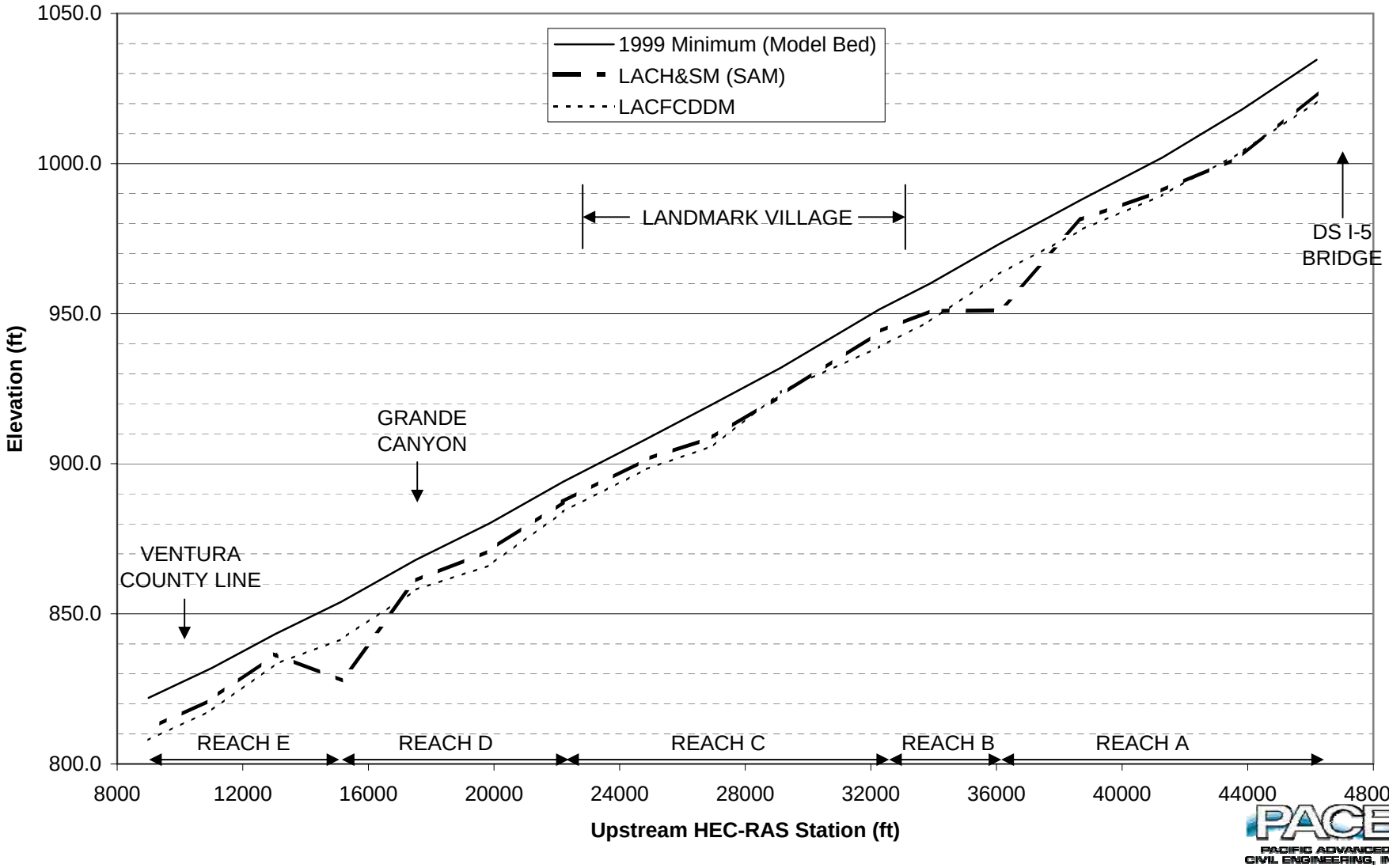

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Figure 7.3B: Santa Clara River Outside Curved Reach Existing, Historic Minimum, and Proposed Conditions Toe-down Elevation

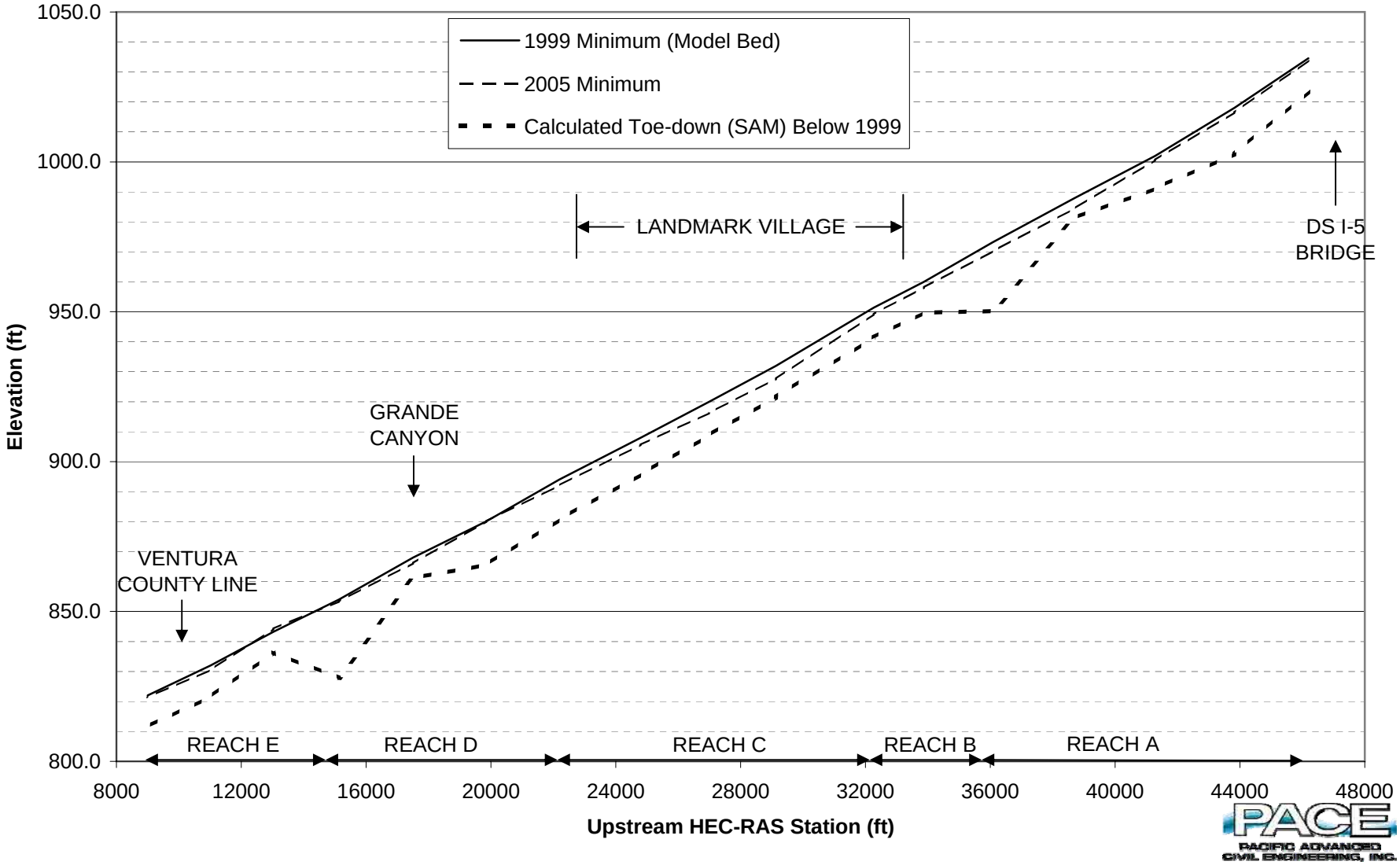

Figure 7.3C: Santa Clara River Straight-Inside Curved Reach Existing, Historic Minimum, and Existing Conditions Toe-down Elevation

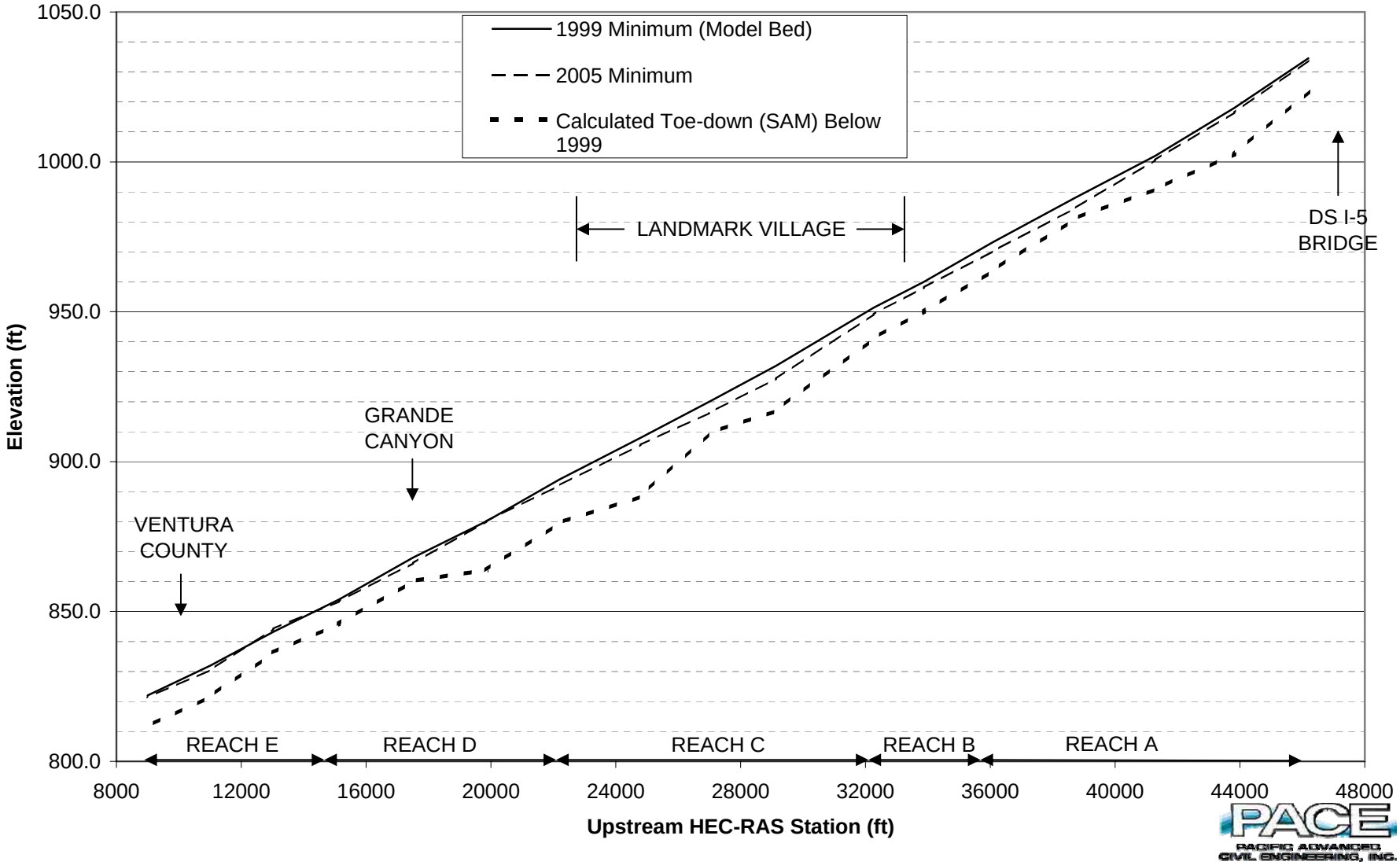

Figure 7.3D: Santa Clara River Straight-Inside Curved Reach Existing, Historic Minimum, and Proposed Conditions Toe-down Elevation

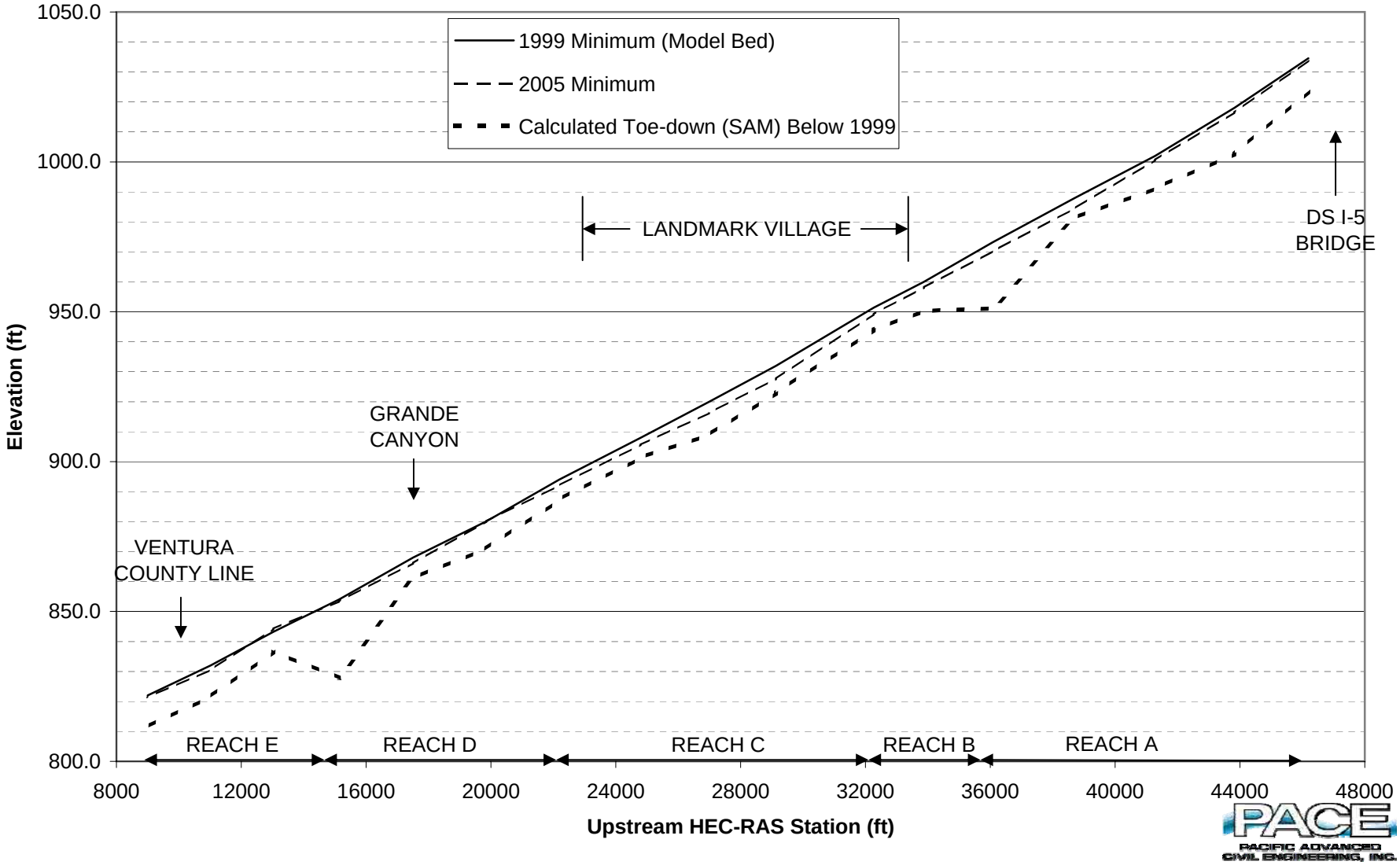

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Table 7.2D: Santa Clara River Proposed Conditions Straight-Inside Curved Reach Toe-down Summary by Methodology (ft)

Subreach	US Station	HEC-RAS Model (1999) Elevation	LACH&SM (SAM)	LACH&SM Toe-down Elevation	LACFCDDM	LACFCDDM Toe-down Elevation	Δ (LACH&SM-LACFCDDM)
SRA1	46195	1034.6	-11.1	1023.5	-14.0	1020.6	2.9
SRA2	43820	1018.0	-15.4	1002.6	-14.0	1004.0	-1.4
SRA3	41280	1002.0	-10.9	991.1	-12.5	989.5	1.6
SRA4	38710	988.0	-6.7	981.3	-10.0	978.0	3.3
SRB1	36080	973.2	-22.1	951.1	-10.0	963.2	-12.1
SRB2	33880	960.0	-9.7	950.3	-12.5	947.5	2.8
SRC1	32265	951.4	-7.4	944.0	-12.5	938.9	5.1
SRC2	29140	932.0	-9.1	922.9	-8.0	924.0	-1.1
SRC3	26990	920.0	-11.0	909.0	-14.0	906.0	3.0
SRC4	24795	908.0	-6.7	901.3	-10.0	898.0	3.3
SRD1	22195	894.0	-6.7	887.3	-10.0	884.0	3.3
SRD2	19855	880.1	-9.1	871.0	-14.0	866.1	4.9
SRD3	17510	868.0	-6.9	861.1	-10.0	858.0	3.1
SRE1	15125	854.0	-26.1	827.9	-12.5	841.5	-13.6
SRE2	13030	843.3	-6.7	836.6	-10.0	833.3	3.3
SRE3	11015	832.0	-10.4	821.6	-14.0	818.0	3.6

Previous studies presented in Chapter 2 found that a toe-down of 12.5 feet would be required for adequate protection of structures within the sphere of the river bed. The results of this study, however, suggest that a variable toe-down from approximately 5 to 27 feet based on SAM modeling, or 8 to 21 feet based on LACFCDDM is appropriate. A large portion of this difference can be attributed to the difference in other adjustment, which in this study was as much as 17.4 feet.

7.1 Freeboard Elevation

Freeboard is considered for the purposes of this report to be the additional height required above the top of a levee or other bank protection to prevent overtopping. The factors considered in the calculation of freeboard are long-term adjustment as aggradation, general adjustment as aggradation, super elevation, and bedform height. Freeboard elevation is calculated in this study based on LACH&SM Chapter 5A-3, and includes LACFCDDM calculations. Freeboard calculations are presented in Appendix Chapter 6.2. Long-term adjustment was calculated based on historical records in the form of topographic data, and taken as the greater of positive long-term area change values as presented in Table 5.1B, or one foot. General adjustment is taken from SAM aggradation values. Table 7.3A-B summarizes the freeboard calculations for both outside of curved reaches and inside of curved or straight reaches. The table shows that long-term aggradation is generally set to one foot. General aggradation ranges from 0 to 2.1 feet with the maximum general aggradation occurring in subreach SRE2. In all cases, either long-term aggradation or bedform height accounts for the largest component of freeboard except in subreach SRD2 and SRE2 where general adjustment dominates. The table also compares the freeboard based on LACH&SM and LACFCDDM methodologies. At the majority of locations, the LACFCDDM values are more conservative and the maximum calculated freeboard based on the two methodologies range from 2.5 to 5.2 feet for either type of reaches.

Table 7.3A: Santa Clara River Proposed Conditions Outside Curved Reach Freeboard Summary (ft)								
Subreach	HEC-RAS Station	Y_{AGG}+	Y_{GA}+	Y_{SE}+	H/2	$Y_{H\&SM}$	Y_{DM}	Y_{MAX}
SRA1	46195	1.0	0.6	0.0	1.5	3.1	2.5	3.1
SRA2	43820	1.0	0.2	0.0	2.7	3.9	2.5	3.9
SRA3	41280	1.0	0.0	0.1	1.0	2.1	2.5	2.5
SRA4	38710	1.0	0.1	0.0	0.9	2.0	2.5	2.5
SRB1	36080	1.0	0.0	0.0	0.8	1.9	2.5	2.5
SRB2	33880	1.0	0.2	0.1	0.7	2.0	2.5	2.5
SRC1	32265	1.0	0.8	0.0	0.4	2.2	2.5	2.5
SRC2	29140	1.0	0.0	0.0	0.8	1.9	2.5	2.5
SRC3	26990	1.0	0.0	0.1	1.2	2.3	2.5	2.5
SRC4	24795	1.9	0.2	0.3	1.3	3.7	2.5	3.7
SRD1	22195	1.4	0.0	0.3	0.8	2.4	2.5	2.5
SRD2	19855	1.0	1.4	0.1	0.5	3.0	2.5	3.0
SRD3	17510	1.0	0.0	0.0	0.7	1.7	2.5	2.5
SRE1	15125	1.0	0.0	0.0	0.4	1.4	2.5	2.5
SRE2	13030	1.0	2.1	0.1	1.0	4.2	2.5	4.2
SRE3	11015	3.1	0.0	0.0	0.7	3.8	2.5	3.8

Table 7.3B: Santa Clara River Proposed Conditions Straight-Inside Curved Reach Freeboard Summary (ft)								
Subreach	HEC-RAS Station	Y_{AGG}+	Y_{GA}+	Y_{SE}+	H/2	$Y_{H\&SM}$	Y_{DM}	Y_{MAX}
SRA1	46195	1.0	0.6	0.0	1.5	3.1	2.5	3.1
SRA2	43820	1.0	0.2	0.0	2.7	3.9	2.5	3.9
SRA3	41280	1.0	0.0	0.0	1.0	2.0	2.5	2.5
SRA4	38710	1.0	0.1	0.0	0.9	2.0	2.5	2.5
SRB1	36080	1.0	0.0	0.0	0.8	1.8	2.5	2.5
SRB2	33880	1.0	0.2	0.0	0.7	1.9	2.5	2.5
SRC1	32265	1.0	0.8	0.0	0.4	2.2	2.5	2.5
SRC2	29140	1.0	0.0	0.0	0.8	1.8	2.5	2.5
SRC3	26990	1.0	0.0	0.0	1.2	2.2	2.5	2.5
SRC4	24795	1.9	0.2	0.0	1.3	3.4	2.5	3.4
SRD1	22195	1.4	0.0	0.0	0.8	2.2	2.5	2.5
SRD2	19855	1.0	1.4	0.0	0.5	2.9	2.5	2.9
SRD3	17510	1.0	0.0	0.0	0.7	1.7	2.5	2.5
SRE1	15125	1.0	0.0	0.0	0.4	1.4	2.5	2.5
SRE2	13030	1.0	2.1	0.0	1.0	4.1	2.5	4.1
SRE3	11015	3.1	0.0	0.0	0.7	3.8	2.5	3.8

YAGG: LONG-TERM AGGRADATION; YGA: GENERAL AGGRADATION; YSE: SUPER ELEVATION ADJUSTMENT; H: BEDFORM HEIGHT;
YH&SM: TOTAL FREEBOARD BASED ON LACDPW H&SM METHODOLOGY; YDM: TOTAL FREEBOARD BASED ON LACFCDDM METHODOLOGY;
YMAX: LARGER OF YH&SM AND YDM. YAGG IS CALCULATED AS THE GREATER OF LONG TERM AGGRADATION FROM TABLE 5.1 OR 1 FOOT.

8 Summary

The total toe-down is the sum of the individual degradational components as described in Chapter 7: general adjustment, or single-event degradation, calculated using the SAM zero-dimensional numerical modeling (Chapter 4); long-term adjustment, or long-term degradation, calculated from long-term historical topographic analysis (Chapter 5); and other adjustments calculated using LACH&SM (Chapter 6). Likewise, total freeboard is calculated as the sum of aggradational components: general aggradation from SAM calculations; long-term aggradation from long-term topographic analysis, and other aggradation from LACH&SM calculations, which includes superelevation changes to water surface elevations. This data is summarized in Table 8 for the outside of curved reaches and inside of curved or straight reaches. The table shows the maximum toe-down below the 1999 model minimum channel bed elevation and the total freeboard above the HEC-RAS water surface elevation by subreach and section. A summary of the significant components and influences of each subreach follows.

Reach A: Reach A is comprised of four subreaches that extend from below Interstate 5 to Commerce Center Drive. Relatively steep, narrow, winding channels lined with woody brush highlight the channel in this section of the river. The north overbank of the channel is primarily occupied by agriculture and on the south overbank is the Magic Mountain theme park and tentatively proposed development. In these subreaches, long-term degradation ranges from approximately -2 to -8 feet, with a maximum of 8.1 feet in SRA2, and it is likely that the physical parameters of the channel listed above lead to this change. SAM modeling in this reach predicts a general adjustment of -0.1 to +0.6 feet (Table 4.2) with the predominant trend in the reach being mild aggradation. Other adjustment dominates the toe-down, ranging from -4.0 to -8.3 feet for both curved and straight reaches (Table 7.1). Like the long-term adjustment, local effects are likely the result of river bed physical characteristics in this reach. At section 43820, LACH&SM estimates of toe-down exceed that estimated by LACFCDDM calculations; for other sections, LACFCDDM calculations are deeper. Maximum total toe-down based on the LACH&SM and LACFCDDM methodologies ranges from -14.0 to -21.0 feet at section 40825 for outside of curved reaches (Table 8). For straight or inside of curved reaches, maximum total toe-down ranges from -10.0 to -17.0 feet at section 43610 (Table 8). Freeboard in this reach ranges from +2.5 to +4.0 feet with a maximum at section 43610 for both curved and straight reaches.

Reach B: Reach B is comprised of two subreaches. The north overbank is occupied by the existing Travel Village development and steep bluffs mark the south bank. Castaic Creek confluences at the southern terminus of the reach. Reach B is relatively narrow and steep, although it is more braided and less woody than Reach A, possibly owing to the development on the north bank. General adjustment on Reach B ranges from -0.7 to +0.2 feet (Table 4.2) and long-term adjustment ranges from -3.2 to -3.4 feet (Table 5.1). Other adjustment (Table 7.1) ranges from -6.9 to -19.1 feet for outside of curved reaches and from -5.7 to -18.2 for straight or inside of curved reaches. Like Reach A, other adjustment dominates the total potential adjustment. LACFCDDM estimates of total toe-down are greater than LACH&SM estimates in this reach. One proposed bridge is located in this reach at section 36080 with a pier scour of -13.3 feet (Appendix Chapter 6.1). Maximum total toe-down ranges from -15.0 to -22.9 feet at section 36080 for outside of curved reaches and ranges from -10.0 to -

22.0 feet at section 36080 for straight or inside of curved reaches (Table 8). Freeboard in this reach is +2.5 feet for both types of reaches.

Reach C: Reach C is comprised or four subreaches. The reach contains the confluences of Castaic Creek at its upstream end, the proposed Landmark development on the north overbank, and steep bluffs on the south bank. The channel is relatively steep and narrow, although some braiding is present in the channel. The north bank of this reach is relatively woody. Historically, the north overbank has been the location of agriculture, and some agricultural fill has been placed in the River. Long Canyon Creek confluences at the downstream terminus of this reach. General adjustment on Reach C ranges from -1.6 to +0.8 feet (Table 4.2) and generally the reach is predicted to degrade. Long-term adjustment ranges from -4.4 to +1.9 feet (Table 5.1). Other adjustment (Table 7.1) is moderate in Reach C and ranges from -4.4 to -10.3 feet for outside of curved reaches and ranges from -3.1 to -7.7 feet for straight or inside of curved reaches. A proposed bridge at section 22790 is expected to have -14.7 feet of pier scour. Maximum total toe-down ranges from -10.3 to -26.8 feet at section 22790 for outside of curved reaches and ranges from -8.0 to -23.0 at section 22790 for straight or inside of curved reaches (Table 8). Freeboard in this reach is from +2.5 to +4.8 feet for outside of curved reaches and from +2.5 to +4.7 feet for straight or inside of curved reaches with maximum freeboard at section 28895.

Reach D: Reach D is relatively flatter and wider than more upstream reaches analyzed in this study. The bank is generally braided with woody vegetation on the banks. Reach D resides between the Long and Chiquito tributaries to the east and the Grande and Potrero tributaries to the west. Historical agriculture has occupied both overbanks. Reach D is comprised of three subreaches. General adjustment on Reach D ranges from -1.3 to +1.4 feet (Table 4.2) and generally the reach is predicted to be in balance. Long-term adjustment ranges from -0.7 to +1.4 feet (Table 5.1). Other adjustment (Table 7.1) is varied in Reach D and ranges from -3.6 to -12.5 feet for outside of curved reaches and ranges from -3.6 to -7.1 feet for straight or inside of curved reaches. Maximum total toe-down ranges from -8.0 to -21.0 feet for outside of curved reaches and ranges from -8.0 to -14.0 feet for straight or inside of curved reaches (Table 8). Freeboard in this reach is from +2.5 to +4.1 feet with a maximum freeboard at section 19050 for both types of reaches.

Reach E: Reach E is the most downstream in the study with a relatively mild slope and a wide braided channel. The banks have sparse to moderate woody vegetation and steep bluffs and some minor agriculture dominate the overbanks. There are three subreaches in Reach E. General adjustment on Reach E ranges from -1.5 to +2.1 feet (Table 4.2) and generally the reach is predicted to be slightly aggrading or in balance. Long-term adjustment ranges from -1.0 to +3.1 feet (Table 5.1). Other adjustment (Table 7.1) is relatively small in Reach E except at the proposed bridge and ranges from -4.9 to -23.7 feet for outside of curved reaches and from -4.7 to -23.7 feet for straight or inside of curved reaches. LACFCDDM estimates of total toe-down are greater than LACH&SM estimates in this reach. A proposed bridge at section 15125 is expected to have -17.4 feet of pier scour. Maximum total toe-down ranges from -10.0 to -26.1 feet at section 15125 (Table 8), while freeboard in this reach ranges from +2.5 feet to +5.2 feet with a maximum freeboard at section 12615 for both types of reaches.

Table 8: Santa Clara River Summary of Maximum Proposed Toe-down & Freeboard (ft)

Subreach	HEC-RAS Section	Z_{99} [2]	Outside Curved Reach		Straight-Inside Curved Reach		WSE	Outside Curved Reach		Straight-Inside Curved Reach	
			Maximum Total Degradation [3]	Proposed Toe-down Elevation [1,4]	Maximum Total Degradation [3]	Proposed Toe-down Elevation [1,4]		Maximum Total Freeboard [3]	Proposed Top of Levee Elevation [1]	Maximum Total Freeboard [3]	Proposed Top of Levee Elevation [1]
SRA1	46195	1035.0	14.0	1021.0	14.0	1021.0	1063.1	3.1	1066.3	3.1	1066.3
	46020	1032.0	14.0	1018.0	14.0	1018.0	1062.0	3.0	1065.0	3.0	1065.0
	45545	1030.0	14.0	1016.0	14.0	1016.0	1057.9	3.4	1061.3	3.4	1061.3
	45030	1025.0	14.0	1011.0	14.0	1011.0	1054.2	3.0	1057.3	3.0	1057.3
	44585	1022.0	14.0	1008.0	14.0	1008.0	1050.6	3.2	1053.8	3.2	1053.8
	44210	1020.0	14.0	1006.0	14.0	1006.0	1047.8	2.9	1050.8	2.9	1050.8
SRA2	43820	1018.0	15.4	1002.6	15.4	1002.6	1042.1	3.9	1046.0	3.9	1046.0
	43610	1017.0	17.0	1000.0	17.0	1000.0	1038.3	4.0	1042.2	4.0	1042.2
	43410	1016.0	15.8	1000.2	15.8	1000.2	1035.8	3.6	1039.4	3.6	1039.4
	43200	1014.0	16.3	997.7	16.3	997.7	1033.2	3.5	1036.7	3.5	1036.7
	42975	1012.0	15.5	996.5	15.5	996.5	1031.0	2.9	1033.8	2.7	1033.7
	42815	1011.0	15.5	995.5	15.5	995.5	1029.7	2.5	1032.2	2.5	1032.2
	42590	1010.0	21.0	989.0	14.7	995.3	1028.4	2.5	1030.9	2.5	1030.9
	42430	1008.0	21.0	987.0	15.3	992.7	1027.5	2.5	1030.0	2.5	1030.0
	42215	1006.0	21.0	985.0	14.7	991.3	1026.7	2.5	1029.2	2.5	1029.2
	41940	1005.0	15.0	990.0	11.9	993.1	1025.6	2.5	1028.1	2.5	1028.1
	41730	1004.0	15.0	989.0	12.0	992.0	1024.6	2.5	1027.1	2.5	1027.1
	41460	1002.0	15.0	987.0	11.9	990.1	1023.2	2.5	1025.7	2.5	1025.7
SRA3	41280	1001.0	12.5	988.5	12.5	988.5	1021.8	2.5	1024.3	2.5	1024.3
	41080	1000.0	14.0	986.0	14.0	986.0	1020.5	2.5	1023.0	2.5	1023.0
	40825	999.5	21.0	978.5	14.0	985.5	1019.3	2.5	1021.8	2.5	1021.8
	40585	998.0	18.0	980.0	12.5	985.5	1018.3	2.5	1020.8	2.5	1020.8
	40335	996.0	15.0	981.0	10.0	986.0	1017.4	2.5	1019.9	2.5	1019.9
	40130	995.0	15.0	980.0	10.0	985.0	1016.6	2.5	1019.1	2.5	1019.1
	39945	994.0	15.0	979.0	10.0	984.0	1015.9	2.5	1018.4	2.5	1018.4
	39755	994.0	12.5	981.5	12.5	981.5	1014.6	2.5	1017.1	2.5	1017.1
	39605	993.0	14.0	979.0	14.0	979.0	1013.7	2.5	1016.2	2.5	1016.2
	39310	992.0	18.0	974.0	12.5	979.5	1012.2	2.5	1014.7	2.5	1014.7
	39100	990.0	14.0	976.0	14.0	976.0	1011.1	2.5	1013.6	2.5	1013.6
	38925	989.5	10.0	979.5	10.0	979.5	1010.3	2.5	1012.8	2.5	1012.8
SRA4	38710	988.0	10.0	978.0	10.0	978.0	1009.2	2.5	1011.7	2.5	1011.7
	38475	986.0	12.5	973.5	12.5	973.5	1007.0	2.6	1009.5	2.6	1009.5
	38300	985.5	14.0	971.5	14.0	971.5	1005.8	2.5	1008.3	2.5	1008.3
	38065	984.0	10.0	974.0	10.0	974.0	1004.1	2.5	1006.6	2.5	1006.6
	37810	983.0	14.0	969.0	14.0	969.0	1001.4	2.8	1004.2	2.8	1004.2
	37655	982.0	14.0	968.0	14.0	968.0	999.9	2.6	1002.5	2.6	1002.5
	37390	981.0	14.0	967.0	14.0	967.0	998.5	2.5	1001.0	2.5	1001.0
	37135	980.0	12.5	967.5	12.5	967.5	996.8	2.5	999.3	2.5	999.3
	36930	978.0	14.0	964.0	14.0	964.0	995.7	2.5	998.2	2.5	998.2
	36735	977.0	12.5	964.5	12.5	964.5	994.6	2.5	997.1	2.5	997.1
	36515	975.0	15.0	960.0	10.0	965.0	993.6	2.5	996.1	2.5	996.1
	36265	974.0	15.0	959.0	10.0	964.0	992.3	2.5	994.8	2.5	994.8
SRB1	36080	973.0	22.9	950.1	22.0	951.0	990.6	2.5	993.1	2.5	993.1
	35845	971.0	15.0	956.0	10.0	961.0	989.1	2.5	991.6	2.5	991.6
	35725	970.0	15.0	955.0	10.0	960.0	988.3	2.5	990.8	2.5	990.8
	35515	969.0	18.0	951.0	12.5	956.5	986.9	2.5	989.4	2.5	989.4
	35245	968.0	18.0	950.0	12.5	955.5	985.0	2.5	987.5	2.5	987.5
	35040	967.0	21.0	946.0	14.0	953.0	983.6	2.5	986.1	2.5	986.1
	34860	966.0	21.0	945.0	14.0	952.0	982.3	2.5	984.8	2.5	984.8
	34720	965.5	21.0	944.5	14.0	951.5	981.3	2.5	983.8	2.5	983.8
	34495	964.0	18.0	946.0	12.5	951.5	979.7	2.5	982.2	2.5	982.2
	34310	963.0	18.0	945.0	12.5	950.5	978.4	2.5	980.9	2.5	980.9
	34090	962.0	18.0	944.0	12.5	949.5	977.0	2.5	979.5	2.5	979.5
SRB2	33880	960.0	18.0	942.0	12.5	947.5	975.7	2.5	978.2	2.5	978.2
	33710	959.0	18.0	941.0	12.5	946.5	974.6	2.5	977.1	2.5	977.1
	33500	958.0	18.0	940.0	12.5	945.5	973.3	2.5	975.8	2.5	975.8
	33310	957.0	18.0	939.0	12.5	944.5	972.3	2.5	974.8	2.5	974.8
	33115	956.0	15.0	941.0	10.0	946.0	971.4	2.5	973.9	2.5	973.9
	32795	954.0	15.0	939.0	10.0	944.0	969.7	2.5	972.2	2.5	972.2
	32605	952.0	15.0	937.0	10.0	942.0	968.7	2.5	971.2	2.5	971.2
SRC1	32265	950.0	18.0	932.0	12.5	937.5	967.2	2.5	969.7	2.5	969.7
	31875	949.0	15.0	934.0	10.0	939.0	965.6	2.5	968.1	2.5	968.1
	31585	946.0	15.0	931.0	10.0	936.0	964.7	2.5	967.2	2.5	967.2
	31360	944.0	15.0	929.0	10.0	934.0	963.9	2.5	966.4	2.5	966.4
	31060	942.0	12.0	930.0	8.0	934.0	963.2	2.5	965.7	2.5	965.7
	30720	940.0	12.0	928.0	8.0	932.0	962.5	2.5	965.0	2.5	965.0
	30445	938.0	12.0	926.0	8.0	930.0	962.1	2.5	964.6	2.5	964.6
	30095	936.0	12.0	924.0	8.0	928.0	961.5	2.5	964.0	2.5	964.0
	29815	935.0	12.0	923.0	8.0	927.0	960.8	2.5	963.3	2.5	963.3
	29565	934.0	12.0	922.0	8.0	926.0	960.3	2.5	962.8	2.5	962.8
	29385	933.0	12.0	921.0	8.0	925.0	959.6	2.5	962.1	2.5	962.1
SRC2	29140	932.0	12.0	920.0	9.1	922.9	958.4	2.5	960.9	2.5	960.9
	28895	930.0	21.0	909.0	14.0	916.0	953.8	4.8	958.6	4.7	958.5
	28695	928.0	15.0	913.0	15.0	913.0	952.9	2.5	955.4	2.5	955.4
	28500	927.5	14.7	912.8	14.7	912.8	950.5	3.1	953.5	2.9	953.4
	28280	926.0	21.0	905.0	14.0	912.0	949.8	2.5	952.3	2.5	952.3
	28080	925.0	15.0	910.0	10.0	915.0	949.1	2.5	951.6	2.5	951.6
	27925	924.0	10.3	913.7	10.3	913.7	948.1	2.5	950.6	2.5	950.6
	27725	923.0	14.0	909.0	14.0	909.0	946.1	2.9	949.0	2.9	949.0
	27545	922.0	15.0	907.0	15.0	907.0	944.3	3.1	947.4	3.1	947.4
	27335	921.0	14.1	906.9	14.1	906.9	943.0	2.7	945.7	2.6	945.6
	27155	920.5	14.0	906.5	14.0	906.5	941.5	2.9	944.4	2.8	944.2
SRC3	26990	920.0	21.0	899.0	14.0	906.0	940.4	2.5	942.9	2.5	942.9
	26780	918.0	21.0	897.0	14.0	904.0	939.3	2.5	941.8	2.5	941.8
	26575	917.0	21.0	896.0	14.0	903.0	938.5	2.5	941.0	2.5	941.0
	26355	916.0	18.0	898.0	12.5	903.5	937.6	2.5	940.1	2.5	940.1
	26170	915.0	18.0	897.0	12.5	902.5	936.9	2.5	939.4	2.5	939.4
	25965	914.0	21.0	893.0	14.0	900.0	936.2	2.6	938.8	2.5	938.7
	25785	913.5	21.0	892.5	14.0	899.5	935.5	2.7	938.2	2.5	938.0
	25600	912.5	21.0	891.5	14.0	898.5	934.8	2.5	937.3	2.5	937.3
	25425	911.0	21.0	890.0	14.0	897.0	934.1	2.5	936.7	2.5	936.6
	25215	910.0	15.0	895.0	10.0	900.0	933.3	2.5	935.8	2.5	935.8
	25000	909.0	15.0	894.0	10.0	899.0	932.5	2.5	935.0	2.5	935.0
SRC4	24795	908.0	15.0	893.0	10.0	898.0	931.5	3.7	935.2	3.4	934.9
	24550	906.0	18.0	888.0	12.5	893.5	930.1	3.6	933.6	3.3	933.4
	24335	905.0	21.0	884.0	14.0	891.0	928.5	3.9	932.4	3.6	932.1
	24115	904.0	21.0	883.0	14.0	890.0	927.0	3.8	930.8	3.5	930.5
	23975	903.5	21.0	882.5	14.0	889.5	926.1	3.5	929.7	3.3	929.4
	23755	902.0	21.0	881.0	14.0	888.0	924.7	3.2	927.9	3.1	927.8
	23565	900.0	21.0	879.0	14.0	886.0	923.6	3.7	927.3	3.4	927.0
	23365	900.0	21.0	879.0	14.0	886.0	922.4	3.5	925.9	3.2	925.6
	23180	899.0	21.0	878.0	14.0	885.0	921.5	3.2	924.6	3.0	924.4
	23000	898.0	21.0	877.0	14.0	884.0	920.0	3.3	923.3	3.0	923.0
	22790	897.5	26.8	870.7	23.0	874.5	917.5	3.1	920.6	3.0	920.5
	22600	896.0	21.0	875.0	14.0	882.0	915.8	3.2	919.0	2.9	918.7
	22415	895.5	21.0	874.5	14.0	881.5	914.4	3.2	917.6	2.9	917.4

1 - Phase 1 Analysis, see end note

2 - Minimum 1999 Bed Elevation

3 - Toe-down and Freeboard based on max of LA County Hydrology & Sedimentation Manual (with SAM general aggradation) and LA County Design Manual, as per Hydrology & Sedimentation Manual

4 - Values at bridges are approxmiate. Final design of levee at bridge locations will include detailed bridge analysis

Table 8: Santa Clara River Summary of Proposed Toe-down & Freeboard (ft) continued

Subreach	HEC-RAS Section	Z_{99} [2]	Outside Curved Reach		Straight-Inside Curved Reach		WSE	Outside Curved Reach		Straight-Inside Curved Reach	
			Maximum Total Degradation [3]	Proposed Toe-down Elevation [1,4]	Maximum Total Degradation [3]	Proposed Toe-down Elevation [1,4]		Maximum Total Freeboard [3]	Proposed Top of Levee Elevation [1]	Maximum Total Freeboard [3]	Proposed Top of Levee Elevation [1]
SRD1	22195	894.0	15.0	879.0	10.0	884.0	913.1	2.5	915.6	2.5	915.6
	22010	892.0	18.0	874.0	12.5	879.5	911.4	2.5	913.9	2.5	913.9
	21790	891.5	21.0	870.5	14.0	877.5	909.9	2.6	912.6	2.5	912.4
	21615	892.0	21.0	871.0	14.0	878.0	908.9	2.6	911.5	2.5	911.4
	21440	890.0	18.0	872.0	12.5	877.5	907.8	2.5	910.3	2.5	910.3
	21225	888.0	21.0	867.0	14.0	874.0	906.7	2.5	909.2	2.5	909.2
	21020	887.0	21.0	866.0	14.0	873.0	905.6	2.5	908.1	2.5	908.1
	20845	886.0	18.0	868.0	12.5	873.5	904.7	2.5	907.2	2.5	907.2
	20595	885.0	15.0	870.0	10.0	875.0	903.6	2.5	906.1	2.5	906.1
	20435	884.0	15.0	869.0	10.0	874.0	902.8	2.5	905.3	2.5	905.3
	20280	883.7	18.0	865.7	12.5	871.2	901.8	2.5	904.3	2.5	904.3
	20070	882.0	21.0	861.0	14.0	868.0	900.6	2.5	903.1	2.5	903.1
SRD2	19855	880.5	21.0	859.5	14.0	866.5	899.6	3.0	902.6	2.9	902.5
	19630	880.0	21.0	859.0	14.0	866.0	898.6	2.9	901.5	2.9	901.5
	19440	878.0	15.0	863.0	10.0	868.0	897.9	3.0	900.8	3.0	900.8
	19240	877.5	18.0	859.5	12.5	865.0	896.9	3.4	900.3	3.4	900.2
	19050	876.0	21.0	855.0	14.0	862.0	896.2	4.1	900.3	4.1	900.3
	18830	874.0	15.0	859.0	10.0	864.0	895.4	4.1	899.4	4.0	899.4
	18650	873.5	15.0	858.5	10.0	863.5	894.7	4.0	898.7	4.0	898.7
	18475	872.0	13.6	858.4	8.0	864.0	894.3	3.4	897.6	3.4	897.6
	18290	871.5	14.1	857.4	8.0	863.5	893.6	3.2	896.8	3.2	896.8
	18025	870.0	8.0	862.0	8.0	862.0	892.9	3.1	895.9	3.1	895.9
	17785	868.0	8.0	860.0	8.0	860.0	892.0	3.2	895.2	3.2	895.2
SRD3	17510	868.0	10.0	858.0	10.0	858.0	890.4	2.5	892.9	2.5	892.9
	17360	868.0	12.5	855.5	12.5	855.5	888.3	2.5	890.8	2.5	890.8
	17110	864.0	14.0	850.0	14.0	850.0	885.5	2.5	888.0	2.5	888.0
	16970	863.7	14.0	849.7	14.0	849.7	884.0	2.5	886.5	2.5	886.5
	16720	863.5	14.0	849.5	14.0	849.5	882.3	2.5	884.8	2.5	884.8
	16515	862.0	14.0	848.0	14.0	848.0	881.2	2.5	883.7	2.5	883.7
	16305	860.0	10.0	850.0	10.0	850.0	880.4	2.5	882.9	2.5	882.9
	16130	860.0	12.5	847.5	12.5	847.5	879.4	2.5	881.9	2.5	881.9
	15960	859.0	12.5	846.5	12.5	846.5	878.6	2.5	881.1	2.5	881.1
	15745	858.0	10.0	848.0	10.0	848.0	877.6	2.5	880.1	2.5	880.1
	15540	857.5	10.0	847.5	10.0	847.5	876.7	2.5	879.2	2.5	879.2
	15335	856.0	12.5	843.5	12.5	843.5	874.8	2.5	877.3	2.5	877.3
SRE1	15125	854.0	26.1	827.9	26.1	827.9	872.0	2.5	874.5	2.5	874.5
	14900	853.0	14.0	839.0	14.0	839.0	869.7	2.5	872.2	2.5	872.2
	14720	852.0	21.0	831.0	14.0	838.0	868.4	2.5	870.9	2.5	870.9
	14480	850.5	21.0	829.5	14.0	836.5	866.9	2.5	869.4	2.5	869.4
	14315	850.0	15.0	835.0	10.0	840.0	866.0	2.5	868.5	2.5	868.5
	14090	850.0	15.0	835.0	10.0	840.0	864.8	2.5	867.3	2.5	867.3
	13850	848.0	15.0	833.0	10.0	838.0	863.6	2.5	866.1	2.5	866.1
	13635	846.0	18.0	828.0	12.5	833.5	862.5	2.5	865.0	2.5	865.0
	13425	845.0	21.0	824.0	14.0	831.0	861.8	2.5	864.3	2.5	864.3
	13190	844.0	15.0	829.0	10.0	834.0	861.1	2.5	863.6	2.5	863.6
SRE2	13030	843.0	15.0	828.0	10.0	833.0	860.6	4.2	864.8	4.1	864.8
	12835	842.0	10.0	832.0	10.0	832.0	860.0	4.7	864.7	4.6	864.7
	12615	841.0	10.0	831.0	10.0	831.0	859.3	5.2	864.6	5.2	864.6
	12395	840.0	10.0	830.0	10.0	830.0	858.7	5.1	863.8	5.1	863.8
	12195	839.0	10.0	829.0	10.0	829.0	858.1	4.2	862.3	4.2	862.3
	11995	837.0	10.0	827.0	10.0	827.0	857.3	4.1	861.4	4.1	861.4
	11780	836.0	10.0	826.0	10.0	826.0	856.6	4.0	860.5	4.0	860.5
	11605	835.5	10.0	825.5	10.0	825.5	855.8	4.0	859.8	4.0	859.8
	11405	834.0	10.0	824.0	10.0	824.0	854.6	3.9	858.6	3.9	858.6
	11180	833.0	12.5	820.5	12.5	820.5	852.7	3.9	856.6	3.9	856.6
SRE3	11015	831.5	14.0	817.5	14.0	817.5	850.2	3.8	854.0	3.8	854.0
	10835	831.0	14.0	817.0	14.0	817.0	848.1	3.7	851.8	3.7	851.8
	10575	830.0	14.0	816.0	14.0	816.0	846.1	3.8	849.9	3.8	849.9
	10390	828.0	14.0	814.0	14.0	814.0	845.1	3.1	848.2	3.1	848.2
	10225	827.5	12.5	815.0	12.5	815.0	844.1	3.1	847.2	3.1	847.2
	10000	826.0	10.0	816.0	10.0	816.0	842.6	3.1	845.7	3.1	845.7
	9820	824.0	14.0	810.0	14.0	810.0	841.4	3.1	844.5	3.1	844.5
	9595	823.8	10.0	813.8	10.0	813.8	839.9	3.1	843.0	3.1	843.0
	9385	823.0	18.0	805.0	12.5	810.5	838.6	3.1	841.7	3.1	841.7
	9220	822.0	18.0	804.0	12.5	809.5	837.6	3.1	840.7	3.1	840.7
	9025	821.0	18.0	803.0	12.5	808.5	836.6	3.1	839.7	3.1	839.7

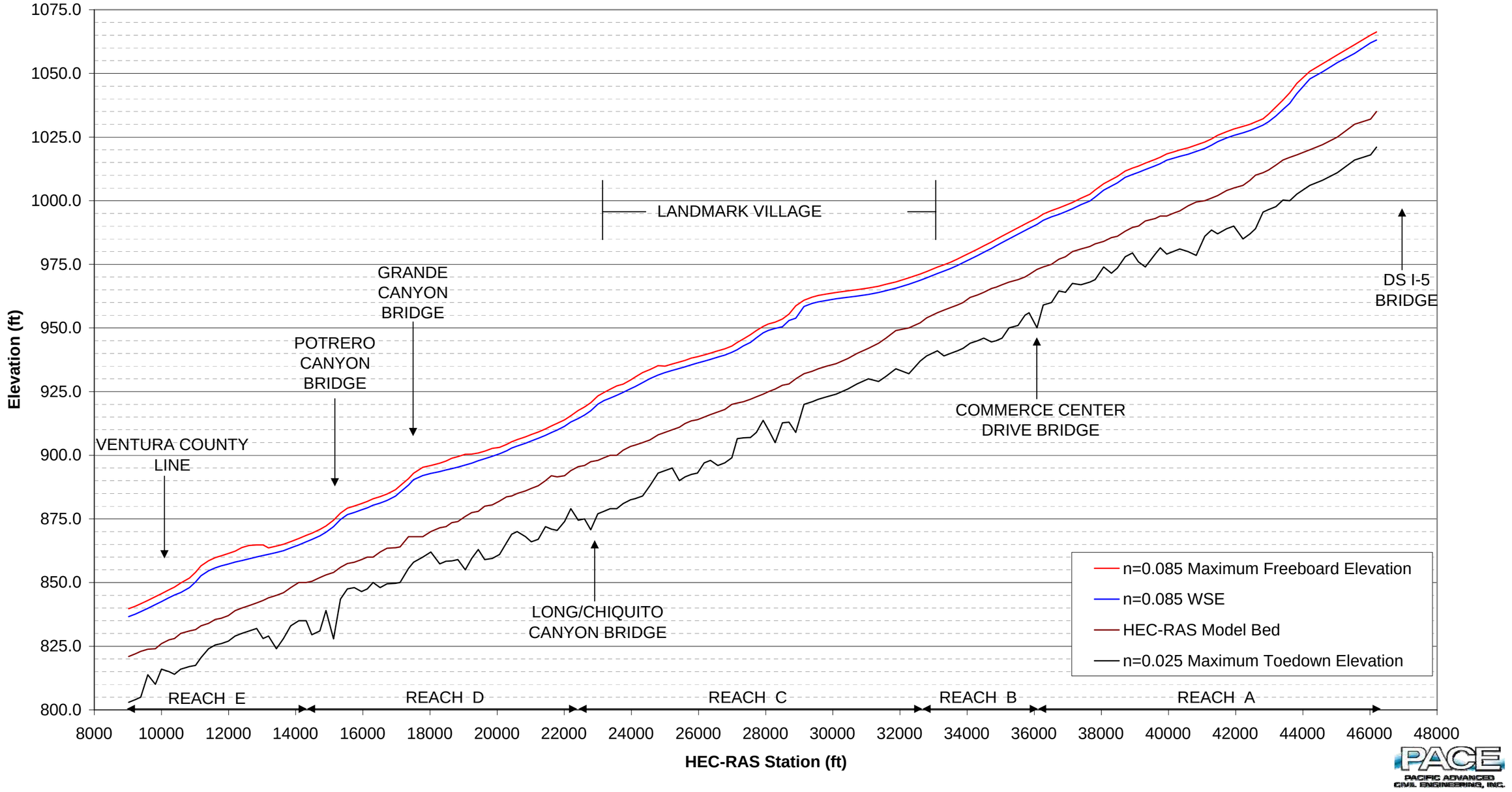
1 - Phase 1 Analysis, see end note

2 - Minimum 1999 Bed Elevation

3 - Toe-down and Freeboard based on max of LA County Hydrology & Sedimentation Manual (with SAM general aggradation) and LA County Design Manual, as per Hydrology & Sedimentation Manual

4 - Values at bridges are approxmiate. Final design of levee at bridge locations will include detailed bridge analysis

Figure 8: Santa Clara River Proposed Conditions Outside Curved Reach Maximum Toedown & Freeboard Summary



P:\8197E\5-Administrative\Reports\Fluvial Report\Fluvial Spreadsheets\Table 8 Summary Proposed Toe & Top 02-22-06

9 References

Kennedy, J.F. (1963). The Mechanics of Dunes and Antidunes in Erodible Bed Channels: Journal of Fluid Mechanics, 16, 521-544.

Los Angeles County Department of Public Works Hydrology and Sedimentation Manual (LACH&SM) (December 1991)

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Sikand Engineering in the *Newhall Ranch Santa Clara River HEC-RAS Study* (June 2000)

Simons, Li & Associates (November 1990) Fluvial Study of Santa Clara River and the Tributaries.

US Army Corps of Engineers (ACOE) (September 2002) SAM Hydraulic Design Package For Channels.

US Geological Survey (USGS) (August 1979) Sediment Discharge in the Santa Clara River Basin, Ventura and Los Angeles Counties, California. Water Resource Investigations 79-78.

Santa Clara River Fluvial Study

APPENDIX CHAPTER 3.1

Site Visit Photos

PACE
PACIFIC ADVANCED CIVIL ENGINEERING, INC.

Photo 1. Santa Clara River looking upstream from I-5.

Photo 2. Santa Clara River immediately upstream of I-5.

Photo 3. Upstream of I-5 Bridge at Santa Clara River Crossing

Photo 4. Santa Clara River downstream of the Old Rd. Bridge

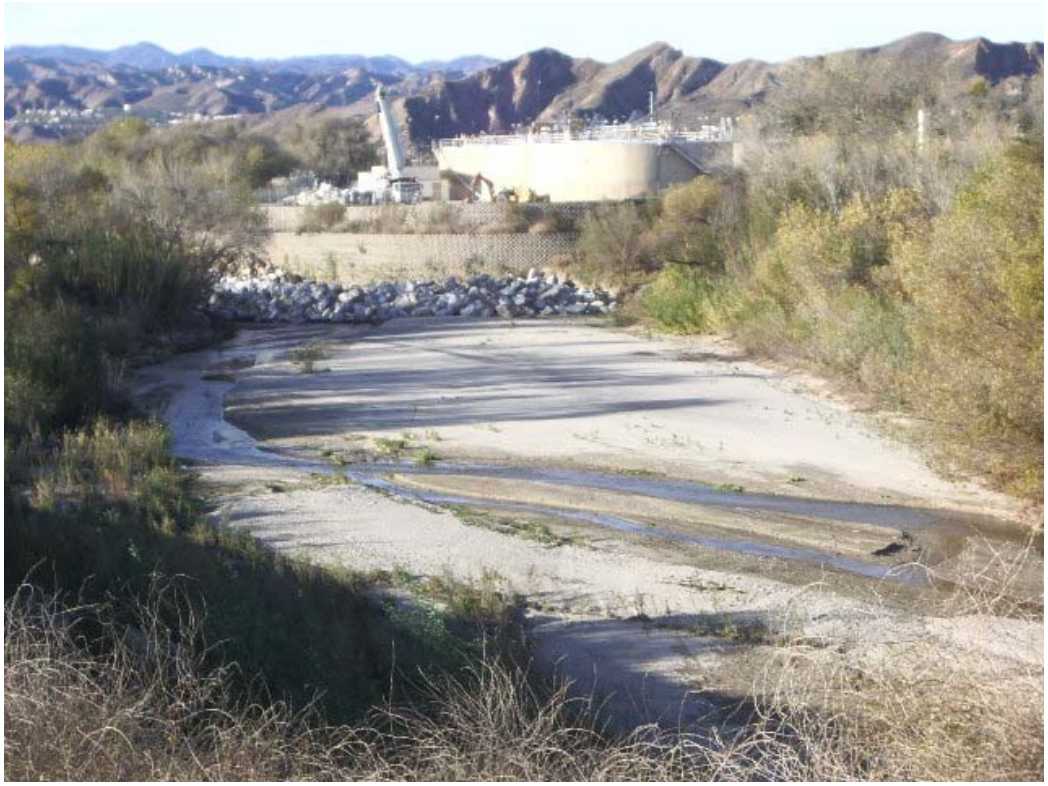


Photo 5. Approximately 1000 ft. downstream of Old Rd. Crossing.

Photo 6. Looking downstream from Magic Mountain Overflow Parking Facility.

Photo 7. Looking downstream from Magic Mountain Overflow Parking Facility (Storm damage to left bank).

Photo 8. Looking upstream at Castaic Junction.

Photo 9. Looking upstream from Feed Mill Rd. approximately 1000 ft. downstream of Magic Mountain Overflow Parking Facility.

Photo 10. Santa Clara River and Castaic Creek confluence looking upstream.

Photo 11 . Santa Clara River and Castaic Creek confluence looking downstream.

Photo 12. Santa Clara River downstream of Potrero Canyon.

Photo13. Santa Clara River downstream of Potrero Canyon looking downstream.

Photo 14. Santa Clara River looking upstream at Ventura County Line. Photo 24.

Santa Clara River Fluvial Study

APPENDIX CHAPTER 3.2

Allan Seward Sampling Study

PACIFIC ADVANCED CIVIL ENGINEERING, INC.

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

February 14, 2005 Job No: 05-1155BE-9 (2)

Pacific Advanced Civil Engineering, Inc. (PACE)
17520 Newhope Street
Suite 200
Fountain Valley, CA 92708

Attn: Mr. Bruce Phillips

Subject: **NEW SEDIMENT GRADATION TEST DATA**
Fluvial Analysis of Santa Clara River and Tributaries

Project: Newhall Ranch
Los Angeles County, California

Dear Mr. Phillips:

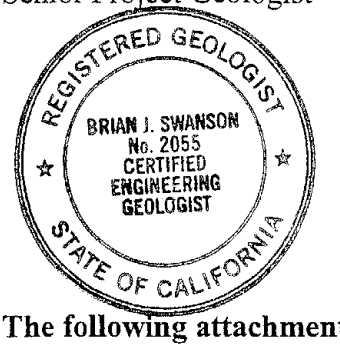
Per your request, we completed gradation tests on sediment samples to assist PACE in completing a fluvial study of the Santa Clara River and its major tributaries on Newhall Ranch. A total of 17 samples were collected adjacent to six different crossings located on various reaches of the Santa Clara River on Newhall Ranch and to the west. Six additional samples were collected from selected tributary canyons as requested. All of the samples were collected by hand from the upper foot of the active or recently active portion of the subject channels. The location and designation of each sample collected are illustrated on the attached Sample Location Map. Particle size distribution test reports and backup data sheets for each sample are attached for your use.

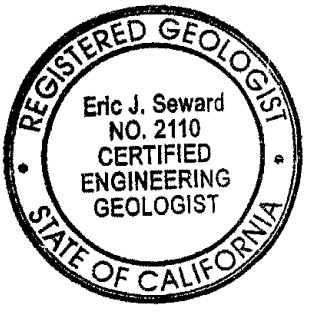
This opportunity to be of service is appreciated. If you have any questions concerning this report, please give us a call.

Respectfully,

Brian J. Swanson, CEG 2055
Senior Project Geologist

Eric J. Seward, CEG 2110
Principal Engineering Geologist
Vice President



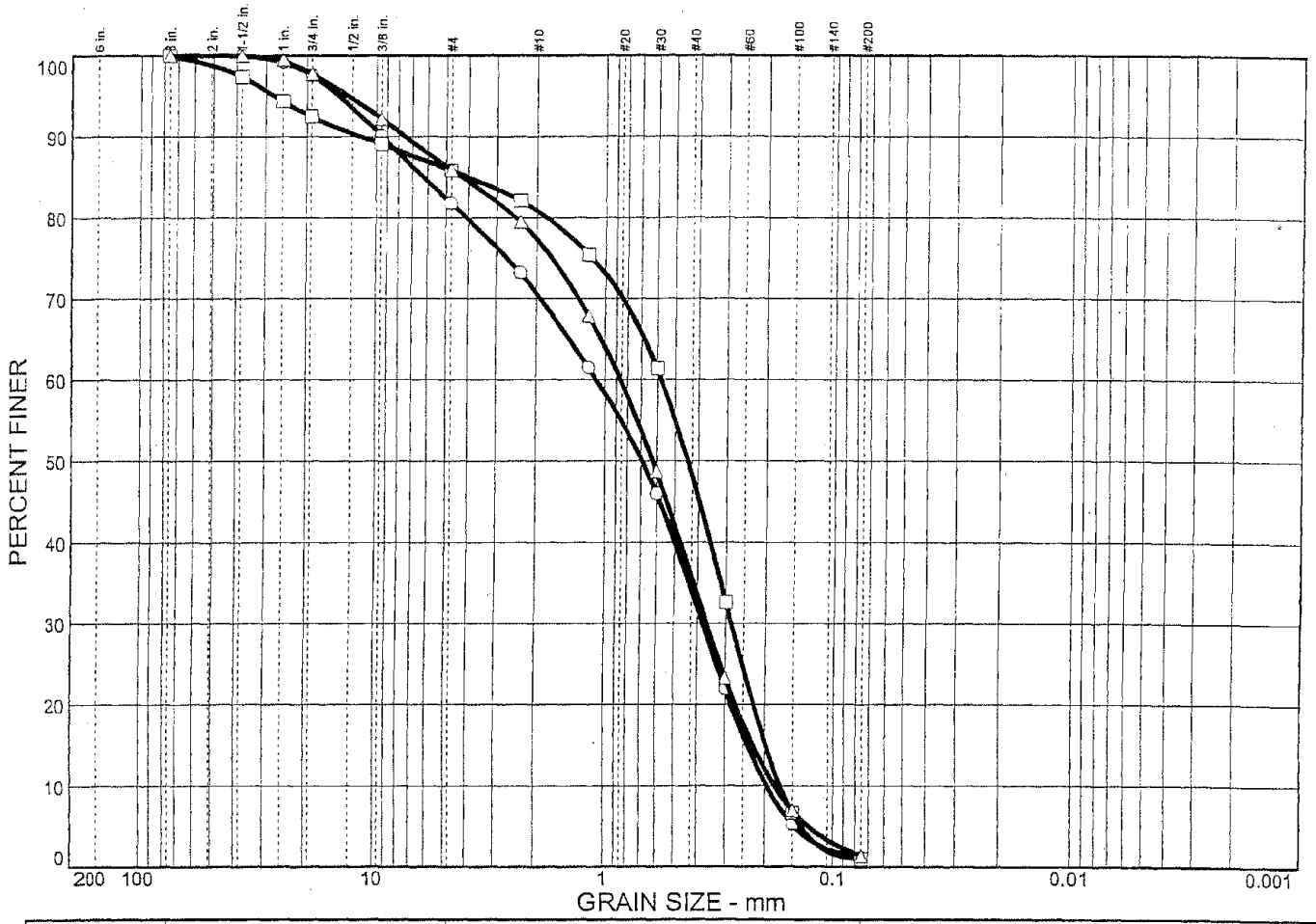


The following attachments complete this report.

Particle Size Distribution Test Reports	Figures 1-8
Laboratory Back up Data Sheets for each Test (23 Total)	
Sample Location Map and Summary Table (Revised)	Plate I

Distribution: (1) PACE
Attn: Addressee
(1) The Newhall Land & Farming Company
Attn: Mr. Glen Adamick

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% COBBLES	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	2.4	15.8	11.1	36.4	33.1	1.2	
□	0.0	7.5	6.7	4.9	32.6	47.3	1.0	
△	0.0	2.2	11.9	8.5	41.5	34.5	1.4	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	DESCRIPTION	USCS
○	SC-1		0-1'	Poorly graded SAND with gravel	SP
□	SC-2		0-1'	Poorly graded SAND	SP
△	SC-3		0-1'	Poorly graded SAND	SP

PARTICLE SIZE DISTRIBUTION TEST REPORT

ALLAN E. SEWARD

ENGINEERING GEOLOGY, INC.

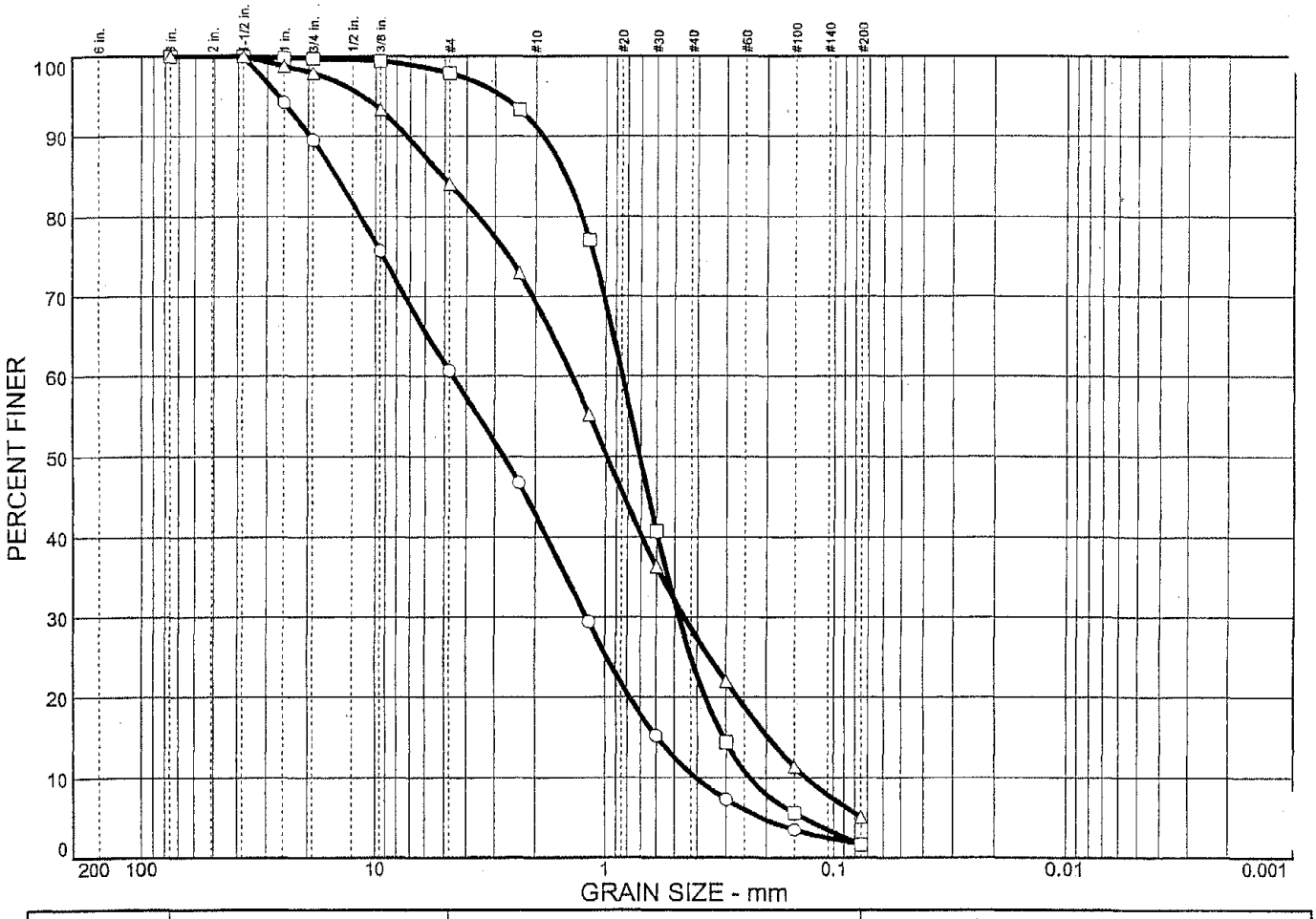
Client: The Newhall Land & Farming Company

Project: PACE Fluvial Study of Santa Clara River and Tributaries

Project No.: 05-1155BE-9(2)

Figure 1

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% COBBLES	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	10.5	28.8	17.8	32.4	8.8	1.7	
□	0.0	0.3	1.8	6.7	66.1	23.5	1.6	
△	0.0	2.1	13.8	14.7	40.8	23.5	5.1	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	DESCRIPTION	USCS
○	MC-1		0-1'	Poorly graded SAND with gravel	SP
□	MC-2		0-1'	Poorly graded SAND	SP
△	MC-3		0-1'	Well graded SAND with silt and gravel	SW-SM

PARTICLE SIZE DISTRIBUTION TEST REPORT

ALLAN E. SEWARD

ENGINEERING GEOLOGY, INC.

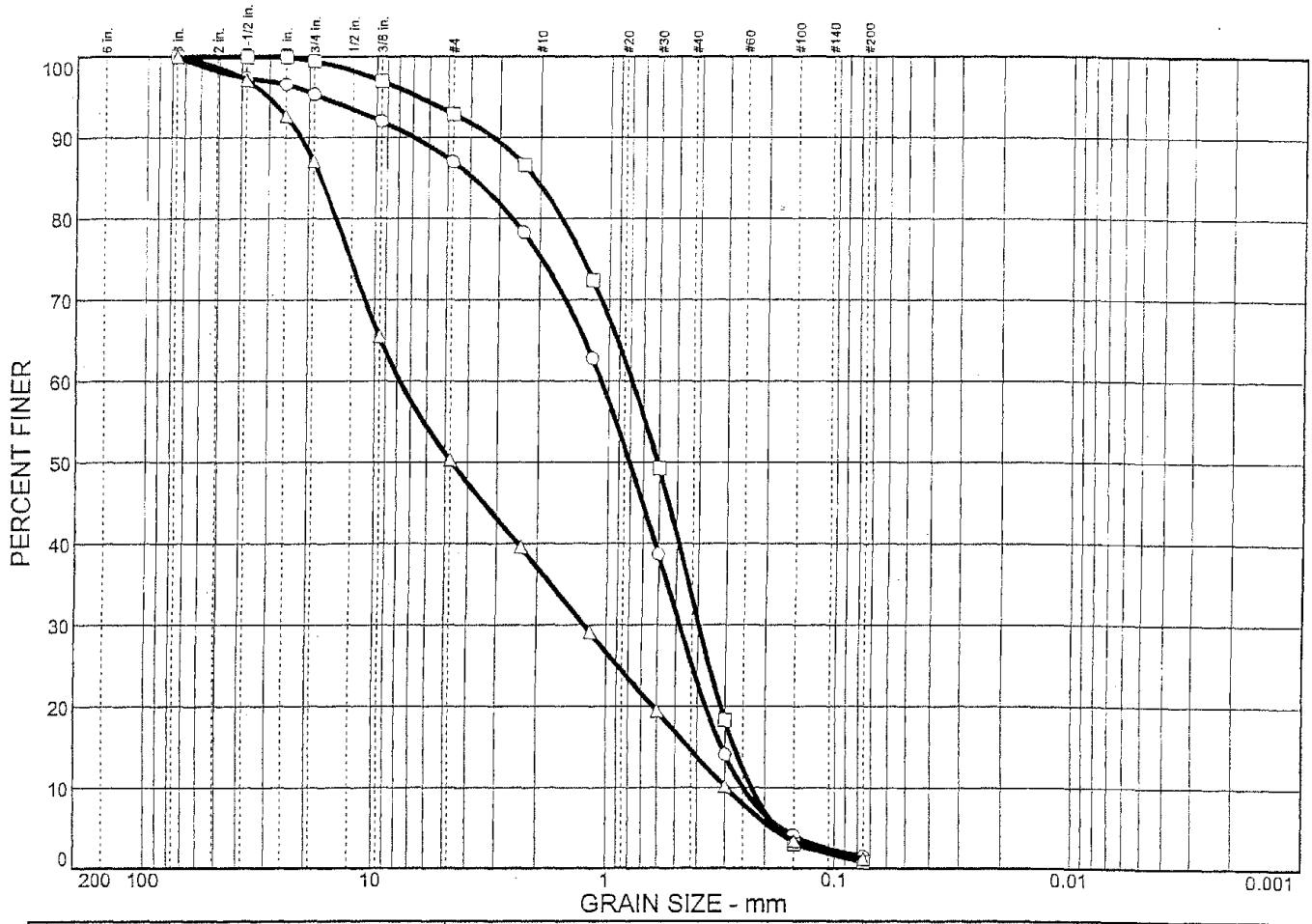
Client: The Newhall Land & Farming Company

Project: PACE Fluvial Study of Santa Clara River and Tributaries

Project No.: 05-1155BE-9(2)

Figure 2

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% COBBLES	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	4.6	8.4	11.6	50.1	23.8	1.5	
□	0.0	0.5	6.6	8.9	50.7	32.5	0.8	
△	0.0	12.9	36.8	13.2	22.4	13.5	1.2	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	DESCRIPTION	USCS
○	AC-1		0-1'	Poorly graded SAND	SP
□	AC-2		0-1'	Poorly graded SAND	SP
△	AC-3		0-1'	Poorly graded GRAVEL with sand	GP

PARTICLE SIZE DISTRIBUTION TEST REPORT

ALLAN E. SEWARD

ENGINEERING GEOLOGY, INC.

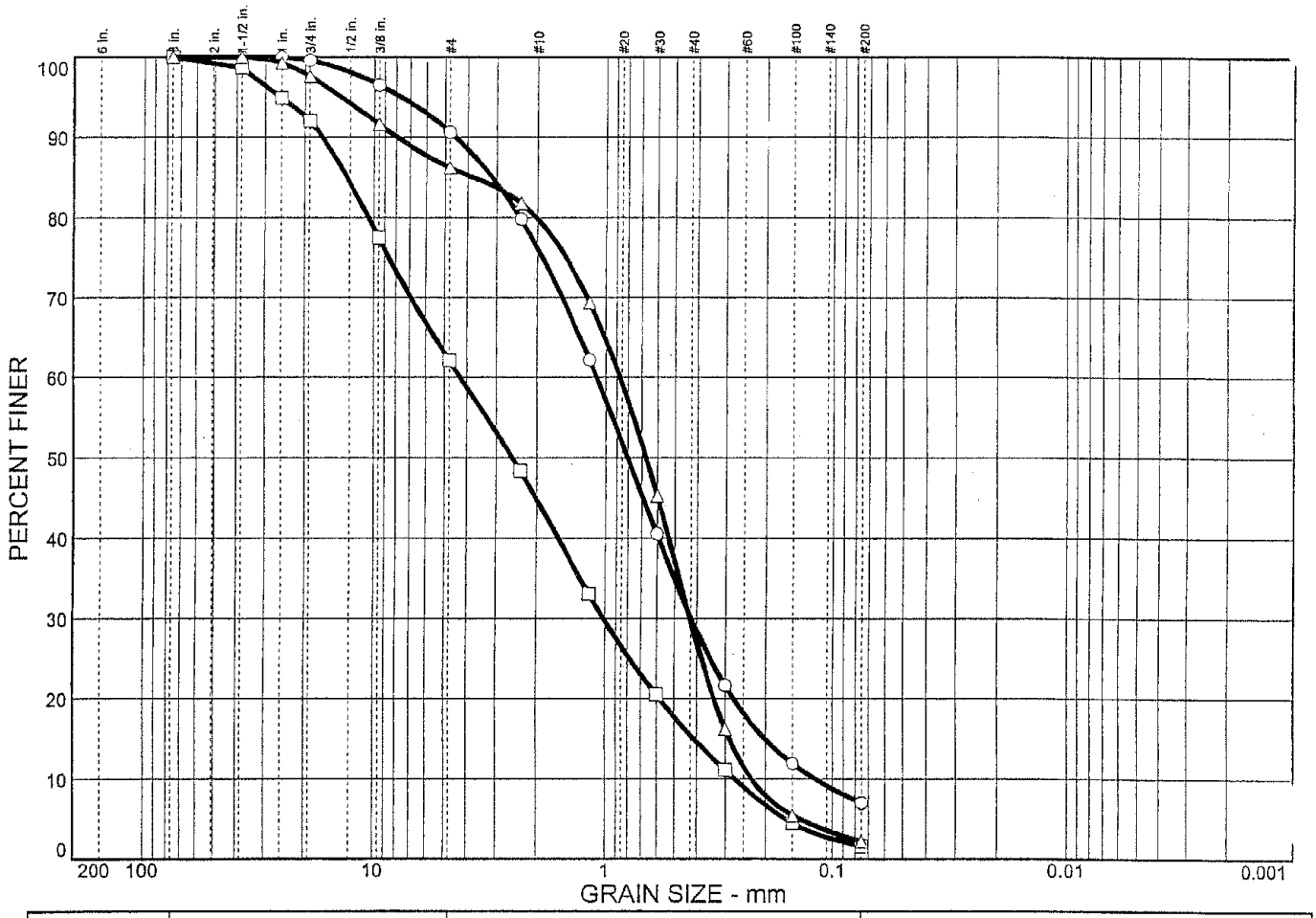
Client: The Newhall Land & Farming Company

Project: PACE Fluvial Study of Santa Clara River and Tributaries

Project No.: 05-1155BE-9(2)

Figure 3

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% COBBLES	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.4	9.0	14.4	46.1	23.1	7.0	
□	0.0	8.0	29.9	17.3	29.4	13.8	1.6	
△	0.0	2.4	11.4	6.3	50.2	27.5	2.2	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	DESCRIPTION	USCS
○	LC-1		0-1'	Well graded SAND with silt	SW-SM
□	LC-2		0-1'	Poorly graded SAND with gravel	SP
△	LC-3		0-1'	Poorly graded SAND	SP

PARTICLE SIZE DISTRIBUTION TEST REPORT

ALLAN E. SEWARD

ENGINEERING GEOLOGY, INC.

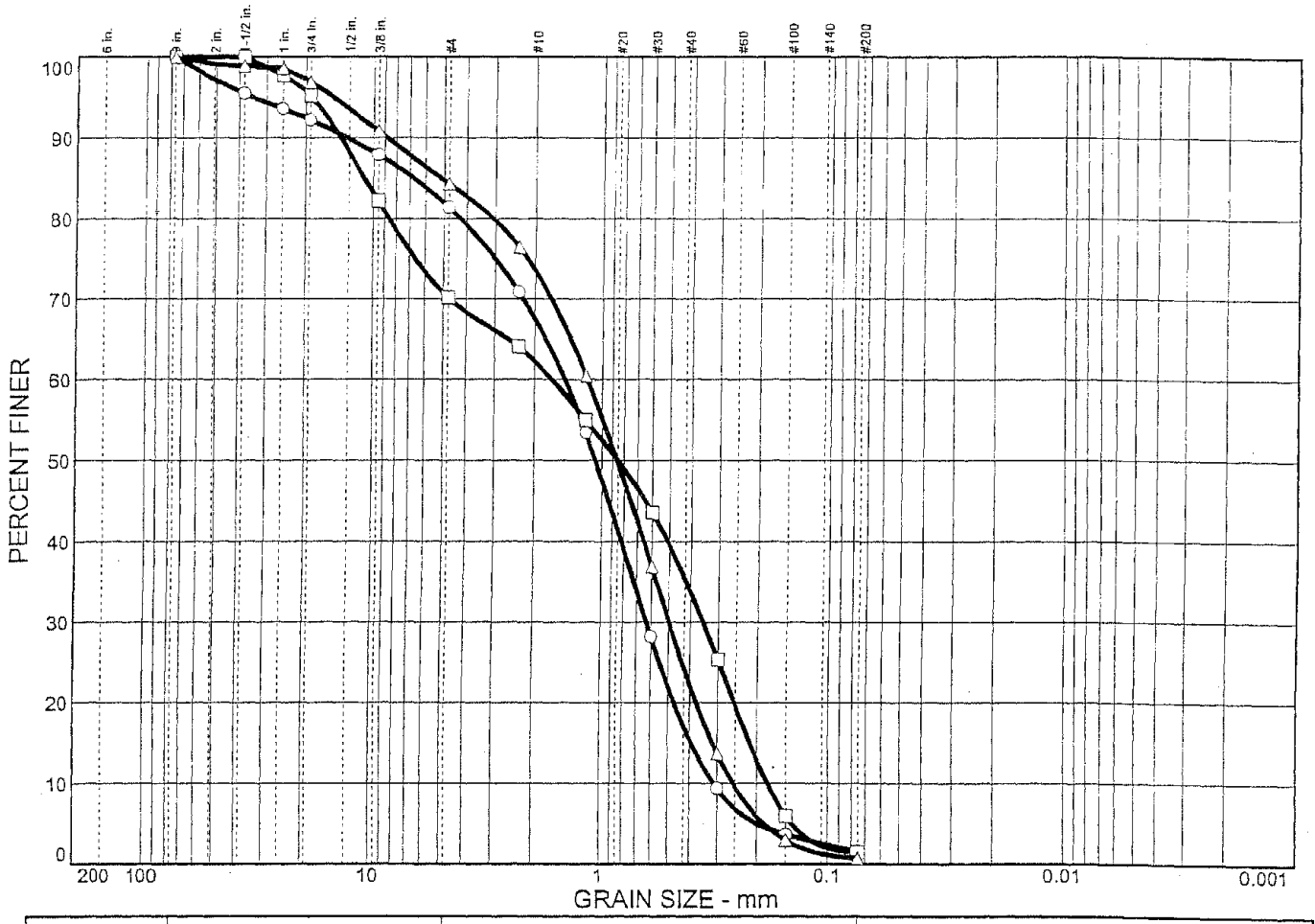
Client: The Newhall Land & Farming Company

Project: PACE Fluvial Study of Santa Clara River and Tributaries

Project No.: 05-1155BE-9(2)

Figure 4

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% COBBLES	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	7.8	10.8	13.8	50.4	15.6	1.6	
□	0.0	4.8	25.0	7.9	26.9	33.9	1.5	
△	0.0	3.1	12.6	10.7	49.2	23.7	0.7	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	DESCRIPTION	USCS
○	HR-1		0-1'	Poorly graded SAND with gravel	SP
□	HR-2		0-1'	Poorly graded SAND with gravel	SP
△	HR-3		0-1'	Poorly graded SAND with gravel	SP

PARTICLE SIZE DISTRIBUTION TEST REPORT

ALLAN E. SEWARD

ENGINEERING GEOLOGY, INC.

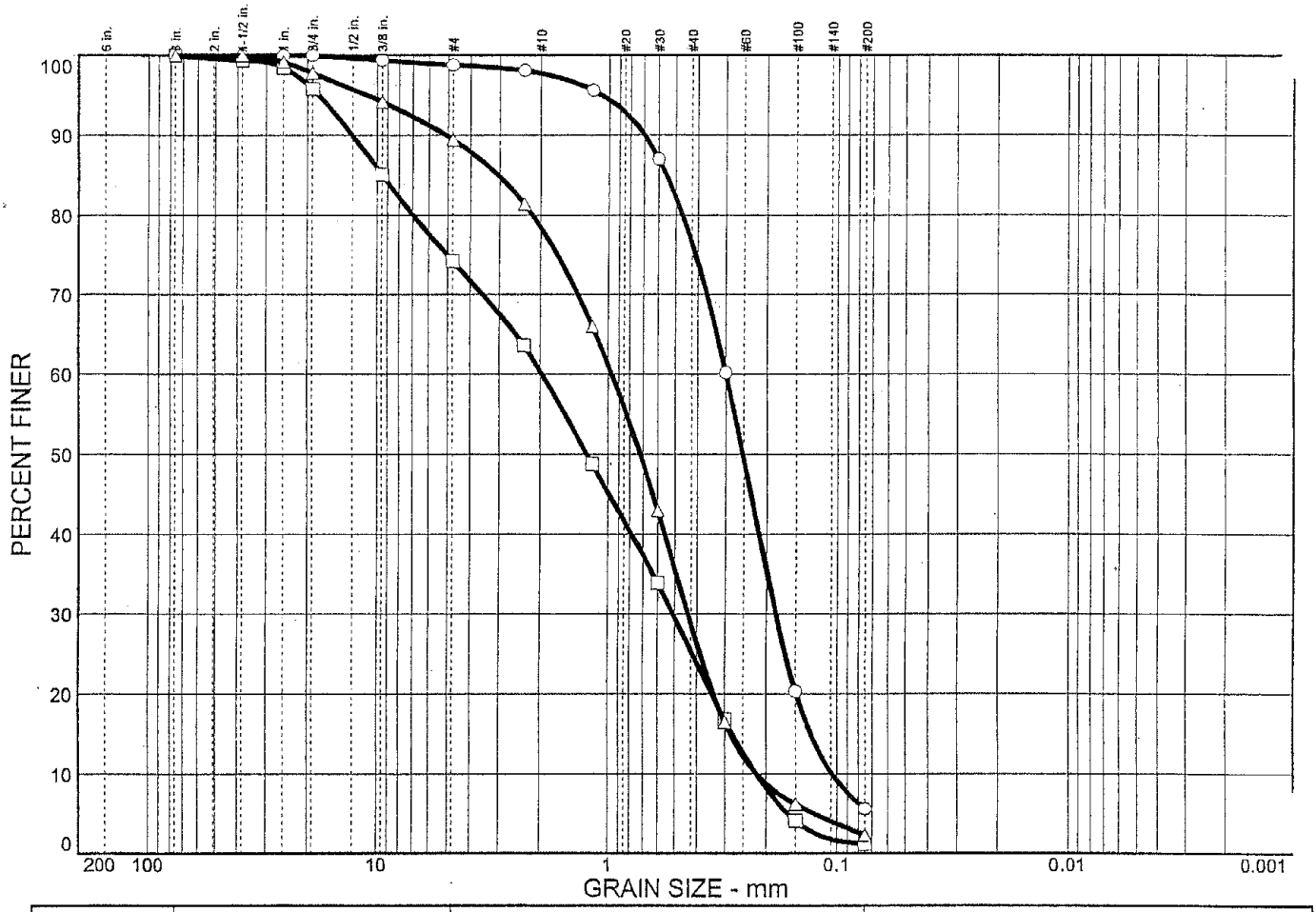
Client: The Newhall Land & Farming Company

Project: PACE Fluvial Study of Santa Clara River and Tributaries

Project No.: 05-1155BE-9(2)

Figure 5

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% COBBLES	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	1.2	1.0	21.2	71.0	5.6	
□	0.0	4.2	21.6	13.8	35.0	24.2	1.2	
△	0.0	2.2	8.4	10.9	49.7	26.5	2.3	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	DESCRIPTION	USCS
○	CB-1		0-1'	Poorly graded SAND with silt	SP-SM
□	CB-2		0-1'	Poorly graded SAND with gravel	SP
△	CB-3		0-1'	Poorly graded SAND	SP

PARTICLE SIZE DISTRIBUTION TEST REPORT

ALLAN E. SEWARD

ENGINEERING GEOLOGY, INC.

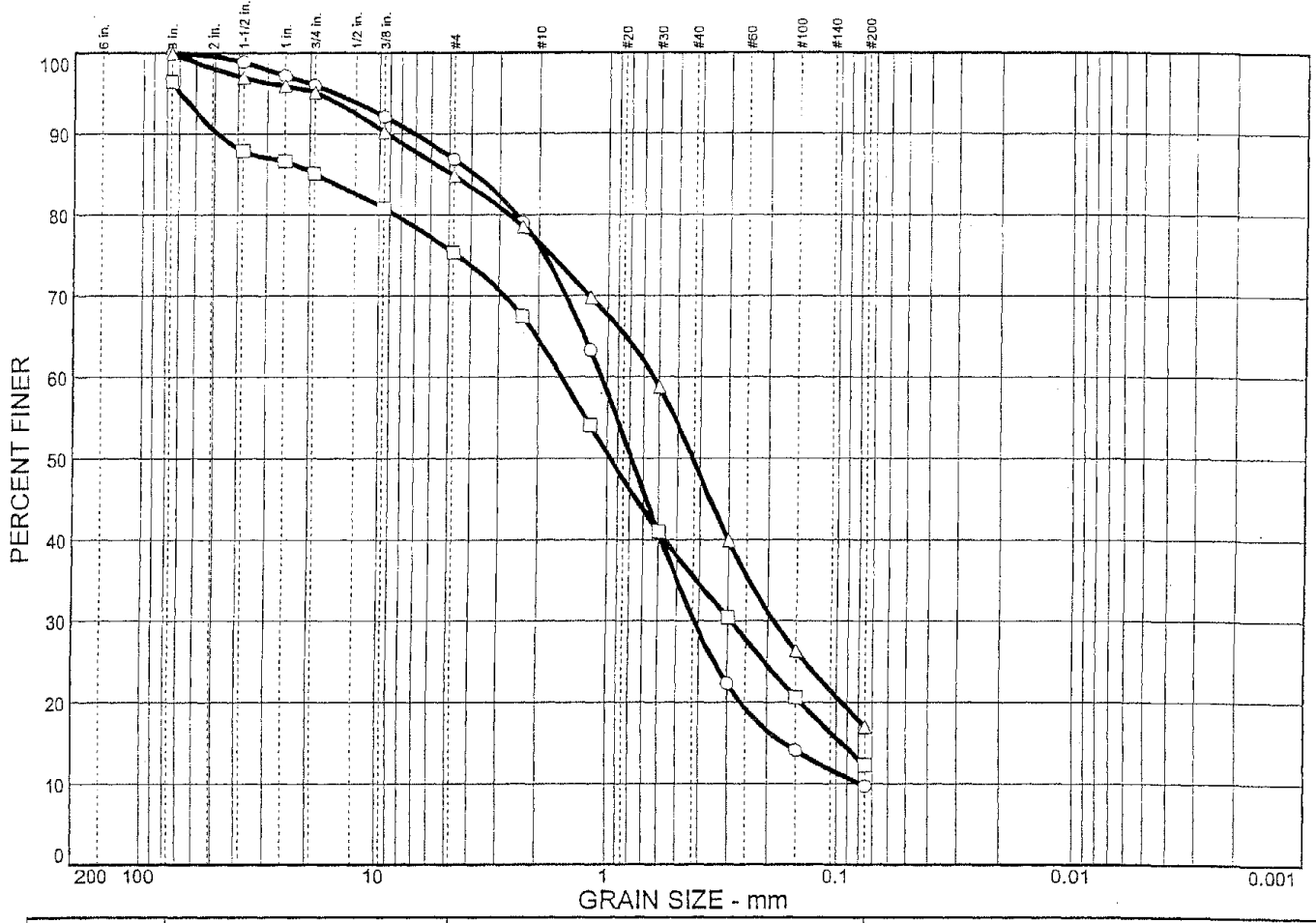
Client: The Newhall Land & Farming Company

Project: PACE Fluvial Study of Santa Clara River and Tributaries

Project No.: 05-1155BE-9(2)

Figure 6

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% COBBLES	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	4.0	9.2	10.7	45.7	20.7	9.7	
□	3.5	11.4	9.8	10.6	29.2	23.2	12.3	
△	0.0	4.9	10.3	8.2	27.0	32.6	17.0	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	DESCRIPTION	USCS
○	SM-1		0-1'	Well graded SAND with silt	SW-SM
□	SM-2		0-1'	Silty SAND with gravel	SM
△	SM-3		0-1'	Silty SAND with gravel	SM

PARTICLE SIZE DISTRIBUTION TEST REPORT

ALLAN E. SEWARD

ENGINEERING GEOLOGY, INC.

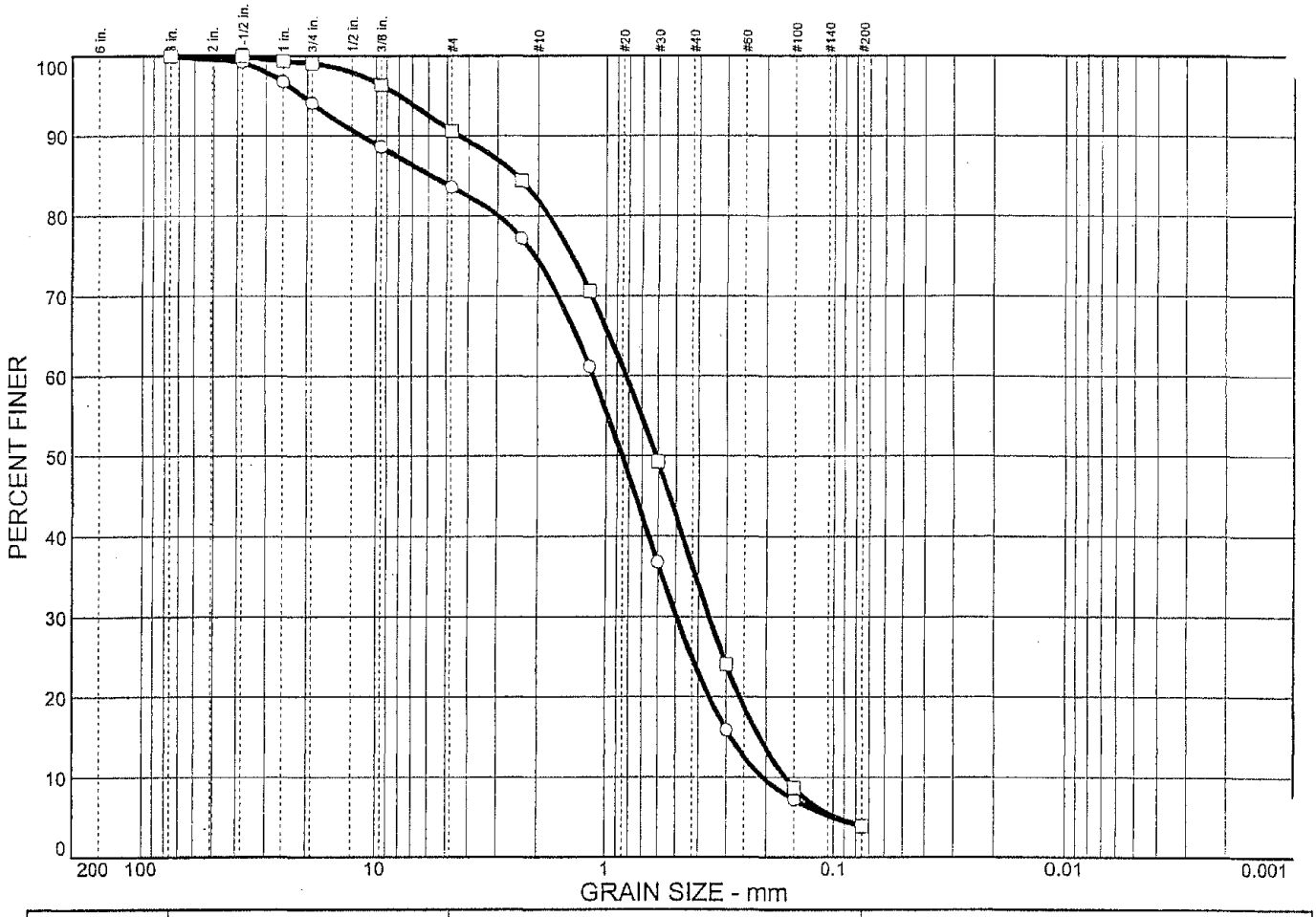
Client: The Newhall Land & Farming Company

Project: PACE Fluvial Study of Santa Clara River and Tributaries

Project No.: 05-1155BE-9(2)

Figure 7

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% COBBLES	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	5.9	10.5	9.1	49.4	21.3	3.8	
□	0.0	0.9	8.5	8.6	45.6	32.5	3.9	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	DESCRIPTION	USCS
○	CC-1		0-1'	Poorly graded SAND with gravel	SP
□	Lion-1		0-1'	Poorly graded SAND	SP

PARTICLE SIZE DISTRIBUTION TEST REPORT

ALLAN E. SEWARD

ENGINEERING GEOLOGY, INC.

Client: The Newhall Land & Farming Company

Project: PACE Fluvial Study of Santa Clara River and Tributaries

Project No.: 05-1155BE-9(2)

Figure 8

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: PACE Fluvial Study of Santa Clara River
and Tributaries
Project Number: 05-1155BE-9(2)

Sample Data

Source: SC-1
Sample No.:
Elev. or Depth: 0-1' Sample Length(in./cm.):
Location:
Description: Poorly graded SAND with gravel
USCS: SP

Mechanical Analysis Data

	Initial
Dry sample and tare=	17433.60
Tare =	0.00
Dry sample weight =	17433.60

Sample split on number 4 sieve
Split sample data:
Sample and tare = 823.18 Tare = .00 Sample weight = 823.18
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
1-1/2 inch	0.00	100.0
1 inch	141.95	99.2
3/4 inch	410.74	97.6
3/8 inch	1731.78	90.1
# 4	3171.78	81.8
# 8	86.53	73.2
# 16	204.60	61.5
# 30	360.50	46.0
# 50	602.30	21.9
# 100	769.92	5.3
# 200	811.58	1.2

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 0.0 % GRAVEL = 18.2 (% coarse = 2.4 % fine = 15.8)
% SAND = 80.6 (% coarse = 11.1 % medium = 36.4 % fine = 33.1)
% FINES = 1.2

D_{85}= 6.25 D_{60}= 1.09 D_{50}= 0.69
D_{30}= 0.38 D_{15}= 0.24 D_{10}= 0.20
C_c= 0.6717 C_u= 5.5821

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: PACE Fluvial Study of Santa Clara River and Tributaries
Project Number: 05-1155BE-9(2)

Sample Data

Source: SC-2
Sample No.:
Elev. or Depth: 0-1' **Sample Length(in./cm.):**
Location:
Description: Poorly graded SAND
USCS: SP

Mechanical Analysis Data

Initial
Dry sample and tare= 17660.60
Tare = 0.00
Dry sample weight = 17660.60
Sample split on number 4 sieve
Split sample data:
Sample and tare = 839.37 Tare = .00 Sample weight = 839.37
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
1-1/2 inch	459.98	97.4
1 inch	989.08	94.4
3/4 inch	1326.98	92.5
3/8 inch	1926.73	89.1
# 4	2512.85	85.8
# 8	36.20	82.1
# 16	101.65	75.4
# 30	238.79	61.4
# 50	520.23	32.6
# 100	773.42	6.7
# 200	829.99	1.0

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 0.0 % GRAVEL = 14.2 (% coarse = 7.5 % fine = 6.7)
% SAND = 84.8 (% coarse = 4.9 % medium = 32.6 % fine = 47.3)
% FINES = 1.0

D_{85}= 4.00 D_{60}= 0.57 D_{50}= 0.44
D_{30}= 0.28 D_{15}= 0.20 D_{10}= 0.17
C_c= 0.8205 C_u= 3.3796

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: PACE Fluvial Study of Santa Clara River and Tributaries
Project Number: 05-1155BE-9(2)

Sample Data

Source: SC-3
Sample No.:
Elev. or Depth: 0-1'
Sample Length(in./cm.):
Location:
Description: Poorly graded SAND
USCS: SP

Mechanical Analysis Data

	Initial
Dry sample and tare=	17388.20
Tare =	0.00
Dry sample weight =	17388.20

Sample split on number 4 sieve
Split sample data:
Sample and tare = 760.52 Tare = .00 Sample weight = 760.52
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
1-1/2 inch	0.00	100.0
1 inch	78.55	99.5
3/4 inch	381.54	97.8
3/8 inch	1356.34	92.2
# 4	2446.02	85.9
# 8	57.04	79.5
# 16	159.19	67.9
# 30	328.93	48.7
# 50	553.86	23.3
# 100	698.78	7.0
# 200	748.36	1.4

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 0.0 % GRAVEL = 14.1 (% coarse = 2.2 % fine = 11.9)
% SAND = 84.5 (% coarse = 8.5 % medium = 41.5 % fine = 34.5)
% FINES = 1.4

D_{85}= 4.26 D_{60}= 0.86 D_{50}= 0.62
D_{30}= 0.36 D_{15}= 0.23 D_{10}= 0.18
C_c= 0.8545 C_u= 4.789

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: PACE Fluvial Study of Santa Clara River and Tributaries
Project Number: 05-1155BE-9(2)

Sample Data

Source: MC-1
Sample No.:
Elev. or Depth: 0-1' **Sample Length(in./cm.):**
Location:
Description: Poorly graded SAND with gravel
USCS: SP

Mechanical Analysis Data

	Initial
Dry sample and tare=	22700.00
Tare =	0.00
Dry sample weight =	22700.00

Sample split on number 4 sieve
Split sample data:
Sample and tare = 805.67 Tare = .00 Sample weight = 805.67
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
1-1/2 inch	0.00	100.0
1 inch	1308.63	94.2
3/4 inch	2378.82	89.5
3/8 inch	5513.99	75.7
# 4	8911.63	60.7
# 8	184.41	46.8
# 16	415.41	29.4
# 30	603.77	15.2
# 50	708.14	7.3
# 100	759.62	3.5
# 200	782.57	1.7

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 0.0 % GRAVEL = 39.3 (% coarse = 10.5 % fine = 28.8)
% SAND = 59.0 (% coarse = 17.8 % medium = 32.4 % fine = 8.8)
% FINES = 1.7

D_{85}= 14.93 D_{60}= 4.59 D_{50}= 2.74
D_{30}= 1.21 D_{15}= 0.59 D_{10}= 0.40
C_c= 0.7875 C_u= 11.3357

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: PACE Fluvial Study of Santa Clara River and Tributaries
Project Number: 05-1155BE-9(2)

Sample Data

Source: MC-2
Sample No.:
Elev. or Depth: 0-1'
Sample Length(in./cm.):
Location:
Description: Poorly graded SAND
USCS: SP

Mechanical Analysis Data

Initial
Dry sample and tare= 17569.80
Tare = 0.00
Dry sample weight = 17569.80
Sample split on number 4 sieve
Split sample data:
Sample and tare = 651.07 Tare = .00 Sample weight = 651.07
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
1-1/2 inch	0.00	100.0
1 inch	41.15	99.8
3/4 inch	57.09	99.7
3/8 inch	113.76	99.4
# 4	361.27	97.9
# 8	30.69	93.3
# 16	138.31	77.1
# 30	380.43	40.7
# 50	555.53	14.4
# 100	614.15	5.6
# 200	640.41	1.6

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 0.0 % GRAVEL = 2.1 (% coarse = 0.3 % fine = 1.8)
% SAND = 96.3 (% coarse = 6.7 % medium = 66.1 % fine = 23.5)
% FINES = 1.6

D_{85}= 1.48 D_{60}= 0.84 D_{50}= 0.71
D_{30}= 0.48 D_{15}= 0.31 D_{10}= 0.24
C_c= 1.152 C_u= 3.5686

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: PACE Fluvial Study of Santa Clara River and Tributaries
Project Number: 05-1155BE-9(2)

Sample Data

Source: MC-3
Sample No.:
Elev. or Depth: 0-1' **Sample Length(in./cm.):**
Location:
Description: Well graded SAND with silt and gravel
USCS: SW-SM

Mechanical Analysis Data

	Initial
Dry sample and tare=	21565.00
Tare =	0.00
Dry sample weight =	21565.00

Sample split on number 4 sieve
Split sample data:
Sample and tare = 839.76 **Tare =** .00 **Sample weight =** 839.76
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
1-1/2 inch	0.00	100.0
1 inch	250.80	98.8
3/4 inch	448.46	97.9
3/8 inch	1443.29	93.3
# 4	3437.57	84.1
# 8	110.41	73.0
# 16	288.71	55.2
# 30	477.58	36.3
# 50	619.89	22.0
# 100	725.46	11.4
# 200	788.40	5.1

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 0.0 **% GRAVEL =** 15.9 **(% coarse =** 2.1 **% fine =** 13.8)
% SAND = 79.0 **(% coarse =** 14.7 **% medium =** 40.8 **% fine =** 23.5)
% FINES = 5.1

D_{85}= 5.06 D_{60}= 1.40 D_{50}= 0.99
D_{30}= 0.46 D_{15}= 0.20 D_{10}= 0.13
C_c= 1.1213 C_u= 10.5481

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: Mesas Area
Alluvial Sediment Gradation Area
Project Number: 05-1155BE-9

Sample Data

Source: AC-1
Sample No.:
Elev. or Depth: 0-1' **Sample Length(in./cm.):**
Location:
Description: Poorly graded SAND
USCS: SP

Mechanical Analysis Data

	Initial
Dry sample and tare=	17978.40
Tare =	0.00
Dry sample weight =	17978.40

Sample split on number 4 sieve
Split sample data:
Sample and tare = 728.55 Tare = .00 Sample weight = 728.55
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
1-1/2 inch	458.72	97.4
1 inch	612.11	96.6
3/4 inch	825.84	95.4
3/8 inch	1435.77	92.0
# 4	2338.67	87.0
# 8	73.03	78.3
# 16	202.51	62.8
# 30	404.22	38.7
# 50	610.16	14.1
# 100	694.19	4.1
# 200	716.13	1.5

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 0.0 % GRAVEL = 13.0 (% coarse = 4.6 % fine = 8.4)
% SAND = 85.5 (% coarse = 11.6 % medium = 50.1 % fine = 23.8)
% FINES = 1.5

D_{85}= 3.89 D_{60}= 1.08 D_{50}= 0.81
D_{30}= 0.48 D_{15}= 0.31 D_{10}= 0.25
C_c= 0.8622 C_u= 4.3201

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: PACE Fluvial Study of Santa Clara River and Tributaries
Project Number: 05-1155BE-9(2)

Sample Data

Source: AC-2
Sample No.:
Elev. or Depth: 0-1' **Sample Length(in./cm.):**
Location:
Description: Poorly graded SAND
USCS: SP

Mechanical Analysis Data

	Initial
Dry sample and tare=	19703.60
Tare =	0.00
Dry sample weight =	19703.60

Sample split on number 4 sieve
Split sample data:
Sample and tare = 721.09 Tare = .00 Sample weight = 721.09
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
1-1/2 inch	0.00	100.0
1 inch	0.00	100.0
3/4 inch	89.11	99.5
3/8 inch	596.94	97.0
# 4	1405.78	92.9
# 8	49.21	86.6
# 16	159.34	72.4
# 30	338.55	49.3
# 50	579.17	18.3
# 100	697.99	3.0
# 200	714.85	0.8

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 0.0 % GRAVEL = 7.1 (% coarse = 0.5 % fine = 6.6)
% SAND = 92.1 (% coarse = 8.9 % medium = 50.7 % fine = 32.5)
% FINES = 0.8

D_{85}= 2.12 D_{60}= 0.79 D_{50}= 0.61
D_{30}= 0.40 D_{15}= 0.27 D_{10}= 0.23
C_c= 0.8691 C_u= 3.4521

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: PACE Fluvial Study of Santa Clara River and Tributaries
Project Number: 05-1155BE-9(2)

Sample Data

Source: AC-3
Sample No.:
Elev. or Depth: 0-1' **Sample Length(in./cm.):**
Location:
Description: Poorly graded GRAVEL with sand
USCS: GP

Mechanical Analysis Data

	Initial
Dry sample and tare=	23244.80
Tare =	0.00
Dry sample weight =	23244.80

Sample split on number 4 sieve
Split sample data:
Sample and tare = 878.11 Tare = .00 Sample weight = 878.11
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
1-1/2 inch	680.15	97.1
1 inch	1686.19	92.7
3/4 inch	2999.30	87.1
3/8 inch	8019.45	65.5
# 4	11551.23	50.3
# 8	187.43	39.6
# 16	369.78	29.1
# 30	537.89	19.5
# 50	700.54	10.2
# 100	817.98	3.4
# 200	856.95	1.2

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 0.0 % GRAVEL = 49.7 (% coarse = 12.9 % fine = 36.8)
% SAND = 49.1 (% coarse = 13.2 % medium = 22.4 % fine = 13.5)
% FINES = 1.2

D_{85}= 17.59 D_{60}= 7.75 D_{50}= 4.67
D_{30}= 1.25 D_{15}= 0.43 D_{10}= 0.30
C_c= 0.6872 C_u= 26.2488

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: Mesas Area
Alluvial Sediment Gradation Area
Project Number: 05-1155BE-9

Sample Data

Source: LC-1
Sample No.:
Elev. or Depth: 0-1' **Sample Length(in./cm.):**
Location:
Description: Well graded SAND with silt
USCS: SW-SM

Mechanical Analysis Data

	Initial
Dry sample and tare=	15209.00
Tare =	0.00
Dry sample weight =	15209.00

Sample split on number 4 sieve
Split sample data:
Sample and tare = 763.95 **Tare =** .00 **Sample weight =** 763.95
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
1-1/2 inch	0.00	100.0
1 inch	0.00	100.0
3/4 inch	54.29	99.6
3/8 inch	530.62	96.5
# 4	1422.64	90.6
# 8	90.96	79.8
# 16	239.41	62.2
# 30	422.48	40.5
# 50	581.66	21.6
# 100	663.72	11.9
# 200	705.30	7.0

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 0.0 **% GRAVEL =** 9.4 **(% coarse =** 0.4 **% fine =** 9.0)
% SAND = 83.6 **(% coarse =** 14.4 **% medium =** 46.1 **% fine =** 23.1)
% FINES = 7.0

D_{85}= 3.14 D_{60}= 1.10 D_{50}= 0.80
D_{30}= 0.42 D_{15}= 0.20 D_{10}= 0.12
C_c= 1.3693 C_u= 9.2286

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: PACE Fluvial Study of Santa Clara River and Tributaries
Project Number: 05-1155BE-9(2)

Sample Data

Source: LC-2
Sample No.:
Elev. or Depth: 0-1' **Sample Length(in./cm.):**
Location:
Description: Poorly graded SAND with gravel
USCS: SP

Mechanical Analysis Data

Initial
Dry sample and tare= 18387.00
Tare = 0.00
Dry sample weight = 18387.00
Sample split on number 4 sieve
Split sample data:
Sample and tare = 832.53 Tare = .00 Sample weight = 832.53
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
1-1/2 inch	242.95	98.7
1 inch	937.81	94.9
3/4 inch	1474.70	92.0
3/8 inch	4129.38	77.5
# 4	6963.31	62.1
# 8	183.83	48.4
# 16	388.23	33.1
# 30	557.04	20.5
# 50	684.35	11.1
# 100	771.61	4.5
# 200	810.78	1.6

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 0.0 % GRAVEL = 37.9 (% coarse = 8.0 % fine = 29.9)
% SAND = 60.5 (% coarse = 17.3 % medium = 29.4 % fine = 13.8)
% FINES = 1.6

D_{85}= 13.07 D_{60}= 4.27 D_{50}= 2.55
D_{30}= 1.02 D_{15}= 0.41 D_{10}= 0.27
C_c= 0.8867 C_u= 15.6708

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: PACE Fluvial Study of Santa Clara River and Tributaries
Project Number: 05-1155BE-9(2)

Sample Data

Source: LC-3
Sample No.:
Elev. or Depth: 0-1' **Sample Length(in./cm.):**
Location:
Description: Poorly graded SAND
USCS: SP

Mechanical Analysis Data

	Initial
Dry sample and tare=	17115.80
Tare =	0.00
Dry sample weight =	17115.80

Sample split on number 4 sieve
Split sample data:
Sample and tare = 784.67 Tare = .00 Sample weight = 784.67
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
1-1/2 inch	0.00	100.0
1 inch	123.98	99.3
3/4 inch	416.69	97.6
3/8 inch	1442.97	91.6
# 4	2356.78	86.2
# 8	40.11	81.8
# 16	152.53	69.4
# 30	372.23	45.3
# 50	636.75	16.2
# 100	734.31	5.5
# 200	764.19	2.2

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 0.0 % GRAVEL = 13.8 (% coarse = 2.4 % fine = 11.4)
% SAND = 84.0 (% coarse = 6.3 % medium = 50.2 % fine = 27.5)
% FINES = 2.2

D_{85}= 3.78 D_{60}= 0.87 D_{50}= 0.67
D_{30}= 0.43 D_{15}= 0.29 D_{10}= 0.23
C_c= 0.9172 C_u= 3.7901

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: PACE Fluvial Study of Santa Clara River and Tributaries
Project Number: 05-1155BE-9(2)

Sample Data

Source: HR-1
Sample No.:
Elev. or Depth: 0-1' Sample Length(in./cm.):
Location:
Description: Poorly graded SAND with gravel
USCS: SP

Mechanical Analysis Data

	Initial
Dry sample and tare=	18704.80
Tare =	0.00
Dry sample weight =	18704.80

Sample split on number 4 sieve
Split sample data:
Sample and tare = 807.10 Tare = .00 Sample weight = 807.10
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
1-1/2 inch	841.69	95.5
1 inch	1202.99	93.6
3/4 inch	1450.16	92.2
3/8 inch	2271.86	87.9
# 4	3483.16	81.4
# 8	104.06	70.9
# 16	276.70	53.5
# 30	527.54	28.2
# 50	713.86	9.4
# 100	770.09	3.7
# 200	791.09	1.6

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 0.0 % GRAVEL = 18.6 (% coarse = 7.8 % fine = 10.8)
% SAND = 79.8 (% coarse = 13.8 % medium = 50.4 % fine = 15.6)
% FINES = 1.6

D_{85}= 6.71 D_{60}= 1.46 D_{50}= 1.07
D_{30}= 0.63 D_{15}= 0.39 D_{10}= 0.31
C_c= 0.8748 C_u= 4.7071

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: PACE Fluvial Study of Santa Clara River and Tributaries
Project Number: 05-1155BE-9(2)

Sample Data

Source: HR-2
Sample No.:
Elev. or Depth: 0-1' **Sample Length(in./cm.):**
Location:
Description: Poorly graded SAND with gravel
USCS: SP

Mechanical Analysis Data

	Initial
Dry sample and tare=	18704.80
Tare =	0.00
Dry sample weight =	18704.80

Sample split on number 4 sieve
Split sample data:
Sample and tare = 733.34 **Tare =** .00 **Sample weight =** 733.34
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
1-1/2 inch	0.00	100.0
1 inch	433.01	97.7
3/4 inch	899.34	95.2
3/8 inch	3322.51	82.2
# 4	5573.90	70.2
# 8	63.23	64.1
# 16	158.38	55.0
# 30	277.62	43.6
# 50	468.94	25.3
# 100	670.63	6.0
# 200	717.39	1.5

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 0.0 **% GRAVEL =** 29.8 **(% coarse =** 4.8 **% fine =** 25.0)
% SAND = 68.7 **(% coarse =** 7.9 **% medium =** 26.9 **% fine =** 33.9)
% FINES = 1.5

D_{85}= 10.86 D_{60}= 1.67 D_{50}= 0.85
D_{30}= 0.35 D_{15}= 0.22 D_{10}= 0.18
C_c= 0.4086 C_u= 9.2675

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: PACE Fluvial Study of Santa Clara River and Tributaries
Project Number: 05-1155BE-9(2)

Sample Data

Source: HR-3
Sample No.:
Elev. or Depth: 0-1' **Sample Length(in./cm.):**
Location:
Description: Poorly graded SAND with gravel
USCS: SP

Mechanical Analysis Data

	Initial
Dry sample and tare=	17660.60
Tare =	0.00
Dry sample weight =	17660.60

Sample split on number 4 sieve
Split sample data:
Sample and tare = 740.55 Tare = .00 Sample weight = 740.55
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
1-1/2 inch	195.94	98.9
1 inch	253.36	98.6
3/4 inch	552.46	96.9
3/8 inch	1620.08	90.8
# 4	2777.78	84.3
# 8	68.28	76.5
# 16	209.20	60.5
# 30	416.09	36.9
# 50	620.47	13.7
# 100	713.88	3.0
# 200	734.13	0.7

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 0.0 % GRAVEL = 15.7 (% coarse = 3.1 % fine = 12.6)
% SAND = 83.6 (% coarse = 10.7 % medium = 49.2 % fine = 23.7)
% FINES = 0.7

D_{85}= 5.13 D_{60}= 1.16 D_{50}= 0.86
D_{30}= 0.50 D_{15}= 0.32 D_{10}= 0.26
C_c= 0.8384 C_u= 4.5513

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: PACE Fluvial Study of Santa Clara River and Tributaries
Project Number: 05-1155BE-9(2)

Sample Data

Source: CB-1
Sample No.:
Elev. or Depth: 0-1' **Sample Length(in./cm.):**
Location:
Description: Poorly graded SAND with silt
USCS: SP-SM

Mechanical Analysis Data

	Initial
Dry sample and tare=	17933.00
Tare =	0.00
Dry sample weight =	17933.00

Sample split on number 4 sieve
Split sample data:
Sample and tare = 742.07 Tare = .00 Sample weight = 742.07
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
1-1/2 inch	0.00	100.0
1 inch	0.00	100.0
3/4 inch	0.00	100.0
3/8 inch	103.36	99.4
# 4	223.16	98.8
# 8	5.50	98.1
# 16	23.81	95.6
# 30	88.78	87.0
# 50	289.75	60.2
# 100	589.56	20.3
# 200	700.18	5.6

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 0.0 % GRAVEL = 1.2 (% coarse = 0.0 % fine = 1.2)
% SAND = 93.2 (% coarse = 1.0 % medium = 21.2 % fine = 71.0)
% FINES = 5.6

D_{85}= 0.55 D_{60}= 0.30 D_{50}= 0.25
D_{30}= 0.18 D_{15}= 0.13 D_{10}= 0.11
C_c= 1.0559 C_u= 2.8469

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: PACE Fluvial Study of Santa Clara River and Tributaries
Project Number: 05-1155BE-9(2)

Sample Data

Source: CB-2
Sample No.:
Elev. or Depth: 0-1' **Sample Length(in./cm.):**
Location:
Description: Poorly graded SAND with gravel
USCS: SP

Mechanical Analysis Data

Initial
Dry sample and tare= 18114.60
Tare = 0.00
Dry sample weight = 18114.60
Sample split on number 4 **sieve**
Split sample data:
Sample and tare = 745.01 **Tare =** .00 **Sample weight =** 745.01
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
1-1/2 inch	101.07	99.4
1 inch	275.52	98.5
3/4 inch	759.46	95.8
3/8 inch	2699.95	85.1
# 4	4680.48	74.2
# 8	106.40	63.6
# 16	255.04	48.8
# 30	405.03	33.9
# 50	576.15	16.8
# 100	703.88	4.1
# 200	732.85	1.2

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 0.0 **% GRAVEL =** 25.8 **(% coarse =** 4.2 **% fine =** 21.6)
% SAND = 73.0 **(% coarse =** 13.8 **% medium =** 35.0 **% fine =** 24.2)
% FINES = 1.2

D_{85}= 9.47 D_{60}= 1.96 D_{50}= 1.25
D_{30}= 0.51 D_{15}= 0.28 D_{10}= 0.22
C_c= 0.6048 C_u= 8.9372

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: PACE Fluvial Study of Santa Clara River and Tributaries
Project Number: 05-1155BE-9(2)

Sample Data

Source: CB-3
Sample No.:
Elev. or Depth: 0-1' **Sample Length(in./cm.):**
Location:
Description: Poorly graded SAND
USCS: SP

Mechanical Analysis Data

Initial
Dry sample and tare= 19022.60
Tare = 0.00
Dry sample weight = 19022.60
Sample split on number 4 sieve
Split sample data:
Sample and tare = 824.36 Tare = .00 Sample weight = 824.36
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
1-1/2 inch	0.00	100.0
1 inch	155.86	99.2
3/4 inch	413.72	97.8
3/8 inch	1112.62	94.2
# 4	2022.57	89.4
# 8	74.07	81.4
# 16	215.58	66.0
# 30	428.05	43.0
# 50	672.06	16.5
# 100	767.22	6.2
# 200	802.70	2.3

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 0.0 % GRAVEL = 10.6 (% coarse = 2.2 % fine = 8.4)
% SAND = 87.1 (% coarse = 10.9 % medium = 49.7 % fine = 26.5)
% FINES = 2.3

D_{85}= 3.05 D_{60}= 0.97 D_{50}= 0.72
D_{30}= 0.44 D_{15}= 0.28 D_{10}= 0.22
C_c= 0.9072 C_u= 4.4031

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: Mesas Area
Alluvial Sediment Gradation Area
Project Number: 05-1155BE-9

Sample Data

Source: SM-1
Sample No.:
Elev. or Depth: 0-1' Sample Length(in./cm.):
Location:
Description: Well graded SAND with silt
USCS: SW-SM

Mechanical Analysis Data

	Initial
Dry sample and tare=	23017.80
Tare =	0.00
Dry sample weight =	23017.80

Sample split on number 4 sieve
Split sample data:
Sample and tare = 731.81 Tare = .00 Sample weight = 731.81
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
1-1/2 inch	264.51	98.9
1 inch	644.65	97.2
3/4 inch	909.55	96.0
3/8 inch	1825.48	92.1
# 4	3038.96	86.8
# 8	65.91	79.0
# 16	198.29	63.3
# 30	387.07	40.9
# 50	543.90	22.3
# 100	613.20	14.1
# 200	649.63	9.7

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 0.0 % GRAVEL = 13.2 (% coarse = 4.0 % fine = 9.2)
% SAND = 77.1 (% coarse = 10.7 % medium = 45.7 % fine = 20.7)
% FINES = 9.7

D_{85}= 3.87 D_{60}= 1.06 D_{50}= 0.79
D_{30}= 0.42 D_{15}= 0.17 D_{10}= 0.08
C_c= 2.0885 C_u= 13.4193

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: PACE Fluvial Study of Santa Clara River and Tributaries
Project Number: 05-1155BE-9(2)

Sample Data

Source: SM-2
Sample No.:
Elev. or Depth: 0-1' **Sample Length(in./cm.):**
Location:
Description: Silty SAND with gravel
USCS: SM

Mechanical Analysis Data

Initial
Dry sample and tare= 60245.80
Tare = 0.00
Dry sample weight = 60245.80
Sample split on number 4 **sieve**
Split sample data:
Sample and tare = 957.88 **Tare =** .00 **Sample weight =** 957.88
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	2121.72	96.5
1-1/2 inch	7269.59	87.9
1 inch	8084.04	86.6
3/4 inch	8958.31	85.1
3/8 inch	11591.67	80.8
# 4	14891.85	75.3
# 8	99.38	67.5
# 16	269.61	54.1
# 30	436.80	41.0
# 50	571.38	30.4
# 100	695.68	20.6
# 200	801.50	12.3

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 3.5 **% GRAVEL =** 21.2 **(% coarse =** 11.4 **% fine =** 9.8)
% SAND = 63.0 **(% coarse =** 10.6 **% medium =** 29.2 **% fine =** 23.2)
% FINES = 12.3

D_{85}= 18.73 D_{60}= 1.57 D_{50}= 0.97
D_{30}= 0.29 D_{15}= 0.09

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: PACE Fluvial Study of Santa Clara River and Tributaries
Project Number: 05-1155BE-9(2)

Sample Data

Source: SM-3
Sample No.:
Elev. or Depth: 0-1' **Sample Length(in./cm.):**
Location:
Description: Silty SAND with gravel
USCS: SM

Mechanical Analysis Data

	Initial
Dry sample and tare=	16207.80
Tare =	0.00
Dry sample weight =	16207.80

Sample split on number 4 sieve
Split sample data:
Sample and tare = 751.27 **Tare =** .00 **Sample weight =** 751.27
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
1-1/2 inch	483.46	97.0
1 inch	671.79	95.9
3/4 inch	799.18	95.1
3/8 inch	1583.39	90.2
# 4	2469.85	84.8
# 8	55.59	78.5
# 16	132.52	69.8
# 30	230.47	58.8
# 50	397.47	39.9
# 100	518.21	26.3
# 200	600.30	17.0

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 0.0 **% GRAVEL =** 15.2 **(% coarse =** 4.9 **% fine =** 10.3)
% SAND = 67.8 **(% coarse =** 8.2 **% medium =** 27.0 **% fine =** 32.6)
% FINES = 17.0

D_{85}= 4.87 D_{60}= 0.63 D_{50}= 0.43
D_{30}= 0.19

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: Mesas Area
Alluvial Sediment Gradation Area
Project Number: 05-1155BE-9

Sample Data

Source: CC-1
Sample No.:
Elev. or Depth: 0-1' **Sample Length(in./cm.):**
Location:
Description: Poorly graded SAND with gravel
USCS: SP

Mechanical Analysis Data

	Initial
Dry sample and tare=	18477.80
Tare =	0.00
Dry sample weight =	18477.80

Sample split on number 4 sieve
Split sample data:
Sample and tare = 779.92 Tare = .00 Sample weight = 779.92
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
1-1/2 inch	135.00	99.3
1 inch	584.04	96.8
3/4 inch	1088.55	94.1
3/8 inch	2113.98	88.6
# 4	3032.35	83.6
# 8	60.03	77.2
# 16	209.43	61.2
# 30	436.82	36.8
# 50	631.92	15.9
# 100	713.17	7.2
# 200	744.09	3.8

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 0.0 % GRAVEL = 16.4 (% coarse = 5.9 % fine = 10.5)
% SAND = 79.8 (% coarse = 9.1 % medium = 49.4 % fine = 21.3)
% FINES = 3.8

D_{85}= 5.81 D_{60}= 1.14 D_{50}= 0.86
D_{30}= 0.49 D_{15}= 0.29 D_{10}= 0.21
C_C= 1.0418 C_u= 5.5003

GRAIN SIZE DISTRIBUTION TEST DATA

Client: The Newhall Land & Farming Company
Project: Mesas Area
Alluvial Sediment Gradation Area
Project Number: 05-1155BE-9

Sample Data

Source: Lion-1
Sample No.:
Elev. or Depth: 0-1' **Sample Length(in./cm.):**
Location:
Description: Poorly graded SAND
USCS: SP

Mechanical Analysis Data

	Initial
Dry sample and tare=	17660.60
Tare =	0.00
Dry sample weight =	17660.60

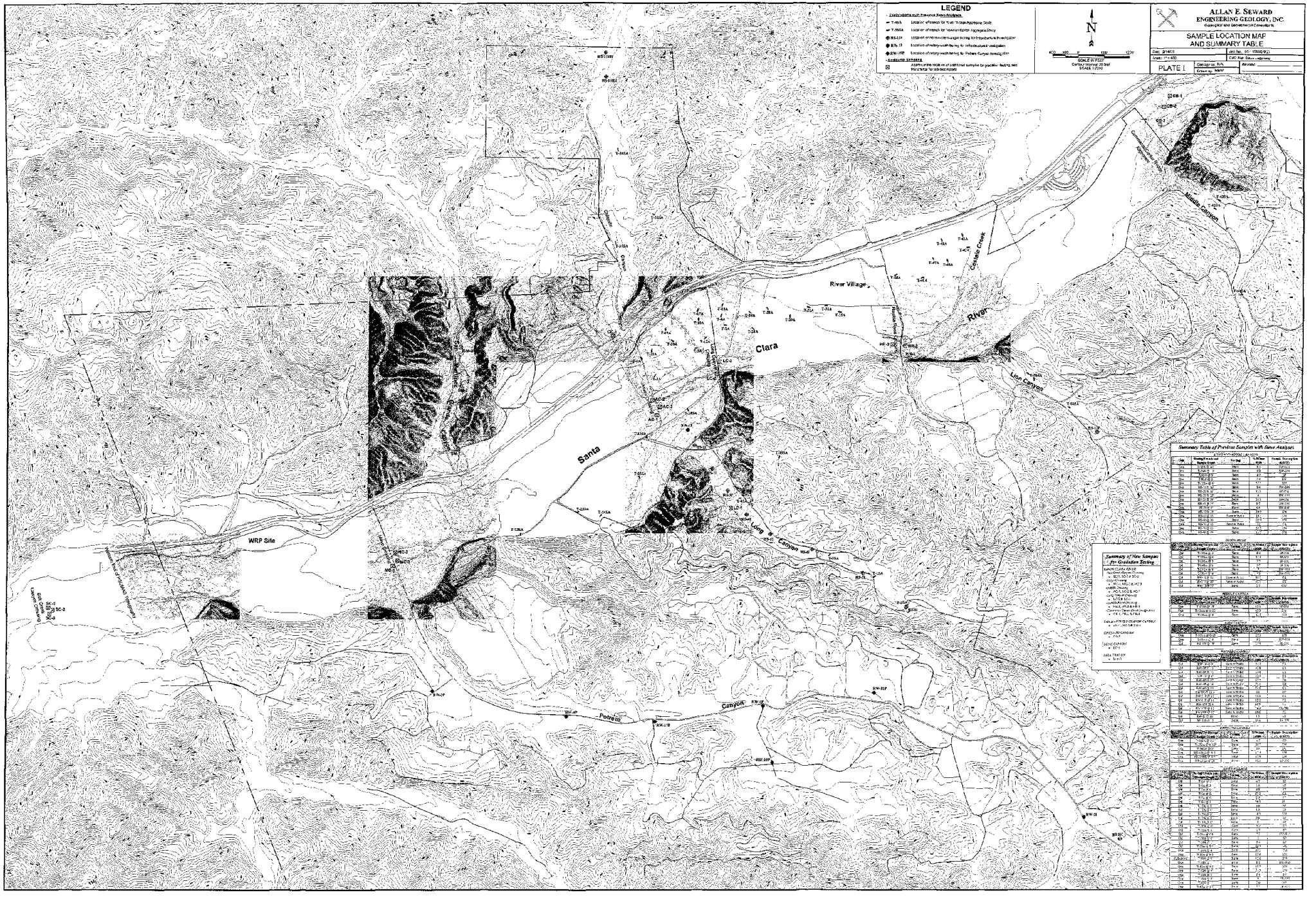
Sample split on number 4 sieve
Split sample data:
Sample and tare = 683.31 Tare = .00 Sample weight = 683.31
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
1-1/2 inch	0.00	100.0
1 inch	106.88	99.4
3/4 inch	150.98	99.1
3/8 inch	627.92	96.4
# 4	1659.02	90.6
# 8	46.53	84.4
# 16	150.65	70.6
# 30	311.37	49.3
# 50	501.22	24.1
# 100	617.55	8.7
# 200	653.55	3.9

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = 0.0 % GRAVEL = 9.4 (% coarse = 0.9 % fine = 8.5)
% SAND = 86.7 (% coarse = 8.6 % medium = 45.6 % fine = 32.5)
% FINES = 3.9

D_{85}= 2.48 D_{60}= 0.82 D_{50}= 0.61
D_{30}= 0.36 D_{15}= 0.21 D_{10}= 0.16
C_c= 0.9476 C_u= 4.9895


LEGEND
Explorations with Previous Sieve Analyses
T-48A Location of trench for River Village Aggregate Study
T-35SA Location of trench for Upwash Ranch Aggregate Study
RS-11 Location of rotary-wash boring for Infrastructure Investigation
RW-11 Location of rotary-wash boring for Infrastructure Investigation
RW-11P Location of rotary-wash boring for Potrero Canyon Investigation
Additional Samples
Approximate location of additional samples for gradation testing and transmittal for tabulated reports
N
SCALE IN FEET
Contour Interval 20 feet
SCALE 1:2200
ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants
SAMPLE LOCATION MAP
AND SUMMARY TABLE
PLATE I
Geologist by: RA
Drawn by: MBW
Revised:
River Village
Santa
Clara
River
Castaic Creek
Middle Canyon
Lion Canyon
Long Canyon
Potrero
Canyon
WRP Site
Summary Table of Previous Samples with Sieve Analyses
Summary of New Samples for Gradation Testing

Santa Clara River Fluvial Study

APPENDIX CHAPTER 4.1

Existing Condition HEC-RAS Output

Plan	***Description***
FinalEx025	***Fluvial Model, Existing Conditions, n=0.025, subcritical flow***
Exist025	***Approved Model, Existing Conditions, n=0.025, mixed flow***
Exist085	***Approved Model, Existing Conditions, n=0.085, mixed flow***

HEC-RAS model modified for fluvial use. See section 4.1.1B for model assembly. For unmodified, mixed flow regimes used in report, refer also to HEC-RAS Modeling Report prepared by PACE, concurrently submitted to LACDPW.

PACIFIC ADVANCED CIVIL ENGINEERING, INC.

HEC-RAS Plan: FinalEx025 River: Reach #1 Reach: SCR Profile: Rev BB FP

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
SCR	46195	Rev BB FP	115111.00	1035.00	1054.30	1054.30	1060.32	0.004006	19.69	5847.54	483.37	1.00
SCR	46020	Rev BB FP	115111.00	1032.00	1052.44	1052.44	1058.13	0.004154	19.14	6013.48	531.51	1.00
SCR	45545	Rev BB FP	115111.00	1030.00	1049.24	1049.24	1055.65	0.004022	20.32	5664.11	446.75	1.01
SCR	45030	Rev BB FP	115111.00	1025.00	1045.55	1044.56	1050.46	0.003176	17.78	6472.94	521.47	0.89
SCR	44585	Rev BB FP	115111.00	1022.00	1043.05	1043.05	1048.75	0.004191	19.17	6003.55	531.86	1.01
SCR	44210	Rev BB FP	115111.00	1020.00	1041.58	1038.72	1044.97	0.001990	14.77	7793.11	585.85	0.71
SCR	43820	Rev BB FP	115111.00	1018.00	1037.47	1037.47	1043.62	0.004071	19.90	5785.45	476.53	1.01
SCR	43610	Rev BB FP	115111.00	1017.00	1034.08	1034.08	1040.13	0.004047	19.74	5832.16	483.68	1.00
SCR	43410	Rev BB FP	115111.00	1016.00	1030.73	1030.73	1035.85	0.004290	18.16	6338.30	623.33	1.00
SCR	43200	Rev BB FP	115111.00	1014.00	1029.28	1029.28	1033.94	0.004388	17.31	6660.68	737.19	1.00
SCR	42975	Rev BB FP	115111.00	1012.00	1026.11	1026.11	1030.25	0.004610	16.33	7050.19	860.39	1.01
SCR	42815	Rev BB FP	115111.00	1011.00	1024.28	1024.28	1027.89	0.004790	15.25	7548.64	1051.01	1.00
SCR	42590	Rev BB FP	115111.00	1010.00	1021.27	1021.27	1024.75	0.004840	14.96	7695.66	1112.88	1.00
SCR	42430	Rev BB FP	115111.00	1008.00	1019.61	1019.61	1023.32	0.004688	15.45	7449.45	1001.02	1.00
SCR	42215	Rev BB FP	115111.00	1006.00	1020.41	1017.69	1022.03	0.001689	10.21	11269.54	1312.59	0.61
SCR	41940	Rev BB FP	115111.00	1005.00	1019.50	1017.71	1021.46	0.002356	11.22	10258.18	1332.54	0.71
SCR	41730	Rev BB FP	115111.00	1004.00	1018.92	1016.50	1020.95	0.002293	11.42	10078.82	1249.08	0.71
SCR	41460	Rev BB FP	115111.00	1002.00	1018.33	1015.19	1020.31	0.002413	11.29	10198.64	1335.15	0.72
SCR	41280	Rev BB FP	115111.00	1001.00	1015.32	1015.32	1019.50	0.004619	16.41	7014.27	851.93	1.01
SCR	41080	Rev BB FP	115111.00	1000.00	1013.55	1013.55	1017.58	0.004646	16.10	7149.54	899.03	1.01
SCR	40825	Rev BB FP	115111.00	999.50	1012.18	1012.18	1015.60	0.004898	14.84	7757.40	1146.76	1.01
SCR	40585	Rev BB FP	115111.00	998.00	1010.63	1010.63	1014.02	0.004921	14.79	7785.23	1161.38	1.01
SCR	40335	Rev BB FP	115111.00	996.00	1010.35	1008.85	1012.23	0.002580	11.01	10452.09	1494.47	0.73
SCR	40130	Rev BB FP	115111.00	995.00	1009.98	1008.43	1011.66	0.002378	10.38	11087.02	1631.34	0.70
SCR	39945	Rev BB FP	115111.00	994.00	1009.80	1007.56	1011.20	0.001767	9.48	12146.73	1639.30	0.61
SCR	39755	Rev BB FP	115111.00	994.00	1007.25	1007.25	1010.49	0.004940	14.43	7974.76	1237.97	1.00
SCR	39605	Rev BB FP	115111.00	993.00	1005.69	1005.69	1009.04	0.004873	14.70	7830.63	1171.12	1.00
SCR	39310	Rev BB FP	115111.00	992.00	1004.14	1004.14	1007.48	0.004928	14.68	7841.97	1184.07	1.01
SCR	39100	Rev BB FP	115111.00	990.00	1004.20	1001.97	1006.14	0.002266	11.20	10276.12	1302.03	0.70
SCR	38925	Rev BB FP	115111.00	989.50	1003.90	1001.28	1005.76	0.001836	10.94	10519.67	1177.05	0.65
SCR	38710	Rev BB FP	115111.00	988.00	1003.69	999.99	1005.37	0.001311	10.39	11078.47	1039.00	0.56
SCR	38475	Rev BB FP	115111.00	986.00	1000.24	1000.24	1004.59	0.004502	16.74	6875.81	795.53	1.00
SCR	38300	Rev BB FP	115111.00	985.50	998.05	997.52	1002.29	0.003650	16.53	6965.85	701.78	0.92
SCR	38065	Rev BB FP	115111.00	984.00	998.22	995.71	1001.31	0.002051	14.09	8168.84	678.40	0.72
SCR	37810	Rev BB FP	115111.00	983.00	995.21	995.21	1000.37	0.004314	18.21	6319.82	622.08	1.01
SCR	37655	Rev BB FP	115111.00	982.00	994.15	994.15	998.54	0.004123	16.80	6851.08	789.42	1.01
SCR	37390	Rev BB FP	115111.00	981.00	989.86	989.86	993.67	0.004341	15.72	7414.85	986.73	0.98
SCR	37135	Rev BB FP	115111.00	980.00	988.56	988.56	992.08	0.004805	15.06	7645.53	1091.59	1.00
SCR	36930	Rev BB FP	115111.00	978.00	987.71	986.88	990.46	0.003082	13.31	8648.06	1125.51	0.85
SCR	36735	Rev BB FP	115111.00	977.00	986.38	986.38	989.70	0.004220	14.61	7881.46	1194.24	1.00
SCR	36515	Rev BB FP	115111.00	975.00	986.32	985.26	988.59	0.002509	12.09	9521.48	1325.55	0.79
SCR	36265	Rev BB FP	115111.00	974.00	985.17	984.78	987.82	0.003492	13.07	8806.95	1373.08	0.91
SCR	36080	Rev BB FP	116236.00	973.00	984.11	984.11	987.01	0.005036	13.69	8492.54	1450.39	1.00
SCR	35845	Rev BB FP	116236.00	971.00	983.85	982.83	985.95	0.002440	11.61	10013.52	1478.08	0.79
SCR	35725	Rev BB FP	116236.00	970.00	982.55	982.55	985.50	0.003815	13.77	8438.90	1427.85	1.00
SCR	35515	Rev BB FP	116236.00	969.00	981.34	981.34	984.38	0.003984	13.99	8309.50	1362.77	1.00
SCR	35245	Rev BB FP	116236.00	968.00	980.14	980.14	983.10	0.004877	13.82	8434.21	1553.42	0.99
SCR	35040	Rev BB FP	116236.00	967.00	978.39	978.32	981.35	0.004794	13.81	8428.24	1401.79	0.98
SCR	34860	Rev BB FP	116236.00	966.00	977.44	977.44	980.48	0.004989	13.99	8307.51	1362.96	1.00
SCR	34720	Rev BB FP	116236.00	965.50	976.17	976.17	979.16	0.005117	13.87	8382.47	1419.56	1.01
SCR	34495	Rev BB FP	116236.00	964.00	974.28	974.28	977.32	0.004209	13.98	8313.86	1380.43	1.00
SCR	34310	Rev BB FP	116236.00	963.00	972.65	972.65	975.83	0.004062	14.32	8114.63	1297.65	1.01
SCR	34090	Rev BB FP	116236.00	962.00	971.64	971.64	974.82	0.004044	14.31	8123.85	1281.00	1.00
SCR	33880	Rev BB FP	116236.00	960.00	970.45	970.45	973.58	0.004005	14.20	8187.96	1320.08	1.00
SCR	33710	Rev BB FP	116236.00	959.00	969.26	969.26	972.35	0.004225	14.11	8238.14	1363.23	1.01
SCR	33500	Rev BB FP	116236.00	958.00	968.15	968.15	970.81	0.003739	13.10	8872.21	1690.39	1.01
SCR	33310	Rev BB FP	116236.00	957.00	967.01	967.01	969.61	0.003786	12.93	8986.36	1751.52	1.01
SCR	33115	Rev BB FP	116236.00	956.00	966.35	965.60	968.34	0.003605	11.33	10261.76	1811.54	0.84
SCR	32795	Rev BB FP	116236.00	954.00	964.95	964.63	967.26	0.003022	12.20	9528.82	1732.86	0.92
SCR	32605	Rev BB FP	116236.00	952.00	963.45	963.45	966.51	0.004030	14.05	8272.67	1344.60	1.00
SCR	32265	Rev BB FP	140776.00	950.00	961.37	961.37	964.12	0.004005	13.31	10579.17	1944.94	1.01
SCR	31875	Rev BB FP	140776.00	949.00	960.00	960.00	961.85	0.003750	10.91	12908.13	2482.20	0.84
SCR	31585	Rev BB FP	140776.00	946.00	957.67	956.99	959.64	0.003504	11.25	12511.05	2181.08	0.83
SCR	31360	Rev BB FP	140776.00	944.00	957.21	955.40	958.92	0.002285	10.51	13391.47	1875.23	0.69
SCR	31060	Rev BB FP	140776.00	942.00	957.24	953.29	958.34	0.000890	8.41	16729.49	1706.23	0.47
SCR	30720	Rev BB FP	140776.00	940.00	957.27	951.33	957.99	0.000542	6.81	20683.35	1886.90	0.36
SCR	30445	Rev BB FP	140776.00	938.00	957.20	949.57	957.83	0.000402	6.38	22074.12	1777.56	0.32
SCR	30095	Rev BB FP	140776.00	936.00	956.95	947.93	957.67	0.000462	6.82	20641.04	1666.43	0.34
SCR	29815	Rev BB FP	140776.00	935.00	956.59	948.10	957.51	0.000632	7.66	18372.99	1572.98	0.40
SCR	29565	Rev BB FP	140776.00	934.00	956.46	947.27	957.34	0.000612	7.51	18750.19	1613.45	0.39
SCR	29385	Rev BB FP	140776.00	933.00	956.05	948.99	957.18	0.000905	8.52	16517.20	1577.58	0.46
SCR	29140	Rev BB FP	140776.00	932.00	954.74	950.98	956.78	0.001928	11.47	12276.15	1324.48	0.66
SCR	28895	Rev BB FP	140776.00	930.00	951.63	951.63	955.99	0.002780	16.75	8402.32	965.72	1.00
SCR	28695	Rev BB FP	140776.00	928.00	947.85	947.85	953.31	0.004258	18.75	7507.53	701.05	1.01
SCR	28500	Rev BB FP	140776.00	927.50	945.09	945.09	951.16	0.003848	19.77	7160.17	654.24	0.99
SCR	28280	Rev BB FP	140776.00	926.00	941.65	941.65	947.91	0.004004	20.08	7009.50	562.69	1.00
SCR	28080	Rev BB FP	140776.00	925.00	942.26	940.11	946.59	0.002276	16.70	8441.98	682.92	0.80
SCR	27925	Rev BB FP	140776.00	924.00	940.35	939.49	946.04	0.003135	19.14	7355.35	549.81	0.92

HEC-RAS Plan: FinalEx025 River: Reach #1 Reach: SCR Profile: Rev BB FP (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
SCR	27725	Rev BB FP	140776.00	923.00	939.27	939.27	945.37	0.003256	19.81	7106.64	586.68	1.00
SCR	27545	Rev BB FP	140776.00	922.00	937.65	937.65	943.27	0.003489	19.04	7395.60	656.47	1.00
SCR	27335	Rev BB FP	140776.00	921.00	936.22	936.22	940.84	0.003040	17.25	8160.86	887.01	1.00
SCR	27155	Rev BB FP	140776.00	920.50	935.43	935.43	939.62	0.003289	16.42	8571.55	1033.54	1.01
SCR	26990	Rev BB FP	140776.00	920.00	933.74	933.74	937.63	0.003639	15.83	8895.76	1147.56	1.00
SCR	26780	Rev BB FP	140776.00	918.00	931.35	931.35	935.09	0.003642	15.50	9080.65	1213.45	1.00
SCR	26575	Rev BB FP	140776.00	917.00	930.61	929.96	933.73	0.003645	14.19	9923.76	1259.87	0.89
SCR	26355	Rev BB FP	140776.00	916.00	929.17	929.17	932.77	0.004708	15.22	9247.19	1278.41	1.00
SCR	26170	Rev BB FP	140776.00	915.00	928.86	928.12	931.70	0.003430	13.53	10408.48	1352.53	0.86
SCR	25965	Rev BB FP	140776.00	914.00	927.22	927.22	930.82	0.004764	15.21	9254.71	1290.20	1.00
SCR	25785	Rev BB FP	140776.00	913.50	926.05	926.05	929.53	0.004772	14.97	9402.31	1344.86	1.00
SCR	25600	Rev BB FP	140776.00	912.50	924.93	924.89	927.92	0.004891	13.87	10151.10	1661.55	0.99
SCR	25425	Rev BB FP	140776.00	911.00	925.37	923.83	927.03	0.001843	10.34	13664.53	2021.56	0.69
SCR	25215	Rev BB FP	140776.00	910.00	923.33	923.33	926.30	0.005117	13.83	10181.28	1732.15	1.01
SCR	25000	Rev BB FP	140776.00	909.00	922.13	922.13	924.61	0.003543	12.64	11135.49	2284.18	1.01
SCR	24795	Rev BB FP	140776.00	908.00	920.36	920.36	922.81	0.003986	12.56	11204.68	2315.50	1.01
SCR	24550	Rev BB FP	140776.00	906.00	919.48	917.96	920.95	0.001944	9.74	14446.28	2238.32	0.68
SCR	24335	Rev BB FP	140776.00	905.00	917.62	917.62	920.25	0.004333	12.99	10833.43	2087.54	1.01
SCR	24115	Rev BB FP	140776.00	904.00	915.93	915.93	918.60	0.005232	13.09	10751.27	2018.76	1.00
SCR	23975	Rev BB FP	140776.00	903.50	914.60	914.60	917.35	0.004636	13.31	10577.23	1919.34	1.00
SCR	23755	Rev BB FP	140776.00	902.00	913.25	913.24	916.01	0.004627	13.32	10567.82	1938.03	1.01
SCR	23565	Rev BB FP	140776.00	900.00	912.40	912.40	915.10	0.004610	13.17	10691.96	2036.28	1.01
SCR	23365	Rev BB FP	140776.00	900.00	911.13	911.13	914.01	0.004622	13.63	10329.86	1783.88	1.00
SCR	23180	Rev BB FP	140776.00	899.00	910.96	909.39	912.53	0.001984	10.05	14012.48	2086.48	0.68
SCR	23000	Rev BB FP	140776.00	898.00	910.89	908.39	912.14	0.001366	8.95	15727.65	2065.37	0.57
SCR	22790	Rev BB FP	140776.00	897.50	910.43	908.15	911.83	0.001448	9.49	14833.41	1946.22	0.61
SCR	22600	Rev BB FP	140776.00	896.00	910.14	907.56	911.55	0.001434	9.52	14788.10	1866.40	0.60
SCR	22415	Rev BB FP	140776.00	895.50	909.67	906.93	911.25	0.001552	10.10	13933.69	1712.91	0.62
SCR	22195	Rev BB FP	141426.00	894.00	906.88	906.88	910.54	0.003786	15.36	9204.46	1262.71	1.00
SCR	22010	Rev BB FP	141426.00	892.00	906.16	906.16	909.69	0.003347	15.08	9380.50	1322.09	1.00
SCR	21790	Rev BB FP	141426.00	891.50	904.86	904.86	908.08	0.002972	14.39	9826.50	1586.66	1.00
SCR	21615	Rev BB FP	141426.00	892.00	903.09	903.09	906.00	0.003182	13.67	10342.23	1845.66	1.00
SCR	21440	Rev BB FP	141426.00	890.00	901.21	901.21	904.53	0.003865	14.61	9680.27	1773.54	1.00
SCR	21225	Rev BB FP	141426.00	888.00	899.81	899.81	902.28	0.003807	12.60	11221.48	2263.50	1.00
SCR	21020	Rev BB FP	141426.00	887.00	897.42	897.42	900.35	0.003921	13.75	10350.76	1908.44	0.99
SCR	20845	Rev BB FP	141426.00	886.00	897.00	897.00	899.41	0.003869	12.46	11348.13	2407.34	1.01
SCR	20595	Rev BB FP	141426.00	885.00	896.43	895.88	898.31	0.002651	10.99	12863.10	2527.28	0.86
SCR	20435	Rev BB FP	141426.00	884.00	896.19	895.33	897.84	0.002261	10.32	13709.67	2581.09	0.79
SCR	20280	Rev BB FP	141426.00	883.70	895.03	895.03	897.31	0.003977	12.14	11653.22	2572.83	1.00
SCR	20070	Rev BB FP	141426.00	882.00	892.74	892.74	895.13	0.003743	12.41	11394.63	2436.05	1.01
SCR	19855	Rev BB FP	141426.00	880.50	891.12	891.12	893.79	0.004114	13.12	10778.78	2072.85	1.01
SCR	19630	Rev BB FP	141426.00	880.00	889.83	889.73	892.52	0.003926	13.17	10735.19	1914.99	0.98
SCR	19440	Rev BB FP	141426.00	878.00	889.91	888.74	891.71	0.002179	10.75	13151.45	2083.68	0.75
SCR	19240	Rev BB FP	141426.00	877.50	888.85	888.46	891.14	0.003158	12.14	11650.49	2090.11	0.91
SCR	19050	Rev BB FP	141426.00	876.00	889.03	887.20	890.46	0.001682	9.60	14759.68	2167.39	0.64
SCR	18830	Rev BB FP	141426.00	874.00	888.73	886.52	890.09	0.001481	9.34	15134.89	2098.85	0.61
SCR	18650	Rev BB FP	141426.00	873.50	888.68	885.42	889.80	0.001016	8.50	16644.25	2025.07	0.52
SCR	18475	Rev BB FP	141426.00	872.00	888.66	884.58	889.58	0.000752	7.70	18373.58	1945.01	0.44
SCR	18290	Rev BB FP	141426.00	871.50	888.41	884.39	889.43	0.000811	8.11	17448.54	1844.66	0.46
SCR	18025	Rev BB FP	141426.00	870.00	888.32	882.81	889.21	0.000556	7.57	18674.68	1611.77	0.39
SCR	17785	Rev BB FP	141426.00	868.00	887.90	882.80	889.03	0.000782	8.54	16558.68	1418.63	0.44
SCR	17510	Rev BB FP	141426.00	867.50	886.20	883.72	888.57	0.002372	12.34	11457.08	1289.70	0.73
SCR	17360	Rev BB FP	141426.00	866.50	883.43	883.43	887.88	0.004458	16.92	8357.42	937.14	1.00
SCR	17110	Rev BB FP	141426.00	864.00	881.13	881.13	884.63	0.004863	15.00	9425.53	1362.48	1.01
SCR	16970	Rev BB FP	141426.00	863.70	879.71	879.71	882.95	0.004916	14.43	9799.49	1514.81	1.00
SCR	16720	Rev BB FP	141426.00	863.50	875.31	875.31	878.43	0.005042	14.17	9981.85	1620.98	1.01
SCR	16515	Rev BB FP	141426.00	862.00	873.47	873.47	876.26	0.005133	13.41	10549.67	1886.90	1.00
SCR	16305	Rev BB FP	141426.00	860.00	871.57	871.17	874.03	0.004195	12.59	11236.89	1898.55	0.91
SCR	16130	Rev BB FP	141426.00	860.00	870.50	870.50	873.24	0.004481	13.29	10641.43	1964.99	1.01
SCR	15960	Rev BB FP	141426.00	859.00	869.21	869.21	871.76	0.004764	12.82	11034.61	2192.96	1.01
SCR	15745	Rev BB FP	141426.00	858.00	868.55	867.80	870.41	0.003042	10.94	12927.79	2278.92	0.81
SCR	15540	Rev BB FP	141426.00	857.50	868.10	867.08	869.78	0.002644	10.40	13602.23	2324.38	0.76
SCR	15335	Rev BB FP	141426.00	856.00	866.54	866.54	868.99	0.004652	12.57	11254.13	2302.38	1.00
SCR	15125	Rev BB FP	142475.00	854.00	864.54	864.54	867.47	0.004356	13.74	10371.47	1768.96	1.00
SCR	14900	Rev BB FP	142475.00	853.00	863.28	863.28	866.30	0.005056	13.96	10205.62	1697.82	1.00
SCR	14720	Rev BB FP	142475.00	852.00	862.06	862.06	864.98	0.004688	13.72	10381.85	1810.00	1.01
SCR	14480	Rev BB FP	142475.00	850.50	860.54	860.53	863.45	0.004424	13.69	10409.04	1796.48	1.00
SCR	14315	Rev BB FP	142475.00	850.00	859.85	859.82	862.67	0.004566	13.47	10576.74	1874.03	1.00
SCR	14090	Rev BB FP	142475.00	849.71	858.68	858.68	861.60	0.004613	13.72	10387.90	1766.91	1.00
SCR	13850	Rev BB FP	142475.00	848.00	857.12	857.12	860.09	0.004634	13.84	10293.87	1731.37	1.00
SCR	13635	Rev BB FP	142475.00	846.00	855.96	855.96	859.00	0.004582	13.99	10182.29	1687.45	1.00
SCR	13425	Rev BB FP	142475.00	845.00	854.59	854.59	857.38	0.004390	13.41	10627.77	1893.46	1.00
SCR	13190	Rev BB FP	142475.00	844.00	853.13	852.76	855.64	0.003872	12.71	11213.28	1844.92	0.91
SCR	13030	Rev BB FP	142475.00	843.00	852.67	851.98	855.02	0.003287	12.32	11565.85	1764.20	0.85
SCR	12835	Rev BB FP	142475.00	842.00	852.13	851.03	854.41	0.002756	12.10	11770.00	1607.56	0.79
SCR	12615	Rev BB FP	142475.00	841.00	851.84	849.84	853.81	0.001933	11.27	12646.02	1470.54	0.68
SCR	12395	Rev BB FP	142475.00	840.00	851.49	849.20	853.39	0.001707	11.07	12874.21	1438.10	0.65
SCR	12195	Rev BB FP	142475.00	838.98	851.43	848.08	853.01	0.001240	10.08	14130.68	1388.77	0.56

HEC-RAS Plan: FinalEx025 River: Reach #1 Reach: SCR Profile: Rev BB FP (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
SCR	11995	Rev BB FP	142475.00	837.00	850.69	848.07	852.68	0.001558	11.32	12590.58	1281.38	0.64
SCR	11780	Rev BB FP	142475.00	836.00	850.53	847.67	852.30	0.001399	10.65	13373.20	1402.92	0.61
SCR	11605	Rev BB FP	142475.00	835.50	849.74	847.20	851.99	0.001650	12.04	11832.96	1304.15	0.70
SCR	11405	Rev BB FP	142475.00	834.00	849.43	846.23	851.67	0.001422	12.02	11855.13	1132.15	0.65
SCR	11180	Rev BB FP	142475.00	833.00	847.64	845.64	851.13	0.002642	14.99	9504.91	868.52	0.80
SCR	11015	Rev BB FP	142475.00	831.50	844.84	844.84	850.40	0.003841	18.92	7530.61	680.33	1.00
SCR	10835	Rev BB FP	142475.00	831.00	843.79	843.79	848.64	0.003827	17.68	8059.61	834.48	1.00
SCR	10575	Rev BB FP	142475.00	830.00	840.17	840.17	844.13	0.004307	15.98	8918.16	1127.52	1.00
SCR	10390	Rev BB FP	142475.00	828.00	839.47	838.56	842.17	0.002692	13.18	10811.18	1390.10	0.83
SCR	10225	Rev BB FP	142475.00	827.50	838.21	838.21	841.57	0.004024	14.72	9676.62	1447.21	1.00
SCR	10000	Rev BB FP	142475.00	826.00	837.11	837.11	840.43	0.004013	14.62	9744.75	1487.06	1.01
SCR	9820	Rev BB FP	142475.00	824.00	835.35	835.35	838.82	0.004324	14.95	9530.31	1373.15	1.00
SCR	9595	Rev BB FP	142475.00	823.80	834.12	834.12	837.42	0.004911	14.58	9769.14	1619.44	1.00
SCR	9385	Rev BB FP	142475.00	823.00	833.11	833.11	836.03	0.005066	13.73	10378.48	1773.73	1.00
SCR	9220	Rev BB FP	142475.00	822.00	831.81	831.81	834.72	0.004539	13.68	10412.72	1813.72	1.01
SCR	9025	Rev BB FP	142475.00	821.00	830.41	830.41	833.36	0.004214	13.77	10347.97	1751.71	1.00

HEC-RAS Plan: Exist025 River: Reach #1 Reach: SCR Profile: Rev BB FP

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
SCR	46195	Rev BB FP	115111.00	1035.00	1053.14	1054.04	1060.43	0.005006	21.67	5313.11	452.97	1.11
SCR	46020	Rev BB FP	115111.00	1032.00	1050.08	1052.47	1059.13	0.008742	24.14	4768.34	520.89	1.41
SCR	45545	Rev BB FP	115111.00	1030.00	1049.23	1049.27	1055.65	0.004028	20.33	5661.33	446.68	1.01
SCR	45030	Rev BB FP	115111.00	1025.00	1041.51	1044.56	1052.09	0.010535	26.10	4410.21	492.54	1.54
SCR	44585	Rev BB FP	115111.00	1022.00	1043.05	1043.07	1048.75	0.004190	19.17	6004.20	531.91	1.01
SCR	44210	Rev BB FP	115111.00	1020.00	1035.36	1038.72	1045.99	0.009463	26.16	4399.47	452.62	1.48
SCR	43820	Rev BB FP	115111.00	1018.00	1037.47	1037.48	1043.62	0.004072	19.90	5785.33	476.53	1.01
SCR	43610	Rev BB FP	115111.00	1017.00	1030.80	1034.06	1041.87	0.010066	26.70	4311.38	450.58	1.52
SCR	43410	Rev BB FP	115111.00	1016.00	1027.33	1031.12	1039.61	0.011140	28.77	4308.74	583.44	1.61
SCR	43200	Rev BB FP	115111.00	1014.00	1026.42	1029.64	1036.81	0.010596	26.11	4615.54	689.15	1.54
SCR	42975	Rev BB FP	115111.00	1012.00	1022.84	1026.28	1033.82	0.016328	26.63	4368.50	735.12	1.82
SCR	42815	Rev BB FP	115111.00	1011.00	1021.61	1024.35	1030.50	0.016385	24.07	4833.92	878.46	1.78
SCR	42590	Rev BB FP	115111.00	1010.00	1018.93	1021.36	1026.81	0.014228	22.59	5182.81	1023.20	1.67
SCR	42430	Rev BB FP	115111.00	1008.00	1017.64	1019.62	1024.35	0.011522	20.83	5543.00	940.48	1.51
SCR	42215	Rev BB FP	115111.00	1006.00	1020.27	1017.68	1021.96	0.001717	10.44	11089.91	1310.38	0.62
SCR	41940	Rev BB FP	115111.00	1005.00	1019.29	1017.71	1021.37	0.002407	11.57	9983.36	1321.54	0.72
SCR	41730	Rev BB FP	115111.00	1004.00	1018.72	1016.50	1020.86	0.002272	11.75	9825.95	1229.51	0.71
SCR	41460	Rev BB FP	115111.00	1002.00	1018.21	1015.19	1020.27	0.002042	11.52	10032.38	1329.00	0.68
SCR	41280	Rev BB FP	115111.00	1001.00	1015.33	1015.33	1019.53	0.004491	16.45	7022.85	852.07	1.00
SCR	41080	Rev BB FP	115111.00	1000.00	1012.07	1013.56	1018.19	0.007468	19.90	5831.66	874.23	1.27
SCR	40825	Rev BB FP	115111.00	999.50	1010.96	1012.05	1016.00	0.007253	18.03	6438.62	1039.92	1.22
SCR	40585	Rev BB FP	115111.00	998.00	1009.71	1010.43	1014.18	0.006366	16.97	6789.33	1005.89	1.15
SCR	40335	Rev BB FP	115111.00	996.00	1010.45	1008.78	1012.35	0.002164	11.11	10609.98	1504.81	0.69
SCR	40130	Rev BB FP	115111.00	995.00	1010.11	1008.56	1011.91	0.001844	11.15	11289.76	1636.51	0.65
SCR	39945	Rev BB FP	115111.00	994.00	1010.06	1007.77	1011.51	0.001383	10.26	12565.23	1648.10	0.57
SCR	39755	Rev BB FP	115111.00	994.00	1007.49	1007.49	1010.91	0.003380	15.35	8268.30	1251.38	0.88
SCR	39605	Rev BB FP	115111.00	993.00	1004.42	1005.91	1010.00	0.006738	19.35	6391.72	1100.64	1.21
SCR	39310	Rev BB FP	115111.00	992.00	1004.42	1004.43	1007.98	0.003512	16.00	8178.22	1204.45	0.90
SCR	39100	Rev BB FP	115111.00	990.00	1004.09	1002.13	1006.32	0.001898	12.37	10137.42	1294.76	0.67
SCR	38925	Rev BB FP	115111.00	989.50	1003.99	1001.39	1005.92	0.001609	11.40	10622.64	1181.25	0.62
SCR	38710	Rev BB FP	115111.00	988.00	1003.86	1000.10	1005.55	0.001174	10.64	11255.51	1043.10	0.54
SCR	38475	Rev BB FP	115111.00	986.00	999.95	999.95	1004.77	0.004258	17.75	6650.60	755.44	1.00
SCR	38300	Rev BB FP	115111.00	985.50	995.32	997.52	1003.33	0.010251	22.72	5066.81	688.08	1.48
SCR	38065	Rev BB FP	115111.00	984.00	998.22	995.71	1001.30	0.002055	14.10	8164.12	678.33	0.72
SCR	37810	Rev BB FP	115111.00	983.00	995.23	995.23	1000.37	0.004288	18.18	6332.08	622.26	1.00
SCR	37655	Rev BB FP	115111.00	982.00	992.29	994.08	999.27	0.008545	21.19	5432.74	735.92	1.37
SCR	37390	Rev BB FP	115111.00	981.00	987.15	989.88	996.01	0.016577	23.93	4834.54	892.17	1.79
SCR	37135	Rev BB FP	115111.00	980.00	987.96	988.63	992.27	0.005950	17.03	6995.53	1088.87	1.12
SCR	36930	Rev BB FP	115111.00	978.00	985.90	987.06	990.89	0.006968	18.32	6620.06	1112.00	1.22
SCR	36735	Rev BB FP	115111.00	977.00	986.56	986.56	989.87	0.003887	15.01	8085.46	1195.65	0.95
SCR	36515	Rev BB FP	115111.00	975.00	984.57	985.42	988.79	0.005510	16.72	7222.58	1306.12	1.15
SCR	36265	Rev BB FP	115111.00	974.00	985.18	984.77	987.82	0.003461	13.04	8831.00	1373.13	0.91
SCR	36080	Rev BB FP	116236.00	973.00	984.66	984.08	987.09	0.003700	12.52	9300.75	1455.39	0.87
SCR	35845	Rev BB FP	116236.00	971.00	984.52	982.90	986.31	0.001825	10.87	11007.98	1496.24	0.68
SCR	35725	Rev BB FP	116236.00	970.00	982.95	982.95	985.91	0.003125	14.70	9008.65	1431.18	0.89
SCR	35515	Rev BB FP	116236.00	969.00	980.94	981.76	985.02	0.004605	17.09	7764.83	1353.35	1.05
SCR	35245	Rev BB FP	116236.00	968.00	980.49	980.49	983.46	0.003192	14.46	8982.03	1555.54	0.88
SCR	35040	Rev BB FP	116236.00	967.00	977.69	978.97	982.44	0.005403	19.45	7455.95	1355.85	1.12
SCR	34860	Rev BB FP	116236.00	966.00	976.05	977.44	981.12	0.008289	18.06	6434.79	1338.93	1.45
SCR	34720	Rev BB FP	116236.00	965.50	974.77	976.17	979.89	0.008895	18.15	6402.85	1411.51	1.50
SCR	34495	Rev BB FP	116236.00	964.00	972.85	974.28	977.92	0.008678	18.08	6430.24	1277.15	1.42
SCR	34310	Rev BB FP	116236.00	963.00	971.99	973.01	976.49	0.005449	17.60	7261.34	1280.76	1.11
SCR	34090	Rev BB FP	116236.00	962.00	970.59	971.64	975.16	0.006767	17.15	6777.33	1267.83	1.31
SCR	33880	Rev BB FP	116236.00	960.00	969.84	970.46	973.69	0.005376	15.75	7378.62	1310.60	1.17
SCR	33710	Rev BB FP	116236.00	959.00	968.38	969.29	972.62	0.006666	16.53	7033.51	1355.12	1.28
SCR	33500	Rev BB FP	116236.00	958.00	967.50	968.41	971.14	0.005805	15.77	7888.10	1474.27	1.09
SCR	33310	Rev BB FP	116236.00	957.00	966.06	967.01	969.97	0.006404	15.86	7329.57	1744.50	1.36
SCR	33115	Rev BB FP	116236.00	956.00	964.72	965.60	968.46	0.008533	15.52	7488.40	1573.15	1.25
SCR	32795	Rev BB FP	116236.00	954.00	964.95	964.63	967.26	0.003022	12.20	9528.82	1732.86	0.92
SCR	32605	Rev BB FP	116236.00	952.00	963.45	963.45	966.51	0.004030	14.05	8272.67	1344.60	1.00
SCR	32265	Rev BB FP	140776.00	950.00	960.23	961.30	964.55	0.007315	16.68	8441.17	1829.94	1.37
SCR	31875	Rev BB FP	140776.00	949.00	960.00	960.00	961.85	0.003638	10.91	12908.13	2482.20	0.84
SCR	31585	Rev BB FP	140776.00	946.00	955.82	956.99	960.09	0.008524	16.58	8491.87	2120.30	1.46
SCR	31360	Rev BB FP	140776.00	944.00	957.86	955.39	959.33	0.001452	9.77	14613.64	1884.43	0.60
SCR	31060	Rev BB FP	140776.00	942.00	957.92	953.29	958.88	0.000719	7.87	17898.38	1711.46	0.43
SCR	30720	Rev BB FP	140776.00	940.00	957.97	951.33	958.60	0.000397	6.40	22006.92	1891.72	0.33
SCR	30445	Rev BB FP	140776.00	938.00	957.92	949.57	958.49	0.000300	6.03	23359.04	1783.69	0.29
SCR	30095	Rev BB FP	140776.00	936.00	957.70	947.93	958.38	0.000278	6.61	21917.00	1730.34	0.28
SCR	29815	Rev BB FP	140776.00	935.00	957.38	948.10	958.27	0.000356	7.69	19642.02	1675.19	0.32
SCR	29565	Rev BB FP	140776.00	934.00	957.34	947.27	958.16	0.000326	7.37	20205.72	1717.44	0.32
SCR	29385	Rev BB FP	140776.00	933.00	956.99	948.97	958.07	0.000447	8.49	18042.34	1675.09	0.37
SCR	29140	Rev BB FP	140776.00	932.00	956.33	950.98	957.88	0.000774	10.06	14550.84	1557.60	0.50
SCR	28895	Rev BB FP	140776.00	930.00	952.39	952.39	957.25	0.002389	19.66	9168.94	1062.28	0.82
SCR	28695	Rev BB FP	140776.00	928.00	943.96	947.96	955.72	0.008766	27.52	5115.18	544.92	1.58
SCR	28500	Rev BB FP	140776.00	927.50	941.05	945.12	953.77	0.010388	28.62	4919.56	503.65	1.61
SCR	28280	Rev BB FP	140776.00	926.00	937.77	941.83	951.33	0.011163	29.67	4853.18	549.28	1.63
SCR	28080	Rev BB FP	140776.00	925.00	936.42	940.05	948.69	0.011257	28.14	5027.76	547.57	1.61
SCR	27925	Rev BB FP	140776.00	924.00	941.45	939.47	946.43	0.002376	17.95	7989.60	612.66	0.80

HEC-RAS Plan: Exist025 River: Reach #1 Reach: SCR Profile: Rev BB FP (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
SCR	27725	Rev BB FP	140776.00	923.00	939.31	939.31	945.73	0.003230	20.54	7126.85	587.11	0.93
SCR	27545	Rev BB FP	140776.00	922.00	935.22	937.81	944.62	0.006843	24.72	5836.41	613.02	1.30
SCR	27335	Rev BB FP	140776.00	921.00	932.95	936.26	942.99	0.008302	25.48	5614.41	691.02	1.43
SCR	27155	Rev BB FP	140776.00	920.50	933.67	935.89	940.99	0.005311	22.28	6835.79	856.59	1.15
SCR	26990	Rev BB FP	140776.00	920.00	931.16	933.85	939.67	0.010073	23.47	6088.49	1008.19	1.60
SCR	26780	Rev BB FP	140776.00	918.00	929.02	931.73	937.60	0.009537	23.94	6335.41	1131.68	1.49
SCR	26575	Rev BB FP	140776.00	917.00	928.01	929.98	934.86	0.012746	21.01	6701.47	1216.43	1.57
SCR	26355	Rev BB FP	140776.00	916.00	929.42	929.42	933.07	0.003461	15.83	9559.47	1282.38	0.93
SCR	26170	Rev BB FP	140776.00	915.00	927.98	928.71	932.32	0.003988	17.96	9212.09	1347.94	0.97
SCR	25965	Rev BB FP	140776.00	914.00	927.00	927.74	931.48	0.004061	17.92	8960.72	1288.34	0.98
SCR	25785	Rev BB FP	140776.00	913.50	925.20	926.55	930.53	0.005499	19.54	8264.34	1336.94	1.12
SCR	25600	Rev BB FP	140776.00	912.50	923.79	925.47	929.42	0.006077	20.55	8274.40	1596.52	1.22
SCR	25425	Rev BB FP	140776.00	911.00	922.33	924.23	928.17	0.007953	20.02	7791.92	1773.81	1.45
SCR	25215	Rev BB FP	140776.00	910.00	923.61	923.61	926.64	0.003392	14.51	10667.78	1748.60	0.91
SCR	25000	Rev BB FP	140776.00	909.00	921.22	922.50	925.58	0.005503	17.42	9139.37	2103.24	1.17
SCR	24795	Rev BB FP	140776.00	908.00	919.43	920.87	924.26	0.006914	18.97	9060.11	2311.66	1.32
SCR	24550	Rev BB FP	140776.00	906.00	916.77	918.41	922.31	0.009115	21.33	8402.41	2227.03	1.61
SCR	24335	Rev BB FP	140776.00	905.00	918.13	918.13	920.69	0.003234	14.49	11895.55	2089.54	0.88
SCR	24115	Rev BB FP	140776.00	904.00	915.09	916.28	919.48	0.007920	18.83	9045.64	2015.76	1.28
SCR	23975	Rev BB FP	140776.00	903.50	913.66	914.88	918.15	0.008173	19.03	8772.57	1913.65	1.36
SCR	23755	Rev BB FP	140776.00	902.00	912.91	913.54	916.35	0.005642	16.73	9905.28	1935.37	1.16
SCR	23565	Rev BB FP	140776.00	900.00	912.71	912.71	915.32	0.003871	14.47	11321.84	2039.50	0.98
SCR	23365	Rev BB FP	140776.00	900.00	910.76	911.37	914.32	0.005655	17.04	9677.26	1781.35	1.14
SCR	23180	Rev BB FP	140776.00	899.00	910.83	909.87	912.71	0.002065	13.16	13743.03	2084.20	0.71
SCR	23000	Rev BB FP	140776.00	898.00	911.00	908.40	912.22	0.001301	8.88	15943.92	2069.07	0.55
SCR	22790	Rev BB FP	140776.00	897.50	910.57	908.15	911.92	0.001363	9.35	15109.43	1949.00	0.58
SCR	22600	Rev BB FP	140776.00	896.00	910.06	907.78	911.63	0.001473	11.36	14637.21	1865.20	0.62
SCR	22415	Rev BB FP	140776.00	895.50	909.56	907.11	911.33	0.001596	11.77	13743.30	1705.56	0.65
SCR	22195	Rev BB FP	141426.00	894.00	907.70	906.79	910.76	0.002704	14.10	10265.56	1322.24	0.83
SCR	22010	Rev BB FP	141426.00	892.00	906.38	906.38	910.15	0.003030	15.99	9665.26	1328.02	0.87
SCR	21790	Rev BB FP	141426.00	891.50	903.07	904.87	909.03	0.005884	19.68	7429.43	1145.70	1.16
SCR	21615	Rev BB FP	141426.00	892.00	900.50	903.04	907.59	0.010112	21.40	6678.16	1161.25	1.52
SCR	21440	Rev BB FP	141426.00	890.00	899.69	901.59	905.74	0.007634	20.12	7633.81	1574.63	1.29
SCR	21225	Rev BB FP	141426.00	888.00	898.62	900.27	903.89	0.007531	19.45	8509.78	2217.71	1.27
SCR	21020	Rev BB FP	141426.00	887.00	895.89	897.85	902.14	0.008670	20.80	7679.38	1676.42	1.37
SCR	20845	Rev BB FP	141426.00	886.00	896.38	897.38	900.20	0.005510	17.07	9870.72	2369.34	1.13
SCR	20595	Rev BB FP	141426.00	885.00	895.93	896.42	898.91	0.003386	15.17	11611.25	2463.72	0.88
SCR	20435	Rev BB FP	141426.00	884.00	896.23	895.77	898.29	0.002186	12.93	13821.87	2582.65	0.72
SCR	20280	Rev BB FP	141426.00	883.70	895.55	895.55	897.86	0.002944	13.96	13014.40	2589.59	0.82
SCR	20070	Rev BB FP	141426.00	882.00	891.22	893.00	896.57	0.008994	20.19	8211.27	1767.50	1.37
SCR	19855	Rev BB FP	141426.00	880.50	890.43	891.49	894.67	0.005944	17.83	9393.73	1975.10	1.14
SCR	19630	Rev BB FP	141426.00	880.00	888.94	890.05	893.30	0.006239	17.86	9074.12	1836.22	1.18
SCR	19440	Rev BB FP	141426.00	878.00	890.13	889.11	892.07	0.001973	11.94	13611.33	2095.28	0.70
SCR	19240	Rev BB FP	141426.00	877.50	888.88	888.88	891.51	0.003097	13.92	11714.43	2091.68	0.88
SCR	19050	Rev BB FP	141426.00	876.00	888.85	887.51	890.49	0.001803	10.96	14382.18	2160.84	0.67
SCR	18830	Rev BB FP	141426.00	874.00	888.56	886.80	890.10	0.001579	10.67	14781.82	2094.37	0.64
SCR	18650	Rev BB FP	141426.00	873.50	888.48	886.00	889.80	0.001087	9.89	16256.74	2022.74	0.53
SCR	18475	Rev BB FP	141426.00	872.00	888.57	884.72	889.53	0.000774	8.07	18194.47	1944.40	0.45
SCR	18290	Rev BB FP	141426.00	871.50	888.27	884.54	889.37	0.000832	8.69	17186.39	1843.67	0.47
SCR	18025	Rev BB FP	141426.00	870.00	888.21	882.91	889.13	0.000573	7.83	18485.26	1610.91	0.40
SCR	17785	Rev BB FP	141426.00	868.00	887.78	882.81	888.95	0.000788	8.71	16382.46	1417.47	0.44
SCR	17510	Rev BB FP	141426.00	867.50	885.46	883.72	888.44	0.001981	13.95	10512.58	1243.63	0.75
SCR	17360	Rev BB FP	141426.00	866.50	883.40	883.40	887.90	0.003623	17.03	8326.59	936.59	1.00
SCR	17110	Rev BB FP	141426.00	864.00	879.37	881.59	886.46	0.006287	21.70	7106.91	1274.30	1.26
SCR	16970	Rev BB FP	141426.00	863.70	877.33	880.05	885.35	0.008185	22.92	6449.08	1125.59	1.47
SCR	16720	Rev BB FP	141426.00	863.50	872.47	875.45	882.24	0.018432	25.15	5735.17	1404.63	2.00
SCR	16515	Rev BB FP	141426.00	862.00	871.52	873.72	878.33	0.012326	21.45	7010.27	1622.64	1.67
SCR	16305	Rev BB FP	141426.00	860.00	869.61	871.44	875.64	0.011136	21.47	7604.36	1812.82	1.64
SCR	16130	Rev BB FP	141426.00	860.00	870.19	870.71	873.47	0.005291	16.06	10039.66	1945.14	1.17
SCR	15960	Rev BB FP	141426.00	859.00	868.27	869.21	872.12	0.010630	15.80	8986.11	2180.88	1.37
SCR	15745	Rev BB FP	141426.00	858.00	868.57	867.78	870.42	0.002999	10.93	12967.71	2278.98	0.82
SCR	15540	Rev BB FP	141426.00	857.50	868.06	867.17	869.80	0.002688	11.03	13523.49	2324.20	0.78
SCR	15335	Rev BB FP	141426.00	856.00	866.50	866.50	869.00	0.004731	12.68	11164.20	2302.06	1.01
SCR	15125	Rev BB FP	142475.00	854.00	863.64	864.54	867.69	0.006528	16.15	8838.57	1618.47	1.21
SCR	14900	Rev BB FP	142475.00	853.00	863.42	863.42	866.43	0.004130	14.54	10443.91	1704.50	0.99
SCR	14720	Rev BB FP	142475.00	852.00	861.25	862.19	865.34	0.007984	16.84	8931.26	1763.49	1.25
SCR	14480	Rev BB FP	142475.00	850.50	860.73	860.73	863.62	0.004264	14.25	10759.99	1801.68	0.95
SCR	14315	Rev BB FP	142475.00	850.00	859.35	859.82	862.74	0.006080	14.79	9631.06	1868.05	1.15
SCR	14090	Rev BB FP	142475.00	849.71	858.67	858.67	861.61	0.004639	13.75	10362.56	1766.78	1.00
SCR	13850	Rev BB FP	142475.00	848.00	856.44	857.11	860.23	0.006745	15.61	9128.71	1727.26	1.20
SCR	13635	Rev BB FP	142475.00	846.00	856.32	856.32	859.30	0.003797	15.41	10784.75	1691.89	0.92
SCR	13425	Rev BB FP	142475.00	845.00	853.32	854.58	857.95	0.009231	17.28	8245.16	1854.35	1.44
SCR	13190	Rev BB FP	142475.00	844.00	853.50	852.81	855.77	0.003210	12.22	11882.13	1847.29	0.83
SCR	13030	Rev BB FP	142475.00	843.00	852.58	852.27	855.21	0.003375	14.20	11409.44	1763.01	0.87
SCR	12835	Rev BB FP	142475.00	842.00	852.13	851.23	854.54	0.002745	13.33	11764.70	1607.52	0.79
SCR	12615	Rev BB FP	142475.00	841.00	851.89	850.08	853.94	0.001885	12.39	12717.39	1471.01	0.67
SCR	12395	Rev BB FP	142475.00	840.00	851.51	849.52	853.56	0.001691	12.30	12903.96	1438.40	0.65
SCR	12195	Rev BB FP	142475.00	838.98	851.52	848.24	853.15	0.001176	10.57	14261.92	1389.31	0.54

HEC-RAS Plan: Exist025 River: Reach #1 Reach: SCR Profile: Rev BB FP (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
SCR	11995	Rev BB FP	142475.00	837.00	850.66	848.45	852.83	0.001570	12.69	12550.93	1281.09	0.63
SCR	11780	Rev BB FP	142475.00	836.00	850.43	848.15	852.47	0.001415	12.50	13224.83	1400.85	0.61
SCR	11605	Rev BB FP	142475.00	835.50	849.24	847.41	852.11	0.001889	14.05	11187.38	1282.91	0.70
SCR	11405	Rev BB FP	142475.00	834.00	849.07	846.17	851.69	0.001520	13.18	11445.85	1130.21	0.64
SCR	11180	Rev BB FP	142475.00	833.00	846.89	845.65	851.10	0.002564	16.60	8864.64	835.68	0.82
SCR	11015	Rev BB FP	142475.00	831.50	844.78	844.78	850.43	0.003842	19.08	7493.10	679.39	0.99
SCR	10835	Rev BB FP	142475.00	831.00	841.87	843.71	849.32	0.007252	21.91	6502.00	790.38	1.35
SCR	10575	Rev BB FP	142475.00	830.00	837.48	840.15	846.52	0.015561	24.13	5904.16	1108.84	1.84
SCR	10390	Rev BB FP	142475.00	828.00	836.77	839.07	843.84	0.008394	22.72	7222.47	1247.06	1.37
SCR	10225	Rev BB FP	142475.00	827.50	837.04	837.97	841.97	0.006870	17.83	8045.11	1373.79	1.26
SCR	10000	Rev BB FP	142475.00	826.00	837.14	837.14	840.54	0.003943	14.90	9785.52	1488.00	0.96
SCR	9820	Rev BB FP	142475.00	824.00	833.97	835.33	839.34	0.008494	18.59	7663.39	1336.56	1.37
SCR	9595	Rev BB FP	142475.00	823.80	834.13	834.13	837.42	0.004885	14.56	9782.42	1619.67	1.00
SCR	9385	Rev BB FP	142475.00	823.00	832.49	833.19	836.23	0.006100	15.78	9290.53	1770.37	1.19
SCR	9220	Rev BB FP	142475.00	822.00	830.86	831.81	835.03	0.007826	16.39	8703.86	1771.40	1.29
SCR	9025	Rev BB FP	142475.00	821.00	829.91	830.57	833.69	0.005308	15.90	9468.27	1736.85	1.09

HEC-RAS Plan: Exist085 River: Reach #1 Reach: SCR Profile: Rev BB FP

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
SCR	46195	Rev BB FP	115111.00	1035.00	1063.12	1054.04	1064.77	0.006261	10.67	11871.29	750.83	0.40
SCR	46020	Rev BB FP	115111.00	1032.00	1062.02	1052.44	1063.64	0.006544	10.21	11277.79	570.22	0.40
SCR	45545	Rev BB FP	115111.00	1030.00	1057.85	1049.24	1059.95	0.008982	11.63	9899.97	524.21	0.47
SCR	45030	Rev BB FP	115111.00	1025.00	1054.23	1044.56	1055.89	0.006629	10.33	11145.02	557.97	0.41
SCR	44585	Rev BB FP	115111.00	1022.00	1050.60	1043.05	1052.39	0.009283	10.74	10717.84	654.38	0.47
SCR	44210	Rev BB FP	115111.00	1020.00	1047.82	1038.72	1049.37	0.006715	9.97	11549.51	619.95	0.41
SCR	43820	Rev BB FP	115111.00	1018.00	1042.08	1037.47	1045.21	0.017543	14.19	8110.90	528.66	0.64
SCR	43610	Rev BB FP	115111.00	1017.00	1038.23	1034.06	1041.46	0.018865	14.41	7990.36	536.80	0.66
SCR	43410	Rev BB FP	115111.00	1016.00	1035.79	1031.12	1038.20	0.012067	13.28	9810.14	728.75	0.55
SCR	43200	Rev BB FP	115111.00	1014.00	1033.10	1029.61	1035.55	0.014949	13.11	9560.66	778.14	0.59
SCR	42975	Rev BB FP	115111.00	1012.00	1030.64	1026.26	1032.42	0.011936	11.00	11112.26	949.35	0.52
SCR	42815	Rev BB FP	115111.00	1011.00	1029.16	1024.33	1030.46	0.009556	9.36	12874.92	1127.61	0.46
SCR	42590	Rev BB FP	115111.00	1010.00	1027.80	1021.36	1028.70	0.005956	7.80	15371.44	1205.17	0.37
SCR	42430	Rev BB FP	115111.00	1008.00	1026.93	1019.62	1027.77	0.005204	7.44	16206.52	1593.65	0.35
SCR	42215	Rev BB FP	115111.00	1006.00	1026.19	1017.68	1026.77	0.003645	6.26	20044.60	1904.81	0.29
SCR	41940	Rev BB FP	115111.00	1005.00	1025.09	1017.71	1025.71	0.004124	6.42	19333.12	2049.42	0.31
SCR	41730	Rev BB FP	115111.00	1004.00	1024.06	1016.50	1024.77	0.004683	6.87	18440.44	2164.96	0.33
SCR	41460	Rev BB FP	115111.00	1002.00	1022.64	1015.18	1023.41	0.005518	7.24	17710.12	2183.35	0.35
SCR	41280	Rev BB FP	115111.00	1001.00	1021.22	1015.33	1022.26	0.007076	8.63	16094.58	2294.98	0.40
SCR	41080	Rev BB FP	115111.00	1000.00	1019.74	1013.55	1020.85	0.006827	8.89	15634.13	2172.37	0.40
SCR	40825	Rev BB FP	115111.00	999.50	1018.37	1012.05	1019.19	0.005782	7.57	17645.24	2239.26	0.36
SCR	40585	Rev BB FP	115111.00	998.00	1017.08	1010.42	1017.84	0.005226	7.28	17989.01	2061.94	0.34
SCR	40335	Rev BB FP	115111.00	996.00	1016.13	1008.78	1016.69	0.003834	6.20	20457.69	2218.13	0.29
SCR	40130	Rev BB FP	115111.00	995.00	1015.32	1008.56	1015.88	0.003905	6.45	20672.41	2115.35	0.30
SCR	39945	Rev BB FP	115111.00	994.00	1014.62	1007.77	1015.16	0.003858	6.47	20759.36	2018.84	0.30
SCR	39755	Rev BB FP	115111.00	994.00	1013.33	1007.49	1014.22	0.005833	8.18	16831.67	1788.58	0.37
SCR	39605	Rev BB FP	115111.00	993.00	1012.55	1005.91	1013.37	0.005051	7.89	17084.59	1638.17	0.35
SCR	39310	Rev BB FP	115111.00	992.00	1011.07	1004.44	1011.82	0.004731	7.73	18174.40	1730.23	0.34
SCR	39100	Rev BB FP	115111.00	990.00	1010.28	1002.13	1010.91	0.003664	6.80	19174.54	1585.97	0.30
SCR	38925	Rev BB FP	115111.00	989.50	1009.52	1001.39	1010.21	0.004043	6.99	18003.52	1446.05	0.31
SCR	38710	Rev BB FP	115111.00	988.00	1008.51	1000.08	1009.31	0.004299	7.44	16801.26	1304.10	0.32
SCR	38475	Rev BB FP	115111.00	986.00	1006.48	999.95	1007.90	0.007873	9.88	12669.19	1018.58	0.43
SCR	38300	Rev BB FP	115111.00	985.50	1005.29	997.52	1006.56	0.006503	9.17	13133.02	960.65	0.40
SCR	38065	Rev BB FP	115111.00	984.00	1003.52	995.71	1004.95	0.007045	9.63	12273.74	874.51	0.41
SCR	37810	Rev BB FP	115111.00	983.00	1000.30	995.23	1002.47	0.012995	11.87	9947.29	823.90	0.55
SCR	37655	Rev BB FP	115111.00	982.00	998.34	994.09	1000.34	0.013555	11.43	10339.29	894.21	0.55
SCR	37390	Rev BB FP	115111.00	981.00	996.69	989.88	997.72	0.006129	8.27	14332.26	1035.91	0.38
SCR	37135	Rev BB FP	115111.00	980.00	995.19	988.63	996.12	0.005987	7.92	14972.85	1117.41	0.37
SCR	36930	Rev BB FP	115111.00	978.00	994.19	987.06	995.00	0.004805	7.46	16289.70	1209.91	0.34
SCR	36735	Rev BB FP	115111.00	977.00	993.22	986.56	994.02	0.005066	7.43	16245.29	1249.96	0.35
SCR	36515	Rev BB FP	115111.00	975.00	992.29	985.40	992.98	0.004355	6.91	17517.05	1353.36	0.32
SCR	36265	Rev BB FP	115111.00	974.00	991.10	984.77	991.81	0.005105	6.78	16998.81	1387.76	0.34
SCR	36080	Rev BB FP	116236.00	973.00	990.12	984.08	990.82	0.005500	6.74	17361.72	1498.29	0.34
SCR	35845	Rev BB FP	116236.00	971.00	988.91	982.89	989.59	0.004952	6.77	17844.10	1607.80	0.34
SCR	35725	Rev BB FP	116236.00	970.00	988.13	982.95	988.93	0.005766	7.75	16788.09	1538.48	0.37
SCR	35515	Rev BB FP	116236.00	969.00	986.78	981.76	987.67	0.006368	8.25	16123.33	1500.16	0.39
SCR	35245	Rev BB FP	116236.00	968.00	984.99	980.49	985.88	0.006898	8.13	16034.87	1580.23	0.40
SCR	35040	Rev BB FP	116236.00	967.00	983.56	978.97	984.47	0.006715	8.80	15960.86	1491.62	0.40
SCR	34860	Rev BB FP	116236.00	966.00	982.28	977.44	983.21	0.007849	7.71	15078.16	1431.69	0.42
SCR	34720	Rev BB FP	116236.00	965.50	981.27	976.17	982.13	0.007058	7.40	15699.07	1450.12	0.40
SCR	34495	Rev BB FP	116236.00	964.00	979.81	974.28	980.61	0.006439	7.20	16154.47	1462.53	0.38
SCR	34310	Rev BB FP	116236.00	963.00	978.54	973.01	979.43	0.006027	8.07	15893.00	1355.84	0.37
SCR	34090	Rev BB FP	116236.00	962.00	977.14	971.64	978.04	0.006788	7.61	15265.48	1316.20	0.39
SCR	33880	Rev BB FP	116236.00	960.00	975.73	970.46	976.59	0.006962	7.46	15582.75	1451.55	0.40
SCR	33710	Rev BB FP	116236.00	959.00	974.64	969.23	975.40	0.006435	6.97	16665.52	1616.75	0.38
SCR	33500	Rev BB FP	116236.00	958.00	973.40	968.41	974.09	0.005844	7.08	17819.12	1720.16	0.36
SCR	33310	Rev BB FP	116236.00	957.00	972.42	967.01	973.03	0.005153	6.27	18547.85	1783.33	0.34
SCR	33115	Rev BB FP	116236.00	956.00	971.47	965.60	972.01	0.004945	5.92	19667.02	1895.57	0.32
SCR	32795	Rev BB FP	116236.00	954.00	969.69	964.63	970.32	0.005717	6.40	18225.40	1917.68	0.36
SCR	32605	Rev BB FP	116236.00	952.00	968.69	963.45	969.24	0.005196	6.07	20132.55	2407.26	0.34
SCR	32265	Rev BB FP	140776.00	950.00	967.14	961.37	967.61	0.004485	5.50	25619.94	2839.88	0.32
SCR	31875	Rev BB FP	140776.00	949.00	965.55	960.00	965.98	0.003821	5.24	27028.75	2630.09	0.28
SCR	31585	Rev BB FP	140776.00	946.00	964.67	956.96	965.05	0.002681	4.95	28485.89	2405.38	0.25
SCR	31360	Rev BB FP	140776.00	944.00	963.99	955.41	964.44	0.002664	5.44	26576.91	1962.49	0.25
SCR	31060	Rev BB FP	140776.00	942.00	963.32	953.29	963.71	0.002122	5.02	28168.09	2195.09	0.24
SCR	30720	Rev BB FP	140776.00	940.00	962.76	951.33	963.08	0.001535	4.52	31325.84	2122.23	0.20
SCR	30445	Rev BB FP	140776.00	938.00	962.37	949.57	962.68	0.001361	4.49	32047.45	2314.72	0.19
SCR	30095	Rev BB FP	140776.00	936.00	961.79	947.93	962.18	0.001460	5.12	30221.52	2339.56	0.20
SCR	29815	Rev BB FP	140776.00	935.00	961.20	948.10	961.71	0.001932	5.96	27202.58	2243.56	0.23
SCR	29565	Rev BB FP	140776.00	934.00	960.71	947.27	961.22	0.001942	5.88	26958.88	2280.34	0.23
SCR	29385	Rev BB FP	140776.00	933.00	960.13	948.97	960.79	0.002694	6.78	24110.69	2215.01	0.27
SCR	29140	Rev BB FP	140776.00	932.00	958.97	950.98	959.94	0.004808	8.05	19093.65	1894.25	0.36
SCR	28895	Rev BB FP	140776.00	930.00	955.75	952.39	958.06	0.011883	14.28	13601.27	1544.41	0.55
SCR	28695	Rev BB FP	140776.00	928.00	954.27	947.96	955.72	0.009038	9.67	14565.01	1446.39	0.54
SCR	28500	Rev BB FP	140776.00	927.50	952.08	945.08	953.95	0.008598	11.42	14381.67	1474.34	0.47
SCR	28280	Rev BB FP	140776.00	926.00	950.52	941.85	952.30	0.006462	11.35	15008.82	1365.30	0.42
SCR	28080	Rev BB FP	140776.00	925.00	949.28	940.04	951.00	0.006263	10.94	14982.78	1251.50	0.41
SCR	27925	Rev BB FP	140776.00	924.00	947.70	939.47	949.86	0.007984	12.13	13253.13	1194.87	0.46

HEC-RAS Plan: Exist085 River: Reach #1 Reach: SCR Profile: Rev BB FP (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
SCR	27725	Rev BB FP	140776.00	923.00	945.26	939.31	947.94	0.010900	13.69	11869.05	1095.99	0.53
SCR	27545	Rev BB FP	140776.00	922.00	943.64	937.81	945.96	0.010086	12.76	12472.57	1144.65	0.51
SCR	27335	Rev BB FP	140776.00	921.00	942.09	936.26	943.91	0.008367	11.43	13966.56	1090.51	0.46
SCR	27155	Rev BB FP	140776.00	920.50	940.45	935.90	942.27	0.009256	11.73	14150.62	1201.24	0.48
SCR	26990	Rev BB FP	140776.00	920.00	939.34	933.85	940.67	0.008023	9.51	15709.68	1279.99	0.44
SCR	26780	Rev BB FP	140776.00	918.00	938.08	931.73	939.15	0.005879	8.93	17692.21	1339.59	0.38
SCR	26575	Rev BB FP	140776.00	917.00	936.99	929.98	937.93	0.005756	7.85	18224.55	1342.33	0.36
SCR	26355	Rev BB FP	140776.00	916.00	935.58	929.42	936.61	0.006173	8.54	17754.09	1376.67	0.39
SCR	26170	Rev BB FP	140776.00	915.00	934.47	928.71	935.49	0.006034	8.90	18074.60	1385.31	0.38
SCR	25965	Rev BB FP	140776.00	914.00	932.91	927.74	934.11	0.007349	9.58	16859.15	1407.92	0.42
SCR	25785	Rev BB FP	140776.00	913.50	931.49	926.55	932.67	0.007808	9.64	17323.82	1620.23	0.43
SCR	25600	Rev BB FP	140776.00	912.50	930.39	925.47	931.28	0.006236	8.59	19924.65	1924.40	0.39
SCR	25425	Rev BB FP	140776.00	911.00	929.54	924.28	930.20	0.005044	7.06	22168.16	2056.40	0.34
SCR	25215	Rev BB FP	140776.00	910.00	927.82	923.53	928.79	0.008126	8.48	18780.94	2121.76	0.43
SCR	25000	Rev BB FP	140776.00	909.00	926.32	922.50	927.11	0.006991	7.83	20977.36	2377.04	0.40
SCR	24795	Rev BB FP	140776.00	908.00	924.94	920.87	925.64	0.006301	7.42	21853.30	2329.84	0.38
SCR	24550	Rev BB FP	140776.00	906.00	923.85	918.41	924.38	0.004427	6.44	24258.73	2252.87	0.32
SCR	24335	Rev BB FP	140776.00	905.00	922.58	918.12	923.30	0.006264	7.63	21215.25	2105.65	0.38
SCR	24115	Rev BB FP	140776.00	904.00	921.37	916.28	922.04	0.005674	7.22	21770.86	2035.28	0.35
SCR	23975	Rev BB FP	140776.00	903.50	920.41	914.88	921.07	0.005319	7.00	21786.51	1940.51	0.35
SCR	23755	Rev BB FP	140776.00	902.00	919.31	913.54	919.93	0.004854	6.81	22570.77	2021.77	0.33
SCR	23565	Rev BB FP	140776.00	900.00	918.41	912.73	919.00	0.004714	6.64	23145.30	2111.49	0.33
SCR	23365	Rev BB FP	140776.00	900.00	917.59	911.37	918.13	0.004130	6.49	24160.49	2110.81	0.31
SCR	23180	Rev BB FP	140776.00	899.00	916.98	909.87	917.43	0.002980	6.28	26872.75	2188.46	0.27
SCR	23000	Rev BB FP	140776.00	898.00	916.50	908.40	916.91	0.002668	5.18	27717.50	2208.07	0.25
SCR	22790	Rev BB FP	140776.00	897.50	915.82	908.15	916.30	0.003103	5.58	25614.63	2052.66	0.27
SCR	22600	Rev BB FP	140776.00	896.00	915.10	907.78	915.65	0.003568	6.61	24212.95	1944.52	0.30
SCR	22415	Rev BB FP	140776.00	895.50	914.24	907.11	914.91	0.004404	7.19	22223.89	1868.49	0.33
SCR	22195	Rev BB FP	141426.00	894.00	912.53	906.79	913.67	0.007227	8.75	17295.44	1597.29	0.42
SCR	22010	Rev BB FP	141426.00	892.00	910.70	906.38	912.13	0.009118	10.16	15737.52	1819.81	0.47
SCR	21790	Rev BB FP	141426.00	891.50	908.38	904.87	909.95	0.010764	10.65	15383.26	2121.00	0.50
SCR	21615	Rev BB FP	141426.00	892.00	907.07	903.04	908.13	0.008280	8.76	18572.14	2207.92	0.44
SCR	21440	Rev BB FP	141426.00	890.00	905.72	901.59	906.68	0.007672	8.62	19330.02	2168.70	0.42
SCR	21225	Rev BB FP	141426.00	888.00	904.25	900.27	905.04	0.007187	8.16	22063.44	2868.73	0.40
SCR	21020	Rev BB FP	141426.00	887.00	903.17	897.78	903.78	0.004839	7.21	24970.26	2894.26	0.33
SCR	20845	Rev BB FP	141426.00	886.00	902.34	897.38	902.89	0.004944	6.90	25539.38	2955.11	0.34
SCR	20595	Rev BB FP	141426.00	885.00	901.14	896.42	901.71	0.004763	7.07	25535.02	2931.69	0.33
SCR	20435	Rev BB FP	141426.00	884.00	900.30	895.77	900.90	0.005083	7.27	24746.88	2825.53	0.34
SCR	20280	Rev BB FP	141426.00	883.70	899.33	895.55	899.99	0.006412	7.64	23039.58	2730.97	0.38
SCR	20070	Rev BB FP	141426.00	882.00	898.37	893.00	898.90	0.004321	6.63	25460.53	2597.82	0.31
SCR	19855	Rev BB FP	141426.00	880.50	897.57	891.50	898.03	0.003550	6.27	27221.95	2688.90	0.29
SCR	19630	Rev BB FP	141426.00	880.00	896.84	890.05	897.28	0.003165	6.01	28170.25	2778.54	0.27
SCR	19440	Rev BB FP	141426.00	878.00	896.29	889.11	896.70	0.002745	5.70	29140.07	2906.48	0.26
SCR	19240	Rev BB FP	141426.00	877.50	895.68	888.88	896.12	0.003010	5.84	27751.57	2599.60	0.27
SCR	19050	Rev BB FP	141426.00	876.00	895.20	887.51	895.59	0.002518	5.36	29006.32	2425.30	0.25
SCR	18830	Rev BB FP	141426.00	874.00	894.61	886.80	895.03	0.002641	5.53	27892.40	2225.08	0.25
SCR	18650	Rev BB FP	141426.00	873.50	894.15	886.00	894.58	0.002435	5.66	27923.98	2093.66	0.25
SCR	18475	Rev BB FP	141426.00	872.00	893.77	884.72	894.16	0.002201	5.13	28384.30	1978.73	0.23
SCR	18290	Rev BB FP	141426.00	871.50	893.26	884.54	893.72	0.002543	5.62	26476.96	1877.78	0.25
SCR	18025	Rev BB FP	141426.00	870.00	892.57	882.91	893.05	0.002398	5.66	25578.77	1642.50	0.25
SCR	17785	Rev BB FP	141426.00	868.00	891.70	882.82	892.35	0.003488	6.51	22017.32	1458.06	0.29
SCR	17510	Rev BB FP	141426.00	867.50	889.57	883.72	890.92	0.007690	9.58	15878.49	1354.91	0.44
SCR	17360	Rev BB FP	141426.00	866.50	887.45	883.40	889.41	0.012589	11.39	13139.27	1272.15	0.55
SCR	17110	Rev BB FP	141426.00	864.00	884.24	881.59	886.16	0.013233	11.94	13804.07	1428.48	0.56
SCR	16970	Rev BB FP	141426.00	863.70	881.85	880.06	883.98	0.016799	12.41	13059.54	1534.19	0.63
SCR	16720	Rev BB FP	141426.00	863.50	879.51	875.45	880.65	0.009318	8.94	17147.30	1726.61	0.46
SCR	16515	Rev BB FP	141426.00	862.00	878.00	873.72	878.88	0.007623	7.94	19233.76	1934.26	0.41
SCR	16305	Rev BB FP	141426.00	860.00	876.79	871.44	877.46	0.005570	7.17	22049.88	2111.77	0.36
SCR	16130	Rev BB FP	141426.00	860.00	875.68	870.71	876.37	0.006258	7.02	21366.03	2125.00	0.38
SCR	15960	Rev BB FP	141426.00	859.00	874.73	869.21	875.30	0.005341	6.12	23312.65	2250.07	0.33
SCR	15745	Rev BB FP	141426.00	858.00	873.76	867.77	874.26	0.004319	5.66	24841.35	2297.25	0.31
SCR	15540	Rev BB FP	141426.00	857.50	872.83	867.17	873.34	0.004545	5.91	24661.45	2348.37	0.32
SCR	15335	Rev BB FP	141426.00	856.00	871.75	866.50	872.32	0.005341	6.09	23340.41	2337.46	0.34
SCR	15125	Rev BB FP	142475.00	854.00	870.49	864.50	871.17	0.005517	6.68	21922.78	2195.20	0.35
SCR	14900	Rev BB FP	142475.00	853.00	869.11	863.42	869.84	0.006090	7.34	21835.14	2363.67	0.37
SCR	14720	Rev BB FP	142475.00	852.00	868.11	862.17	868.79	0.005661	7.00	22080.85	2123.96	0.35
SCR	14480	Rev BB FP	142475.00	850.50	866.84	860.73	867.50	0.005032	6.80	22113.92	1903.92	0.33
SCR	14315	Rev BB FP	142475.00	850.00	866.05	859.82	866.68	0.004845	6.37	22413.72	1938.14	0.33
SCR	14090	Rev BB FP	142475.00	849.71	864.84	858.67	865.53	0.005192	6.69	21422.24	1813.83	0.34
SCR	13850	Rev BB FP	142475.00	848.00	863.69	857.11	864.36	0.004758	6.57	21800.31	1769.55	0.33
SCR	13635	Rev BB FP	142475.00	846.00	862.65	856.32	863.33	0.004705	7.28	21990.27	1806.91	0.33
SCR	13425	Rev BB FP	142475.00	845.00	861.91	854.58	862.43	0.003526	5.80	24660.66	1936.16	0.28
SCR	13190	Rev BB FP	142475.00	844.00	861.23	852.81	861.68	0.002766	5.48	26772.91	2028.03	0.25
SCR	13030	Rev BB FP	142475.00	843.00	860.75	852.27	861.22	0.002892	6.09	26656.37	2060.86	0.26
SCR	12835	Rev BB FP	142475.00	842.00	860.14	851.23	860.64	0.002947	6.23	26293.16	2064.81	0.27
SCR	12615	Rev BB FP	142475.00	841.00	859.40	850.08	859.97	0.003127	6.72	24621.62	1866.17	0.28
SCR	12395	Rev BB FP	142475.00	840.00	858.68	849.52	859.30	0.003225	6.93	23816.79	1753.66	0.28
SCR	12195	Rev BB FP	142475.00	838.98	858.07	848.24	858.68	0.002883	6.53	23531.59	1569.29	0.27

HEC-RAS Plan: Exist085 River: Reach #1 Reach: SCR Profile: Rev BB FP (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
SCR	11995	Rev BB FP	142475.00	837.00	857.33	848.45	858.03	0.003457	7.35	21781.52	1445.69	0.30
SCR	11780	Rev BB FP	142475.00	836.00	856.60	848.15	857.30	0.003393	7.35	22101.86	1459.15	0.29
SCR	11605	Rev BB FP	142475.00	835.50	855.77	847.41	856.63	0.004096	8.01	20215.42	1423.31	0.32
SCR	11405	Rev BB FP	142475.00	834.00	854.64	846.17	855.71	0.004789	8.61	17818.79	1156.11	0.35
SCR	11180	Rev BB FP	142475.00	833.00	852.65	845.62	854.33	0.007767	10.74	14423.92	1022.07	0.44
SCR	11015	Rev BB FP	142475.00	831.50	850.24	844.78	852.64	0.011974	12.57	11808.85	850.99	0.54
SCR	10835	Rev BB FP	142475.00	831.00	848.06	843.71	850.34	0.013460	12.24	12146.95	1068.77	0.57
SCR	10575	Rev BB FP	142475.00	830.00	846.12	840.16	847.40	0.007982	9.13	15863.63	1311.49	0.43
SCR	10390	Rev BB FP	142475.00	828.00	845.08	839.07	846.06	0.005761	8.70	18840.71	1492.14	0.37
SCR	10225	Rev BB FP	142475.00	827.50	844.10	838.16	845.05	0.006398	7.95	18566.19	1545.15	0.38
SCR	10000	Rev BB FP	142475.00	826.00	842.55	837.14	843.54	0.006984	8.14	18351.28	1626.01	0.40
SCR	9820	Rev BB FP	142475.00	824.00	841.35	835.33	842.31	0.006527	7.91	18387.28	1648.84	0.39
SCR	9595	Rev BB FP	142475.00	823.80	839.87	834.13	840.80	0.006938	7.76	18438.71	1719.61	0.39
SCR	9385	Rev BB FP	142475.00	823.00	838.58	833.19	839.36	0.006233	7.21	20157.16	1799.30	0.37
SCR	9220	Rev BB FP	142475.00	822.00	837.62	831.80	838.34	0.005586	6.82	21094.14	1853.43	0.35
SCR	9025	Rev BB FP	142475.00	821.00	836.62	830.57	837.33	0.005004	7.02	21529.03	1822.90	0.34

Santa Clara River Fluvial Study

APPENDIX CHAPTER 4.2

Proposed Condition HEC-RAS Output

Plan	***Description***
FinalProp025	***Fluvial Model, Proposed Conditions, n=0.025, subcritical flow***
FinalProp085	***Fluvial Model, Proposed Conditions, n=0.085, subcritical flow***
Pr025LevCode	***Approved Model, Proposed Conditions, n=0.025, mixed flow***
Pr085LevCode	***Approved Model, Proposed Conditions, n=0.085, mixed flow***
FinalPr085Q2	***Approved Model, Proposed Conditions, n=0.085, mixed flow***

HEC-RAS model modified for fluvial use. See section 4.1.1B for model assembly. For unmodified, mixed flow regimes used in report, refer also to HEC-RAS Modeling Report prepared by PACE, concurrently submitted to LACDPW.

PACE
PACIFIC ADVANCED CIVIL ENGINEERING, INC.

HEC-RAS Plan: FinalProp025 River: SCR Reach: Project Profile: Rev BB

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Project	46195	Rev BB	115111.00	1035.00	1054.30	1054.30	1060.32	0.004006	19.69	5847.54	483.37	1.00
Project	46020	Rev BB	115111.00	1032.00	1052.44	1052.44	1058.13	0.004154	19.14	6013.48	531.51	1.00
Project	45545	Rev BB	115111.00	1030.00	1049.24	1049.24	1055.65	0.004022	20.32	5664.17	446.75	1.01
Project	45030	Rev BB	115111.00	1025.00	1045.55	1044.56	1050.46	0.003177	17.78	6472.44	521.46	0.89
Project	44585	Rev BB	115111.00	1022.00	1043.05	1043.05	1048.75	0.004190	19.17	6004.20	531.91	1.01
Project	44210	Rev BB	115111.00	1020.00	1041.58	1038.72	1044.97	0.001990	14.77	7793.25	585.85	0.71
Project	43820	Rev BB	115111.00	1018.00	1037.47	1037.47	1043.62	0.004072	19.90	5785.10	476.52	1.01
Project	43610	Rev BB	115111.00	1017.00	1034.08	1034.08	1040.13	0.004047	19.74	5832.04	483.67	1.00
Project	43410	Rev BB	115111.00	1016.00	1030.73	1030.73	1035.85	0.004279	18.14	6344.39	623.58	1.00
Project	43200	Rev BB	115111.00	1014.00	1029.33	1029.33	1033.92	0.004457	17.19	6697.33	738.00	1.01
Project	42975	Rev BB	115111.00	1012.00	1026.13	1026.13	1030.25	0.004579	16.29	7064.89	860.57	1.00
Project	42815	Rev BB	115111.00	1011.00	1024.36	1024.36	1028.02	0.004808	15.35	7496.97	1037.15	1.01
Project	42590	Rev BB	115111.00	1010.00	1021.50	1021.50	1025.01	0.004851	15.05	7649.36	1098.81	1.01
Project	42430	Rev BB	115111.00	1008.00	1020.26	1020.26	1024.03	0.004681	15.58	7396.51	1011.86	1.00
Project	42215	Rev BB	115111.00	1006.00	1019.73	1018.65	1022.25	0.003063	12.73	9040.32	1182.74	0.81
Project	41940	Rev BB	115111.00	1005.00	1019.28	1017.68	1021.36	0.002488	11.57	9945.28	1284.28	0.73
Project	41730	Rev BB	115111.00	1004.00	1018.65	1016.46	1020.82	0.002417	11.83	9727.36	1189.05	0.73
Project	41460	Rev BB	115111.00	1002.00	1018.12	1015.18	1020.22	0.001971	11.65	9876.94	1057.29	0.67
Project	41280	Rev BB	115111.00	1001.00	1015.34	1015.34	1019.50	0.004582	16.37	7032.47	852.22	1.00
Project	41080	Rev BB	115111.00	1000.00	1013.58	1013.58	1017.58	0.004593	16.04	7175.77	899.51	1.00
Project	40825	Rev BB	115111.00	999.50	1012.10	1012.10	1015.60	0.004938	15.00	7673.93	1122.98	1.01
Project	40585	Rev BB	115111.00	998.00	1010.59	1010.59	1014.03	0.004892	14.87	7741.09	1139.82	1.01
Project	40335	Rev BB	115111.00	996.00	1010.95	1008.70	1012.73	0.001840	10.69	10770.98	1248.81	0.64
Project	40130	Rev BB	115111.00	995.00	1010.41	1008.27	1012.32	0.001960	11.09	10380.24	1194.95	0.66
Project	39945	Rev BB	115111.00	994.00	1010.17	1007.59	1011.94	0.001684	10.67	10785.01	1172.47	0.62
Project	39755	Rev BB	115111.00	994.00	1007.18	1007.18	1011.21	0.004631	16.12	7140.66	893.31	1.00
Project	39605	Rev BB	115111.00	993.00	1005.78	1005.78	1009.87	0.004594	16.23	7091.77	873.24	1.00
Project	39310	Rev BB	115111.00	992.00	1004.36	1004.36	1008.29	0.004683	15.92	7232.22	929.34	1.01
Project	39100	Rev BB	115111.00	990.00	1003.74	1002.09	1006.89	0.002587	14.23	8088.07	788.26	0.78
Project	38925	Rev BB	115111.00	989.50	1003.74	1001.54	1006.30	0.002114	12.85	8958.42	873.34	0.71
Project	38710	Rev BB	115111.00	988.00	1003.55	1000.32	1005.82	0.001584	12.07	9534.83	820.16	0.62
Project	38475	Rev BB	115111.00	986.00	1000.04	1000.04	1004.98	0.004338	17.83	6455.50	659.76	1.00
Project	38300	Rev BB	115111.00	985.50	997.87	997.87	1002.71	0.004334	17.65	6520.77	677.19	1.00
Project	38065	Rev BB	115111.00	984.00	998.04	995.74	1001.32	0.002212	14.54	7917.91	658.42	0.74
Project	37810	Rev BB	115111.00	983.00	995.22	995.22	1000.37	0.004276	18.21	6321.28	618.24	1.00
Project	37655	Rev BB	115111.00	982.00	994.10	994.10	998.80	0.004442	17.39	6619.75	713.56	1.01
Project	37390	Rev BB	115111.00	981.00	991.46	990.10	994.58	0.002779	14.17	8124.66	840.59	0.80
Project	37135	Rev BB	115111.00	980.00	989.31	989.31	993.58	0.004549	16.58	6941.62	821.44	1.01
Project	36930	Rev BB	115111.00	978.00	987.92	987.46	991.71	0.003820	15.63	7364.69	834.69	0.93
Project	36735	Rev BB	115111.00	977.00	986.85	986.85	990.85	0.004582	16.06	7167.57	896.97	1.00
Project	36515	Rev BB	115111.00	975.00	987.04	985.39	989.58	0.002466	12.79	8997.40	994.80	0.75
Project	36265	Rev BB	115111.00	974.00	986.48	985.22	988.84	0.003073	12.33	9335.36	1176.00	0.77
Project	36080	Rev BB	116236.00	973.00	984.63	984.63	987.98	0.005710	14.69	7914.07	1176.00	1.00
Project	35845	Rev BB	116236.00	971.00	984.09	982.87	986.24	0.002731	11.74	9897.11	1385.15	0.76
Project	35725	Rev BB	116236.00	970.00	982.61	982.61	985.70	0.004997	14.11	8236.80	1374.87	1.00
Project	35515	Rev BB	116236.00	969.00	981.34	981.34	984.38	0.003984	14.00	8305.35	1363.56	1.00
Project	35245	Rev BB	116236.00	968.00	980.17	980.17	983.10	0.005053	13.71	8476.11	1553.65	1.00
Project	35040	Rev BB	116236.00	967.00	978.33	978.33	981.35	0.005109	13.94	8335.53	1400.46	1.01
Project	34860	Rev BB	116236.00	966.00	977.40	977.40	980.48	0.004124	14.07	8261.68	1362.38	1.01
Project	34720	Rev BB	116236.00	965.50	976.17	976.17	979.16	0.004168	13.87	8382.56	1419.56	1.01
Project	34495	Rev BB	116236.00	964.00	974.28	974.28	977.32	0.004209	13.98	8314.11	1380.43	1.00
Project	34310	Rev BB	116236.00	963.00	972.64	972.64	975.81	0.005099	14.28	8141.11	1311.42	1.01
Project	34090	Rev BB	116236.00	962.00	971.59	971.59	974.73	0.004069	14.21	8178.26	1312.61	1.00
Project	33880	Rev BB	116236.00	960.00	970.25	970.25	973.34	0.004192	14.12	8232.70	1343.51	1.01
Project	33710	Rev BB	116236.00	959.00	969.25	969.25	972.29	0.004184	14.00	8301.62	1377.88	1.01
Project	33500	Rev BB	116236.00	958.00	968.06	968.06	970.72	0.005489	13.08	8884.50	1720.67	1.01
Project	33310	Rev BB	116236.00	957.00	966.96	966.96	969.53	0.003818	12.88	9026.38	1780.29	1.01
Project	33115	Rev BB	116236.00	956.00	966.60	965.32	968.27	0.002770	10.36	11217.64	1847.27	0.74
Project	32795	Rev BB	116236.00	954.00	964.56	964.56	967.18	0.003570	12.99	8949.41	1735.59	1.01
Project	32605	Rev BB	116236.00	952.00	963.61	963.61	966.27	0.003728	13.08	8889.37	1766.10	1.00
Project	32265	Rev BB	140776.00	950.00	961.33	961.33	964.12	0.004082	13.40	10505.64	1941.10	1.02
Project	31875	Rev BB	140776.00	949.00	959.38	959.38	961.76	0.005507	12.38	11368.08	2409.14	1.00
Project	31585	Rev BB	140776.00	946.00	957.27	956.99	959.54	0.004462	12.10	11630.56	2178.50	0.92
Project	31360	Rev BB	140776.00	944.00	956.57	955.40	958.64	0.003098	11.54	12197.85	1866.19	0.80
Project	31060	Rev BB	140776.00	942.00	956.59	953.29	957.85	0.001200	9.01	15628.46	1701.29	0.52
Project	30720	Rev BB	140776.00	940.00	956.60	951.33	957.42	0.000665	7.25	19427.36	1882.31	0.40
Project	30445	Rev BB	140776.00	938.00	956.52	949.57	957.23	0.000483	6.75	20869.51	1771.80	0.35
Project	30095	Rev BB	140776.00	936.00	956.31	947.93	957.06	0.000474	6.95	20255.18	1619.47	0.35
Project	29815	Rev BB	140776.00	935.00	955.93	948.10	956.89	0.000611	7.87	17894.76	1430.05	0.39
Project	29565	Rev BB	140776.00	934.00	955.81	947.31	956.74	0.000520	7.74	18197.69	1320.30	0.37
Project	29385	Rev BB	140776.00	933.00	955.46	949.39	956.61	0.000672	8.60	16378.75	1233.03	0.42
Project	29140	Rev BB	140776.00	932.00	954.76	949.95	956.37	0.000994	10.18	13831.13	1082.52	0.50
Project	28895	Rev BB	140776.00	930.00	951.29	951.29	955.65	0.004486	16.75	8406.99	966.73	1.00
Project	28695	Rev BB	140776.00	928.00	948.27	945.72	951.01	0.001962	13.28	10604.18	929.93	0.69

HEC-RAS Plan: FinalProp025 River: SCR Reach: Project Profile: Rev BB (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Project	28500	Rev BB	140776.00	927.50	945.99	945.99	950.30	0.004557	16.65	8456.66	998.18	1.01
Project	28280	Rev BB	140776.00	926.00	943.37	939.86	945.58	0.001474	11.94	11789.80	976.23	0.61
Project	28080	Rev BB	140776.00	925.00	943.39	938.17	945.23	0.001004	10.88	12937.54	923.44	0.51
Project	27925	Rev BB	140776.00	924.00	942.60	938.71	944.99	0.001424	12.41	11347.95	863.96	0.60
Project	27725	Rev BB	140776.00	923.00	939.26	939.26	944.27	0.004292	17.96	7836.66	784.78	1.00
Project	27545	Rev BB	140776.00	922.00	937.62	937.62	943.27	0.004131	19.08	7378.13	656.25	1.00
Project	27335	Rev BB	140776.00	921.00	936.15	936.15	940.86	0.004392	17.42	8079.14	865.36	1.00
Project	27155	Rev BB	140776.00	920.50	935.27	935.27	939.88	0.004380	17.23	8170.77	888.23	1.00
Project	26990	Rev BB	140776.00	920.00	933.70	933.70	938.05	0.004510	16.73	8413.85	976.89	1.00
Project	26780	Rev BB	140776.00	918.00	931.32	931.32	935.44	0.004591	16.27	8650.56	1062.31	1.00
Project	26575	Rev BB	140776.00	917.00	930.42	929.95	933.79	0.003886	14.72	9560.94	1203.73	0.92
Project	26355	Rev BB	140776.00	916.00	929.13	929.13	932.81	0.004778	15.40	9144.23	1256.77	1.01
Project	26170	Rev BB	140776.00	915.00	928.17	928.16	931.80	0.004729	15.28	9212.38	1267.86	1.00
Project	25965	Rev BB	140776.00	914.00	927.26	927.21	930.82	0.004663	15.15	9292.56	1281.80	0.99
Project	25785	Rev BB	140776.00	913.50	926.78	926.18	929.97	0.003660	14.35	9809.35	1224.04	0.89
Project	25600	Rev BB	140776.00	912.50	925.76	925.21	929.25	0.003734	15.00	9384.78	1112.87	0.91
Project	25425	Rev BB	140776.00	911.00	925.28	924.40	928.57	0.003288	14.56	9667.52	1090.05	0.86
Project	25215	Rev BB	140776.00	910.00	924.72	923.65	927.87	0.003073	14.23	9894.10	1097.30	0.84
Project	25000	Rev BB	140776.00	909.00	924.47	922.49	927.15	0.002252	13.13	10725.52	1062.40	0.73
Project	24795	Rev BB	140776.00	908.00	923.60	921.79	926.64	0.002430	13.99	10061.45	957.43	0.76
Project	24550	Rev BB	140776.00	906.00	922.49	920.91	925.97	0.002629	14.97	9403.51	856.09	0.80
Project	24335	Rev BB	140776.00	905.00	920.03	920.03	925.11	0.004254	18.10	7779.37	764.96	1.00
Project	24115	Rev BB	140776.00	904.00	918.66	918.66	923.80	0.004273	18.20	7736.79	757.86	1.00
Project	23975	Rev BB	140776.00	903.50	917.68	917.68	922.69	0.004306	17.96	7837.58	789.45	1.00
Project	23755	Rev BB	140776.00	902.00	916.75	916.75	921.65	0.004327	17.75	7930.29	816.51	1.00
Project	23565	Rev BB	140776.00	900.00	915.57	915.57	920.26	0.004363	17.38	8100.02	867.04	1.00
Project	23365	Rev BB	140776.00	900.00	914.40	914.40	918.85	0.004458	16.92	8320.34	939.52	1.00
Project	23180	Rev BB	140776.00	899.00	913.20	912.61	917.17	0.003607	15.99	8806.14	926.00	0.91
Project	23000	Rev BB	140776.00	898.00	912.81	911.12	916.46	0.003290	15.34	9177.96	784.00	0.79
Project	22790	Rev BB	140776.00	897.50	910.47	910.47	915.48	0.005111	17.96	7838.51	784.00	1.00
Project	22600	Rev BB	140776.00	896.00	909.60	909.60	913.89	0.004591	16.62	8469.77	1007.62	1.01
Project	22415	Rev BB	140776.00	895.50	907.97	907.97	912.10	0.004576	16.31	8630.14	1052.83	1.00
Project	22195	Rev BB	141426.00	894.00	907.47	906.87	910.61	0.003724	14.21	9951.36	1281.58	0.90
Project	22010	Rev BB	141426.00	892.00	906.10	906.10	909.78	0.004698	15.38	9195.89	1252.29	1.00
Project	21790	Rev BB	141426.00	891.50	904.77	904.77	908.11	0.004855	14.67	9642.87	1507.80	1.00
Project	21615	Rev BB	141426.00	892.00	902.80	902.80	906.20	0.004803	14.80	9557.40	1401.11	1.00
Project	21440	Rev BB	141426.00	890.00	901.57	901.57	905.07	0.004769	15.01	9424.54	1342.59	1.00
Project	21225	Rev BB	141426.00	888.00	900.52	900.52	903.69	0.004968	14.30	9886.64	1563.91	1.00
Project	21020	Rev BB	141426.00	887.00	899.97	898.94	902.33	0.003046	12.34	11464.58	1568.45	0.80
Project	20845	Rev BB	141426.00	886.00	898.39	898.39	901.57	0.004961	14.31	9883.42	1561.02	1.00
Project	20595	Rev BB	141426.00	885.00	898.33	896.46	900.25	0.002128	11.13	12703.95	1548.09	0.68
Project	20435	Rev BB	141426.00	884.00	898.08	895.80	899.89	0.001872	10.78	13124.39	1524.83	0.65
Project	20280	Rev BB	141426.00	883.70	896.01	896.01	899.29	0.005069	14.53	9735.55	1527.35	1.01
Project	20070	Rev BB	141426.00	882.00	894.29	894.29	897.53	0.005010	14.44	9793.63	1537.65	1.01
Project	19855	Rev BB	141426.00	880.50	892.65	892.65	895.81	0.005043	14.26	9916.93	1593.11	1.01
Project	19630	Rev BB	141426.00	880.00	891.48	890.46	894.67	0.003143	14.35	9854.55	1098.59	0.84
Project	19440	Rev BB	141426.00	878.00	891.37	889.68	893.96	0.002469	12.92	10950.06	1194.62	0.75
Project	19240	Rev BB	141426.00	877.50	889.40	889.40	893.18	0.004749	15.60	9068.42	1219.41	1.01
Project	19050	Rev BB	141426.00	876.00	889.38	887.89	891.70	0.002632	12.21	11580.60	1442.64	0.76
Project	18830	Rev BB	141426.00	874.00	888.82	887.50	891.10	0.002798	12.12	11667.44	1538.23	0.78
Project	18650	Rev BB	141426.00	873.50	888.72	886.68	890.53	0.002006	10.78	13119.62	1607.26	0.66
Project	18475	Rev BB	141426.00	872.00	888.91	885.02	890.10	0.001016	8.76	16151.21	1621.67	0.49
Project	18290	Rev BB	141426.00	871.50	888.50	885.07	889.87	0.001262	9.40	15041.49	1594.70	0.54
Project	18025	Rev BB	141426.00	870.00	888.57	882.91	889.51	0.000633	7.79	18154.44	1520.48	0.40
Project	17785	Rev BB	141426.00	868.00	888.25	882.79	889.34	0.000722	8.38	16870.97	1398.41	0.43
Project	17510	Rev BB	141426.00	868.00	887.46	883.42	889.03	0.001273	10.07	14045.60	1353.64	0.55
Project	17360	Rev BB	141426.00	868.00	883.98	883.98	888.42	0.004472	16.91	8364.98	944.54	1.00
Project	17110	Rev BB	141426.00	864.00	881.08	881.08	884.88	0.004682	15.65	9039.19	1191.88	1.00
Project	16970	Rev BB	141426.00	863.70	879.57	879.57	883.40	0.004698	15.72	8997.01	1180.24	1.00
Project	16720	Rev BB	141426.00	863.50	875.41	875.41	879.35	0.004709	15.94	8873.56	1146.54	1.01
Project	16515	Rev BB	141426.00	862.00	873.88	873.85	877.54	0.004720	15.36	9209.61	1259.97	1.00
Project	16305	Rev BB	141426.00	860.00	874.53	872.03	876.44	0.001769	11.08	12765.90	1360.42	0.64
Project	16130	Rev BB	141426.00	860.00	872.23	872.23	875.79	0.004840	15.15	9332.88	1325.97	1.01
Project	15960	Rev BB	141426.00	859.00	871.57	870.96	874.47	0.003673	13.67	10347.30	1395.60	0.88
Project	15745	Rev BB	141426.00	858.00	871.32	869.77	873.67	0.002505	12.30	11500.92	1363.87	0.75
Project	15540	Rev BB	141426.00	857.50	871.22	868.50	872.95	0.001594	10.54	13415.28	1426.97	0.61
Project	15335	Rev BB	141426.00	856.00	868.08	868.08	872.16	0.005518	16.21	8723.27	1064.14	1.00
Project	15125	Rev BB	142475.00	854.00	866.25	866.25	870.52	0.005571	16.58	8594.49	1005.21	1.00
Project	14900	Rev BB	142475.00	853.00	864.18	864.18	868.31	0.004518	16.29	8744.60	1681.96	1.00
Project	14720	Rev BB	142475.00	852.00	863.25	863.25	867.16	0.004589	15.87	8988.33	1754.84	1.00
Project	14480	Rev BB	142475.00	850.50	860.78	860.75	864.04	0.004765	14.50	9824.86	1761.86	0.99
Project	14315	Rev BB	142475.00	850.00	860.12	860.12	863.17	0.004972	14.01	10170.99	1883.64	1.00
Project	14090	Rev BB	142475.00	850.00	858.71	858.71	861.64	0.005088	13.74	10369.15	1774.74	1.00
Project	13850	Rev BB	142475.00	848.00	857.10	857.10	860.08	0.005085	13.85	10284.52	1738.35	1.00

HEC-RAS Plan: FinalProp025 River: SCR Reach: Project Profile: Rev BB (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Project	13635	Rev BB	142475.00	846.00	855.96	855.96	858.98	0.004582	13.95	10211.78	1703.12	1.00
Project	13425	Rev BB	142475.00	845.00	854.24	854.24	857.06	0.004529	13.47	10578.16	1897.18	1.01
Project	13190	Rev BB	142475.00	844.00	853.32	852.74	855.68	0.003742	12.34	11549.85	1846.11	0.87
Project	13030	Rev BB	142475.00	843.00	852.86	851.95	855.08	0.003185	11.96	11909.27	1766.79	0.81
Project	12835	Rev BB	142475.00	842.00	852.34	851.01	854.49	0.002668	11.77	12100.72	1610.12	0.76
Project	12615	Rev BB	142475.00	841.00	852.03	849.82	853.92	0.001904	11.02	12926.14	1472.31	0.66
Project	12395	Rev BB	142475.00	840.00	851.67	849.16	853.50	0.001752	10.85	13135.39	1440.65	0.63
Project	12195	Rev BB	142475.00	838.98	851.58	848.08	853.12	0.001248	9.95	14313.41	1384.21	0.55
Project	11995	Rev BB	142475.00	837.00	850.88	848.04	852.79	0.001627	11.11	12823.25	1283.08	0.62
Project	11780	Rev BB	142475.00	836.00	850.70	847.66	852.39	0.001520	10.44	13642.49	1424.15	0.59
Project	11605	Rev BB	142475.00	835.50	849.96	847.34	852.05	0.001993	11.60	12285.52	1341.91	0.68
Project	11405	Rev BB	142475.00	834.00	849.37	846.23	851.65	0.001801	12.11	11766.04	1116.35	0.66
Project	11180	Rev BB	142475.00	833.00	847.48	845.64	851.07	0.002263	15.22	9359.01	861.14	0.81
Project	11015	Rev BB	142475.00	831.50	844.86	844.86	850.40	0.003816	18.88	7546.81	680.73	1.00
Project	10835	Rev BB	142475.00	831.00	843.79	843.79	848.64	0.003827	17.68	8059.51	834.48	1.00
Project	10575	Rev BB	142475.00	830.00	840.16	840.16	844.13	0.004323	15.99	8907.77	1127.45	1.00
Project	10390	Rev BB	142475.00	828.00	839.75	838.53	842.26	0.002882	12.70	11218.28	1408.98	0.79
Project	10225	Rev BB	142475.00	827.50	838.21	838.21	841.57	0.004878	14.72	9676.62	1447.21	1.00
Project	10000	Rev BB	142475.00	826.00	837.14	837.14	840.43	0.003961	14.56	9788.33	1488.06	1.00
Project	9820	Rev BB	142475.00	824.00	835.36	835.36	838.82	0.004314	14.94	9537.68	1450.92	1.00
Project	9595	Rev BB	142475.00	823.80	834.15	834.15	837.42	0.004846	14.53	9808.52	1620.11	1.00
Project	9385	Rev BB	142475.00	823.00	833.09	833.09	836.04	0.005132	13.78	10337.67	1773.60	1.01
Project	9220	Rev BB	142475.00	822.00	831.82	831.82	834.72	0.004516	13.66	10429.99	1814.14	1.00
Project	9025	Rev BB	142475.00	821.00	830.39	830.39	833.36	0.004263	13.82	10307.78	1751.03	1.00

HEC-RAS Plan: FinalProp085 River: SCR Reach: Project Profile: Rev BB

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Project	46195	Rev BB	115111.00	1035.00	1063.47	1054.30	1064.87	0.007341	9.49	12131.56	752.82	0.42
Project	46020	Rev BB	115111.00	1032.00	1062.02	1052.44	1063.64	0.006543	10.21	11278.49	570.25	0.40
Project	45545	Rev BB	115111.00	1030.00	1057.85	1049.24	1059.95	0.008978	11.63	9901.38	524.22	0.47
Project	45030	Rev BB	115111.00	1025.00	1054.23	1044.56	1055.89	0.006624	10.33	11148.02	558.00	0.41
Project	44585	Rev BB	115111.00	1022.00	1050.61	1043.05	1052.40	0.009260	10.73	10726.47	654.45	0.47
Project	44210	Rev BB	115111.00	1020.00	1047.85	1038.72	1049.39	0.006689	9.95	11564.12	620.11	0.41
Project	43820	Rev BB	115111.00	1018.00	1042.18	1037.47	1045.27	0.017205	14.10	8166.67	530.01	0.63
Project	43610	Rev BB	115111.00	1017.00	1038.67	1034.08	1041.71	0.017230	13.99	8227.50	539.45	0.63
Project	43410	Rev BB	115111.00	1016.00	1036.61	1030.73	1038.51	0.011821	11.06	10407.01	734.51	0.52
Project	43200	Rev BB	115111.00	1014.00	1033.78	1029.33	1035.80	0.014294	11.41	10091.65	785.15	0.56
Project	42975	Rev BB	115111.00	1012.00	1031.27	1026.13	1032.77	0.011383	9.83	11714.26	961.37	0.50
Project	42815	Rev BB	115111.00	1011.00	1029.95	1024.36	1031.07	0.008590	8.49	13555.60	1123.09	0.43
Project	42590	Rev BB	115111.00	1010.00	1028.69	1021.50	1029.49	0.005332	7.17	16066.51	1248.66	0.35
Project	42430	Rev BB	115111.00	1008.00	1027.84	1020.26	1028.57	0.005587	6.91	17118.29	1596.16	0.35
Project	42215	Rev BB	115111.00	1006.00	1026.89	1018.65	1027.51	0.004188	6.31	18233.84	1375.77	0.31
Project	41940	Rev BB	115111.00	1005.00	1025.82	1017.68	1026.42	0.003813	6.23	18490.49	1328.21	0.29
Project	41730	Rev BB	115111.00	1004.00	1024.84	1016.46	1025.54	0.004347	6.69	17201.33	1222.58	0.31
Project	41460	Rev BB	115111.00	1002.00	1023.44	1015.18	1024.26	0.005190	7.30	15773.56	1122.33	0.34
Project	41280	Rev BB	115111.00	1001.00	1022.21	1015.34	1023.16	0.007140	7.84	14689.39	1195.76	0.39
Project	41080	Rev BB	115111.00	1000.00	1020.85	1013.58	1021.79	0.006509	7.77	14810.43	1139.40	0.38
Project	40825	Rev BB	115111.00	999.50	1019.54	1012.10	1020.30	0.004962	6.98	16487.71	1214.08	0.33
Project	40585	Rev BB	115111.00	998.00	1018.42	1010.59	1019.12	0.004550	6.73	17110.93	1249.11	0.32
Project	40335	Rev BB	115111.00	996.00	1017.57	1008.70	1018.14	0.003259	6.01	19166.52	1289.69	0.27
Project	40130	Rev BB	115111.00	995.00	1016.78	1008.27	1017.40	0.003782	6.33	18185.41	1266.60	0.29
Project	39945	Rev BB	115111.00	994.00	1016.05	1007.59	1016.70	0.003847	6.47	17791.94	1214.29	0.30
Project	39755	Rev BB	115111.00	994.00	1014.76	1007.18	1015.73	0.006323	7.91	14562.19	1096.92	0.38
Project	39605	Rev BB	115111.00	993.00	1013.91	1005.78	1014.86	0.005477	7.85	14763.11	1083.20	0.36
Project	39310	Rev BB	115111.00	992.00	1012.32	1004.36	1013.25	0.005319	7.77	14818.98	977.78	0.35
Project	39100	Rev BB	115111.00	990.00	1011.14	1002.09	1012.17	0.005052	8.16	14158.82	850.63	0.35
Project	38925	Rev BB	115111.00	989.50	1010.35	1001.54	1011.28	0.004789	7.75	14843.71	906.85	0.34
Project	38710	Rev BB	115111.00	988.00	1009.19	1000.32	1010.20	0.005036	8.09	14224.74	844.23	0.35
Project	38475	Rev BB	115111.00	986.00	1006.99	1000.04	1008.64	0.008697	10.31	11167.84	695.45	0.45
Project	38300	Rev BB	115111.00	985.50	1005.78	997.87	1007.19	0.007044	9.56	12043.94	716.83	0.41
Project	38065	Rev BB	115111.00	984.00	1004.14	995.74	1005.56	0.006775	9.56	12036.74	691.32	0.40
Project	37810	Rev BB	115111.00	983.00	1001.39	995.22	1003.36	0.010602	11.26	10228.44	648.53	0.50
Project	37655	Rev BB	115111.00	982.00	999.90	994.10	1001.66	0.010464	10.62	10834.10	739.02	0.49
Project	37390	Rev BB	115111.00	981.00	998.49	990.10	999.52	0.005339	8.15	14131.07	869.25	0.36
Project	37135	Rev BB	115111.00	980.00	996.84	989.31	998.01	0.006512	8.67	13273.15	864.25	0.39
Project	36930	Rev BB	115111.00	978.00	995.75	987.46	996.75	0.005471	8.01	14378.93	926.41	0.36
Project	36735	Rev BB	115111.00	977.00	994.66	986.85	995.64	0.005652	7.97	14443.30	963.48	0.36
Project	36515	Rev BB	115111.00	975.00	993.64	985.37	994.48	0.004699	7.33	15700.20	1032.84	0.33
Project	36265	Rev BB	115111.00	974.00	992.27	985.22	993.06	0.006888	7.13	16149.47	1176.00	0.34
Project	36080	Rev BB	116236.00	973.00	990.65	984.63	991.59	0.008983	7.75	14999.86	1176.00	0.38
Project	35845	Rev BB	116236.00	971.00	989.14	982.87	989.89	0.005586	6.95	16718.71	1512.86	0.35
Project	35725	Rev BB	116236.00	970.00	988.33	982.61	989.15	0.006539	7.30	15919.91	1489.98	0.38
Project	35515	Rev BB	116236.00	969.00	987.05	981.34	987.85	0.005995	7.20	16145.45	1503.16	0.37
Project	35245	Rev BB	116236.00	968.00	985.20	980.17	986.04	0.007449	7.36	15792.43	1581.24	0.39
Project	35040	Rev BB	116236.00	967.00	983.73	978.33	984.52	0.007010	7.17	16215.62	1493.00	0.38
Project	34860	Rev BB	116236.00	966.00	982.28	977.40	983.21	0.007849	7.71	15077.98	1431.69	0.42
Project	34720	Rev BB	116236.00	965.50	981.27	976.17	982.13	0.007059	7.40	15698.80	1450.12	0.40
Project	34495	Rev BB	116236.00	964.00	979.81	974.28	980.61	0.006440	7.20	16154.11	1462.52	0.38
Project	34310	Rev BB	116236.00	963.00	978.58	972.64	979.39	0.006581	7.21	16112.75	1388.30	0.37
Project	34090	Rev BB	116236.00	962.00	977.05	971.59	977.93	0.006750	7.49	15517.16	1371.20	0.39
Project	33880	Rev BB	116236.00	960.00	975.68	970.25	976.50	0.006734	7.27	15989.40	1483.22	0.39
Project	33710	Rev BB	116236.00	959.00	974.59	969.25	975.34	0.006419	6.93	16763.53	1638.24	0.38
Project	33500	Rev BB	116236.00	958.00	973.35	968.06	974.00	0.006109	6.43	18080.31	1755.79	0.35
Project	33310	Rev BB	116236.00	957.00	972.33	966.96	972.93	0.005176	6.21	18719.75	1828.22	0.34
Project	33115	Rev BB	116236.00	956.00	971.42	965.32	971.93	0.004618	5.75	20262.43	1927.27	0.31
Project	32795	Rev BB	116236.00	954.00	969.71	964.56	970.33	0.005520	6.33	18411.74	1921.08	0.36
Project	32605	Rev BB	116236.00	952.00	968.73	963.61	969.28	0.005123	6.04	20231.14	2407.57	0.34
Project	32265	Rev BB	140776.00	950.00	967.22	961.33	967.68	0.004388	5.45	25825.19	2840.45	0.32
Project	31875	Rev BB	140776.00	949.00	965.64	959.38	966.07	0.003807	5.22	27033.89	2594.16	0.28
Project	31585	Rev BB	140776.00	946.00	964.73	956.99	965.10	0.002884	4.92	28606.50	2377.72	0.25
Project	31360	Rev BB	140776.00	944.00	964.01	955.40	964.44	0.002856	5.30	26583.39	1959.81	0.25
Project	31060	Rev BB	140776.00	942.00	963.24	953.29	963.64	0.002469	5.05	27851.26	1976.23	0.24
Project	30720	Rev BB	140776.00	940.00	962.60	951.33	962.93	0.001689	4.57	30819.70	1911.83	0.20
Project	30445	Rev BB	140776.00	938.00	962.16	949.57	962.48	0.001559	4.53	31093.12	1842.15	0.19
Project	30095	Rev BB	140776.00	936.00	961.53	947.93	961.90	0.001737	4.90	28752.99	1637.52	0.21
Project	29815	Rev BB	140776.00	935.00	960.83	948.10	961.33	0.002377	5.64	24945.23	1445.25	0.24
Project	29565	Rev BB	140776.00	934.00	960.18	947.31	960.72	0.002432	5.87	24002.03	1334.60	0.24
Project	29385	Rev BB	140776.00	933.00	959.53	949.39	960.20	0.003234	6.57	21423.61	1248.62	0.28
Project	29140	Rev BB	140776.00	932.00	958.17	949.95	959.17	0.005290	8.02	17548.01	1094.18	0.35
Project	28895	Rev BB	140776.00	930.00	954.62	951.29	956.89	0.017865	12.08	11651.29	981.60	0.62
Project	28695	Rev BB	140776.00	928.00	953.10	945.72	954.44	0.007151	9.29	15147.15	952.31	0.41

HEC-RAS Plan: FinalProp085 River: SCR Reach: Project Profile: Rev BB (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Project	28500	Rev BB	140776.00	927.50	951.00	945.99	952.67	0.011472	10.35	13606.97	1041.16	0.50
Project	28280	Rev BB	140776.00	926.00	950.17	939.86	951.07	0.003943	7.60	18528.58	1005.15	0.31
Project	28080	Rev BB	140776.00	925.00	949.41	938.17	950.31	0.003613	7.58	18572.27	946.60	0.30
Project	27925	Rev BB	140776.00	924.00	948.51	938.71	949.63	0.004894	8.52	16518.98	886.47	0.35
Project	27725	Rev BB	140776.00	923.00	946.74	939.26	948.35	0.007913	10.18	13823.56	814.27	0.44
Project	27545	Rev BB	140776.00	922.00	944.98	937.62	946.75	0.009932	10.70	13156.60	854.99	0.48
Project	27335	Rev BB	140776.00	921.00	943.42	936.15	944.83	0.007683	9.56	14721.97	939.21	0.43
Project	27155	Rev BB	140776.00	920.50	941.86	935.27	943.34	0.008754	9.78	14398.34	980.49	0.45
Project	26990	Rev BB	140776.00	920.00	940.62	933.70	941.93	0.007507	9.18	15333.37	1021.74	0.42
Project	26780	Rev BB	140776.00	918.00	939.53	931.32	940.52	0.005306	8.01	17571.72	1107.51	0.35
Project	26575	Rev BB	140776.00	917.00	938.72	929.95	939.51	0.004216	7.14	19724.69	1244.26	0.32
Project	26355	Rev BB	140776.00	916.00	937.83	929.13	938.58	0.004073	6.95	20261.90	1295.29	0.31
Project	26170	Rev BB	140776.00	915.00	937.12	928.16	937.83	0.003833	6.80	20700.37	1301.90	0.30
Project	25965	Rev BB	140776.00	914.00	936.38	927.21	937.07	0.003632	6.67	21119.28	1313.87	0.29
Project	25785	Rev BB	140776.00	913.50	935.72	926.18	936.42	0.003567	6.74	20899.07	1257.60	0.29
Project	25600	Rev BB	140776.00	912.50	934.94	925.21	935.73	0.003778	7.12	19783.70	1150.59	0.30
Project	25425	Rev BB	140776.00	911.00	934.27	924.40	935.07	0.003763	7.16	19676.46	1139.17	0.30
Project	25215	Rev BB	140776.00	910.00	933.49	923.65	934.28	0.003774	7.15	19675.54	1134.33	0.30
Project	25000	Rev BB	140776.00	909.00	932.66	922.49	933.46	0.003681	7.20	19553.49	1094.28	0.30
Project	24795	Rev BB	140776.00	908.00	931.68	921.79	932.64	0.004300	7.85	17926.30	987.02	0.32
Project	24550	Rev BB	140776.00	906.00	930.28	920.91	931.46	0.005239	8.69	16197.81	887.76	0.36
Project	24335	Rev BB	140776.00	905.00	928.76	920.03	930.20	0.006433	9.63	14619.51	801.23	0.40
Project	24115	Rev BB	140776.00	904.00	927.27	918.66	928.75	0.006654	9.77	14414.92	794.39	0.40
Project	23975	Rev BB	140776.00	903.50	926.43	917.68	927.81	0.006247	9.43	14928.26	829.53	0.39
Project	23755	Rev BB	140776.00	902.00	925.02	916.75	926.36	0.006964	9.29	15158.33	941.12	0.41
Project	23565	Rev BB	140776.00	900.00	923.80	915.57	925.07	0.006358	9.02	15604.61	942.91	0.39
Project	23365	Rev BB	140776.00	900.00	922.66	914.40	923.82	0.005909	8.65	16278.47	988.72	0.38
Project	23180	Rev BB	140776.00	899.00	921.68	912.61	922.76	0.005147	8.35	16869.25	976.84	0.35
Project	23000	Rev BB	140776.00	898.00	920.17	911.12	921.55	0.008753	9.42	14947.76	784.00	0.38
Project	22790	Rev BB	140776.00	897.50	917.71	910.47	919.39	0.011776	10.42	13511.74	784.00	0.44
Project	22600	Rev BB	140776.00	896.00	916.14	909.60	917.47	0.008004	9.25	15211.94	1052.34	0.43
Project	22415	Rev BB	140776.00	895.50	914.82	907.97	916.03	0.007157	8.81	15982.03	1093.93	0.41
Project	22195	Rev BB	141426.00	894.00	913.51	906.87	914.43	0.006693	7.70	18363.87	1466.03	0.38
Project	22010	Rev BB	141426.00	892.00	911.96	906.10	913.01	0.008584	8.23	17188.55	1803.93	0.43
Project	21790	Rev BB	141426.00	891.50	910.41	904.77	911.26	0.006915	7.52	19320.02	1781.74	0.39
Project	21615	Rev BB	141426.00	892.00	909.33	902.80	910.10	0.006037	7.05	20056.92	1690.87	0.36
Project	21440	Rev BB	141426.00	890.00	908.27	901.57	909.05	0.005983	7.09	19960.76	1656.11	0.36
Project	21225	Rev BB	141426.00	888.00	907.08	900.52	907.83	0.005424	6.97	20279.11	1603.39	0.35
Project	21020	Rev BB	141426.00	887.00	906.08	898.94	906.78	0.004697	6.68	21188.20	1610.45	0.32
Project	20845	Rev BB	141426.00	886.00	905.18	898.39	905.90	0.005127	6.85	20644.44	1607.47	0.34
Project	20595	Rev BB	141426.00	885.00	904.07	896.46	904.73	0.004338	6.51	21721.47	1608.91	0.31
Project	20435	Rev BB	141426.00	884.00	903.31	895.80	903.99	0.004686	6.63	21321.67	1627.73	0.32
Project	20280	Rev BB	141426.00	883.70	902.35	896.01	903.15	0.006133	7.17	19767.98	1749.06	0.36
Project	20070	Rev BB	141426.00	882.00	901.17	894.29	901.87	0.005844	6.74	20986.95	1849.69	0.35
Project	19855	Rev BB	141426.00	880.50	900.16	892.65	900.78	0.004249	6.33	22462.36	1851.55	0.31
Project	19630	Rev BB	141426.00	880.00	899.23	890.46	899.83	0.004178	6.23	22797.11	1871.07	0.30
Project	19440	Rev BB	141426.00	878.00	898.40	889.68	898.98	0.004680	6.12	23122.45	2019.07	0.32
Project	19240	Rev BB	141426.00	877.50	897.28	889.40	897.97	0.005271	6.69	21152.97	1747.11	0.34
Project	19050	Rev BB	141426.00	876.00	896.50	887.89	897.09	0.003878	6.16	22999.78	1762.81	0.30
Project	18830	Rev BB	141426.00	874.00	895.62	887.50	896.22	0.004004	6.23	22683.43	1690.74	0.30
Project	18650	Rev BB	141426.00	873.50	894.96	886.68	895.53	0.003602	6.04	23403.52	1688.66	0.29
Project	18475	Rev BB	141426.00	872.00	894.47	885.02	894.95	0.002736	5.59	25295.13	1667.77	0.25
Project	18290	Rev BB	141426.00	871.50	893.84	885.07	894.40	0.003329	5.98	23665.47	1633.61	0.28
Project	18025	Rev BB	141426.00	870.00	893.11	882.91	893.60	0.002558	5.62	25143.79	1559.41	0.25
Project	17785	Rev BB	141426.00	868.00	892.29	882.79	892.90	0.003271	6.25	22632.10	1447.29	0.28
Project	17510	Rev BB	141426.00	868.00	890.81	883.42	891.70	0.005886	7.59	18654.98	1414.71	0.36
Project	17360	Rev BB	141426.00	868.00	888.82	883.98	890.35	0.013569	9.95	14215.52	1305.45	0.53
Project	17110	Rev BB	141426.00	864.00	885.85	881.08	887.26	0.010933	9.55	14814.13	1232.51	0.49
Project	16970	Rev BB	141426.00	863.70	884.19	879.57	885.67	0.011338	9.76	14491.26	1196.81	0.49
Project	16720	Rev BB	141426.00	863.50	882.37	875.41	883.44	0.006539	8.31	17010.13	1187.95	0.39
Project	16515	Rev BB	141426.00	862.00	881.31	873.85	882.19	0.005350	7.54	18766.93	1306.21	0.35
Project	16305	Rev BB	141426.00	860.00	880.45	872.03	881.16	0.004085	6.76	20922.92	1395.94	0.31
Project	16130	Rev BB	141426.00	860.00	879.49	872.23	880.34	0.005368	7.40	19112.35	1369.50	0.35
Project	15960	Rev BB	141426.00	859.00	878.70	870.96	879.45	0.004570	6.91	20452.81	1438.39	0.32
Project	15745	Rev BB	141426.00	858.00	877.73	869.77	878.48	0.004476	6.94	20373.34	1402.37	0.32
Project	15540	Rev BB	141426.00	857.50	876.91	868.50	877.56	0.004066	6.49	22408.43	2361.93	0.30
Project	15335	Rev BB	141426.00	856.00	875.11	868.08	876.29	0.009480	8.73	16198.42	1064.14	0.39
Project	15125	Rev BB	142475.00	854.00	872.68	866.25	874.03	0.011555	9.34	15249.43	1053.51	0.43
Project	14900	Rev BB	142475.00	853.00	870.38	864.18	871.63	0.009216	8.97	15881.59	2238.73	0.45
Project	14720	Rev BB	142475.00	852.00	868.64	863.25	869.90	0.010452	9.02	15810.26	2022.13	0.47
Project	14480	Rev BB	142475.00	850.50	867.05	860.75	867.91	0.006131	7.43	19187.13	1853.66	0.37
Project	14315	Rev BB	142475.00	850.00	866.10	860.12	866.88	0.005923	7.08	20111.41	1942.36	0.36
Project	14090	Rev BB	142475.00	850.00	864.88	858.71	865.56	0.005375	6.64	21464.46	1816.59	0.34
Project	13850	Rev BB	142475.00	848.00	863.69	857.10	864.35	0.004893	6.52	21855.87	1775.36	0.33

HEC-RAS Plan: FinalProp085 River: SCR Reach: Project Profile: Rev BB (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Project	13635	Rev BB	142475.00	846.00	862.66	855.96	863.31	0.004619	6.49	22131.17	1820.37	0.32
Project	13425	Rev BB	142475.00	845.00	861.97	854.24	862.46	0.003252	5.61	25397.52	1936.85	0.27
Project	13190	Rev BB	142475.00	844.00	861.29	852.74	861.74	0.002835	5.37	26541.57	1912.15	0.25
Project	13030	Rev BB	142475.00	843.00	860.83	851.95	861.29	0.002789	5.40	26405.92	1864.73	0.25
Project	12835	Rev BB	142475.00	842.00	860.25	851.01	860.73	0.002859	5.54	25707.76	1777.11	0.26
Project	12615	Rev BB	142475.00	841.00	859.56	849.82	860.09	0.002907	5.85	24347.79	1569.00	0.26
Project	12395	Rev BB	142475.00	840.00	858.89	849.16	859.44	0.003000	5.97	23856.91	1549.44	0.27
Project	12195	Rev BB	142475.00	838.98	858.30	848.08	858.85	0.002869	5.98	23808.84	1469.16	0.26
Project	11995	Rev BB	142475.00	837.00	857.55	848.04	858.19	0.003608	6.44	22107.60	1450.22	0.29
Project	11780	Rev BB	142475.00	836.00	856.80	847.66	857.43	0.003467	6.35	22449.24	1462.33	0.29
Project	11605	Rev BB	142475.00	835.50	856.01	847.34	856.75	0.004360	6.88	20711.16	1419.08	0.32
Project	11405	Rev BB	142475.00	834.00	854.76	846.23	855.75	0.005373	7.98	17861.03	1145.60	0.36
Project	11180	Rev BB	142475.00	833.00	852.84	845.64	854.31	0.007515	9.72	14662.38	1010.63	0.45
Project	11015	Rev BB	142475.00	831.50	850.47	844.86	852.66	0.011939	11.87	12004.65	852.64	0.56
Project	10835	Rev BB	142475.00	831.00	848.29	843.79	850.42	0.013047	11.76	12400.58	1074.47	0.57
Project	10575	Rev BB	142475.00	830.00	846.33	840.16	847.54	0.007986	8.84	16140.29	1323.35	0.43
Project	10390	Rev BB	142475.00	828.00	845.30	838.53	846.14	0.005968	7.35	19375.22	1517.90	0.36
Project	10225	Rev BB	142475.00	827.50	844.20	838.21	845.10	0.006835	7.61	18716.44	1545.61	0.39
Project	10000	Rev BB	142475.00	826.00	842.62	837.11	843.54	0.006877	7.72	18453.52	1626.59	0.40
Project	9820	Rev BB	142475.00	824.00	841.41	835.36	842.34	0.006465	7.71	18478.98	1650.05	0.39
Project	9595	Rev BB	142475.00	823.80	839.92	834.15	840.84	0.006985	7.70	18513.50	1720.36	0.39
Project	9385	Rev BB	142475.00	823.00	838.61	833.09	839.38	0.006487	7.05	20207.47	1799.40	0.37
Project	9220	Rev BB	142475.00	822.00	837.64	831.82	838.35	0.005584	6.74	21127.86	1853.53	0.35
Project	9025	Rev BB	142475.00	821.00	836.65	830.39	837.32	0.005004	6.60	21582.88	1823.02	0.34

HEC-RAS Plan: Pr025LevCode River: SCR Reach: Project Profile: Rev BB

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Project	46195	Rev BB	115111.00	1035.00	1053.14	1054.04	1060.43	0.005006	21.67	5313.11	452.97	1.11
Project	46020	Rev BB	115111.00	1032.00	1050.08	1052.47	1059.13	0.008742	24.14	4768.34	520.89	1.41
Project	45545	Rev BB	115111.00	1030.00	1049.23	1049.27	1055.65	0.004027	20.33	5661.39	446.68	1.01
Project	45030	Rev BB	115111.00	1025.00	1041.51	1044.56	1052.09	0.010535	26.10	4410.21	492.54	1.54
Project	44585	Rev BB	115111.00	1022.00	1043.05	1043.07	1048.75	0.004190	19.17	6004.20	531.91	1.01
Project	44210	Rev BB	115111.00	1020.00	1035.36	1038.72	1045.99	0.009463	26.16	4399.47	452.62	1.48
Project	43820	Rev BB	115111.00	1018.00	1037.47	1037.48	1043.62	0.004072	19.90	5785.33	476.53	1.01
Project	43610	Rev BB	115111.00	1017.00	1030.80	1034.06	1041.87	0.010066	26.70	4311.38	450.58	1.52
Project	43410	Rev BB	115111.00	1016.00	1027.33	1031.12	1039.61	0.011140	28.76	4308.81	583.44	1.61
Project	43200	Rev BB	115111.00	1014.00	1026.42	1029.64	1036.81	0.010596	26.11	4615.62	689.16	1.54
Project	42975	Rev BB	115111.00	1012.00	1022.84	1026.28	1033.82	0.016327	26.63	4368.54	735.12	1.82
Project	42815	Rev BB	115111.00	1011.00	1021.72	1024.45	1030.58	0.015830	23.92	4840.30	864.26	1.76
Project	42590	Rev BB	115111.00	1010.00	1019.24	1021.61	1026.97	0.013663	22.43	5239.45	1013.12	1.64
Project	42430	Rev BB	115111.00	1008.00	1018.67	1020.25	1024.62	0.009146	19.57	5880.86	915.78	1.36
Project	42215	Rev BB	115111.00	1006.00	1017.22	1018.65	1022.53	0.008689	18.48	6228.87	1018.99	1.32
Project	41940	Rev BB	115111.00	1005.00	1019.27	1017.69	1021.36	0.002429	11.60	9938.85	1284.24	0.73
Project	41730	Rev BB	115111.00	1004.00	1018.69	1016.46	1020.85	0.002298	11.79	9782.67	1190.92	0.71
Project	41460	Rev BB	115111.00	1002.00	1018.18	1015.18	1020.26	0.002007	11.56	9955.93	1093.49	0.68
Project	41280	Rev BB	115111.00	1001.00	1015.35	1015.35	1019.53	0.004463	16.42	7036.47	852.28	1.00
Project	41080	Rev BB	115111.00	1000.00	1012.06	1013.54	1018.19	0.007501	19.93	5822.75	874.06	1.27
Project	40825	Rev BB	115111.00	999.50	1010.97	1012.14	1016.00	0.007233	18.02	6444.40	1040.35	1.22
Project	40585	Rev BB	115111.00	998.00	1009.70	1010.42	1014.18	0.006378	16.98	6785.22	1005.81	1.15
Project	40335	Rev BB	115111.00	996.00	1011.09	1008.70	1012.81	0.001736	10.54	10937.81	1249.57	0.63
Project	40130	Rev BB	115111.00	995.00	1010.49	1008.34	1012.42	0.001793	11.30	10477.71	1195.64	0.64
Project	39945	Rev BB	115111.00	994.00	1010.29	1007.73	1012.07	0.001542	11.00	10919.88	1173.27	0.60
Project	39755	Rev BB	115111.00	994.00	1007.28	1007.28	1011.39	0.004003	16.46	7234.94	894.45	0.96
Project	39605	Rev BB	115111.00	993.00	1004.51	1005.87	1010.45	0.006872	19.70	6001.74	849.68	1.23
Project	39310	Rev BB	115111.00	992.00	1004.65	1004.65	1008.62	0.003630	16.53	7501.51	931.10	0.92
Project	39100	Rev BB	115111.00	990.00	1000.40	1002.12	1007.21	0.008939	20.94	5496.16	761.14	1.37
Project	38925	Rev BB	115111.00	989.50	1003.76	1001.55	1006.31	0.002096	12.82	8981.87	873.49	0.70
Project	38710	Rev BB	115111.00	988.00	1003.58	1000.32	1005.83	0.001571	12.04	9558.11	820.29	0.62
Project	38475	Rev BB	115111.00	986.00	1000.04	1000.04	1005.00	0.004280	17.89	6451.15	659.72	1.00
Project	38300	Rev BB	115111.00	985.50	995.78	997.87	1003.64	0.009518	22.51	5114.38	666.28	1.43
Project	38065	Rev BB	115111.00	984.00	998.04	995.74	1001.32	0.002214	14.54	7914.65	658.41	0.74
Project	37810	Rev BB	115111.00	983.00	995.22	995.22	1000.37	0.004276	18.21	6321.20	618.24	1.00
Project	37655	Rev BB	115111.00	982.00	992.54	994.10	999.31	0.008065	20.88	5511.72	706.72	1.32
Project	37390	Rev BB	115111.00	981.00	987.53	990.11	996.27	0.015047	23.73	4850.91	823.78	1.72
Project	37135	Rev BB	115111.00	980.00	989.30	989.33	993.58	0.004550	16.58	6941.42	821.44	1.01
Project	36930	Rev BB	115111.00	978.00	986.10	987.49	992.18	0.008097	19.79	5815.33	812.44	1.30
Project	36735	Rev BB	115111.00	977.00	986.84	986.84	990.86	0.004540	16.10	7161.17	896.91	1.00
Project	36515	Rev BB	115111.00	975.00	987.02	985.36	989.58	0.002443	12.85	8981.37	994.69	0.75
Project	36265	Rev BB	115111.00	974.00	986.48	985.22	988.84	0.003072	12.33	9335.94	1176.00	0.77
Project	36080	Rev BB	116236.00	973.00	984.63	984.63	987.98	0.005713	14.69	7912.71	1176.00	1.00
Project	35845	Rev BB	116236.00	971.00	984.64	982.88	986.50	0.002139	10.95	10632.07	1401.71	0.68
Project	35725	Rev BB	116236.00	970.00	982.95	982.95	986.05	0.003627	14.96	8689.93	1377.89	0.90
Project	35515	Rev BB	116236.00	969.00	981.00	981.77	985.11	0.004566	17.10	7670.88	1354.77	1.04
Project	35245	Rev BB	116236.00	968.00	979.34	980.44	983.69	0.005894	17.32	7329.53	1328.31	1.12
Project	35040	Rev BB	116236.00	967.00	977.65	978.97	982.46	0.005549	19.57	7402.76	1354.78	1.13
Project	34860	Rev BB	116236.00	966.00	975.96	977.40	981.22	0.008614	18.40	6315.84	1285.71	1.46
Project	34720	Rev BB	116236.00	965.50	974.72	976.17	979.96	0.009180	18.37	6328.08	1411.20	1.53
Project	34495	Rev BB	116236.00	964.00	973.04	974.28	977.75	0.009172	17.42	6673.93	1283.85	1.35
Project	34310	Rev BB	116236.00	963.00	972.28	973.00	976.33	0.004852	16.76	7668.82	1308.50	1.03
Project	34090	Rev BB	116236.00	962.00	970.57	971.59	975.05	0.006730	16.98	6843.72	1295.50	1.30
Project	33880	Rev BB	116236.00	960.00	969.33	970.25	973.60	0.006606	16.57	7013.99	1318.43	1.27
Project	33710	Rev BB	116236.00	959.00	968.71	969.25	972.38	0.005499	15.39	7555.15	1372.11	1.16
Project	33500	Rev BB	116236.00	958.00	967.26	967.96	971.11	0.006549	16.18	7665.86	1495.98	1.14
Project	33310	Rev BB	116236.00	957.00	966.03	966.96	969.89	0.006423	15.77	7371.77	1770.35	1.36
Project	33115	Rev BB	116236.00	956.00	966.60	965.32	968.27	0.002770	10.36	11217.41	1847.27	0.74
Project	32795	Rev BB	116236.00	954.00	964.56	964.56	967.18	0.003570	12.99	8949.52	1735.59	1.01
Project	32605	Rev BB	116236.00	952.00	963.12	963.61	966.33	0.004754	14.38	8080.57	1699.92	1.13
Project	32265	Rev BB	140776.00	950.00	960.46	961.32	964.38	0.006433	15.88	8862.89	1853.19	1.28
Project	31875	Rev BB	140776.00	949.00	959.38	959.38	961.76	0.005505	12.38	11368.96	2409.15	1.00
Project	31585	Rev BB	140776.00	946.00	957.85	956.96	959.70	0.003160	10.91	12900.93	2182.22	0.79
Project	31360	Rev BB	140776.00	944.00	957.45	955.41	959.09	0.001898	10.28	13848.11	1878.67	0.64
Project	31060	Rev BB	140776.00	942.00	957.49	953.29	958.54	0.000883	8.20	17165.15	1708.18	0.46
Project	30720	Rev BB	140776.00	940.00	957.52	951.33	958.21	0.000503	6.65	21153.55	1888.61	0.35
Project	30445	Rev BB	140776.00	938.00	957.46	949.57	958.06	0.000373	6.25	22524.41	1779.71	0.31
Project	30095	Rev BB	140776.00	936.00	957.25	947.93	957.94	0.000304	6.72	21778.32	1622.72	0.29
Project	29815	Rev BB	140776.00	935.00	956.93	948.10	957.82	0.000390	7.74	19323.91	1433.15	0.33
Project	29565	Rev BB	140776.00	934.00	956.88	947.30	957.70	0.000380	7.40	19609.21	1323.79	0.32
Project	29385	Rev BB	140776.00	933.00	956.59	949.37	957.61	0.000483	8.28	17777.02	1237.37	0.36
Project	29140	Rev BB	140776.00	932.00	956.13	949.97	957.44	0.000712	9.19	15319.17	1087.20	0.43
Project	28895	Rev BB	140776.00	930.00	952.50	952.50	956.86	0.002171	18.80	9575.46	972.12	0.78
Project	28695	Rev BB	140776.00	928.00	942.01	945.73	954.96	0.024913	28.87	4876.24	899.40	2.18

HEC-RAS Plan: Pr025LevCode River: SCR Reach: Project Profile: Rev BB (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Project	28500	Rev BB	140776.00	927.50	943.62	946.10	951.41	0.005568	22.39	6287.19	552.17	1.17
Project	28280	Rev BB	140776.00	926.00	936.76	940.42	949.18	0.012736	29.59	5431.96	944.52	1.71
Project	28080	Rev BB	140776.00	925.00	944.09	938.55	945.83	0.000816	11.26	13583.41	926.37	0.48
Project	27925	Rev BB	140776.00	924.00	943.26	939.25	945.62	0.001091	13.09	11919.32	866.57	0.55
Project	27725	Rev BB	140776.00	923.00	939.71	939.71	945.00	0.002680	19.03	8197.14	786.61	0.85
Project	27545	Rev BB	140776.00	922.00	936.05	937.70	944.07	0.005424	22.89	6357.92	643.23	1.16
Project	27335	Rev BB	140776.00	921.00	933.30	936.32	942.60	0.007749	24.55	5857.59	703.53	1.35
Project	27155	Rev BB	140776.00	920.50	935.29	935.76	940.56	0.003283	19.09	8183.45	888.43	0.92
Project	26990	Rev BB	140776.00	920.00	931.45	933.72	939.36	0.010995	22.60	6251.25	922.34	1.51
Project	26780	Rev BB	140776.00	918.00	929.28	931.66	937.27	0.009096	23.11	6501.43	1043.32	1.42
Project	26575	Rev BB	140776.00	917.00	928.11	929.98	934.77	0.011845	20.70	6801.06	1187.27	1.52
Project	26355	Rev BB	140776.00	916.00	929.39	929.39	933.05	0.003824	15.86	9475.99	1260.40	0.93
Project	26170	Rev BB	140776.00	915.00	928.48	928.73	932.37	0.003357	16.99	9605.44	1269.04	0.90
Project	25965	Rev BB	140776.00	914.00	926.88	927.72	931.53	0.004261	18.22	8811.74	1281.32	1.00
Project	25785	Rev BB	140776.00	913.50	925.60	926.63	930.65	0.004882	18.93	8376.91	1219.65	1.07
Project	25600	Rev BB	140776.00	912.50	924.93	925.64	929.69	0.004574	18.53	8467.08	1109.36	1.03
Project	25425	Rev BB	140776.00	911.00	923.47	924.43	928.67	0.006886	18.30	7702.49	1082.21	1.20
Project	25215	Rev BB	140776.00	910.00	924.72	923.68	927.87	0.003051	14.27	9886.47	1097.27	0.83
Project	25000	Rev BB	140776.00	909.00	924.48	922.49	927.16	0.002226	13.17	10726.62	1062.41	0.73
Project	24795	Rev BB	140776.00	908.00	923.60	921.80	926.66	0.002399	14.05	10060.99	957.43	0.76
Project	24550	Rev BB	140776.00	906.00	922.50	920.91	926.00	0.002585	15.05	9407.90	856.12	0.79
Project	24335	Rev BB	140776.00	905.00	920.00	920.00	925.14	0.004222	18.23	7758.55	764.84	1.00
Project	24115	Rev BB	140776.00	904.00	917.79	918.66	923.97	0.005627	19.97	7075.98	754.15	1.14
Project	23975	Rev BB	140776.00	903.50	916.36	917.71	923.05	0.006734	20.79	6802.82	783.24	1.23
Project	23755	Rev BB	140776.00	902.00	916.70	916.70	921.73	0.004144	18.07	7883.57	815.66	0.99
Project	23565	Rev BB	140776.00	900.00	914.30	915.55	920.61	0.006682	20.21	7009.72	850.93	1.22
Project	23365	Rev BB	140776.00	900.00	914.27	914.69	919.18	0.004225	18.44	8193.99	939.03	1.00
Project	23180	Rev BB	140776.00	899.00	911.64	913.14	918.15	0.005198	21.91	7362.50	916.60	1.13
Project	23000	Rev BB	140776.00	898.00	909.26	911.13	916.78	0.010007	22.01	6396.83	784.00	1.36
Project	22790	Rev BB	140776.00	897.50	910.49	910.49	915.48	0.005082	17.93	7853.44	784.00	1.00
Project	22600	Rev BB	140776.00	896.00	908.75	909.83	914.38	0.005814	19.84	7611.16	998.99	1.15
Project	22415	Rev BB	140776.00	895.50	906.26	907.97	912.91	0.009659	21.28	6839.61	1039.08	1.42
Project	22195	Rev BB	141426.00	894.00	907.98	906.82	910.85	0.002733	13.64	10506.24	1309.62	0.79
Project	22010	Rev BB	141426.00	892.00	906.34	906.34	910.19	0.003231	16.12	9490.52	1254.05	0.88
Project	21790	Rev BB	141426.00	891.50	903.06	904.80	909.04	0.005997	19.71	7416.01	1144.54	1.16
Project	21615	Rev BB	141426.00	892.00	900.54	902.67	907.53	0.011263	21.25	6724.20	1162.96	1.50
Project	21440	Rev BB	141426.00	890.00	900.97	901.64	905.59	0.004781	17.47	8486.12	1286.09	1.04
Project	21225	Rev BB	141426.00	888.00	899.73	900.84	904.50	0.005437	18.05	8659.23	1558.99	1.10
Project	21020	Rev BB	141426.00	887.00	896.71	898.87	903.05	0.007282	20.26	7028.37	902.97	1.26
Project	20845	Rev BB	141426.00	886.00	898.73	898.73	902.00	0.003234	15.09	10415.32	1563.68	0.87
Project	20595	Rev BB	141426.00	885.00	898.44	896.85	900.55	0.001741	12.43	12879.93	1548.78	0.65
Project	20435	Rev BB	141426.00	884.00	898.29	896.35	900.24	0.001485	12.07	13441.56	1528.26	0.61
Project	20280	Rev BB	141426.00	883.70	896.49	896.49	899.77	0.003240	15.58	10469.12	1531.27	0.87
Project	20070	Rev BB	141426.00	882.00	893.08	894.65	898.66	0.006088	19.34	7950.22	1526.62	1.17
Project	19855	Rev BB	141426.00	880.50	890.72	892.94	897.11	0.007654	20.60	7256.29	1205.44	1.29
Project	19630	Rev BB	141426.00	880.00	888.85	890.50	895.26	0.008984	20.59	7022.63	1060.31	1.37
Project	19440	Rev BB	141426.00	878.00	891.37	889.70	894.01	0.002361	13.14	10944.01	1194.54	0.74
Project	19240	Rev BB	141426.00	877.50	889.35	889.35	893.26	0.004288	15.89	9009.98	1216.93	0.97
Project	19050	Rev BB	141426.00	876.00	886.51	887.89	891.96	0.009085	18.83	7609.36	1321.43	1.35
Project	18830	Rev BB	141426.00	874.00	888.57	887.55	891.15	0.002730	13.26	11286.43	1531.54	0.79
Project	18650	Rev BB	141426.00	873.50	888.51	886.84	890.60	0.001837	12.07	12773.93	1604.48	0.66
Project	18475	Rev BB	141426.00	872.00	888.89	885.04	890.10	0.001001	8.89	16125.18	1621.53	0.49
Project	18290	Rev BB	141426.00	871.50	888.43	885.13	889.87	0.001213	9.80	14922.77	1594.15	0.54
Project	18025	Rev BB	141426.00	870.00	888.54	882.94	889.50	0.000621	7.92	18109.90	1520.22	0.40
Project	17785	Rev BB	141426.00	868.00	888.22	882.78	889.33	0.000704	8.45	16839.22	1398.14	0.42
Project	17510	Rev BB	141426.00	868.00	887.23	883.27	889.02	0.001136	10.97	13735.28	1350.70	0.54
Project	17360	Rev BB	141426.00	868.00	883.91	883.91	888.45	0.004427	17.10	8296.49	943.23	1.00
Project	17110	Rev BB	141426.00	864.00	879.19	881.42	886.72	0.007499	22.29	6796.11	1175.37	1.30
Project	16970	Rev BB	141426.00	863.70	877.25	879.83	885.42	0.010272	23.07	6337.44	1066.97	1.48
Project	16720	Rev BB	141426.00	863.50	872.70	875.43	881.94	0.018711	24.39	5801.39	1122.93	1.88
Project	16515	Rev BB	141426.00	862.00	872.36	873.86	878.20	0.010048	19.44	7302.33	1249.88	1.41
Project	16305	Rev BB	141426.00	860.00	874.55	872.14	876.49	0.001716	11.59	12787.87	1360.53	0.64
Project	16130	Rev BB	141426.00	860.00	872.31	872.31	875.86	0.004579	15.67	9439.97	1326.45	0.99
Project	15960	Rev BB	141426.00	859.00	869.97	870.98	874.69	0.008166	17.65	8113.94	1385.96	1.27
Project	15745	Rev BB	141426.00	858.00	871.32	869.77	873.67	0.002505	12.30	11500.58	1363.87	0.75
Project	15540	Rev BB	141426.00	857.50	871.22	868.50	872.95	0.001597	10.55	13406.47	1426.61	0.61
Project	15335	Rev BB	141426.00	856.00	868.08	868.08	872.16	0.005521	16.21	8721.97	1064.14	1.00
Project	15125	Rev BB	142475.00	854.00	865.62	866.25	870.59	0.007031	17.89	7966.16	1000.47	1.12
Project	14900	Rev BB	142475.00	853.00	862.77	864.23	868.54	0.008996	19.28	7389.85	1626.46	1.35
Project	14720	Rev BB	142475.00	852.00	861.80	862.97	866.83	0.007951	18.07	7995.80	1722.27	1.27
Project	14480	Rev BB	142475.00	850.50	859.35	860.83	864.69	0.009831	19.03	7857.43	1726.69	1.39
Project	14315	Rev BB	142475.00	850.00	859.90	859.99	862.93	0.005287	13.99	10186.13	1880.98	1.02
Project	14090	Rev BB	142475.00	850.00	858.47	858.71	861.66	0.005810	14.34	9937.41	1772.81	1.06
Project	13850	Rev BB	142475.00	848.00	857.69	857.10	860.17	0.003694	12.62	11299.46	1741.62	0.87

HEC-RAS Plan: Pr025LevCode River: SCR Reach: Project Profile: Rev BB (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Project	13635	Rev BB	142475.00	846.00	856.29	856.29	859.29	0.003837	15.47	10777.84	1705.84	0.93
Project	13425	Rev BB	142475.00	845.00	852.82	854.24	857.85	0.010659	18.00	7915.99	1850.66	1.53
Project	13190	Rev BB	142475.00	844.00	853.52	852.80	855.78	0.003254	12.17	11923.29	1847.43	0.82
Project	13030	Rev BB	142475.00	843.00	852.58	852.23	855.21	0.003379	14.20	11406.11	1762.99	0.87
Project	12835	Rev BB	142475.00	842.00	852.13	851.20	854.54	0.002769	13.31	11761.95	1607.50	0.79
Project	12615	Rev BB	142475.00	841.00	851.86	850.10	853.94	0.001918	12.46	12681.30	1470.78	0.68
Project	12395	Rev BB	142475.00	840.00	851.49	849.52	853.55	0.001708	12.32	12873.68	1438.10	0.65
Project	12195	Rev BB	142475.00	838.98	851.49	848.24	853.14	0.001192	10.62	14191.69	1383.66	0.55
Project	11995	Rev BB	142475.00	837.00	850.60	848.45	852.80	0.001625	12.80	12474.09	1280.52	0.64
Project	11780	Rev BB	142475.00	836.00	850.37	848.11	852.44	0.001447	12.59	13173.69	1422.19	0.61
Project	11605	Rev BB	142475.00	835.50	849.29	847.46	852.08	0.001869	13.90	11381.14	1325.50	0.69
Project	11405	Rev BB	142475.00	834.00	849.07	846.17	851.69	0.001519	13.18	11428.21	1114.61	0.64
Project	11180	Rev BB	142475.00	833.00	846.89	845.65	851.10	0.002564	16.60	8864.64	835.68	0.82
Project	11015	Rev BB	142475.00	831.50	844.78	844.78	850.43	0.003842	19.08	7493.10	679.39	0.99
Project	10835	Rev BB	142475.00	831.00	841.87	843.71	849.32	0.007252	21.91	6502.00	790.38	1.35
Project	10575	Rev BB	142475.00	830.00	837.47	840.16	846.52	0.015567	24.13	5903.48	1108.84	1.84
Project	10390	Rev BB	142475.00	828.00	836.77	839.04	843.84	0.008452	22.72	7220.95	1247.02	1.37
Project	10225	Rev BB	142475.00	827.50	837.05	838.17	841.96	0.006830	17.80	8061.12	1374.14	1.26
Project	10000	Rev BB	142475.00	826.00	837.14	837.14	840.54	0.003942	14.90	9785.79	1488.00	0.96
Project	9820	Rev BB	142475.00	824.00	833.98	835.33	839.33	0.008466	18.57	7671.79	1402.32	1.37
Project	9595	Rev BB	142475.00	823.80	834.12	834.12	837.42	0.004905	14.58	9770.14	1619.46	1.00
Project	9385	Rev BB	142475.00	823.00	832.49	833.15	836.23	0.006101	15.78	9289.78	1770.37	1.19
Project	9220	Rev BB	142475.00	822.00	830.86	831.81	835.03	0.007824	16.39	8704.29	1771.41	1.29
Project	9025	Rev BB	142475.00	821.00	829.91	830.56	833.69	0.005307	15.90	9468.91	1736.86	1.09

HEC-RAS Plan: Pr085LevCode River: SCR Reach: Project Profile: Rev BB

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Project	46195	Rev BB	115111.00	1035.00	1063.12	1054.04	1064.77	0.006261	10.67	11871.29	750.83	0.40
Project	46020	Rev BB	115111.00	1032.00	1062.02	1052.44	1063.64	0.006544	10.21	11277.79	570.22	0.40
Project	45545	Rev BB	115111.00	1030.00	1057.85	1049.24	1059.95	0.008982	11.63	9900.10	524.21	0.47
Project	45030	Rev BB	115111.00	1025.00	1054.23	1044.56	1055.89	0.006629	10.33	11145.16	557.97	0.41
Project	44585	Rev BB	115111.00	1022.00	1050.60	1043.05	1052.39	0.009283	10.74	10717.92	654.38	0.47
Project	44210	Rev BB	115111.00	1020.00	1047.83	1038.72	1049.37	0.006714	9.97	11549.74	619.95	0.41
Project	43820	Rev BB	115111.00	1018.00	1042.08	1037.47	1045.21	0.017534	14.19	8112.26	528.70	0.64
Project	43610	Rev BB	115111.00	1017.00	1038.25	1034.06	1041.46	0.018806	14.39	7998.42	536.89	0.66
Project	43410	Rev BB	115111.00	1016.00	1035.83	1031.12	1038.22	0.011970	13.25	9837.37	729.14	0.54
Project	43200	Rev BB	115111.00	1014.00	1033.24	1029.61	1035.63	0.014478	12.98	9662.58	779.49	0.58
Project	42975	Rev BB	115111.00	1012.00	1030.98	1026.26	1032.66	0.010954	10.71	11432.61	955.76	0.50
Project	42815	Rev BB	115111.00	1011.00	1029.67	1024.43	1030.90	0.008589	9.10	13242.80	1120.79	0.44
Project	42590	Rev BB	115111.00	1010.00	1028.42	1021.61	1029.28	0.005536	7.65	15735.26	1230.66	0.36
Project	42430	Rev BB	115111.00	1008.00	1027.53	1020.25	1028.39	0.005373	7.55	15955.86	1334.91	0.35
Project	42215	Rev BB	115111.00	1006.00	1026.68	1018.65	1027.34	0.004067	6.60	17936.38	1374.62	0.31
Project	41940	Rev BB	115111.00	1005.00	1025.62	1017.69	1026.25	0.003871	6.38	18230.06	1327.03	0.30
Project	41730	Rev BB	115111.00	1004.00	1024.63	1016.46	1025.35	0.004429	6.86	16939.62	1221.47	0.32
Project	41460	Rev BB	115111.00	1002.00	1023.17	1015.18	1024.03	0.005512	7.43	15483.49	1120.97	0.35
Project	41280	Rev BB	115111.00	1001.00	1021.79	1015.35	1022.90	0.006803	8.69	14194.24	1193.24	0.40
Project	41080	Rev BB	115111.00	1000.00	1020.52	1013.58	1021.61	0.006027	8.64	14443.03	1136.84	0.38
Project	40825	Rev BB	115111.00	999.50	1019.34	1012.13	1020.15	0.004966	7.34	16245.37	1212.96	0.34
Project	40585	Rev BB	115111.00	998.00	1018.25	1010.42	1018.99	0.004404	7.05	16893.35	1247.23	0.32
Project	40335	Rev BB	115111.00	996.00	1017.43	1008.70	1018.01	0.003313	6.09	18980.28	1288.56	0.28
Project	40130	Rev BB	115111.00	995.00	1016.61	1008.34	1017.27	0.003693	6.64	17974.92	1264.54	0.30
Project	39945	Rev BB	115111.00	994.00	1015.89	1007.73	1016.57	0.003832	6.82	17605.07	1212.34	0.30
Project	39755	Rev BB	115111.00	994.00	1014.56	1007.28	1015.64	0.005781	8.58	14340.28	1088.09	0.37
Project	39605	Rev BB	115111.00	993.00	1013.74	1005.87	1014.80	0.005317	8.49	14586.36	1074.69	0.36
Project	39310	Rev BB	115111.00	992.00	1012.22	1004.65	1013.22	0.005130	8.42	14723.69	977.30	0.35
Project	39100	Rev BB	115111.00	990.00	1011.11	1002.09	1012.15	0.005092	8.18	14069.44	831.46	0.35
Project	38925	Rev BB	115111.00	989.50	1010.31	1001.54	1011.25	0.004818	7.77	14815.54	906.70	0.34
Project	38710	Rev BB	115111.00	988.00	1009.15	1000.32	1010.17	0.005022	8.12	14194.81	844.08	0.35
Project	38475	Rev BB	115111.00	986.00	1006.95	1000.04	1008.63	0.008448	10.43	11138.93	695.26	0.45
Project	38300	Rev BB	115111.00	985.50	1005.77	997.87	1007.19	0.007052	9.56	12039.52	716.81	0.41
Project	38065	Rev BB	115111.00	984.00	1004.13	995.74	1005.55	0.006785	9.57	12028.87	691.25	0.40
Project	37810	Rev BB	115111.00	983.00	1001.38	995.22	1003.35	0.010638	11.27	10217.52	648.42	0.50
Project	37655	Rev BB	115111.00	982.00	999.88	994.10	1001.64	0.010523	10.64	10815.11	738.91	0.49
Project	37390	Rev BB	115111.00	981.00	998.45	990.10	999.49	0.005379	8.16	14098.28	869.10	0.36
Project	37135	Rev BB	115111.00	980.00	996.79	989.31	997.96	0.006585	8.70	13225.00	863.67	0.39
Project	36930	Rev BB	115111.00	978.00	995.67	987.49	996.71	0.005428	8.25	14200.96	923.68	0.36
Project	36735	Rev BB	115111.00	977.00	994.61	986.84	995.61	0.005534	8.08	14397.32	963.18	0.36
Project	36515	Rev BB	115111.00	975.00	993.62	985.36	994.47	0.004637	7.39	15678.21	1032.73	0.33
Project	36265	Rev BB	115111.00	974.00	992.27	985.22	993.06	0.006897	7.13	16142.37	1176.00	0.34
Project	36080	Rev BB	116236.00	973.00	990.64	984.63	991.58	0.009003	7.75	14989.02	1176.00	0.38
Project	35845	Rev BB	116236.00	971.00	989.14	982.87	989.89	0.005531	6.98	16713.90	1512.83	0.35
Project	35725	Rev BB	116236.00	970.00	988.29	982.95	989.16	0.006293	8.01	15871.91	1488.92	0.38
Project	35515	Rev BB	116236.00	969.00	986.85	981.77	987.82	0.006633	8.45	15243.73	1501.04	0.39
Project	35245	Rev BB	116236.00	968.00	984.99	980.44	985.93	0.007356	8.26	15487.04	1580.25	0.40
Project	35040	Rev BB	116236.00	967.00	983.55	978.97	984.46	0.006763	8.81	15947.66	1491.55	0.40
Project	34860	Rev BB	116236.00	966.00	982.27	977.40	983.19	0.007889	7.72	15053.43	1431.50	0.42
Project	34720	Rev BB	116236.00	965.50	981.25	976.17	982.11	0.007109	7.42	15663.31	1449.93	0.40
Project	34495	Rev BB	116236.00	964.00	979.74	974.28	980.55	0.006712	7.24	16056.04	1461.49	0.38
Project	34310	Rev BB	116236.00	963.00	978.44	973.00	979.33	0.006216	8.12	15915.74	1384.94	0.38
Project	34090	Rev BB	116236.00	962.00	977.04	971.59	977.91	0.006781	7.50	15494.22	1371.03	0.39
Project	33880	Rev BB	116236.00	960.00	975.66	970.25	976.48	0.006784	7.29	15950.57	1482.88	0.39
Project	33710	Rev BB	116236.00	959.00	974.55	969.25	975.30	0.006495	6.96	16700.10	1637.90	0.38
Project	33500	Rev BB	116236.00	958.00	973.31	967.96	973.99	0.005863	6.99	17999.09	1755.45	0.35
Project	33310	Rev BB	116236.00	957.00	972.33	966.96	972.92	0.005184	6.21	18709.82	1828.18	0.34
Project	33115	Rev BB	116236.00	956.00	971.41	965.32	971.93	0.004628	5.75	20248.08	1927.09	0.31
Project	32795	Rev BB	116236.00	954.00	969.69	964.56	970.32	0.005544	6.34	18385.59	1920.75	0.36
Project	32605	Rev BB	116236.00	952.00	968.71	963.61	969.26	0.005158	6.06	20182.80	2407.42	0.34
Project	32265	Rev BB	140776.00	950.00	967.18	961.33	967.65	0.004429	5.48	25728.28	2840.18	0.32
Project	31875	Rev BB	140776.00	949.00	965.59	959.38	966.01	0.003875	5.25	26887.78	2593.08	0.28
Project	31585	Rev BB	140776.00	946.00	964.66	956.96	965.04	0.002932	4.96	28433.09	2377.46	0.25
Project	31360	Rev BB	140776.00	944.00	963.92	955.41	964.37	0.002797	5.46	26418.22	1959.45	0.25
Project	31060	Rev BB	140776.00	942.00	963.17	953.29	963.57	0.002504	5.08	27711.47	1975.93	0.24
Project	30720	Rev BB	140776.00	940.00	962.52	951.33	962.85	0.001709	4.59	30668.14	1911.53	0.20
Project	30445	Rev BB	140776.00	938.00	962.08	949.57	962.41	0.001527	4.58	30947.53	1841.84	0.19
Project	30095	Rev BB	140776.00	936.00	961.46	947.93	961.86	0.001543	5.18	28649.25	1637.30	0.20
Project	29815	Rev BB	140776.00	935.00	960.83	948.10	961.36	0.002089	6.05	24935.54	1445.23	0.23
Project	29565	Rev BB	140776.00	934.00	960.26	947.30	960.81	0.002264	6.03	24109.24	1334.86	0.24
Project	29385	Rev BB	140776.00	933.00	959.64	949.37	960.33	0.003009	6.82	21565.54	1249.05	0.28
Project	29140	Rev BB	140776.00	932.00	958.42	949.97	959.39	0.005030	7.90	17821.87	1095.03	0.35
Project	28895	Rev BB	140776.00	930.00	953.81	952.50	957.09	0.017778	16.50	10852.34	977.96	0.66
Project	28695	Rev BB	140776.00	928.00	952.93	945.73	954.30	0.007405	9.39	14984.17	951.56	0.42

HEC-RAS Plan: Pr085LevCode River: SCR Reach: Project Profile: Rev BB (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Project	28500	Rev BB	140776.00	927.50	950.46	946.10	952.50	0.010938	11.99	13039.30	1039.52	0.51
Project	28280	Rev BB	140776.00	926.00	949.82	940.43	950.81	0.003962	8.71	18177.10	1003.89	0.32
Project	28080	Rev BB	140776.00	925.00	949.08	938.55	950.03	0.003667	8.32	18252.46	945.35	0.31
Project	27925	Rev BB	140776.00	924.00	948.08	939.25	949.34	0.004899	9.61	16137.12	884.88	0.36
Project	27725	Rev BB	140776.00	923.00	946.11	939.71	948.04	0.007805	11.87	13307.67	811.81	0.45
Project	27545	Rev BB	140776.00	922.00	944.30	937.76	946.51	0.009174	12.41	12580.74	852.53	0.49
Project	27335	Rev BB	140776.00	921.00	943.00	936.32	944.66	0.007204	10.87	14331.54	937.22	0.43
Project	27155	Rev BB	140776.00	920.50	941.47	935.68	943.23	0.008132	11.39	14013.66	978.05	0.45
Project	26990	Rev BB	140776.00	920.00	940.42	933.69	941.79	0.007553	9.43	15133.02	1020.89	0.42
Project	26780	Rev BB	140776.00	918.00	939.32	931.66	940.39	0.005229	8.76	17337.33	1106.54	0.36
Project	26575	Rev BB	140776.00	917.00	938.54	929.98	939.36	0.004267	7.26	19508.54	1243.55	0.32
Project	26355	Rev BB	140776.00	916.00	937.64	929.39	938.43	0.004072	7.43	20021.06	1294.51	0.32
Project	26170	Rev BB	140776.00	915.00	936.93	928.73	937.71	0.003759	7.69	20464.75	1301.20	0.31
Project	25965	Rev BB	140776.00	914.00	936.21	927.72	936.96	0.003524	7.51	20897.77	1313.23	0.30
Project	25785	Rev BB	140776.00	913.50	935.53	926.61	936.29	0.003475	7.49	20670.97	1256.91	0.30
Project	25600	Rev BB	140776.00	912.50	934.78	925.61	935.61	0.003744	7.77	19592.25	1149.92	0.31
Project	25425	Rev BB	140776.00	911.00	934.12	924.40	934.93	0.003804	7.28	19499.23	1138.28	0.31
Project	25215	Rev BB	140776.00	910.00	933.33	923.65	934.14	0.003786	7.28	19489.43	1133.64	0.31
Project	25000	Rev BB	140776.00	909.00	932.49	922.49	933.32	0.003701	7.33	19370.94	1093.78	0.30
Project	24795	Rev BB	140776.00	908.00	931.50	921.80	932.49	0.004350	8.01	17745.99	986.47	0.33
Project	24550	Rev BB	140776.00	906.00	930.07	920.91	931.29	0.005312	8.89	16012.83	887.13	0.36
Project	24335	Rev BB	140776.00	905.00	928.51	920.00	930.01	0.006539	9.87	14423.97	800.25	0.40
Project	24115	Rev BB	140776.00	904.00	927.00	918.67	928.55	0.006726	10.04	14198.88	793.23	0.41
Project	23975	Rev BB	140776.00	903.50	926.14	917.71	927.59	0.006337	9.71	14687.95	828.21	0.40
Project	23755	Rev BB	140776.00	902.00	924.71	916.73	926.18	0.006617	9.86	14864.52	939.24	0.41
Project	23565	Rev BB	140776.00	900.00	923.57	915.55	924.91	0.006257	9.40	15381.71	941.49	0.39
Project	23365	Rev BB	140776.00	900.00	922.44	914.69	923.69	0.005846	9.37	16064.14	987.42	0.38
Project	23180	Rev BB	140776.00	899.00	921.46	913.15	922.64	0.005042	9.55	16653.38	975.52	0.36
Project	23000	Rev BB	140776.00	898.00	920.04	911.13	921.44	0.008933	9.48	14845.64	784.00	0.38
Project	22790	Rev BB	140776.00	897.50	917.49	910.49	919.22	0.012226	10.55	13340.82	784.00	0.45
Project	22600	Rev BB	140776.00	896.00	915.78	909.80	917.24	0.008268	10.17	14841.19	1050.23	0.45
Project	22415	Rev BB	140776.00	895.50	914.43	908.00	915.72	0.007649	9.33	15555.24	1091.58	0.42
Project	22195	Rev BB	141426.00	894.00	913.05	906.82	914.10	0.006704	8.42	17691.91	1463.96	0.39
Project	22010	Rev BB	141426.00	892.00	911.36	906.34	912.70	0.008118	9.77	15883.23	1735.05	0.44
Project	21790	Rev BB	141426.00	891.50	909.92	904.80	911.00	0.006786	9.03	18446.60	1778.41	0.40
Project	21615	Rev BB	141426.00	892.00	908.91	902.67	909.82	0.005937	7.96	19349.10	1687.67	0.37
Project	21440	Rev BB	141426.00	890.00	907.84	901.64	908.76	0.005947	8.18	19246.72	1652.97	0.37
Project	21225	Rev BB	141426.00	888.00	906.65	900.86	907.52	0.005590	8.04	19593.15	1600.82	0.36
Project	21020	Rev BB	141426.00	887.00	905.64	898.87	906.47	0.004588	7.78	20476.53	1607.44	0.33
Project	20845	Rev BB	141426.00	886.00	904.74	898.73	905.59	0.005266	7.87	19957.19	1605.07	0.35
Project	20595	Rev BB	141426.00	885.00	903.62	896.85	904.38	0.004470	7.54	20997.42	1600.38	0.33
Project	20435	Rev BB	141426.00	884.00	902.82	896.35	903.63	0.004789	7.88	20533.92	1613.47	0.34
Project	20280	Rev BB	141426.00	883.70	901.75	896.49	902.72	0.006590	8.68	18742.02	1636.29	0.39
Project	20070	Rev BB	141426.00	882.00	900.58	894.65	901.48	0.005609	8.31	19907.01	1797.75	0.37
Project	19855	Rev BB	141426.00	880.50	899.60	892.94	900.37	0.004492	7.67	21440.38	1809.58	0.33
Project	19630	Rev BB	141426.00	880.00	898.64	890.50	899.40	0.004164	7.38	21715.34	1833.73	0.32
Project	19440	Rev BB	141426.00	878.00	897.86	889.68	898.60	0.004126	7.19	22046.05	1986.11	0.31
Project	19240	Rev BB	141426.00	877.50	896.87	889.35	897.70	0.004758	7.58	20444.11	1737.98	0.34
Project	19050	Rev BB	141426.00	876.00	896.19	887.89	896.86	0.003748	6.72	22459.06	1753.41	0.30
Project	18830	Rev BB	141426.00	874.00	895.35	887.44	896.02	0.003931	6.84	22235.02	1684.04	0.31
Project	18650	Rev BB	141426.00	873.50	894.72	886.84	895.34	0.003526	6.73	22990.32	1686.19	0.29
Project	18475	Rev BB	141426.00	872.00	894.25	885.04	894.75	0.002797	5.78	24928.99	1665.89	0.26
Project	18290	Rev BB	141426.00	871.50	893.60	885.13	894.19	0.003383	6.31	23260.68	1631.88	0.28
Project	18025	Rev BB	141426.00	870.00	892.85	882.94	893.37	0.002605	5.82	24748.10	1557.41	0.25
Project	17785	Rev BB	141426.00	868.00	892.02	882.78	892.66	0.003309	6.43	22237.59	1444.07	0.28
Project	17510	Rev BB	141426.00	868.00	890.43	883.27	891.45	0.005785	8.40	18121.15	1398.94	0.37
Project	17360	Rev BB	141426.00	868.00	888.28	883.91	890.13	0.012863	11.10	13512.13	1303.31	0.53
Project	17110	Rev BB	141426.00	864.00	885.50	881.46	887.17	0.010479	11.03	14389.15	1229.58	0.50
Project	16970	Rev BB	141426.00	863.70	883.96	879.78	885.60	0.010995	10.74	14212.17	1195.98	0.50
Project	16720	Rev BB	141426.00	863.50	882.28	875.41	883.38	0.006484	8.47	16891.55	1182.04	0.39
Project	16515	Rev BB	141426.00	862.00	881.23	873.86	882.13	0.005324	7.67	18660.39	1303.83	0.35
Project	16305	Rev BB	141426.00	860.00	880.38	872.14	881.10	0.004083	7.10	20814.07	1395.48	0.31
Project	16130	Rev BB	141426.00	860.00	879.38	872.31	880.25	0.005470	7.68	18966.94	1368.87	0.35
Project	15960	Rev BB	141426.00	859.00	878.56	870.96	879.32	0.004714	7.06	20250.69	1437.55	0.33
Project	15745	Rev BB	141426.00	858.00	877.56	869.77	878.32	0.004657	7.03	20125.55	1401.31	0.33
Project	15540	Rev BB	141426.00	857.50	876.69	868.51	877.36	0.004308	6.61	21873.23	2361.20	0.31
Project	15335	Rev BB	141426.00	856.00	874.77	868.08	876.01	0.010129	8.92	15846.59	1064.14	0.41
Project	15125	Rev BB	142475.00	854.00	871.99	866.25	873.49	0.013374	9.80	14531.32	1053.51	0.47
Project	14900	Rev BB	142475.00	853.00	869.74	864.23	870.94	0.008488	8.83	16644.53	2233.10	0.43
Project	14720	Rev BB	142475.00	852.00	868.35	862.97	869.45	0.008069	8.54	17440.60	2020.85	0.42
Project	14480	Rev BB	142475.00	850.50	866.91	860.83	867.72	0.005898	7.39	19912.22	1851.81	0.36
Project	14315	Rev BB	142475.00	850.00	866.04	859.99	866.75	0.005537	6.77	21071.02	1944.13	0.35
Project	14090	Rev BB	142475.00	850.00	864.80	858.71	865.50	0.005413	6.72	21309.57	1816.18	0.34
Project	13850	Rev BB	142475.00	848.00	863.60	857.10	864.27	0.004956	6.60	21684.38	1774.85	0.33

HEC-RAS Plan: Pr085LevCode River: SCR Reach: Project Profile: Rev BB (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Project	13635	Rev BB	142475.00	846.00	862.52	856.29	863.21	0.004839	7.34	21858.75	1817.99	0.34
Project	13425	Rev BB	142475.00	845.00	861.81	854.24	862.31	0.003346	5.70	25084.97	1936.05	0.28
Project	13190	Rev BB	142475.00	844.00	861.11	852.80	861.58	0.002886	5.56	26195.39	1911.13	0.26
Project	13030	Rev BB	142475.00	843.00	860.64	852.23	861.12	0.002842	6.01	26034.42	1863.68	0.26
Project	12835	Rev BB	142475.00	842.00	860.03	851.20	860.54	0.002909	6.16	25313.27	1775.13	0.27
Project	12615	Rev BB	142475.00	841.00	859.33	850.10	859.90	0.002952	6.51	23997.77	1566.52	0.27
Project	12395	Rev BB	142475.00	840.00	858.66	849.52	859.26	0.003032	6.71	23513.12	1542.96	0.28
Project	12195	Rev BB	142475.00	838.98	858.07	848.24	858.67	0.002825	6.46	23478.39	1463.74	0.27
Project	11995	Rev BB	142475.00	837.00	857.31	848.45	858.03	0.003521	7.40	21763.81	1448.52	0.30
Project	11780	Rev BB	142475.00	836.00	856.59	848.11	857.28	0.003385	7.33	22140.13	1460.82	0.29
Project	11605	Rev BB	142475.00	835.50	855.78	847.45	856.62	0.004035	7.93	20373.82	1417.47	0.32
Project	11405	Rev BB	142475.00	834.00	854.62	846.17	855.70	0.004843	8.65	17696.63	1144.88	0.35
Project	11180	Rev BB	142475.00	833.00	852.66	845.62	854.32	0.007682	10.68	14475.94	1009.18	0.44
Project	11015	Rev BB	142475.00	831.50	850.24	844.78	852.64	0.011984	12.57	11805.37	850.96	0.54
Project	10835	Rev BB	142475.00	831.00	848.05	843.71	850.33	0.013479	12.24	12146.77	1072.95	0.57
Project	10575	Rev BB	142475.00	830.00	846.10	840.15	847.39	0.008015	9.14	15843.91	1322.18	0.43
Project	10390	Rev BB	142475.00	828.00	845.09	839.04	846.04	0.005680	8.63	19054.95	1516.98	0.37
Project	10225	Rev BB	142475.00	827.50	844.10	838.16	845.05	0.006403	7.96	18553.74	1543.40	0.39
Project	10000	Rev BB	142475.00	826.00	842.55	837.14	843.54	0.006984	8.14	18351.48	1626.01	0.40
Project	9820	Rev BB	142475.00	824.00	841.35	835.33	842.31	0.006527	7.91	18387.37	1648.84	0.39
Project	9595	Rev BB	142475.00	823.80	839.87	834.12	840.80	0.006938	7.76	18438.52	1719.61	0.39
Project	9385	Rev BB	142475.00	823.00	838.58	833.15	839.36	0.006233	7.21	20157.06	1799.30	0.37
Project	9220	Rev BB	142475.00	822.00	837.62	831.81	838.34	0.005586	6.82	21094.14	1853.43	0.35
Project	9025	Rev BB	142475.00	821.00	836.62	830.56	837.33	0.005004	7.02	21529.03	1822.90	0.34

HEC-RAS Plan: FinalPr085Q2 River: SCR Reach: Project Profile: Old 2-Year

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Project	46195	Old 2-Year	1890.00	1035.00	1037.91	1036.89	1038.13	0.015238	3.78	500.66	215.66	0.44
Project	46020	Old 2-Year	1890.00	1032.00	1036.93		1037.04	0.003252	2.65	712.22	162.70	0.22
Project	45545	Old 2-Year	1890.00	1030.00	1033.60		1033.93	0.018551	4.61	409.79	151.31	0.49
Project	45030	Old 2-Year	1890.00	1025.00	1029.15		1029.27	0.005278	2.71	696.88	222.55	0.27
Project	44585	Old 2-Year	1890.00	1022.00	1026.44		1026.61	0.006748	3.30	573.02	163.72	0.31
Project	44210	Old 2-Year	1890.00	1020.00	1024.34		1024.46	0.004860	2.74	690.38	204.32	0.26
Project	43820	Old 2-Year	1890.00	1018.00	1022.15		1022.28	0.006434	2.95	639.61	207.81	0.30
Project	43610	Old 2-Year	1890.00	1017.00	1020.53		1020.69	0.009508	3.13	604.25	242.11	0.35
Project	43410	Old 2-Year	1890.00	1016.00	1018.91		1019.01	0.007189	2.60	728.11	312.76	0.30
Project	43200	Old 2-Year	1890.00	1014.00	1017.48		1017.58	0.006627	2.55	741.60	308.38	0.29
Project	42975	Old 2-Year	1890.00	1012.00	1016.15		1016.22	0.005389	2.14	885.14	410.54	0.26
Project	42815	Old 2-Year	1890.00	1011.00	1014.97		1015.07	0.009716	2.63	718.89	380.39	0.34
Project	42590	Old 2-Year	1890.00	1010.00	1012.84		1012.93	0.009456	2.44	776.10	451.85	0.33
Project	42430	Old 2-Year	1890.00	1008.00	1011.51		1011.59	0.007090	2.25	841.78	445.90	0.29
Project	42215	Old 2-Year	1890.00	1006.00	1010.16		1010.23	0.005773	2.03	931.90	493.19	0.26
Project	41940	Old 2-Year	1890.00	1005.00	1008.54		1008.61	0.006087	2.13	887.58	454.20	0.27
Project	41730	Old 2-Year	1890.00	1004.00	1007.19		1007.27	0.006523	2.28	829.64	404.14	0.28
Project	41460	Old 2-Year	1890.00	1002.00	1005.76		1005.83	0.004561	2.13	887.64	365.67	0.24
Project	41280	Old 2-Year	1890.00	1001.00	1005.01		1005.07	0.003862	2.08	909.07	342.38	0.22
Project	41080	Old 2-Year	1890.00	1000.00	1004.20		1004.26	0.004239	1.95	967.43	429.50	0.23
Project	40825	Old 2-Year	1890.00	999.50	1003.20		1003.25	0.003716	1.88	1004.29	426.62	0.22
Project	40585	Old 2-Year	1890.00	998.00	1001.67		1001.78	0.011310	2.69	703.54	404.25	0.36
Project	40335	Old 2-Year	1890.00	996.00	1000.27		1000.32	0.003588	1.92	986.15	397.20	0.21
Project	40130	Old 2-Year	1890.00	995.00	999.43		999.51	0.004294	2.23	848.05	311.26	0.24
Project	39945	Old 2-Year	1890.00	994.00	998.41		998.51	0.006997	2.64	715.84	293.75	0.30
Project	39755	Old 2-Year	1890.00	994.00	997.40		997.48	0.004217	2.26	836.14	296.67	0.24
Project	39605	Old 2-Year	1890.00	993.00	996.67		996.75	0.005898	2.34	806.62	348.84	0.27
Project	39310	Old 2-Year	1890.00	992.00	994.61		994.72	0.007964	2.64	715.15	323.42	0.31
Project	39100	Old 2-Year	1890.00	990.00	993.54		993.60	0.003849	1.89	1002.44	436.50	0.22
Project	38925	Old 2-Year	1890.00	989.50	992.72		992.79	0.005552	2.13	886.43	422.32	0.26
Project	38710	Old 2-Year	1890.00	988.00	991.78		991.83	0.003563	1.92	986.07	394.93	0.21
Project	38475	Old 2-Year	1890.00	986.00	990.40		990.51	0.010472	2.70	698.92	375.05	0.35
Project	38300	Old 2-Year	1890.00	985.50	988.59		988.70	0.010144	2.59	729.16	407.55	0.34
Project	38065	Old 2-Year	1890.00	984.00	987.34		987.38	0.003437	1.64	1152.45	569.04	0.20
Project	37810	Old 2-Year	1890.00	983.00	986.36		986.41	0.004187	1.77	1069.34	546.75	0.22
Project	37655	Old 2-Year	1890.00	982.00	984.96		985.14	0.020993	3.43	551.19	348.91	0.48
Project	37390	Old 2-Year	1890.00	981.00	983.18		983.21	0.003538	1.44	1311.43	803.34	0.20
Project	37135	Old 2-Year	1890.00	980.00	981.39		981.50	0.017325	2.67	706.87	564.00	0.42
Project	36930	Old 2-Year	1890.00	978.00	980.01		980.05	0.003777	1.55	1222.97	708.31	0.21
Project	36735	Old 2-Year	1890.00	977.00	978.86		978.93	0.009234	2.11	894.38	633.76	0.31
Project	36515	Old 2-Year	1890.00	975.00	977.99		978.03	0.002321	1.50	1262.13	532.09	0.17
Project	36265	Old 2-Year	1890.00	974.00	977.31	975.21	977.36	0.003084	1.87	1012.76	358.97	0.20
Project	36080	Old 2-Year	2560.00	973.00	976.09	974.81	976.25	0.011403	3.25	786.96	326.32	0.37
Project	35845	Old 2-Year	2560.00	971.00	974.77	972.71	974.85	0.003562	2.21	1159.46	376.20	0.22
Project	35725	Old 2-Year	2560.00	970.00	974.29	972.29	974.37	0.004300	2.33	1098.42	378.19	0.24
Project	35515	Old 2-Year	2560.00	969.00	973.38	971.33	973.47	0.004507	2.37	1080.19	379.27	0.25
Project	35245	Old 2-Year	2560.00	968.00	971.89	970.49	971.99	0.006692	2.57	997.32	414.32	0.29
Project	35040	Old 2-Year	2560.00	967.00	970.93		970.99	0.003523	2.07	1239.42	440.94	0.22
Project	34860	Old 2-Year	2560.00	966.00	969.93		970.05	0.009090	2.76	926.06	432.92	0.33
Project	34720	Old 2-Year	2560.00	965.50	968.74		968.83	0.007930	2.47	1036.23	545.61	0.32
Project	34495	Old 2-Year	2560.00	964.00	966.78		966.89	0.009606	2.75	931.32	504.60	0.36
Project	34310	Old 2-Year	2560.00	963.00	965.77		965.81	0.003675	1.75	1458.94	684.48	0.21
Project	34090	Old 2-Year	2560.00	962.00	964.74		964.80	0.006084	1.93	1325.42	787.51	0.26
Project	33880	Old 2-Year	2560.00	960.00	963.55		963.61	0.005405	1.89	1354.42	761.04	0.25
Project	33710	Old 2-Year	2560.00	959.00	962.24		962.33	0.010559	2.36	1084.35	719.21	0.34
Project	33500	Old 2-Year	2560.00	958.00	960.64		960.70	0.005886	2.04	1255.57	666.42	0.26
Project	33310	Old 2-Year	2560.00	957.00	959.35		959.43	0.007811	2.31	1108.79	609.86	0.30
Project	33115	Old 2-Year	2560.00	956.00	958.44		958.48	0.003169	1.69	1512.33	667.75	0.20
Project	32795	Old 2-Year	2560.00	954.00	957.22		957.27	0.004740	1.88	1359.22	697.56	0.24
Project	32605	Old 2-Year	2560.00	952.00	956.11	954.72	956.18	0.006829	2.15	1189.09	652.84	0.28
Project	32265	Old 2-Year	2579.00	950.00	953.86		953.93	0.006524	2.14	1205.44	650.99	0.28
Project	31875	Old 2-Year	2579.00	949.00	951.51		951.58	0.005551	2.15	1196.97	562.04	0.26
Project	31585	Old 2-Year	2579.00	946.00	949.72		949.80	0.006960	2.22	1162.94	619.45	0.29
Project	31360	Old 2-Year	2579.00	944.00	948.39		948.45	0.005040	1.95	1324.53	672.21	0.24
Project	31060	Old 2-Year	2579.00	942.00	946.38		946.44	0.009465	2.04	1261.20	954.95	0.31
Project	30720	Old 2-Year	2579.00	940.00	944.28		944.33	0.004358	1.76	1462.57	772.68	0.23
Project	30445	Old 2-Year	2579.00	938.00	942.33		942.43	0.012745	2.53	1019.12	700.89	0.37
Project	30095	Old 2-Year	2579.00	936.00	940.09		940.14	0.003925	1.87	1379.29	617.14	0.22
Project	29815	Old 2-Year	2579.00	935.00	938.67		938.75	0.006532	2.28	1131.43	551.12	0.28
Project	29565	Old 2-Year	2579.00	934.00	937.89		937.94	0.001867	1.68	1535.99	461.78	0.16
Project	29385	Old 2-Year	2579.00	933.00	937.50		937.56	0.002342	1.94	1329.77	381.52	0.18
Project	29140	Old 2-Year	2579.00	932.00	936.43		936.61	0.007369	3.43	752.83	217.19	0.32
Project	28895	Old 2-Year	2579.00	930.00	934.06		934.32	0.012370	4.12	625.43	201.92	0.41
Project	28695	Old 2-Year	2579.00	928.00	932.41		932.55	0.006312	3.00	858.70	269.57	0.30

HEC-RAS Plan: FinalPr085Q2 River: SCR Reach: Project Profile: Old 2-Year (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Project	28500	Old 2-Year	2579.00	927.50	930.64		930.83	0.013053	3.46	744.75	326.01	0.40
Project	28280	Old 2-Year	2579.00	926.00	929.34		929.42	0.003716	2.24	1153.51	379.14	0.23
Project	28080	Old 2-Year	2579.00	925.00	928.39		928.49	0.005850	2.47	1045.43	416.63	0.27
Project	27925	Old 2-Year	2579.00	924.00	927.29		927.41	0.008266	2.78	929.01	401.99	0.32
Project	27725	Old 2-Year	2579.00	923.00	926.41		926.48	0.002905	2.06	1251.38	386.18	0.20
Project	27545	Old 2-Year	2579.00	922.00	925.57		925.68	0.007542	2.68	962.13	409.60	0.31
Project	27335	Old 2-Year	2579.00	921.00	924.70		924.76	0.002863	1.98	1303.00	422.52	0.20
Project	27155	Old 2-Year	2579.00	920.50	924.11		924.18	0.003567	2.06	1253.19	452.43	0.22
Project	26990	Old 2-Year	2579.00	920.00	923.23		923.34	0.007365	2.58	998.42	440.86	0.30
Project	26780	Old 2-Year	2579.00	918.00	922.06		922.12	0.004625	2.09	1232.77	527.47	0.24
Project	26575	Old 2-Year	2579.00	917.00	921.36		921.41	0.002731	1.80	1428.90	513.48	0.19
Project	26355	Old 2-Year	2579.00	916.00	920.25		920.35	0.010678	2.55	1010.81	601.37	0.35
Project	26170	Old 2-Year	2579.00	915.00	918.95		919.03	0.004998	2.26	1138.73	457.77	0.25
Project	25965	Old 2-Year	2579.00	914.00	917.91		917.98	0.005300	2.11	1219.50	568.37	0.25
Project	25785	Old 2-Year	2579.00	913.50	916.92		916.99	0.005668	2.19	1180.20	550.88	0.26
Project	25600	Old 2-Year	2579.00	912.50	915.89		915.97	0.005355	2.27	1134.24	478.13	0.26
Project	25425	Old 2-Year	2579.00	911.00	915.17		915.24	0.003240	2.10	1227.81	399.76	0.21
Project	25215	Old 2-Year	2579.00	910.00	914.27		914.36	0.005813	2.40	1074.83	444.58	0.27
Project	25000	Old 2-Year	2579.00	909.00	912.98		913.07	0.005874	2.39	1079.92	453.08	0.27
Project	24795	Old 2-Year	2579.00	908.00	911.61		911.73	0.007563	2.73	944.18	391.43	0.31
Project	24550	Old 2-Year	2579.00	906.00	910.48		910.55	0.003221	2.25	1145.29	334.03	0.21
Project	24335	Old 2-Year	2579.00	905.00	909.47		909.59	0.006748	2.80	921.17	337.18	0.30
Project	24115	Old 2-Year	2579.00	904.00	908.17		908.26	0.005327	2.38	1081.54	422.65	0.26
Project	23975	Old 2-Year	2579.00	903.50	907.53		907.62	0.004000	2.35	1097.95	354.12	0.24
Project	23755	Old 2-Year	2579.00	902.00	906.40		906.52	0.006481	2.78	927.91	333.89	0.29
Project	23565	Old 2-Year	2579.00	900.00	905.26		905.37	0.005523	2.69	959.86	322.21	0.27
Project	23365	Old 2-Year	2579.00	900.00	903.62		903.79	0.012255	3.38	762.28	329.38	0.39
Project	23180	Old 2-Year	2579.00	899.00	902.44		902.52	0.004160	2.26	1140.20	400.70	0.24
Project	23000	Old 2-Year	2579.00	898.00	901.59	899.90	901.68	0.005269	2.36	1092.83	407.55	0.25
Project	22790	Old 2-Year	2579.00	897.50	900.64	898.70	900.71	0.004049	2.14	1205.95	425.48	0.22
Project	22600	Old 2-Year	2579.00	896.00	899.82		899.90	0.004491	2.35	1098.28	386.74	0.25
Project	22415	Old 2-Year	2579.00	895.50	898.79		898.89	0.006713	2.56	1008.46	422.32	0.29
Project	22195	Old 2-Year	2615.00	894.00	897.39	895.49	897.50	0.006042	2.62	997.20	371.33	0.28
Project	22010	Old 2-Year	2615.00	892.00	896.38	894.30	896.46	0.005123	2.27	1152.71	471.79	0.26
Project	21790	Old 2-Year	2615.00	891.50	895.21	893.51	895.28	0.005615	2.19	1192.80	549.87	0.26
Project	21615	Old 2-Year	2615.00	892.00	894.04	892.93	894.13	0.007898	2.41	1086.74	563.09	0.31
Project	21440	Old 2-Year	2615.00	890.00	893.15	891.46	893.20	0.003663	1.81	1441.09	638.87	0.21
Project	21225	Old 2-Year	2615.00	888.00	891.23		891.51	0.028226	4.25	615.04	352.44	0.57
Project	21020	Old 2-Year	2615.00	887.00	890.38		890.41	0.001985	1.48	1767.94	674.99	0.16
Project	20845	Old 2-Year	2615.00	886.00	889.71		889.79	0.007590	2.30	1137.99	613.69	0.30
Project	20595	Old 2-Year	2615.00	885.00	888.64		888.68	0.002939	1.60	1635.44	744.48	0.19
Project	20435	Old 2-Year	2615.00	884.00	888.20		888.24	0.002508	1.55	1694.90	765.16	0.18
Project	20280	Old 2-Year	2615.00	883.70	887.45		887.56	0.008806	2.74	953.06	439.60	0.33
Project	20070	Old 2-Year	2615.00	882.00	885.67		885.76	0.008458	2.39	1093.59	602.40	0.31
Project	19855	Old 2-Year	2615.00	880.50	883.89		883.98	0.008030	2.38	1098.93	585.89	0.31
Project	19630	Old 2-Year	2615.00	880.00	882.69		882.75	0.003932	1.86	1405.32	634.15	0.22
Project	19440	Old 2-Year	2615.00	878.00	881.58		881.67	0.008585	2.52	1038.97	536.33	0.32
Project	19240	Old 2-Year	2615.00	877.50	880.22		880.31	0.005501	2.37	1102.54	445.37	0.27
Project	19050	Old 2-Year	2615.00	876.00	879.24		879.32	0.004990	2.36	1106.97	418.07	0.26
Project	18830	Old 2-Year	2615.00	874.00	878.02		878.13	0.005974	2.71	964.36	338.85	0.28
Project	18650	Old 2-Year	2615.00	873.50	877.00		877.11	0.005378	2.62	996.29	339.65	0.27
Project	18475	Old 2-Year	2615.00	872.00	876.05		876.16	0.005337	2.63	995.12	336.63	0.27
Project	18290	Old 2-Year	2615.00	871.50	874.69		874.84	0.010316	3.10	843.58	365.13	0.36
Project	18025	Old 2-Year	2615.00	870.00	873.68		873.73	0.002122	1.89	1380.64	380.36	0.18
Project	17785	Old 2-Year	2615.00	868.00	872.98		873.06	0.003941	2.26	1154.93	389.34	0.23
Project	17510	Old 2-Year	2615.00	868.00	872.05		872.13	0.002996	2.24	1169.03	326.32	0.21
Project	17360	Old 2-Year	2615.00	868.00	871.07		871.31	0.012005	3.93	665.30	223.64	0.40
Project	17110	Old 2-Year	2615.00	864.00	868.91		869.08	0.006728	3.29	795.78	228.67	0.31
Project	16970	Old 2-Year	2615.00	863.70	868.19		868.31	0.004247	2.83	925.23	235.74	0.25
Project	16720	Old 2-Year	2615.00	863.50	866.70		866.87	0.008244	3.32	788.14	259.99	0.34
Project	16515	Old 2-Year	2615.00	862.00	865.03		865.19	0.008355	3.16	827.01	296.50	0.33
Project	16305	Old 2-Year	2615.00	860.00	864.16		864.24	0.002729	2.23	1170.34	304.58	0.20
Project	16130	Old 2-Year	2615.00	860.00	863.65		863.73	0.003146	2.28	1149.27	323.40	0.21
Project	15960	Old 2-Year	2615.00	859.00	862.83		862.96	0.006569	2.95	886.96	294.64	0.30
Project	15745	Old 2-Year	2615.00	858.00	861.57		861.69	0.005376	2.77	942.80	295.79	0.27
Project	15540	Old 2-Year	2615.00	857.50	860.42		860.54	0.005933	2.69	973.68	344.87	0.28
Project	15335	Old 2-Year	2615.00	856.00	858.93	857.51	859.06	0.008876	2.96	883.23	348.62	0.33
Project	15125	Old 2-Year	2860.00	854.00	857.46	855.66	857.55	0.005871	2.47	1157.62	437.27	0.27
Project	14900	Old 2-Year	2860.00	853.00	856.46	854.54	856.52	0.003502	1.93	1485.15	584.08	0.21
Project	14720	Old 2-Year	2860.00	852.00	855.59	853.72	855.68	0.006668	2.42	1180.14	532.85	0.29
Project	14480	Old 2-Year	2860.00	850.50	854.75	852.03	854.79	0.002326	1.49	1922.76	819.84	0.17
Project	14315	Old 2-Year	2860.00	850.00	854.21	851.61	854.25	0.004653	1.68	1700.67	1014.44	0.23
Project	14090	Old 2-Year	2860.00	850.00	852.66		852.75	0.010069	2.35	1218.98	787.44	0.33
Project	13850	Old 2-Year	2860.00	848.00	850.86		850.94	0.006075	2.27	1257.27	582.65	0.27

HEC-RAS Plan: FinalPr085Q2 River: SCR Reach: Project Profile: Old 2-Year (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Project	13635	Old 2-Year	2860.00	846.00	849.24		849.34	0.009079	2.49	1150.83	631.20	0.32
Project	13425	Old 2-Year	2860.00	845.00	847.99		848.06	0.004376	2.08	1376.44	576.31	0.24
Project	13190	Old 2-Year	2860.00	844.00	846.80		846.87	0.005939	2.08	1372.94	713.93	0.26
Project	13030	Old 2-Year	2860.00	843.00	845.94		846.00	0.004971	1.98	1447.37	712.89	0.24
Project	12835	Old 2-Year	2860.00	842.00	844.65		844.73	0.008829	2.24	1275.31	799.35	0.31
Project	12615	Old 2-Year	2860.00	841.00	843.18		843.24	0.005214	2.01	1441.76	741.83	0.25
Project	12395	Old 2-Year	2860.00	840.00	842.18		842.23	0.004143	1.84	1550.30	738.12	0.22
Project	12195	Old 2-Year	2860.00	838.98	841.22		841.27	0.005672	1.80	1586.99	990.77	0.25
Project	11995	Old 2-Year	2860.00	837.00	840.22		840.29	0.004132	2.02	1417.82	589.38	0.23
Project	11780	Old 2-Year	2860.00	836.00	839.08		839.17	0.006773	2.34	1223.34	590.36	0.29
Project	11605	Old 2-Year	2860.00	835.50	837.77		837.86	0.008568	2.51	1137.88	587.56	0.32
Project	11405	Old 2-Year	2860.00	834.00	836.57		836.64	0.004482	2.08	1372.55	579.74	0.24
Project	11180	Old 2-Year	2860.00	833.00	835.42		835.50	0.006001	2.27	1257.17	580.18	0.27
Project	11015	Old 2-Year	2860.00	831.50	834.75		834.81	0.002883	1.91	1494.85	519.83	0.20
Project	10835	Old 2-Year	2860.00	831.00	834.02		834.10	0.005665	2.35	1216.98	510.40	0.27
Project	10575	Old 2-Year	2860.00	830.00	831.82		831.96	0.013152	2.97	962.14	534.53	0.39
Project	10390	Old 2-Year	2860.00	828.00	831.18		831.22	0.001762	1.55	1842.61	598.09	0.16
Project	10225	Old 2-Year	2860.00	827.50	830.73		830.80	0.004206	2.00	1427.18	606.87	0.23
Project	10000	Old 2-Year	2860.00	826.00	829.55		829.62	0.006592	2.18	1309.06	685.26	0.28
Project	9820	Old 2-Year	2860.00	824.00	828.47	826.85	828.53	0.005488	1.97	1449.29	773.35	0.25
Project	9595	Old 2-Year	2860.00	823.80	827.53	825.68	827.58	0.003431	1.78	1604.52	698.10	0.21
Project	9385	Old 2-Year	2860.00	823.00	826.62		826.68	0.005423	2.05	1395.31	693.99	0.25
Project	9220	Old 2-Year	2860.00	822.00	825.09		825.22	0.015979	2.92	979.72	645.06	0.42
Project	9025	Old 2-Year	2860.00	821.00	823.54	822.03	823.62	0.005003	2.22	1290.81	537.58	0.25

Santa Clara River Fluvial Study

APPENDIX CHAPTER 4.3

Modeling CD-ROM

1) HEC-RAS Existing Conditions In/Out File
2) HEC-RAS Proposed Conditions In/Out File
3) HEC-2 Existing Conditions In/Out File
4) HEC-2 Proposed Conditions In/Out File
5) SAM Existing Conditions In/Out File
6) SAM Proposed Conditions In/Out File
7) WSE at Santa Clara River Confluence Existing
8) WSE at Santa Clara River Confluence Proposed

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CIVIL ENGINEERING, INC.

For Modeling CD contents, see
“Appendix Chapter 4.3” folder within
“PDF Files” folder.

Santa Clara River Fluvial Study

APPENDIX CHAPTER 4.4

Existing & Proposed Conditions HEC-RAS Velocity And Water Surface Elevation

Proposed Conditions HEC-RAS To SAM **Conversion Analysis**

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Table A4.4A: Santa Clara River Existing & Proposed Conditions HEC-RAS Velocity & WSE [1]					
Subreach	HEC-RAS Station	Existing (QCAP) Velocity (fps)	WSE (ft)	Proposed (QCAP) Velocity (fps)	WSE (ft)
SRA1	46195	19.7	1054.3	19.7	1054.3
	46020	19.1	1052.4	19.1	1052.4
	45545	20.3	1049.2	20.3	1049.2
	45030	17.8	1045.6	17.8	1045.6
	44585	19.2	1043.1	19.2	1043.1
	44210	14.8	1041.6	14.8	1041.6
SRA2	43820	19.9	1037.5	19.9	1037.5
	43610	19.7	1034.1	19.7	1034.1
	43410	18.2	1030.7	18.1	1030.7
	43200	17.3	1029.3	17.2	1029.3
	42975	16.3	1026.1	16.3	1026.1
	42815	15.3	1024.3	15.4	1024.4
	42590	15.0	1021.3	15.1	1021.5
	42430	15.5	1019.6	15.6	1020.3
	42215	10.2	1020.4	12.7	1019.7
	41940	11.2	1019.5	11.6	1019.3
	41730	11.4	1018.9	11.8	1018.7
	41460	11.3	1018.3	11.7	1018.1
SRA3	41280	16.4	1015.3	16.4	1015.3
	41080	16.1	1013.6	16.0	1013.6
	40825	14.8	1012.2	15.0	1012.1
	40585	14.8	1010.6	14.9	1010.6
	40335	11.0	1010.4	10.7	1011.0
	40130	10.4	1010.0	11.1	1010.4
	39945	9.5	1009.8	10.7	1010.2
	39755	14.4	1007.3	16.1	1007.2
	39605	14.7	1005.7	16.2	1005.8
	39310	14.7	1004.1	15.9	1004.4
	39100	11.2	1004.2	14.2	1003.7
	38925	10.9	1003.9	12.9	1003.7
SRA4	38710	10.4	1003.7	12.1	1003.6
	38475	16.7	1000.2	17.8	1000.0
	38300	16.5	998.1	17.7	997.9
	38065	14.1	998.2	14.5	998.0
	37810	18.2	995.2	18.2	995.2
	37655	16.8	994.2	17.4	994.1
	37390	15.7	989.9	14.2	991.5
	37135	15.1	988.6	16.6	989.3
	36930	13.3	987.7	15.6	987.9
	36735	14.6	986.4	16.1	986.9
	36515	12.1	986.3	12.8	987.0
	36265	13.1	985.2	12.3	986.5
SRB1	36080	13.7	984.1	14.7	984.6
	35845	11.6	983.9	11.7	984.1
	35725	13.8	982.6	14.1	982.6
	35515	14.0	981.3	14.0	981.3
	35245	13.8	980.1	13.7	980.2
	35040	13.8	978.4	13.9	978.3
	34860	14.0	977.4	14.1	977.4
	34720	13.9	976.2	13.9	976.2
	34495	14.0	974.3	14.0	974.3
	34310	14.3	972.7	14.3	972.6
	34090	14.3	971.6	14.2	971.6
SRB2	33880	14.2	970.5	14.1	970.3
	33710	14.1	969.3	14.0	969.3
	33500	13.1	968.2	13.1	968.1
	33310	12.9	967.0	12.9	967.0

1 - Velocities & WSEs reflect HEC-RAS model modified for fluvial purposes at subcritical flow n=0.025

Table A4.4A: Santa Clara River Existing & Proposed Conditions HEC-RAS Velocity & WSE [1] (ctd)					
	33115	11.3	966.4	10.4	966.6
	32795	12.2	965.0	13.0	964.6
	32605	14.1	963.5	13.1	963.6
SRC1	32265	13.3	961.4	13.4	961.3
	31875	10.9	960.0	12.4	959.4
	31585	11.3	957.7	12.1	957.3
	31360	10.5	957.2	11.5	956.6
	31060	8.4	957.2	9.0	956.6
	30720	6.8	957.3	7.3	956.6
	30445	6.4	957.2	6.8	956.5
	30095	6.8	957.0	7.0	956.3
	29815	7.7	956.6	7.9	955.9
	29565	7.5	956.5	7.7	955.8
	29385	8.5	956.1	8.6	955.5
SRC2	29140	11.5	954.7	10.2	954.8
	28895	16.8	951.6	16.8	951.3
	28695	18.8	947.9	13.3	948.3
	28500	19.8	945.1	16.7	946.0
	28280	20.1	941.7	11.9	943.4
	28080	16.7	942.3	10.9	943.4
	27925	19.1	940.4	12.4	942.6
	27725	19.8	939.3	18.0	939.3
	27545	19.0	937.7	19.1	937.6
	27335	17.3	936.2	17.4	936.2
	27155	16.4	935.4	17.2	935.3
SRC3	26990	15.8	933.7	16.7	933.7
	26780	15.5	931.4	16.3	931.3
	26575	14.2	930.6	14.7	930.4
	26355	15.2	929.2	15.4	929.1
	26170	13.5	928.9	15.3	928.2
	25965	15.2	927.2	15.2	927.3
	25785	15.0	926.1	14.4	926.8
	25600	13.9	924.9	15.0	925.8
	25425	10.3	925.4	14.6	925.3
	25215	13.8	923.3	14.2	924.7
	25000	12.6	922.1	13.1	924.5
SRC4	24795	12.6	920.4	14.0	923.6
	24550	9.7	919.5	15.0	922.5
	24335	13.0	917.6	18.1	920.0
	24115	13.1	915.9	18.2	918.7
	23975	13.3	914.6	18.0	917.7
	23755	13.3	913.3	17.8	916.8
	23565	13.2	912.4	17.4	915.6
	23365	13.6	911.1	16.9	914.4
	23180	10.1	911.0	16.0	913.2
	23000	9.0	910.9	15.3	912.8
	22790	9.5	910.4	18.0	910.5
	22600	9.5	910.1	16.6	909.6
	22415	10.1	909.7	16.3	908.0
SRD1	22195	15.4	906.9	14.2	907.5
	22010	15.1	906.2	15.4	906.1
	21790	14.4	904.9	14.7	904.8
	21615	13.7	903.1	14.8	902.8
	21440	14.6	901.2	15.0	901.6
	21225	12.6	899.8	14.3	900.5
	21020	13.8	897.4	12.3	900.0
	20845	12.5	897.0	14.3	898.4
	20595	11.0	896.4	11.1	898.3

1 - Velocities & WSEs reflect HEC-RAS model modified for fluvial purposes at subcritical flow n=0.025

Table A4.4A: Santa Clara River Existing & Proposed Conditions HEC-RAS Velocity & WSE [1] (ctd)					
	20435	10.3	896.2	10.8	898.1
	20280	12.1	895.0	14.5	896.0
	20070	12.4	892.7	14.4	894.3
SRD2	19855	13.1	891.1	14.3	892.7
	19630	13.2	889.8	14.4	891.5
	19440	10.8	889.9	12.9	891.4
	19240	12.1	888.9	15.6	889.4
	19050	9.6	889.0	12.2	889.4
	18830	9.3	888.7	12.1	888.8
	18650	8.5	888.7	10.8	888.7
	18475	7.7	888.7	8.8	888.9
	18290	8.1	888.4	9.4	888.5
	18025	7.6	888.3	7.8	888.6
	17785	8.5	887.9	8.4	888.3
SRD3	17510	12.3	886.2	10.1	887.5
	17360	16.9	883.4	16.9	884.0
	17110	15.0	881.1	15.7	881.1
	16970	14.4	879.7	15.7	879.6
	16720	14.2	875.3	15.9	875.4
	16515	13.4	873.5	15.4	873.9
	16305	12.6	871.6	11.1	874.5
	16130	13.3	870.5	15.2	872.2
	15960	12.8	869.2	13.7	871.6
	15745	10.9	868.6	12.3	871.3
	15540	10.4	868.1	10.5	871.2
	15335	12.6	866.5	16.2	868.1
SRE1	15125	13.7	864.5	16.6	866.3
	14900	14.0	863.3	16.3	864.2
	14720	13.7	862.1	15.9	863.3
	14480	13.7	860.5	14.5	860.8
	14315	13.5	859.9	14.0	860.1
	14090	13.7	858.7	13.7	858.7
	13850	13.8	857.1	13.9	857.1
	13635	14.0	856.0	14.0	856.0
	13425	13.4	854.6	13.5	854.2
	13190	12.7	853.1	12.3	853.3
SRE2	13030	12.3	852.7	12.0	852.9
	12835	12.1	852.1	11.8	852.3
	12615	11.3	851.8	11.0	852.0
	12395	11.1	851.5	10.9	851.7
	12195	10.1	851.4	10.0	851.6
	11995	11.3	850.7	11.1	850.9
	11780	10.7	850.5	10.4	850.7
	11605	12.0	849.7	11.6	850.0
	11405	12.0	849.4	12.1	849.4
	11180	15.0	847.6	15.2	847.5
SRE3	11015	18.9	844.8	18.9	844.9
	10835	17.7	843.8	17.7	843.8
	10575	16.0	840.2	16.0	840.2
	10390	13.2	839.5	12.7	839.8
	10225	14.7	838.2	14.7	838.2
	10000	14.6	837.1	14.6	837.1
	9820	15.0	835.4	14.9	835.4
	9595	14.6	834.1	14.5	834.2
	9385	13.7	833.1	13.8	833.1
	9220	13.7	831.8	13.7	831.8
	9025	13.8	830.4	13.8	830.4

1 - Velocities & WSEs reflect HEC-RAS model modified for fluvial purposes at subcritical flow n=0.025

It has been noted in the text that the conversion process from HEC-RAS to SAM is a powerful tool for fluvial analysis. This appendix presents, in part, the proposed conditions HEC-RAS to SAM conversion analysis in table format (Table A4.4B1-2). The tables compare the velocity and water surface elevation for the HEC-RAS mixed flow model, the HEC-RAS subcritical flow model, the HEC-RAS model processed for HEC-2 conversion, the HEC-2 model, and the HEC-2 model imported into HEC-RAS. At most sections the differences between steps in the conversion process is only a few percent. The few locations where the difference between steps is high generally result from the supercritical nature of the flow in the HEC-RAS mixed flow model. Several pertinent points should be addressed here. First, the observed differences are a result of the conversion process itself. The most appropriate use of SAM is to include the available data from the hydraulic modeling. As noted in Section 4.1.1, the T95 file produced by HEC-2 is read directly into the SAM model. This is preferable to attempting to consider each section as hydraulically independent from others in the system. A T95 file is not produced in HEC-RAS so the RAS model that is used for hydraulic analysis is down converted to HEC-2 format, as described above. Second, the supercritical nature of the model is the result of the low Manning's number (n=0.025) used, as required by LACDPW criteria. In the River during an actual event a Manning's number this low is not expected for an entire cross-section or an entire reach. In instances where the Manning's number exceeds approximately n=0.035 supercritical flow does not occur in the River for the Q_{CAP} discharge, and Manning's values in the River are expected to be at least n=0.035 or higher during an actual event. Finally, in the final phase of the analysis HEC-6 numerical modeling will be employed to analyze the fluvial mechanics of the River system. The affect of this modeling is to fine tune the SAM analysis presented in the present phase, and HEC-6 modeling will use expected Manning's values as parameters. For these reasons, any differences in water surface elevation or velocity resulting from modeled flow regime presented in Table A4.4B1-2 are not expected to impact analysis or final design.

Table A4.4B1 Santa Clara River Proposed Condition HEC-RAS to HEC-2 Conversion n=0.025

		HEC-RAS Mixed	HEC-RAS Subcritical	Fluvial HEC-RAS Subcritical	Δ (%)	Fluvial HEC2	Δ (%)	Fluvial HEC2 IMPORT Subcritical	Δ (%)
	HEC-RAS Station	Depth (ft)	Depth (ft)	Depth (ft)	Depth (ft %)	Depth (ft)	Depth (ft %)	Depth (ft)	Depth (ft %)
SRA1	46195	18.1	19.0	19.3	**-1%**	19.3	**0%**	19.3	**0%**
	46020	18.1	20.4	20.4	**0%**	20.3	**1%**	20.4	**-1%**
	45545	19.2	19.2	19.2	**0%**	19.2	**0%**	19.2	**0%**
	45030	16.5	20.6	20.6	**0%**	20.3	**1%**	20.5	**-1%**
	44585	21.1	21.1	21.1	**0%**	21.1	**0%**	21.1	**0%**
	44210	15.4	21.6	21.6	**0%**	21.1	**2%**	21.6	**-2%**
SRA2	43820	19.5	19.5	19.5	**0%**	19.5	**0%**	19.5	**0%**
	43610	13.8	17.1	17.1	**0%**	17.1	**0%**	17.1	**0%**
	43410	11.3	15.1	14.7	**3%**	14.8	**0%**	14.7	**0%**
	43200	12.4	15.6	15.3	**2%**	15.3	**0%**	15.3	**0%**
	42975	10.8	14.3	14.1	**1%**	14.1	**1%**	14.1	**-1%**
	42815	10.7	13.4	13.4	**1%**	13.3	**0%**	13.4	**0%**
	42590	9.2	11.6	11.5	**1%**	11.5	**0%**	11.5	**0%**
	42430	10.7	12.3	12.3	**0%**	12.3	**0%**	12.3	**0%**
	42215	11.2	13.7	13.7	**0%**	13.3	**3%**	13.7	**-3%**
	41940	14.3	14.3	14.3	**0%**	14.0	**2%**	14.3	**-2%**
	41730	14.7	14.7	14.7	**0%**	14.3	**3%**	14.7	**-3%**
	41460	16.2	16.2	16.1	**0%**	15.8	**2%**	16.1	**-2%**
SRA3	41280	14.4	14.4	14.3	**0%**	14.3	**1%**	14.3	**-1%**
	41080	12.1	13.6	13.6	**0%**	13.5	**1%**	13.6	**-1%**
	40825	11.5	12.6	12.6	**0%**	12.6	**0%**	12.6	**0%**
	40585	11.7	12.4	12.6	**-1%**	12.6	**0%**	12.6	**0%**
	40335	15.1	15.1	15.0	**1%**	14.7	**2%**	15.0	**-2%**
	40130	15.5	15.5	15.4	**1%**	15.1	**2%**	15.4	**-2%**
	39945	16.3	16.3	16.2	**1%**	15.9	**2%**	16.2	**-2%**
	39755	13.3	13.3	13.2	**1%**	13.1	**0%**	13.2	**0%**
	39605	11.5	12.9	12.8	**1%**	12.7	**0%**	12.8	**0%**
	39310	12.7	12.7	12.4	**2%**	12.4	**0%**	12.4	**0%**
	39100	10.4	13.8	13.7	**0%**	12.6	**8%**	13.7	**-9%**
	38925	14.3	14.3	14.2	**0%**	13.7	**4%**	14.2	**-4%**
SRA4	38710	15.6	15.6	15.6	**0%**	15.2	**2%**	15.6	**-3%**
	38475	14.0	14.0	14.0	**0%**	14.1	**0%**	14.0	**0%**
	38300	10.3	12.4	12.4	**0%**	12.3	**0%**	12.4	**0%**
	38065	14.0	14.0	14.0	**0%**	13.7	**2%**	14.0	**-2%**
	37810	12.2	12.2	12.2	**0%**	12.2	**0%**	12.2	**0%**
	37655	10.5	12.1	12.1	**0%**	12.1	**0%**	12.1	**0%**
	37390	6.5	10.5	10.5	**0%**	10.2	**2%**	10.5	**-2%**
	37135	9.3	9.3	9.3	**0%**	9.3	**0%**	9.3	**0%**
	36930	8.1	9.7	9.9	**-3%**	9.9	**1%**	9.9	**0%**
	36735	9.8	9.8	9.9	**0%**	9.8	**0%**	9.9	**0%**
	36515	12.0	12.0	12.0	**0%**	11.5	**5%**	11.7	**-2%**
	36265	12.5	12.5	12.5	**0%**	12.1	**3%**	12.2	**-1%**
SRB1	36080	11.6	11.6	11.6	**0%**	11.5	**2%**	11.5	**-1%**
	35845	13.6	13.6	13.1	**4%**	12.9	**1%**	13.1	**-1%**
	35725	13.0	13.0	12.6	**3%**	12.5	**1%**	12.6	**-1%**
	35515	12.0	12.8	12.3	**3%**	12.6	**-2%**	12.5	**1%**
	35245	11.3	12.4	12.2	**2%**	12.1	**1%**	12.2	**-1%**
	35040	10.7	12.0	11.3	**5%**	11.5	**-2%**	11.5	**0%**
	34860	10.0	11.4	11.4	**0%**	11.4	**0%**	11.4	**0%**
	34720	9.2	10.7	10.7	**0%**	10.6	**0%**	10.7	**0%**
	34495	9.0	10.3	10.3	**0%**	10.2	**0%**	10.3	**0%**
	34310	9.3	10.0	9.6	**4%**	9.8	**-1%**	9.7	**0%**
	34090	8.6	9.6	9.6	**0%**	9.5	**0%**	9.6	**0%**
SRB2	33880	9.3	10.3	10.3	**0%**	10.2	**0%**	10.2	**0%**
	33710	9.7	10.3	10.3	**0%**	10.3	**0%**	10.2	**0%**
	33500	9.3	10.0	10.1	**-1%**	10.1	**0%**	10.1	**0%**
	33310	9.0	10.0	10.0	**0%**	10.0	**0%**	10.0	**0%**
	33115	10.6	10.6	10.6	**0%**	10.6	**0%**	10.7	**-1%**
	32795	10.6	10.6	10.6	**0%**	10.9	**-3%**	11.0	**-1%**
	32605	11.1	11.6	11.6	**0%**	11.6	**0%**	11.6	**0%**
SRC1	32265	10.5	11.3	11.3	**0%**	11.2	**1%**	11.3	**-1%**
	31875	10.4	10.4	10.4	**0%**	10.3	**1%**	10.4	**-1%**
	31585	11.9	11.9	11.3	**5%**	11.2	**1%**	11.3	**-1%**
	31360	13.5	13.5	12.6	**7%**	11.4	**9%**	12.6	**-10%**
	31060	15.5	15.5	14.6	**6%**	14.1	**4%**	14.6	**-4%**
	30720	17.5	17.5	16.6	**5%**	16.3	**2%**	16.6	**-2%**
	30445	19.5	19.5	18.5	**5%**	18.2	**2%**	18.5	**-2%**
	30095	21.3	21.3	20.3	**4%**	20.0	**2%**	20.3	**-2%**
	29815	21.9	21.9	20.9	**5%**	20.6	**2%**	20.9	**-2%**
	29565	22.9	22.9	21.8	**5%**	21.5	**1%**	21.8	**-1%**
	29385	23.6	23.6	22.5	**5%**	22.2	**1%**	22.5	**-1%**
SRC2	29140	24.1	24.1	22.8	**6%**	22.4	**1%**	22.8	**-1%**
	28895	22.5	22.5	21.3	**5%**	21.1	**1%**	21.3	**-1%**
	28695	14.0	21.1	20.3	**4%**	20.0	**1%**	20.3	**-1%**
	28500	16.1	18.6	18.5	**1%**	18.5	**0%**	18.5	**0%**
	28280	10.8	18.0	17.4	**3%**	16.8	**3%**	17.4	**-3%**
	28080	19.1	19.1	18.4	**4%**	18.0	**2%**	18.4	**-2%**
	27925	19.3	19.3	18.6	**3%**	18.2	**2%**	18.6	**-2%**
	27725	16.7	16.7	16.3	**3%**	16.2	**1%**	16.3	**-1%**
	27545	14.1	15.8	15.6	**1%**	15.5	**1%**	15.6	**-1%**
	27335	12.3	15.3	15.2	**1%**	15.1	**0%**	15.2	**0%**
	27155	14.8	15.2	14.8	**3%**	14.7	**0%**	14.8	**0%**
SRC3	26990	11.5	13.7	13.7	**0%**	13.7	**0%**	13.7	**0%**
	26780	11.3	13.7	13.3	**2%**	13.3	**0%**	13.3	**0%**
	26575	11.1	13.9	13.4	**3%**	13.4	**0%**	13.4	**0%**
	26355	13.4	13.4	13.1	**2%**	13.1	**0%**	13.1	**0%**
	26170	13.5	13.7	13.2	**4%**	13.2	**0%**	13.2	**0%**
	25965	12.9	13.7	13.3	**3%**	13.2	**1%**	13.3	**-1%**
	25785	12.1	13.1	13.3	**-1%**	13.2	**1%**	13.3	**-1%**
	25600	12.4	13.1	13.3	**-1%**	12.9	**3%**	13.3	**-3%**
	25425	12.5	14.3	14.3	**0%**	14.0	**2%**	14.3	**-2%**
	25215	14.7	14.7	14.7	**0%**	14.1	**4%**	14.7	**-5%**
	25000	15.5	15.5	15.5	**0%**	15.3	**1%**	15.5	**-2%**

Table A4.4B1 HEC-RAS to HEC-2 Conversion SCR Proposed n=0.025 continued

Subreach	HEC-RAS Station	HEC-RAS Mixed Depth (ft)	HEC-RAS Subcritical Depth (ft)	Fluvial HEC-RAS Subcritical Depth (ft)	Δ (%) Depth (ft %)	Fluvial HEC2 Depth (ft)	Δ (%) Depth (ft %)	Fluvial HEC2 IMPORT Subcritical Depth (ft)	Δ (%) Depth (ft %)
SRC4	24795	15.6	15.6	15.6	**0%**	15.4	**2%**	15.6	**-2%**
	24550	16.5	16.5	16.5	**0%**	16.2	**2%**	16.5	**-2%**
	24335	15.0	15.0	15.0	**0%**	15.0	**1%**	15.0	**-1%**
	24115	13.8	14.7	14.7	**0%**	14.6	**0%**	14.7	**0%**
	23975	12.9	14.2	14.2	**0%**	14.2	**0%**	14.2	**0%**
	23755	14.7	14.7	14.8	**0%**	14.7	**0%**	14.8	**0%**
	23565	14.3	15.6	15.6	**0%**	15.5	**0%**	15.6	**0%**
	23365	14.3	14.7	14.4	**2%**	14.3	**1%**	14.4	**-1%**
	23180	12.6	14.1	14.2	**0%**	13.6	**4%**	13.6	**0%**
	23000	11.3	14.8	14.8	**0%**	14.0	**5%**	14.2	**-2%**
	22790	13.0	13.0	13.0	**0%**	12.8	**1%**	12.9	**-1%**
	22600	12.8	13.8	13.6	**1%**	13.6	**0%**	13.6	**0%**
	22415	10.8	12.5	12.5	**0%**	12.4	**0%**	12.5	**0%**
SRD1	22195	14.0	14.0	13.5	**4%**	13.3	**1%**	13.5	**-1%**
	22010	14.3	14.3	14.1	**2%**	14.0	**1%**	14.1	**-1%**
	21790	11.6	13.3	13.3	**0%**	13.2	**1%**	13.3	**-1%**
	21615	8.5	10.7	10.8	**-1%**	10.8	**0%**	10.8	**0%**
	21440	11.0	11.6	11.6	**1%**	11.5	**1%**	11.6	**-1%**
	21225	11.7	12.9	12.5	**3%**	12.5	**0%**	12.5	**0%**
	21020	9.7	12.2	13.0	**-6%**	12.8	**1%**	13.0	**-1%**
	20845	12.7	12.7	12.4	**3%**	12.3	**1%**	12.3	**0%**
	20595	13.4	13.4	13.3	**1%**	13.1	**2%**	13.3	**-2%**
	20435	14.3	14.3	14.1	**1%**	13.9	**2%**	14.1	**-2%**
	20280	12.8	12.8	12.3	**4%**	12.3	**0%**	12.3	**0%**
	20070	11.1	12.7	12.3	**3%**	12.3	**0%**	12.3	**0%**
SRD2	19855	10.2	12.4	12.2	**2%**	12.1	**0%**	12.2	**0%**
	19630	8.9	11.4	11.5	**-1%**	10.6	**8%**	11.5	**-8%**
	19440	13.4	13.4	13.4	**0%**	13.2	**2%**	13.4	**-2%**
	19240	11.9	11.9	11.9	**0%**	11.9	**0%**	11.9	**0%**
	19050	10.5	13.3	13.4	**-1%**	13.2	**1%**	13.4	**-1%**
	18830	14.6	14.6	14.8	**-2%**	13.4	**10%**	14.8	**-11%**
	18650	15.0	15.0	15.2	**-1%**	14.2	**7%**	15.2	**-7%**
	18475	16.9	16.9	16.9	**0%**	16.4	**3%**	16.9	**-3%**
	18290	16.9	16.9	17.0	**0%**	16.5	**3%**	17.0	**-3%**
	18025	18.5	18.5	18.6	**0%**	18.2	**2%**	18.6	**-2%**
	17785	20.2	20.2	20.3	**0%**	19.9	**2%**	20.3	**-2%**
SRD3	17510	19.2	19.2	19.5	**-1%**	19.1	**2%**	19.5	**-2%**
	17360	15.9	15.9	16.0	**0%**	16.0	**0%**	16.0	**0%**
	17110	15.2	17.5	17.1	**2%**	17.0	**1%**	17.1	**-1%**
	16970	13.6	16.1	15.9	**1%**	15.8	**1%**	15.9	**-1%**
	16720	9.2	11.9	11.9	**0%**	11.9	**0%**	11.9	**0%**
	16515	10.4	11.9	11.9	**0%**	11.8	**1%**	11.9	**-1%**
	16305	14.6	14.6	14.5	**0%**	14.3	**2%**	14.5	**-2%**
	16130	12.3	12.3	12.2	**1%**	12.3	**0%**	12.2	**0%**
	15960	11.0	12.6	12.6	**0%**	12.0	**5%**	12.1	**-1%**
	15745	13.3	13.3	13.3	**0%**	11.7	**12%**	12.6	**-8%**
	15540	13.7	13.7	13.7	**0%**	12.9	**6%**	13.2	**-2%**
	15335	12.1	12.1	12.1	**0%**	11.8	**2%**	11.9	**-1%**
SRE1	15125	11.6	12.3	12.3	**0%**	11.9	**3%**	12.0	**0%**
	14900	9.8	11.2	11.2	**0%**	11.1	**0%**	11.2	**0%**
	14720	9.8	11.0	11.3	**-3%**	11.2	**1%**	11.3	**-1%**
	14480	8.9	10.3	10.3	**0%**	10.1	**1%**	10.2	**-1%**
	14315	9.9	10.0	10.1	**-1%**	9.9	**2%**	9.9	**0%**
	14090	8.5	8.7	8.7	**0%**	8.7	**0%**	8.7	**0%**
	13850	9.7	9.7	9.1	**6%**	9.2	**-1%**	9.1	**0%**
	13635	10.3	10.3	10.0	**3%**	9.9	**0%**	10.0	**0%**
	13425	7.8	9.2	9.2	**0%**	9.3	**0%**	9.2	**0%**
	13190	9.5	9.5	9.3	**2%**	9.1	**3%**	9.3	**-3%**
SRE2	13030	9.6	9.6	9.9	**-3%**	9.6	**3%**	9.9	**-3%**
	12835	10.1	10.1	10.3	**-2%**	9.9	**5%**	10.4	**-5%**
	12615	10.9	10.9	11.0	**-2%**	10.7	**3%**	11.1	**-4%**
	12395	11.5	11.5	11.7	**-2%**	11.3	**4%**	11.7	**-4%**
	12195	12.5	12.5	12.6	**-1%**	12.3	**2%**	12.7	**-3%**
	11995	13.6	13.6	13.9	**-2%**	13.6	**2%**	14.0	**-3%**
	11780	14.4	14.4	14.7	**-2%**	14.5	**1%**	14.8	**-2%**
	11605	13.8	13.8	14.5	**-5%**	14.2	**2%**	14.6	**-3%**
	11405	15.1	15.1	15.4	**-2%**	15.1	**2%**	15.5	**-3%**
	11180	13.9	13.9	14.5	**-4%**	14.2	**2%**	14.7	**-3%**
SRE3	11015	13.3	13.3	13.4	**-1%**	13.2	**1%**	13.4	**-1%**
	10835	10.9	12.7	12.8	**-1%**	12.8	**0%**	12.8	**0%**
	10575	7.5	10.2	10.2	**0%**	10.2	**0%**	10.2	**0%**
	10390	8.8	11.0	11.8	**-6%**	11.6	**1%**	11.8	**-1%**
	10225	9.5	10.7	10.7	**0%**	10.7	**0%**	10.7	**0%**
	10000	11.1	11.1	11.1	**0%**	11.2	**0%**	11.1	**0%**
	9820	10.0	11.3	11.4	**0%**	11.3	**1%**	11.4	**-1%**
	9595	10.3	10.3	10.4	**0%**	10.3	**1%**	10.4	**-1%**
	9385	9.5	10.2	10.1	**1%**	10.0	**0%**	10.1	**0%**
	9220	8.9	9.8	9.8	**0%**	9.8	**0%**	9.8	**0%**
	9025	8.9	9.6	9.4	**2%**	9.4	**0%**	9.4	**0%**

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Table A4.4B2 Santa Clara River Proposed Condition HEC-RAS to HEC-2 Conversion n=0.025									
		HEC-RAS Mixed	HEC-RAS Subcritical	Fluvial HEC-RAS Subcritical	Δ (%)	Fluvial HEC2	Δ (%)	Fluvial HEC2 IMPORT Subcritical	Δ (%)
	HEC-RAS Station	Vel Chnl (ft/s)	Vel Chnl (ft/s)	Vel Chnl (ft/s)	Vel Chnl (ft/s %)	Vel Chnl (ft/s)	Vel Chnl (ft/s %)	Vel Chnl (ft/s)	Vel Chnl (ft/s %)
SRA1	46195	21.7	20.1	19.7	**2%**	19.6	**0%**	19.7	**0%**
	46020	24.1	19.1	19.1	**0%**	19.3	**-1%**	19.1	**1%**
	45545	20.3	20.3	20.3	**0%**	20.4	**0%**	20.3	**0%**
	45030	26.1	17.8	17.8	**0%**	18.1	**-2%**	17.8	**1%**
	44585	19.2	19.2	19.2	**0%**	19.1	**0%**	19.1	**0%**
	44210	26.2	14.8	14.8	**0%**	15.3	**-4%**	14.8	**3%**
SRA2	43820	19.9	19.9	19.9	**0%**	19.9	**0%**	19.9	**0%**
	43610	26.7	19.8	19.7	**0%**	19.7	**0%**	19.7	**0%**
	43410	28.8	19.2	18.1	**6%**	18.1	**0%**	18.1	**0%**
	43200	26.1	18.0	17.2	**4%**	17.2	**0%**	17.2	**0%**
	42975	26.6	16.7	16.3	**2%**	16.5	**-1%**	16.3	**1%**
	42815	23.9	15.7	15.4	**2%**	15.5	**-1%**	15.4	**1%**
	42590	22.4	15.3	15.1	**2%**	15.2	**-1%**	15.1	**1%**
	42430	19.6	15.6	15.6	**0%**	15.6	**0%**	15.6	**0%**
	42215	18.5	12.9	12.7	**1%**	13.5	**-6%**	12.7	**6%**
	41940	11.6	11.6	11.6	**0%**	12.0	**-3%**	11.6	**3%**
	41730	11.8	11.8	11.8	**0%**	12.4	**-5%**	11.8	**5%**
	41460	11.6	11.6	11.7	**-1%**	12.1	**-4%**	11.7	**3%**
SRA3	41280	16.4	16.4	16.4	**0%**	16.6	**-1%**	16.4	**1%**
	41080	19.9	16.5	16.0	**3%**	16.2	**-1%**	16.0	**1%**
	40825	18.0	15.3	15.0	**2%**	15.0	**0%**	15.0	**0%**
	40585	17.0	15.3	14.9	**3%**	15.0	**-1%**	14.8	**1%**
	40335	10.5	10.5	10.7	**-1%**	11.0	**-3%**	10.7	**3%**
	40130	11.3	11.3	11.1	**2%**	11.5	**-4%**	11.1	**4%**
	39945	11.0	11.0	10.7	**3%**	11.1	**-4%**	10.7	**3%**
	39755	16.5	16.5	16.1	**2%**	16.2	**-1%**	16.1	**1%**
	39605	19.7	16.6	16.2	**2%**	16.3	**-1%**	16.2	**1%**
	39310	16.5	16.5	15.9	**4%**	15.9	**0%**	15.9	**0%**
	39100	20.9	14.2	14.2	**0%**	16.0	**-12%**	14.2	**11%**
	38925	12.8	12.8	12.9	**0%**	13.6	**-6%**	12.9	**5%**
SRA4	38710	12.0	12.0	12.1	**0%**	12.5	**-3%**	12.1	**3%**
	38475	17.9	17.9	17.8	**0%**	17.8	**0%**	17.8	**0%**
	38300	22.5	17.7	17.7	**0%**	17.7	**0%**	17.7	**0%**
	38065	14.5	14.5	14.5	**0%**	15.0	**-3%**	14.5	**3%**
	37810	18.2	18.2	18.2	**0%**	18.2	**0%**	18.2	**0%**
	37655	20.9	17.4	17.4	**0%**	17.4	**0%**	17.4	**0%**
	37390	23.7	14.2	14.2	**0%**	14.5	**-3%**	14.2	**3%**
	37135	16.6	16.6	16.6	**0%**	16.6	**0%**	16.6	**0%**
	36930	19.8	16.3	15.6	**4%**	15.7	**-1%**	15.7	**0%**
	36735	16.1	16.1	16.1	**0%**	16.1	**0%**	16.1	**1%**
	36515	12.9	12.9	12.8	**0%**	13.7	**-7%**	13.3	**3%**
	36265	12.3	12.3	12.3	**0%**	12.8	**-3%**	12.5	**2%**
SRB1	36080	14.7	14.7	14.7	**0%**	14.8	**-1%**	14.6	**1%**
	35845	11.0	11.0	11.7	**-7%**	12.0	**-2%**	11.7	**2%**
	35725	15.0	15.0	14.1	**6%**	14.3	**-1%**	14.1	**1%**
	35515	17.1	15.2	14.0	**8%**	13.4	**4%**	13.6	**-1%**
	35245	17.3	14.5	13.7	**6%**	13.9	**-1%**	13.7	**1%**
	35040	19.6	15.6	13.9	**11%**	13.5	**3%**	13.6	**0%**
	34860	18.4	14.1	14.1	**0%**	14.2	**-1%**	14.1	**1%**
	34720	18.4	13.9	13.9	**0%**	14.0	**-1%**	13.9	**1%**
	34495	17.4	14.0	14.0	**0%**	14.1	**-1%**	14.0	**1%**
	34310	16.8	15.0	14.3	**5%**	14.0	**2%**	14.1	**-1%**
	34090	17.0	14.2	14.2	**0%**	14.3	**-1%**	14.2	**1%**
SRB2	33880	16.6	14.1	14.1	**0%**	14.2	**-1%**	14.1	**0%**
	33710	15.4	14.0	14.0	**0%**	14.0	**0%**	14.0	**0%**
	33500	16.2	14.3	13.1	**8%**	13.0	**0%**	13.1	**0%**
	33310	15.8	12.9	12.9	**0%**	12.8	**1%**	12.8	**0%**
	33115	10.4	10.4	10.4	**0%**	10.3	**0%**	10.2	**1%**
	32795	13.0	13.0	13.0	**0%**	12.2	**6%**	12.1	**1%**
	32605	14.4	13.1	13.1	**0%**	13.1	**0%**	13.1	**0%**
SRC1	32265	15.9	13.4	13.4	**0%**	13.7	**-2%**	13.4	**2%**
	31875	12.4	12.4	12.4	**0%**	12.6	**-2%**	12.4	**2%**
	31585	10.9	10.9	12.1	**-11%**	12.3	**-1%**	12.1	**1%**
	31360	10.3	10.3	11.5	**-12%**	13.9	**-20%**	11.5	**17%**
	31060	8.2	8.2	9.0	**-10%**	9.6	**-6%**	9.0	**6%**
	30720	6.7	6.7	7.3	**-9%**	7.5	**-3%**	7.3	**3%**
	30445	6.3	6.3	6.8	**-8%**	6.9	**-3%**	6.7	**3%**
	30095	6.7	6.7	7.0	**-3%**	7.1	**-3%**	7.0	**3%**
	29815	7.7	7.7	7.9	**-2%**	8.1	**-3%**	7.9	**2%**
	29565	7.4	7.4	7.7	**-5%**	7.9	**-2%**	7.7	**2%**
	29385	8.3	8.3	8.6	**-4%**	8.8	**-2%**	8.6	**2%**
SRC2	29140	9.2	9.2	10.2	**-11%**	10.4	**-3%**	10.2	**2%**
	28895	18.8	18.8	16.8	**11%**	17.1	**-2%**	16.8	**2%**
	28695	28.9	12.4	13.3	**-7%**	13.6	**-2%**	13.3	**2%**
	28500	22.4	17.7	16.7	**6%**	16.7	**0%**	16.6	**1%**
	28280	29.6	13.0	11.9	**8%**	12.5	**-5%**	11.9	**5%**
	28080	11.3	11.3	10.9	**3%**	11.2	**-3%**	10.9	**3%**
	27925	13.1	13.1	12.4	**5%**	12.8	**-3%**	12.4	**3%**
	27725	19.0	19.0	18.0	**6%**	18.1	**-1%**	18.0	**1%**
	27545	22.9	19.7	19.1	**3%**	19.2	**-1%**	19.1	**1%**
	27335	24.6	18.3	17.4	**5%**	17.5	**-1%**	17.4	**1%**
	27155	19.1	18.4	17.2	**6%**	17.4	**-1%**	17.2	**1%**
SRC3	26990	22.6	16.9	16.7	**1%**	16.8	**-1%**	16.7	**1%**
	26780	23.1	16.9	16.3	**4%**	16.4	**-1%**	16.3	**1%**
	26575	20.7	13.9	14.7	**-6%**	14.8	**-1%**	14.8	**0%**
	26355	15.9	15.9	15.4	**3%**	15.5	**-1%**	15.4	**1%**
	26170	17.0	16.5	15.3	**7%**	15.3	**0%**	15.3	**0%**
	25965	18.2	16.3	15.2	**7%**	15.4	**-1%**	15.2	**1%**
	25785	18.9	16.5	14.4	**13%**	14.6	**-2%**	14.4	**1%**
	25600	18.5	17.0	15.0	**12%**	15.7	**-4%**	15.0	**4%**
	25425	18.3	14.6	14.6	**0%**	15.1	**-3%**	14.6	**3%**
	25215	14.3	14.3	14.2	**0%**	15.3	**-8%**	14.2	**7%**
	25000	13.2	13.2	13.1	**0%**	13.4	**-2%**	13.1	**2%**

Table A4.4B2 HEC-RAS to HEC-2 Conversion SCR Proposed n=0.025 continued

Subreach	HEC-RAS Station	HEC-RAS Mixed Vel Chnl (ft/s)	HEC-RAS Subcritical Vel Chnl (ft/s)	Fluvial HEC-RAS Subcritical Vel Chnl (ft/s)	Δ (%) Vel Chnl (ft/s %)	Fluvial HEC2 Vel Chnl (ft/s)	Δ (%) Vel Chnl (ft/s %)	Fluvial HEC2 IMPORT Subcritical Vel Chnl (ft/s)	Δ (%) Vel Chnl (ft/s %)
SRC4	24795	14.1	14.1	14.0	**0%**	14.3	**-2%**	14.0	**2%**
	24550	15.1	15.1	15.0	**1%**	15.4	**-3%**	15.0	**3%**
	24335	18.2	18.2	18.1	**1%**	18.2	**-1%**	18.1	**1%**
	24115	20.0	18.3	18.2	**0%**	18.3	**0%**	18.2	**0%**
	23975	20.8	18.0	18.0	**0%**	17.9	**0%**	18.0	**0%**
	23755	18.1	18.0	17.8	**1%**	17.8	**-1%**	17.8	**1%**
	23565	20.2	17.6	17.4	**1%**	17.5	**-1%**	17.4	**1%**
	23365	18.4	17.6	16.9	**4%**	17.1	**-1%**	16.9	**1%**
	23180	21.9	18.5	16.0	**13%**	17.0	**-6%**	17.0	**0%**
	23000	22.0	15.4	15.3	**0%**	16.2	**-5%**	15.8	**2%**
	22790	17.9	17.9	18.0	**0%**	17.9	**0%**	17.8	**1%**
	22600	19.8	17.4	16.6	**5%**	16.6	**0%**	16.6	**0%**
	22415	21.3	16.8	16.3	**3%**	16.4	**-1%**	16.3	**1%**
SRD1	22195	13.6	13.6	14.2	**-4%**	14.5	**-2%**	14.2	**2%**
	22010	16.1	16.1	15.4	**5%**	15.6	**-1%**	15.4	**1%**
	21790	19.7	15.9	14.7	**8%**	14.9	**-1%**	14.7	**1%**
	21615	21.3	15.6	14.8	**5%**	14.9	**-1%**	14.8	**1%**
	21440	17.5	16.1	15.0	**6%**	15.1	**-1%**	15.0	**1%**
	21225	18.1	15.2	14.3	**6%**	14.3	**0%**	14.4	**-1%**
	21020	20.3	14.9	12.3	**17%**	12.6	**-2%**	12.3	**2%**
	20845	15.1	15.1	14.3	**5%**	14.5	**-1%**	14.4	**1%**
	20595	12.4	12.4	11.1	**10%**	11.5	**-3%**	11.1	**3%**
	20435	12.1	12.1	10.8	**11%**	11.1	**-3%**	10.8	**3%**
	20280	15.6	15.6	14.5	**7%**	14.5	**0%**	14.5	**0%**
	20070	19.3	15.4	14.4	**6%**	14.4	**0%**	14.5	**0%**
SRD2	19855	20.6	15.2	14.3	**6%**	14.3	**0%**	14.2	**1%**
	19630	20.6	14.8	14.4	**3%**	15.9	**-11%**	14.4	**10%**
	19440	13.1	13.1	12.9	**2%**	13.2	**-2%**	12.9	**2%**
	19240	15.9	15.9	15.6	**2%**	15.6	**0%**	15.6	**0%**
	19050	18.8	12.7	12.2	**4%**	12.5	**-2%**	12.2	**2%**
	18830	13.3	13.3	12.1	**9%**	14.8	**-22%**	12.1	**18%**
	18650	12.1	12.1	10.8	**11%**	12.3	**-14%**	10.8	**12%**
	18475	8.9	8.9	8.8	**1%**	9.2	**-5%**	8.8	**5%**
	18290	9.8	9.8	9.4	**4%**	10.0	**-6%**	9.4	**6%**
	18025	7.9	7.9	7.8	**2%**	8.0	**-3%**	7.8	**3%**
	17785	8.5	8.5	8.4	**1%**	8.6	**-3%**	8.4	**3%**
SRD3	17510	11.0	11.0	10.1	**8%**	10.5	**-4%**	10.1	**4%**
	17360	17.1	17.1	16.9	**1%**	16.9	**0%**	16.9	**0%**
	17110	22.3	16.6	15.7	**6%**	15.9	**-1%**	15.7	**1%**
	16970	23.1	16.4	15.7	**4%**	16.0	**-2%**	15.7	**2%**
	16720	24.4	16.0	15.9	**0%**	15.9	**0%**	15.9	**0%**
	16515	19.4	15.4	15.4	**0%**	15.5	**-1%**	15.4	**1%**
	16305	11.6	11.6	11.1	**4%**	11.4	**-3%**	11.1	**3%**
	16130	15.7	15.7	15.2	**3%**	15.1	**0%**	15.2	**0%**
	15960	17.7	13.8	13.7	**1%**	14.8	**-9%**	14.7	**1%**
	15745	12.3	12.3	12.3	**0%**	15.1	**-23%**	13.4	**11%**
	15540	10.6	10.6	10.5	**0%**	11.5	**-9%**	11.2	**3%**
	15335	16.2	16.2	16.2	**0%**	16.2	**0%**	16.0	**1%**
SRE1	15125	17.9	16.6	16.6	**0%**	16.5	**1%**	16.4	**1%**
	14900	19.3	15.6	16.3	**-4%**	16.4	**-1%**	16.3	**1%**
	14720	18.1	15.1	15.9	**-5%**	16.1	**-1%**	15.9	**1%**
	14480	19.0	14.7	14.5	**1%**	14.6	**0%**	14.5	**1%**
	14315	14.0	13.8	14.0	**-2%**	13.8	**2%**	13.8	**0%**
	14090	14.3	13.8	13.7	**0%**	13.8	**-1%**	13.7	**1%**
	13850	12.6	12.6	13.9	**-10%**	13.7	**1%**	13.8	**0%**
	13635	15.5	15.5	14.0	**10%**	14.0	**-1%**	14.0	**1%**
	13425	18.0	13.5	13.5	**0%**	13.4	**0%**	13.5	**0%**
	13190	12.2	12.2	12.3	**-1%**	12.9	**-4%**	12.3	**4%**
SRE2	13030	14.2	14.2	12.0	**16%**	12.5	**-5%**	11.9	**5%**
	12835	13.3	13.3	11.8	**12%**	12.6	**-7%**	11.7	**7%**
	12615	12.5	12.5	11.0	**12%**	11.5	**-4%**	11.0	**5%**
	12395	12.3	12.3	10.9	**12%**	11.4	**-5%**	10.8	**5%**
	12195	10.6	10.6	10.0	**6%**	10.2	**-3%**	9.9	**3%**
	11995	12.8	12.8	11.1	**13%**	11.4	**-3%**	11.0	**4%**
	11780	12.6	12.6	10.4	**17%**	10.7	**-2%**	10.4	**3%**
	11605	13.9	13.9	11.6	**17%**	11.9	**-3%**	11.4	**4%**
	11405	13.2	13.2	12.1	**8%**	12.4	**-3%**	11.9	**4%**
	11180	16.6	16.6	15.2	**8%**	15.6	**-3%**	14.9	**4%**
SRE3	11015	19.1	19.1	18.9	**1%**	19.1	**-1%**	18.9	**1%**
	10835	21.9	17.9	17.7	**1%**	17.8	**0%**	17.7	**0%**
	10575	24.1	16.0	16.0	**0%**	16.0	**0%**	16.0	**0%**
	10390	22.7	16.3	12.7	**22%**	13.0	**-2%**	12.7	**2%**
	10225	17.8	15.0	14.7	**2%**	14.8	**-1%**	14.7	**1%**
	10000	14.9	14.9	14.6	**2%**	14.4	**1%**	14.6	**-1%**
	9820	18.6	15.0	14.9	**0%**	15.1	**-1%**	14.9	**1%**
	9595	14.6	14.6	14.5	**0%**	14.7	**-1%**	14.5	**1%**
	9385	15.8	14.0	13.8	**2%**	13.9	**-1%**	13.8	**1%**
	9220	16.4	13.7	13.7	**1%**	13.8	**-1%**	13.7	**1%**
	9025	15.9	14.3	13.8	**3%**	13.8	**0%**	13.8	**0%**

PACE
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Santa Clara River Fluvial Study

APPENDIX CHAPTER 4.5

Existing & Proposed Conditions Hydraulic Subreach Analysis

PACIFIC ADVANCED CIVIL ENGINEERING, INC.

Table A4.5A1: Santa Clara River Existing Conditions Hec-Ras Output and Parameter Correlation: Reach A

Subreach	River Sta	Q Total	Min Ch El ft	W.S. Elev ft	Crit W.S. ft	E.G. Elev ft	E.G. Slope	Vel Chnl fps	Flow Area sq ft	Top Width ft	Froude #	bedslope 1	bedslope 2	bedslope 3
SRA1	**46195**	115111	1035.0	1054.3	1054.3	1060.3	0.004	19.7	5847.5	483.4	1.00			
	46020	115111	1032.0	1052.4	1052.4	1058.1	0.004	19.1	6013.5	531.5	1.00	0.017		
	45545	115111	1030.0	1049.2	1049.2	1055.7	0.004	20.3	5664.1	446.8	1.01	0.004	0.008	
	45030	115111	1025.0	1045.6	1044.6	1050.5	0.003	17.8	6472.9	521.5	0.89	0.010	0.007	0.009
	44585	115111	1022.0	1043.1	1043.1	1048.8	0.004	19.2	6003.6	531.9	1.01	0.007	0.008	0.007
	44210	115111	1020.0	1041.6	1038.7	1045.0	0.002	14.8	7793.1	585.9	0.71	0.005	0.006	0.007
SRA2	**43820**	115111	1018.0	1037.5	1037.5	1043.6	0.004	19.9	5785.5	476.5	1.01	0.005	0.005	0.006
	43610	115111	1017.0	1034.1	1034.1	1040.1	0.004	19.7	5832.2	483.7	1.00	0.005	0.005	0.005
	43410	115111	1016.0	1030.7	1030.7	1035.9	0.004	18.2	6338.3	623.3	1.00	0.005	0.005	0.005
	43200	115111	1014.0	1029.3	1029.3	1033.9	0.004	17.3	6660.7	737.2	1.00	0.010	0.007	0.006
	42975	115111	1012.0	1026.1	1026.1	1030.3	0.005	16.3	7050.2	860.4	1.01	0.009	0.009	0.008
	42815	115111	1011.0	1024.3	1024.3	1027.9	0.005	15.3	7548.6	1051.0	1.00	0.006	0.008	0.008
	42590	115111	1010.0	1021.3	1021.3	1024.8	0.005	15.0	7695.7	1112.9	1.00	0.004	0.005	0.007
	42430	115111	1008.0	1019.6	1019.6	1023.3	0.005	15.5	7449.5	1001.0	1.00	0.013	0.008	0.007
	42215	115111	1006.0	1020.4	1017.7	1022.0	0.002	10.2	11269.5	1312.6	0.61	0.009	0.011	0.008
	41940	115111	1005.0	1019.5	1017.7	1021.5	0.002	11.2	10258.2	1332.5	0.71	0.004	0.006	0.008
	41730	115111	1004.0	1018.9	1016.5	1021.0	0.002	11.4	10078.8	1249.1	0.71	0.005	0.004	0.006
	41460	115111	1002.0	1018.3	1015.2	1020.3	0.002	11.3	10198.6	1335.2	0.72	0.007	0.006	0.005
SRA3	**41280**	115111	1001.0	1015.3	1015.3	1019.5	0.005	16.4	7014.3	851.9	1.01	0.006	0.007	0.006
	41080	115111	1000.0	1013.6	1013.6	1017.6	0.005	16.1	7149.5	899.0	1.01	0.005	0.005	0.006
	40825	115111	999.5	1012.2	1012.2	1015.6	0.005	14.8	7757.4	1146.8	1.01	0.002	0.003	0.004
	40585	115111	998.0	1010.6	1010.6	1014.0	0.005	14.8	7785.2	1161.4	1.01	0.006	0.004	0.004
	40335	115111	996.0	1010.4	1008.9	1012.2	0.003	11.0	10452.1	1494.5	0.73	0.008	0.007	0.005
	40130	115111	995.0	1010.0	1008.4	1011.7	0.002	10.4	11087.0	1631.3	0.70	0.005	0.007	0.006
	39945	115111	994.0	1009.8	1007.6	1011.2	0.002	9.5	12146.7	1639.3	0.61	0.005	0.005	0.006
	39755	115111	994.0	1007.3	1007.3	1010.5	0.005	14.4	7974.8	1238.0	1.00	0.000	0.003	0.003
	39605	115111	993.0	1005.7	1005.7	1009.0	0.005	14.7	7830.6	1171.1	1.00	0.007	0.003	0.004
	39310	115111	992.0	1004.1	1004.1	1007.5	0.005	14.7	7842.0	1184.1	1.01	0.003	0.004	0.003
	39100	115111	990.0	1004.2	1002.0	1006.1	0.002	11.2	10276.1	1302.0	0.70	0.010	0.006	0.006
	38925	115111	989.5	1003.9	1001.3	1005.8	0.002	10.9	10519.7	1177.1	0.65	0.003	0.006	0.005
SRA4	**38710**	115111	988.0	1003.7	1000.0	1005.4	0.001	10.4	11078.5	1039.0	0.56	0.007	0.005	0.007
	38475	115111	986.0	1000.2	1000.2	1004.6	0.005	16.7	6875.8	795.5	1.00	0.009	0.008	0.006
	38300	115111	985.5	998.1	997.5	1002.3	0.004	16.5	6965.9	701.8	0.92	0.003	0.006	0.006
	38065	115111	984.0	998.2	995.7	1001.3	0.002	14.1	8168.8	678.4	0.72	0.006	0.005	0.006
	37810	115111	983.0	995.2	995.2	1000.4	0.004	18.2	6319.8	622.1	1.01	0.004	0.005	0.005
	37655	115111	982.0	994.2	994.2	998.5	0.004	16.8	6851.1	789.4	1.01	0.006	0.005	0.005
	37390	115111	981.0	989.9	989.9	993.7	0.004	15.7	7414.9	986.7	0.98	0.004	0.005	0.004
	37135	115111	980.0	988.6	988.6	992.1	0.005	15.1	7645.5	1091.6	1.00	0.004	0.004	0.004
	36930	115111	978.0	987.7	986.9	990.5	0.003	13.3	8648.1	1125.5	0.85	0.010	0.007	0.006
	36735	115111	977.0	986.4	986.4	989.7	0.004	14.6	7881.5	1194.2	1.00	0.005	0.008	0.006
	36515	115111	975.0	986.3	985.3	988.6	0.003	12.1	9521.5	1325.6	0.79	0.009	0.007	0.008
	36265	115111	974.0	985.2	984.8	987.8	0.003	13.1	8807.0	1373.1	0.91	0.004	0.006	0.006

corr(x,v)=	0.486087
corr(x,a)=	-0.393283
corr(x,b)=	**-0.5195**
corr(x,m1)=	0.287884
corr(x,m2)=	0.270636
corr(x,m3)=	0.366906

Figure A4.5A1: Santa Clara River Existing Conditions HEC-RAS Reach A - Station vs Top Width

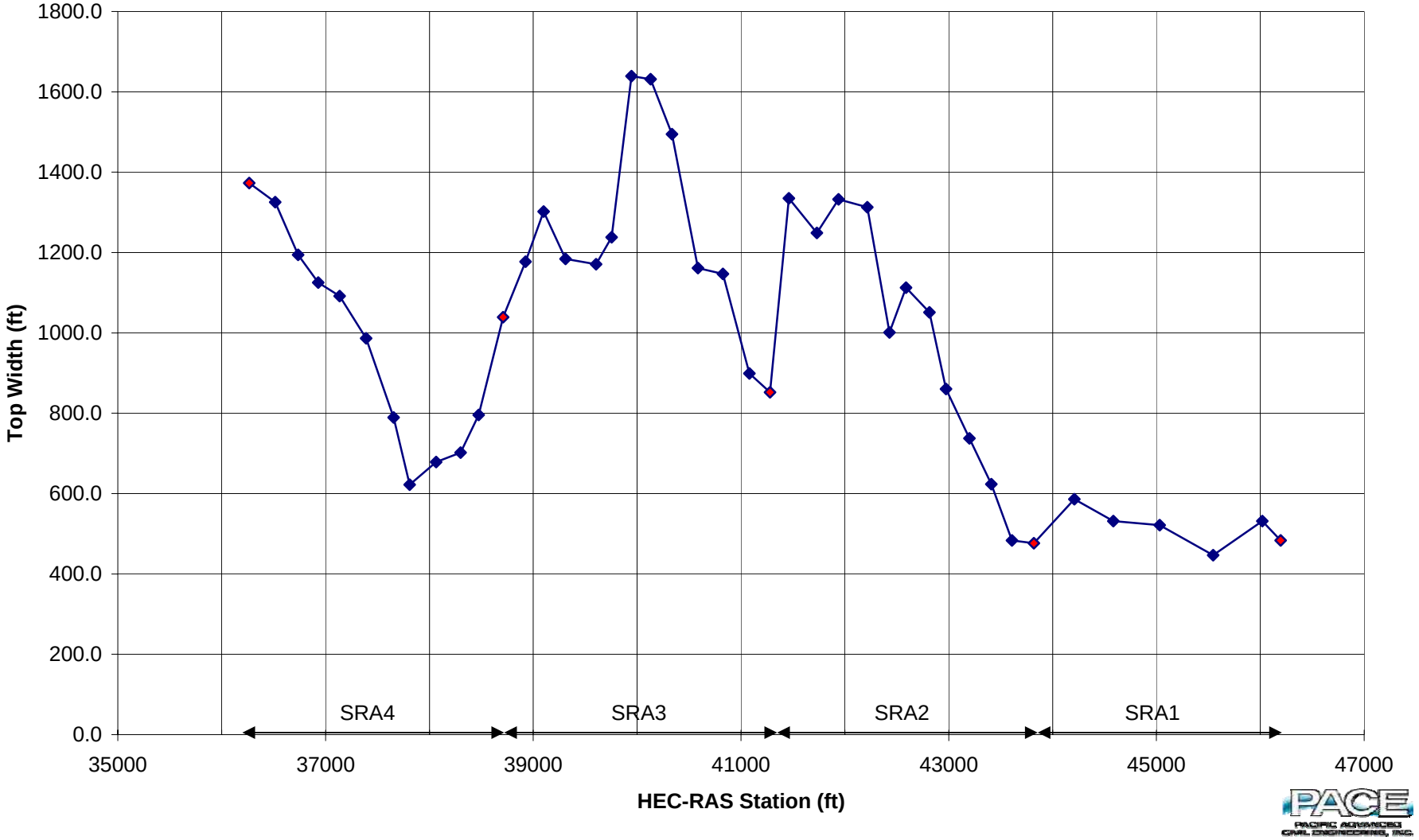


Table A4.5A2: Santa Clara River Existing Conditions Hec-Ras Output and Parameter Correlation: Reach B

Subreach	River Sta	Q Total	Min Ch El ft	W.S. Elev ft	Crit W.S. ft	E.G. Elev ft	E.G. Slope	Vel Chnl fps	Flow Area sq ft	Top Width ft	Froude #	bedslope 1	bedslope 2	bedslope 3
SRB1	**36080**	116236	973.0	984.1	984.1	987.0	0.005	13.7	8492.5	1450.4	1.00			
	35845	116236	971.0	983.9	982.8	986.0	0.002	11.6	10013.5	1478.1	0.79	0.009		
	35725	116236	970.0	982.6	982.6	985.5	0.004	13.8	8438.9	1427.9	1.00	0.008	0.008	
	35515	116236	969.0	981.3	981.3	984.4	0.004	14.0	8309.5	1362.8	1.00	0.005	0.006	0.007
	35245	116236	968.0	980.1	980.1	983.1	0.005	13.8	8434.2	1553.4	0.99	0.004	0.004	0.005
	35040	116236	967.0	978.4	978.3	981.4	0.005	13.8	8428.2	1401.8	0.98	0.005	0.004	0.004
	34860	116236	966.0	977.4	977.4	980.5	0.005	14.0	8307.5	1363.0	1.00	0.006	0.005	0.005
	34720	116236	965.5	976.2	976.2	979.2	0.005	13.9	8382.5	1419.6	1.01	0.004	0.005	0.005
	34495	116236	964.0	974.3	974.3	977.3	0.004	14.0	8313.9	1380.4	1.00	0.007	0.005	0.006
	34310	116236	963.0	972.7	972.7	975.8	0.004	14.3	8114.6	1297.7	1.01	0.005	0.006	0.005
	34090	116236	962.0	971.6	971.6	974.8	0.004	14.3	8123.9	1281.0	1.00	0.005	0.005	0.006
SRB2	**33880**	116236	960.0	970.5	970.5	973.6	0.004	14.2	8188.0	1320.1	1.00	0.010	0.007	0.007
	33710	116236	959.0	969.3	969.3	972.4	0.004	14.1	8238.1	1363.2	1.01	0.006	0.008	0.007
	33500	116236	958.0	968.2	968.2	970.8	0.004	13.1	8872.2	1690.4	1.01	0.005	0.005	0.007
	33310	116236	957.0	967.0	967.0	969.6	0.004	12.9	8986.4	1751.5	1.01	0.005	0.005	0.005
	33115	116236	956.0	966.4	965.6	968.3	0.004	11.3	10261.8	1811.5	0.84	0.005	0.005	0.005
	32795	116236	954.0	965.0	964.6	967.3	0.003	12.2	9528.8	1732.9	0.92	0.006	0.006	0.006
	32605	116236	952.0	963.5	963.5	966.5	0.004	14.1	8272.7	1344.6	1.00	0.011	0.008	0.007
corr(x,v)=	0.186906													
corr(x,a)=	-0.18573													
corr(x,b)=	**-0.37919**													
corr(x,m1)=	-0.14733													
corr(x,m2)=	-0.13339													
corr(x,m3)=	-0.33786													

Figure A4.5A2: Santa Clara River Existing Conditions HEC-RAS Reach B - Station vs Top Width

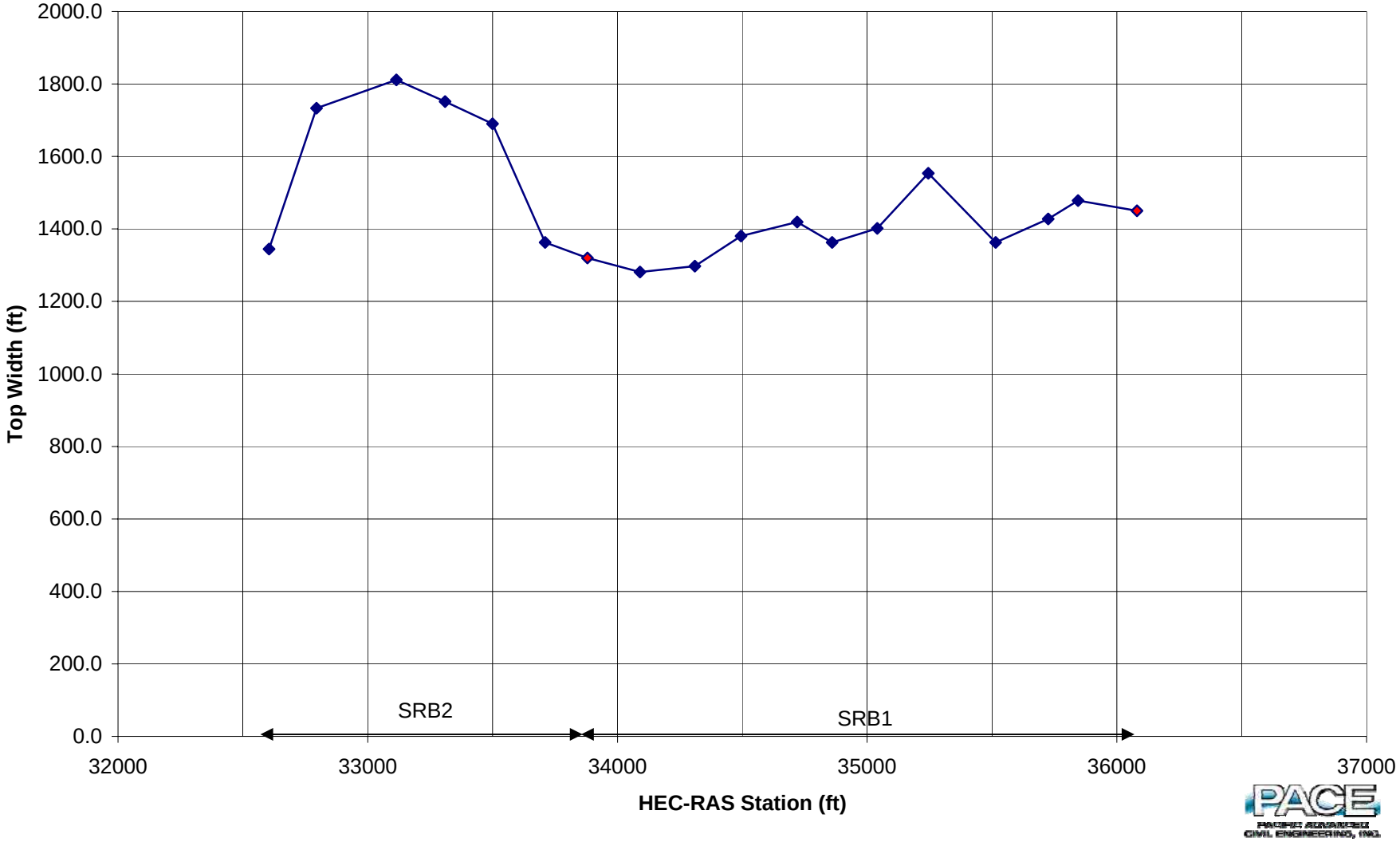


Table A4.5A3: Santa Clara River Existing Conditions Hec-Ras Output and Parameter Correlation: Reach C

Subreach	River Sta	Q Total	Min Ch El ft	W.S. Elev ft	Crit W.S. ft	E.G. Elev ft	E.G. Slope	Vel Chnl fps	Flow Area sq ft	Top Width ft	Froude #	bedslope 1	bedslope 2	bedslope 3
SRC1	**32265**	140776	950.0	961.4	961.4	964.1	0.004	13.3	10579.2	1944.9	1.01			
	31875	140776	949.0	960.0	960.0	961.9	0.004	10.9	12908.1	2482.2	0.84	0.003		
	31585	140776	946.0	957.7	957.0	959.6	0.004	11.3	12511.1	2181.1	0.83	0.010	0.006	
	31360	140776	944.0	957.2	955.4	958.9	0.002	10.5	13391.5	1875.2	0.69	0.009	0.010	0.007
	31060	140776	942.0	957.2	953.3	958.3	0.001	8.4	16729.5	1706.2	0.47	0.007	0.008	0.009
	30720	140776	940.0	957.3	951.3	958.0	0.001	6.8	20683.4	1886.9	0.36	0.006	0.006	0.007
	30445	140776	938.0	957.2	949.6	957.8	0.000	6.4	22074.1	1777.6	0.32	0.007	0.007	0.007
	30095	140776	936.0	957.0	947.9	957.7	0.000	6.8	20641.0	1666.4	0.34	0.006	0.006	0.006
	29815	140776	935.0	956.6	948.1	957.5	0.001	7.7	18373.0	1573.0	0.40	0.004	0.005	0.006
	29565	140776	934.0	956.5	947.3	957.3	0.001	7.5	18750.2	1613.5	0.39	0.004	0.004	0.005
	29385	140776	933.0	956.1	949.0	957.2	0.001	8.5	16517.2	1577.6	0.46	0.006	0.005	0.004
SRC2	**29140**	140776	932.0	954.7	951.0	956.8	0.002	11.5	12276.2	1324.5	0.66	0.004	0.005	0.004
	28895	140776	930.0	951.6	951.6	956.0	0.003	16.8	8402.3	965.7	1.00	0.008	0.006	0.006
	28695	140776	928.0	947.9	947.9	953.3	0.004	18.8	7507.5	701.1	1.01	0.010	0.009	0.007
	28500	140776	927.5	945.1	945.1	951.2	0.004	19.8	7160.2	654.2	0.99	0.003	0.006	0.007
	28280	140776	926.0	941.7	941.7	947.9	0.004	20.1	7009.5	562.7	1.00	0.007	0.005	0.007
	28080	140776	925.0	942.3	940.1	946.6	0.002	16.7	8442.0	682.9	0.80	0.005	0.006	0.005
	27925	140776	924.0	940.4	939.5	946.0	0.003	19.1	7355.4	549.8	0.92	0.006	0.006	0.006
	27725	140776	923.0	939.3	939.3	945.4	0.003	19.8	7106.6	586.7	1.00	0.005	0.006	0.005
	27545	140776	922.0	937.7	937.7	943.3	0.003	19.0	7395.6	656.5	1.00	0.006	0.005	0.006
	27335	140776	921.0	936.2	936.2	940.8	0.003	17.3	8160.9	887.0	1.00	0.005	0.005	0.005
	27155	140776	920.5	935.4	935.4	939.6	0.003	16.4	8571.6	1033.5	1.01	0.003	0.004	0.004
SRC3	**26990**	140776	920.0	933.7	933.7	937.6	0.004	15.8	8895.8	1147.6	1.00	0.003	0.003	0.004
	26780	140776	918.0	931.4	931.4	935.1	0.004	15.5	9080.7	1213.5	1.00	0.010	0.007	0.005
	26575	140776	917.0	930.6	930.0	933.7	0.004	14.2	9923.8	1259.9	0.89	0.005	0.007	0.006
	26355	140776	916.0	929.2	929.2	932.8	0.005	15.2	9247.2	1278.4	1.00	0.005	0.005	0.006
	26170	140776	915.0	928.9	928.1	931.7	0.003	13.5	10408.5	1352.5	0.86	0.005	0.005	0.005
	25965	140776	914.0	927.2	927.2	930.8	0.005	15.2	9254.7	1290.2	1.00	0.005	0.005	0.005
	25785	140776	913.5	926.1	926.1	929.5	0.005	15.0	9402.3	1344.9	1.00	0.003	0.004	0.004
	25600	140776	912.5	924.9	924.9	927.9	0.005	13.9	10151.1	1661.6	0.99	0.005	0.004	0.004
	25425	140776	911.0	925.4	923.8	927.0	0.002	10.3	13664.5	2021.6	0.69	0.009	0.007	0.006
	25215	140776	910.0	923.3	923.3	926.3	0.005	13.8	10181.3	1732.2	1.01	0.005	0.006	0.006
	25000	140776	909.0	922.1	922.1	924.6	0.004	12.6	11135.5	2284.2	1.01	0.005	0.005	0.006
SRC4	**24795**	140776	908.0	920.4	920.4	922.8	0.004	12.6	11204.7	2315.5	1.01	0.005	0.005	0.005
	24550	140776	906.0	919.5	918.0	921.0	0.002	9.7	14446.3	2238.3	0.68	0.008	0.007	0.006
	24335	140776	905.0	917.6	917.6	920.3	0.004	13.0	10833.4	2087.5	1.01	0.005	0.007	0.006
	24115	140776	904.0	915.9	915.9	918.6	0.005	13.1	10751.3	2018.8	1.00	0.005	0.005	0.006
	23975	140776	903.5	914.6	914.6	917.4	0.005	13.3	10577.2	1919.3	1.00	0.004	0.004	0.004
	23755	140776	902.0	913.3	913.2	916.0	0.005	13.3	10567.8	1938.0	1.01	0.007	0.006	0.005
	23565	140776	900.0	912.4	912.4	915.1	0.005	13.2	10692.0	2036.3	1.01	0.011	0.009	0.007
	23365	140776	900.0	911.1	911.1	914.0	0.005	13.6	10329.9	1783.9	1.00	0.000	0.005	0.006
	23180	140776	899.0	911.0	909.4	912.5	0.002	10.1	14012.5	2086.5	0.68	0.005	0.003	0.005
	23000	140776	898.0	910.9	908.4	912.1	0.001	9.0	15727.7	2065.4	0.57	0.006	0.005	0.004
	22790	140776	897.5	910.4	908.2	911.8	0.001	9.5	14833.4	1946.2	0.61	0.002	0.004	0.004
	22600	140776	896.0	910.1	907.6	911.6	0.001	9.5	14788.1	1866.4	0.60	0.008	0.005	0.005
	22415	140776	895.5	909.7	906.9	911.3	0.002	10.1	13933.7	1712.9	0.62	0.003	0.005	0.004

corr(x,v)=	-0.05991
corr(x,a)=	0.2074
corr(x,b)=	-0.22352
corr(x,m1)=	0.195674
corr(x,m2)=	0.31057
corr(x,m3)=	**0.398648**

Figure A4.5A3: Santa Clara River Existing Conditions HEC-RAS Reach C - Station vs Bedslope 3

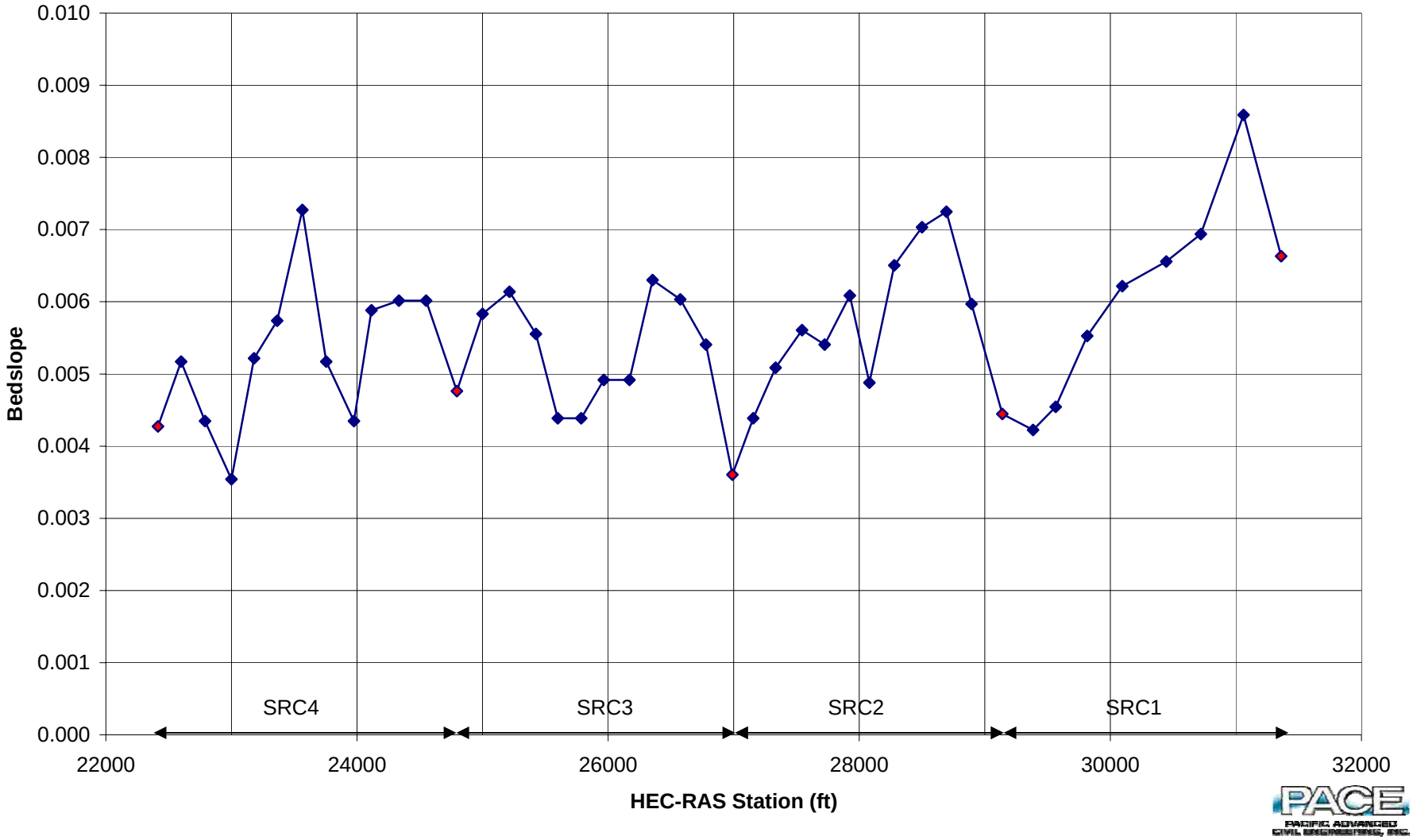


Table A4.5A4: Santa Clara River Existing Conditions Hec-Ras Output and Parameter Correlation: Reach D

Subreach	River Sta	Q Total	Min Ch El ft	W.S. Elev ft	Crit W.S. ft	E.G. Elev ft	E.G. Slope	Vel Chnl fps	Flow Area sq ft	Top Width ft	Froude #	bedslope 1	bedslope 2	bedslope 3
SRD1	**22195**	141426	894.0	906.9	906.9	910.5	0.004	15.4	9204.5	1262.7	1.00			
	22010	141426	892.0	906.2	906.2	909.7	0.003	15.1	9380.5	1322.1	1.00	0.011		
	21790	141426	891.5	904.9	904.9	908.1	0.003	14.4	9826.5	1586.7	1.00	0.002	0.006	
	21615	141426	892.0	903.1	903.1	906.0	0.003	13.7	10342.2	1845.7	1.00	-0.003	0.000	0.003
	21440	141426	890.0	901.2	901.2	904.5	0.004	14.6	9680.3	1773.5	1.00	0.011	0.004	0.004
	21225	141426	888.0	899.8	899.8	902.3	0.004	12.6	11221.5	2263.5	1.00	0.009	0.010	0.006
	21020	141426	887.0	897.4	897.4	900.4	0.004	13.8	10350.8	1908.4	0.99	0.005	0.007	0.008
	20845	141426	886.0	897.0	897.0	899.4	0.004	12.5	11348.1	2407.3	1.01	0.006	0.005	0.007
	20595	141426	885.0	896.4	895.9	898.3	0.003	11.0	12863.1	2527.3	0.86	0.004	0.005	0.005
	20435	141426	884.0	896.2	895.3	897.8	0.002	10.3	13709.7	2581.1	0.79	0.006	0.005	0.005
	20280	141426	883.7	895.0	895.0	897.3	0.004	12.1	11653.2	2572.8	1.00	0.002	0.004	0.004
	20070	141426	882.0	892.7	892.7	895.1	0.004	12.4	11394.6	2436.1	1.01	0.008	0.005	0.006
SRD2	**19855**	141426	880.5	891.1	891.1	893.8	0.004	13.1	10778.8	2072.9	1.01	0.007	0.008	0.006
	19630	141426	880.0	889.8	889.7	892.5	0.004	13.2	10735.2	1915.0	0.98	0.002	0.005	0.006
	19440	141426	878.0	889.9	888.7	891.7	0.002	10.8	13151.5	2083.7	0.75	0.011	0.006	0.006
	19240	141426	877.5	888.9	888.5	891.1	0.003	12.1	11650.5	2090.1	0.91	0.003	0.006	0.005
	19050	141426	876.0	889.0	887.2	890.5	0.002	9.6	14759.7	2167.4	0.64	0.008	0.005	0.007
	18830	141426	874.0	888.7	886.5	890.1	0.001	9.3	15134.9	2098.9	0.61	0.009	0.009	0.007
	18650	141426	873.5	888.7	885.4	889.8	0.001	8.5	16644.3	2025.1	0.52	0.003	0.006	0.007
	18475	141426	872.0	888.7	884.6	889.6	0.001	7.7	18373.6	1945.0	0.44	0.009	0.006	0.007
	18290	141426	871.5	888.4	884.4	889.4	0.001	8.1	17448.5	1844.7	0.46	0.003	0.006	0.005
	18025	141426	870.0	888.3	882.8	889.2	0.001	7.6	18674.7	1611.8	0.39	0.006	0.004	0.006
	17785	141426	868.0	887.9	882.8	889.0	0.001	8.5	16558.7	1418.6	0.44	0.008	0.007	0.006
SRD3	**17510**	141426	867.5	886.2	883.7	888.6	0.002	12.3	11457.1	1289.7	0.73	0.002	0.005	0.005
	17360	141426	866.5	883.4	883.4	887.9	0.004	16.9	8357.4	937.1	1.00	0.007	0.004	0.005
	17110	141426	864.0	881.1	881.1	884.6	0.005	15.0	9425.5	1362.5	1.01	0.010	0.009	0.006
	16970	141426	863.7	879.7	879.7	883.0	0.005	14.4	9799.5	1514.8	1.00	0.002	0.007	0.007
	16720	141426	863.5	875.3	875.3	878.4	0.005	14.2	9981.9	1621.0	1.01	0.001	0.001	0.005
	16515	141426	862.0	873.5	873.5	876.3	0.005	13.4	10549.7	1886.9	1.00	0.007	0.004	0.003
	16305	141426	860.0	871.6	871.2	874.0	0.004	12.6	11236.9	1898.6	0.91	0.010	0.008	0.006
	16130	141426	860.0	870.5	870.5	873.2	0.004	13.3	10641.4	1965.0	1.01	0.000	0.005	0.006
	15960	141426	859.0	869.2	869.2	871.8	0.005	12.8	11034.6	2193.0	1.01	0.006	0.003	0.005
	15745	141426	858.0	868.6	867.8	870.4	0.003	10.9	12927.8	2278.9	0.81	0.005	0.005	0.004
	15540	141426	857.5	868.1	867.1	869.8	0.003	10.4	13602.2	2324.4	0.76	0.002	0.004	0.004
	15335	141426	856.0	866.5	866.5	869.0	0.005	12.6	11254.1	2302.4	1.00	0.007	0.005	0.005

corr(x,v)=	**0.170227**
corr(x,a)=	-0.15893
corr(x,b)=	0.035906
corr(x,m1)=	0.087873
corr(x,m2)=	0.094747
corr(x,m3)=	0.162424

Figure A4.5A4: Santa Clara River Existing Conditions HEC-RAS Reach D - Station vs Channel Velocity

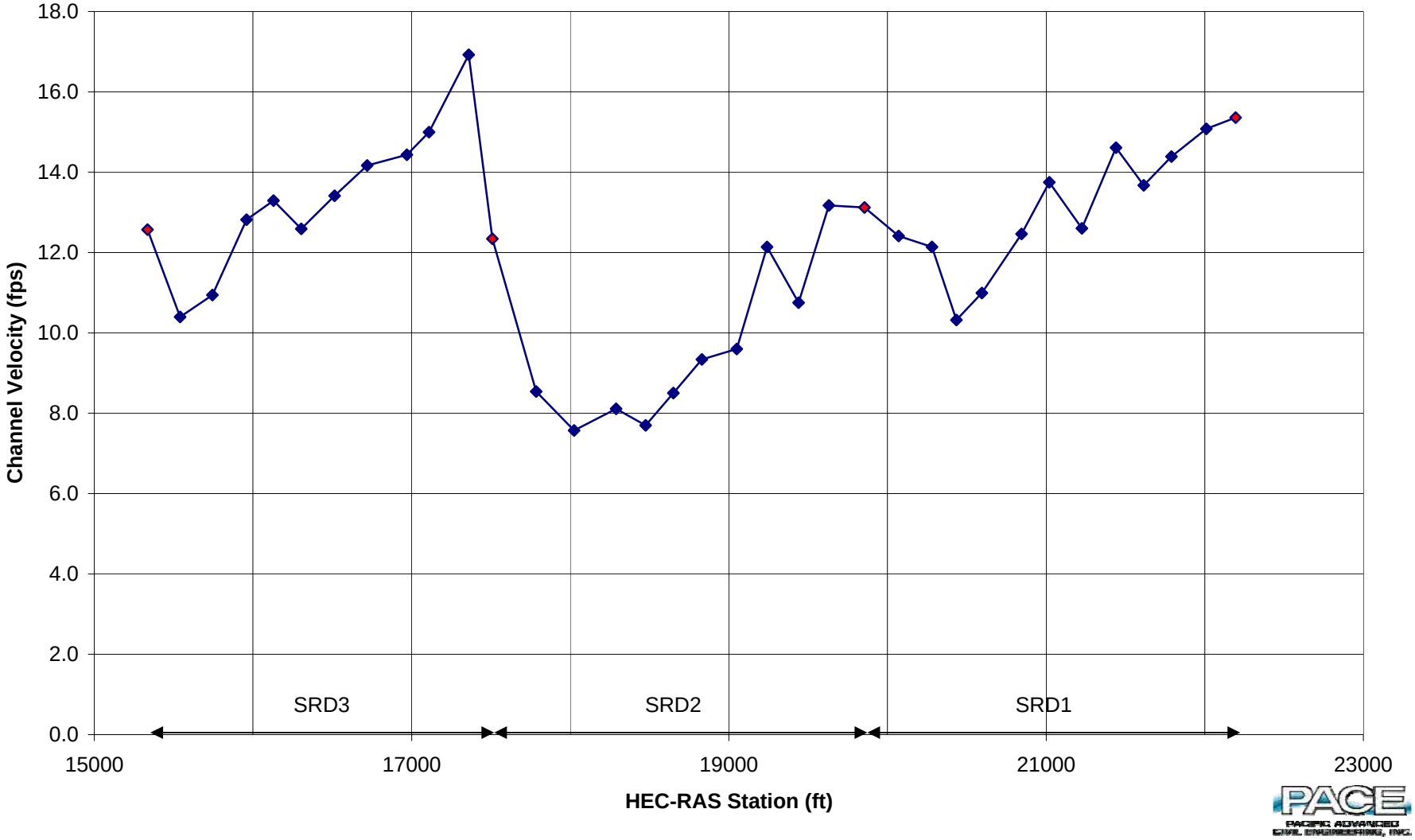


Table A4.5A5: Santa Clara River Existing Conditions Hec-Ras Output and Parameter Correlation: Reach E

Subreach	River Sta	Q Total	Min Ch El ft	W.S. Elev ft	Crit W.S. ft	E.G. Elev ft	E.G. Slope	Vel Chnl fps	Flow Area sq ft	Top Width ft	Froude #	bedslope 1	bedslope 2	bedslope 3
SRE1	**15125**	142475	854.0	864.5	864.5	867.5	0.004	13.7	10371.5	1769.0	1.00			
	14900	142475	853.0	863.3	863.3	866.3	0.005	14.0	10205.6	1697.8	1.00	0.004		
	14720	142475	852.0	862.1	862.1	865.0	0.005	13.7	10381.9	1810.0	1.01	0.006	0.005	
	14480	142475	850.5	860.5	860.5	863.5	0.004	13.7	10409.0	1796.5	1.00	0.006	0.006	0.005
	14315	142475	850.0	859.9	859.8	862.7	0.005	13.5	10576.7	1874.0	1.00	0.003	0.005	0.005
	14090	142475	849.7	858.7	858.7	861.6	0.005	13.7	10387.9	1766.9	1.00	0.001	0.002	0.004
	13850	142475	848.0	857.1	857.1	860.1	0.005	13.8	10293.9	1731.4	1.00	0.007	0.004	0.004
	13635	142475	846.0	856.0	856.0	859.0	0.005	14.0	10182.3	1687.5	1.00	0.009	0.008	0.006
	13425	142475	845.0	854.6	854.6	857.4	0.004	13.4	10627.8	1893.5	1.00	0.005	0.007	0.007
	13190	142475	844.0	853.1	852.8	855.6	0.004	12.7	11213.3	1844.9	0.91	0.004	0.004	0.006
SRE2	**13030**	142475	843.0	852.7	852.0	855.0	0.003	12.3	11565.9	1764.2	0.85	0.006	0.005	0.005
	12835	142475	842.0	852.1	851.0	854.4	0.003	12.1	11770.0	1607.6	0.79	0.005	0.006	0.005
	12615	142475	841.0	851.8	849.8	853.8	0.002	11.3	12646.0	1470.5	0.68	0.005	0.005	0.005
	12395	142475	840.0	851.5	849.2	853.4	0.002	11.1	12874.2	1438.1	0.65	0.005	0.005	0.005
	12195	142475	839.0	851.4	848.1	853.0	0.001	10.1	14130.7	1388.8	0.56	0.005	0.005	0.005
	11995	142475	837.0	850.7	848.1	852.7	0.002	11.3	12590.6	1281.4	0.64	0.010	0.008	0.006
	11780	142475	836.0	850.5	847.7	852.3	0.001	10.7	13373.2	1402.9	0.61	0.005	0.007	0.007
	11605	142475	835.5	849.7	847.2	852.0	0.002	12.0	11833.0	1304.2	0.70	0.003	0.004	0.006
	11405	142475	834.0	849.4	846.2	851.7	0.001	12.0	11855.1	1132.2	0.65	0.008	0.005	0.005
	11180	142475	833.0	847.6	845.6	851.1	0.003	15.0	9504.9	868.5	0.80	0.004	0.006	0.005
SRE3	**11015**	142475	831.5	844.8	844.8	850.4	0.004	18.9	7530.6	680.3	1.00	0.009	0.006	0.007
	10835	142475	831.0	843.8	843.8	848.6	0.004	17.7	8059.6	834.5	1.00	0.003	0.006	0.005
	10575	142475	830.0	840.2	840.2	844.1	0.004	16.0	8918.2	1127.5	1.00	0.004	0.003	0.005
	10390	142475	828.0	839.5	838.6	842.2	0.003	13.2	10811.2	1390.1	0.83	0.011	0.007	0.006
	10225	142475	827.5	838.2	838.2	841.6	0.004	14.7	9676.6	1447.2	1.00	0.003	0.007	0.006
	10000	142475	826.0	837.1	837.1	840.4	0.004	14.6	9744.8	1487.1	1.01	0.007	0.005	0.007
	9820	142475	824.0	835.4	835.4	838.8	0.004	15.0	9530.3	1373.2	1.00	0.011	0.009	0.007
	9595	142475	823.8	834.1	834.1	837.4	0.005	14.6	9769.1	1619.4	1.00	0.001	0.005	0.006
	9385	142475	823.0	833.1	833.1	836.0	0.005	13.7	10378.5	1773.7	1.00	0.004	0.002	0.005
	9220	142475	822.0	831.8	831.8	834.7	0.005	13.7	10412.7	1813.7	1.01	0.006	0.005	0.003
	9025	142475	821.0	830.4	830.4	833.4	0.004	13.8	10348.0	1751.7	1.00	0.005	0.006	0.005

corr(x,v)=	-0.248811
corr(x,a)=	0.216874
corr(x,b)=	**0.4079725**
corr(x,m1)=	-0.076918
corr(x,m2)=	-0.084312
corr(x,m3)=	-0.104576

Figure A4.5A5: Santa Clara River Existing Conditions HEC-RAS Reach E - Station vs Top Width

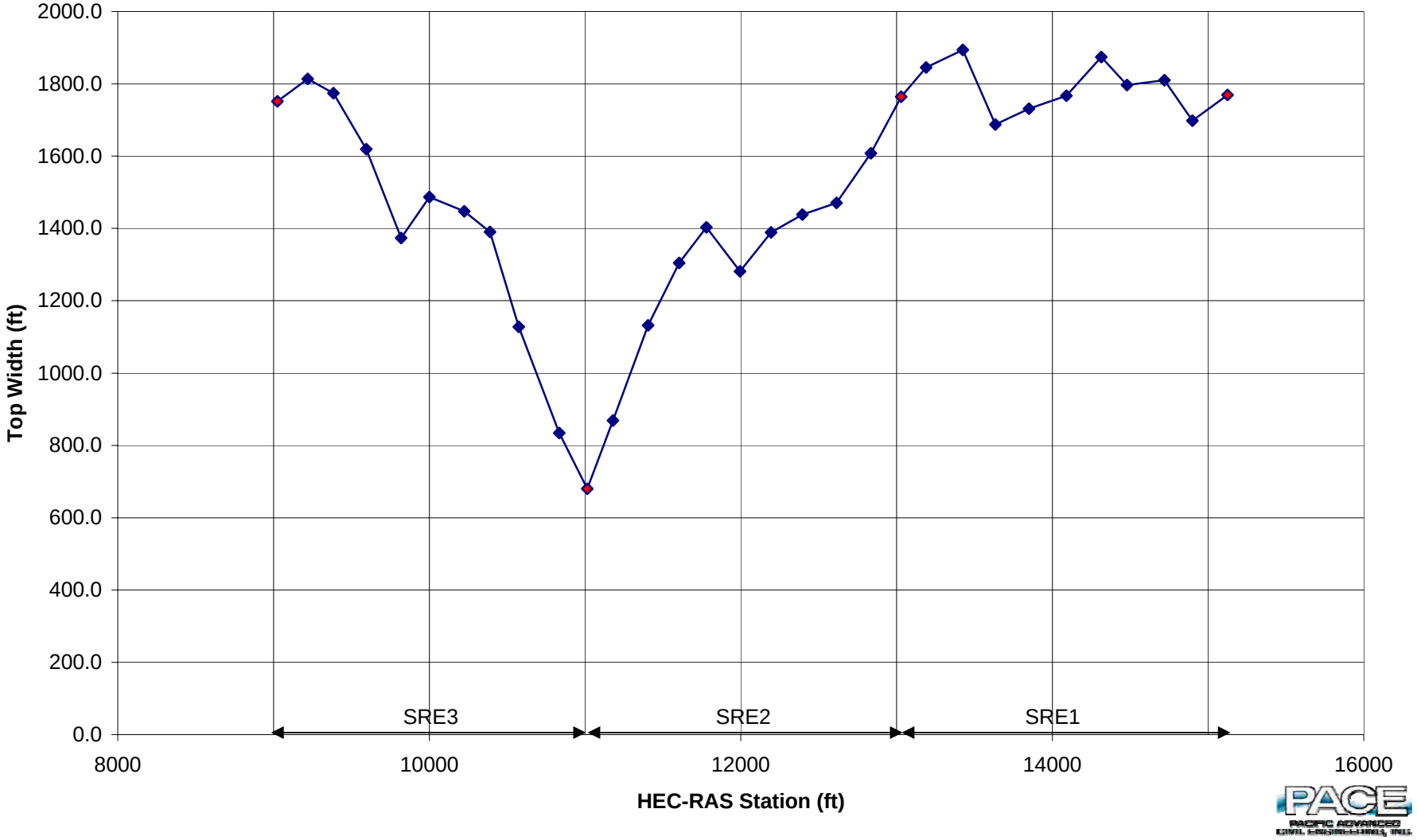


Table A4.5B1: Santa Clara River Proposed Conditions Hec-Ras Output and Parameter Correlation: Reach A

Subreach	River Sta	Q Total	Min Ch El ft	W.S. Elev ft	Crit W.S. ft	E.G. Elev ft	E.G. Slope	Vel Chnl fps	Flow Area sq ft	Top Width ft	Froude #	bedslope 1	bedslope 2	bedslope 3
SRA1	**46195**	115111	1035.0	1054.3	1054.3	1060.3	0.004	19.7	5847.5	483.4	1.00			
	46020	115111	1032.0	1052.4	1052.4	1058.1	0.004	19.1	6013.5	531.5	1.00	0.017		
	45545	115111	1030.0	1049.2	1049.2	1055.7	0.004	20.3	5664.2	446.8	1.01	0.004	0.008	
	45030	115111	1025.0	1045.6	1044.6	1050.5	0.003	17.8	6472.4	521.5	0.89	0.010	0.007	0.009
	44585	115111	1022.0	1043.1	1043.1	1048.8	0.004	19.2	6004.2	531.9	1.01	0.007	0.008	0.007
	44210	115111	1020.0	1041.6	1038.7	1045.0	0.002	14.8	7793.3	585.9	0.71	0.005	0.006	0.007
SRA2	**43820**	115111	1018.0	1037.5	1037.5	1043.6	0.004	19.9	5785.1	476.5	1.01	0.005	0.005	0.006
	43610	115111	1017.0	1034.1	1034.1	1040.1	0.004	19.7	5832.0	483.7	1.00	0.005	0.005	0.005
	43410	115111	1016.0	1030.7	1030.7	1035.9	0.004	18.1	6344.4	623.6	1.00	0.005	0.005	0.005
	43200	115111	1014.0	1029.3	1029.3	1033.9	0.004	17.2	6697.3	738.0	1.01	0.010	0.007	0.006
	42975	115111	1012.0	1026.1	1026.1	1030.3	0.005	16.3	7064.9	860.6	1.00	0.009	0.009	0.008
	42815	115111	1011.0	1024.4	1024.4	1028.0	0.005	15.4	7497.0	1037.2	1.01	0.006	0.008	0.008
	42590	115111	1010.0	1021.5	1021.5	1025.0	0.005	15.1	7649.4	1098.8	1.01	0.004	0.005	0.007
	42430	115111	1008.0	1020.3	1020.3	1024.0	0.005	15.6	7396.5	1011.9	1.00	0.013	0.008	0.007
	42215	115111	1006.0	1019.7	1018.7	1022.3	0.003	12.7	9040.3	1182.7	0.81	0.009	0.011	0.008
	41940	115111	1005.0	1019.3	1017.7	1021.4	0.002	11.6	9945.3	1284.3	0.73	0.004	0.006	0.008
	41730	115111	1004.0	1018.7	1016.5	1020.8	0.002	11.8	9727.4	1189.1	0.73	0.005	0.004	0.006
	41460	115111	1002.0	1018.1	1015.2	1020.2	0.002	11.7	9876.9	1057.3	0.67	0.007	0.006	0.005
SRA3	**41280**	115111	1001.0	1015.3	1015.3	1019.5	0.005	16.4	7032.5	852.2	1.00	0.006	0.007	0.006
	41080	115111	1000.0	1013.6	1013.6	1017.6	0.005	16.0	7175.8	899.5	1.00	0.005	0.005	0.006
	40825	115111	999.5	1012.1	1012.1	1015.6	0.005	15.0	7673.9	1123.0	1.01	0.002	0.003	0.004
	40585	115111	998.0	1010.6	1010.6	1014.0	0.005	14.9	7741.1	1139.8	1.01	0.006	0.004	0.004
	40335	115111	996.0	1011.0	1008.7	1012.7	0.002	10.7	10771.0	1248.8	0.64	0.008	0.007	0.005
	40130	115111	995.0	1010.4	1008.3	1012.3	0.002	11.1	10380.2	1195.0	0.66	0.005	0.007	0.006
	39945	115111	994.0	1010.2	1007.6	1011.9	0.002	10.7	10785.0	1172.5	0.62	0.005	0.005	0.006
	39755	115111	994.0	1007.2	1007.2	1011.2	0.005	16.1	7140.7	893.3	1.00	0.000	0.003	0.003
	39605	115111	993.0	1005.8	1005.8	1009.9	0.005	16.2	7091.8	873.2	1.00	0.007	0.003	0.004
	39310	115111	992.0	1004.4	1004.4	1008.3	0.005	15.9	7232.2	929.3	1.01	0.003	0.004	0.003
	39100	115111	990.0	1003.7	1002.1	1006.9	0.003	14.2	8088.1	788.3	0.78	0.010	0.006	0.006
	38925	115111	989.5	1003.7	1001.5	1006.3	0.002	12.9	8958.4	873.3	0.71	0.003	0.006	0.005
SRA4	**38710**	115111	988.0	1003.6	1000.3	1005.8	0.002	12.1	9534.8	820.2	0.62	0.007	0.005	0.007
	38475	115111	986.0	1000.0	1000.0	1005.0	0.004	17.8	6455.5	659.8	1.00	0.009	0.008	0.006
	38300	115111	985.5	997.9	997.9	1002.7	0.004	17.7	6520.8	677.2	1.00	0.003	0.006	0.006
	38065	115111	984.0	998.0	995.7	1001.3	0.002	14.5	7917.9	658.4	0.74	0.006	0.005	0.006
	37810	115111	983.0	995.2	995.2	1000.4	0.004	18.2	6321.3	618.2	1.00	0.004	0.005	0.005
	37655	115111	982.0	994.1	994.1	998.8	0.004	17.4	6619.8	713.6	1.01	0.006	0.005	0.005
	37390	115111	981.0	991.5	990.1	994.6	0.003	14.2	8124.7	840.6	0.80	0.004	0.005	0.004
	37135	115111	980.0	989.3	989.3	993.6	0.005	16.6	6941.6	821.4	1.01	0.004	0.004	0.004
	36930	115111	978.0	987.9	987.5	991.7	0.004	15.6	7364.7	834.7	0.93	0.010	0.007	0.006
	36735	115111	977.0	986.9	986.9	990.9	0.005	16.1	7167.6	897.0	1.00	0.005	0.008	0.006
	36515	115111	975.0	987.0	985.4	989.6	0.002	12.8	8997.4	994.8	0.75	0.009	0.007	0.008
	36265	115111	974.0	986.5	985.2	988.8	0.003	12.3	9335.4	1176.0	0.77	0.004	0.006	0.006

corr(x,v)=	**0.420839**
corr(x,a)=	-0.34894
corr(x,b)=	-0.35235
corr(x,m1)=	0.287884
corr(x,m2)=	0.270636
corr(x,m3)=	0.366906

Figure A4.5B1: Santa Clara River Proposed Conditions HEC-RAS Reach A - Station vs Channel Velocity

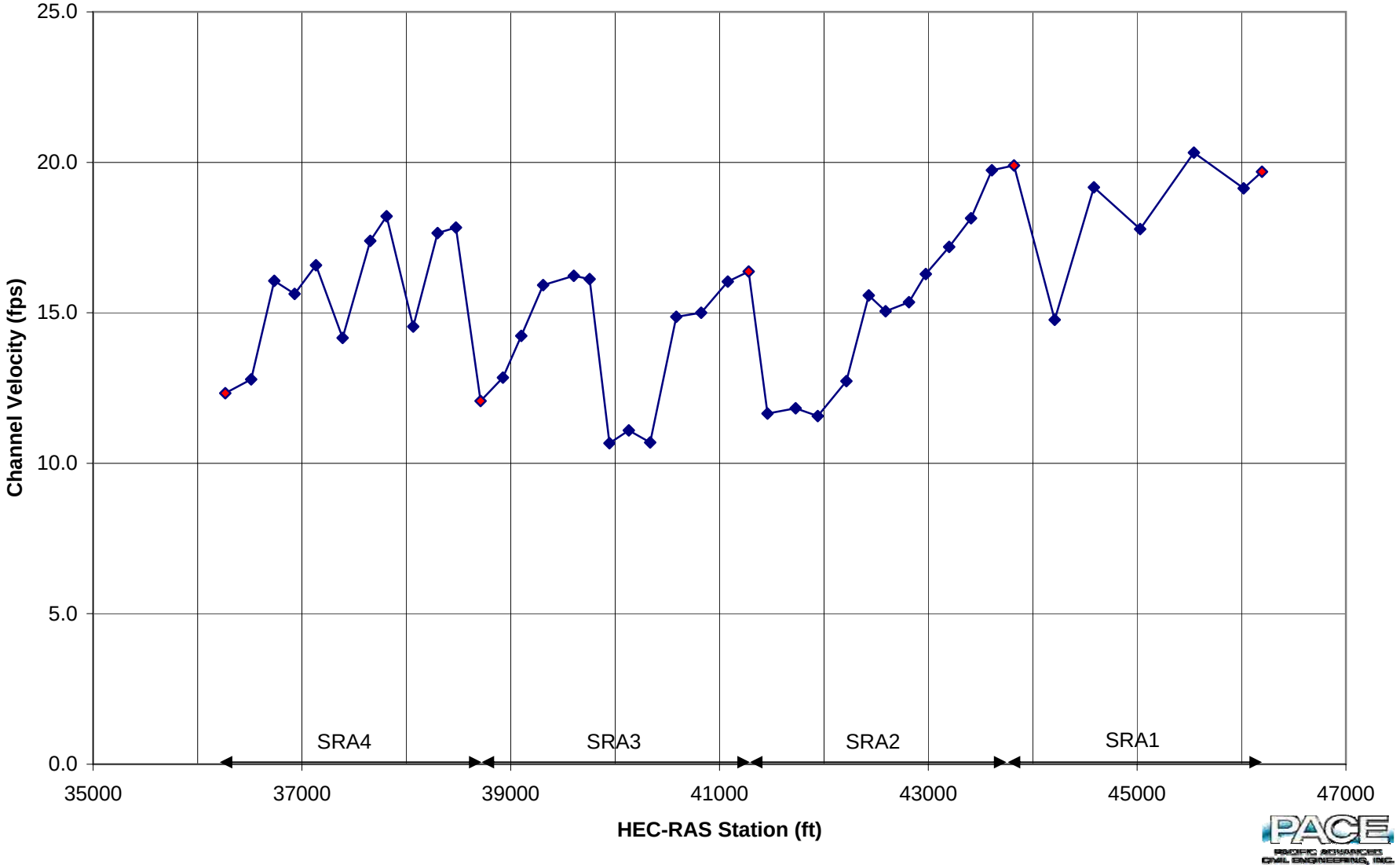


Table A4.5B2: Santa Clara River Proposed Conditions Hec-Ras Output and Parameter Correlation: Reach B

Subreach	River Sta	Q Total	Min Ch El ft	W.S. Elev ft	Crit W.S. ft	E.G. Elev ft	E.G. Slope	Vel Chnl fps	Flow Area sq ft	Top Width ft	Froude #	bedslope 1	bedslope 2	bedslope 3
SRB1	**36080**	116236	973.0	984.6	984.6	988.0	0.006	14.7	7914.1	1176.0	1.00			
	35845	116236	971.0	984.1	982.9	986.2	0.003	11.7	9897.1	1385.2	0.76	0.009		
	35725	116236	970.0	982.6	982.6	985.7	0.005	14.1	8236.8	1374.9	1.00	0.008	0.008	
	35515	116236	969.0	981.3	981.3	984.4	0.004	14.0	8305.4	1363.6	1.00	0.005	0.006	0.007
	35245	116236	968.0	980.2	980.2	983.1	0.005	13.7	8476.1	1553.7	1.00	0.004	0.004	0.005
	35040	116236	967.0	978.3	978.3	981.4	0.005	13.9	8335.5	1400.5	1.01	0.005	0.004	0.004
	34860	116236	966.0	977.4	977.4	980.5	0.004	14.1	8261.7	1362.4	1.01	0.006	0.005	0.005
	34720	116236	965.5	976.2	976.2	979.2	0.004	13.9	8382.6	1419.6	1.01	0.004	0.005	0.005
	34495	116236	964.0	974.3	974.3	977.3	0.004	14.0	8314.1	1380.4	1.00	0.007	0.005	0.006
	34310	116236	963.0	972.6	972.6	975.8	0.005	14.3	8141.1	1311.4	1.01	0.005	0.006	0.005
	34090	116236	962.0	971.6	971.6	974.7	0.004	14.2	8178.3	1312.6	1.00	0.005	0.005	0.006
SRB2	**33880**	116236	960.0	970.3	970.3	973.3	0.004	14.1	8232.7	1343.5	1.01	0.010	0.007	0.007
	33710	116236	959.0	969.3	969.3	972.3	0.004	14.0	8301.6	1377.9	1.01	0.006	0.008	0.007
	33500	116236	958.0	968.1	968.1	970.7	0.005	13.1	8884.5	1720.7	1.01	0.005	0.005	0.007
	33310	116236	957.0	967.0	967.0	969.5	0.004	12.9	9026.4	1780.3	1.01	0.005	0.005	0.005
	33115	116236	956.0	966.6	965.3	968.3	0.003	10.4	11217.6	1847.3	0.74	0.005	0.005	0.005
	32795	116236	954.0	964.6	964.6	967.2	0.004	13.0	8949.4	1735.6	1.01	0.006	0.006	0.006
	32605	116236	952.0	963.6	963.6	966.3	0.004	13.1	8889.4	1766.1	1.00	0.011	0.008	0.007

corr(x,v)=	0.387052
corr(x,a)=	-0.3601
corr(x,b)=	**-0.74378**
corr(x,m1)=	-0.14733
corr(x,m2)=	-0.13339
corr(x,m3)=	-0.33786

Figure A4.5B2: Santa Clara River Proposed Conditions HEC-RAS Reach B - Station vs Top Width

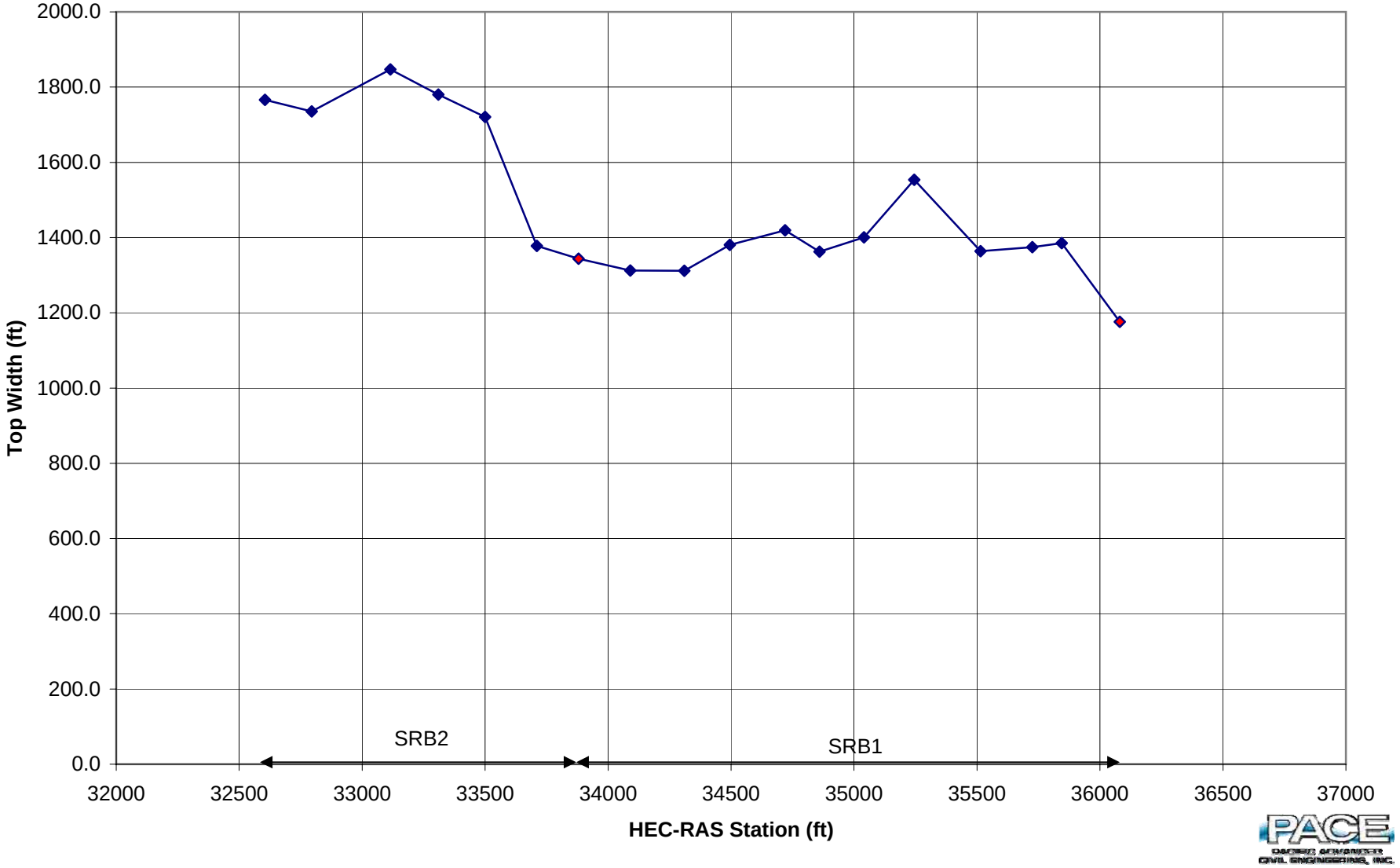


Table A4.5B3: Santa Clara River Proposed Conditions Hec-Ras Output and Parameter Correlation: Reach C

Subreach	River Sta	Q Total	Min Ch El ft	W.S. Elev ft	Crit W.S. ft	E.G. Elev ft	E.G. Slope	Vel Chnl fps	Flow Area sq ft	Top Width ft	Froude #	bedslope 1	bedslope 2	bedslope 3
SRC1	**32265**	140776	950.0	961.3	961.3	964.1	0.004	13.4	10505.6	1941.1	1.02	0.006	0.008	0.007
	31875	140776	949.0	959.4	959.4	961.8	0.006	12.4	11368.1	2409.1	1.00	0.003	0.004	0.005
	31585	140776	946.0	957.3	957.0	959.5	0.004	12.1	11630.6	2178.5	0.92	0.010	0.006	0.006
	31360	140776	944.0	956.6	955.4	958.6	0.003	11.5	12197.9	1866.2	0.80			
	31060	140776	942.0	956.6	953.3	957.9	0.001	9.0	15628.5	1701.3	0.52	0.007		
	30720	140776	940.0	956.6	951.3	957.4	0.001	7.3	19427.4	1882.3	0.40	0.006	0.006	
	30445	140776	938.0	956.5	949.6	957.2	0.000	6.8	20869.5	1771.8	0.35	0.007	0.007	0.007
	30095	140776	936.0	956.3	947.9	957.1	0.000	7.0	20255.2	1619.5	0.35	0.006	0.006	0.006
	29815	140776	935.0	955.9	948.1	956.9	0.001	7.9	17894.8	1430.1	0.39	0.004	0.005	0.006
	29565	140776	934.0	955.8	947.3	956.7	0.001	7.7	18197.7	1320.3	0.37	0.004	0.004	0.005
	29385	140776	933.0	955.5	949.4	956.6	0.001	8.6	16378.8	1233.0	0.42	0.006	0.005	0.004
SRC2	**29140**	140776	932.0	954.8	950.0	956.4	0.001	10.2	13831.1	1082.5	0.50	0.004	0.005	0.004
	28895	140776	930.0	951.3	951.3	955.7	0.004	16.8	8407.0	966.7	1.00	0.008	0.006	0.006
	28695	140776	928.0	948.3	945.7	951.0	0.002	13.3	10604.2	929.9	0.69	0.010	0.009	0.007
	28500	140776	927.5	946.0	946.0	950.3	0.005	16.7	8456.7	998.2	1.01	0.003	0.006	0.007
	28280	140776	926.0	943.4	939.9	945.6	0.001	11.9	11789.8	976.2	0.61	0.007	0.005	0.007
	28080	140776	925.0	943.4	938.2	945.2	0.001	10.9	12937.5	923.4	0.51	0.005	0.006	0.005
	27925	140776	924.0	942.6	938.7	945.0	0.001	12.4	11348.0	864.0	0.60	0.006	0.006	0.006
	27725	140776	923.0	939.3	939.3	944.3	0.004	18.0	7836.7	784.8	1.00	0.005	0.006	0.005
	27545	140776	922.0	937.6	937.6	943.3	0.004	19.1	7378.1	656.3	1.00	0.006	0.005	0.006
	27335	140776	921.0	936.2	936.2	940.9	0.004	17.4	8079.1	865.4	1.00	0.005	0.005	0.005
	27155	140776	920.5	935.3	935.3	939.9	0.004	17.2	8170.8	888.2	1.00	0.003	0.004	0.004
SRC3	**26990**	140776	920.0	933.7	933.7	938.1	0.005	16.7	8413.9	976.9	1.00	0.003	0.003	0.004
	26780	140776	918.0	931.3	931.3	935.4	0.005	16.3	8650.6	1062.3	1.00	0.010	0.007	0.005
	26575	140776	917.0	930.4	930.0	933.8	0.004	14.7	9560.9	1203.7	0.92	0.005	0.007	0.006
	26355	140776	916.0	929.1	929.1	932.8	0.005	15.4	9144.2	1256.8	1.01	0.005	0.005	0.006
	26170	140776	915.0	928.2	928.2	931.8	0.005	15.3	9212.4	1267.9	1.00	0.005	0.005	0.005
	25965	140776	914.0	927.3	927.2	930.8	0.005	15.2	9292.6	1281.8	0.99	0.005	0.005	0.005
	25785	140776	913.5	926.8	926.2	930.0	0.004	14.4	9809.4	1224.0	0.89	0.003	0.004	0.004
	25600	140776	912.5	925.8	925.2	929.3	0.004	15.0	9384.8	1112.9	0.91	0.005	0.004	0.004
	25425	140776	911.0	925.3	924.4	928.6	0.003	14.6	9667.5	1090.1	0.86	0.009	0.007	0.006
	25215	140776	910.0	924.7	923.7	927.9	0.003	14.2	9894.1	1097.3	0.84	0.005	0.006	0.006
	25000	140776	909.0	924.5	922.5	927.2	0.002	13.1	10725.5	1062.4	0.73	0.005	0.005	0.006
SRC4	**24795**	140776	908.0	923.6	921.8	926.6	0.002	14.0	10061.5	957.4	0.76	0.005	0.005	0.005
	24550	140776	906.0	922.5	920.9	926.0	0.003	15.0	9403.5	856.1	0.80	0.008	0.007	0.006
	24335	140776	905.0	920.0	920.0	925.1	0.004	18.1	7779.4	765.0	1.00	0.005	0.007	0.006
	24115	140776	904.0	918.7	918.7	923.8	0.004	18.2	7736.8	757.9	1.00	0.005	0.005	0.006
	23975	140776	903.5	917.7	917.7	922.7	0.004	18.0	7837.6	789.5	1.00	0.004	0.004	0.004
	23755	140776	902.0	916.8	916.8	921.7	0.004	17.8	7930.3	816.5	1.00	0.007	0.006	0.005
	23565	140776	900.0	915.6	915.6	920.3	0.004	17.4	8100.0	867.0	1.00	0.011	0.009	0.007
	23365	140776	900.0	914.4	914.4	918.9	0.004	16.9	8320.3	939.5	1.00	0.000	0.005	0.006
	23180	140776	899.0	913.2	912.6	917.2	0.004	16.0	8806.1	926.0	0.91	0.005	0.003	0.005
	23000	140776	898.0	912.8	911.1	916.5	0.003	15.3	9178.0	784.0	0.79	0.006	0.005	0.004
	22790	140776	897.5	910.5	910.5	915.5	0.005	18.0	7838.5	784.0	1.00	0.002	0.004	0.004
	22600	140776	896.0	909.6	909.6	913.9	0.005	16.6	8469.8	1007.6	1.01	0.008	0.005	0.005
	22415	140776	895.5	908.0	908.0	912.1	0.005	16.3	8630.1	1052.8	1.00	0.003	0.005	0.004

corr(x,v)=	-0.71507
corr(x,a)=	**0.711145**
corr(x,b)=	0.655976
corr(x,m1)=	0.131527
corr(x,m2)=	0.154975
corr(x,m3)=	0.224278

Figure A4.5B3: Santa Clara River Proposed Conditions HEC-RAS Reach C - Station vs Flow Area

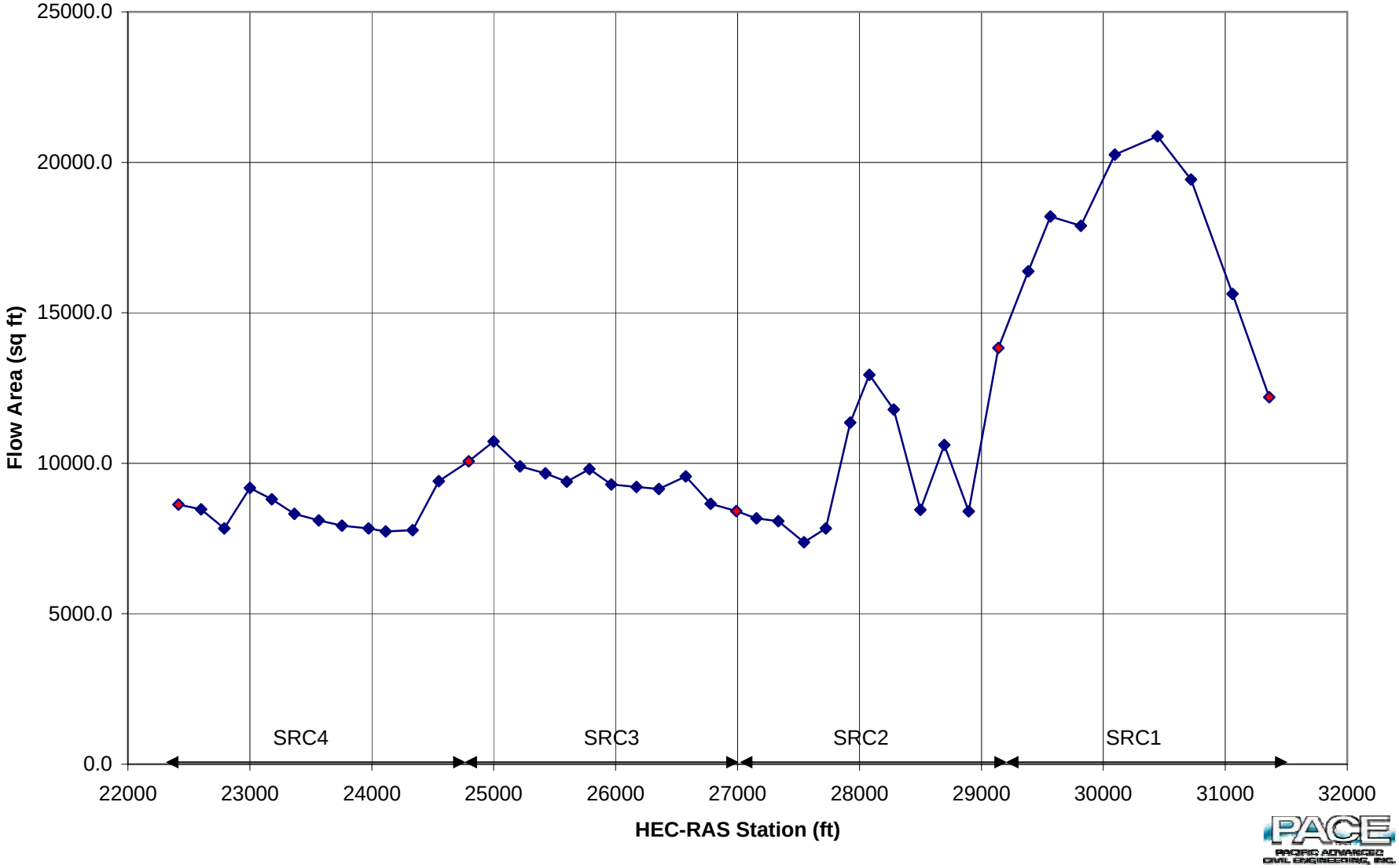


Table A4.5B4: Santa Clara River Proposed Conditions Hec-Ras Output and Parameter Correlation: Reach D

Subreach	River Sta	Q Total	Min Ch El ft	W.S. Elev ft	Crit W.S. ft	E.G. Elev ft	E.G. Slope	Vel Chnl fps	Flow Area sq ft	Top Width ft	Froude #	bedslope 1	bedslope 2	bedslope 3
SRD1	**22195**	141426	894.0	907.5	906.9	910.6	0.004	14.2	9951.4	1281.6	0.90			
	22010	141426	892.0	906.1	906.1	909.8	0.005	15.4	9195.9	1252.3	1.00	0.011		
	21790	141426	891.5	904.8	904.8	908.1	0.005	14.7	9642.9	1507.8	1.00	0.002	0.006	
	21615	141426	892.0	902.8	902.8	906.2	0.005	14.8	9557.4	1401.1	1.00	-0.003	0.000	0.003
	21440	141426	890.0	901.6	901.6	905.1	0.005	15.0	9424.5	1342.6	1.00	0.011	0.004	0.004
	21225	141426	888.0	900.5	900.5	903.7	0.005	14.3	9886.6	1563.9	1.00	0.009	0.010	0.006
	21020	141426	887.0	900.0	898.9	902.3	0.003	12.3	11464.6	1568.5	0.80	0.005	0.007	0.008
	20845	141426	886.0	898.4	898.4	901.6	0.005	14.3	9883.4	1561.0	1.00	0.006	0.005	0.007
	20595	141426	885.0	898.3	896.5	900.3	0.002	11.1	12704.0	1548.1	0.68	0.004	0.005	0.005
	20435	141426	884.0	898.1	895.8	899.9	0.002	10.8	13124.4	1524.8	0.65	0.006	0.005	0.005
	20280	141426	883.7	896.0	896.0	899.3	0.005	14.5	9735.6	1527.4	1.01	0.002	0.004	0.004
	20070	141426	882.0	894.3	894.3	897.5	0.005	14.4	9793.6	1537.7	1.01	0.008	0.005	0.006
SRD2	**19855**	141426	880.5	892.7	892.7	895.8	0.005	14.3	9916.9	1593.1	1.01	0.007	0.008	0.006
	19630	141426	880.0	891.5	890.5	894.7	0.003	14.4	9854.6	1098.6	0.84	0.002	0.005	0.006
	19440	141426	878.0	891.4	889.7	894.0	0.002	12.9	10950.1	1194.6	0.75	0.011	0.006	0.006
	19240	141426	877.5	889.4	889.4	893.2	0.005	15.6	9068.4	1219.4	1.01	0.003	0.006	0.005
	19050	141426	876.0	889.4	887.9	891.7	0.003	12.2	11580.6	1442.6	0.76	0.008	0.005	0.007
	18830	141426	874.0	888.8	887.5	891.1	0.003	12.1	11667.4	1538.2	0.78	0.009	0.009	0.007
	18650	141426	873.5	888.7	886.7	890.5	0.002	10.8	13119.6	1607.3	0.66	0.003	0.006	0.007
	18475	141426	872.0	888.9	885.0	890.1	0.001	8.8	16151.2	1621.7	0.49	0.009	0.006	0.007
	18290	141426	871.5	888.5	885.1	889.9	0.001	9.4	15041.5	1594.7	0.54	0.003	0.006	0.005
	18025	141426	870.0	888.6	882.9	889.5	0.001	7.8	18154.4	1520.5	0.40	0.006	0.004	0.006
	17785	141426	868.0	888.3	882.8	889.3	0.001	8.4	16871.0	1398.4	0.43	0.008	0.007	0.006
SRD3	**17510**	141426	868.0	887.5	883.4	889.0	0.001	10.1	14045.6	1353.6	0.55	0.000	0.004	0.004
	17360	141426	868.0	884.0	884.0	888.4	0.004	16.9	8365.0	944.5	1.00	0.000	0.000	0.003
	17110	141426	864.0	881.1	881.1	884.9	0.005	15.7	9039.2	1191.9	1.00	0.016	0.010	0.006
	16970	141426	863.7	879.6	879.6	883.4	0.005	15.7	8997.0	1180.2	1.00	0.002	0.011	0.008
	16720	141426	863.5	875.4	875.4	879.4	0.005	15.9	8873.6	1146.5	1.01	0.001	0.001	0.007
	16515	141426	862.0	873.9	873.9	877.5	0.005	15.4	9209.6	1260.0	1.00	0.007	0.004	0.003
	16305	141426	860.0	874.5	872.0	876.4	0.002	11.1	12765.9	1360.4	0.64	0.010	0.008	0.006
	16130	141426	860.0	872.2	872.2	875.8	0.005	15.2	9332.9	1326.0	1.01	0.000	0.005	0.006
	15960	141426	859.0	871.6	871.0	874.5	0.004	13.7	10347.3	1395.6	0.88	0.006	0.003	0.005
	15745	141426	858.0	871.3	869.8	873.7	0.003	12.3	11500.9	1363.9	0.75	0.005	0.005	0.004
	15540	141426	857.5	871.2	868.5	873.0	0.002	10.5	13415.3	1427.0	0.61	0.002	0.004	0.004
	15335	141426	856.0	868.1	868.1	872.2	0.006	16.2	8723.3	1064.1	1.00	0.007	0.005	0.005

corr(x,v)=	0.100396
corr(x,a)=	-0.14163
corr(x,b)=	**0.358193**
corr(x,m1)=	0.081919
corr(x,m2)=	0.060966
corr(x,m3)=	0.113964

Figure A4.5B4: Santa Clara River Proposed Conditions HEC-RAS Reach D - Station vs Top Width

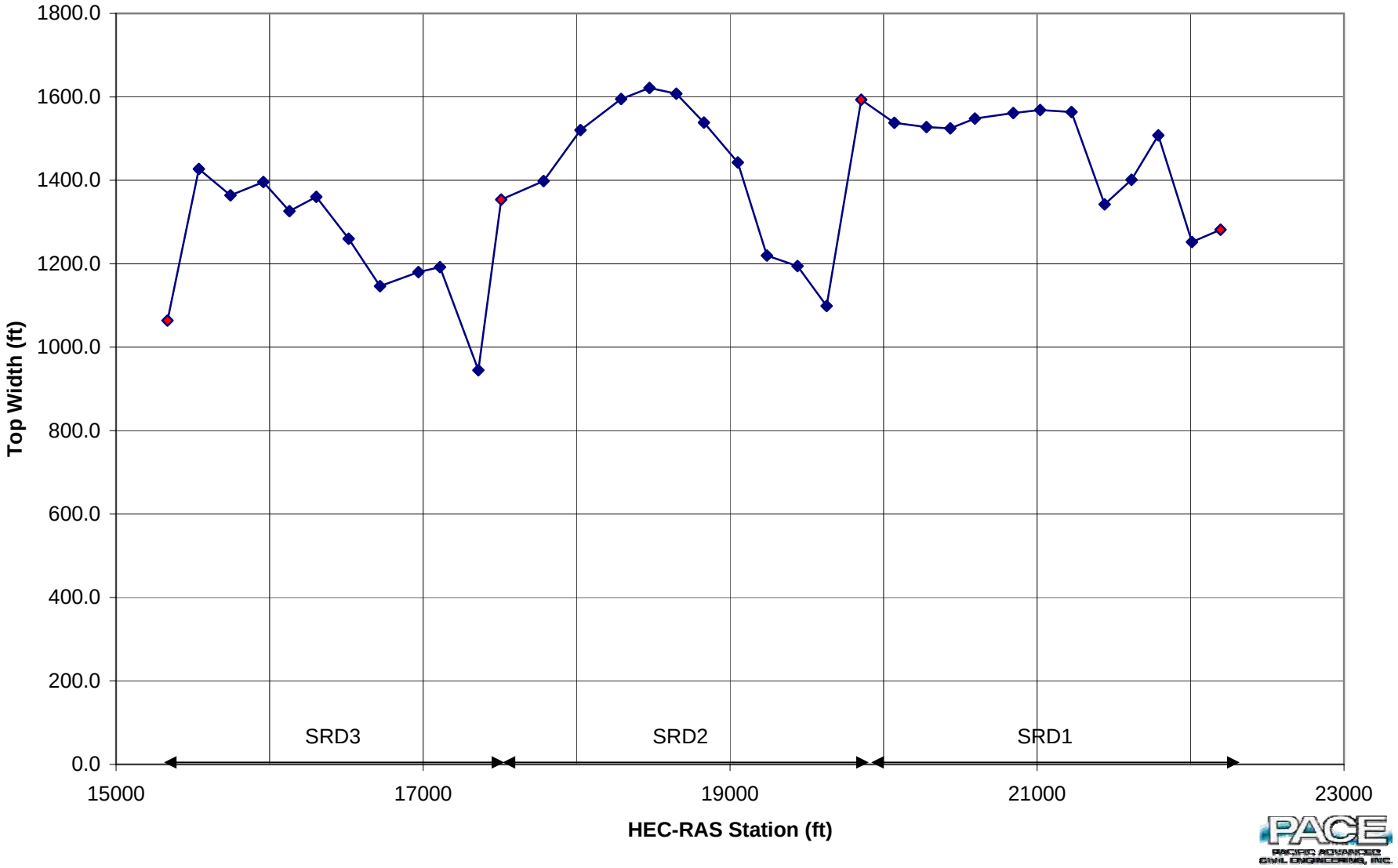
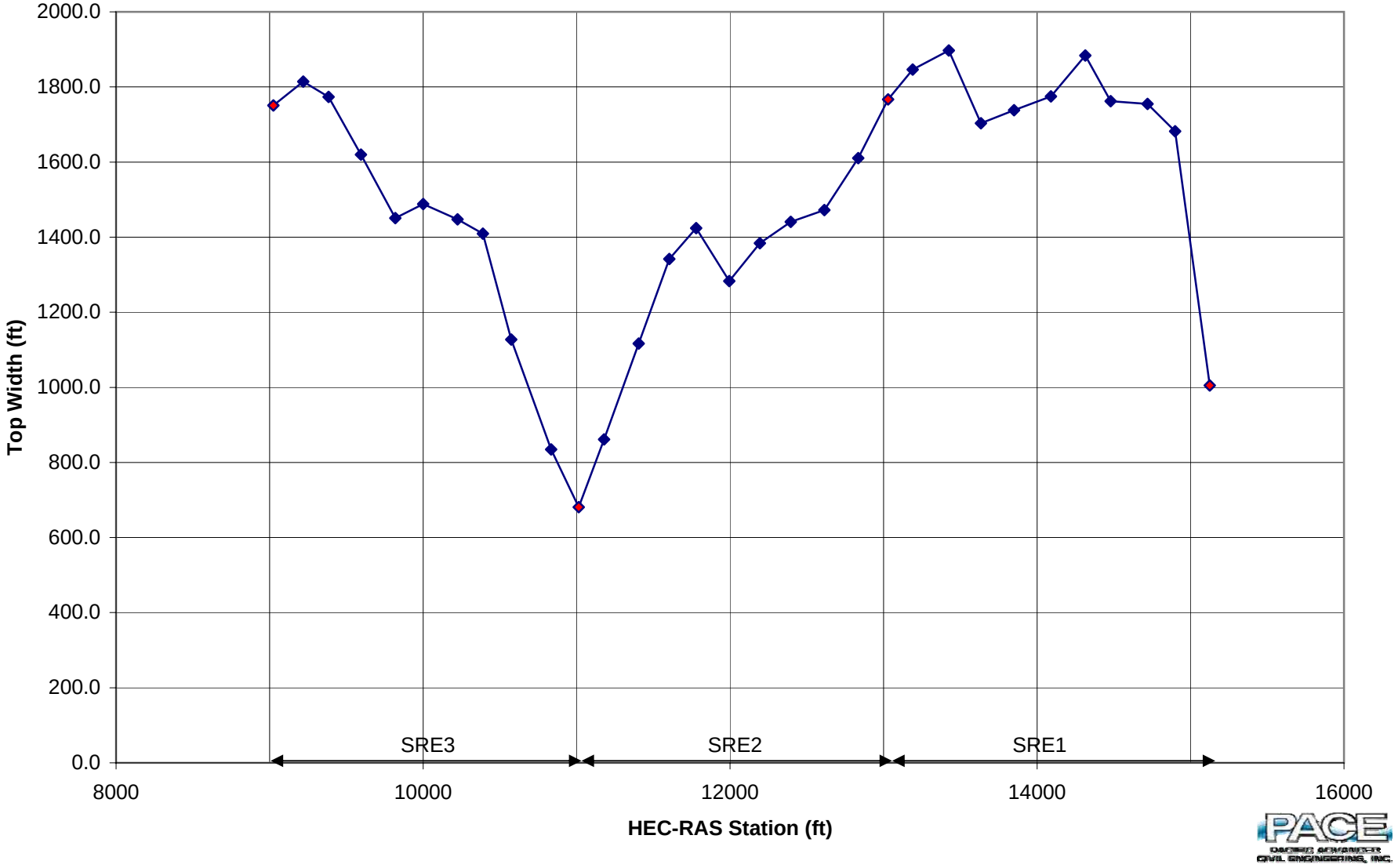


Table A4.5B5: Santa Clara River Proposed Conditions Hec-Ras Output and Parameter Correlation: Reach E

Subreach	River Sta	Q Total	Min Ch El ft	W.S. Elev ft	Crit W.S. ft	E.G. Elev ft	E.G. Slope	Vel Chnl fps	Flow Area sq ft	Top Width ft	Froude #	bedslope 1	bedslope 2	bedslope 3
SRE1	**15125**	142475	854.0	866.3	866.3	870.5	0.006	16.6	8594.5	1005.2	1.00			
	14900	142475	853.0	864.2	864.2	868.3	0.005	16.3	8744.6	1682.0	1.00	0.004		
	14720	142475	852.0	863.3	863.3	867.2	0.005	15.9	8988.3	1754.8	1.00	0.006	0.005	
	14480	142475	850.5	860.8	860.8	864.0	0.005	14.5	9824.9	1761.9	0.99	0.006	0.006	0.005
	14315	142475	850.0	860.1	860.1	863.2	0.005	14.0	10171.0	1883.6	1.00	0.003	0.005	0.005
	14090	142475	850.0	858.7	858.7	861.6	0.005	13.7	10369.2	1774.7	1.00	0.000	0.001	0.003
	13850	142475	848.0	857.1	857.1	860.1	0.005	13.9	10284.5	1738.4	1.00	0.008	0.004	0.004
	13635	142475	846.0	856.0	856.0	859.0	0.005	14.0	10211.8	1703.1	1.00	0.009	0.009	0.006
	13425	142475	845.0	854.2	854.2	857.1	0.005	13.5	10578.2	1897.2	1.01	0.005	0.007	0.008
	13190	142475	844.0	853.3	852.7	855.7	0.004	12.3	11549.9	1846.1	0.87	0.004	0.004	0.006
SRE2	**13030**	142475	843.0	852.9	852.0	855.1	0.003	12.0	11909.3	1766.8	0.81	0.006	0.005	0.005
	12835	142475	842.0	852.3	851.0	854.5	0.003	11.8	12100.7	1610.1	0.76	0.005	0.006	0.005
	12615	142475	841.0	852.0	849.8	853.9	0.002	11.0	12926.1	1472.3	0.66	0.005	0.005	0.005
	12395	142475	840.0	851.7	849.2	853.5	0.002	10.9	13135.4	1440.7	0.63	0.005	0.005	0.005
	12195	142475	839.0	851.6	848.1	853.1	0.001	10.0	14313.4	1384.2	0.55	0.005	0.005	0.005
	11995	142475	837.0	850.9	848.0	852.8	0.002	11.1	12823.3	1283.1	0.62	0.010	0.008	0.006
	11780	142475	836.0	850.7	847.7	852.4	0.002	10.4	13642.5	1424.2	0.59	0.005	0.007	0.007
	11605	142475	835.5	850.0	847.3	852.1	0.002	11.6	12285.5	1341.9	0.68	0.003	0.004	0.006
	11405	142475	834.0	849.4	846.2	851.7	0.002	12.1	11766.0	1116.4	0.66	0.008	0.005	0.005
	11180	142475	833.0	847.5	845.6	851.1	0.002	15.2	9359.0	861.1	0.81	0.004	0.006	0.005
SRE3	**11015**	142475	831.5	844.9	844.9	850.4	0.004	18.9	7546.8	680.7	1.00	0.009	0.006	0.007
	10835	142475	831.0	843.8	843.8	848.6	0.004	17.7	8059.5	834.5	1.00	0.003	0.006	0.005
	10575	142475	830.0	840.2	840.2	844.1	0.004	16.0	8907.8	1127.5	1.00	0.004	0.003	0.005
	10390	142475	828.0	839.8	838.5	842.3	0.003	12.7	11218.3	1409.0	0.79	0.011	0.007	0.006
	10225	142475	827.5	838.2	838.2	841.6	0.005	14.7	9676.6	1447.2	1.00	0.003	0.007	0.006
	10000	142475	826.0	837.1	837.1	840.4	0.004	14.6	9788.3	1488.1	1.00	0.007	0.005	0.007
	9820	142475	824.0	835.4	835.4	838.8	0.004	14.9	9537.7	1450.9	1.00	0.011	0.009	0.007
	9595	142475	823.8	834.2	834.2	837.4	0.005	14.5	9808.5	1620.1	1.00	0.001	0.005	0.006
	9385	142475	823.0	833.1	833.1	836.0	0.005	13.8	10337.7	1773.6	1.01	0.004	0.002	0.005
	9220	142475	822.0	831.8	831.8	834.7	0.005	13.7	10430.0	1814.1	1.00	0.006	0.005	0.003
	9025	142475	821.0	830.4	830.4	833.4	0.004	13.8	10307.8	1751.0	1.00	0.005	0.006	0.005

corr(x,v)=	-0.0153
corr(x,a)=	0.022217
corr(x,b)=	**0.248521**
corr(x,m1)=	-0.07691
corr(x,m2)=	-0.08554
corr(x,m3)=	-0.10549

Figure A4.5B5: Santa Clara River Proposed Conditions HEC-RAS Reach E - Station vs Top Width



Santa Clara River Fluvial Study

APPENDIX CHAPTER 4.6

Existing & Proposed Conditions SAM.AID Transport Equation Summary

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Table A4.6A: Santa Clara River Existing Conditions SAM Transport Potential Summary												
Subreach	US Sta	DS Sta	Width (ft)	Yang	Ackers-White	MPM	Brownlie, d50	Laursen-Copeland	Laursen-Madden	Yang, d50	Ackers-White, d50	MPM, d50
SRA1	46195	44210	525.6	11,578,207		403,938	10,213,413		10,288,930		2,616,358	428,254
SRA2	43820	41460	977.0	7,019,537		330,678	5,396,854		7,428,092		1,828,759	
SRA3	41280	38925	1,242.2	8,423,927		401,167	5,999,501		8,661,182		2,114,228	
SRA4	38710	36265	952.0	7,472,957		343,735	5,760,137		7,762,680		1,917,288	
SRB1	36080	34090	1,389.0	10,501,440		483,359	7,166,304		10,291,797		2,506,537	
SRB2	33880	32605	1,650.3	9,981,533		488,063	6,529,088		10,032,043		2,427,273	
SRC1	32265	29385	1,965.8	549,651		101,035		3,776,574		445,251		
SRC2	29140	27155	780.8	6,114,881	103,813,640	470,866	5,607,809	59,236,428		3,144,927		
SRC3	26990	25000	1,492.1	6,112,071	72,451,720	558,797	4,709,391	56,391,164		3,062,371		
SRC4	24795	22415	2,008.5	4,354,715	38,238,164	468,697	3,139,686	37,428,088		2,332,338		
SRD1	22195	20070	2,009.0	6,555,626	68,813,664	675,434	4,673,919	60,892,464		3,226,039		
SRD2	19855	17785	1,936.3	1,702,374		241,344		12,902,746		1,141,649		
SRD3	17510	15335	1,812.5	6,123,644	66,058,544	623,943	4,496,810	56,559,088		3,077,924		
SRE1	15125	13190	1,878.9	9,343,788		796,646	6,294,619		9,559,064		1,623,079	
SRE2	13030	11180	1,372.4	2,942,931		307,423	2,244,769	23,642,152	3,819,590	1,718,088	681,086	
SRE3	11015	9025	1,390.6	7,526,579		624,904	5,541,755		7,915,211		1,347,439	

Table A4.6B: Santa Clara River Proposed Conditions SAM Transport Potential Summary												
Subreach	US Sta	DS Sta	Width (ft)	Yang	Ackers-White	MPM	Brownlie, d50	Laursen-Copeland	Laursen-Madden	Yang, d50	Ackers-White, d50	MPM, d50
SRA1	46195	44210	525.6	11,578,207		403,938	10,213,413		10,288,930		2,616,358	428,254
SRA2	43820	41460	958.6	7,946,985		359,566	6,086,816		8,125,280		2,006,747	
SRA3	41280	38925	1,022.2	8,573,228		385,857	6,421,179		8,636,340		2,127,909	
SRA4	38710	36265	797.6	8,853,698		370,217	7,072,628		8,670,224		2,163,247	
SRB1	36080	34090	1,376.0	12,125,351		534,683	8,220,035		11,438,973		2,793,897	
SRB2	33880	32605	1,709.1	10,043,264		494,553	6,502,022		10,096,604		2,439,216	
SRC1	32265	29385	1,859.8	949,043		147,697		6,770,803		699,695		
SRC2	29140	27155	899.2	4,534,666		389,467		41,054,972		2,493,064		
SRC3	26990	25000	1,159.3	7,868,941	119,958,744	633,550	6,462,984	77,554,248		3,741,335		
SRC4	24795	22415	860.1	8,184,735		603,656		83,418,544		3,895,934		
SRD1	22195	20070	1,511.4	7,052,652	89,557,384	661,922	5,428,181	67,565,112		3,449,140		
SRD2	19855	17785	1,431.8	2,755,468		319,200		22,530,518		1,691,165		
SRD3	17510	15335	1,274.3	6,885,280	95,199,624	620,768	5,553,703	66,390,272		3,411,958		
SRE1	15125	13190	1,588.9	8,848,421	138,177,216	731,941	6,244,320	84,638,576		3,866,203		
SRE2	13030	11180	1,375.5	2,726,007		291,031		21,732,192		1,620,062		
SRE3	11015	9025	1,399.4	7,687,321	121,551,024	635,705	5,646,198	72,173,344		3,516,310		

Santa Clara River Fluvial Study

APPENDIX CHAPTER 5.1

Historical Topographic Maps

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Figure B1 – Mesa Area 1929-1931 USGS Surveys, 1940 Editions of Castaic and Saugus 6' Quads

Figure B2 – Mesas Area – 1947 USGS Survey, 1969 Edition of Val Verde and Newhall 7.5 Quads

Figure B3 – 11/63 and 1/64 Horizon Survey from 8/15/90, Mapsheets by Sikand

Figure B4 – Digital Topography by Psomas Engineering, from Data Generated @1999

Figure B5 – Digital Topography by McElhanney, from Data Generated @2004

Figure B6 – Digital Topography by McElhanney, from Data Generated @2005

Santa Clara River Fluvial Study

APPENDIX CHAPTER 5.2

Historical Thalweg Analysis

Previous drafts of this report calculated long-term trends based on an analysis of historic thalweg data. Analysis of long-term data based on cross-sections has been found to more clearly portray the historic trends of the creek bed. The historic analysis is included here for completeness.

The thalwegs and an additional alignment were digitized from the historic topography shown in Chapter 5, and these alignments were overlain in every digitized data set. That is, the 1930 thalweg was overlain in the 1930, 1947, 1963, 1999, 2004 and 2005 topographies. This was repeated for the other thalwegs as well. Thalwegs were chosen because they served as a reference and generally represent the lowest portion of the riverbed cross-section for a given year. The additional alignment was positioned so that an even distribution of alignments was achieved over the width of the channel for the study reach. The alignments are shown in Figure A5.3.1. The bed elevations along all alignments for all years were determined and compared, and a historic mean bed elevation was determined. Calculations of the minimum and mean bed elevation for all stations for all years examined is presented in Table A5.3.1. The historic bed elevation data, as well as historic mean bed elevation, is presented in Figure 5.2A-B. The figure illustrates variation in bed elevations throughout the period of record.

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Table A5.2 Santa Clara River Thalweg Analysis Caluclation of Long Term Aggradation/Degradation Based on Historical Bed Analysis (ft)

Subreach	HEC-RAS Station	1930		1947		1963		1999		2004		2005		[1]MINIMUM OF ALL MINIMUMS	[1]MEAN OF ALL MEANS	99 MEAN-ALL MEAN
		Topo Mean	Topo Min	Topo Mean	Topo Min	Topo Mean	Topo Min	Topo Mean	Topo Min	Topo Mean	Topo Min	Topo Mean	Topo Min			
	48025	1053.7	1053.5					1050.5	1049.1					**1049.1**	**1050.5**	**0.0**
	47850	1052.1	1051.8					1048.7	1046.0					**1046.0**	**1048.7**	**0.0**
	47670	1051.1	1050.3					1048.8	1044.4					**1044.4**	**1048.8**	**0.0**
	47510	1049.1	1049.1					1045.7	1044.0					**1044.0**	**1045.7**	**0.0**
	47440	1048.5	1048.5					1045.4	1044.0					**1044.0**	**1045.4**	**0.0**
	47180	1046.6	1045.9			1049.9	1049.6	1046.5	1042.0					**1042.0**	**1048.2**	**-1.7**
	47015	1046.9	1045.0			1048.9	1047.7	1046.7	1040.4					**1040.4**	**1047.8**	**-1.1**
	46890	1049.2	1043.5			1047.3	1046.5	1045.6	1040.0					**1040.0**	**1046.4**	**-0.8**
	46800	1047.0	1042.1			1046.3	1045.5	1042.0	1038.5					**1038.5**	**1044.1**	**-2.1**
	46760	1045.2	1041.5			1045.8	1045.1	1041.6	1039.4					**1039.4**	**1043.7**	**-2.1**
	46695	1043.7	1040.9			1045.3	1044.7	1040.9	1038.7					**1038.7**	**1043.1**	**-2.2**
	46550	1040.8	1038.9			1043.6	1043.3	1038.2	1037.1					**1037.1**	**1040.9**	**-2.7**
	46370	1042.8	1034.8			1043.1	1042.0	1036.9	1036.2	1039.6	1039.5			**1036.2**	**1039.9**	**-2.9**
SRA1	46195	1041.5	1032.2			1042.4	1041.6	1036.3	1034.6	1037.4	1032.3			**1032.3**	**1038.7**	**-2.4**
	46020	1029.4	1023.3			1040.1	1040.0	1032.9	1032.0	1031.7	1029.9	1034.6	1033.8	**1029.9**	**1034.8**	**-1.9**
	45545	1031.9	1017.5			1045.0	1040.0	1032.4	1030.0	1034.1	1027.6	1033.9	1030.7	**1027.6**	**1036.4**	**-3.9**
	45030	1038.7	1015.0			1034.0	1030.2	1028.8	1026.0	1028.6	1025.8	1027.2	1026.5	**1025.8**	**1029.7**	**-0.8**
	44585	1043.6	1015.0			1039.6	1030.0	1038.1	1022.0	1033.9	1019.2	1031.4	1023.0	**1019.2**	**1035.8**	**2.4**
	44210	1037.5	1015.0			1033.7	1026.7	1029.3	1020.0	1028.7	1017.3	1026.9	1020.9	**1017.3**	**1029.7**	**-0.3**
SRA2	43820	1017.8	1010.2			1023.0	1020.0	1018.4	1018.0	1017.2	1015.9	1017.5	1016.5	**1015.9**	**1019.0**	**-0.6**
	43610	1014.8	1010.0			1021.9	1020.0	1019.5	1016.7	1016.4	1014.4	1017.7	1016.1	**1014.4**	**1018.9**	**0.6**
	43410	1014.4	1010.0	1019.9	1019.9	1023.2	1020.0	1019.2	1015.7	1017.8	1013.5	1020.8	1014.8	**1013.5**	**1020.2**	**-1.0**
	43200	1018.2	1010.0	1023.3	1018.1	1025.2	1020.0	1021.4	1014.0	1020.2	1012.3	1024.4	1013.5	**1012.3**	**1022.9**	**-1.5**
	42975	1021.4	1010.0	1025.3	1016.9	1025.6	1020.0	1018.9	1012.0	1022.1	1011.0	1023.3	1013.0	**1011.0**	**1023.0**	**-4.1**
	42815	1019.9	1009.0	1026.8	1015.0	1024.7	1020.0	1017.5	1012.0	1021.4	1009.5	1024.2	1011.7	**1009.5**	**1022.9**	**-5.4**
	42590	1015.0	1006.5	1024.9	1015.0	1023.0	1017.9	1013.8	1010.0	1016.2	1008.8	1023.2	1009.3	**1008.8**	**1020.3**	**-6.4**
	42430	1012.5	1005.0	1023.1	1013.6	1020.1	1013.9	1012.3	1010.0	1012.9	1007.4	1013.3	1008.5	**1007.4**	**1016.3**	**-4.1**
	42215	1014.0	1005.0	1022.2	1012.1	1017.1	1010.0	1011.8	1008.0	1010.4	1006.6	1011.3	1007.5	**1006.6**	**1014.6**	**-2.7**
	41940	1008.8	1005.0	1020.0	1009.5	1013.5	1010.0	1010.4	1006.0	1006.2	1005.1	1008.6	1006.0	**1005.1**	**1011.7**	**-1.3**
	41730	1008.8	1002.6	1013.0	1008.0	1012.2	1010.0	1009.0	1004.0	1007.8	1003.5	1006.6	1003.5	**1003.5**	**1009.7**	**-0.7**
	41460	1010.1	999.5	1009.8	1006.7	1011.0	1009.7	1007.5	1002.0	1005.5	1000.9	1004.2	1002.5	**1000.9**	**1007.6**	**-0.1**
SRA3	41280	1010.0	998.2	1006.5	1004.0	1008.5	1006.7	1007.5	1002.0	1002.6	1000.4	1002.3	1000.6	**1000.4**	**1005.5**	**2.0**
	41080	1009.5	996.8	1004.1	1002.3	1004.6	1003.2	1003.7	1001.3	1000.5	999.1	999.8	998.8	**998.8**	**1002.5**	**1.1**
	40825	1005.0	995.0	1005.9	1000.0	1004.4	1000.0	1003.0	1000.0	1000.7	996.0	998.9	997.4	**996.0**	**1002.6**	**0.4**
	40585	1002.7	995.0	1003.3	1000.0	1003.5	1000.0	1003.3	998.0	999.7	995.5	996.9	995.6	**995.5**	**1001.3**	**2.0**
	40335	1005.4	995.0	1000.0	995.1	1002.3	1000.0	1001.2	996.0	997.4	992.7	994.8	994.2	**992.7**	**999.1**	**2.0**
	40130	1006.5	993.7	1001.2	992.5	1002.8	1000.0	999.8	996.0	997.0	992.1	994.0	993.2	**992.1**	**999.0**	**0.8**
	39945	1003.5	990.0	1000.0	991.3	1002.5	999.9	997.3	994.0	995.6	991.0	993.5	991.7	**991.0**	**997.8**	**-0.5**
	39755	999.2	990.0	993.5	988.6	1000.2	997.3	996.2	994.0	994.3	990.1	993.3	990.9	**988.6**	**995.5**	**0.7**
	39605	995.8	989.9	990.9	987.7	997.9	995.6	996.9	994.0	994.7	989.4	991.7	989.4	**987.7**	**994.4**	**2.5**
	39310	993.5	985.0	987.9	985.9	991.5	990.0	995.6	992.0	992.6	988.1	990.6	987.6	**985.9**	**991.6**	**3.9**
	39100	992.9	985.0	986.7	982.9	992.0	990.0	993.0	990.0	991.0	987.4	988.7	985.5	**982.9**	**990.3**	**2.8**
	38925	991.3	983.3	986.8	980.8	992.0	990.0	993.0	990.0	990.6	987.4	987.6	984.8	**980.8**	**990.0**	**3.0**
SRA4	38710	990.0	980.3	983.7	980.0	990.6	990.0	991.3	988.0	988.7	985.5	986.0	984.5	**980.0**	**988.1**	**3.3**
	38475	988.8	980.0	983.0	980.0	991.0	990.0	989.7	986.3	988.2	984.0	984.1	982.5	**980.0**	**987.2**	**2.5**
	38300	988.0	979.2	982.1	979.8	990.4	990.0	988.2	986.0	987.6	983.1	982.8	982.0	**979.8**	**986.2**	**2.0**
	38065	987.8	977.5	979.6	978.1	990.0	990.0	984.3	984.0	983.7	982.0	981.6	980.8	**978.1**	**983.8**	**0.5**
	37810	986.3	975.5	979.8	976.4	985.6	984.8	984.1	983.2	983.8	980.3	981.0	979.5	**976.4**	**982.9**	**1.2**
	37655	984.7	975.0	978.9	975.7	984.0	982.3	983.5	982.0	982.7	979.7	980.8	978.7	**975.7**	**982.0**	**1.5**
	37390	983.0	975.0	978.6	975.0	981.6	980.0	982.1	981.1	981.7	978.1	978.4	976.6	**975.0**	**980.5**	**1.6**
	37135	982.3	975.0	979.4	975.0	981.3	980.0	980.4	979.5	979.9	975.8	979.1	975.9	**975.0**	**980.0**	**0.4**
	36930	981.3	974.5	979.6	975.0	981.3	980.0	978.7	978.0	978.3	975.4	977.4	975.0	**975.0**	**979.1**	**-0.4**
	36735	980.8	973.1	977.3	974.9	980.6	980.0	977.7	976.3	977.4	974.6	976.0	973.7	**973.7**	**977.8**	**-0.1**
	36515	979.2	972.5	975.2	973.3	980.1	980.0	976.9	976.0	976.4	973.0	975.4	972.8	**972.8**	**976.8**	**0.1**
	36265	977.4	971.2	973.2	971.4	980.2	980.0	976.1	974.0	975.5	972.7	974.5	972.0	**971.4**	**975.9**	**0.2**
SRB1	36080	973.9	969.8	972.1	970.0	980.3	980.0	976.9	973.2	974.1	971.8	972.1	970.2	**970.0**	**975.1**	**1.8**
	35845	971.7	968.9	971.0	970.0	979.0	977.6	977.9	972.0	972.9	970.3	970.1	968.7	**968.7**	**974.2**	**3.7**
	35725	970.4	968.5	970.3	970.0	978.0	977.0	978.3	970.0	972.0	969.6	969.4	968.7	**968.7**	**973.6**	**4.7**
	35515	969.3	967.7	970.4	970.0	976.0	975.6	976.8	970.0	972.1	969.3	968.8	968.2	**968.2**	**972.8**	**4.0**
	35245	968.7	966.5	969.9	967.8	973.6	972.7	974.6	968.0	971.8	968.4	968.6	966.4	**966.4**	**971.7**	**2.9**
	35040	968.2	965.8	968.7	966.4	972.4	971.2	973.4	968.0	971.2	966.1	967.6	965.9	**965.9**	**970.7**	**2.8**
	34860	967.5	965.0	967.5	965.0	971.5	970.0	972.6	966.0	969.7	965.1	966.6	965.3	**965.0**	**969.6**	**3.1**
	34720	966.7	965.0	966.8	964.9	970.6	970.0	971.0	966.0	968.8	964.8	965.2	964.0	**964.0**	**968.5**	**2.5**
	34495	966.8	965.0	965.4	963.5	970.0	970.0	967.9	964.0	967.2	963.7	964.4	962.0	**962.0**	**967.0**	**0.9**
	34310	967.0	963.8	964.4	962.5	968.7	967.9	966.4	963.2	965.4	962.4	963.9	960.7	**960.7**	**965.8**	**0.7**
	34090	965.9	962.0	963.1	961.6	967.3	965.2	965.9	962.0	963.7	960.8	961.6	959.3	**959.3**	**964.3**	**1.6**
SRB2	33880	964.7	961.3	962.7	960.1	965.2	962.3	964.6	960.0	961.6	958.9	960.6	958.1	**958.1**	**962.9**	**1.6**
	33710	963.1	960.0	962.5	960.0	963.4	960.0	963.9	960.0	960.1	957.8	959.2	957.6	**957.6**	**961.8**	**2.1**
	33500	962.5	960.0	962.3	960.3	961.2	960.0	961.4	958.0	959.3	957.7	957.7	956.1	**956.1**	**960.4**	**1.0**
	33310	961.5	960.0	960.9	959.0	959.9	959.4	961.1	956.2	959.7	955.3	957.2	954.9	**954.9**	**959.8**	**1.3**
	33115	960.8	960.0	960.5	957.3	959.8	957.3	961.0	956.0	958.1	954.8	957.0	954.1	**954.1**	**959.3**	**1.7**
	32795	961.4	958.8	960.5	956.8	959.0	954.8	958.2	954.0	955.5	947.7	955.2	951.9	**947.7**	**957.7**	**0.5**
	32605	960.4	957.8	958.7	955.0	957.6	952.9	956.7	952.5	954.6	950.9	954.1	950.6	**950.6**	**956.3**	**0.4**
SRC1	32265	957.7	956.3	952.4	951.8	954.3	950.0	954.8	951.4	953.1	949.6	951.2	949.1	**949.1**	**953.2**	**1.6**
	31875	960.1	955.0	951.3	948.2	950.0	950.0	952.8	949.5	949.4	944.0	950.1	944.0	**944.0**	**950.7**	**2.1**
	31585	960.7	952.8	950.2	945.0	950.0	950.0	948.4	946.0	947.0	943.9	945.8	943.4	**943.4**	**948.3**	**0.1**
	31360	959.1	951.1	946.8	945.0	949.3	948.5	948.0	945.1	946.0	943.3	945.5	942.5	**942.5**	**947.1**	**0.9**
	31060	955.9	950.0	947.3	945.0	948.2	945.9	944.8	944.0	942.2	939.1	942.3	939.8	**939.1**	**945.0**	**-0.2**
	30720	950.7	945.0	946.8	942.2	946.1	942.7	943.0	940.0	939.8	936.2	940.9	938.7	**936.2**	**943.3**	**-0.4**
	30445	946.7	942.0	945.2	940.0	945.9	940.4	941.0	938.0	938.2	935.1	939.5	937.4	**935.1**	**942.0**	**-0.9**
	30095	946.1	944.1	940.4	937.3	943.6	940.0	939.1	936.8	935.8	933.4	935.0	931.6	**931.6**	**938.8**	**0.3**
	29815	942.0	936.7	939.3	935.9	940.5	940.0	937.0	936.0	933.8	931.0	933.6	933.0	**931.0**	**936.8**	**0.2**
	29565	938.9	934.3	939.1	933.9	940.0	940.0	935.1	934.0	933.2	930.0	931.9	930.5	**930.0**	**935.9**	**-0.8**
	29385	937.3	931.1	936.8	932.7	941.2	940.0	933.8	932.7	932.3	929.6	931.5	930.1	**929.6**	**935.1**	**-1.3**
SRC2	29140	936.9	930.4	933.4	931.2	940.0	940.0	933.5	932.0	929.0	926.8	928.9	927.6	**926.8**	**933.0**	**0.5**
	28895	925.0	924.4	930.4	930.0	937.9	937.6	931.6	930.0	927.7	926.1	928.4	926.9	**926.1**	**931.2**	**0.4**
	28695	923.9	923.7	930.4	929.5	934.5	932.7	932.1	928.0	929.8	925.0	930.4	925.7	**925.0**	**931.4**	**0.7**
	28500	922.9	922.5	928.6	927.0	932.3	930.3	929.9	928.0	926.2	924.0	928.0	924.6	**924.0**	**929.0**	**1.0**
	28280	922.0	921.6	926.7	925.0	931.7	930.0	929.9	926.0	927.2	922.7	926.1	923.2	**922.7**	**928.3**	**1.6**
	28080	921.6	920.5	927.0	925.0	931.0	930.0	928.5	926.0	926.2	921.8	925.0	923.2	**921.8**	**927.5**	**0.9**
	27925	920.0	920.0	925.5	925.0	930.2	930.0	927.1	924.7	924.2	921.9	923.4	922.1	**921.9**	**926.1**	**1.0**
	27725	919.5	919.4	924.2	923.8	928.6	928.3	924.0	924.0	920.8	920.4	921.9	920.5	**920.4**	**923.9**	**0.1**
	27545	919.3	919.1	923.1	922.8	927.9	927.3	923.2	922.5	920.0	919.3	920.6	919.4	**919.3**	**923.0**	**0.3**
	27335	919.0	918.6	922.0	921.4	926.6	925.9	922.0	922.0	919.6	918.7	920.0	918.3	**918.3**	**922.0**	**0.0**
	27155	918.8	918.3	921.0	920.3	925.7	924.3	921.2	920.5	919.5	918.0	919.1	918.0	**918.0**	**921.3**	**-0.1**
SRC3	26990	918.4	917.7	920.2	919.4	924.1	922.9	920.6	920.0	919.4	917.9	917.2	916.2	**916.2**	**920.3**	**0.3**
	26780	918.0	917.2	919.6	918.5	922.7	921.2	919.4	918.0	917.6	916.8	916.3	914.3	**914.3**	**919.1**	**0.2**
	26575	917.5	916.8	919.2	917.6	921.4	920.0	918.3	918.0	916.5	915.5	915.6	913.7	**913.7**	**918.2**	**0.1**
	26355	917.0	916.2	919.0	916.9	921.0	920.0	917.9	916.0	916.1	914.6	914.9	913.4	**913.4**	**917.8**	**0.2**
	26170	916.9	915.7	919.1	915.9	921.0	919.8	916.6	916.0	914.3	912.5	914.2	912.9	**912.5**	**917.0**	**-0.5**
	25965	917.1	915.3	918.3	915.0	919.2	918.1	916.4	914.1	915.1	912.3	913.8	911.6	**911.6**	**916.6**	**-0.2**
	25785	917.2	914.5	917.4	913.9	917.5	916.5	915.7	914.0	914.0	911.5	912.3	911.1	**911.1**	**915.4**	**0.3**
	25600	917.2	914.1	916.7	912.9	916.1	915.0	915.2	912.1	913.5	910.8	911.7	909.7	**909.7**	**914.6**	**0.6**
	25425	917.1	914.2	915.7	912.2	914.7	913.7	915.0	912.0	912.8	909.7	911.3	910.0	**909.7**	**913.9**	**1.1**
	25215	916.4	912.9	914.7	910.9	913.1	911.9	914.7	910.0	911.6	908.8	910.6	908.6	**908.6**	**912.9**	**1.8**
	25000	915.1	910.7	912.7	910.0	912.1	910.4	911.8	908.1	910.3	908.1	909.5	907.8	**907.8**	**911.3**	**0.5**
SRC4	24795	911.2	907.7	910.6	910.0	910.6	910.0	910.0	908.0	909.0	906.3	907.5	905.6	**905.6**	**909.5**	**0.5**
	24550	905.6	905.0	908.9	908.4	909.7	909.1	907.1	906.0	905.4	904.1	905.0	904.0	**904.0**	**907.2**	**-0.1**
	24335	904.6	902.2	908.7	906.3	908.3	907.9	906.5	906.0	904.7	903.5	904.2	903.2	**903.2**	**906.5**	**0.0**
	24115	904.2	899.1	905.7	904.7	907.0	906.7	905.1	904.0	903.2	902.6	902.8	901.8	**901.8**	**904.7**	**0.4**
	23975	903.8	897.5	904.8	904.2	906.1	905.8	903.9	903.5	903.2	901.6	901.7	901.2	**901.2**	**903.9**	**-0.1**
	23755	902.9	895.7	904.0	903.3	904.5	904.0	902.9	902.0	901.7	900.4	900.2	899.9	**899.9**	**902.7**	**0.2**
	23565	902.3	895.0	903.8	902.5	903.4	902.7	903.0	900.0	900.6	899.6	899.6	898.7	**898.7**	**902.1**	**0.9**
	23365	901.9	895.0	904.0	902.2	901.8	901.3	902.3	900.4	898.6	897.1	898.8	897.9	**897.1**	**901.1**	**1.2**
	23180	901.2	894.0	904.1	901.2	900.6	900.0	900.0	898.2	900.1	896.6	900.1	897.2	**896.6**	**901.0**	**-1.0**
	23000	900.5	892.7	902.8	900.3	900.2	900.0	898.0	898.0	898.4	896.1	896.7	896.0	**896.0**	**899.2**	**-1.2**
	22790	899.8	891.5	900.4	900.0	900.2	900.0	898.0	898.0	897.4	895.5	896.5	895.0	**895.0**	**898.5**	**-0.5**
	22600	898.8	890.0	899.4	898.9	899.1	898.4	899.8	896.0	898.3	894.8	896.7	894.5	**894.5**	**898.7**	**1.1**
	22415	897.3	890.0	898.2	897.5	897.5	896.7	898.2	894.8	897.0	894.1	896.5	893.3	**893.3**	**897.5**	**0.7**

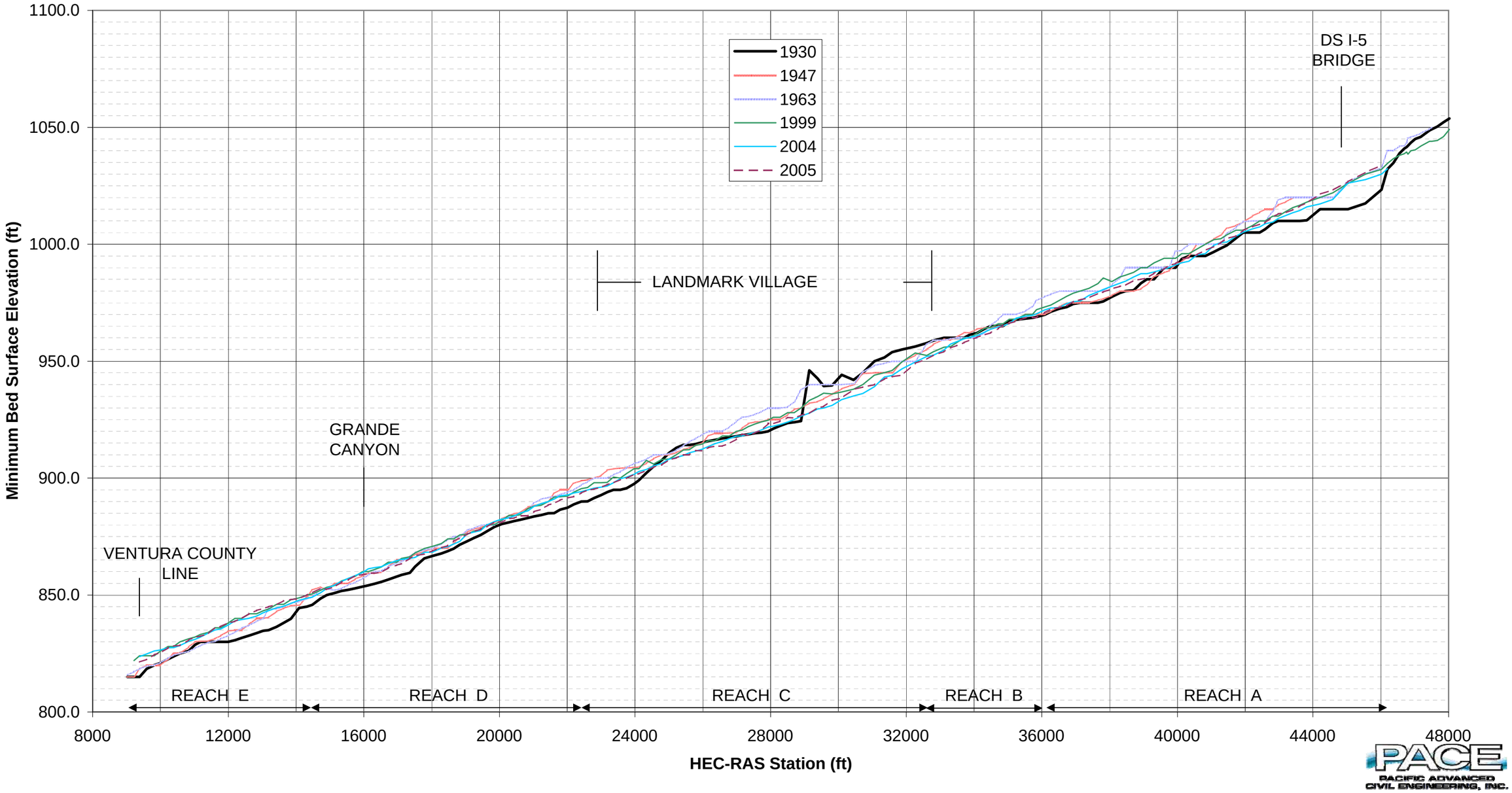
(1) "All years" excludes 1930

Table A5.2 Santa Clara River Thalweg Analysis Caluclation of Long Term Aggradation/Degradation Based on Historical Bed Analysis (ft) (continued)

Subreach	HEC-RAS Station	1930		1947		1963		1999		2004		2005		[1]MINIMUM OF ALL MINIMUMS	[1]MEAN OF ALL MEANS	99 MEAN-ALL MEAN
		Topo Mean	Topo Min	Topo Mean	Topo Min	Topo Mean	Topo Min	Topo Mean	Topo Min	Topo Mean	Topo Min	Topo Mean	Topo Min			
SRD1	22195	895.9	888.8	896.9	896.1	895.3	894.7	896.2	894.0	895.7	893.6	895.3	892.1	**892.1**	**895.9**	**0.3**
	22010	894.9	887.4	895.6	894.5	894.3	893.8	894.3	892.3	894.3	892.5	893.4	891.5	**891.5**	**894.4**	**-0.1**
	21790	893.8	886.5	894.5	893.8	893.4	892.7	894.2	892.0	893.4	892.2	891.6	890.4	**890.4**	**893.5**	**0.8**
	21615	892.3	885.0	893.0	892.3	892.7	891.9	893.7	891.9	891.5	891.0	890.5	889.0	**889.0**	**892.3**	**1.4**
	21440	890.0	884.9	891.3	890.0	891.6	891.1	892.5	890.0	890.7	889.9	890.3	888.3	**888.3**	**891.3**	**1.2**
	21225	889.1	884.2	890.1	889.0	890.7	890.2	892.3	888.3	890.9	889.0	889.7	886.4	**886.4**	**890.7**	**1.5**
	21020	888.0	883.5	888.5	888.0	889.1	887.8	891.4	888.0	889.7	887.9	888.3	885.7	**885.7**	**889.4**	**2.0**
	20845	887.5	883.0	887.2	886.2	887.1	886.1	890.2	887.0	888.6	885.9	886.2	883.9	**883.9**	**887.9**	**2.3**
	20595	886.5	882.2	885.7	885.0	886.3	884.3	888.2	884.2	886.9	885.0	885.4	883.9	**883.9**	**886.5**	**1.7**
	20435	885.7	881.6	885.2	884.7	884.5	883.3	887.3	884.0	885.7	883.8	884.2	882.8	**882.8**	**885.4**	**1.9**
	20280	885.1	881.0	884.3	883.7	883.4	882.6	886.0	884.0	884.7	882.8	883.5	882.0	**882.0**	**884.4**	**1.6**
	20070	884.0	880.3	882.8	882.6	882.1	881.3	883.6	882.0	883.7	882.3	882.0	880.9	**880.9**	**882.9**	**0.8**
SRD2	19855	882.5	879.1	881.6	880.9	880.5	880.0	882.2	880.1	882.6	881.2	881.0	880.1	**880.0**	**881.6**	**0.6**
	19630	879.9	877.2	881.4	880.0	880.2	880.0	881.2	880.0	881.1	879.8	879.8	879.0	**879.0**	**880.7**	**0.5**
	19440	877.2	875.4	881.0	878.8	879.5	878.6	879.9	878.0	879.5	877.6	878.7	877.7	**877.6**	**879.7**	**0.1**
	19240	875.8	874.3	879.7	877.0	878.5	877.0	879.8	877.2	877.5	876.6	877.6	876.8	**876.6**	**878.6**	**1.2**
	19050	873.5	870.0	877.4	875.4	877.3	875.6	878.2	876.0	875.9	875.3	876.6	875.5	**875.3**	**877.1**	**1.1**
	18830	871.8	869.0	875.7	875.0	876.2	875.0	878.9	875.0	874.6	872.9	875.5	874.0	**872.9**	**876.2**	**2.7**
	18650	870.1	868.8	875.5	872.3	875.2	874.6	876.6	874.0	875.0	871.6	874.1	873.1	**871.6**	**875.3**	**1.3**
	18475	868.9	867.0	874.5	870.0	874.4	873.4	875.7	872.0	874.4	870.7	872.1	868.8	**868.8**	**874.2**	**1.5**
	18290	867.9	865.2	874.5	870.0	873.7	871.9	875.9	872.0	873.5	870.1	871.8	869.0	**869.0**	**873.9**	**2.0**
	18025	867.1	865.0	873.8	870.0	871.2	870.0	874.1	870.0	873.3	868.4	871.3	867.6	**867.6**	**872.7**	**1.3**
	17785	866.0	865.0	872.1	868.6	869.6	869.2	873.6	868.1	872.0	868.2	870.2	867.1	**867.1**	**871.5**	**2.1**
SRD3	17510	861.9	860.4	870.6	866.4	869.5	866.7	873.7	868.0	871.5	866.0	870.1	866.2	**866.0**	**871.1**	**2.6**
	17360	860.4	859.5	869.5	865.0	868.3	865.2	873.2	866.0	869.7	865.7	868.1	864.6	**864.6**	**869.8**	**3.4**
	17110	859.0	858.6	867.3	865.0	865.9	864.1	870.0	864.8	867.3	865.0	864.4	860.9	**860.9**	**867.0**	**3.0**
	16970	858.9	857.8	867.0	865.0	866.0	863.8	866.7	864.0	865.8	864.5	864.0	861.9	**861.9**	**865.9**	**0.8**
	16720	858.3	856.6	864.3	862.0	864.3	862.0	865.2	863.0	865.3	863.4	863.1	861.6	**861.6**	**864.5**	**0.8**
	16515	857.6	855.6	862.7	859.7	862.5	860.3	863.8	862.0	864.0	862.1	861.7	859.7	**859.7**	**862.9**	**0.8**
	16305	856.8	854.8	862.8	859.2	861.6	860.0	863.3	860.0	863.7	861.7	861.6	859.3	**859.2**	**862.6**	**0.7**
	16130	856.1	854.1	862.4	859.3	860.2	858.6	862.5	860.0	862.9	861.2	860.5	858.9	**858.6**	**861.7**	**0.8**
	15960	855.3	853.5	861.5	858.2	858.4	857.0	861.8	860.0	861.0	859.5	859.7	858.6	**857.0**	**860.5**	**1.3**
	15745	854.0	852.9	860.3	856.8	856.5	855.3	860.0	858.0	859.7	858.2	859.0	857.5	**855.3**	**859.1**	**0.9**
	15540	853.2	851.9	859.5	855.0	855.1	854.2	858.3	856.0	859.5	857.1	857.8	856.4	**854.2**	**858.0**	**0.3**
	15335	852.6	851.7	859.6	855.0	852.8	852.0	858.1	856.0	857.2	855.7	857.0	855.5	**852.0**	**857.0**	**1.1**
SRE1	15125	851.8	850.7	859.5	855.0	852.1	850.2	856.0	854.0	855.8	853.3	855.3	853.3	**850.2**	**855.7**	**0.2**
	14900	851.2	850.0	857.3	852.3	854.0	850.4	855.4	853.2	854.8	852.8	854.3	852.4	**850.4**	**855.2**	**0.2**
	14720	850.7	848.3	856.0	853.1	853.6	850.0	854.6	852.0	853.9	851.0	853.9	852.5	**850.0**	**854.4**	**0.2**
	14480	849.6	845.7	854.5	850.0	852.9	848.5	854.3	850.4	853.2	849.1	853.6	851.0	**848.5**	**853.7**	**0.6**
	14315	849.1	845.0	854.3	849.1	852.1	848.0	852.6	850.0	852.0	848.6	852.3	850.0	**848.0**	**852.7**	**-0.1**
	14090	848.3	844.2	852.0	845.0	851.3	847.2	851.6	848.6	850.6	847.8	850.7	848.5	**845.0**	**851.2**	**0.4**
	13850	845.8	839.9	850.7	845.0	850.2	846.4	850.8	848.0	849.2	846.4	849.5	848.1	**845.0**	**850.1**	**0.7**
	13635	843.4	837.9	849.4	844.3	847.7	845.0	850.0	846.0	848.0	845.2	848.8	847.6	**844.3**	**848.8**	**1.2**
	13425	843.5	836.4	847.7	842.5	846.2	843.2	848.1	846.0	847.2	844.5	847.6	845.9	**842.5**	**847.4**	**0.8**
	13190	841.7	835.0	845.7	840.4	844.6	841.7	846.4	844.0	845.8	843.3	846.1	845.0	**840.4**	**845.7**	**0.7**
SRE2	13030	840.1	834.7	844.0	840.0	842.5	840.0	846.1	843.3	844.8	842.4	845.3	844.2	**840.0**	**844.5**	**1.6**
	12835	838.0	833.7	841.8	840.0	841.1	838.5	844.4	842.0	843.7	841.0	844.0	842.9	**838.5**	**843.0**	**1.4**
	12615	836.5	832.5	840.4	837.1	839.8	837.0	843.6	841.5	842.3	840.1	842.5	841.6	**837.0**	**841.7**	**1.9**
	12395	835.8	831.7	839.2	835.0	838.7	835.9	841.9	840.0	841.7	839.5	841.4	840.0	**835.0**	**840.6**	**1.3**
	12195	834.7	830.7	839.2	835.0	836.4	834.0	841.1	839.0	840.0	838.9	840.1	838.7	**834.0**	**839.4**	**1.8**
	11995	833.4	830.0	839.2	834.6	836.3	832.6	839.6	838.0	838.7	837.2	839.1	838.1	**832.6**	**838.6**	**1.0**
	11780	831.8	830.0	837.7	832.6	834.8	831.2	837.7	836.0	837.2	835.5	837.7	836.1	**831.2**	**837.0**	**0.7**
	11605	831.1	830.0	836.5	831.3	833.5	830.1	837.1	836.0	836.5	834.8	836.6	834.2	**830.1**	**836.1**	**1.1**
	11405	830.2	830.0	834.5	830.0	831.8	829.7	834.8	834.0	835.5	833.7	835.0	832.8	**829.7**	**834.3**	**0.5**
	11180	829.1	828.4	832.5	828.4	828.9	828.3	833.4	832.5	833.5	831.8	833.6	832.4	**828.3**	**832.4**	**1.0**
SRE3	11015	827.8	827.1	831.3	826.6	828.4	827.3	832.1	832.0	832.8	831.0	832.3	830.5	**826.6**	**831.4**	**0.7**
	10835	826.4	825.7	829.9	825.0	827.6	825.7	832.3	830.0	832.2	830.2	831.5	829.4	**825.0**	**830.7**	**1.5**
	10575	825.4	825.0	827.6	825.0	826.2	825.0	831.3	830.0	831.0	828.3	830.1	828.4	**825.0**	**829.2**	**2.0**
	10390	824.1	823.7	826.1	825.0	824.6	823.5	829.7	828.0	830.2	827.5	829.0	828.1	**823.5**	**827.9**	**1.8**
	10225	823.3	822.6	825.2	822.6	823.5	822.4	828.7	828.0	828.6	827.3	827.9	827.4	**822.4**	**826.8**	**2.0**
	10000	823.9	820.9	822.2	820.0	821.5	821.0	827.3	826.0	828.0	826.4	825.4	824.3	**820.0**	**824.9**	**2.5**
	9820	823.0	820.0	821.2	820.0	820.9	820.0	826.3	824.0	827.6	826.0	825.4	823.7	**820.0**	**824.3**	**2.1**
	9595	822.9	818.5	820.3	819.3	819.9	819.1	825.8	824.0	826.5	824.8	824.3	822.3	**819.1**	**823.4**	**2.4**
	9385	822.5	815.0	819.4	816.7	818.9	818.3	825.5	824.0	825.2	823.7	823.7	821.3	**816.7**	**822.5**	**3.0**
	9220	821.6	815.0	818.0	815.0	818.0	816.9	824.2	822.0					**815.0**	**820.0**	**4.1**
	9025	820.0	815.0	816.1	815.0	816.5	815.8							**815.0**	**816.3**	

(1) "All years" excludes 1930

Figure A5.2.2A Santa Clara River Historical Minimum Bed Elevation



PACE
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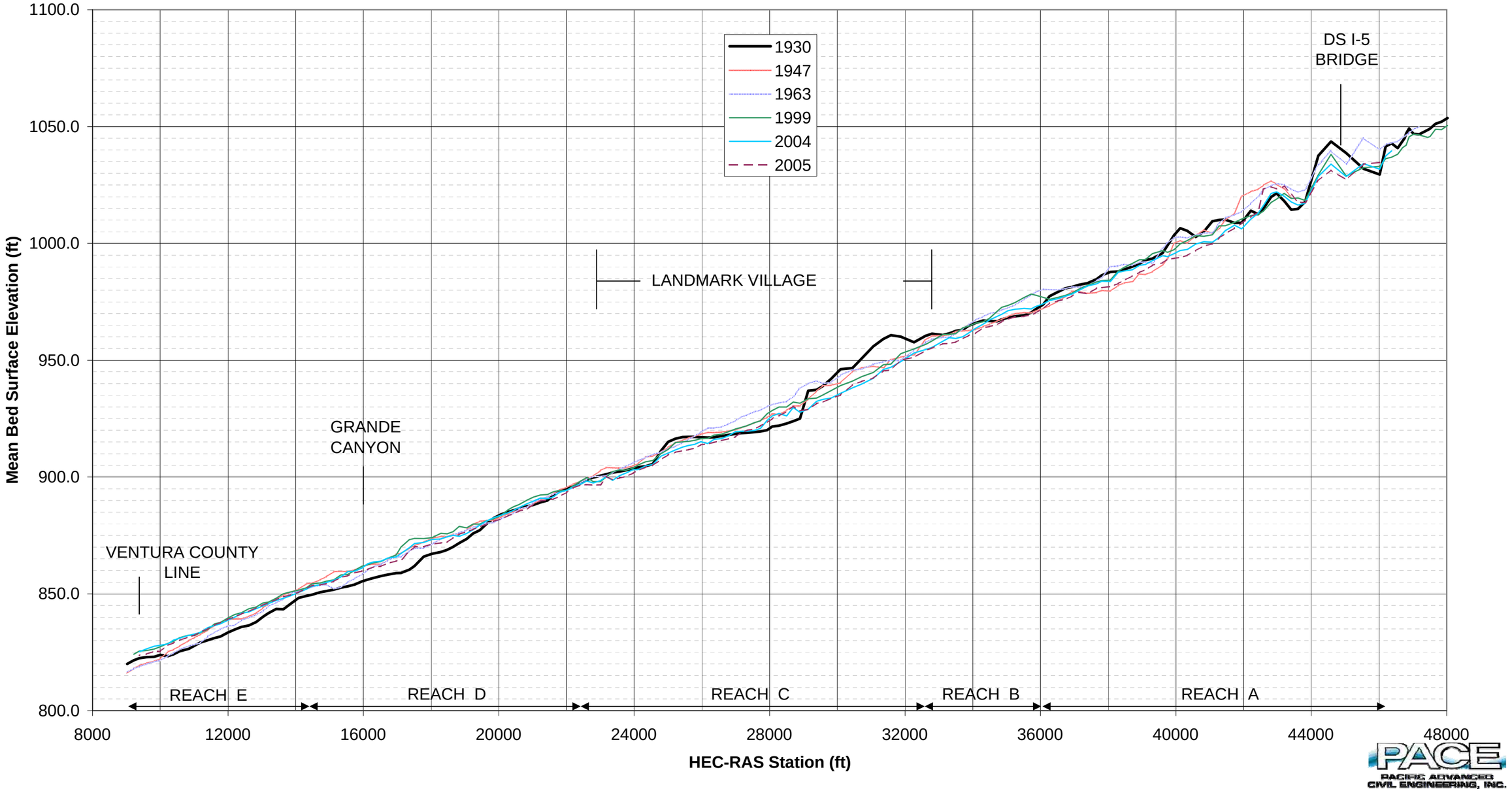
P:\8197E\5-Administrative\Reports\Fluvial Report\Fluvial Spreadsheets\Appendix 5.2 Min-Mean Thalweg by Year 11-02-05

Figure A5.2.2B Santa Clara River Historical Mean Bed Elevation



Xrefs: 8197-SantaClara-Profiles.dwg; 8197-11x17Exh-Tblk.dwg
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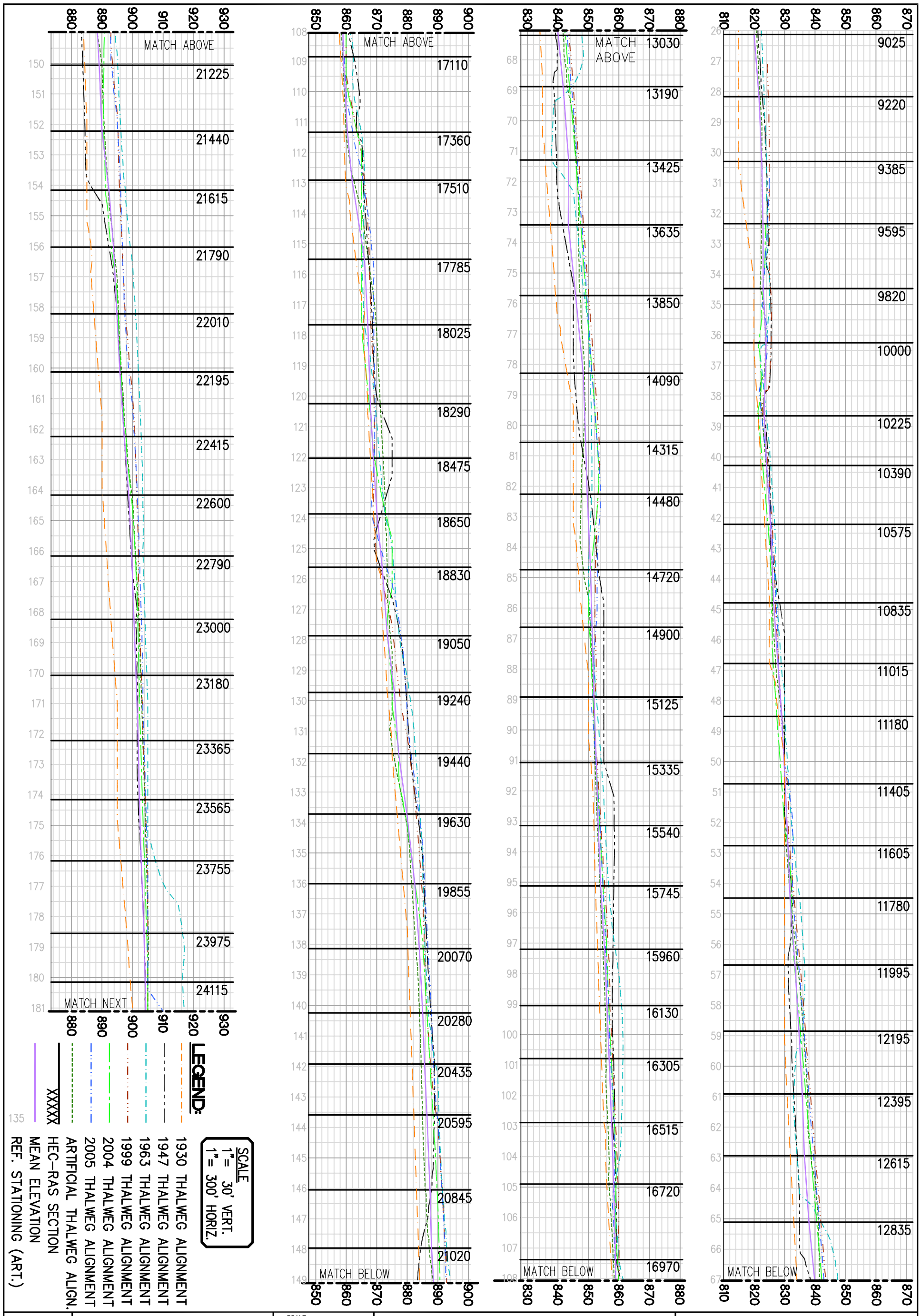

FIGURE A5.3.1A

PACE
PACIFIC ADVANCED CIVIL ENGINEERING
17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

SCALE	1"= 300'
DESIGNED	DAJ
DRAWN	DAD
CHECKED	MEK
DATE	09/13/05
JOB NO.	8197E

JOB
SANTA CLARA RIVER FLUVIAL STUDY
LOS ANGELES COUNTY CA

TITLE
SANTA CLARA RIVER HISTORIC BED PROFILES (1930 TOPO)

P:\8197E\Engineering\GlobalExhibits\8197 Historic Profiles - Santa Clara.dwg - Tab: A By: ddrahn on Mar. 14, 2006 at 05:05 pm

Xrefs: 8197-SantaClara-Profiles.dwg; 8197-11x17Exh-Tblk.dwg
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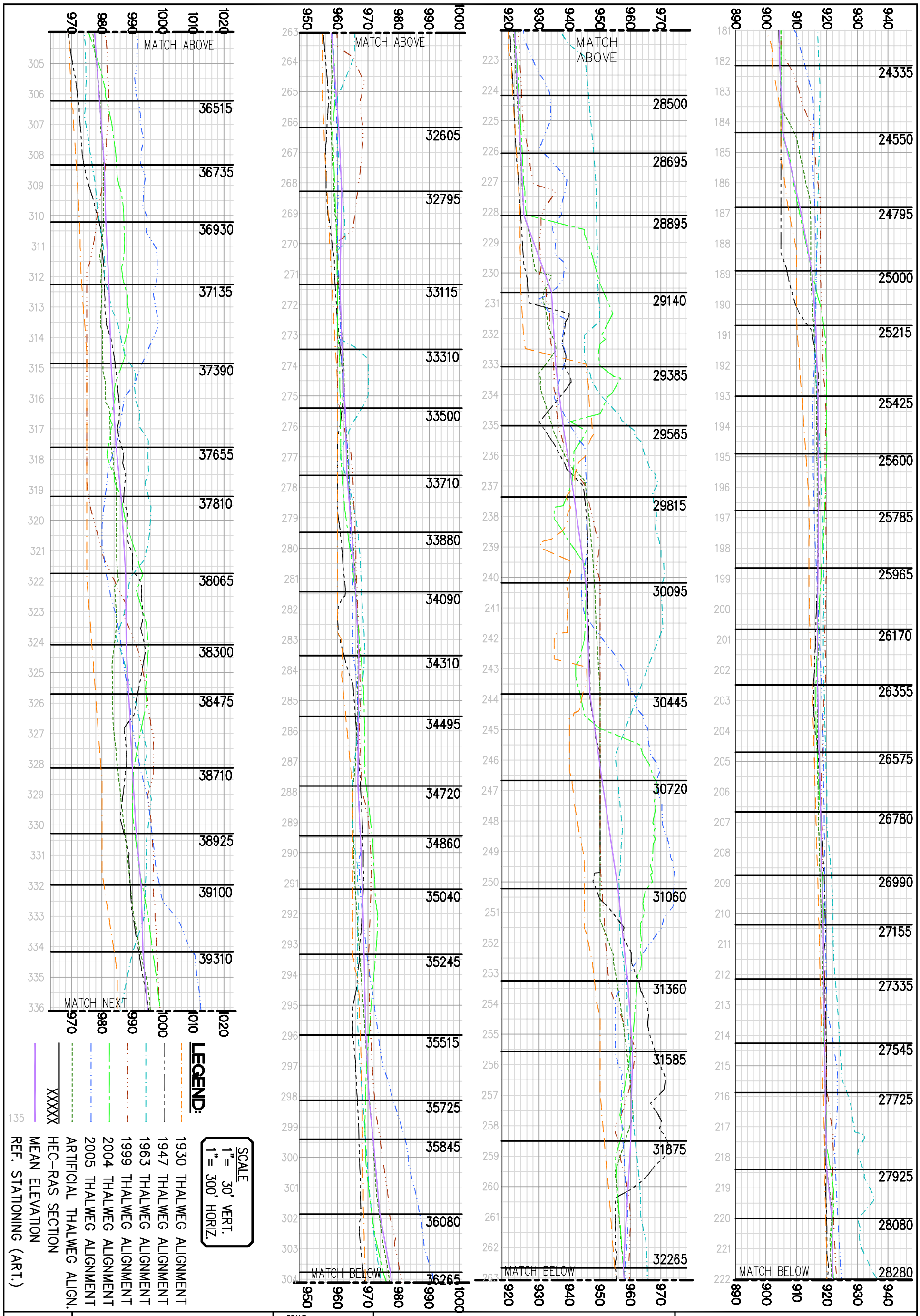

FIGURE A5.3.1B

PACE
PACIFIC ADVANCED CIVIL ENGINEERING
17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

SCALE	1"= 300'
DESIGNED	DAJ
DRAWN	DAD
CHECKED	MEK
DATE	09/13/05
JOB NO.	8197E

JOB
SANTA CLARA RIVER FLUVIAL STUDY
LOS ANGELES COUNTY CA

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Xrefs: 8197-SantaClara-Profiles.dwg; 8197-11x17Exh-Tblk.dwg
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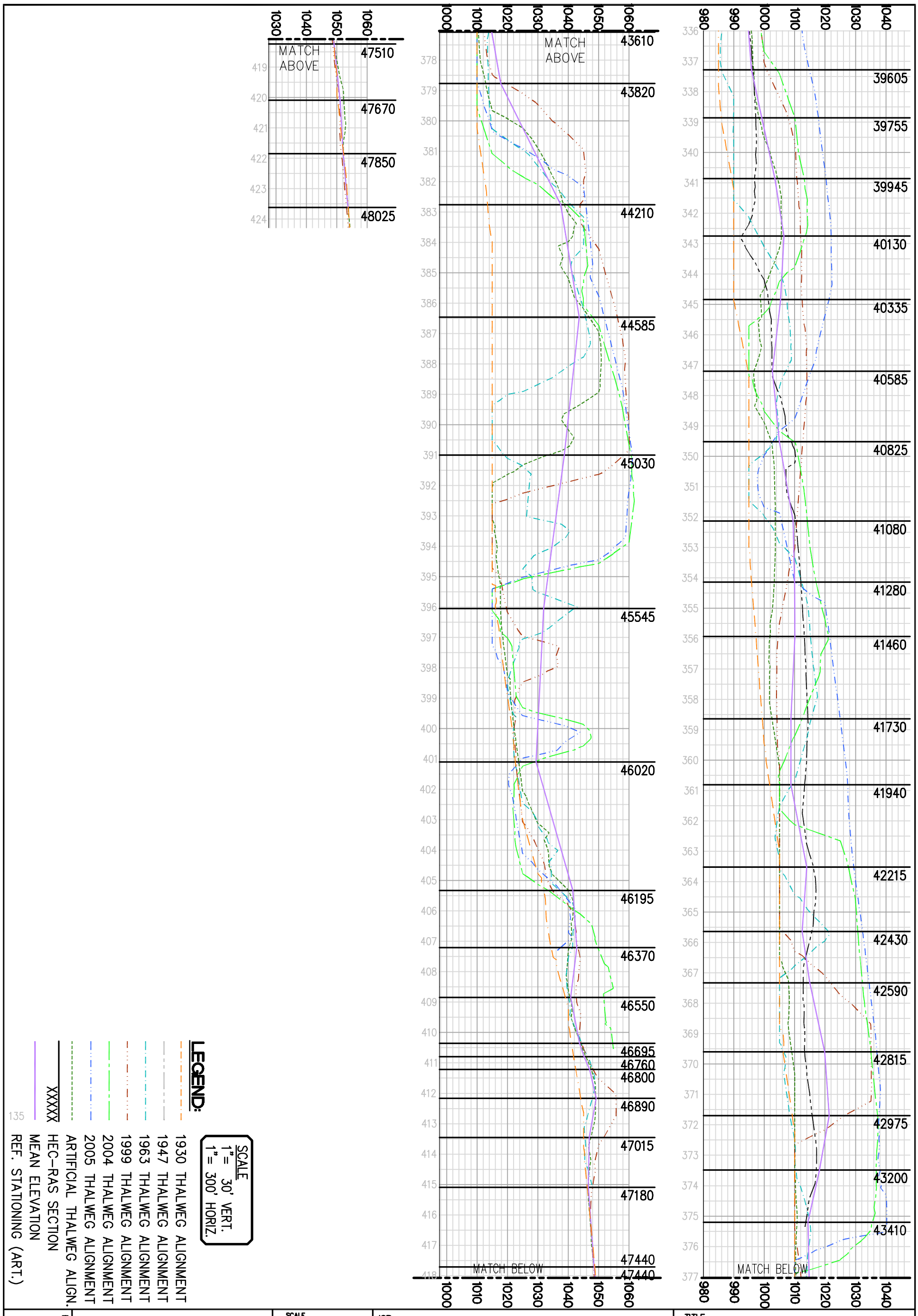

FIGURE A5.3.1G

PACE
PACIFIC ADVANCED CIVIL ENGINEERING
17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

SCALE	1"= 300'
DESIGNED	DAJ
DRAWN	DAD
CHECKED	MEK
DATE	09/13/05
JOB NO.	8197E

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SANTA CLARA RIVER HISTORIC BED PROFILES (1930 TOPO)

P:\8197E\Engineering\GlobalExhibits\8197 Historic Profiles - Santa Clara.dwg - Tab: C By: ddrahn on Mar. 14, 2006 at 05:04 pm

Xrefs: 8197-SantaClara-Profiles.dwg; 8197-11x17Exh-Tblk.dwg
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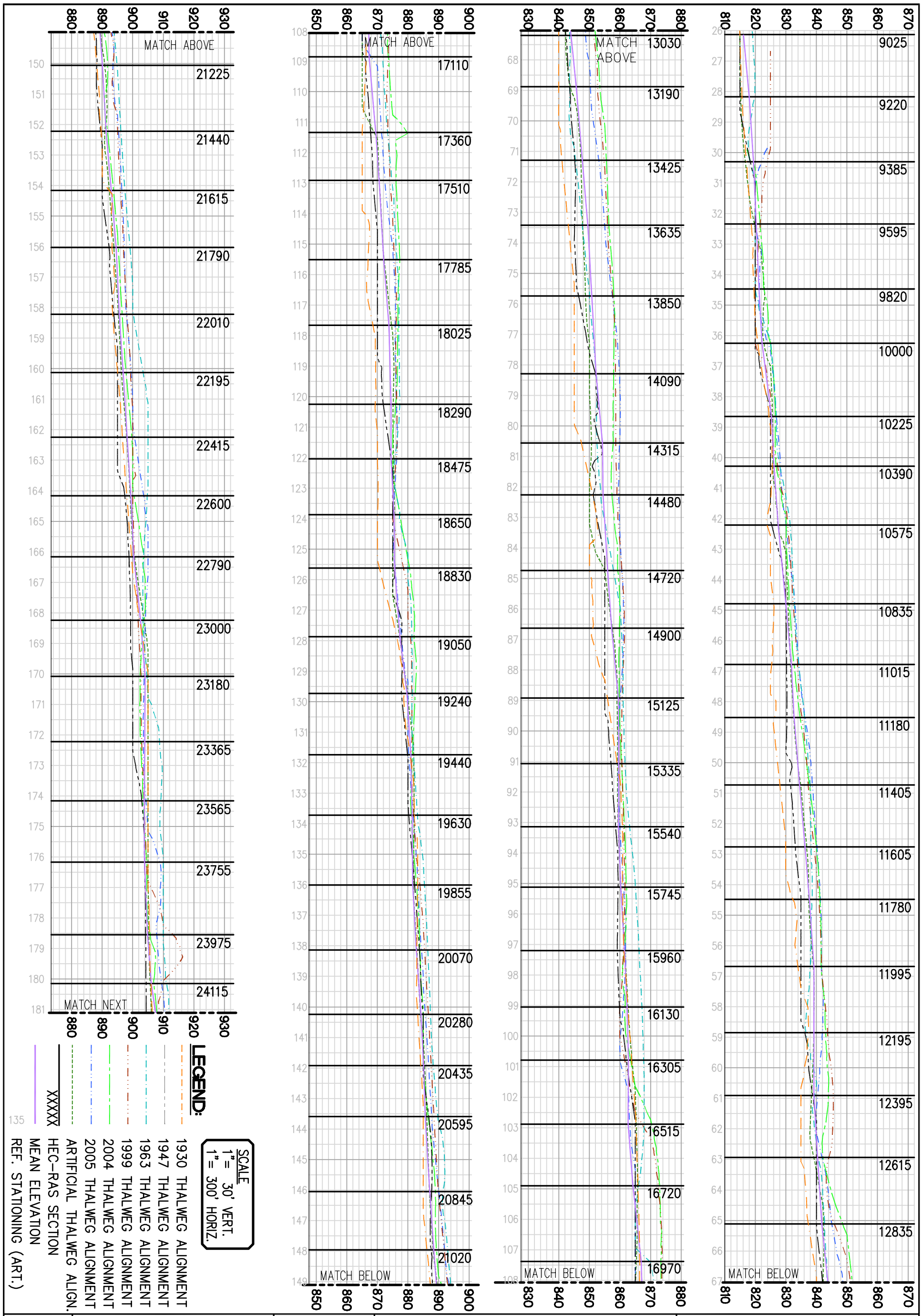

FIGURE A5.3.1D	PACE PACIFIC ADVANCED CIVIL ENGINEERING 17520 NEWHOPE STREET, SUITE 200 FOUNTAIN VALLEY, CA 92708 PH (714) 481-7300 FAX (714) 481-7299	SCALE 1"= 300' / DESIGNED DAJ / DRAWN DAD / CHECKED MEK / DATE 09/13/05 / JOB NO. 8197E	JOB SANTA CLARA RIVER FLUVIAL STUDY LOS ANGELES COUNTY CA

TITLE
SANTA CLARA RIVER HISTORIC BED PROFILES (1947 TOPO)

P:\8197E\Engineering\GlobalExhibits\8197 Historic Profiles - Santa Clara.dwg - Tab: D By: ddrahn on Mar. 14, 2006 at 05:04 pm

Xrefs: 8197-SantaClara-Profiles.dwg; 8197-11x17Exh-Tblk.dwg
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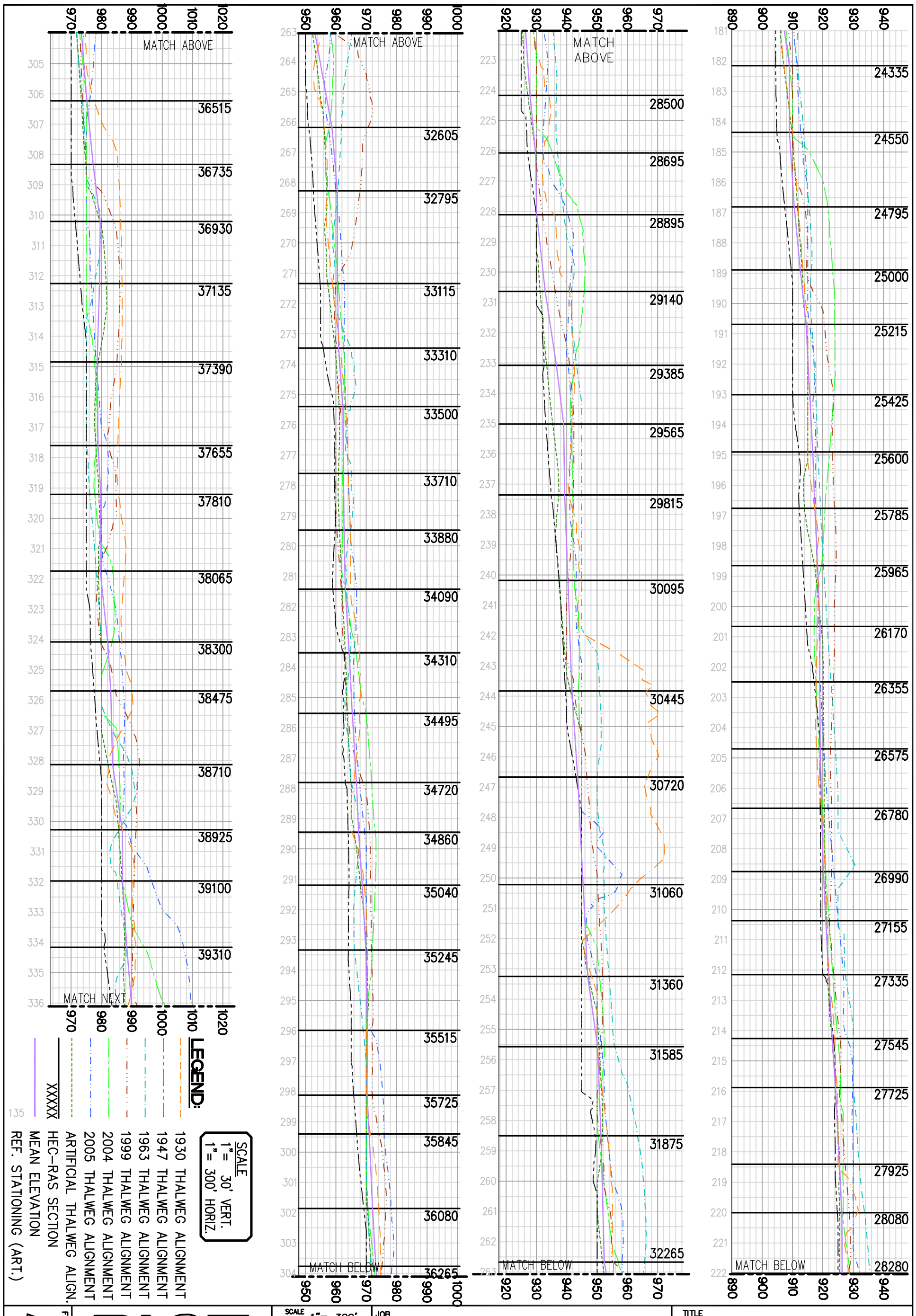

FIGURE A5.3.1E

PACE
PACIFIC ADVANCED CIVIL ENGINEERING
17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

SCALE	1"= 300'
DESIGNED	DAJ
DRAWN	DAD
CHECKED	MEK
DATE	09/13/05
JOB NO.	8197E

JOB
SANTA CLARA RIVER FLUVIAL STUDY
LOS ANGELES COUNTY CA

TITLE
SANTA CLARA RIVER HISTORIC BED PROFILES (1947 TOPO)

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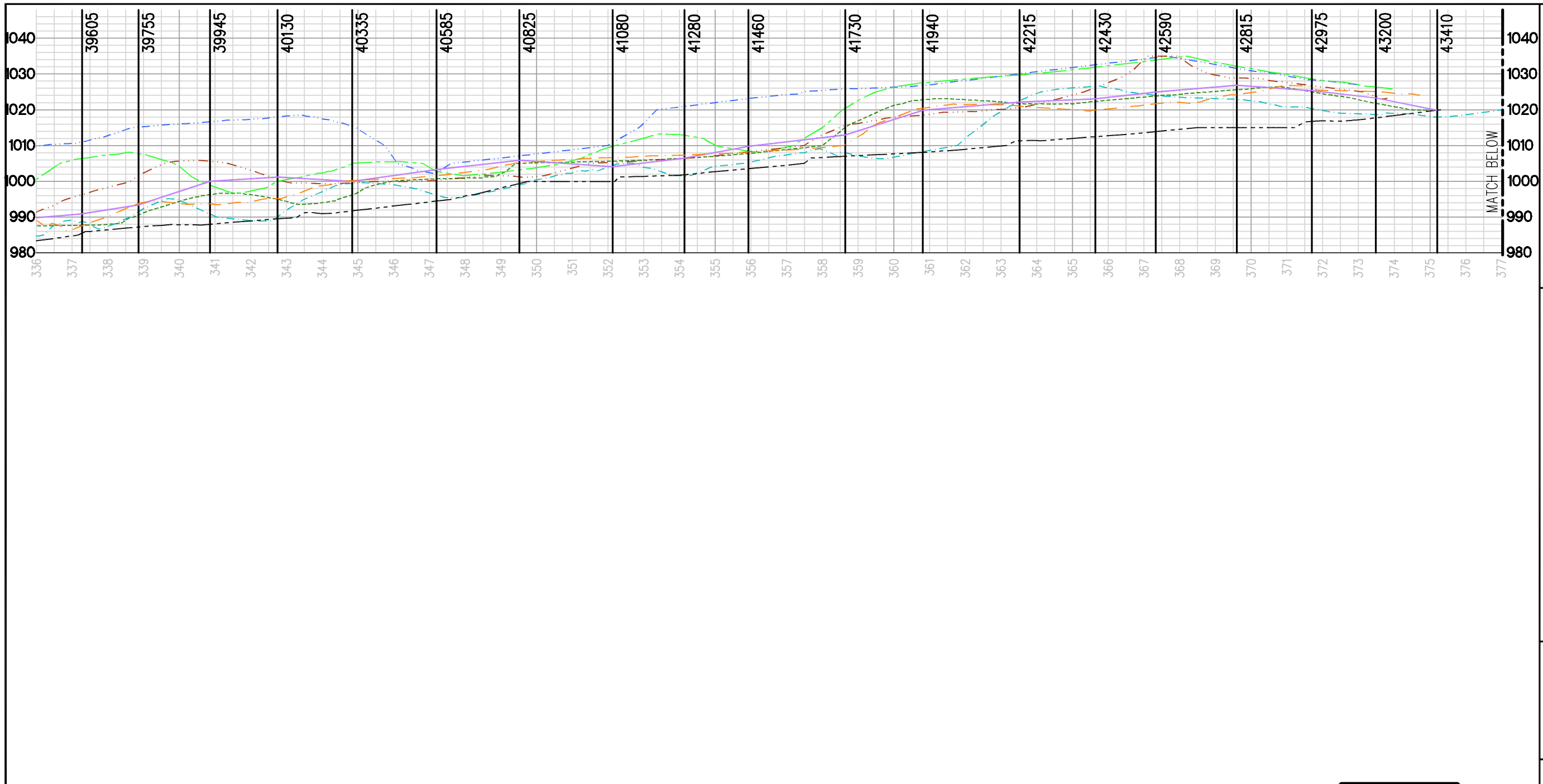

LEGEND:

- 1930 THALWEG ALIGNMENT
- 1947 THALWEG ALIGNMENT
- 1963 THALWEG ALIGNMENT
- 1999 THALWEG ALIGNMENT
- 2004 THALWEG ALIGNMENT
- 2005 THALWEG ALIGNMENT
- ARTIFICIAL THALWEG ALIGN.
- XXXXX HEC-RAS SECTION
- MEAN ELEVATION
- 135 REF. STATIONING (ART.)

SCALE
1"= 30' VERT.
1"= 300' HORIZ.

TITLE
SANTA CLARA RIVER
HISTORIC BED
PROFILES (1947 TOPO)

JOB
SANTA CLARA RIVER
FLUVIAL STUDY
LOS ANGELES COUNTY CA

SCALE	1"= 300'
DESIGNED	DAJ
DRAWN	DAD
CHECKED	MEK
DATE	09/13/05
JOB NO.	8197E

PACE
PACIFIC ADVANCED CIVIL ENGINEERING
1220 NEWPORT STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

FIGURE
A5.3.1F

Xrefs: 8197-SantaClara-Profiles.dwg; 8197-11x17Exh-Tblk.dwg
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Xrefs: 8197-SantaClara-Profiles.dwg; 8197-11x17Exh-Tblk.dwg
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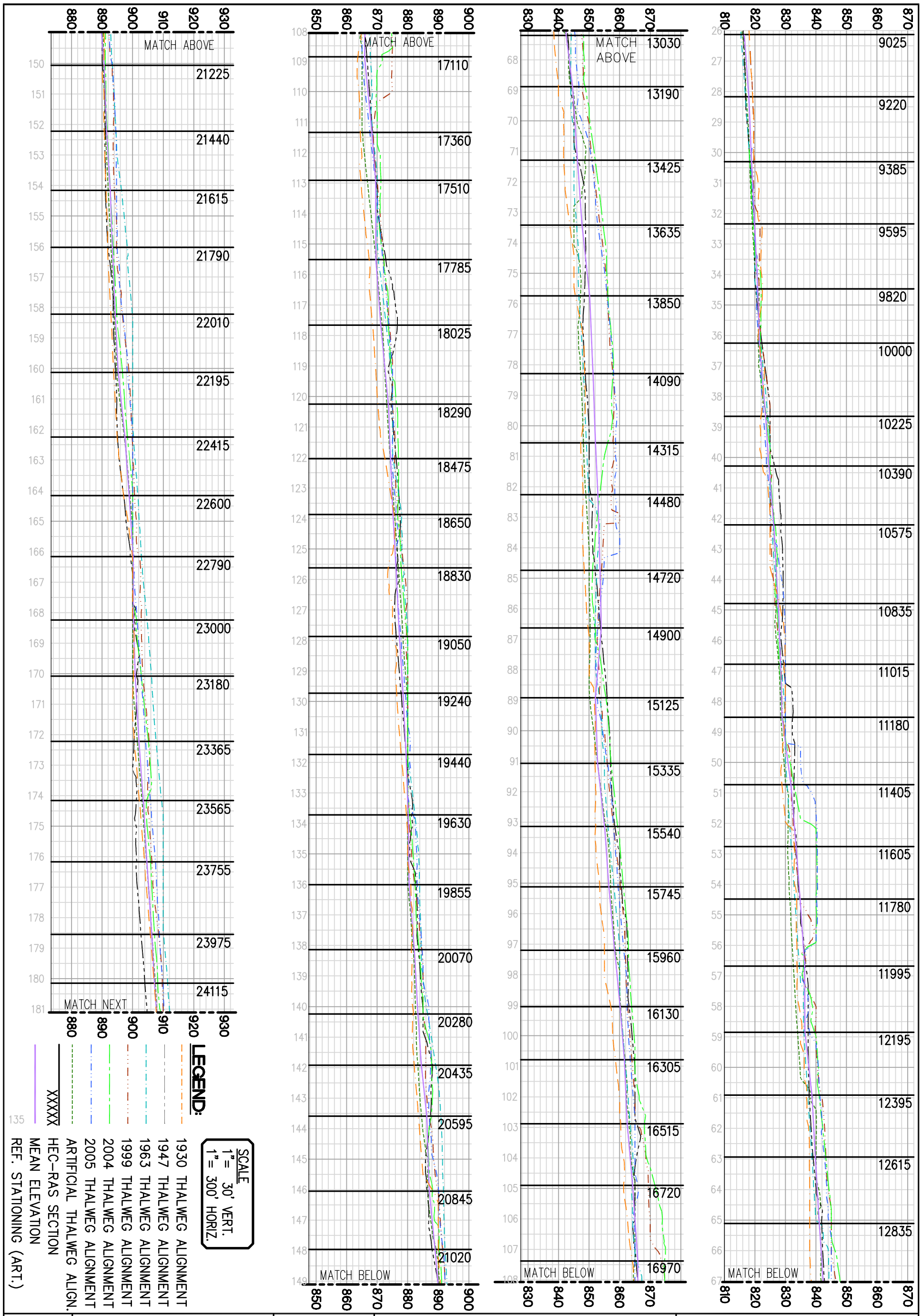

FIGURE	A5.3.1G
SCALE	1"= 300'
DESIGNED	DAJ
DRAWN	DAD
CHECKED	MEK
DATE	09/13/05
JOB NO.	8197E

PACIFIC ADVANCED CIVIL ENGINEERING
17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

JOB
SANTA CLARA RIVER FLUVIAL STUDY
LOS ANGELES COUNTY CA

TITLE
SANTA CLARA RIVER HISTORIC BED PROFILES (1963 TOPO)

P:\8197E\Engineering\GlobalExhibits\8197 Historic Profiles - Santa Clara.dwg - Tab: G By: ddrahn on Mar. 14, 2006 at 05:04 pm

Xrefs: 8197-SantaClara-Profiles.dwg; 8197-11x17Exh-Tblk.dwg
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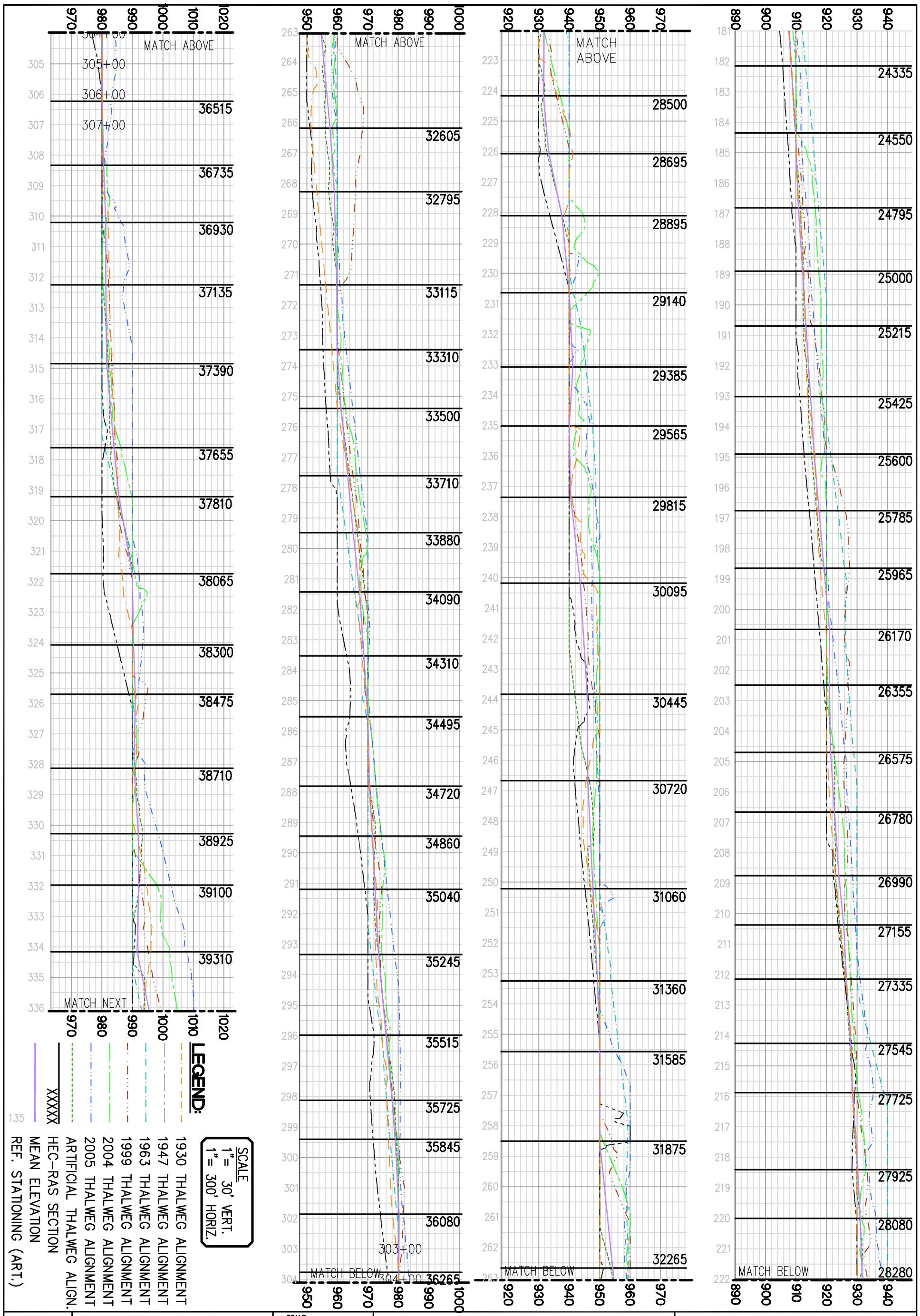


FIGURE A5.3.1H

PACE
PACIFIC ADVANCED CIVIL ENGINEERING
17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

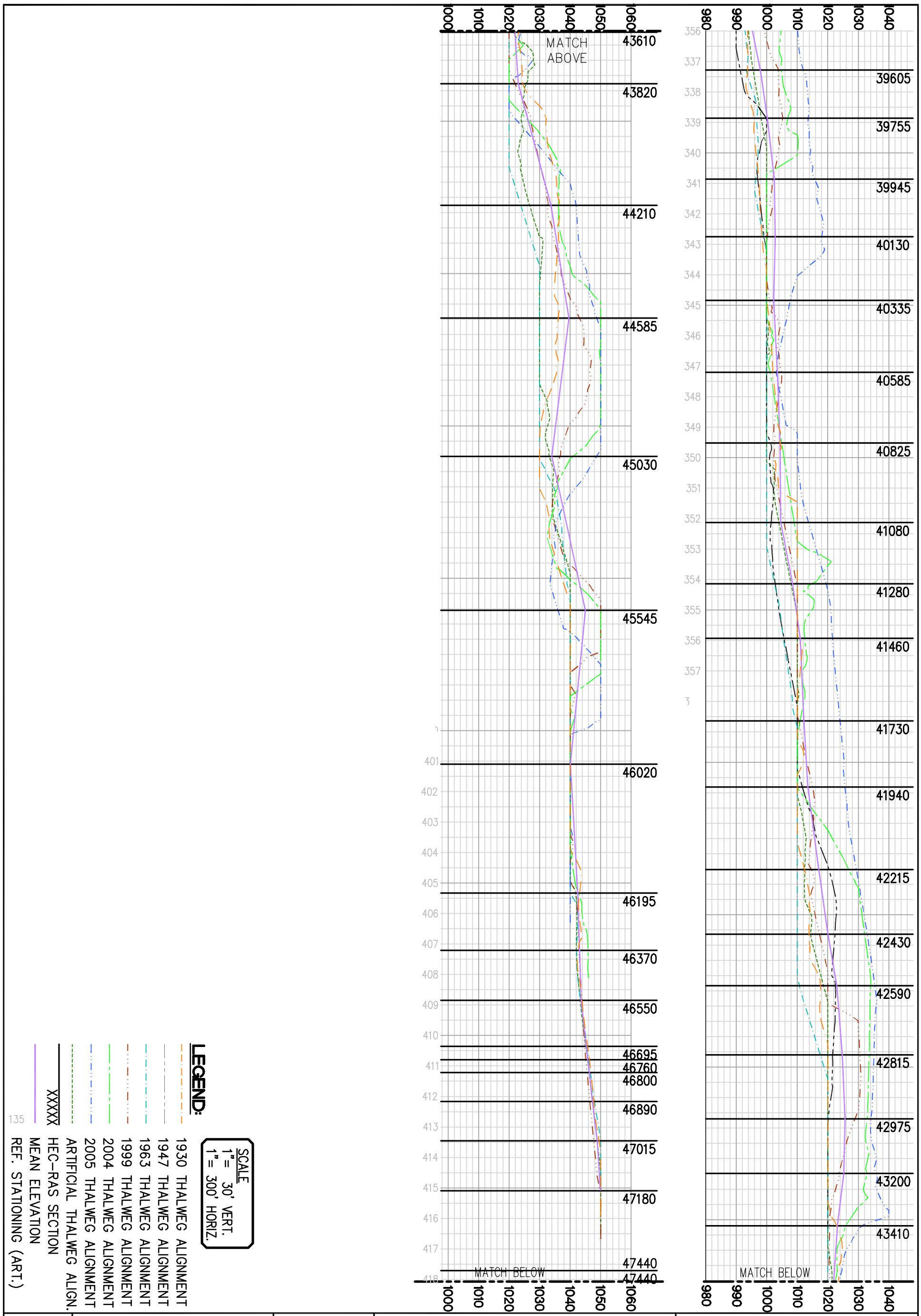
SCALE	1"= 300'
DESIGNED	DAJ
DRAWN	DAD
CHECKED	MEK
DATE	09/13/05
JOB NO.	8197E

JOB
SANTA CLARA RIVER FLUVIAL STUDY
LOS ANGELES COUNTY CA

TITLE
SANTA CLARA RIVER HISTORIC BED PROFILES (1963 TOPO)

P:\8197E\Engineering\GlobalExhibits\8197 Historic Profiles - Santa Clara.dwg - Tab: H By: ddrahn on Mar. 14, 2006 at 05:04 pm

Xrefs: 8197-SantaClara-Profiles.dwg; 8197-11x17Exh-Tblk.dwg
Dimscale = 300; LTscale = 0.5; PSltscale = 1; Acad Ver. = 16.2s (LMS Tech); Visretain = 1



LEGEND:

- 1930 THALWEG ALIGNMENT
- 1947 THALWEG ALIGNMENT
- 1963 THALWEG ALIGNMENT
- 1999 THALWEG ALIGNMENT
- 2004 THALWEG ALIGNMENT
- 2005 THALWEG ALIGNMENT
- ARTIFICIAL THALWEG ALIGN.
- HEC-RAS SECTION
- MEAN ELEVATION
- REF. STATIONING (ART.)

XXXXX

SCALE
1"= 30' VERT.
1"= 300' HORIZ.

FIGURE A5.3.11

PACE
PACIFIC ADVANCED CIVIL ENGINEERING
17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

SCALE	1"= 300'
DESIGNED	DAJ
DRAWN	DAD
CHECKED	MEK
DATE	09/13/05
JOB NO.	8197E

JOB
SANTA CLARA RIVER FLUVIAL STUDY
LOS ANGELES COUNTY CA

TITLE
SANTA CLARA RIVER HISTORIC BED PROFILES (1963 TOPO)

P:\8197E\Engineering\GlobalExhibits\8197 Historic Profiles - Santa Clara.dwg - Tab: I By: ddrahn on Mar. 14, 2006 at 05:04 pm

Xrefs: 8197-SantaClara-Profiles.dwg; 8197-11x17Exh-Tblk.dwg
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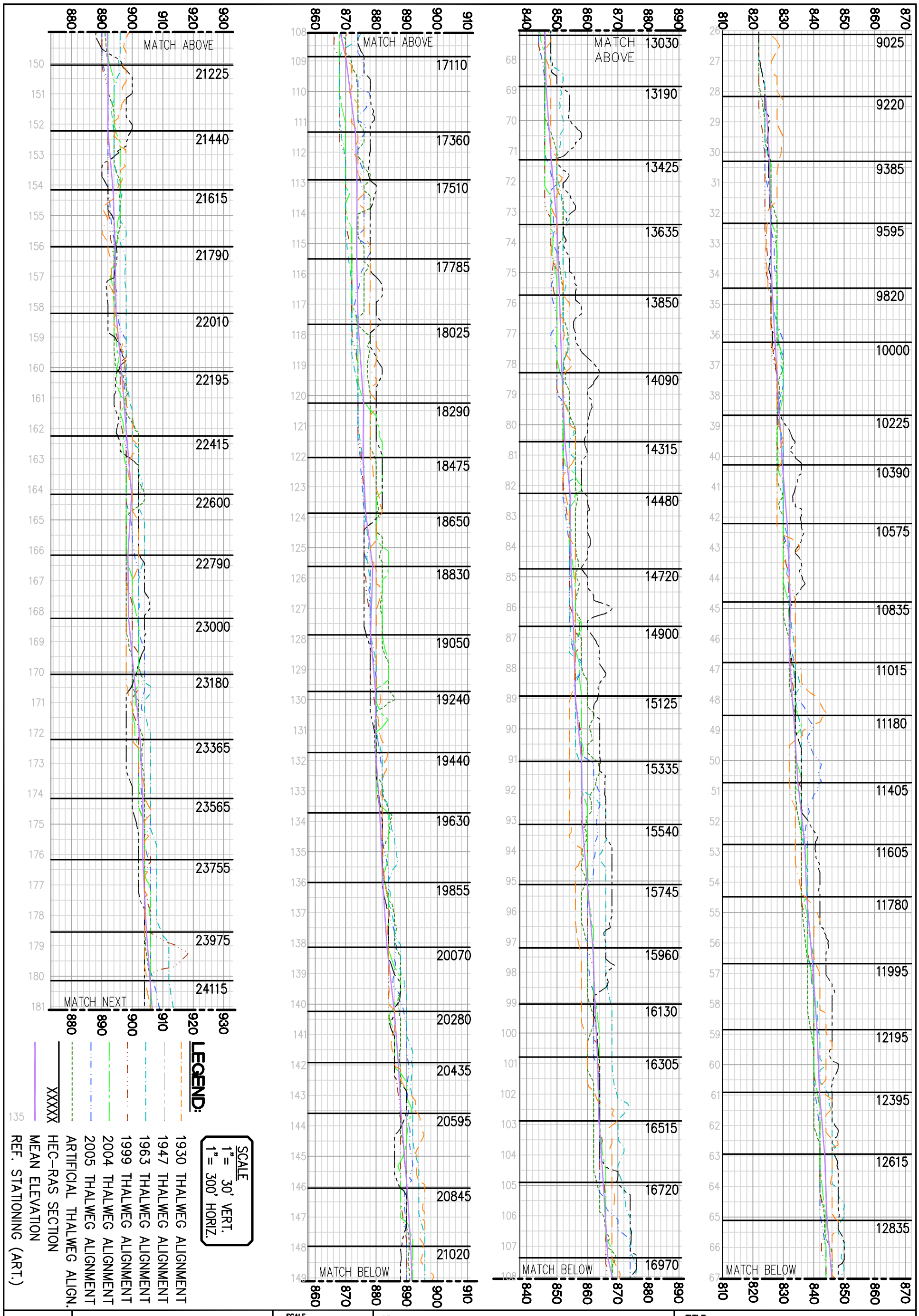

FIGURE A5.3.1J

PACE
PACIFIC ADVANCED CIVIL ENGINEERING
17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

SCALE	1"= 300'
DESIGNED	DAJ
DRAWN	DAD
CHECKED	MEK
DATE	09/13/05
JOB NO.	8197E

JOB
SANTA CLARA RIVER FLUVIAL STUDY
LOS ANGELES COUNTY CA

TITLE
SANTA CLARA RIVER HISTORIC BED PROFILES (1999 TOPO)

P:\8197E\Engineering\GlobalExhibits\8197 Historic Profiles - Santa Clara.dwg - Tab: J By: ddrahn on Mar. 14, 2006 at 05:04 pm

Xrefs: 8197-SantaClara-Profiles.dwg; 8197-11x17Exh-Tblk.dwg
Dimscale = 300; LTscale = 0.5; PSltscale = 1; Acad Ver. = 16.2s (LMS Tech); Visretain = 1

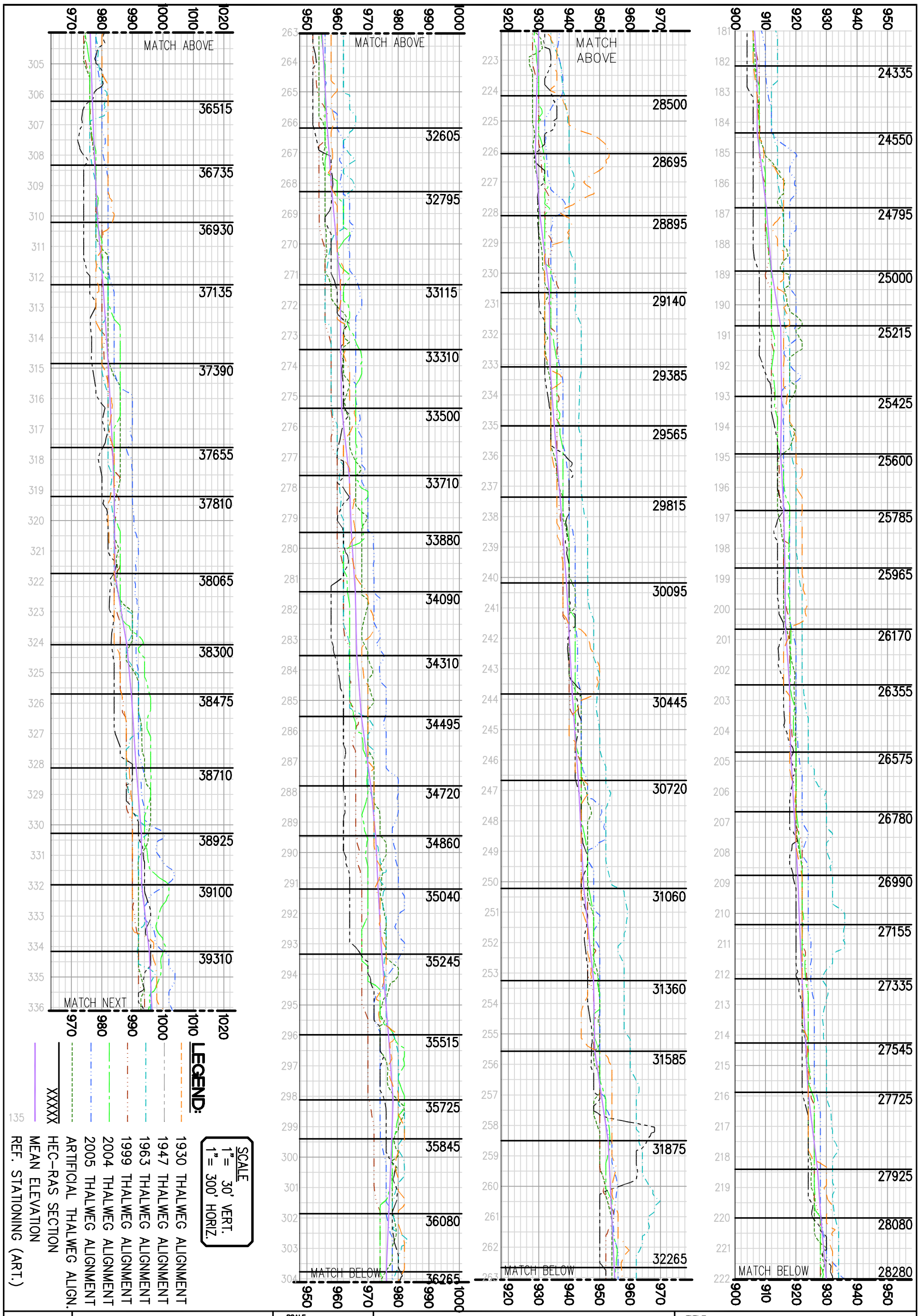

FIGURE A5.3.1K

PACE
PACIFIC ADVANCED CIVIL ENGINEERING
17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

SCALE	1"= 300'
DESIGNED	DAJ
DRAWN	DAD
CHECKED	MEK
DATE	09/13/05
JOB NO.	8197E

JOB
SANTA CLARA RIVER FLUVIAL STUDY
LOS ANGELES COUNTY CA

TITLE
SANTA CLARA RIVER HISTORIC BED PROFILES (1999 TOPO)

P:\8197E\Engineering\GlobalExhibits\8197 Historic Profiles - Santa Clara.dwg - Tab: K By: ddrahn on Mar. 14, 2006 at 05:04 pm

Xrefs: 8197-SantaClara-Profiles.dwg; 8197-11x17Exh-Tblk.dwg
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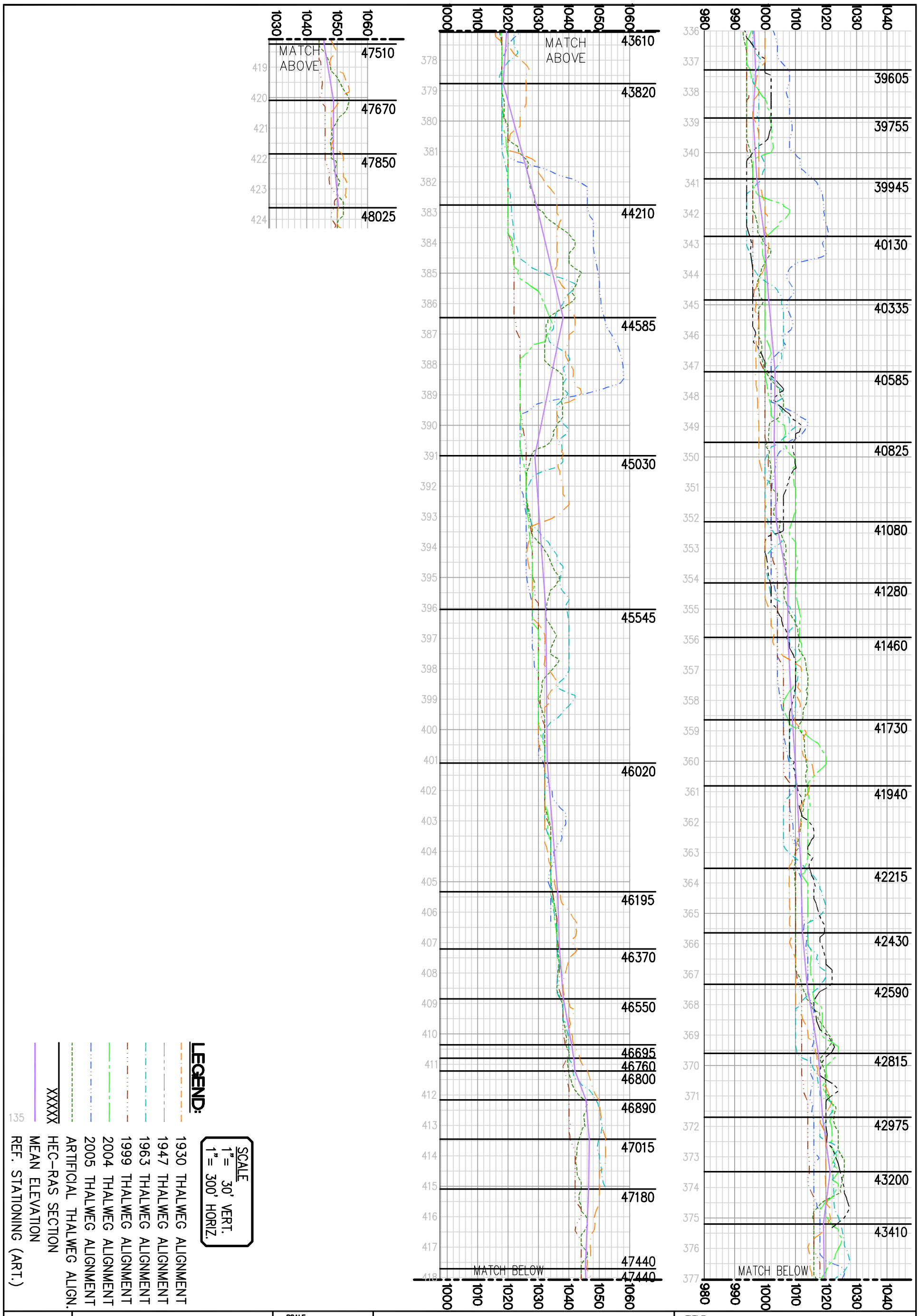

FIGURE A5.3.1L

PACE
PACIFIC ADVANCED CIVIL ENGINEERING
17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

SCALE	1"= 300'
DESIGNED	DAJ
DRAWN	DAD
CHECKED	MEK
DATE	09/13/05
JOB NO.	8197E

JOB
SANTA CLARA RIVER FLUVIAL STUDY
LOS ANGELES COUNTY CA

TITLE
SANTA CLARA RIVER HISTORIC BED PROFILES (1999 TOPO)

P:\8197E\Engineering\GlobalExhibits\8197 Historic Profiles - Santa Clara.dwg - Tab: L By: ddrahn on Mar. 14, 2006 at 05:04 pm

Xrefs: 8197-SantaClara-Profiles.dwg; 8197-11x17Exh-Tblk.dwg
Dimscale = 300; LTscale = 0.5; PSltscale = 1; Acad Ver. = 16.2s (LMS Tech); Visretain = 1

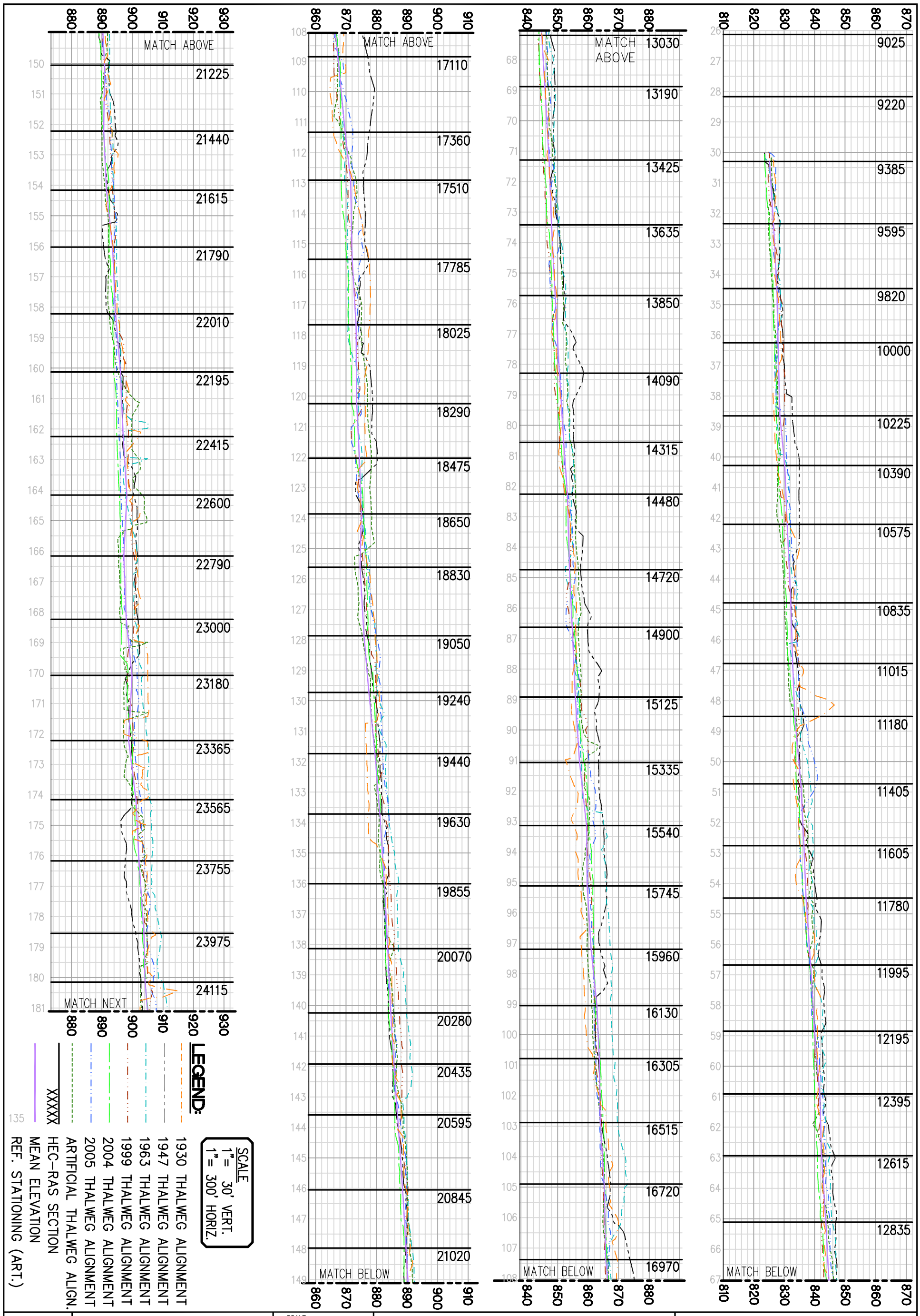

FIGURE A5.3.1M

PACE
PACIFIC ADVANCED CIVIL ENGINEERING
17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

SCALE	1"= 300'
DESIGNED	DAJ
DRAWN	DAD
CHECKED	MEK
DATE	09/13/05
JOB NO.	8197E

JOB
SANTA CLARA RIVER FLUVIAL STUDY
LOS ANGELES COUNTY CA

TITLE
SANTA CLARA RIVER HISTORIC BED PROFILES (2004 TOPO)

P:\8197E\Engineering\GlobalExhibits\8197 Historic Profiles - Santa Clara.dwg - Tab: M By: ddrahn on Mar. 14, 2006 at 05:03 pm

Xrefs: 8197-SantaClara-Profiles.dwg; 8197-11x17Exh-Tblk.dwg
Dimscale = 300; LTscale = 0.5; PSltscale = 1; Acad Ver. = 16.2s (LMS Tech); Visretain = 1

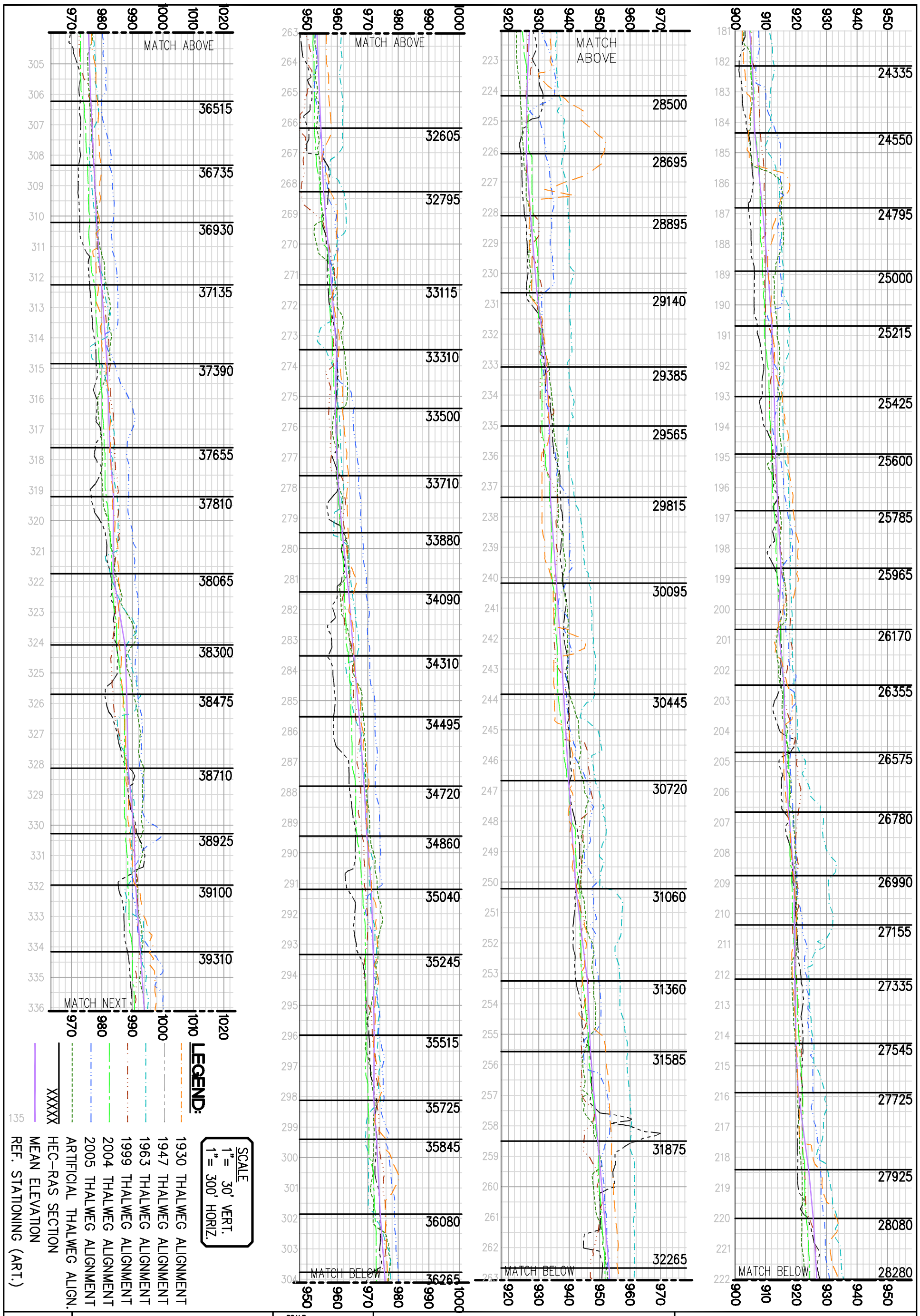

FIGURE A5.3.1N

PACE
PACIFIC ADVANCED CIVIL ENGINEERING
17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

SCALE	1"= 300'
DESIGNED	DAJ
DRAWN	DAD
CHECKED	MEK
DATE	09/13/05
JOB NO.	8197E

JOB
SANTA CLARA RIVER FLUVIAL STUDY
LOS ANGELES COUNTY CA

TITLE
SANTA CLARA RIVER HISTORIC BED PROFILES (2004 TOPO)

P:\8197E\Engineering\GlobalExhibits\8197 Historic Profiles - Santa Clara.dwg - Tab: N By: ddrahn on Mar. 14, 2006 at 05:03 pm

Xrefs: 8197-SantaClara-Profiles.dwg; 8197-11x17Exh-Tblk.dwg
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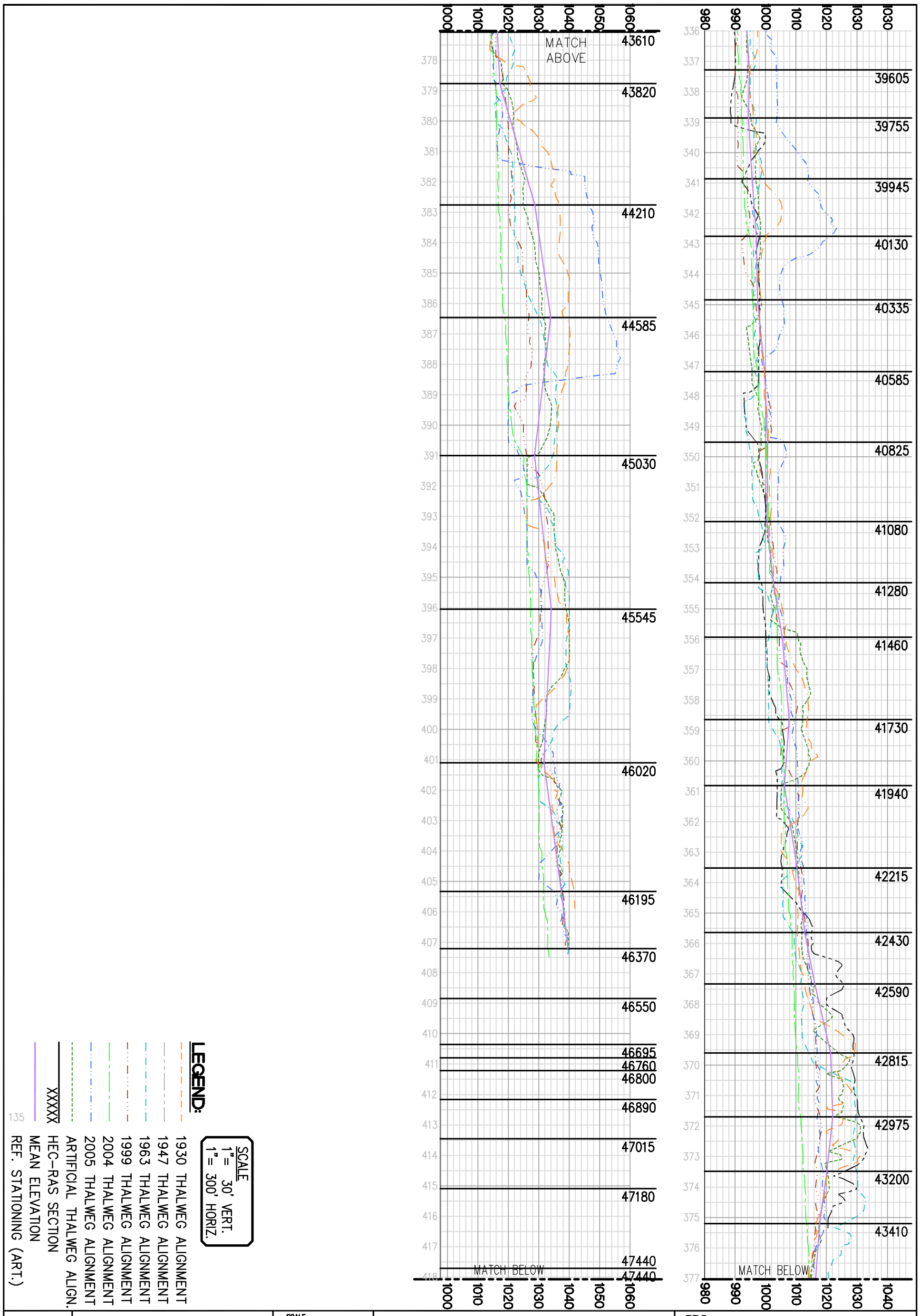

LEGEND:

- 1930 THALWEG ALIGNMENT
- 1947 THALWEG ALIGNMENT
- 1963 THALWEG ALIGNMENT
- 1999 THALWEG ALIGNMENT
- 2004 THALWEG ALIGNMENT
- 2005 THALWEG ALIGNMENT
- ARTIFICIAL THALWEG ALIGN.
- HEC-RAS SECTION
- MEAN ELEVATION
- REF. STATIONING (ART.)

135 XXXXX

SCALE
1"= 30' VERT.
1"= 300' HORIZ.

FIGURE A5.3.10

PACE
PACIFIC ADVANCED CIVIL ENGINEERING
17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

SCALE	1"= 300'
DESIGNED	DAJ
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DATE	09/13/05
JOB NO.	8197E

JOB
SANTA CLARA RIVER FLUVIAL STUDY
LOS ANGELES COUNTY CA

TITLE
SANTA CLARA RIVER HISTORIC BED PROFILES (2004 TOPO)

P:\8197E\Engineering\GlobalExhibits\8197 Historic Profiles - Santa Clara.dwg - Tab: 0 By: ddrahn on Mar. 14, 2006 at 05:03 pm

Xrefs: 8197-SantaClara-Profiles.dwg; 8197-11x17Exh-Tblk.dwg
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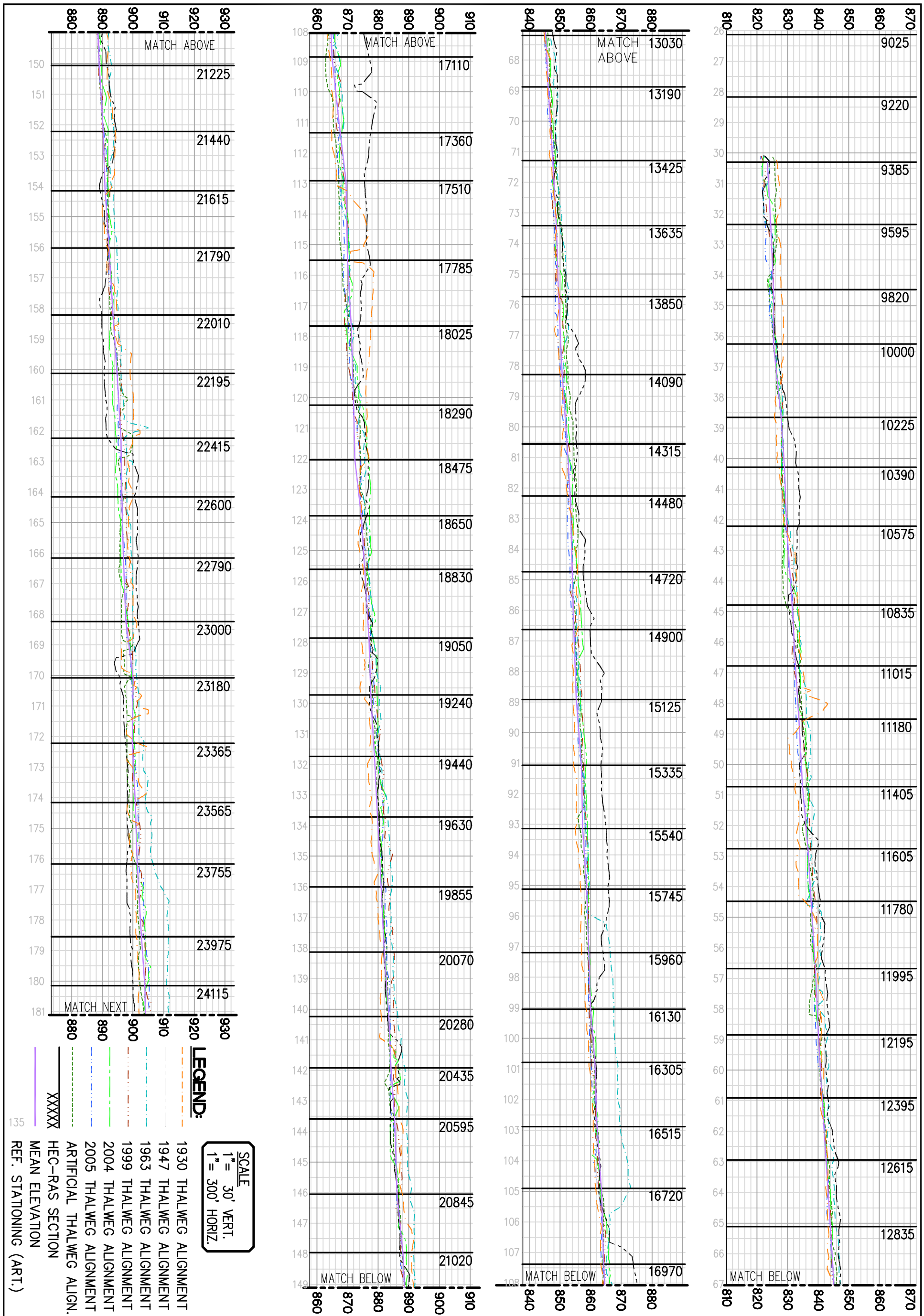


FIGURE A5.3.1P

PACE
PACIFIC ADVANCED CIVIL ENGINEERING
17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

SCALE	1"= 300'
DESIGNED	DAJ
DRAWN	DAD
CHECKED	MEK
DATE	09/13/05
JOB NO.	8197E

JOB
SANTA CLARA RIVER FLUVIAL STUDY
LOS ANGELES COUNTY CA

TITLE
SANTA CLARA RIVER HISTORIC BED PROFILES (2005 TOPO)

P:\8197E\Engineering\GlobalExhibits\8197 Historic Profiles - Santa Clara.dwg - Tab: P By: ddrahn on Mar. 14, 2006 at 05:03 pm

Xrefs: 8197-SantaClara-Profiles.dwg; 8197-11x17Exh-Tblk.dwg
Dimscale = 300; LTscale = 0.5; PSltscale = 1; Acad Ver. = 16.2s (LMS Tech); Visretain = 1

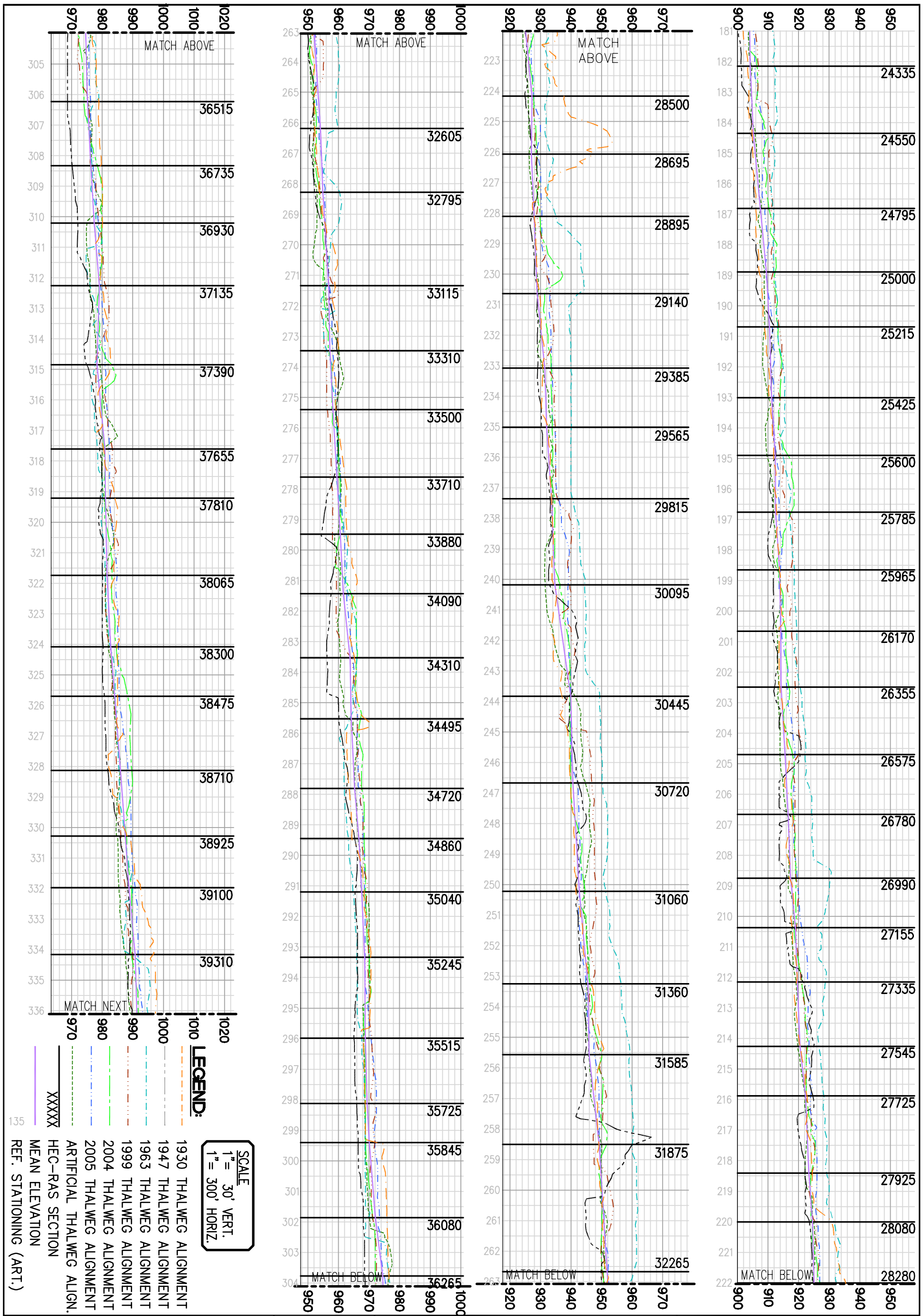


FIGURE A5.8.10

PACE
PACIFIC ADVANCED CIVIL ENGINEERING
17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

SCALE	1"= 300'
DESIGNED	DAJ
DRAWN	DAD
CHECKED	MEK
DATE	09/13/05
JOB NO.	8197E

JOB
SANTA CLARA RIVER FLUVIAL STUDY
LOS ANGELES COUNTY CA

TITLE
SANTA CLARA RIVER HISTORIC BED PROFILES (2005 TOPO)

P:\8197E\Engineering\GlobalExhibits\8197 Historic Profiles - Santa Clara.dwg - Tab: Q By: ddrahn on Mar. 14, 2006 at 05:03 pm

Xrefs: 8197-SantaClara-Profiles.dwg; 8197-11x17Exh-Tblk.dwg
Dimscale = 300; LTscale = 0.5; PSltscale = 1; Acad Ver. = 16.2s (LMS Tech); Visretain = 1

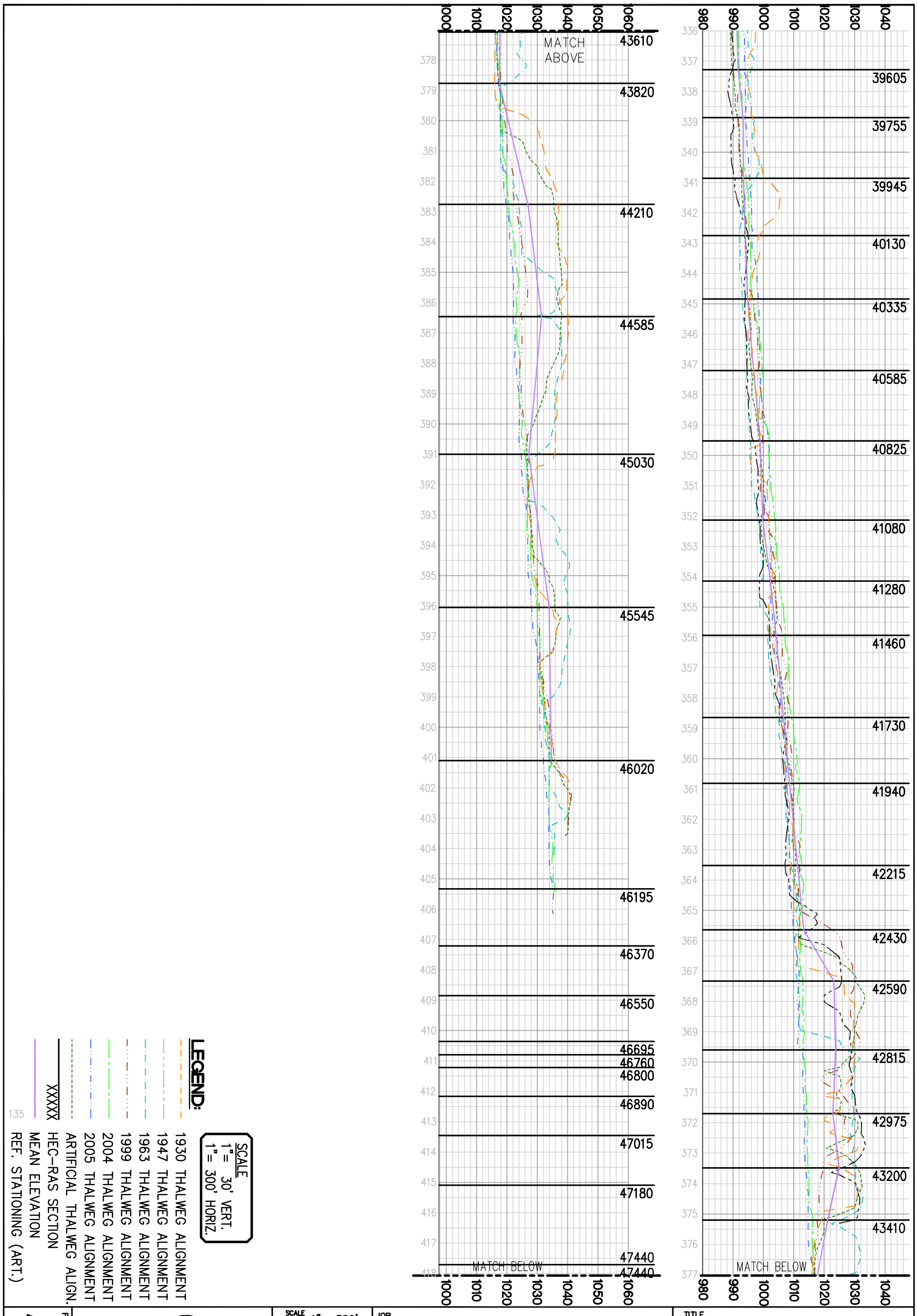


FIGURE A5.3.1R

PACE
PACIFIC ADVANCED CIVIL ENGINEERING
17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

SCALE	1"= 300'
DESIGNED	DAJ
DRAWN	DAD
CHECKED	MEK
DATE	09/13/05
JOB NO.	8197E

JOB
SANTA CLARA RIVER FLUVIAL STUDY
LOS ANGELES COUNTY CA

TITLE
SANTA CLARA RIVER HISTORIC BED PROFILES (2005 TOPO)

P:\8197E\Engineering\GlobalExhibits\8197 Historic Profiles - Santa Clara.dwg - Tab: R By: ddrahn on Mar. 14, 2006 at 05:03 pm

Santa Clara River Fluvial Study

APPENDIX CHAPTER 6.1A

LACH&SM Toe
Existing & Proposed Conditions
Curved & Straight Reaches

PACIFIC ADVANCED
CIVIL ENGINEERING, INC.

CALCULATIONS FOR TOTAL TOE-DOWN BY INDIVIDUAL ADJUSTMENT COMPONENT BASED ON LACH&SM -- SANTA CLARA RIVER EXISTING CONDITIONS OUTSIDE CURVED REACH C_{CAP} n=0.025

SECTION	Z_{MAX}=	Z_{TOT}=	V (FPS)	FLOW DEPTH (FT)	Z_{DEG}+	Z_{GS}+	PIER TYPE	B	ABUT TYPE	A	SOFT	Z_{LS}+	BEND COEFF	HYD DEPTH	E SLOPE	TOP WIDTH	RADIUS	Z_{BS}+	Z_f+	H/2	Z_{DM}=
46195	18.2	18.2	21.7	18.1	2.8	7.1	0	0.0	1	0.0	0	0.0	1	11.7	0.005	453.0	9000	0.0	2.0	6.3	14.0
46020	21.2	21.2	24.1	18.1	2.8	8.5	0	0.0	1	0.0	0	0.0	1	9.2	0.009	520.9	9000	0.0	2.0	7.9	14.0
45545	16.8	16.8	20.3	19.2	2.8	6.4	0	0.0	1	0.0	0	0.0	1	12.7	0.004	446.7	9000	0.0	2.0	5.6	14.0
45030	22.8	22.8	26.1	16.5	2.8	9.7	0	0.0	1	0.0	0	0.0	1	9.0	0.011	492.5	9000	0.0	2.0	8.3	14.0
44585	15.5	15.5	19.2	21.1	2.8	5.8	0	0.0	1	0.0	0	0.0	1	11.3	0.004	531.9	9000	0.0	2.0	5.0	14.0
44210	22.2	22.2	26.2	15.4	2.8	9.7	0	0.0	1	0.0	0	0.0	1	9.7	0.009	452.6	9000	0.0	2.0	7.7	14.0
43820	21.6	21.6	19.9	19.5	8.1	6.2	0	0.0	1	0.0	0	0.0	1	12.1	0.004	476.5	9000	0.0	2.0	5.3	14.0
43610	27.1	27.1	26.7	13.8	8.1	10.1	0	0.0	1	0.0	0	0.0	1	9.6	0.010	450.6	9000	0.0	2.0	6.9	14.0
43410	27.2	27.2	28.8	11.3	8.1	11.5	0	0.0	1	0.0	0	0.0	1	7.4	0.011	583.4	9000	0.0	2.0	5.7	14.0
43200	26.0	26.0	26.1	12.4	8.1	9.7	0	0.0	1	0.0	0	0.0	1	6.7	0.011	689.2	9000	0.0	2.0	6.2	14.0
42975	25.6	25.6	26.6	10.8	8.1	10.0	0	0.0	1	0.0	0	0.0	1	5.9	0.016	735.1	9000	0.0	2.0	5.4	14.0
42815	23.9	23.9	24.1	10.6	8.1	8.5	0	0.0	1	0.0	0	0.0	1	5.5	0.016	878.5	9000	0.0	2.0	5.3	14.0
42590	22.6	22.6	22.6	8.9	8.1	7.6	0	0.0	1	0.0	0	0.0	1	5.1	0.014	1023.2	9000	0.4	2.0	4.5	21.0
42430	21.7	21.7	20.8	9.6	8.1	6.6	0	0.0	1	0.0	0	0.0	1	5.9	0.012	940.5	9000	0.2	2.0	4.8	21.0
42215	15.3	15.3	10.4	14.3	8.1	2.2	0	0.0	1	0.0	0	0.0	1	8.5	0.002	1310.4	9000	1.5	2.0	1.5	15.0
41940	16.1	16.1	11.6	14.3	8.1	2.6	0	0.0	1	0.0	0	0.0	1	7.6	0.002	1321.5	9000	1.6	2.0	1.8	15.0
41730	16.0	16.0	11.8	14.7	8.1	2.7	0	0.0	1	0.0	0	0.0	1	8.0	0.002	1229.5	9000	1.3	2.0	1.9	15.0
41460	16.4	16.4	11.5	16.2	8.1	2.6	0	0.0	1	0.0	0	0.0	1	7.6	0.002	1329.0	9000	1.9	2.0	1.8	15.0
41280	15.4	15.4	16.5	14.3	5.2	4.5	0	0.0	1	0.0	0	0.0	1	8.2	0.004	852.1	9000	0.0	2.0	3.7	12.5
41080	18.7	18.7	19.9	12.1	5.2	6.2	0	0.0	1	0.0	0	0.0	1	6.7	0.007	874.2	9000	0.0	2.0	5.3	14.0
40825	21.0	17.4	18.0	11.5	5.2	5.2	0	0.0	1	0.0	0	0.0	1	6.2	0.007	1039.9	9000	0.5	2.0	4.4	21.0
40585	18.0	16.3	17.0	11.7	5.2	4.7	0	0.0	1	0.0	0	0.0	1	6.8	0.006	1005.9	9000	0.4	2.0	3.9	18.0
40335	15.0	13.5	11.1	14.5	5.2	2.4	0	0.0	1	0.0	0	0.0	1	7.1	0.002	1504.8	9000	2.2	2.0	1.7	15.0
40130	15.0	14.2	11.2	15.1	5.2	2.5	0	0.0	1	0.0	0	0.0	1	6.9	0.002	1636.5	9000	2.8	2.0	1.7	15.0
39945	15.0	13.8	10.3	16.1	5.2	2.2	0	0.0	1	0.0	0	0.0	1	7.6	0.001	1648.1	9000	3.0	2.0	1.4	15.0
39755	18.0	15.9	15.4	13.5	5.2	4.0	0	0.0	1	0.0	0	0.0	1	6.6	0.003	1251.4	9000	1.5	2.0	3.2	18.0
39605	21.0	19.0	19.4	11.4	5.2	5.9	0	0.0	1	0.0	0	0.0	1	5.8	0.007	1100.6	9000	0.8	2.0	5.1	21.0
39310	18.0	16.2	16.0	12.4	5.2	4.3	0	0.0	1	0.0	0	0.0	1	6.8	0.004	1204.5	9000	1.3	2.0	3.5	18.0
39100	15.0	13.8	12.4	14.1	5.2	2.9	0	0.0	1	0.0	0	0.0	1	7.8	0.002	1294.8	9000	1.6	2.0	2.1	15.0
38925	15.0	12.7	11.4	14.5	5.2	2.5	0	0.0	1	0.0	0	0.0	1	9.0	0.002	1181.3	9000	1.2	2.0	1.8	15.0
38710	15.0	9.2	10.6	15.9	2.7	2.3	0	0.0	1	0.0	0	0.0	1	10.8	0.001	1043.1	9000	0.7	2.0	1.5	15.0
38475	14.1	14.1	17.8	14.0	2.7	5.1	0	0.0	1	0.0	0	0.0	1	8.8	0.004	755.4	9000	0.0	2.0	4.3	12.5
38300	17.3	17.3	22.7	9.8	2.7	7.7	0	0.0	1	0.0	0	0.0	1	7.4	0.010	688.1	9000	0.0	2.0	4.9	14.0
38065	10.9	10.9	14.1	14.2	2.7	3.5	0	0.0	1	0.0	0	0.0	1	12.0	0.002	678.3	9000	0.0	2.0	2.7	10.0
37810	14.5	14.5	18.2	12.2	2.7	5.3	0	0.0	1	0.0	0	0.0	1	10.2	0.004	622.3	9000	0.0	2.0	4.5	14.0
37655	16.7	16.7	21.2	10.3	2.7	6.8	0	0.0	1	0.0	0	0.0	1	7.4	0.009	735.9	9000	0.0	2.0	5.1	14.0
37390	16.1	16.1	23.9	6.1	2.7	8.4	0	0.0	1	0.0	0	0.0	1	5.4	0.017	892.2	9000	0.0	2.0	3.1	14.0
37135	18.0	13.9	17.0	8.0	2.7	4.8	0	0.0	1	0.0	0	0.0	1	6.4	0.006	1088.9	9000	0.5	2.0	3.9	18.0
36930	21.0	14.6	18.3	7.9	2.7	5.4	0	0.0	1	0.0	0	0.0	1	6.0	0.007	1112.0	9000	0.6	2.0	3.9	21.0
36735	18.0	12.5	15.0	9.6	2.7	3.9	0	0.0	1	0.0	0	0.0	1	6.8	0.004	1195.7	9000	0.9	2.0	3.0	18.0
36515	18.0	14.3	16.7	9.6	2.7	4.6	0	0.0	1	0.0	0	0.0	1	5.5	0.006	1306.1	9000	1.2	2.0	3.8	18.0
36265	15.0	11.5	13.0	11.2	2.7	3.1	0	0.0	1	0.0	0	0.0	1	6.4	0.003	1373.1	9000	1.4	2.0	2.3	15.0
36080	15.0	11.8	12.5	11.7	3.2	2.9	0	0.0	1	0.0	0	0.0	1	6.4	0.004	1455.4	9000	1.6	2.0	2.1	15.0
35845	15.0	11.2	10.9	13.5	3.2	2.4	0	0.0	1	0.0	0	0.0	1	7.4	0.002	1496.2	9000	2.1	2.0	1.6	15.0
35725	15.0	13.9	14.7	13.0	3.2	3.8	0	0.0	1	0.0	0	0.0	1	6.3	0.003	1431.2	9000	2.1	2.0	2.9	15.0
35515	18.0	15.7	17.1	11.9	3.2	4.8	0	0.0	1	0.0	0	0.0	1	5.7	0.005	1353.4	9000	1.8	2.0	3.9	18.0
35245	15.0	14.1	14.5	12.5	3.2	3.7	0	0.0	1	0.0	0	0.0	1	5.8	0.003	1555.5	9000	2.4	2.0	2.8	15.0
35040	21.0	17.9	19.5	10.7	3.2	5.9	0	0.0	1	0.0	0	0.0	1	5.5	0.005	1355.9	9000	1.7	2.0	5.1	21.0
34860	21.0	16.2	18.1	10.1	3.2	5.3	0	0.0	1	0.0	0	0.0	1	4.8	0.008	1338.9	9000	1.3	2.0	4.4	21.0
34720	21.0	16.3	18.2	9.3	3.2	5.3	0	0.0	1	0.0	0	0.0	1	4.5	0.009	1411.5	9000	1.4	2.0	4.4	21.0
34495	21.0	15.8	18.1	8.9	3.2	5.3	0	0.0	1	0.0	0	0.0	1	5.0	0.009	1277.2	9000	1.0	2.0	4.4	21.0
34310	18.0	15.5	17.6	9.0	3.2	5.0	0	0.0	1	0.0	0	0.0	1	5.7	0.005	1280.8	9000	1.1	2.0	4.2	18.0
34090	18.0	14.9	17.2	8.6	3.2	4.8	0	0.0	1	0.0	0	0.0	1	5.4	0.007	1267.8	9000	1.0	2.0	4.0	18.0
33880	18.0	14.1	15.8	9.8	3.4	4.2	0	0.0	1	0.0	0	0.0	1	5.6	0.005	1310.6	9000	1.2	2.0	3.3	18.0
33710	18.0	14.9	16.5	9.4	3.4	4.6	0	0.0	1	0.0	0	0.0	1	5.2	0.007	1355.1	9000	1.3	2.0	3.7	18.0
33500	18.0	14.5	15.8	9.5	3.4	4.2	0	0.0	1	0.0	0	0.0	1	5.4	0.006	1474.3	9000	1.5	2.0	3.4	18.0
33310	18.0	15.1	15.9	9.1	3.4	4.3	0	0.0	1	0.0	0	0.0	1	4.2	0.006	1744.5	9000	2.1	2.0	3.4	18.0
33115	18.0	14.2	15.5	8.7	3.4	4.1	0	0.0	1	0.0	0	0.0	1	4.8	0.009	1573.2	9000	1.5	2.0	3.3	18.0
32795	15.0	12.5	12.2	11.0	3.4	2.8	0	0.0	1	0.0	0	0.0	1	5.5	0.003	1732.9	9000	2.3	2.0	2.0	15.0
32605	15.0	13.0	14.1	11.5	3.4	3.5	0	0.0	1	0.0	0	0.0	1	6.2	0.004	1344.6	9000	1.4	2.0	2.7	15.0
32265	18.0	14.8	16.7	10.2	2.0	4.6	0	0.0	1	0.0	0	0.0	1	4.6	0.007	1829.9	9000	2.5	2.0	3.8	18.0
31875	15.0	11.2	10.9	11.0	2.0	2.4	0	0.0	1	0.0	0	0.0	1	5.2	0.004	2482.2	9000	3.3	2.0	1.6	15.0
31585	18.0	15.2	16.6	9.8	2.0	4.6	0	0.0	1	0.0	0	0.0	1	4.0	0.009	2120.3	9000	2.9	2.0	3.7	18.0
31360	12.0	10.3	9.8	13.9	2.0	2.0	0	0.0	1	0.0	0	0.0	1	7.8	0.001	1884.4	9000	3.0	2.0	1.3	12.0
31060	12.0	9.0	7.9	15.9	2.0	1.5	0	0.0	1	0.0	0	0.0	1	10.5	0.001	1711.5	9000	2.7	2.0	0.8	12.0
30720	12.0	9.1	6.4	18.0	2.0	1.1	0	0.0	1	0.0	0	0.0	1	11.6	0.000	1891.7	9000	3.5	2.0	0.6	12.0
30445	12.0	9.0	6.0	19.9	2.0	1.0	0	0.0	1	0.0	0	0.0	1	13.1	0.000	1783.7	9000	3.5	2.0	0.5	12.0
30095	12.0	9.8	6.6	21.7	2.0	1.1	0	0.0	1	0.0	0	0.0	1	12.7	0.000	1730.3	9000	4.1	2.0	0.6	12.0
29815	12.0	10.5	7.7	22.4	2.0	1.4	0	0.0	1	0.0	0	0.0	1	11.7	0.000	1675.2	9000	4.3	2.0	0.8	12.0
29565	12.0	10.7	7.4	23.3	2.0	1.3	0	0.0	1	0.0	0	0.0	1	11.8	0.000	1717.4	9000	4.6	2.0	0.7	12.0
29385	12.0	11.4	8.5	24.0	2.0	1.6	0	0.0	1	0.0	0	0.0	1	10.8	0.000	1675.1	9000	4.8	2.0	1.0	12.0
29140	15.0	14.3	10.1	24.3	4.4	2.1	0	0.0	1	0.0	0	0.0	1	9.3	0.001	1557.6	9000	4.4	2.0	1.4	15.0
28895	21.0	19.2	19.7	22.4	4.4	6.0	0	0.0	1	0.0	0	0.0	1	8.6	0.002	1062.3	9000	1.6	2.0	5.2	21.0
28695	25.0	25.0	27.5	16.0	4.4	10.6	0	0.0	1	0.0	0	0.0	1	9.4	0.009	544.9	9000	0.0	2.0	8.0	14.0
28500	24.5	24.5	28.6	13.6	4.4	11.4	0	0.0	1	0.0	0	0.0	1	9.8	0.010	503.7	9000	0.0	2.0	6.8	14.0
28280	24.4	24.4	29.7	11.8	4.4	12.1	0	0.0	1	0.0	0	0.0	1	8.8	0.011	549.3	9000	0.0	2.0	5.9	14.0
28080	23.1	23.1	28.1	11.4	4.4	11.0	0	0.0	1	0.0	0	0.0	1	9.2	0.011	547.6	9000	0.0	2.0	5.7	14.0
27925	15.9	15.9	18.0	17.5	4.4	5.2	0	0.0	1	0.0	0	0.0	1	13.0	0.002	612.7	9000	0.0	2.0	4.3	12.5
27725	18.6	18.6	20.5	16.3	4.4	6.5	0	0.0	1	0.0	0	0.0	1	12.1	0.003	587.1	9000	0.0	2.0	5.7	14.0
27545	21.8	21.8	24.7	13.2	4.4	8.8	0	0.0	1	0.0	0	0.0	1	9.5	0.007	613.0	9000	0.0	2.0	6.6	14.0
27335	21.7	21.7	25.5	12.0	4.4	9.3	0	0.0	1	0.0	0	0.0	1	8.1	0.008	691.0	9000	0.0	2.0	6.0	14.0
27155	20.4	20.4	22.3	13.2	4.4	7.4	0	0.0	1	0.0	0	0.0	1	8.0	0.005	856.6	9000	0.0	2.0	6.6	14.0
26990	21.0	18.2	23.5	11.2	2.0	8.1	0	0.0	1	0.0	0	0.0	1	6.0	0.010	1008.2	9000	0.5	2.0	5.6	21.0
26780	21.0	18.9	23.9	11.0	2.0	8.4	0	0.0	1	0.0	0	0.0	1	5.6	0.010	1131.7	9000	1.0	2.0	5.5	21.0
26575	21.5	21.5	21.0	11.0	2.0	6.7	0	0.0	1	0.0	0	0.0	1	5.5	0.013	1216.4	3000	5.3	2.0	5.5	21.0
26355	18.6	18.6	15.8	13.4	2.0	4.2	0	0.0	1	0.0	0	0.0	1	7.5	0.003	1282.4	3000	7.0	2.0	3.4	18.0
26170	21.3	21.3	18.0	13.0	2.0	5.2	0	0.0	1	0.0	0	0.0	1	6.8	0.004	1347.9	3000	7.7	2.0	4.4	18.0

DEFINITIONS

V(FPS) =VELOCITY IN FEET PER SECOND
Z_{TOT}=TOTAL POTENTIAL VERTICAL ADJUSTMENT IN FEET
Z_{DEG}=LONG TERM DEGRADATION IN FEET
Z_{GS}=GENERAL SCOUR IN FEET
Z_{LS}=LOCAL SCOUR IN FEET
PIER TYPE=PIER SHAPE FACTOR; IF NO PIERS=**0**
=SQUARE NOSE; **0.9** ROUND NOSE; **0.9** CYLINDER;
1.0 SHARP NOSE; **0.9** GROUP OF CYLINDERS
1.0
FLOW DEPTH=WATER DEPTH IN CHANNEL IN FEET
B=WIDTH OF PIERS IN FEET; NO PIER=0
ABUT TYPE=VERT WALL FACTOR; IF VERT=**2**; NON VERT=**1**
A=ABUTMENT PROTRUSION INTO FLOW PATH IN FEET
SOFT = SOFT BOTTOM AT A BRIDGE OR AN ABUTMENT
= HARD BOTTOM; **1** = SOFT BOTTOM
Z_{BS}=BEND SCOUR IN FEET
BEND COEFF=BEND COEFFICIENT; IF NO BEND=0, BEND=1
HYD DEPTH=HYDRAULIC DEPTH IN FEET
E SLOPE=ENERGY SLOPE, UNITLESS
TOP WIDTH=CHANNEL TOP WIDTH IN FEET
RADIUS=RADIUS OF CURVATURE TO CENTERLINE IN FEET
Z_f=LOW-FLOW INCISEMENT IN FEET, MEASURED OR 2'; VALUE **NOT LESS THAN 2'**
H=BEDFORM HEIGHT IN FEET, LIMITED TO FLOW DEPTH AFTER KENNEDY (1963)
Z_{DM}=CUT OFF DEPTH REQUIRED BY LACFCDDM

GENERAL

THIS SPREADSHEET IS DESIGNED TO CALCULATE SCOUR PROTECTION (TOE DOWN) BASED ON LADPW COUNTY HYDROLOGY MANUAL (1991) PAGES 5.2-5.8 AND ASSOCIATED APPENDICES (SEDIMENTATION MANUAL). ALL VELOCITIES ARE IN FPS, WITH A MAXIMUM VALUE LIMITED BY THE EQUATION. THE PRESENT VERSION (10/04) WILL CALCULATE UP TO 50 VELOCITIES AT ONE TIME. LONG TERM DEGRADATION IS USER SUPPLIED. GENERAL SCOUR IS TAKEN FROM APPENDIX Q3, INTERPOLATED. LOCAL SCOUR AT BENDS AND ABUTMENTS ARE BASED ON LADWP EQUATIONS FOUND IN APP Q12. BEND SCOUR IS BASED ON EQUATIONS IN APPENDIX Q12. A LONGITUDINAL EXTENT BASED ON SECONDARY CURRENTS IS NOT INCLUDED. BEDFORM HEIGHT IS BASED ON EQUATIONS IN APPENDIX Q13. JULY 2005 REVISION INCLUDES CALCULATION FOR CUT OFF DEPTH BASED ON LOS ANGELES COUNTY FLOOD CONTROL DISTRICT DESIGN MANUAL. THE CALCULATION DOES NOT CONSIDER ADJUSTMENTS TO CUT OFF DEPTH BASED ON TABLE F-06 THE OCTOBER 2005 REVISION INCLUDES ADDITIONAL TOEDOWN AT BRIDGES/ABUTMENTS WITH SOFT BOTTOMS.

COLOR CODES

OUTPUT
DATA FROM HEC-RAS
USER SUPPLIED DATA
INTERMEDIATE CALCULATIONS (INDIVIDUAL SHEETS ONLY)

DESIGNED BY DAVID A JAFFE, PHD, PE
PACIFIC ADVANCED CIVIL ENGINEERING, INC
OCTOBER, 2004
OCTOBER 2005, REVISED

SECTION	Z_{MAX}=	Z_{TOT}=	V (FPS)	FLOW DEPTH (FT)	Z_{NEG}+	Z_{GS}+	PIER TYPE	B	ABUT TYPE	A	SOFT	Z_{LS}+	BEND COEFF	HYD DEPTH	E SLOPE	TOP WIDTH	RADIUS	Z_{BS}+	Z_L+	H/2	Z_{INV}=
25965	20.9	20.9	17.9	13.0	2.0	5.2	0	0.0	1	0.0	0	0.0	1	7.0	0.004	1288.3	3000	7.4	2.0	4.3	18.0
25785	22.1	22.1	19.5	11.7	2.0	6.0	0	0.0	1	0.0	0	0.0	1	6.2	0.005	1336.9	3000	7.0	2.0	5.2	21.0
25600	24.5	24.5	20.6	11.3	2.0	6.5	0	0.0	1	0.0	0	0.0	1	5.2	0.006	1596.5	3000	8.3	2.0	5.6	21.0
25425	24.3	24.3	20.0	11.3	2.0	6.2	0	0.0	1	0.0	0	0.0	1	4.4	0.008	1773.8	3000	8.7	2.0	5.4	21.0
25215	19.6	19.6	14.5	13.6	2.0	3.7	0	0.0	1	0.0	0	0.0	1	6.1	0.003	1748.6	3000	9.0	2.0	2.8	15.0
25000	23.5	23.5	17.4	12.2	2.0	5.0	0	0.0	1	0.0	0	0.0	1	4.4	0.006	2103.2	3000	10.5	2.0	4.1	18.0
24795	25.4	25.4	19.0	11.4	2.0	5.7	0	0.0	1	0.0	0	0.0	1	3.9	0.007	2311.7	3000	10.8	2.0	4.9	21.0
24550	26.5	26.5	21.3	10.8	2.0	6.9	0	0.0	1	0.0	0	0.0	1	3.8	0.009	2227.0	3000	10.2	2.0	5.4	21.0
24335	20.7	20.7	14.5	13.1	2.0	3.7	0	0.0	1	0.0	0	0.0	1	5.7	0.003	2089.5	3000	10.2	2.0	2.8	15.0
24115	23.1	23.1	18.8	11.1	2.0	5.6	0	0.0	1	0.0	0	0.0	1	4.5	0.008	2015.8	3000	8.7	2.0	4.8	21.0
23975	22.3	22.3	19.0	10.2	2.0	5.7	0	0.0	1	0.0	0	0.0	1	4.6	0.008	1913.7	3000	7.7	2.0	4.9	21.0
23755	20.4	20.4	16.7	10.9	2.0	4.6	0	0.0	1	0.0	0	0.0	1	5.1	0.006	1935.4	3000	8.0	2.0	3.8	18.0
23565	19.8	19.8	14.5	12.7	2.0	3.7	0	0.0	1	0.0	0	0.0	1	5.6	0.004	2039.5	3000	9.3	2.0	2.8	15.0
23365	20.1	20.1	17.0	10.8	2.0	4.8	0	0.0	1	0.0	0	0.0	1	5.4	0.006	1781.4	3000	7.4	2.0	3.9	18.0
23180	18.7	18.7	13.2	11.8	2.0	3.2	0	0.0	1	0.0	0	0.0	1	6.6	0.002	2084.2	3000	9.2	2.0	2.3	15.0
23000	14.7	14.7	8.9	13.0	2.0	1.7	0	0.0	1	0.0	0	0.0	1	7.7	0.001	2069.1	3000	7.9	2.0	1.1	12.0
22790	14.9	14.9	9.4	13.1	2.0	1.9	0	0.0	1	0.0	0	0.0	1	7.8	0.001	1949.0	3000	7.8	2.0	1.2	12.0
22600	17.6	17.6	11.4	14.1	2.0	2.5	0	0.0	1	0.0	0	0.0	1	7.9	0.001	1865.2	3000	9.3	2.0	1.7	15.0
22415	17.3	17.3	11.8	14.1	2.0	2.7	0	0.0	1	0.0	0	0.0	1	8.1	0.002	1705.6	3000	8.7	2.0	1.9	15.0
22195	17.3	17.3	14.1	13.7	2.0	3.5	0	0.0	1	0.0	0	0.0	1	7.8	0.003	1322.2	3000	7.1	2.0	2.7	15.0
22010	19.9	19.9	16.0	14.4	2.0	4.3	0	0.0	1	0.0	0	0.0	1	7.3	0.003	1328.0	3000	8.2	2.0	3.5	18.0
21790	21.2	21.2	19.7	11.6	2.0	6.0	0	0.0	1	0.0	0	0.0	1	6.5	0.006	1145.7	3000	5.9	2.0	5.2	21.0
21615	21.0	19.4	21.4	8.5	2.0	6.9	0	0.0	1	0.0	0	0.0	1	5.8	0.010	1161.3	3000	4.2	2.0	4.3	21.0
21440	21.7	21.7	20.1	9.7	2.0	6.3	0	0.0	1	0.0	0	0.0	1	5.0	0.008	1574.6	3000	6.6	2.0	4.8	21.0
21225	24.8	24.8	19.5	10.6	2.0	5.9	0	0.0	1	0.0	0	0.0	1	3.9	0.008	2217.7	3000	9.7	2.0	5.1	21.0
21020	21.5	21.5	20.8	8.9	2.0	6.6	0	0.0	1	0.0	0	0.0	1	4.6	0.009	1676.4	3000	6.5	2.0	4.4	21.0
20845	22.3	22.3	17.1	10.4	2.0	4.8	0	0.0	1	0.0	0	0.0	1	4.2	0.006	2369.3	3000	9.6	2.0	3.9	18.0
20595	21.4	21.4	15.2	10.9	2.0	4.0	0	0.0	1	0.0	0	0.0	1	4.7	0.003	2463.7	3000	10.3	2.0	3.1	18.0
20435	20.7	20.7	12.9	12.2	2.0	3.1	0	0.0	1	0.0	0	0.0	1	5.4	0.002	2582.7	3000	11.3	2.0	2.3	15.0
20280	21.1	21.1	14.0	11.8	2.0	3.5	0	0.0	1	0.0	0	0.0	1	5.0	0.003	2589.6	3000	11.0	2.0	2.6	15.0
20070	21.6	21.6	20.2	9.2	2.0	6.3	0	0.0	1	0.0	0	0.0	1	4.7	0.009	1767.5	3000	6.7	2.0	4.6	21.0
19855	21.3	21.3	17.8	9.9	2.0	5.1	0	0.0	1	0.0	0	0.0	1	4.8	0.006	1975.1	3000	7.9	2.0	4.3	18.0
19630	20.0	20.0	17.9	8.9	2.0	5.2	0	0.0	1	0.0	0	0.0	1	4.9	0.006	1836.2	3000	6.6	2.0	4.3	18.0
19440	17.5	17.5	11.9	12.1	2.0	2.7	0	0.0	1	0.0	0	0.0	1	6.5	0.002	2095.3	3000	8.9	2.0	1.9	15.0
19240	18.8	18.8	13.9	11.4	2.0	3.5	0	0.0	1	0.0	0	0.0	1	5.6	0.003	2091.7	3000	8.7	2.0	2.6	15.0
19050	17.1	17.1	11.0	12.9	2.0	2.4	0	0.0	1	0.0	0	0.0	1	6.7	0.002	2160.8	3000	9.1	2.0	1.6	15.0
18830	17.9	17.9	10.7	14.6	2.0	2.3	0	0.0	1	0.0	0	0.0	1	7.1	0.002	2094.4	3000	10.1	2.0	1.5	15.0
18650	17.5	17.5	9.9	15.0	2.0	2.1	0	0.0	1	0.0	0	0.0	1	8.0	0.001	2022.7	3000	10.1	2.0	1.3	12.0
18475	16.1	16.1	8.1	16.6	2.0	1.5	0	0.0	1	0.0	0	0.0	1	9.4	0.001	1944.4	3000	9.7	2.0	0.9	12.0
18290	16.6	16.6	8.7	16.8	2.0	1.7	0	0.0	1	0.0	0	0.0	1	9.3	0.001	1843.7	3000	9.9	2.0	1.0	12.0
18025	8.0	6.3	7.8	18.2	2.0	1.5	0	0.0	1	0.0	0	0.0	1	11.5	0.001	1610.9	17000	0.0	2.0	0.8	8.0
17785	8.0	6.7	8.7	19.8	2.0	1.7	0	0.0	1	0.0	0	0.0	1	11.6	0.001	1417.5	17000	0.0	2.0	1.0	8.0
17510	10.1	10.1	14.0	18.0	2.0	3.5	0	0.0	1	0.0	0	0.0	1	8.5	0.002	1243.6	17000	0.0	2.0	2.6	10.0
17360	12.7	12.7	17.0	16.9	2.0	4.8	0	0.0	1	0.0	0	0.0	1	8.9	0.004	936.6	17000	0.0	2.0	3.9	12.5
17110	17.5	17.5	21.7	15.4	2.0	7.1	0	0.0	1	0.0	0	0.0	1	5.6	0.006	1274.3	17000	0.0	2.0	6.4	14.0
16970	18.6	18.6	22.9	13.6	2.0	7.8	0	0.0	1	0.0	0	0.0	1	5.7	0.008	1125.6	17000	0.0	2.0	6.8	14.0
16720	17.6	17.6	25.2	9.0	2.0	9.1	0	0.0	1	0.0	0	0.0	1	4.1	0.018	1404.6	17000	0.0	2.0	4.5	14.0
16515	15.7	15.7	21.5	9.5	2.0	7.0	0	0.0	1	0.0	0	0.0	1	4.3	0.012	1622.6	17000	0.0	2.0	4.8	14.0
16305	21.0	16.1	21.5	9.6	2.0	7.0	0	0.0	1	0.0	0	0.0	1	4.2	0.011	1812.8	17000	0.3	2.0	4.8	21.0
16130	18.0	12.3	16.1	10.2	2.0	4.3	0	0.0	1	0.0	0	0.0	1	5.2	0.005	1945.1	17000	0.5	2.0	3.5	18.0
15960	18.0	12.3	15.8	9.3	2.0	4.2	0	0.0	1	0.0	0	0.0	1	4.1	0.011	2180.9	17000	0.7	2.0	3.4	18.0
15745	15.0	8.9	10.9	10.6	2.0	2.4	0	0.0	1	0.0	0	0.0	1	5.7	0.003	2279.0	17000	0.9	2.0	1.6	15.0
15540	15.0	9.0	11.0	10.6	2.0	2.4	0	0.0	1	0.0	0	0.0	1	5.8	0.003	2324.2	17000	1.0	2.0	1.6	15.0
15335	15.0	10.1	12.7	10.5	2.0	3.0	0	0.0	1	0.0	0	0.0	1	4.9	0.005	2302.1	17000	1.0	2.0	2.2	15.0
15125	12.5	11.9	16.2	9.6	2.0	4.4	0	0.0	1	0.0	0	0.0	1	5.5	0.007	1618.5	17000	0.0	2.0	3.5	12.5
14900	15.0	10.6	14.5	10.4	2.0	3.7	0	0.0	1	0.0	0	0.0	1	6.1	0.004	1704.5	17000	0.1	2.0	2.9	15.0
14720	18.0	12.7	16.8	9.3	2.0	4.7	0	0.0	1	0.0	0	0.0	1	5.1	0.008	1763.5	17000	0.1	2.0	3.8	18.0
14480	15.0	10.6	14.3	10.2	2.0	3.6	0	0.0	1	0.0	0	0.0	1	6.0	0.004	1801.7	17000	0.2	2.0	2.7	15.0
14315	15.0	11.1	14.8	9.4	2.0	3.8	0	0.0	1	0.0	0	0.0	1	5.2	0.006	1868.1	17000	0.3	2.0	3.0	15.0
14090	15.0	10.1	13.8	9.0	2.0	3.4	0	0.0	1	0.0	0	0.0	1	5.9	0.005	1766.8	17000	0.1	2.0	2.6	15.0
13850	18.0	11.5	15.6	8.4	2.0	4.2	0	0.0	1	0.0	0	0.0	1	5.3	0.007	1727.3	17000	0.1	2.0	3.3	18.0
13635	12.5	11.3	15.4	10.3	2.0	4.1	0	0.0	1	0.0	0	0.0	1	6.4	0.004	1691.9	17000	0.0	2.0	3.2	12.5
13425	18.0	13.2	17.3	8.3	2.0	4.9	0	0.0	1	0.0	0	0.0	1	4.5	0.009	1854.4	17000	0.3	2.0	4.0	18.0
13190	15.0	9.1	12.2	9.5	2.0	2.8	0	0.0	1	0.0	0	0.0	1	6.4	0.003	1847.3	17000	0.3	2.0	2.0	15.0
13030	15.0	10.4	14.2	9.6	2.0	3.6	0	0.0	1	0.0	0	0.0	1	6.5	0.003	1763.0	17000	0.2	2.0	2.7	15.0
12835	10.0	9.6	13.3	10.1	2.0	3.2	0	0.0	1	0.0	0	0.0	1	7.3	0.003	1607.5	17000	0.0	2.0	2.4	10.0
12615	10.0	9.0	12.4	10.9	2.0	2.9	0	0.0	1	0.0	0	0.0	1	8.7	0.002	1471.0	17000	0.0	2.0	2.1	10.0
12395	10.0	8.9	12.3	11.5	2.0	2.9	0	0.0	1	0.0	0	0.0	1	9.0	0.002	1438.4	17000	0.0	2.0	2.0	10.0
12195	10.0	7.8	10.6	12.5	2.0	2.3	0	0.0	1	0.0	0	0.0	1	10.3	0.001	1389.3	17000	0.0	2.0	1.5	10.0
11995	10.0	9.2	12.7	13.7	2.0	3.0	0	0.0	1	0.0	0	0.0	1	9.8	0.002	1281.1	17000	0.0	2.0	2.2	10.0
11780	10.0	9.0	12.5	14.4	2.0	2.9	0	0.0	1	0.0	0	0.0	1	9.4	0.001	1400.9	17000	0.0	2.0	2.1	10.0
11605	10.2	10.2	14.1	13.7	2.0	3.5	0	0.0	1	0.0	0	0.0	1	8.7	0.002	1282.9	17000	0.0	2.0	2.7	10.0
11405	10.0	9.5	13.2	15.1	2.0	3.2	0	0.0	1	0.0	0	0.0	1	10.1	0.002	1130.2	17000	0.0	2.0	2.3	10.0
11180	12.5	12.3	16.6	13.9	2.0	4.6	0	0.0	1	0.0	0	0.0	1	10.6	0.003	835.7	17000	0.0	2.0	3.7	12.5
11015	14.7	14.7	19.1	13.3	2.0	5.7	0	0.0	1	0.0	0	0.0	1	11.0	0.004	679.4	17000	0.0	2.0	4.9	14.0
10835	16.7	16.7	21.9	10.9	2.0	7.2	0	0.0	1	0.0	0	0.0	1	8.2	0.007	790.4	17000	0.0	2.0	5.4	14.0
10575	16.2	16.2	24.1	7.5	2.0	8.5	0	0.0	1	0.0	0	0.0	1	5.3	0.016	1108.8	17000	0.0	2.0	3.7	14.0
10390	16.1	16.1	22.7	8.8	2.0	7.7	0	0.0	1	0.0	0	0.0	1	5.8	0.008	1247.1	17000	0.0	2.0	4.4	14.0
10225	13.4	13.4	17.8	9.5	2.0	5.1	0	0.0	1	0.0	0	0.0	1	5.9	0.007	1373.8	17000	0.0	2.0	4.3	12.5
10000	10.9	10.9	14.9	11.1	2.0	3.9	0	0.0	1	0.0	0	0.0	1	6.6	0.004	1488.0	17000	0.0	2.0	3.0	10.0
9820	14.2	14.2	18.6	10.0	2.0	5.5	0	0.0	1	0.0	0	0.0	1	5.7	0.008	1336.6	17000	0.0	2.0	4.7	14.0
9595	10.6	10.6	14.6	10.3	2.0	3.7	0	0.0	1	0.0	0	0.0	1	6.6	0.005	1619.7	17000	0.0	2.0	2.9	10.0
9385	18.0	11.7	15.8	9.5	2.0	4.2	0	0.0	1	0.0	0	0.0	1	5.3	0.006	1770.4	17000	0.2	2.0	3.4	18.0
9220	18.0	12.3	16.4	8.9	2.0	4.5	0	0.0	1	0.0	0	0.0	1	4.9	0.008	1771.4	17000	0.1	2.0	3.6	18.0
9025	18.0	11.8	15.9	8.9	2.0	4.3	0	0.0	1	0.0	0	0.0	1	5.5	0.005	1736.9	17000	0.1	2.0	3.4	18.0
MAX=	27.2	27.2			8.1	12.1						0.0					17000.0	11.3	2.0	8.3	21.0
MIN=	8.0	6.3			2.0	1.0						0.0					3000.0	0.0	2.0	0.5	8.0

CALCULATIONS FOR TOTAL TOE-DOWN BY INDIVIDUAL ADJUSTMENT COMPONENT BASED ON LACH&SM -- SANTA CLARA RIVER EXISTING CONDITIONS STRAIGHT-INSIDE CURVED REACH, Q_{50} n=0.025

SECTION	Z_{MAX}=	Z_{TOT}=	V (FPS)	FLOW DEPTH (FT)	Z_{DEG}+	Z_{GS}+	PIER TYPE	B	ABUT TYPE	A	SOFT	Z_{LS}+	BEND COEFF	HYD DEPTH	E SLOPE	TOP WIDTH	RADIUS	Z_{BS}+	Z_I+	H/2	Z_{DM}=
46195	18.2	18.2	21.7	18.1	2.8	7.1	0	0.0	1	0.0	0	0.0	0	11.7	0.005	453.0	9000	0.0	2.0	6.3	14.0
46020	21.2	21.2	24.1	18.1	2.8	8.5	0	0.0	1	0.0	0	0.0	0	9.2	0.009	520.9	9000	0.0	2.0	7.9	14.0
45545	16.8	16.8	20.3	19.2	2.8	6.4	0	0.0	1	0.0	0	0.0	0	12.7	0.004	446.7	9000	0.0	2.0	5.6	14.0
45030	22.8	22.8	26.1	16.5	2.8	9.7	0	0.0	1	0.0	0	0.0	0	9.0	0.011	492.5	9000	0.0	2.0	8.3	14.0
44585	15.5	15.5	19.2	21.1	2.8	5.8	0	0.0	1	0.0	0	0.0	0	11.3	0.004	531.9	9000	0.0	2.0	5.0	14.0
44210	22.2	22.2	26.2	15.4	2.8	9.7	0	0.0	1	0.0	0	0.0	0	9.7	0.009	452.6	9000	0.0	2.0	7.7	14.0
43820	21.6	21.6	19.9	19.5	8.1	6.2	0	0.0	1	0.0	0	0.0	0	12.1	0.004	476.5	9000	0.0	2.0	5.3	14.0
43610	27.1	27.1	26.7	13.8	8.1	10.1	0	0.0	1	0.0	0	0.0	0	9.6	0.010	450.6	9000	0.0	2.0	6.9	14.0
43410	27.2	27.2	28.8	11.3	8.1	11.5	0	0.0	1	0.0	0	0.0	0	7.4	0.011	583.4	9000	0.0	2.0	5.7	14.0
43200	26.0	26.0	26.1	12.4	8.1	9.7	0	0.0	1	0.0	0	0.0	0	6.7	0.011	689.2	9000	0.0	2.0	6.2	14.0
42975	25.6	25.6	26.6	10.8	8.1	10.0	0	0.0	1	0.0	0	0.0	0	5.9	0.016	735.1	9000	0.0	2.0	5.4	14.0
42815	23.9	23.9	24.1	10.6	8.1	8.5	0	0.0	1	0.0	0	0.0	0	5.5	0.016	878.5	9000	0.0	2.0	5.3	14.0
42590	22.2	22.2	22.6	8.9	8.1	7.6	0	0.0	1	0.0	0	0.0	0	5.1	0.014	1023.2	9000	0.0	2.0	4.5	14.0
42430	21.6	21.6	20.8	9.6	8.1	6.6	0	0.0	1	0.0	0	0.0	0	5.9	0.012	940.5	9000	0.0	2.0	4.8	14.0
42215	13.8	13.8	10.4	14.3	8.1	2.2	0	0.0	1	0.0	0	0.0	0	8.5	0.002	1310.4	9000	0.0	2.0	1.5	10.0
41940	14.5	14.5	11.6	14.3	8.1	2.6	0	0.0	1	0.0	0	0.0	0	7.6	0.002	1321.5	9000	0.0	2.0	1.8	10.0
41730	14.6	14.6	11.8	14.7	8.1	2.7	0	0.0	1	0.0	0	0.0	0	8.0	0.002	1229.5	9000	0.0	2.0	1.9	10.0
41460	14.5	14.5	11.5	16.2	8.1	2.6	0	0.0	1	0.0	0	0.0	0	7.6	0.002	1329.0	9000	0.0	2.0	1.8	10.0
41280	15.4	15.4	16.5	14.3	5.2	4.5	0	0.0	1	0.0	0	0.0	0	8.2	0.004	852.1	9000	0.0	2.0	3.7	12.5
41080	18.7	18.7	19.9	12.1	5.2	6.2	0	0.0	1	0.0	0	0.0	0	6.7	0.007	874.2	9000	0.0	2.0	5.3	14.0
40825	16.8	16.8	18.0	11.5	5.2	5.2	0	0.0	1	0.0	0	0.0	0	6.2	0.007	1039.9	9000	0.0	2.0	4.4	14.0
40585	15.8	15.8	17.0	11.7	5.2	4.7	0	0.0	1	0.0	0	0.0	0	6.8	0.006	1005.9	9000	0.0	2.0	3.9	12.5
40335	11.3	11.3	11.1	14.5	5.2	2.4	0	0.0	1	0.0	0	0.0	0	7.1	0.002	1504.8	9000	0.0	2.0	1.7	10.0
40130	11.3	11.3	11.2	15.1	5.2	2.5	0	0.0	1	0.0	0	0.0	0	6.9	0.002	1636.5	9000	0.0	2.0	1.7	10.0
39945	10.8	10.8	10.3	16.1	5.2	2.2	0	0.0	1	0.0	0	0.0	0	7.6	0.001	1648.1	9000	0.0	2.0	1.4	10.0
39755	14.4	14.4	15.4	13.5	5.2	4.0	0	0.0	1	0.0	0	0.0	0	6.6	0.003	1251.4	9000	0.0	2.0	3.2	12.5
39605	18.1	18.1	19.4	11.4	5.2	5.9	0	0.0	1	0.0	0	0.0	0	5.8	0.007	1100.6	9000	0.0	2.0	5.1	14.0
39310	15.0	15.0	16.0	12.4	5.2	4.3	0	0.0	1	0.0	0	0.0	0	6.8	0.004	1204.5	9000	0.0	2.0	3.5	12.5
39100	12.1	12.1	12.4	14.1	5.2	2.9	0	0.0	1	0.0	0	0.0	0	7.8	0.002	1294.8	9000	0.0	2.0	2.1	10.0
38925	11.5	11.5	11.4	14.5	5.2	2.5	0	0.0	1	0.0	0	0.0	0	9.0	0.002	1181.3	9000	0.0	2.0	1.8	10.0
38710	10.0	8.5	10.6	15.9	2.7	2.3	0	0.0	1	0.0	0	0.0	0	10.8	0.001	1043.1	9000	0.0	2.0	1.5	10.0
38475	14.1	14.1	17.8	14.0	2.7	5.1	0	0.0	1	0.0	0	0.0	0	8.8	0.004	755.4	9000	0.0	2.0	4.3	12.5
38300	17.3	17.3	22.7	9.8	2.7	7.7	0	0.0	1	0.0	0	0.0	0	7.4	0.010	688.1	9000	0.0	2.0	4.9	14.0
38065	10.9	10.9	14.1	14.2	2.7	3.5	0	0.0	1	0.0	0	0.0	0	12.0	0.002	678.3	9000	0.0	2.0	2.7	10.0
37810	14.5	14.5	18.2	12.2	2.7	5.3	0	0.0	1	0.0	0	0.0	0	10.2	0.004	622.3	9000	0.0	2.0	4.5	14.0
37655	16.7	16.7	21.2	10.3	2.7	6.8	0	0.0	1	0.0	0	0.0	0	7.4	0.009	735.9	9000	0.0	2.0	5.1	14.0
37390	16.1	16.1	23.9	6.1	2.7	8.4	0	0.0	1	0.0	0	0.0	0	5.4	0.017	892.2	9000	0.0	2.0	3.1	14.0
37135	13.4	13.4	17.0	8.0	2.7	4.8	0	0.0	1	0.0	0	0.0	0	6.4	0.006	1088.9	9000	0.0	2.0	3.9	12.5
36930	14.0	14.0	18.3	7.9	2.7	5.4	0	0.0	1	0.0	0	0.0	0	6.0	0.007	1112.0	9000	0.0	2.0	3.9	14.0
36735	12.5	11.6	15.0	9.6	2.7	3.9	0	0.0	1	0.0	0	0.0	0	6.8	0.004	1195.7	9000	0.0	2.0	3.0	12.5
36515	13.1	13.1	16.7	9.6	2.7	4.6	0	0.0	1	0.0	0	0.0	0	5.5	0.006	1306.1	9000	0.0	2.0	3.8	12.5
36265	10.1	10.1	13.0	11.2	2.7	3.1	0	0.0	1	0.0	0	0.0	0	6.4	0.003	1373.1	9000	0.0	2.0	2.3	10.0
36080	10.2	10.2	12.5	11.7	3.2	2.9	0	0.0	1	0.0	0	0.0	0	6.4	0.004	1455.4	9000	0.0	2.0	2.1	10.0
35845	10.0	9.1	10.9	13.5	3.2	2.4	0	0.0	1	0.0	0	0.0	0	7.4	0.002	1496.2	9000	0.0	2.0	1.6	10.0
35725	11.8	11.8	14.7	13.0	3.2	3.8	0	0.0	1	0.0	0	0.0	0	6.3	0.003	1431.2	9000	0.0	2.0	2.9	10.0
35515	13.9	13.9	17.1	11.9	3.2	4.8	0	0.0	1	0.0	0	0.0	0	5.7	0.005	1353.4	9000	0.0	2.0	3.9	12.5
35245	11.7	11.7	14.5	12.5	3.2	3.7	0	0.0	1	0.0	0	0.0	0	5.8	0.003	1555.5	9000	0.0	2.0	2.8	10.0
35040	16.2	16.2	19.5	10.7	3.2	5.9	0	0.0	1	0.0	0	0.0	0	5.5	0.005	1355.9	9000	0.0	2.0	5.1	14.0
34860	14.8	14.8	18.1	10.1	3.2	5.3	0	0.0	1	0.0	0	0.0	0	4.8	0.008	1338.9	9000	0.0	2.0	4.4	14.0
34720	14.9	14.9	18.2	9.3	3.2	5.3	0	0.0	1	0.0	0	0.0	0	4.5	0.009	1411.5	9000	0.0	2.0	4.4	14.0
34495	14.8	14.8	18.1	8.9	3.2	5.3	0	0.0	1	0.0	0	0.0	0	5.0	0.009	1277.2	9000	0.0	2.0	4.4	14.0
34310	14.4	14.4	17.6	9.0	3.2	5.0	0	0.0	1	0.0	0	0.0	0	5.7	0.005	1280.8	9000	0.0	2.0	4.2	12.5
34090	14.0	14.0	17.2	8.6	3.2	4.8	0	0.0	1	0.0	0	0.0	0	5.4	0.007	1267.8	9000	0.0	2.0	4.0	12.5
33880	12.9	12.9	15.8	9.8	3.4	4.2	0	0.0	1	0.0	0	0.0	0	5.6	0.005	1310.6	9000	0.0	2.0	3.3	12.5
33710	13.6	13.6	16.5	9.4	3.4	4.6	0	0.0	1	0.0	0	0.0	0	5.2	0.007	1355.1	9000	0.0	2.0	3.7	12.5
33500	13.0	13.0	15.8	9.5	3.4	4.2	0	0.0	1	0.0	0	0.0	0	5.4	0.006	1474.3	9000	0.0	2.0	3.4	12.5
33310	13.0	13.0	15.9	9.1	3.4	4.3	0	0.0	1	0.0	0	0.0	0	4.2	0.006	1744.5	9000	0.0	2.0	3.4	12.5
33115	12.7	12.7	15.5	8.7	3.4	4.1	0	0.0	1	0.0	0	0.0	0	4.8	0.009	1573.2	9000	0.0	2.0	3.3	12.5
32795	10.2	10.2	12.2	11.0	3.4	2.8	0	0.0	1	0.0	0	0.0	0	5.5	0.003	1732.9	9000	0.0	2.0	2.0	10.0
32605	11.6	11.6	14.1	11.5	3.4	3.5	0	0.0	1	0.0	0	0.0	0	6.2	0.004	1344.6	9000	0.0	2.0	2.7	10.0
32265	12.5	12.4	16.7	10.2	2.0	4.6	0	0.0	1	0.0	0	0.0	0	4.6	0.007	1829.9	9000	0.0	2.0	3.8	12.5
31875	10.0	8.0	10.9	11.0	2.0	2.4	0	0.0	1	0.0	0	0.0	0	5.2	0.004	2482.2	9000	0.0	2.0	1.6	10.0
31585	12.5	12.3	16.6	9.8	2.0	4.6	0	0.0	1	0.0	0	0.0	0	4.0	0.009	2120.3	9000	0.0	2.0	3.7	12.5
31360	8.0	7.3	9.8	13.9	2.0	2.0	0	0.0	1	0.0	0	0.0	0	7.8	0.001	1884.4	9000	0.0	2.0	1.3	8.0
31060	8.0	6.3	7.9	15.9	2.0	1.5	0	0.0	1	0.0	0	0.0	0	10.5	0.001	1711.5	9000	0.0	2.0	0.8	8.0
30720	8.0	5.6	6.4	18.0	2.0	1.1	0	0.0	1	0.0	0	0.0	0	11.6	0.000	1891.7	9000	0.0	2.0	0.6	8.0
30445	8.0	5.5	6.0	19.9	2.0	1.0	0	0.0	1	0.0	0	0.0	0	13.1	0.000	1783.7	9000	0.0	2.0	0.5	8.0
30095	8.0	5.7	6.6	21.7	2.0	1.1	0	0.0	1	0.0	0	0.0	0	12.7	0.000	1730.3	9000	0.0	2.0	0.6	8.0
29815	8.0	6.2	7.7	22.4	2.0	1.4	0	0.0	1	0.0	0	0.0	0	11.7	0.000	1675.2	9000	0.0	2.0	0.8	8.0
29565	8.0	6.1	7.4	23.3	2.0	1.3	0	0.0	1	0.0	0	0.0	0	11.8	0.000	1717.4	9000	0.0	2.0	0.7	8.0
29385	8.0	6.6	8.5	24.0	2.0	1.6	0	0.0	1	0.0	0	0.0	0	10.8	0.000	1675.1	9000	0.0	2.0	1.0	8.0
29140	10.0	9.8	10.1	24.3	4.4	2.1	0	0.0	1	0.0	0	0.0	0	9.3	0.001	1557.6	9000	0.0	2.0	1.4	10.0
28895	17.6	17.6	19.7	22.4	4.4	6.0	0	0.0	1	0.0	0	0.0	0	8.6	0.002	1062.3	9000	0.0	2.0	5.2	14.0
28695	25.0	25.0	27.5	16.0	4.4	10.6	0	0.0	1	0.0	0	0.0	0	9.4	0.009	544.9	9000	0.0	2.0	8.0	14.0
28500	24.5	24.5	28.6	13.6	4.4	11.4	0	0.0	1	0.0	0	0.0	0	9.8	0.010	503.7	9000	0.0	2.0	6.8	14.0
28280	24.4	24.4	29.7	11.8	4.4	12.1	0	0.0	1	0.0	0	0.0	0	8.8	0.011	549.3	9000	0.0	2.0	5.9	14.0
28080	23.1	23.1	28.1	11.4	4.4	11.0	0	0.0	1	0.0	0	0.0	0	9.2	0.011	547.6	9000	0.0	2.0	5.7	14.0
27925	15.9	15.9	18.0	17.5	4.4	5.2	0	0.0	1	0.0	0	0.0	0	13.0	0.002	612.7	9000	0.0	2.0	4.3	12.5
27725	18.6	18.6	20.5	16.3	4.4	6.5	0	0.0	1	0.0	0	0.0	0	12.1	0.003	587.1	9000	0.0	2.0	5.7	14.0
27545	21.8	21.8	24.7	13.2	4.4	8.8	0	0.0	1	0.0	0	0.0	0	9.5	0.007	613.0	9000	0.0	2.0	6.6	14.0
27335	21.7	21.7	25.5	12.0	4.4	9.3	0	0.0	1	0.0	0	0.0	0	8.1	0.008	691.0	9000	0.0	2.0	6.0	14.0
27155	20.4	20.4	22.3	13.2	4.4	7.4	0	0.0	1	0.0	0	0.0	0	8.0	0.005	856.6	9000	0.0	2.0	6.6	14.0
26990	17.7	17.7	23.5	11.2	2.0	8.1	0	0.0	1	0.0	0	0.0	0	6.0	0.010	1008.2	9000	0.0	2.0	5.6	14.0
26780	17.9	17.9	23.9	11.0	2.0	8.4	0	0.0	1	0.0	0	0.0	0	5.6	0.010	1131.7	9000	0.0	2.0	5.5	14.0
26575	16.2	16.2	21.0	11.0	2.0	6.7	0	0.0	1	0.0	0	0.0	0	5.5	0.013	1216.4	3000	0.0	2.0	5.5	14.0
26355	12.5	11.6	15.8	13.4	2.0	4.2	0	0.0	1	0.0	0	0.0	0	7.5	0.003	1282.4	3000	0.0	2.0	3.4	12.5
26170	13.6	13.6	18.0	13.0	2.0	5.2	0	0.0	1	0.0	0	0.0	0	6.8	0.004	1347.9	3000	0.0	2.0	4.4	12.5
25965	13.5	13.5	17.9	13.0	2.0	5.2	0	0.0	1	0.0	0	0.0	0	7.0	0.004	1288.3	3000	0.0	2.0	4.3	12.5

DEFINITIONS

V(FPS) =VELOCITY IN FEET PER SECOND
Z_{TOT}=TOTAL POTENTIAL VERTICAL ADJUSTMENT IN FEET
Z_{DEG}=LONG TERM DEGRADATION IN FEET
Z_{GS}=GENERAL SCOUR IN FEET
Z_{LS}=LOCAL SCOUR IN FEET
PIER TYPE=PIER SHAPE FACTOR; IF NO PIERS=**0**
=SQUARE NOSE; **0.9** ROUND NOSE; **0.9** CYLINDER;
1.0 SHARP NOSE; **0.9** GROUP OF CYLINDERS
FLOW DEPTH=WATER DEPTH IN CHANNEL IN FEET
B=WIDTH OF PIERS IN FEET; NO PIER=0
ABUT TYPE=VERT WALL FACTOR; IF VERT=**2**; NON VERT=**1**
A=ABUTMENT PROTRUSION INTO FLOW PATH IN FEET
SOFT = SOFT BOTTOM AT A BRIDGE OR AN ABUTMENT
= HARD BOTTOM; **1** = SOFT BOTTOM
Z_{BS}=BEND SCOUR IN FEET
BEND COEFF=BEND COEFFICIENT; IF NO BEND=0, BEND=1
HYD DEPTH=HYDRAULIC DEPTH IN FEET
E SLOPE=ENERGY SLOPE, UNITLESS
TOP WIDTH=CHANNEL TOP WIDTH IN FEET
RADIUS=RADIUS OF CURVATURE TO CENTERLINE IN FEET
Z_I=LOW-FLOW INCISEMENT IN FEET, MEASURED OR 2'; VALUE **NOT LESS THAN 2'**
H=BEDFORM HEIGHT IN FEET, LIMITED TO FLOW DEPTH AFTER KENNEDY (1963)
Z_{DM}=CUT OFF DEPTH REQUIRED BY LACFCDDM

GENERAL

THIS SPREADSHEET IS DESIGNED TO CALCULATE SCOUR PROTECTION (TOE DOWN) BASED ON LADPW COUNTY HYDROLOGY MANUAL (1991) PAGES 5.2-5.8 AND ASSOCIATED APPENDICES (SEDIMENTATION MANUAL). ALL VELOCITIES ARE IN FPS, WITH A MAXIMUM VALUE LIMITED BY THE EQUATION. THE PRESENT VERSION (10/04) WILL CALCULATE UP TO 50 VELOCITIES AT ONE TIME. LONG TERM DEGRADATION IS USER SUPPLIED. GENERAL SCOUR IS TAKEN FROM APPENDIX Q3, INTERPOLATED. LOCAL SCOUR AT BENDS AND ABUTMENTS ARE BASED ON LADWP EQUATIONS FOUND IN APP Q12. BEND SCOUR IS BASED ON EQUATIONS IN APPENDIX Q12. A LONGITUDINAL EXTENT BASED ON SECONDARY CURRENTS IS NOT INCLUDED. BEDFORM HEIGHT IS BASED ON EQUATIONS IN APPENDIX Q13. JULY 2005 REVISION INCLUDES CALCULATION FOR CUT OFF DEPTH BASED ON LOS ANGELES COUNTY FLOOD CONTROL DISTRICT DESIGN MANUAL. THE CALCULATION DOES NOT CONSIDER ADJUSTMENTS TO CUT OFF DEPTH BASED ON TABLE F-06 THE OCTOBER 2005 REVISION INCLUDES ADDITIONAL TOEDOWN AT BRIDGES/ABUTMENTS WITH SOFT BOTTOMS.

COLOR CODES

OUTPUT
DATA FROM HEC-RAS
USER SUPPLIED DATA
INTERMEDIATE CALCULATIONS (INDIVIDUAL SHEETS ONLY)

DESIGNED BY DAVID A JAFFE, PHD, PE
PACIFIC ADVANCED CIVIL ENGINEERING, INC
OCTOBER, 2004
OCTOBER 2005, REVISED

SECTION	Z_{MAX}=	Z_{TOT}=	V (FPS)	FLOW DEPTH (FT)	Z_{DEQ}+	Z_{GS}+	PIER TYPE	B	ABUT TYPE	A	SOFT	Z_{LS}+	BEND COEFF	HYD DEPTH	E SLOPE	TOP WIDTH	RADIUS	Z_{BS}+	Z_t+	H/2	Z_{DM}=
25785	15.1	15.1	19.5	11.7	2.0	6.0	0	0.0	1	0.0	0	0.0	0	6.2	0.005	1336.9	3000	0.0	2.0	5.2	14.0
25600	16.1	16.1	20.6	11.3	2.0	6.5	0	0.0	1	0.0	0	0.0	0	5.2	0.006	1596.5	3000	0.0	2.0	5.6	14.0
25425	15.6	15.6	20.0	11.3	2.0	6.2	0	0.0	1	0.0	0	0.0	0	4.4	0.008	1773.8	3000	0.0	2.0	5.4	14.0
25215	10.5	10.5	14.5	13.6	2.0	3.7	0	0.0	1	0.0	0	0.0	0	6.1	0.003	1748.6	3000	0.0	2.0	2.8	10.0
25000	13.0	13.0	17.4	12.2	2.0	5.0	0	0.0	1	0.0	0	0.0	0	4.4	0.006	2103.2	3000	0.0	2.0	4.1	12.5
24795	14.5	14.5	19.0	11.4	2.0	5.7	0	0.0	1	0.0	0	0.0	0	3.9	0.007	2311.7	3000	0.0	2.0	4.9	14.0
24550	16.3	16.3	21.3	10.8	2.0	6.9	0	0.0	1	0.0	0	0.0	0	3.8	0.009	2227.0	3000	0.0	2.0	5.4	14.0
24335	10.5	10.5	14.5	13.1	2.0	3.7	0	0.0	1	0.0	0	0.0	0	5.7	0.003	2089.5	3000	0.0	2.0	2.8	10.0
24115	14.4	14.4	18.8	11.1	2.0	5.6	0	0.0	1	0.0	0	0.0	0	4.5	0.008	2015.8	3000	0.0	2.0	4.8	14.0
23975	14.6	14.6	19.0	10.2	2.0	5.7	0	0.0	1	0.0	0	0.0	0	4.6	0.008	1913.7	3000	0.0	2.0	4.9	14.0
23755	12.5	12.4	16.7	10.9	2.0	4.6	0	0.0	1	0.0	0	0.0	0	5.1	0.006	1935.4	3000	0.0	2.0	3.8	12.5
23565	10.5	10.5	14.5	12.7	2.0	3.7	0	0.0	1	0.0	0	0.0	0	5.6	0.004	2039.5	3000	0.0	2.0	2.8	10.0
23365	12.7	12.7	17.0	10.8	2.0	4.8	0	0.0	1	0.0	0	0.0	0	5.4	0.006	1781.4	3000	0.0	2.0	3.9	12.5
23180	10.0	9.5	13.2	11.8	2.0	3.2	0	0.0	1	0.0	0	0.0	0	6.6	0.002	2084.2	3000	0.0	2.0	2.3	10.0
23000	8.0	6.8	8.9	13.0	2.0	1.7	0	0.0	1	0.0	0	0.0	0	7.7	0.001	2069.1	3000	0.0	2.0	1.1	8.0
22790	8.0	7.1	9.4	13.1	2.0	1.9	0	0.0	1	0.0	0	0.0	0	7.8	0.001	1949.0	3000	0.0	2.0	1.2	8.0
22600	10.0	8.3	11.4	14.1	2.0	2.5	0	0.0	1	0.0	0	0.0	0	7.9	0.001	1865.2	3000	0.0	2.0	1.7	10.0
22415	10.0	8.5	11.8	14.1	2.0	2.7	0	0.0	1	0.0	0	0.0	0	8.1	0.002	1705.6	3000	0.0	2.0	1.9	10.0
22195	10.2	10.2	14.1	13.7	2.0	3.5	0	0.0	1	0.0	0	0.0	0	7.8	0.003	1322.2	3000	0.0	2.0	2.7	10.0
22010	12.5	11.8	16.0	14.4	2.0	4.3	0	0.0	1	0.0	0	0.0	0	7.3	0.003	1328.0	3000	0.0	2.0	3.5	12.5
21790	15.3	15.3	19.7	11.6	2.0	6.0	0	0.0	1	0.0	0	0.0	0	6.5	0.006	1145.7	3000	0.0	2.0	5.2	14.0
21615	15.2	15.2	21.4	8.5	2.0	6.9	0	0.0	1	0.0	0	0.0	0	5.8	0.010	1161.3	3000	0.0	2.0	4.3	14.0
21440	15.1	15.1	20.1	9.7	2.0	6.3	0	0.0	1	0.0	0	0.0	0	5.0	0.008	1574.6	3000	0.0	2.0	4.8	14.0
21225	15.0	15.0	19.5	10.6	2.0	5.9	0	0.0	1	0.0	0	0.0	0	3.9	0.008	2217.7	3000	0.0	2.0	5.1	14.0
21020	15.1	15.1	20.8	8.9	2.0	6.6	0	0.0	1	0.0	0	0.0	0	4.6	0.009	1676.4	3000	0.0	2.0	4.4	14.0
20845	12.7	12.7	17.1	10.4	2.0	4.8	0	0.0	1	0.0	0	0.0	0	4.2	0.006	2369.3	3000	0.0	2.0	3.9	12.5
20595	12.5	11.1	15.2	10.9	2.0	4.0	0	0.0	1	0.0	0	0.0	0	4.7	0.003	2463.7	3000	0.0	2.0	3.1	12.5
20435	10.0	9.3	12.9	12.2	2.0	3.1	0	0.0	1	0.0	0	0.0	0	5.4	0.002	2582.7	3000	0.0	2.0	2.3	10.0
20280	10.1	10.1	14.0	11.8	2.0	3.5	0	0.0	1	0.0	0	0.0	0	5.0	0.003	2589.6	3000	0.0	2.0	2.6	10.0
20070	14.9	14.9	20.2	9.2	2.0	6.3	0	0.0	1	0.0	0	0.0	0	4.7	0.009	1767.5	3000	0.0	2.0	4.6	14.0
19855	13.4	13.4	17.8	9.9	2.0	5.1	0	0.0	1	0.0	0	0.0	0	4.8	0.006	1975.1	3000	0.0	2.0	4.3	12.5
19630	13.5	13.5	17.9	8.9	2.0	5.2	0	0.0	1	0.0	0	0.0	0	4.9	0.006	1836.2	3000	0.0	2.0	4.3	12.5
19440	10.0	8.7	11.9	12.1	2.0	2.7	0	0.0	1	0.0	0	0.0	0	6.5	0.002	2095.3	3000	0.0	2.0	1.9	10.0
19240	10.1	10.1	13.9	11.4	2.0	3.5	0	0.0	1	0.0	0	0.0	0	5.6	0.003	2091.7	3000	0.0	2.0	2.6	10.0
19050	10.0	8.0	11.0	12.9	2.0	2.4	0	0.0	1	0.0	0	0.0	0	6.7	0.002	2160.8	3000	0.0	2.0	1.6	10.0
18830	10.0	7.8	10.7	14.6	2.0	2.3	0	0.0	1	0.0	0	0.0	0	7.1	0.002	2094.4	3000	0.0	2.0	1.5	10.0
18650	8.0	7.4	9.9	15.0	2.0	2.1	0	0.0	1	0.0	0	0.0	0	8.0	0.001	2022.7	3000	0.0	2.0	1.3	8.0
18475	8.0	6.4	8.1	16.6	2.0	1.5	0	0.0	1	0.0	0	0.0	0	9.4	0.001	1944.4	3000	0.0	2.0	0.9	8.0
18290	8.0	6.7	8.7	16.8	2.0	1.7	0	0.0	1	0.0	0	0.0	0	9.3	0.001	1843.7	3000	0.0	2.0	1.0	8.0
18025	8.0	6.3	7.8	18.2	2.0	1.5	0	0.0	1	0.0	0	0.0	0	11.5	0.001	1610.9	17000	0.0	2.0	0.8	8.0
17785	8.0	6.7	8.7	19.8	2.0	1.7	0	0.0	1	0.0	0	0.0	0	11.6	0.001	1417.5	17000	0.0	2.0	1.0	8.0
17510	10.1	10.1	14.0	18.0	2.0	3.5	0	0.0	1	0.0	0	0.0	0	8.5	0.002	1243.6	17000	0.0	2.0	2.6	10.0
17360	12.7	12.7	17.0	16.9	2.0	4.8	0	0.0	1	0.0	0	0.0	0	8.9	0.004	936.6	17000	0.0	2.0	3.9	12.5
17110	17.5	17.5	21.7	15.4	2.0	7.1	0	0.0	1	0.0	0	0.0	0	5.6	0.006	1274.3	17000	0.0	2.0	6.4	14.0
16970	18.6	18.6	22.9	13.6	2.0	7.8	0	0.0	1	0.0	0	0.0	0	5.7	0.008	1125.6	17000	0.0	2.0	6.8	14.0
16720	17.6	17.6	25.2	9.0	2.0	9.1	0	0.0	1	0.0	0	0.0	0	4.1	0.018	1404.6	17000	0.0	2.0	4.5	14.0
16515	15.7	15.7	21.5	9.5	2.0	7.0	0	0.0	1	0.0	0	0.0	0	4.3	0.012	1622.6	17000	0.0	2.0	4.8	14.0
16305	15.8	15.8	21.5	9.6	2.0	7.0	0	0.0	1	0.0	0	0.0	0	4.2	0.011	1812.8	17000	0.0	2.0	4.8	14.0
16130	12.5	11.8	16.1	10.2	2.0	4.3	0	0.0	1	0.0	0	0.0	0	5.2	0.005	1945.1	17000	0.0	2.0	3.5	12.5
15960	12.5	11.6	15.8	9.3	2.0	4.2	0	0.0	1	0.0	0	0.0	0	4.1	0.011	2180.9	17000	0.0	2.0	3.4	12.5
15745	10.0	8.0	10.9	10.6	2.0	2.4	0	0.0	1	0.0	0	0.0	0	5.7	0.003	2279.0	17000	0.0	2.0	1.6	10.0
15540	10.0	8.1	11.0	10.6	2.0	2.4	0	0.0	1	0.0	0	0.0	0	5.8	0.003	2324.2	17000	0.0	2.0	1.6	10.0
15335	10.0	9.2	12.7	10.5	2.0	3.0	0	0.0	1	0.0	0	0.0	0	4.9	0.005	2302.1	17000	0.0	2.0	2.2	10.0
15125	12.5	11.9	16.2	9.6	2.0	4.4	0	0.0	1	0.0	0	0.0	0	5.5	0.007	1618.5	17000	0.0	2.0	3.5	12.5
14900	10.6	10.6	14.5	10.4	2.0	3.7	0	0.0	1	0.0	0	0.0	0	6.1	0.004	1704.5	17000	0.0	2.0	2.9	10.0
14720	12.5	12.5	16.8	9.3	2.0	4.7	0	0.0	1	0.0	0	0.0	0	5.1	0.008	1763.5	17000	0.0	2.0	3.8	12.5
14480	10.3	10.3	14.3	10.2	2.0	3.6	0	0.0	1	0.0	0	0.0	0	6.0	0.004	1801.7	17000	0.0	2.0	2.7	10.0
14315	10.8	10.8	14.8	9.4	2.0	3.8	0	0.0	1	0.0	0	0.0	0	5.2	0.006	1868.1	17000	0.0	2.0	3.0	10.0
14090	10.0	9.9	13.8	9.0	2.0	3.4	0	0.0	1	0.0	0	0.0	0	5.9	0.005	1766.8	17000	0.0	2.0	2.6	10.0
13850	12.5	11.4	15.6	8.4	2.0	4.2	0	0.0	1	0.0	0	0.0	0	5.3	0.007	1727.3	17000	0.0	2.0	3.3	12.5
13635	12.5	11.3	15.4	10.3	2.0	4.1	0	0.0	1	0.0	0	0.0	0	6.4	0.004	1691.9	17000	0.0	2.0	3.2	12.5
13425	12.9	12.9	17.3	8.3	2.0	4.9	0	0.0	1	0.0	0	0.0	0	4.5	0.009	1854.4	17000	0.0	2.0	4.0	12.5
13190	10.0	8.8	12.2	9.5	2.0	2.8	0	0.0	1	0.0	0	0.0	0	6.4	0.003	1847.3	17000	0.0	2.0	2.0	10.0
13030	10.3	10.3	14.2	9.6	2.0	3.6	0	0.0	1	0.0	0	0.0	0	6.5	0.003	1763.0	17000	0.0	2.0	2.7	10.0
12835	10.0	9.6	13.3	10.1	2.0	3.2	0	0.0	1	0.0	0	0.0	0	7.3	0.003	1607.5	17000	0.0	2.0	2.4	10.0
12615	10.0	9.0	12.4	10.9	2.0	2.9	0	0.0	1	0.0	0	0.0	0	8.7	0.002	1471.0	17000	0.0	2.0	2.1	10.0
12395	10.0	8.9	12.3	11.5	2.0	2.9	0	0.0	1	0.0	0	0.0	0	9.0	0.002	1438.4	17000	0.0	2.0	2.0	10.0
12195	10.0	7.8	10.6	12.5	2.0	2.3	0	0.0	1	0.0	0	0.0	0	10.3	0.001	1389.3	17000	0.0	2.0	1.5	10.0
11995	10.0	9.2	12.7	13.7	2.0	3.0	0	0.0	1	0.0	0	0.0	0	9.8	0.002	1281.1	17000	0.0	2.0	2.2	10.0
11780	10.0	9.0	12.5	14.4	2.0	2.9	0	0.0	1	0.0	0	0.0	0	9.4	0.001	1400.9	17000	0.0	2.0	2.1	10.0
11605	10.2	10.2	14.1	13.7	2.0	3.5	0	0.0	1	0.0	0	0.0	0	8.7	0.002	1282.9	17000	0.0	2.0	2.7	10.0
11405	10.0	9.5	13.2	15.1	2.0	3.2	0	0.0	1	0.0	0	0.0	0	10.1	0.002	1130.2	17000	0.0	2.0	2.3	10.0
11180	12.5	12.3	16.6	13.9	2.0	4.6	0	0.0	1	0.0	0	0.0	0	10.6	0.003	835.7	17000	0.0	2.0	3.7	12.5
11015	14.7	14.7	19.1	13.3	2.0	5.7	0	0.0	1	0.0	0	0.0	0	11.0	0.004	679.4	17000	0.0	2.0	4.9	14.0
10835	16.7	16.7	21.9	10.9	2.0	7.2	0	0.0	1	0.0	0	0.0	0	8.2	0.007	790.4	17000	0.0	2.0	5.4	14.0
10575	16.2	16.2	24.1	7.5	2.0	8.5	0	0.0	1	0.0	0	0.0	0	5.3	0.016	1108.8	17000	0.0	2.0	3.7	14.0
10390	16.1	16.1	22.7	8.8	2.0	7.7	0	0.0	1	0.0	0	0.0	0	5.8	0.008	1247.1	17000	0.0	2.0	4.4	14.0
10225	13.4	13.4	17.8	9.5	2.0	5.1	0	0.0	1	0.0	0	0.0	0	5.9	0.007	1373.8	17000	0.0	2.0	4.3	12.5
10000	10.9	10.9	14.9	11.1	2.0	3.9	0	0.0	1	0.0	0	0.0	0	6.6	0.004	1488.0	17000	0.0	2.0	3.0	10.0
9820	14.2	14.2	18.6	10.0	2.0	5.5	0	0.0	1	0.0	0	0.0	0	5.7	0.008	1336.6	17000	0.0	2.0	4.7	14.0
9595	10.6	10.6	14.6	10.3	2.0	3.7	0	0.0	1	0.0	0	0.0	0	6.6	0.005	1619.7	17000	0.0	2.0	2.9	10.0
9385	12.5	11.6	15.8	9.5	2.0	4.2	0	0.0	1	0.0	0	0.0	0	5.3	0.006	1770.4	17000	0.0	2.0	3.4	12.5
9220	12.5	12.1	16.4	8.9	2.0	4.5	0	0.0	1	0.0	0	0.0	0	4.9	0.008	1771.4	17000	0.0	2.0	3.6	12.5
9025	12.5	11.7	15.9	8.9	2.0	4.3	0	0.0	1	0.0	0	0.0	0	5.5	0.005	1736.9	17000	0.0	2.0	3.4	12.5
MAX=	27.2	27.2			8.1	12.1						0.0					17000.0	0.0	2.0	8.3	14.0
MIN=	8.0	5.5			2.0	1.0						0.0					3000.0	0.0	2.0	0.5	8.0

CALCULATIONS FOR TOTAL TOE-DOWN BY INDIVIDUAL ADJUSTMENT COMPONENT BASED ON LACH&SM -- SANTA CLARA RIVER PROPOSED CONDITIONS OUTSIDE CURVED REACH C_{-AR} n=0.025

SECTION	Z_{MAX}=	Z_{TOT}=	V (FPS)	FLOW DEPTH (FT)	Z_{DEG}+	Z_{GS}+	PIER TYPE	B	ABUT TYPE	A	SOFT	Z_{LS}+	BEND COEFF	HYD DEPTH	E SLOPE	TOP WIDTH	RADIUS	Z_{BS}+	Z_f+	H/2	Z_{DM}=
46195	18.2	18.2	21.7	18.1	2.8	7.1	0	0.0	1	0.0	0	0.0	1	11.7	0.005	453.0	9000	0.0	2.0	6.3	14.0
46020	21.2	21.2	24.1	18.1	2.8	8.5	0	0.0	1	0.0	0	0.0	1	9.2	0.009	520.9	9000	0.0	2.0	7.9	14.0
45545	16.8	16.8	20.3	19.2	2.8	6.4	0	0.0	1	0.0	0	0.0	1	12.7	0.004	446.7	9000	0.0	2.0	5.6	14.0
45030	22.8	22.8	26.1	16.5	2.8	9.7	0	0.0	1	0.0	0	0.0	1	9.0	0.011	492.5	9000	0.0	2.0	8.3	14.0
44585	15.5	15.5	19.2	21.1	2.8	5.8	0	0.0	1	0.0	0	0.0	1	11.3	0.004	531.9	9000	0.0	2.0	5.0	14.0
44210	22.2	22.2	26.2	15.4	2.8	9.7	0	0.0	1	0.0	0	0.0	1	9.7	0.009	452.6	9000	0.0	2.0	7.7	14.0
43820	21.6	21.6	19.9	19.5	8.1	6.2	0	0.0	1	0.0	0	0.0	1	12.1	0.004	476.5	9000	0.0	2.0	5.3	14.0
43610	27.1	27.1	26.7	13.8	8.1	10.1	0	0.0	1	0.0	0	0.0	1	9.6	0.010	450.6	9000	0.0	2.0	6.9	14.0
43410	27.2	27.2	28.8	11.3	8.1	11.5	0	0.0	1	0.0	0	0.0	1	7.4	0.011	583.4	9000	0.0	2.0	5.7	14.0
43200	26.0	26.0	26.1	12.4	8.1	9.7	0	0.0	1	0.0	0	0.0	1	6.7	0.011	689.2	9000	0.0	2.0	6.2	14.0
42975	25.6	25.6	26.6	10.8	8.1	10.0	0	0.0	1	0.0	0	0.0	1	5.9	0.016	735.1	9000	0.0	2.0	5.4	14.0
42815	23.8	23.8	23.9	10.7	8.1	8.4	0	0.0	1	0.0	0	0.0	1	5.6	0.016	864.3	9000	0.0	2.0	5.4	14.0
42590	22.6	22.6	22.4	9.2	8.1	7.5	0	0.0	1	0.0	0	0.0	1	5.2	0.014	1013.1	9000	0.4	2.0	4.6	21.0
42430	21.4	21.4	19.6	10.7	8.1	6.0	0	0.0	1	0.0	0	0.0	1	6.4	0.009	915.8	9000	0.1	2.0	5.2	21.0
42215	21.0	20.6	18.5	11.2	8.1	5.5	0	0.0	1	0.0	0	0.0	1	6.1	0.009	1019.0	9000	0.5	2.0	4.6	21.0
41940	16.0	16.0	11.6	14.3	8.1	2.6	0	0.0	1	0.0	0	0.0	1	7.7	0.002	1284.2	9000	1.4	2.0	1.8	15.0
41730	15.8	15.8	11.8	14.7	8.1	2.7	0	0.0	1	0.0	0	0.0	1	8.2	0.002	1190.9	9000	1.2	2.0	1.9	15.0
41460	15.4	15.4	11.6	16.2	8.1	2.6	0	0.0	1	0.0	0	0.0	1	9.1	0.002	1093.5	9000	0.9	2.0	1.8	15.0
41280	15.3	15.3	16.4	14.4	5.2	4.5	0	0.0	1	0.0	0	0.0	1	8.3	0.004	852.3	9000	0.0	2.0	3.6	12.5
41080	18.7	18.7	19.9	12.1	5.2	6.2	0	0.0	1	0.0	0	0.0	1	6.7	0.008	874.1	9000	0.0	2.0	5.4	14.0
40825	21.0	17.4	18.0	11.5	5.2	5.2	0	0.0	1	0.0	0	0.0	1	6.2	0.007	1040.4	9000	0.5	2.0	4.4	21.0
40585	18.0	16.3	17.0	11.7	5.2	4.8	0	0.0	1	0.0	0	0.0	1	6.8	0.006	1005.8	9000	0.4	2.0	3.9	18.0
40335	15.0	12.3	10.5	15.1	5.2	2.3	0	0.0	1	0.0	0	0.0	1	8.8	0.002	1249.6	9000	1.4	2.0	1.5	15.0
40130	15.0	12.7	11.3	15.5	5.2	2.5	0	0.0	1	0.0	0	0.0	1	8.8	0.002	1195.6	9000	1.3	2.0	1.7	15.0
39945	15.0	12.5	11.0	16.3	5.2	2.4	0	0.0	1	0.0	0	0.0	1	9.3	0.002	1173.3	9000	1.3	2.0	1.6	15.0
39755	15.4	15.4	16.5	13.3	5.2	4.5	0	0.0	1	0.0	0	0.0	1	8.1	0.004	894.5	9000	0.0	2.0	3.7	12.5
39605	18.5	18.5	19.7	11.5	5.2	6.1	0	0.0	1	0.0	0	0.0	1	7.1	0.007	849.7	9000	0.0	2.0	5.2	14.0
39310	18.0	15.6	16.5	12.7	5.2	4.6	0	0.0	1	0.0	0	0.0	1	8.1	0.004	931.1	9000	0.2	2.0	3.7	18.0
39100	19.1	19.1	20.9	10.4	5.2	6.7	0	0.0	1	0.0	0	0.0	1	7.2	0.009	761.1	9000	0.0	2.0	5.2	14.0
38925	12.5	12.5	12.8	14.3	5.2	3.0	0	0.0	1	0.0	0	0.0	1	10.3	0.002	873.5	9000	0.0	2.0	2.2	10.0
38710	10.0	9.4	12.0	15.6	2.7	2.8	0	0.0	1	0.0	0	0.0	1	11.7	0.002	820.3	9000	0.0	2.0	2.0	10.0
38475	14.2	14.2	17.9	14.0	2.7	5.2	0	0.0	1	0.0	0	0.0	1	9.8	0.004	659.7	9000	0.0	2.0	4.3	12.5
38300	17.4	17.4	22.5	10.3	2.7	7.6	0	0.0	1	0.0	0	0.0	1	7.7	0.010	666.3	9000	0.0	2.0	5.1	14.0
38065	11.3	11.3	14.5	14.0	2.7	3.7	0	0.0	1	0.0	0	0.0	1	12.0	0.002	658.4	9000	0.0	2.0	2.9	10.0
37810	14.5	14.5	18.2	12.2	2.7	5.3	0	0.0	1	0.0	0	0.0	1	10.2	0.004	618.2	9000	0.0	2.0	4.5	14.0
37655	16.6	16.6	20.9	10.5	2.7	6.7	0	0.0	1	0.0	0	0.0	1	7.8	0.008	706.7	9000	0.0	2.0	5.3	14.0
37390	16.2	16.2	23.7	6.5	2.7	8.3	0	0.0	1	0.0	0	0.0	1	5.9	0.015	823.8	9000	0.0	2.0	3.3	14.0
37135	13.0	13.0	16.6	9.3	2.7	4.6	0	0.0	1	0.0	0	0.0	1	8.5	0.005	821.4	9000	0.0	2.0	3.7	12.5
36930	14.8	14.8	19.8	8.1	2.7	6.1	0	0.0	1	0.0	0	0.0	1	7.2	0.008	812.4	9000	0.0	2.0	4.1	14.0
36735	12.6	12.6	16.1	9.8	2.7	4.4	0	0.0	1	0.0	0	0.0	1	8.0	0.005	896.9	9000	0.0	2.0	3.5	12.5
36515	15.0	10.4	12.9	12.0	2.7	3.1	0	0.0	1	0.0	0	0.0	1	9.0	0.002	994.7	9000	0.4	2.0	2.2	15.0
36265	15.0	10.5	12.3	12.5	2.7	2.9	0	0.0	1	0.0	0	0.0	1	7.9	0.003	1176.0	9000	0.9	2.0	2.1	15.0
36080	26.0	26.0	14.7	11.6	3.2	3.8	0.9	2.0	1	0.0	0	13.3	1	6.7	0.006	1176.0	9000	0.9	2.0	2.9	15.0
35845	15.0	10.9	11.0	13.6	3.2	2.4	0	0.0	1	0.0	0	0.0	1	7.9	0.002	1401.7	9000	1.7	2.0	1.6	15.0
35725	15.0	13.9	15.0	13.0	3.2	3.9	0	0.0	1	0.0	0	0.0	1	6.5	0.004	1377.9	9000	1.8	2.0	3.0	15.0
35515	18.0	15.6	17.1	12.0	3.2	4.8	0	0.0	1	0.0	0	0.0	1	6.0	0.005	1354.8	9000	1.7	2.0	3.9	18.0
35245	18.0	15.6	17.3	11.3	3.2	4.9	0	0.0	1	0.0	0	0.0	1	5.5	0.006	1328.3	9000	1.5	2.0	4.0	18.0
35040	21.0	18.0	19.6	10.7	3.2	6.0	0	0.0	1	0.0	0	0.0	1	5.5	0.006	1354.8	9000	1.7	2.0	5.2	21.0
34860	21.0	16.3	18.4	10.0	3.2	5.4	0	0.0	1	0.0	0	0.0	1	4.9	0.009	1285.7	9000	1.2	2.0	4.6	21.0
34720	21.0	16.5	18.4	9.2	3.2	5.4	0	0.0	1	0.0	0	0.0	1	4.5	0.009	1411.2	9000	1.4	2.0	4.6	21.0
34495	18.0	15.2	17.4	9.0	3.2	5.0	0	0.0	1	0.0	0	0.0	1	5.2	0.009	1283.9	9000	1.0	2.0	4.1	18.0
34310	18.0	14.8	16.8	9.3	3.2	4.7	0	0.0	1	0.0	0	0.0	1	5.9	0.005	1308.5	9000	1.2	2.0	3.8	18.0
34090	18.0	14.8	17.0	8.6	3.2	4.8	0	0.0	1	0.0	0	0.0	1	5.3	0.007	1295.5	9000	1.0	2.0	3.9	18.0
33880	18.0	14.8	16.6	9.3	3.4	4.6	0	0.0	1	0.0	0	0.0	1	5.3	0.007	1318.4	9000	1.2	2.0	3.7	18.0
33710	18.0	13.9	15.4	9.7	3.4	4.1	0	0.0	1	0.0	0	0.0	1	5.5	0.005	1372.1	9000	1.3	2.0	3.2	18.0
33500	18.0	14.8	16.2	9.3	3.4	4.4	0	0.0	1	0.0	0	0.0	1	5.1	0.007	1496.0	9000	1.5	2.0	3.5	18.0
33310	18.0	15.1	15.8	9.0	3.4	4.2	0	0.0	1	0.0	0	0.0	1	4.2	0.006	1770.4	9000	2.1	2.0	3.4	18.0
33115	15.0	11.2	10.4	10.6	3.4	2.2	0	0.0	1	0.0	0	0.0	1	6.1	0.003	1847.3	9000	2.1	2.0	1.4	15.0
32795	15.0	13.0	13.0	10.6	3.4	3.1	0	0.0	1	0.0	0	0.0	1	5.2	0.004	1735.6	9000	2.3	2.0	2.3	15.0
32605	15.0	14.2	14.4	11.1	3.4	3.6	0	0.0	1	0.0	0	0.0	1	5.0	0.005	1699.9	9000	2.3	2.0	2.8	15.0
32265	18.0	14.2	15.9	10.5	2.0	4.3	0	0.0	1	0.0	0	0.0	1	4.8	0.006	1853.2	9000	2.5	2.0	3.4	18.0
31875	15.0	12.0	12.4	10.4	2.0	2.9	0	0.0	1	0.0	0	0.0	1	4.7	0.006	2409.2	9000	3.0	2.0	2.1	15.0
31585	15.0	11.0	10.9	11.9	2.0	2.4	0	0.0	1	0.0	0	0.0	1	5.9	0.003	2182.2	9000	3.0	2.0	1.6	15.0
31360	15.0	10.4	10.3	13.5	2.0	2.2	0	0.0	1	0.0	0	0.0	1	7.4	0.002	1878.7	9000	2.8	2.0	1.4	15.0
31060	12.0	9.1	8.2	15.5	2.0	1.6	0	0.0	1	0.0	0	0.0	1	10.1	0.001	1708.2	9000	2.6	2.0	0.9	12.0
30720	12.0	9.1	6.7	17.5	2.0	1.2	0	0.0	1	0.0	0	0.0	1	11.2	0.001	1888.6	9000	3.3	2.0	0.6	12.0
30445	12.0	8.9	6.3	19.5	2.0	1.1	0	0.0	1	0.0	0	0.0	1	12.7	0.000	1779.7	9000	3.3	2.0	0.5	12.0
30095	12.0	9.2	6.7	21.3	2.0	1.2	0	0.0	1	0.0	0	0.0	1	13.4	0.000	1622.7	9000	3.5	2.0	0.6	12.0
29815	12.0	9.1	7.7	21.9	2.0	1.4	0	0.0	1	0.0	0	0.0	1	13.5	0.000	1433.2	9000	2.9	2.0	0.8	12.0
29565	12.0	8.4	7.4	22.9	2.0	1.3	0	0.0	1	0.0	0	0.0	1	14.8	0.000	1323.8	9000	2.4	2.0	0.7	12.0
29385	12.0	8.6	8.3	23.6	2.0	1.6	0	0.0	1	0.0	0	0.0	1	14.4	0.000	1237.4	9000	2.1	2.0	0.9	12.0
29140	12.0	10.6	9.2	24.1	4.4	1.8	0	0.0	1	0.0	0	0.0	1	14.1	0.001	1087.2	9000	1.2	2.0	1.1	12.0
28895	21.0	17.5	18.8	22.5	4.4	5.6	0	0.0	1	0.0	0	0.0	1	9.9	0.002	972.1	9000	0.8	2.0	4.8	21.0
28695	24.9	24.9	28.9	14.0	4.4	11.5	0	0.0	1	0.0	0	0.0	1	5.4	0.025	899.4	9000	0.0	2.0	7.0	14.0
28500	20.6	20.6	22.4	16.1	4.4	7.5	0	0.0	1	0.0	0	0.0	1	11.4	0.006	552.2	9000	0.0	2.0	6.8	14.0
28280	24.1	24.1	29.6	10.8	4.4	12.0	0	0.0	1	0.0	0	0.0	1	5.8	0.013	944.5	9000	0.3	2.0	5.4	21.0
28080	15.0	10.8	11.3	19.1	4.4	2.5	0	0.0	1	0.0	0	0.0	1	14.7	0.001	926.4	9000	0.2	2.0	1.7	15.0
27925	11.8	11.8	13.1	19.3	4.4	3.1	0	0.0	1	0.0	0	0.0	1	13.8	0.001	866.6	9000	0.0	2.0	2.3	10.0
27725	17.0	17.0	19.0	16.7	4.4	5.7	0	0.0	1	0.0	0	0.0	1	10.4	0.003	786.6	9000	0.0	2.0	4.9	14.0
27545	21.2	21.2	22.9	14.1	4.4	7.8	0	0.0	1	0.0	0	0.0	1	9.9	0.005	643.2	9000	0.0	2.0	7.0	14.0
27335	21.3	21.3	24.6	12.3	4.4	8.7	0	0.0	1	0.0	0	0.0	1	8.3	0.008	703.5	9000	0.0	2.0	6.2	14.0
27155	17.0	17.0	19.1	14.8	4.4	5.7	0	0.0	1	0.0	0	0.0	1	9.2	0.003	888.4	9000	0.0	2.0	4.9	14.0
26990	21.0	17.5	22.6	11.5	2.0	7.6	0	0.0	1	0.0	0	0.0	1	6.8	0.011	922.3	9000	0.1	2.0	5.7	21.0
26780	21.0	18.2	23.1	11.3	2.0	7.9	0	0.0	1	0.0	0	0.0	1	6.2	0.009	1043.3	9000	0.6	2.0	5.6	21.0
26575	21.3	21.3	20.7	11.1	2.0	6.6	0	0.0	1	0.0	0	0.0	1	5.7	0.012	1187.3	3000	5.2	2.0	5.6	21.0
26355	18.3	18.3	15.9	13.4	2.0	4.3	0	0.0	1	0.0	0	0.0	1	7.5	0.004	1260.4	3000	6.7	2.0	3.4	18.0
26170	20.1	20.1	17.0	13.5	2.0	4.8	0	0.0	1	0.0	0	0.0	1	7.6	0.003	1269.0	3000	7.4	2.0	3.9	18.0
25965	21.1	21.1	18.2	12.9	2.0	5.3	0	0.0	1	0.0	0	0.0	1	6.9	0.004	1281.3	3000	7.3	2.0	4.5	21.0
25785	21.0	21.0	18.9	12.1	2.0	5.7	0	0.0	1	0.0	0	0.0	1	6.9	0.005	1219.7	3000	6.5	2.0	4.8	21.0
25600	21.0	20.1	18.5	12.4	2.0	5.5	0	0.0	1	0.0	0	0.0	1	7.6	0.005	1109.4	3000	6.0	2.0	4.6	21.0

DEFINITIONS

V(FPS) =VELOCITY IN FEET PER SECOND
Z_{TOT}=TOTAL POTENTIAL VERTICAL ADJUSTMENT IN FEET
Z_{DEG}=LONG TERM DEGRADATION IN FEET
Z_{GS}=GENERAL SCOUR IN FEET
Z_{LS}=LOCAL SCOUR IN FEET
PIER TYPE=PIER SHAPE FACTOR; IF NO PIERS=**0**
=SQUARE NOSE; **0.9** ROUND NOSE; **0.9** CYLINDER;
1.0 SHARP NOSE; **0.9** GROUP OF CYLINDERS
FLOW DEPTH=WATER DEPTH IN CHANNEL IN FEET
B=WIDTH OF PIERS IN FEET; NO PIER=0
ABUT TYPE=VERT WALL FACTOR; IF VERT=**2**; NON VERT=**1**
A=ABUTMENT PROTRUSION INTO FLOW PATH IN FEET
SOFT = SOFT BOTTOM AT A BRIDGE OR AN ABUTMENT
= HARD BOTTOM; **1** = SOFT BOTTOM
Z_{BS}=BEND SCOUR IN FEET
BEND COEFF=BEND COEFFICIENT; IF NO BEND=0, BEND=1
HYD DEPTH=HYDRAULIC DEPTH IN FEET
E SLOPE=ENERGY SLOPE, UNITLESS
TOP WIDTH=CHANNEL TOP WIDTH IN FEET
RADIUS=RADIUS OF CURVATURE TO CENTERLINE IN FEET
Z_f=LOW-FLOW INCISEMENT IN FEET, MEASURED OR 2'; VALUE **NOT LESS THAN 2'**
H=BEDFORM HEIGHT IN FEET, LIMITED TO FLOW DEPTH AFTER KENNEDY (1963)
Z_{DM}=CUT OFF DEPTH REQUIRED BY LACFCDDM

GENERAL

THIS SPREADSHEET IS DESIGNED TO CALCULATE SCOUR PROTECTION (TOE DOWN) BASED ON LADPW COUNTY HYDROLOGY MANUAL (1991) PAGES 5.2-5.8 AND ASSOCIATED APPENDICES (SEDIMENTATION MANUAL). ALL VELOCITIES ARE IN FPS, WITH A MAXIMUM VALUE LIMITED BY THE EQUATION. THE PRESENT VERSION (10/04) WILL CALCULATE UP TO 50 VELOCITIES AT ONE TIME. LONG TERM DEGRADATION IS USER SUPPLIED. GENERAL SCOUR IS TAKEN FROM APPENDIX Q3, INTERPOLATED. LOCAL SCOUR AT BENDS AND ABUTMENTS ARE BASED ON LADWP EQUATIONS FOUND IN APP Q12. BEND SCOUR IS BASED ON EQUATIONS IN APPENDIX Q12. A LONGITUDINAL EXTENT BASED ON SECONDARY CURRENTS IS NOT INCLUDED. BEDFORM HEIGHT IS BASED ON EQUATIONS IN APPENDIX Q13. JULY 2005 REVISION INCLUDES CALCULATION FOR CUT OFF DEPTH BASED ON LOS ANGELES COUNTY FLOOD CONTROL DISTRICT DESIGN MANUAL. THE CALCULATION DOES NOT CONSIDER ADJUSTMENTS TO CUT OFF DEPTH BASED ON TABLE F-06 THE OCTOBER 2005 REVISION INCLUDES ADDITIONAL TOEDOWN AT BRIDGES/ABUTMENTS WITH SOFT BOTTOMS.

COLOR CODES

OUTPUT
DATA FROM HEC-RAS
USER SUPPLIED DATA
INTERMEDIATE CALCULATIONS (INDIVIDUAL SHEETS ONLY)

DESIGNED BY DAVID A JAFFE, PHD, PE
PACIFIC ADVANCED CIVIL ENGINEERING, INC
OCTOBER, 2004
OCTOBER 2005, REVISED

SECTION	Z_{MAX}=	Z_{TOT}=	V (FPS)	FLOW DEPTH (FT)	Z_{DEG}+	Z_{GS}+	PIER TYPE	B	ABUT TYPE	A	SOFT	Z_{LS}+	BEND COEFF	HYD DEPTH	E SLOPE	TOP WIDTH	RADIUS	Z_{RS}+	Z_t+	H/2	Z_{DM}=
25425	21.0	19.2	18.3	12.5	2.0	5.4	0	0.0	1	0.0	0	0.0	1	7.1	0.007	1082.2	3000	5.3	2.0	4.5	21.0
25215	16.3	16.3	14.3	14.7	2.0	3.6	0	0.0	1	0.0	0	0.0	1	9.0	0.003	1097.3	3000	6.0	2.0	2.7	15.0
25000	15.5	15.5	13.2	15.5	2.0	3.2	0	0.0	1	0.0	0	0.0	1	10.1	0.002	1062.4	3000	6.0	2.0	2.3	15.0
24795	15.8	15.8	14.1	15.6	2.0	3.5	0	0.0	1	0.0	0	0.0	1	10.5	0.002	957.4	3000	5.6	2.0	2.7	15.0
24550	18.0	16.4	15.1	16.5	2.0	3.9	0	0.0	1	0.0	0	0.0	1	11.0	0.003	856.1	3000	5.4	2.0	3.1	18.0
24335	21.0	18.3	18.2	15.0	2.0	5.3	0	0.0	1	0.0	0	0.0	1	10.1	0.004	764.8	3000	4.5	2.0	4.5	21.0
24115	21.0	19.7	20.0	13.8	2.0	6.2	0	0.0	1	0.0	0	0.0	1	9.4	0.006	754.2	3000	4.1	2.0	5.4	21.0
23975	21.0	20.5	20.8	12.9	2.0	6.6	0	0.0	1	0.0	0	0.0	1	8.7	0.007	783.2	3000	4.1	2.0	5.8	21.0
23755	21.0	18.5	18.1	14.7	2.0	5.3	0	0.0	1	0.0	0	0.0	1	9.7	0.004	815.7	3000	4.8	2.0	4.4	21.0
23565	21.0	20.8	20.2	14.3	2.0	6.3	0	0.0	1	0.0	0	0.0	1	8.2	0.007	850.9	3000	4.9	2.0	5.5	21.0
23365	21.0	19.7	18.4	14.3	2.0	5.4	0	0.0	1	0.0	0	0.0	1	8.7	0.004	939.0	3000	5.7	2.0	4.6	21.0
23180	23.0	23.0	21.9	12.6	2.0	7.2	0	0.0	1	0.0	0	0.0	1	8.0	0.005	916.6	3000	5.5	2.0	6.3	21.0
23000	21.0	20.3	22.0	11.3	2.0	7.3	0	0.0	1	0.0	0	0.0	1	8.2	0.010	784.0	3000	3.4	2.0	5.6	21.0
22790	31.9	31.9	17.9	13.0	2.0	5.2	0.9	2.0	1	0.0	0	14.7	1	10.0	0.005	784.0	3000	3.7	2.0	4.3	18.0
22600	21.0	20.9	19.8	12.8	2.0	6.1	0	0.0	1	0.0	0	0.0	1	7.6	0.006	999.0	3000	5.5	2.0	5.3	21.0
22415	21.0	20.9	21.3	10.8	2.0	6.9	0	0.0	1	0.0	0	0.0	1	6.6	0.010	1039.1	3000	4.6	2.0	5.4	21.0
22195	16.5	16.5	13.6	14.0	2.0	3.4	0	0.0	1	0.0	0	0.0	1	8.7	0.003	1309.6	3000	6.6	2.0	2.5	15.0
22010	19.5	19.5	16.1	14.3	2.0	4.4	0	0.0	1	0.0	0	0.0	1	7.6	0.003	1254.1	3000	7.6	2.0	3.5	18.0
21790	21.2	21.2	19.7	11.6	2.0	6.1	0	0.0	1	0.0	0	0.0	1	6.5	0.006	1144.5	3000	5.9	2.0	5.2	21.0
21615	21.0	19.2	21.3	8.5	2.0	6.9	0	0.0	1	0.0	0	0.0	1	5.8	0.011	1163.0	3000	4.1	2.0	4.3	21.0
21440	18.9	18.9	17.5	11.0	2.0	5.0	0	0.0	1	0.0	0	0.0	1	6.9	0.005	1286.1	3000	5.8	2.0	4.1	18.0
21225	21.4	21.4	18.1	11.7	2.0	5.2	0	0.0	1	0.0	0	0.0	1	5.6	0.005	1559.0	3000	7.7	2.0	4.4	21.0
21020	21.0	18.8	20.3	9.7	2.0	6.3	0	0.0	1	0.0	0	0.0	1	7.8	0.007	903.0	3000	3.6	2.0	4.9	21.0
20845	18.9	18.9	15.1	12.7	2.0	3.9	0	0.0	1	0.0	0	0.0	1	6.7	0.003	1563.7	3000	7.9	2.0	3.1	18.0
20595	16.8	16.8	12.4	13.4	2.0	2.9	0	0.0	1	0.0	0	0.0	1	8.3	0.002	1548.8	3000	7.8	2.0	2.1	15.0
20435	17.0	17.0	12.1	14.3	2.0	2.8	0	0.0	1	0.0	0	0.0	1	8.8	0.001	1528.3	3000	8.3	2.0	2.0	15.0
20280	19.4	19.4	15.6	12.8	2.0	4.1	0	0.0	1	0.0	0	0.0	1	6.8	0.003	1531.3	3000	8.0	2.0	3.3	18.0
20070	22.5	22.5	19.3	11.1	2.0	5.9	0	0.0	1	0.0	0	0.0	1	5.2	0.006	1526.6	3000	7.5	2.0	5.0	21.0
19855	21.0	21.0	20.6	10.2	2.0	6.5	0	0.0	1	0.0	0	0.0	1	6.0	0.008	1205.4	3000	5.4	2.0	5.1	21.0
19630	21.0	18.8	20.6	8.9	2.0	6.5	0	0.0	1	0.0	0	0.0	1	6.6	0.009	1060.3	3000	3.8	2.0	4.4	21.0
19440	15.4	15.4	13.1	13.4	2.0	3.2	0	0.0	1	0.0	0	0.0	1	9.2	0.002	1194.5	3000	5.9	2.0	2.3	15.0
19240	18.0	17.3	15.9	11.9	2.0	4.3	0	0.0	1	0.0	0	0.0	1	7.4	0.004	1216.9	3000	5.6	2.0	3.4	18.0
19050	21.0	19.8	18.8	10.5	2.0	5.6	0	0.0	1	0.0	0	0.0	1	5.8	0.009	1321.4	3000	5.4	2.0	4.8	21.0
18830	17.7	17.7	13.3	14.6	2.0	3.2	0	0.0	1	0.0	0	0.0	1	7.4	0.003	1531.5	3000	8.1	2.0	2.4	15.0
18650	17.5	17.5	12.1	15.0	2.0	2.8	0	0.0	1	0.0	0	0.0	1	8.0	0.002	1604.5	3000	8.8	2.0	2.0	15.0
18475	15.4	15.4	8.9	16.9	2.0	1.8	0	0.0	1	0.0	0	0.0	1	9.9	0.001	1621.5	3000	8.5	2.0	1.1	12.0
18290	16.2	16.2	9.8	16.9	2.0	2.0	0	0.0	1	0.0	0	0.0	1	9.4	0.001	1594.2	3000	8.9	2.0	1.3	12.0
18025	8.0	6.3	7.9	18.5	2.0	1.5	0	0.0	1	0.0	0	0.0	1	11.9	0.001	1520.2	17000	0.0	2.0	0.8	8.0
17785	8.0	6.6	8.5	20.2	2.0	1.6	0	0.0	1	0.0	0	0.0	1	12.0	0.001	1398.1	17000	0.0	2.0	1.0	8.0
17510	10.0	8.0	11.0	19.2	2.0	2.4	0	0.0	1	0.0	0	0.0	1	10.2	0.001	1350.7	17000	0.0	2.0	1.6	10.0
17360	12.8	12.8	17.1	15.9	2.0	4.8	0	0.0	1	0.0	0	0.0	1	8.8	0.004	943.2	17000	0.0	2.0	3.9	12.5
17110	18.1	18.1	22.3	15.2	2.0	7.4	0	0.0	1	0.0	0	0.0	1	5.8	0.007	1175.4	17000	0.0	2.0	6.7	14.0
16970	18.6	18.6	23.1	13.6	2.0	7.9	0	0.0	1	0.0	0	0.0	1	5.9	0.010	1067.0	17000	0.0	2.0	6.8	14.0
16720	17.2	17.2	24.4	9.2	2.0	8.6	0	0.0	1	0.0	0	0.0	1	5.2	0.019	1122.9	17000	0.0	2.0	4.6	14.0
16515	15.0	15.0	19.4	10.4	2.0	5.9	0	0.0	1	0.0	0	0.0	1	5.8	0.010	1249.9	17000	0.0	2.0	5.1	14.0
16305	10.0	8.4	11.6	14.6	2.0	2.6	0	0.0	1	0.0	0	0.0	1	9.4	0.002	1360.5	17000	0.0	2.0	1.8	10.0
16130	12.5	11.5	15.7	12.3	2.0	4.2	0	0.0	1	0.0	0	0.0	1	7.1	0.005	1326.5	17000	0.0	2.0	3.3	12.5
15960	13.3	13.3	17.7	11.0	2.0	5.1	0	0.0	1	0.0	0	0.0	1	5.9	0.008	1386.0	17000	0.0	2.0	4.2	12.5
15745	10.0	8.9	12.3	13.3	2.0	2.9	0	0.0	1	0.0	0	0.0	1	8.4	0.003	1363.9	17000	0.0	2.0	2.0	10.0
15540	10.0	7.8	10.6	13.7	2.0	2.3	0	0.0	1	0.0	0	0.0	1	9.4	0.002	1426.6	17000	0.0	2.0	1.5	10.0
15335	12.5	12.0	16.2	12.1	2.0	4.4	0	0.0	1	0.0	0	0.0	1	8.2	0.006	1064.1	17000	0.0	2.0	3.5	12.5
15125	30.9	30.9	17.9	11.6	2.0	5.2	0.9	4.0	1	0.0	0	17.4	1	8.0	0.007	1000.5	17000	0.0	2.0	4.3	12.5
14900	14.7	14.7	19.3	9.8	2.0	5.8	0	0.0	1	0.0	0	0.0	1	6.3	0.009	1626.5	17000	0.0	2.0	4.9	14.0
14720	21.0	13.7	18.1	9.8	2.0	5.3	0	0.0	1	0.0	0	0.0	1	6.0	0.008	1722.3	17000	0.1	2.0	4.4	21.0
14480	21.0	14.2	19.0	8.9	2.0	5.7	0	0.0	1	0.0	0	0.0	1	5.2	0.010	1726.7	17000	0.1	2.0	4.4	21.0
14315	15.0	10.4	14.0	9.9	2.0	3.5	0	0.0	1	0.0	0	0.0	1	5.8	0.005	1881.0	17000	0.3	2.0	2.6	15.0
14090	15.0	10.5	14.3	8.5	2.0	3.6	0	0.0	1	0.0	0	0.0	1	5.6	0.006	1772.8	17000	0.1	2.0	2.8	15.0
13850	15.0	9.2	12.6	9.7	2.0	3.0	0	0.0	1	0.0	0	0.0	1	6.5	0.004	1741.6	17000	0.1	2.0	2.2	15.0
13635	18.0	11.4	15.5	10.3	2.0	4.1	0	0.0	1	0.0	0	0.0	1	6.3	0.004	1705.8	17000	0.1	2.0	3.2	18.0
13425	21.0	13.4	18.0	7.8	2.0	5.2	0	0.0	1	0.0	0	0.0	1	4.3	0.011	1850.7	17000	0.2	2.0	3.9	21.0
13190	15.0	9.1	12.2	9.5	2.0	2.8	0	0.0	1	0.0	0	0.0	1	6.5	0.003	1847.4	17000	0.3	2.0	2.0	15.0
13030	15.0	10.4	14.2	9.6	2.0	3.6	0	0.0	1	0.0	0	0.0	1	6.5	0.003	1763.0	17000	0.2	2.0	2.7	15.0
12835	10.0	9.6	13.3	10.1	2.0	3.2	0	0.0	1	0.0	0	0.0	1	7.3	0.003	1607.5	17000	0.0	2.0	2.4	10.0
12615	10.0	9.0	12.5	10.9	2.0	2.9	0	0.0	1	0.0	0	0.0	1	8.6	0.002	1470.8	17000	0.0	2.0	2.1	10.0
12395	10.0	8.9	12.3	11.5	2.0	2.9	0	0.0	1	0.0	0	0.0	1	9.0	0.002	1438.1	17000	0.0	2.0	2.0	10.0
12195	10.0	7.8	10.6	12.5	2.0	2.3	0	0.0	1	0.0	0	0.0	1	10.3	0.001	1383.7	17000	0.0	2.0	1.5	10.0
11995	10.0	9.3	12.8	13.6	2.0	3.0	0	0.0	1	0.0	0	0.0	1	9.7	0.002	1280.5	17000	0.0	2.0	2.2	10.0
11780	10.0	9.1	12.6	14.4	2.0	3.0	0	0.0	1	0.0	0	0.0	1	9.3	0.001	1422.2	17000	0.0	2.0	2.1	10.0
11605	10.1	10.1	13.9	13.8	2.0	3.5	0	0.0	1	0.0	0	0.0	1	8.6	0.002	1325.5	17000	0.0	2.0	2.6	10.0
11405	10.0	9.5	13.2	15.1	2.0	3.2	0	0.0	1	0.0	0	0.0	1	10.3	0.002	1114.6	17000	0.0	2.0	2.3	10.0
11180	12.5	12.3	16.6	13.9	2.0	4.6	0	0.0	1	0.0	0	0.0	1	10.6	0.003	835.7	17000	0.0	2.0	3.7	12.5
11015	14.7	14.7	19.1	13.3	2.0	5.7	0	0.0	1	0.0	0	0.0	1	11.0	0.004	679.4	17000	0.0	2.0	4.9	14.0
10835	16.7	16.7	21.9	10.9	2.0	7.2	0	0.0	1	0.0	0	0.0	1	8.2	0.007	790.4	17000	0.0	2.0	5.4	14.0
10575	16.2	16.2	24.1	7.5	2.0	8.5	0	0.0	1	0.0	0	0.0	1	5.3	0.016	1108.8	17000	0.0	2.0	3.7	14.0
10390	16.1	16.1	22.7	8.8	2.0	7.7	0	0.0	1	0.0	0	0.0	1	5.8	0.008	1247.0	17000	0.0	2.0	4.4	14.0
10225	13.4	13.4	17.8	9.5	2.0	5.1	0	0.0	1	0.0	0	0.0	1	5.9	0.007	1374.1	17000	0.0	2.0	4.3	12.5
10000	10.9	10.9	14.9	11.1	2.0	3.9	0	0.0	1	0.0	0	0.0	1	6.6	0.004	1488.0	17000	0.0	2.0	3.0	10.0
9820	14.2	14.2	18.6	10.0	2.0	5.5	0	0.0	1	0.0	0	0.0	1	5.7	0.008	1402.3	17000	0.0	2.0	4.7	14.0
9595	10.6	10.6	14.6	10.3	2.0	3.7	0	0.0	1	0.0	0	0.0	1	6.6	0.005	1619.5	17000	0.0	2.0	2.9	10.0
9385	18.0	11.7	15.8	9.5	2.0	4.2	0	0.0	1	0.0	0	0.0	1	5.3	0.006	1770.4	17000	0.2	2.0	3.4	18.0
9220	18.0	12.3	16.4	8.9	2.0	4.5	0	0.0	1	0.0	0	0.0	1	4.9	0.008	1771.4	17000	0.1	2.0	3.6	18.0
9025	18.0	11.8	15.9	8.9	2.0	4.3	0	0.0	1	0.0	0	0.0	1	5.5	0.005	1736.9	17000	0.1	2.0	3.4	18.0
MAX=	31.9	31.9			8.1	12.0						17.4					17000.0	8.9	2.0	8.3	21.0
MIN=	8.0	6.3			2.0	1.1						0.0					3000.0	0.0	2.0	0.5	8.0

CALCULATIONS FOR TOTAL TOE-DOWN BY INDIVIDUAL ADJUSTMENT COMPONENT BASED ON LACH&SM -- SANTA CLARA RIVER PROPOSED CONDITIONS STRAIGHT-INSIDE CURVED REACH, Q_{50} n=0.025

SECTION	Z_{MAX}=	Z_{TOT}=	V (FPS)	FLOW DEPTH (FT)	Z_{DEG}+	Z_{GS}+	PIER TYPE	B	ABUT TYPE	A	SOFT	Z_{LS}+	BEND COEFF	HYD DEPTH	E SLOPE	TOP WIDTH	RADIUS	Z_{BS}+	Z_F+	H/2	Z_{DM}=
46195	18.2	18.2	21.7	18.1	2.8	7.1	0	0.0	1	0.0	0	0.0	0	11.7	0.005	453.0	9000	0.0	2.0	6.3	14.0
46020	21.2	21.2	24.1	18.1	2.8	8.5	0	0.0	1	0.0	0	0.0	0	9.2	0.009	520.9	9000	0.0	2.0	7.9	14.0
45545	16.8	16.8	20.3	19.2	2.8	6.4	0	0.0	1	0.0	0	0.0	0	12.7	0.004	446.7	9000	0.0	2.0	5.6	14.0
45030	22.8	22.8	26.1	16.5	2.8	9.7	0	0.0	1	0.0	0	0.0	0	9.0	0.011	492.5	9000	0.0	2.0	8.3	14.0
44585	15.5	15.5	19.2	21.1	2.8	5.8	0	0.0	1	0.0	0	0.0	0	11.3	0.004	531.9	9000	0.0	2.0	5.0	14.0
44210	22.2	22.2	26.2	15.4	2.8	9.7	0	0.0	1	0.0	0	0.0	0	9.7	0.009	452.6	9000	0.0	2.0	7.7	14.0
43820	21.6	21.6	19.9	19.5	8.1	6.2	0	0.0	1	0.0	0	0.0	0	12.1	0.004	476.5	9000	0.0	2.0	5.3	14.0
43610	27.1	27.1	26.7	13.8	8.1	10.1	0	0.0	1	0.0	0	0.0	0	9.6	0.010	450.6	9000	0.0	2.0	6.9	14.0
43410	27.2	27.2	28.8	11.3	8.1	11.5	0	0.0	1	0.0	0	0.0	0	7.4	0.011	583.4	9000	0.0	2.0	5.7	14.0
43200	26.0	26.0	26.1	12.4	8.1	9.7	0	0.0	1	0.0	0	0.0	0	6.7	0.011	689.2	9000	0.0	2.0	6.2	14.0
42975	25.6	25.6	26.6	10.8	8.1	10.0	0	0.0	1	0.0	0	0.0	0	5.9	0.016	735.1	9000	0.0	2.0	5.4	14.0
42815	23.8	23.8	23.9	10.7	8.1	8.4	0	0.0	1	0.0	0	0.0	0	5.6	0.016	864.3	9000	0.0	2.0	5.4	14.0
42590	22.2	22.2	22.4	9.2	8.1	7.5	0	0.0	1	0.0	0	0.0	0	5.2	0.014	1013.1	9000	0.0	2.0	4.6	14.0
42430	21.3	21.3	19.6	10.7	8.1	6.0	0	0.0	1	0.0	0	0.0	0	6.4	0.009	915.8	9000	0.0	2.0	5.2	14.0
42215	20.2	20.2	18.5	11.2	8.1	5.5	0	0.0	1	0.0	0	0.0	0	6.1	0.009	1019.0	9000	0.0	2.0	4.6	14.0
41940	14.5	14.5	11.6	14.3	8.1	2.6	0	0.0	1	0.0	0	0.0	0	7.7	0.002	1284.2	9000	0.0	2.0	1.8	10.0
41730	14.7	14.7	11.8	14.7	8.1	2.7	0	0.0	1	0.0	0	0.0	0	8.2	0.002	1190.9	9000	0.0	2.0	1.9	10.0
41460	14.5	14.5	11.6	16.2	8.1	2.6	0	0.0	1	0.0	0	0.0	0	9.1	0.002	1093.5	9000	0.0	2.0	1.8	10.0
41280	15.3	15.3	16.4	14.4	5.2	4.5	0	0.0	1	0.0	0	0.0	0	8.3	0.004	852.3	9000	0.0	2.0	3.6	12.5
41080	18.7	18.7	19.9	12.1	5.2	6.2	0	0.0	1	0.0	0	0.0	0	6.7	0.008	874.1	9000	0.0	2.0	5.4	14.0
40825	16.8	16.8	18.0	11.5	5.2	5.2	0	0.0	1	0.0	0	0.0	0	6.2	0.007	1040.4	9000	0.0	2.0	4.4	14.0
40585	15.8	15.8	17.0	11.7	5.2	4.8	0	0.0	1	0.0	0	0.0	0	6.8	0.006	1005.8	9000	0.0	2.0	3.9	12.5
40335	11.0	11.0	10.5	15.1	5.2	2.3	0	0.0	1	0.0	0	0.0	0	8.8	0.002	1249.6	9000	0.0	2.0	1.5	10.0
40130	11.4	11.4	11.3	15.5	5.2	2.5	0	0.0	1	0.0	0	0.0	0	8.8	0.002	1195.6	9000	0.0	2.0	1.7	10.0
39945	11.2	11.2	11.0	16.3	5.2	2.4	0	0.0	1	0.0	0	0.0	0	9.3	0.002	1173.3	9000	0.0	2.0	1.6	10.0
39755	15.4	15.4	16.5	13.3	5.2	4.5	0	0.0	1	0.0	0	0.0	0	8.1	0.004	894.5	9000	0.0	2.0	3.7	12.5
39605	18.5	18.5	19.7	11.5	5.2	6.1	0	0.0	1	0.0	0	0.0	0	7.1	0.007	849.7	9000	0.0	2.0	5.2	14.0
39310	15.4	15.4	16.5	12.7	5.2	4.6	0	0.0	1	0.0	0	0.0	0	8.1	0.004	931.1	9000	0.0	2.0	3.7	12.5
39100	19.1	19.1	20.9	10.4	5.2	6.7	0	0.0	1	0.0	0	0.0	0	7.2	0.009	761.1	9000	0.0	2.0	5.2	14.0
38925	12.5	12.5	12.8	14.3	5.2	3.0	0	0.0	1	0.0	0	0.0	0	10.3	0.002	873.5	9000	0.0	2.0	2.2	10.0
38710	10.0	9.4	12.0	15.6	2.7	2.8	0	0.0	1	0.0	0	0.0	0	11.7	0.002	820.3	9000	0.0	2.0	2.0	10.0
38475	14.2	14.2	17.9	14.0	2.7	5.2	0	0.0	1	0.0	0	0.0	0	9.8	0.004	659.7	9000	0.0	2.0	4.3	12.5
38300	17.4	17.4	22.5	10.3	2.7	7.6	0	0.0	1	0.0	0	0.0	0	7.7	0.010	666.3	9000	0.0	2.0	5.1	14.0
38065	11.3	11.3	14.5	14.0	2.7	3.7	0	0.0	1	0.0	0	0.0	0	12.0	0.002	658.4	9000	0.0	2.0	2.9	10.0
37810	14.5	14.5	18.2	12.2	2.7	5.3	0	0.0	1	0.0	0	0.0	0	10.2	0.004	618.2	9000	0.0	2.0	4.5	14.0
37655	16.6	16.6	20.9	10.5	2.7	6.7	0	0.0	1	0.0	0	0.0	0	7.8	0.008	706.7	9000	0.0	2.0	5.3	14.0
37390	16.2	16.2	23.7	6.5	2.7	8.3	0	0.0	1	0.0	0	0.0	0	5.9	0.015	823.8	9000	0.0	2.0	3.3	14.0
37135	13.0	13.0	16.6	9.3	2.7	4.6	0	0.0	1	0.0	0	0.0	0	8.5	0.005	821.4	9000	0.0	2.0	3.7	12.5
36930	14.8	14.8	19.8	8.1	2.7	6.1	0	0.0	1	0.0	0	0.0	0	7.2	0.008	812.4	9000	0.0	2.0	4.1	14.0
36735	12.6	12.6	16.1	9.8	2.7	4.4	0	0.0	1	0.0	0	0.0	0	8.0	0.005	896.9	9000	0.0	2.0	3.5	12.5
36515	10.0	10.0	12.9	12.0	2.7	3.1	0	0.0	1	0.0	0	0.0	0	9.0	0.002	994.7	9000	0.0	2.0	2.2	10.0
36265	10.0	9.6	12.3	12.5	2.7	2.9	0	0.0	1	0.0	0	0.0	0	7.9	0.003	1176.0	9000	0.0	2.0	2.1	10.0
36080	25.1	25.1	14.7	11.6	3.2	3.8	0.9	2.0	1	0.0	0	13.3	0	6.7	0.006	1176.0	9000	0.0	2.0	2.9	10.0
35845	10.0	9.2	11.0	13.6	3.2	2.4	0	0.0	1	0.0	0	0.0	0	7.9	0.002	1401.7	9000	0.0	2.0	1.6	10.0
35725	12.1	12.1	15.0	13.0	3.2	3.9	0	0.0	1	0.0	0	0.0	0	6.5	0.004	1377.9	9000	0.0	2.0	3.0	10.0
35515	13.9	13.9	17.1	12.0	3.2	4.8	0	0.0	1	0.0	0	0.0	0	6.0	0.005	1354.8	9000	0.0	2.0	3.9	12.5
35245	14.1	14.1	17.3	11.3	3.2	4.9	0	0.0	1	0.0	0	0.0	0	5.5	0.006	1328.3	9000	0.0	2.0	4.0	12.5
35040	16.3	16.3	19.6	10.7	3.2	6.0	0	0.0	1	0.0	0	0.0	0	5.5	0.006	1354.8	9000	0.0	2.0	5.2	14.0
34860	15.1	15.1	18.4	10.0	3.2	5.4	0	0.0	1	0.0	0	0.0	0	4.9	0.009	1285.7	9000	0.0	2.0	4.6	14.0
34720	15.1	15.1	18.4	9.2	3.2	5.4	0	0.0	1	0.0	0	0.0	0	4.5	0.009	1411.2	9000	0.0	2.0	4.6	14.0
34495	14.2	14.2	17.4	9.0	3.2	5.0	0	0.0	1	0.0	0	0.0	0	5.2	0.009	1283.9	9000	0.0	2.0	4.1	12.5
34310	13.6	13.6	16.8	9.3	3.2	4.7	0	0.0	1	0.0	0	0.0	0	5.9	0.005	1308.5	9000	0.0	2.0	3.8	12.5
34090	13.8	13.8	17.0	8.6	3.2	4.8	0	0.0	1	0.0	0	0.0	0	5.3	0.007	1295.5	9000	0.0	2.0	3.9	12.5
33880	13.7	13.7	16.6	9.3	3.4	4.6	0	0.0	1	0.0	0	0.0	0	5.3	0.007	1318.4	9000	0.0	2.0	3.7	12.5
33710	12.6	12.6	15.4	9.7	3.4	4.1	0	0.0	1	0.0	0	0.0	0	5.5	0.005	1372.1	9000	0.0	2.0	3.2	12.5
33500	13.3	13.3	16.2	9.3	3.4	4.4	0	0.0	1	0.0	0	0.0	0	5.1	0.007	1496.0	9000	0.0	2.0	3.5	12.5
33310	13.0	13.0	15.8	9.0	3.4	4.2	0	0.0	1	0.0	0	0.0	0	4.2	0.006	1770.4	9000	0.0	2.0	3.4	12.5
33115	10.0	9.0	10.4	10.6	3.4	2.2	0	0.0	1	0.0	0	0.0	0	6.1	0.003	1847.3	9000	0.0	2.0	1.4	10.0
32795	10.8	10.8	13.0	10.6	3.4	3.1	0	0.0	1	0.0	0	0.0	0	5.2	0.004	1735.6	9000	0.0	2.0	2.3	10.0
32605	11.8	11.8	14.4	11.1	3.4	3.6	0	0.0	1	0.0	0	0.0	0	5.0	0.005	1699.9	9000	0.0	2.0	2.8	10.0
32265	12.5	11.7	15.9	10.5	2.0	4.3	0	0.0	1	0.0	0	0.0	0	4.8	0.006	1853.2	9000	0.0	2.0	3.4	12.5
31875	10.0	9.0	12.4	10.4	2.0	2.9	0	0.0	1	0.0	0	0.0	0	4.7	0.006	2409.2	9000	0.0	2.0	2.1	10.0
31585	10.0	8.0	10.9	11.9	2.0	2.4	0	0.0	1	0.0	0	0.0	0	5.9	0.003	2182.2	9000	0.0	2.0	1.6	10.0
31360	10.0	7.6	10.3	13.5	2.0	2.2	0	0.0	1	0.0	0	0.0	0	7.4	0.002	1878.7	9000	0.0	2.0	1.4	10.0
31060	8.0	6.5	8.2	15.5	2.0	1.6	0	0.0	1	0.0	0	0.0	0	10.1	0.001	1708.2	9000	0.0	2.0	0.9	8.0
30720	8.0	5.7	6.7	17.5	2.0	1.2	0	0.0	1	0.0	0	0.0	0	11.2	0.001	1888.6	9000	0.0	2.0	0.6	8.0
30445	8.0	5.6	6.3	19.5	2.0	1.1	0	0.0	1	0.0	0	0.0	0	12.7	0.000	1779.7	9000	0.0	2.0	0.5	8.0
30095	8.0	5.8	6.7	21.3	2.0	1.2	0	0.0	1	0.0	0	0.0	0	13.4	0.000	1622.7	9000	0.0	2.0	0.6	8.0
29815	8.0	6.2	7.7	21.9	2.0	1.4	0	0.0	1	0.0	0	0.0	0	13.5	0.000	1433.2	9000	0.0	2.0	0.8	8.0
29565	8.0	6.1	7.4	22.9	2.0	1.3	0	0.0	1	0.0	0	0.0	0	14.8	0.000	1323.8	9000	0.0	2.0	0.7	8.0
29385	8.0	6.5	8.3	23.6	2.0	1.6	0	0.0	1	0.0	0	0.0	0	14.4	0.000	1237.4	9000	0.0	2.0	0.9	8.0
29140	9.4	9.4	9.2	24.1	4.4	1.8	0	0.0	1	0.0	0	0.0	0	14.1	0.001	1087.2	9000	0.0	2.0	1.1	8.0
28895	16.8	16.8	18.8	22.5	4.4	5.6	0	0.0	1	0.0	0	0.0	0	9.9	0.002	972.1	9000	0.0	2.0	4.8	14.0
28695	24.9	24.9	28.9	14.0	4.4	11.5	0	0.0	1	0.0	0	0.0	0	5.4	0.025	899.4	9000	0.0	2.0	7.0	14.0
28500	20.6	20.6	22.4	16.1	4.4	7.5	0	0.0	1	0.0	0	0.0	0	11.4	0.006	552.2	9000	0.0	2.0	6.8	14.0
28280	23.8	23.8	29.6	10.8	4.4	12.0	0	0.0	1	0.0	0	0.0	0	5.8	0.013	944.5	9000	0.0	2.0	5.4	14.0
28080	10.6	10.6	11.3	19.1	4.4	2.5	0	0.0	1	0.0	0	0.0	0	14.7	0.001	926.4	9000	0.0	2.0	1.7	10.0
27925	11.8	11.8	13.1	19.3	4.4	3.1	0	0.0	1	0.0	0	0.0	0	13.8	0.001	866.6	9000	0.0	2.0	2.3	10.0
27725	17.0	17.0	19.0	16.7	4.4	5.7	0	0.0	1	0.0	0	0.0	0	10.4	0.003	786.6	9000	0.0	2.0	4.9	14.0
27545	21.2	21.2	22.9	14.1	4.4	7.8	0	0.0	1	0.0	0	0.0	0	9.9	0.005	643.2	9000	0.0	2.0	7.0	14.0
27335	21.3	21.3	24.6	12.3	4.4	8.7	0	0.0	1	0.0	0	0.0	0	8.3	0.008	703.5	9000	0.0	2.0	6.2	14.0
27155	17.0	17.0	19.1	14.8	4.4	5.7	0	0.0	1	0.0	0	0.0	0	9.2	0.003	888.4	9000	0.0	2.0	4.9	14.0
26990	17.3	17.3	22.6	11.5	2.0	7.6	0	0.0	1	0.0	0	0.0	0	6.8	0.011	922.3	9000	0.0	2.0	5.7	14.0
26780	17.5	17.5	23.1	11.3	2.0	7.9	0	0.0	1	0.0	0	0.0	0	6.2	0.009	1043.3	9000	0.0	2.0	5.6	14.0
26575	16.1	16.1	20.7	11.1	2.0	6.6	0	0.0	1	0.0	0	0.0	0	5.7	0.012	1187.3	3000	0.0	2.0	5.6	14.0
26355	12.5	11.7	15.9	13.4	2.0	4.3	0	0.0	1	0.0	0	0.0	0	7.5	0.004	1260.4	3000	0.0	2.0	3.4	12.5
26170	12.7	12.7	17.0	13.5	2.0	4.8	0	0.0	1	0.0	0	0.0	0	7.6	0.003	1269.0	3000	0.0	2.0	3.9	12.5
25965	14.0	13.8	18.2	12.9	2.0	5.3	0	0.0	1	0.0	0	0.0	0	6.9	0.004	1281.3	3000	0.0	2.0	4.5	14.0

DEFINITIONS

V(FPS) =VELOCITY IN FEET PER SECOND
Z_{TOT}=TOTAL POTENTIAL VERTICAL ADJUSTMENT IN FEET
Z_{DEG}=LONG TERM DEGRADATION IN FEET
Z_{GS}=GENERAL SCOUR IN FEET
Z_{LS}=LOCAL SCOUR IN FEET
PIER TYPE=PIER SHAPE FACTOR; IF NO PIERS=**0**
=SQUARE NOSE; **0.9** ROUND NOSE; **0.9** CYLINDER;
1.0 SHARP NOSE; **0.9** GROUP OF CYLINDERS
FLOW DEPTH=WATER DEPTH IN CHANNEL IN FEET
B=WIDTH OF PIERS IN FEET; NO PIER=0
ABUT TYPE=VERT WALL FACTOR; IF VERT=**2**; NON VERT=**1**
A=ABUTMENT PROTRUSION INTO FLOW PATH IN FEET
SOFT = SOFT BOTTOM AT A BRIDGE OR AN ABUTMENT
= HARD BOTTOM; **1** = SOFT BOTTOM
Z_{BS}=BEND SCOUR IN FEET
BEND COEFF=BEND COEFFICIENT; IF NO BEND=0, BEND=1
HYD DEPTH=HYDRAULIC DEPTH IN FEET
E SLOPE=ENERGY SLOPE, UNITLESS
TOP WIDTH=CHANNEL TOP WIDTH IN FEET
RADIUS=RADIUS OF CURVATURE TO CENTERLINE IN FEET
Z_F=LOW-FLOW INCISEMENT IN FEET, MEASURED OR 2'; VALUE **NOT LESS THAN 2'**
H=BEDFORM HEIGHT IN FEET, LIMITED TO FLOW DEPTH AFTER KENNEDY (1963)
Z_{DM}=CUT OFF DEPTH REQUIRED BY LACFCDDM

GENERAL

THIS SPREADSHEET IS DESIGNED TO CALCULATE SCOUR PROTECTION (TOE DOWN) BASED ON LADPW COUNTY HYDROLOGY MANUAL (1991) PAGES 5.2-5.8 AND ASSOCIATED APPENDICES (SEDIMENTATION MANUAL). ALL VELOCITIES ARE IN FPS, WITH A MAXIMUM VALUE LIMITED BY THE EQUATION. THE PRESENT VERSION (10/04) WILL CALCULATE UP TO 50 VELOCITIES AT ONE TIME. LONG TERM DEGRADATION IS USER SUPPLIED. GENERAL SCOUR IS TAKEN FROM APPENDIX Q3, INTERPOLATED. LOCAL SCOUR AT BENDS AND ABUTMENTS ARE BASED ON LADWP EQUATIONS FOUND IN APP Q12. BEND SCOUR IS BASED ON EQUATIONS IN APPENDIX Q12. A LONGITUDINAL EXTENT BASED ON SECONDARY CURRENTS IS NOT INCLUDED. BEDFORM HEIGHT IS BASED ON EQUATIONS IN APPENDIX Q13. JULY 2005 REVISION INCLUDES CALCULATION FOR CUT OFF DEPTH BASED ON LOS ANGELES COUNTY FLOOD CONTROL DISTRICT DESIGN MANUAL. THE CALCULATION DOES NOT CONSIDER ADJUSTMENTS TO CUT OFF DEPTH BASED ON TABLE F-06 THE OCTOBER 2005 REVISION INCLUDES ADDITIONAL TOEDOWN AT BRIDGES/ABUTMENTS WITH SOFT BOTTOMS.

COLOR CODES

OUTPUT
DATA FROM HEC-RAS
USER SUPPLIED DATA
INTERMEDIATE CALCULATIONS (INDIVIDUAL SHEETS ONLY)

DESIGNED BY DAVID A JAFFE, PHD, PE
PACIFIC ADVANCED CIVIL ENGINEERING, INC
OCTOBER, 2004
OCTOBER 2005, REVISED

SECTION	Z_{MAX}=	Z_{TOT}=	V (FPS)	FLOW DEPTH (FT)	Z_{DEG}+	Z_{GS}+	PIER TYPE	B	ABUT TYPE	A	SOFT	Z_{LS}+	BEND COEFF	HYD DEPTH	E SLOPE	TOP WIDTH	RADIUS	Z_{BS}+	Z+	H/2	Z_{DM}=
25785	14.5	14.5	18.9	12.1	2.0	5.7	0	0.0	1	0.0	0	0.0	0	6.9	0.005	1219.7	3000	0.0	2.0	4.8	14.0
25600	14.1	14.1	18.5	12.4	2.0	5.5	0	0.0	1	0.0	0	0.0	0	7.6	0.005	1109.4	3000	0.0	2.0	4.6	14.0
25425	14.0	13.9	18.3	12.5	2.0	5.4	0	0.0	1	0.0	0	0.0	0	7.1	0.007	1082.2	3000	0.0	2.0	4.5	14.0
25215	10.4	10.4	14.3	14.7	2.0	3.6	0	0.0	1	0.0	0	0.0	0	9.0	0.003	1097.3	3000	0.0	2.0	2.7	10.0
25000	10.0	9.5	13.2	15.5	2.0	3.2	0	0.0	1	0.0	0	0.0	0	10.1	0.002	1062.4	3000	0.0	2.0	2.3	10.0
24795	10.2	10.2	14.1	15.6	2.0	3.5	0	0.0	1	0.0	0	0.0	0	10.5	0.002	957.4	3000	0.0	2.0	2.7	10.0
24550	12.5	11.0	15.1	16.5	2.0	3.9	0	0.0	1	0.0	0	0.0	0	11.0	0.003	856.1	3000	0.0	2.0	3.1	12.5
24335	14.0	13.8	18.2	15.0	2.0	5.3	0	0.0	1	0.0	0	0.0	0	10.1	0.004	764.8	3000	0.0	2.0	4.5	14.0
24115	15.6	15.6	20.0	13.8	2.0	6.2	0	0.0	1	0.0	0	0.0	0	9.4	0.006	754.2	3000	0.0	2.0	5.4	14.0
23975	16.5	16.5	20.8	12.9	2.0	6.6	0	0.0	1	0.0	0	0.0	0	8.7	0.007	783.2	3000	0.0	2.0	5.8	14.0
23755	14.0	13.7	18.1	14.7	2.0	5.3	0	0.0	1	0.0	0	0.0	0	9.7	0.004	815.7	3000	0.0	2.0	4.4	14.0
23565	15.8	15.8	20.2	14.3	2.0	6.3	0	0.0	1	0.0	0	0.0	0	8.2	0.007	850.9	3000	0.0	2.0	5.5	14.0
23365	14.0	14.0	18.4	14.3	2.0	5.4	0	0.0	1	0.0	0	0.0	0	8.7	0.004	939.0	3000	0.0	2.0	4.6	14.0
23180	17.5	17.5	21.9	12.6	2.0	7.2	0	0.0	1	0.0	0	0.0	0	8.0	0.005	916.6	3000	0.0	2.0	6.3	14.0
23000	16.9	16.9	22.0	11.3	2.0	7.3	0	0.0	1	0.0	0	0.0	0	8.2	0.010	784.0	3000	0.0	2.0	5.6	14.0
22790	28.2	28.2	17.9	13.0	2.0	5.2	0.9	2.0	1	0.0	0	14.7	0	10.0	0.005	784.0	3000	0.0	2.0	4.3	12.5
22600	15.4	15.4	19.8	12.8	2.0	6.1	0	0.0	1	0.0	0	0.0	0	7.6	0.006	999.0	3000	0.0	2.0	5.3	14.0
22415	16.3	16.3	21.3	10.8	2.0	6.9	0	0.0	1	0.0	0	0.0	0	6.6	0.010	1039.1	3000	0.0	2.0	5.4	14.0
22195	10.0	9.9	13.6	14.0	2.0	3.4	0	0.0	1	0.0	0	0.0	0	8.7	0.003	1309.6	3000	0.0	2.0	2.5	10.0
22010	12.5	11.9	16.1	14.3	2.0	4.4	0	0.0	1	0.0	0	0.0	0	7.6	0.003	1254.1	3000	0.0	2.0	3.5	12.5
21790	15.3	15.3	19.7	11.6	2.0	6.1	0	0.0	1	0.0	0	0.0	0	6.5	0.006	1144.5	3000	0.0	2.0	5.2	14.0
21615	15.1	15.1	21.3	8.5	2.0	6.9	0	0.0	1	0.0	0	0.0	0	5.8	0.011	1163.0	3000	0.0	2.0	4.3	14.0
21440	13.1	13.1	17.5	11.0	2.0	5.0	0	0.0	1	0.0	0	0.0	0	6.9	0.005	1286.1	3000	0.0	2.0	4.1	12.5
21225	14.0	13.6	18.1	11.7	2.0	5.2	0	0.0	1	0.0	0	0.0	0	5.6	0.005	1559.0	3000	0.0	2.0	4.4	14.0
21020	15.2	15.2	20.3	9.7	2.0	6.3	0	0.0	1	0.0	0	0.0	0	7.8	0.007	903.0	3000	0.0	2.0	4.9	14.0
20845	12.5	11.0	15.1	12.7	2.0	3.9	0	0.0	1	0.0	0	0.0	0	6.7	0.003	1563.7	3000	0.0	2.0	3.1	12.5
20595	10.0	9.0	12.4	13.4	2.0	2.9	0	0.0	1	0.0	0	0.0	0	8.3	0.002	1548.8	3000	0.0	2.0	2.1	10.0
20435	10.0	8.7	12.1	14.3	2.0	2.8	0	0.0	1	0.0	0	0.0	0	8.8	0.001	1528.3	3000	0.0	2.0	2.0	10.0
20280	12.5	11.4	15.6	12.8	2.0	4.1	0	0.0	1	0.0	0	0.0	0	6.8	0.003	1531.3	3000	0.0	2.0	3.3	12.5
20070	14.9	14.9	19.3	11.1	2.0	5.9	0	0.0	1	0.0	0	0.0	0	5.2	0.006	1526.6	3000	0.0	2.0	5.0	14.0
19855	15.6	15.6	20.6	10.2	2.0	6.5	0	0.0	1	0.0	0	0.0	0	6.0	0.008	1205.4	3000	0.0	2.0	5.1	14.0
19630	14.9	14.9	20.6	8.9	2.0	6.5	0	0.0	1	0.0	0	0.0	0	6.6	0.009	1060.3	3000	0.0	2.0	4.4	14.0
19440	10.0	9.5	13.1	13.4	2.0	3.2	0	0.0	1	0.0	0	0.0	0	9.2	0.002	1194.5	3000	0.0	2.0	2.3	10.0
19240	12.5	11.7	15.9	11.9	2.0	4.3	0	0.0	1	0.0	0	0.0	0	7.4	0.004	1216.9	3000	0.0	2.0	3.4	12.5
19050	14.4	14.4	18.8	10.5	2.0	5.6	0	0.0	1	0.0	0	0.0	0	5.8	0.009	1321.4	3000	0.0	2.0	4.8	14.0
18830	10.0	9.6	13.3	14.6	2.0	3.2	0	0.0	1	0.0	0	0.0	0	7.4	0.003	1531.5	3000	0.0	2.0	2.4	10.0
18650	10.0	8.7	12.1	15.0	2.0	2.8	0	0.0	1	0.0	0	0.0	0	8.0	0.002	1604.5	3000	0.0	2.0	2.0	10.0
18475	8.0	6.8	8.9	16.9	2.0	1.8	0	0.0	1	0.0	0	0.0	0	9.9	0.001	1621.5	3000	0.0	2.0	1.1	8.0
18290	8.0	7.3	9.8	16.9	2.0	2.0	0	0.0	1	0.0	0	0.0	0	9.4	0.001	1594.2	3000	0.0	2.0	1.3	8.0
18025	8.0	6.3	7.9	18.5	2.0	1.5	0	0.0	1	0.0	0	0.0	0	11.9	0.001	1520.2	17000	0.0	2.0	0.8	8.0
17785	8.0	6.6	8.5	20.2	2.0	1.6	0	0.0	1	0.0	0	0.0	0	12.0	0.001	1398.1	17000	0.0	2.0	1.0	8.0
17510	10.0	8.0	11.0	19.2	2.0	2.4	0	0.0	1	0.0	0	0.0	0	10.2	0.001	1350.7	17000	0.0	2.0	1.6	10.0
17360	12.8	12.8	17.1	15.9	2.0	4.8	0	0.0	1	0.0	0	0.0	0	8.8	0.004	943.2	17000	0.0	2.0	3.9	12.5
17110	18.1	18.1	22.3	15.2	2.0	7.4	0	0.0	1	0.0	0	0.0	0	5.8	0.007	1175.4	17000	0.0	2.0	6.7	14.0
16970	18.6	18.6	23.1	13.6	2.0	7.9	0	0.0	1	0.0	0	0.0	0	5.9	0.010	1067.0	17000	0.0	2.0	6.8	14.0
16720	17.2	17.2	24.4	9.2	2.0	8.6	0	0.0	1	0.0	0	0.0	0	5.2	0.019	1122.9	17000	0.0	2.0	4.6	14.0
16515	15.0	15.0	19.4	10.4	2.0	5.9	0	0.0	1	0.0	0	0.0	0	5.8	0.010	1249.9	17000	0.0	2.0	5.1	14.0
16305	10.0	8.4	11.6	14.6	2.0	2.6	0	0.0	1	0.0	0	0.0	0	9.4	0.002	1360.5	17000	0.0	2.0	1.8	10.0
16130	12.5	11.5	15.7	12.3	2.0	4.2	0	0.0	1	0.0	0	0.0	0	7.1	0.005	1326.5	17000	0.0	2.0	3.3	12.5
15960	13.3	13.3	17.7	11.0	2.0	5.1	0	0.0	1	0.0	0	0.0	0	5.9	0.008	1386.0	17000	0.0	2.0	4.2	12.5
15745	10.0	8.9	12.3	13.3	2.0	2.9	0	0.0	1	0.0	0	0.0	0	8.4	0.003	1363.9	17000	0.0	2.0	2.0	10.0
15540	10.0	7.8	10.6	13.7	2.0	2.3	0	0.0	1	0.0	0	0.0	0	9.4	0.002	1426.6	17000	0.0	2.0	1.5	10.0
15335	12.5	12.0	16.2	12.1	2.0	4.4	0	0.0	1	0.0	0	0.0	0	8.2	0.006	1064.1	17000	0.0	2.0	3.5	12.5
15125	30.9	30.9	17.9	11.6	2.0	5.2	0.9	4.0	1	0.0	0	17.4	0	8.0	0.007	1000.5	17000	0.0	2.0	4.3	12.5
14900	14.7	14.7	19.3	9.8	2.0	5.8	0	0.0	1	0.0	0	0.0	0	6.3	0.009	1626.5	17000	0.0	2.0	4.9	14.0
14720	14.0	13.7	18.1	9.8	2.0	5.3	0	0.0	1	0.0	0	0.0	0	6.0	0.008	1722.3	17000	0.0	2.0	4.4	14.0
14480	14.1	14.1	19.0	8.9	2.0	5.7	0	0.0	1	0.0	0	0.0	0	5.2	0.010	1726.7	17000	0.0	2.0	4.4	14.0
14315	10.1	10.1	14.0	9.9	2.0	3.5	0	0.0	1	0.0	0	0.0	0	5.8	0.005	1881.0	17000	0.0	2.0	2.6	10.0
14090	10.4	10.4	14.3	8.5	2.0	3.6	0	0.0	1	0.0	0	0.0	0	5.6	0.006	1772.8	17000	0.0	2.0	2.8	10.0
13850	10.0	9.1	12.6	9.7	2.0	3.0	0	0.0	1	0.0	0	0.0	0	6.5	0.004	1741.6	17000	0.0	2.0	2.2	10.0
13635	12.5	11.3	15.5	10.3	2.0	4.1	0	0.0	1	0.0	0	0.0	0	6.3	0.004	1705.8	17000	0.0	2.0	3.2	12.5
13425	14.0	13.1	18.0	7.8	2.0	5.2	0	0.0	1	0.0	0	0.0	0	4.3	0.011	1850.7	17000	0.0	2.0	3.9	14.0
13190	10.0	8.8	12.2	9.5	2.0	2.8	0	0.0	1	0.0	0	0.0	0	6.5	0.003	1847.4	17000	0.0	2.0	2.0	10.0
13030	10.3	10.3	14.2	9.6	2.0	3.6	0	0.0	1	0.0	0	0.0	0	6.5	0.003	1763.0	17000	0.0	2.0	2.7	10.0
12835	10.0	9.6	13.3	10.1	2.0	3.2	0	0.0	1	0.0	0	0.0	0	7.3	0.003	1607.5	17000	0.0	2.0	2.4	10.0
12615	10.0	9.0	12.5	10.9	2.0	2.9	0	0.0	1	0.0	0	0.0	0	8.6	0.002	1470.8	17000	0.0	2.0	2.1	10.0
12395	10.0	8.9	12.3	11.5	2.0	2.9	0	0.0	1	0.0	0	0.0	0	9.0	0.002	1438.1	17000	0.0	2.0	2.0	10.0
12195	10.0	7.8	10.6	12.5	2.0	2.3	0	0.0	1	0.0	0	0.0	0	10.3	0.001	1383.7	17000	0.0	2.0	1.5	10.0
11995	10.0	9.3	12.8	13.6	2.0	3.0	0	0.0	1	0.0	0	0.0	0	9.7	0.002	1280.5	17000	0.0	2.0	2.2	10.0
11780	10.0	9.1	12.6	14.4	2.0	3.0	0	0.0	1	0.0	0	0.0	0	9.3	0.001	1422.2	17000	0.0	2.0	2.1	10.0
11605	10.1	10.1	13.9	13.8	2.0	3.5	0	0.0	1	0.0	0	0.0	0	8.6	0.002	1325.5	17000	0.0	2.0	2.6	10.0
11405	10.0	9.5	13.2	15.1	2.0	3.2	0	0.0	1	0.0	0	0.0	0	10.3	0.002	1114.6	17000	0.0	2.0	2.3	10.0
11180	12.5	12.3	16.6	13.9	2.0	4.6	0	0.0	1	0.0	0	0.0	0	10.6	0.003	835.7	17000	0.0	2.0	3.7	12.5
11015	14.7	14.7	19.1	13.3	2.0	5.7	0	0.0	1	0.0	0	0.0	0	11.0	0.004	679.4	17000	0.0	2.0	4.9	14.0
10835	16.7	16.7	21.9	10.9	2.0	7.2	0	0.0	1	0.0	0	0.0	0	8.2	0.007	790.4	17000	0.0	2.0	5.4	14.0
10575	16.2	16.2	24.1	7.5	2.0	8.5	0	0.0	1	0.0	0	0.0	0	5.3	0.016	1108.8	17000	0.0	2.0	3.7	14.0
10390	16.1	16.1	22.7	8.8	2.0	7.7	0	0.0	1	0.0	0	0.0	0	5.8	0.008	1247.0	17000	0.0	2.0	4.4	14.0
10225	13.4	13.4	17.8	9.5	2.0	5.1	0	0.0	1	0.0	0	0.0	0	5.9	0.007	1374.1	17000	0.0	2.0	4.3	12.5
10000	10.9	10.9	14.9	11.1	2.0	3.9	0	0.0	1	0.0	0	0.0	0	6.6	0.004	1488.0	17000	0.0	2.0	3.0	10.0
9820	14.2	14.2	18.6	10.0	2.0	5.5	0	0.0	1	0.0	0	0.0	0	5.7	0.008	1402.3	17000	0.0	2.0	4.7	14.0
9595	10.6	10.6	14.6	10.3	2.0	3.7	0	0.0	1	0.0	0	0.0	0	6.6	0.005	1619.5	17000	0.0	2.0	2.9	10.0
9385	12.5	11.6	15.8	9.5	2.0	4.2	0	0.0	1	0.0	0	0.0	0	5.3	0.006	1770.4	17000	0.0	2.0	3.4	12.5
9220	12.5	12.1	16.4	8.9	2.0	4.5	0	0.0	1	0.0	0	0.0	0	4.9	0.008	1771.4	17000	0.0	2.0	3.6	12.5
9025	12.5	11.7	15.9	8.9	2.0	4.3	0	0.0	1	0.0	0	0.0	0	5.5	0.005	1736.9	17000	0.0	2.0	3.4	12.5
MAX=	30.9	30.9			8.1	12.0						17.4					17000.0	0.0	2.0	8.3	14.0
MIN=	8.0	5.6			2.0	1.1						0.0					3000.0	0.0	2.0	0.5	8.0

Santa Clara River Fluvial Study

APPENDIX CHAPTER 6.1B

LACH&SM with SAM Toe
Existing & Proposed Conditions
Curved & Straight Reaches

PACIFIC ADVANCED
CIVIL ENGINEERING, INC.

CALCULATIONS FOR TOTAL TOE-DOWN BY INDIVIDUAL ADJUSTMENT COMPONENT BASED ON LACH&SM W/ SAM -- SANTA CLARA RIVER EXISTING CONDITIONS OUTSIDE CURVED REACH C_{AB} n=0.025

SECTION	Z_{MAX}=	Z_{TOT}=	V (FPS)	FLOW DEPTH (FT)	Z_{DEG}+	Z_{GS}+	PIER TYPE	B	ABUT TYPE	A	SOFT	Z_{LS}+	BEND COEFF	HYD DEPTH	E SLOPE	TOP WIDTH	RADIUS	Z_{BS}+	Z_f+	H/2	Z_{DM}=
46195	14.0	11.1	21.7	18.1	2.8	0.0	0	0.0	1	0.0	0	0.0	1	11.7	0.005	453.0	9000	0.0	2.0	6.3	14.0
46020	14.0	12.7	24.1	18.1	2.8	0.0	0	0.0	1	0.0	0	0.0	1	9.2	0.009	520.9	9000	0.0	2.0	7.9	14.0
45545	14.0	10.4	20.3	19.2	2.8	0.0	0	0.0	1	0.0	0	0.0	1	12.7	0.004	446.7	9000	0.0	2.0	5.6	14.0
45030	14.0	13.1	26.1	16.5	2.8	0.0	0	0.0	1	0.0	0	0.0	1	9.0	0.011	492.5	9000	0.0	2.0	8.3	14.0
44585	14.0	9.8	19.2	21.1	2.8	0.0	0	0.0	1	0.0	0	0.0	1	11.3	0.004	531.9	9000	0.0	2.0	5.0	14.0
44210	14.0	12.5	26.2	15.4	2.8	0.0	0	0.0	1	0.0	0	0.0	1	9.7	0.009	452.6	9000	0.0	2.0	7.7	14.0
43820	15.4	15.4	19.9	19.5	8.1	0.0	0	0.0	1	0.0	0	0.0	1	12.1	0.004	476.5	9000	0.0	2.0	5.3	14.0
43610	17.0	17.0	26.7	13.8	8.1	0.0	0	0.0	1	0.0	0	0.0	1	9.6	0.010	450.6	9000	0.0	2.0	6.9	14.0
43410	15.8	15.8	28.8	11.3	8.1	0.0	0	0.0	1	0.0	0	0.0	1	7.4	0.011	583.4	9000	0.0	2.0	5.7	14.0
43200	16.3	16.3	26.1	12.4	8.1	0.0	0	0.0	1	0.0	0	0.0	1	6.7	0.011	689.2	9000	0.0	2.0	6.2	14.0
42975	15.5	15.5	26.6	10.8	8.1	0.0	0	0.0	1	0.0	0	0.0	1	5.9	0.016	735.1	9000	0.0	2.0	5.4	14.0
42815	15.4	15.4	24.1	10.6	8.1	0.0	0	0.0	1	0.0	0	0.0	1	5.5	0.016	878.5	9000	0.0	2.0	5.3	14.0
42590	21.0	15.0	22.6	8.9	8.1	0.0	0	0.0	1	0.0	0	0.0	1	5.1	0.014	1023.2	9000	0.4	2.0	4.5	21.0
42430	21.0	15.1	20.8	9.6	8.1	0.0	0	0.0	1	0.0	0	0.0	1	5.9	0.012	940.5	9000	0.2	2.0	4.8	21.0
42215	15.0	13.1	10.4	14.3	8.1	0.0	0	0.0	1	0.0	0	0.0	1	8.5	0.002	1310.4	9000	1.5	2.0	1.5	15.0
41940	15.0	13.5	11.6	14.3	8.1	0.0	0	0.0	1	0.0	0	0.0	1	7.6	0.002	1321.5	9000	1.6	2.0	1.8	15.0
41730	15.0	13.3	11.8	14.7	8.1	0.0	0	0.0	1	0.0	0	0.0	1	8.0	0.002	1229.5	9000	1.3	2.0	1.9	15.0
41460	15.0	13.8	11.5	16.2	8.1	0.0	0	0.0	1	0.0	0	0.0	1	7.6	0.002	1329.0	9000	1.9	2.0	1.8	15.0
41280	12.5	11.2	16.5	14.3	5.2	0.3	0	0.0	1	0.0	0	0.0	1	8.2	0.004	852.1	9000	0.0	2.0	3.7	12.5
41080	14.0	12.8	19.9	12.1	5.2	0.3	0	0.0	1	0.0	0	0.0	1	6.7	0.007	874.2	9000	0.0	2.0	5.3	14.0
40825	21.0	12.4	18.0	11.5	5.2	0.3	0	0.0	1	0.0	0	0.0	1	6.2	0.007	1039.9	9000	0.5	2.0	4.4	21.0
40585	18.0	11.8	17.0	11.7	5.2	0.3	0	0.0	1	0.0	0	0.0	1	6.8	0.006	1005.9	9000	0.4	2.0	3.9	18.0
40335	15.0	11.4	11.1	14.5	5.2	0.3	0	0.0	1	0.0	0	0.0	1	7.1	0.002	1504.8	9000	2.2	2.0	1.7	15.0
40130	15.0	12.0	11.2	15.1	5.2	0.3	0	0.0	1	0.0	0	0.0	1	6.9	0.002	1636.5	9000	2.8	2.0	1.7	15.0
39945	15.0	11.9	10.3	16.1	5.2	0.3	0	0.0	1	0.0	0	0.0	1	7.6	0.001	1648.1	9000	3.0	2.0	1.4	15.0
39755	18.0	12.2	15.4	13.5	5.2	0.3	0	0.0	1	0.0	0	0.0	1	6.6	0.003	1251.4	9000	1.5	2.0	3.2	18.0
39605	21.0	13.4	19.4	11.4	5.2	0.3	0	0.0	1	0.0	0	0.0	1	5.8	0.007	1100.6	9000	0.8	2.0	5.1	21.0
39310	18.0	12.2	16.0	12.4	5.2	0.3	0	0.0	1	0.0	0	0.0	1	6.8	0.004	1204.5	9000	1.3	2.0	3.5	18.0
39100	15.0	11.2	12.4	14.1	5.2	0.3	0	0.0	1	0.0	0	0.0	1	7.8	0.002	1294.8	9000	1.6	2.0	2.1	15.0
38925	15.0	10.4	11.4	14.5	5.2	0.3	0	0.0	1	0.0	0	0.0	1	9.0	0.002	1181.3	9000	1.2	2.0	1.8	15.0
38710	15.0	6.9	10.6	15.9	2.7	0.0	0	0.0	1	0.0	0	0.0	1	10.8	0.001	1043.1	9000	0.7	2.0	1.5	15.0
38475	12.5	9.0	17.8	14.0	2.7	0.0	0	0.0	1	0.0	0	0.0	1	8.8	0.004	755.4	9000	0.0	2.0	4.3	12.5
38300	14.0	9.6	22.7	9.8	2.7	0.0	0	0.0	1	0.0	0	0.0	1	7.4	0.010	688.1	9000	0.0	2.0	4.9	14.0
38065	10.0	7.4	14.1	14.2	2.7	0.0	0	0.0	1	0.0	0	0.0	1	12.0	0.002	678.3	9000	0.0	2.0	2.7	10.0
37810	14.0	9.2	18.2	12.2	2.7	0.0	0	0.0	1	0.0	0	0.0	1	10.2	0.004	622.3	9000	0.0	2.0	4.5	14.0
37655	14.0	9.8	21.2	10.3	2.7	0.0	0	0.0	1	0.0	0	0.0	1	7.4	0.009	735.9	9000	0.0	2.0	5.1	14.0
37390	14.0	7.8	23.9	6.1	2.7	0.0	0	0.0	1	0.0	0	0.0	1	5.4	0.017	892.2	9000	0.0	2.0	3.1	14.0
37135	18.0	9.1	17.0	8.0	2.7	0.0	0	0.0	1	0.0	0	0.0	1	6.4	0.006	1088.9	9000	0.5	2.0	3.9	18.0
36930	21.0	9.2	18.3	7.9	2.7	0.0	0	0.0	1	0.0	0	0.0	1	6.0	0.007	1112.0	9000	0.6	2.0	3.9	21.0
36735	18.0	8.6	15.0	9.6	2.7	0.0	0	0.0	1	0.0	0	0.0	1	6.8	0.004	1195.7	9000	0.9	2.0	3.0	18.0
36515	18.0	9.7	16.7	9.6	2.7	0.0	0	0.0	1	0.0	0	0.0	1	5.5	0.006	1306.1	9000	1.2	2.0	3.8	18.0
36265	15.0	8.4	13.0	11.2	2.7	0.0	0	0.0	1	0.0	0	0.0	1	6.4	0.003	1373.1	9000	1.4	2.0	2.3	15.0
36080	15.0	9.5	12.5	11.7	3.2	0.6	0	0.0	1	0.0	0	0.0	1	6.4	0.004	1455.4	9000	1.6	2.0	2.1	15.0
35845	15.0	9.4	10.9	13.5	3.2	0.6	0	0.0	1	0.0	0	0.0	1	7.4	0.002	1496.2	9000	2.1	2.0	1.6	15.0
35725	15.0	10.7	14.7	13.0	3.2	0.6	0	0.0	1	0.0	0	0.0	1	6.3	0.003	1431.2	9000	2.1	2.0	2.9	15.0
35515	18.0	11.4	17.1	11.9	3.2	0.6	0	0.0	1	0.0	0	0.0	1	5.7	0.005	1353.4	9000	1.8	2.0	3.9	18.0
35245	15.0	11.0	14.5	12.5	3.2	0.6	0	0.0	1	0.0	0	0.0	1	5.8	0.003	1555.5	9000	2.4	2.0	2.8	15.0
35040	21.0	12.6	19.5	10.7	3.2	0.6	0	0.0	1	0.0	0	0.0	1	5.5	0.005	1355.9	9000	1.7	2.0	5.1	21.0
34860	21.0	11.5	18.1	10.1	3.2	0.6	0	0.0	1	0.0	0	0.0	1	4.8	0.008	1338.9	9000	1.3	2.0	4.4	21.0
34720	21.0	11.6	18.2	9.3	3.2	0.6	0	0.0	1	0.0	0	0.0	1	4.5	0.009	1411.5	9000	1.4	2.0	4.4	21.0
34495	21.0	11.2	18.1	8.9	3.2	0.6	0	0.0	1	0.0	0	0.0	1	5.0	0.009	1277.2	9000	1.0	2.0	4.4	21.0
34310	18.0	11.1	17.6	9.0	3.2	0.6	0	0.0	1	0.0	0	0.0	1	5.7	0.005	1280.8	9000	1.1	2.0	4.2	18.0
34090	18.0	10.7	17.2	8.6	3.2	0.6	0	0.0	1	0.0	0	0.0	1	5.4	0.007	1267.8	9000	1.0	2.0	4.0	18.0
33880	18.0	9.9	15.8	9.8	3.4	0.0	0	0.0	1	0.0	0	0.0	1	5.6	0.005	1310.6	9000	1.2	2.0	3.3	18.0
33710	18.0	10.3	16.5	9.4	3.4	0.0	0	0.0	1	0.0	0	0.0	1	5.2	0.007	1355.1	9000	1.3	2.0	3.7	18.0
33500	18.0	10.3	15.8	9.5	3.4	0.0	0	0.0	1	0.0	0	0.0	1	5.4	0.006	1474.3	9000	1.5	2.0	3.4	18.0
33310	18.0	10.9	15.9	9.1	3.4	0.0	0	0.0	1	0.0	0	0.0	1	4.2	0.006	1744.5	9000	2.1	2.0	3.4	18.0
33115	18.0	10.1	15.5	8.7	3.4	0.0	0	0.0	1	0.0	0	0.0	1	4.8	0.009	1573.2	9000	1.5	2.0	3.3	18.0
32795	15.0	9.7	12.2	11.0	3.4	0.0	0	0.0	1	0.0	0	0.0	1	5.5	0.003	1732.9	9000	2.3	2.0	2.0	15.0
32605	15.0	9.5	14.1	11.5	3.4	0.0	0	0.0	1	0.0	0	0.0	1	6.2	0.004	1344.6	9000	1.4	2.0	2.7	15.0
32265	18.0	10.2	16.7	10.2	2.0	0.0	0	0.0	1	0.0	0	0.0	1	4.6	0.007	1829.9	9000	2.5	2.0	3.8	18.0
31875	15.0	8.9	10.9	11.0	2.0	0.0	0	0.0	1	0.0	0	0.0	1	5.2	0.004	2482.2	9000	3.3	2.0	1.6	15.0
31585	18.0	10.6	16.6	9.8	2.0	0.0	0	0.0	1	0.0	0	0.0	1	4.0	0.009	2120.3	9000	2.9	2.0	3.7	18.0
31360	12.0	8.3	9.8	13.9	2.0	0.0	0	0.0	1	0.0	0	0.0	1	7.8	0.001	1884.4	9000	3.0	2.0	1.3	12.0
31060	12.0	7.6	7.9	15.9	2.0	0.0	0	0.0	1	0.0	0	0.0	1	10.5	0.001	1711.5	9000	2.7	2.0	0.8	12.0
30720	12.0	8.1	6.4	18.0	2.0	0.0	0	0.0	1	0.0	0	0.0	1	11.6	0.000	1891.7	9000	3.5	2.0	0.6	12.0
30445	12.0	8.0	6.0	19.9	2.0	0.0	0	0.0	1	0.0	0	0.0	1	13.1	0.000	1783.7	9000	3.5	2.0	0.5	12.0
30095	12.0	8.7	6.6	21.7	2.0	0.0	0	0.0	1	0.0	0	0.0	1	12.7	0.000	1730.3	9000	4.1	2.0	0.6	12.0
29815	12.0	9.1	7.7	22.4	2.0	0.0	0	0.0	1	0.0	0	0.0	1	11.7	0.000	1675.2	9000	4.3	2.0	0.8	12.0
29565	12.0	9.4	7.4	23.3	2.0	0.0	0	0.0	1	0.0	0	0.0	1	11.8	0.000	1717.4	9000	4.6	2.0	0.7	12.0
29385	12.0	9.8	8.5	24.0	2.0	0.0	0	0.0	1	0.0	0	0.0	1	10.8	0.000	1675.1	9000	4.8	2.0	1.0	12.0
29140	15.1	15.1	10.1	24.3	4.4	2.9	0	0.0	1	0.0	0	0.0	1	9.3	0.001	1557.6	9000	4.4	2.0	1.4	15.0
28895	21.0	16.1	19.7	22.4	4.4	2.9	0	0.0	1	0.0	0	0.0	1	8.6	0.002	1062.3	9000	1.6	2.0	5.2	21.0
28695	17.3	17.3	27.5	16.0	4.4	2.9	0	0.0	1	0.0	0	0.0	1	9.4	0.009	544.9	9000	0.0	2.0	8.0	14.0
28500	16.1	16.1	28.6	13.6	4.4	2.9	0	0.0	1	0.0	0	0.0	1	9.8	0.010	503.7	9000	0.0	2.0	6.8	14.0
28280	15.2	15.2	29.7	11.8	4.4	2.9	0	0.0	1	0.0	0	0.0	1	8.8	0.011	549.3	9000	0.0	2.0	5.9	14.0
28080	15.0	15.0	28.1	11.4	4.4	2.9	0	0.0	1	0.0	0	0.0	1	9.2	0.011	547.6	9000	0.0	2.0	5.7	14.0
27925	13.6	13.6	18.0	17.5	4.4	2.9	0	0.0	1	0.0	0	0.0	1	13.0	0.002	612.7	9000	0.0	2.0	4.3	12.5
27725	15.0	15.0	20.5	16.3	4.4	2.9	0	0.0	1	0.0	0	0.0	1	12.1	0.003	587.1	9000	0.0	2.0	5.7	14.0
27545	15.9	15.9	24.7	13.2	4.4	2.9	0	0.0	1	0.0	0	0.0	1	9.5	0.007	613.0	9000	0.0	2.0	6.6	14.0
27335	15.3	15.3	25.5	12.0	4.4	2.9	0	0.0	1	0.0	0	0.0	1	8.1	0.008	691.0	9000	0.0	2.0	6.0	14.0
27155	15.9	15.9	22.3	13.2	4.4	2.9	0	0.0	1	0.0	0	0.0	1	8.0	0.005	856.6	9000	0.0	2.0	6.6	14.0
26990	21.0	10.5	23.5	11.2	2.0	0.4	0	0.0	1	0.0	0	0.0	1	6.0	0.010	1008.2	9000	0.5	2.0	5.6	21.0
26780	21.0	10.9	23.9	11.0	2.0	0.4	0	0.0	1	0.0	0	0.0	1	5.6	0.010	1131.7	9000	1.0	2.0	5.5	21.0
26575	21.0	15.2	21.0	11.0	2.0	0.4	0	0.0	1	0.0	0	0.0	1	5.5	0.013	1216.4	3000	5.3	2.0	5.5	21.0
26355	18.0	14.8	15.8	13.4	2.0	0.4	0	0.0	1	0.0	0	0.0	1	7.5	0.003	1282.4	3000	7.0	2.0	3.4	18.0
26170	18.0	16.5	18.0	13.0	2.0	0.4	0	0.0	1	0.0	0	0.0	1	6.8	0.004	1347.9	3000	7.7	2.0	4.4	18.0

DEFINITIONS

V(FPS) =VELOCITY IN FEET PER SECOND
Z_{TOT}=TOTAL POTENTIAL VERTICAL ADJUSTMENT IN FEET
Z_{DEG}=LONG TERM DEGRADATION IN FEET
Z_{GS}=GENERAL SCOUR IN FEET FROM SAM
Z_{LS}=LOCAL SCOUR IN FEET
PIER TYPE=PIER SHAPE FACTOR; IF NO PIERS=**0**
=SQUARE NOSE; **0.9** ROUND NOSE; **0.9** CYLINDER;
1.0 SHARP NOSE; **0.9** GROUP OF CYLINDERS
1.0
FLOW DEPTH=WATER DEPTH IN CHANNEL IN FEET
B=WIDTH OF PIERS IN FEET; NO PIER=0
ABUT TYPE=VERT WALL FACTOR; IF VERT=**2**; NON VERT=**1**
A=ABUTMENT PROTRUSION INTO FLOW PATH IN FEET
SOFT = SOFT BOTTOM AT A BRIDGE OR AN ABUTMENT
= HARD BOTTOM; **1** = SOFT BOTTOM
Z_{BS}=BEND SCOUR IN FEET
BEND COEFF=BEND COEFFICIENT; IF NO BEND=0, BEND=1
HYD DEPTH=HYDRAULIC DEPTH IN FEET
E SLOPE=ENERGY SLOPE, UNITLESS
TOP WIDTH=CHANNEL TOP WIDTH IN FEET
RADIUS=RADIUS OF CURVATURE TO CENTERLINE IN FEET
Z_f=LOW-FLOW INCISEMENT IN FEET, MEASURED OR 2'; VALUE **NOT LESS THAN 2'**
H=BEDFORM HEIGHT IN FEET, LIMITED TO FLOW DEPTH AFTER KENNEDY (1963)
Z_{DM}=CUT OFF DEPTH REQUIRED BY LACFCDDM

GENERAL

THIS SPREADSHEET IS DESIGNED TO CALCULATE SCOUR PROTECTION (TOE DOWN) BASED ON LADPW COUNTY HYDROLOGY MANUAL (1991) PAGES 5.2-5.8 AND ASSOCIATED APPENDICES (SEDIMENTATION MANUAL). ALL VELOCITIES ARE IN FPS, WITH A MAXIMUM VALUE LIMITED BY THE EQUATION. THE PRESENT VERSION (10/04) WILL CALCULATE UP TO 50 VELOCITIES AT ONE TIME. LONG TERM DEGRADATION IS USER SUPPLIED. GENERAL SCOUR IS TAKEN FROM APPENDIX Q3, INTERPOLATED. LOCAL SCOUR AT BENDS AND ABUTMENTS ARE BASED ON LADWP EQUATIONS FOUND IN APP Q12. BEND SCOUR IS BASED ON EQUATIONS IN APPENDIX Q12. A LONGITUDINAL EXTENT BASED ON SECONDARY CURRENTS IS NOT INCLUDED. BEDFORM HEIGHT IS BASED ON EQUATIONS IN APPENDIX Q13. JULY 2005 REVISION INCLUDES CALCULATION FOR CUT OFF DEPTH BASED ON LOS ANGELES COUNTY FLOOD CONTROL DISTRICT DESIGN MANUAL. THE CALCULATION DOES NOT CONSIDER ADJUSTMENTS TO CUT OFF DEPTH BASED ON TABLE F-06 THE OCTOBER 2005 REVISION INCLUDES ADDITIONAL TOEDOWN AT BRIDGES/ABUTMENTS WITH SOFT BOTTOMS.

COLOR CODES

OUTPUT
DATA FROM HEC-RAS
USER SUPPLIED DATA
INTERMEDIATE CALCULATIONS (INDIVIDUAL SHEETS ONLY)

DESIGNED BY DAVID A JAFFE, PHD, PE
PACIFIC ADVANCED CIVIL ENGINEERING, INC
OCTOBER, 2004
OCTOBER 2005, REVISED

SECTION	Z_{MAX}=	Z_{TOT}=	V (FPS)	FLOW DEPTH (FT)	Z_{NEG}+	Z_{GS}+	PIER TYPE	B	ABUT TYPE	A	SOFT	Z_{LS}+	BEND COEFF	HYD DEPTH	E SLOPE	TOP WIDTH	RADIUS	Z_{BS}+	Z_L+	H/2	Z_{INV}=
25965	18.0	16.1	17.9	13.0	2.0	0.4	0	0.0	1	0.0	0	0.0	1	7.0	0.004	1288.3	3000	7.4	2.0	4.3	18.0
25785	21.0	16.6	19.5	11.7	2.0	0.4	0	0.0	1	0.0	0	0.0	1	6.2	0.005	1336.9	3000	7.0	2.0	5.2	21.0
25600	21.0	18.4	20.6	11.3	2.0	0.4	0	0.0	1	0.0	0	0.0	1	5.2	0.006	1596.5	3000	8.3	2.0	5.6	21.0
25425	21.0	18.5	20.0	11.3	2.0	0.4	0	0.0	1	0.0	0	0.0	1	4.4	0.008	1773.8	3000	8.7	2.0	5.4	21.0
25215	16.3	16.3	14.5	13.6	2.0	0.4	0	0.0	1	0.0	0	0.0	1	6.1	0.003	1748.6	3000	9.0	2.0	2.8	15.0
25000	19.0	19.0	17.4	12.2	2.0	0.4	0	0.0	1	0.0	0	0.0	1	4.4	0.006	2103.2	3000	10.5	2.0	4.1	18.0
24795	21.0	19.7	19.0	11.4	2.0	0.0	0	0.0	1	0.0	0	0.0	1	3.9	0.007	2311.7	3000	10.8	2.0	4.9	21.0
24550	21.0	19.6	21.3	10.8	2.0	0.0	0	0.0	1	0.0	0	0.0	1	3.8	0.009	2227.0	3000	10.2	2.0	5.4	21.0
24335	17.0	17.0	14.5	13.1	2.0	0.0	0	0.0	1	0.0	0	0.0	1	5.7	0.003	2089.5	3000	10.2	2.0	2.8	15.0
24115	21.0	17.5	18.8	11.1	2.0	0.0	0	0.0	1	0.0	0	0.0	1	4.5	0.008	2015.8	3000	8.7	2.0	4.8	21.0
23975	21.0	16.6	19.0	10.2	2.0	0.0	0	0.0	1	0.0	0	0.0	1	4.6	0.008	1913.7	3000	7.7	2.0	4.9	21.0
23755	18.0	15.8	16.7	10.9	2.0	0.0	0	0.0	1	0.0	0	0.0	1	5.1	0.006	1935.4	3000	8.0	2.0	3.8	18.0
23565	16.1	16.1	14.5	12.7	2.0	0.0	0	0.0	1	0.0	0	0.0	1	5.6	0.004	2039.5	3000	9.3	2.0	2.8	15.0
23365	18.0	15.3	17.0	10.8	2.0	0.0	0	0.0	1	0.0	0	0.0	1	5.4	0.006	1781.4	3000	7.4	2.0	3.9	18.0
23180	15.5	15.5	13.2	11.8	2.0	0.0	0	0.0	1	0.0	0	0.0	1	6.6	0.002	2084.2	3000	9.2	2.0	2.3	15.0
23000	13.0	13.0	8.9	13.0	2.0	0.0	0	0.0	1	0.0	0	0.0	1	7.7	0.001	2069.1	3000	7.9	2.0	1.1	12.0
22790	13.0	13.0	9.4	13.1	2.0	0.0	0	0.0	1	0.0	0	0.0	1	7.8	0.001	1949.0	3000	7.8	2.0	1.2	12.0
22600	15.0	15.0	11.4	14.1	2.0	0.0	0	0.0	1	0.0	0	0.0	1	7.9	0.001	1865.2	3000	9.3	2.0	1.7	15.0
22415	15.0	14.6	11.8	14.1	2.0	0.0	0	0.0	1	0.0	0	0.0	1	8.1	0.002	1705.6	3000	8.7	2.0	1.9	15.0
22195	15.0	14.4	14.1	13.7	2.0	0.6	0	0.0	1	0.0	0	0.0	1	7.8	0.003	1322.2	3000	7.1	2.0	2.7	15.0
22010	18.0	16.2	16.0	14.4	2.0	0.6	0	0.0	1	0.0	0	0.0	1	7.3	0.003	1328.0	3000	8.2	2.0	3.5	18.0
21790	21.0	15.7	19.7	11.6	2.0	0.6	0	0.0	1	0.0	0	0.0	1	6.5	0.006	1145.7	3000	5.9	2.0	5.2	21.0
21615	21.0	13.0	21.4	8.5	2.0	0.6	0	0.0	1	0.0	0	0.0	1	5.8	0.010	1161.3	3000	4.2	2.0	4.3	21.0
21440	21.0	16.0	20.1	9.7	2.0	0.6	0	0.0	1	0.0	0	0.0	1	5.0	0.008	1574.6	3000	6.6	2.0	4.8	21.0
21225	21.0	19.5	19.5	10.6	2.0	0.6	0	0.0	1	0.0	0	0.0	1	3.9	0.008	2217.7	3000	9.7	2.0	5.1	21.0
21020	21.0	15.5	20.8	8.9	2.0	0.6	0	0.0	1	0.0	0	0.0	1	4.6	0.009	1676.4	3000	6.5	2.0	4.4	21.0
20845	18.1	18.1	17.1	10.4	2.0	0.6	0	0.0	1	0.0	0	0.0	1	4.2	0.006	2369.3	3000	9.6	2.0	3.9	18.0
20595	18.0	18.0	15.2	10.9	2.0	0.6	0	0.0	1	0.0	0	0.0	1	4.7	0.003	2463.7	3000	10.3	2.0	3.1	18.0
20435	18.2	18.2	12.9	12.2	2.0	0.6	0	0.0	1	0.0	0	0.0	1	5.4	0.002	2582.7	3000	11.3	2.0	2.3	15.0
20280	18.2	18.2	14.0	11.8	2.0	0.6	0	0.0	1	0.0	0	0.0	1	5.0	0.003	2589.6	3000	11.0	2.0	2.6	15.0
20070	21.0	15.9	20.2	9.2	2.0	0.6	0	0.0	1	0.0	0	0.0	1	4.7	0.009	1767.5	3000	6.7	2.0	4.6	21.0
19855	18.0	16.2	17.8	9.9	2.0	0.0	0	0.0	1	0.0	0	0.0	1	4.8	0.006	1975.1	3000	7.9	2.0	4.3	18.0
19630	18.0	14.9	17.9	8.9	2.0	0.0	0	0.0	1	0.0	0	0.0	1	4.9	0.006	1836.2	3000	6.6	2.0	4.3	18.0
19440	15.0	14.8	11.9	12.1	2.0	0.0	0	0.0	1	0.0	0	0.0	1	6.5	0.002	2095.3	3000	8.9	2.0	1.9	15.0
19240	15.3	15.3	13.9	11.4	2.0	0.0	0	0.0	1	0.0	0	0.0	1	5.6	0.003	2091.7	3000	8.7	2.0	2.6	15.0
19050	15.0	14.7	11.0	12.9	2.0	0.0	0	0.0	1	0.0	0	0.0	1	6.7	0.002	2160.8	3000	9.1	2.0	1.6	15.0
18830	15.6	15.6	10.7	14.6	2.0	0.0	0	0.0	1	0.0	0	0.0	1	7.1	0.002	2094.4	3000	10.1	2.0	1.5	15.0
18650	15.5	15.5	9.9	15.0	2.0	0.0	0	0.0	1	0.0	0	0.0	1	8.0	0.001	2022.7	3000	10.1	2.0	1.3	12.0
18475	14.6	14.6	8.1	16.6	2.0	0.0	0	0.0	1	0.0	0	0.0	1	9.4	0.001	1944.4	3000	9.7	2.0	0.9	12.0
18290	14.9	14.9	8.7	16.8	2.0	0.0	0	0.0	1	0.0	0	0.0	1	9.3	0.001	1843.7	3000	9.9	2.0	1.0	12.0
18025	8.0	4.8	7.8	18.2	2.0	0.0	0	0.0	1	0.0	0	0.0	1	11.5	0.001	1610.9	17000	0.0	2.0	0.8	8.0
17785	8.0	5.0	8.7	19.8	2.0	0.0	0	0.0	1	0.0	0	0.0	1	11.6	0.001	1417.5	17000	0.0	2.0	1.0	8.0
17510	10.0	7.8	14.0	18.0	2.0	1.2	0	0.0	1	0.0	0	0.0	1	8.5	0.002	1243.6	17000	0.0	2.0	2.6	10.0
17360	12.5	9.1	17.0	16.9	2.0	1.2	0	0.0	1	0.0	0	0.0	1	8.9	0.004	936.6	17000	0.0	2.0	3.9	12.5
17110	14.0	11.6	21.7	15.4	2.0	1.2	0	0.0	1	0.0	0	0.0	1	5.6	0.006	1274.3	17000	0.0	2.0	6.4	14.0
16970	14.0	12.0	22.9	13.6	2.0	1.2	0	0.0	1	0.0	0	0.0	1	5.7	0.008	1125.6	17000	0.0	2.0	6.8	14.0
16720	14.0	9.7	25.2	9.0	2.0	1.2	0	0.0	1	0.0	0	0.0	1	4.1	0.018	1404.6	17000	0.0	2.0	4.5	14.0
16515	14.0	10.0	21.5	9.5	2.0	1.2	0	0.0	1	0.0	0	0.0	1	4.3	0.012	1622.6	17000	0.0	2.0	4.8	14.0
16305	21.0	10.3	21.5	9.6	2.0	1.2	0	0.0	1	0.0	0	0.0	1	4.2	0.011	1812.8	17000	0.3	2.0	4.8	21.0
16130	18.0	9.2	16.1	10.2	2.0	1.2	0	0.0	1	0.0	0	0.0	1	5.2	0.005	1945.1	17000	0.5	2.0	3.5	18.0
15960	18.0	9.3	15.8	9.3	2.0	1.2	0	0.0	1	0.0	0	0.0	1	4.1	0.011	2180.9	17000	0.7	2.0	3.4	18.0
15745	15.0	7.7	10.9	10.6	2.0	1.2	0	0.0	1	0.0	0	0.0	1	5.7	0.003	2279.0	17000	0.9	2.0	1.6	15.0
15540	15.0	7.8	11.0	10.6	2.0	1.2	0	0.0	1	0.0	0	0.0	1	5.8	0.003	2324.2	17000	1.0	2.0	1.6	15.0
15335	15.0	8.3	12.7	10.5	2.0	1.2	0	0.0	1	0.0	0	0.0	1	4.9	0.005	2302.1	17000	1.0	2.0	2.2	15.0
15125	12.5	8.1	16.2	9.6	2.0	0.6	0	0.0	1	0.0	0	0.0	1	5.5	0.007	1618.5	17000	0.0	2.0	3.5	12.5
14900	15.0	7.5	14.5	10.4	2.0	0.6	0	0.0	1	0.0	0	0.0	1	6.1	0.004	1704.5	17000	0.1	2.0	2.9	15.0
14720	18.0	8.6	16.8	9.3	2.0	0.6	0	0.0	1	0.0	0	0.0	1	5.1	0.008	1763.5	17000	0.1	2.0	3.8	18.0
14480	15.0	7.6	14.3	10.2	2.0	0.6	0	0.0	1	0.0	0	0.0	1	6.0	0.004	1801.7	17000	0.2	2.0	2.7	15.0
14315	15.0	7.8	14.8	9.4	2.0	0.6	0	0.0	1	0.0	0	0.0	1	5.2	0.006	1868.1	17000	0.3	2.0	3.0	15.0
14090	15.0	7.3	13.8	9.0	2.0	0.6	0	0.0	1	0.0	0	0.0	1	5.9	0.005	1766.8	17000	0.1	2.0	2.6	15.0
13850	18.0	8.0	15.6	8.4	2.0	0.6	0	0.0	1	0.0	0	0.0	1	5.3	0.007	1727.3	17000	0.1	2.0	3.3	18.0
13635	12.5	7.8	15.4	10.3	2.0	0.6	0	0.0	1	0.0	0	0.0	1	6.4	0.004	1691.9	17000	0.0	2.0	3.2	12.5
13425	18.0	8.9	17.3	8.3	2.0	0.6	0	0.0	1	0.0	0	0.0	1	4.5	0.009	1854.4	17000	0.3	2.0	4.0	18.0
13190	15.0	6.9	12.2	9.5	2.0	0.6	0	0.0	1	0.0	0	0.0	1	6.4	0.003	1847.3	17000	0.3	2.0	2.0	15.0
13030	15.0	6.9	14.2	9.6	2.0	0.0	0	0.0	1	0.0	0	0.0	1	6.5	0.003	1763.0	17000	0.2	2.0	2.7	15.0
12835	10.0	6.4	13.3	10.1	2.0	0.0	0	0.0	1	0.0	0	0.0	1	7.3	0.003	1607.5	17000	0.0	2.0	2.4	10.0
12615	10.0	6.1	12.4	10.9	2.0	0.0	0	0.0	1	0.0	0	0.0	1	8.7	0.002	1471.0	17000	0.0	2.0	2.1	10.0
12395	10.0	6.0	12.3	11.5	2.0	0.0	0	0.0	1	0.0	0	0.0	1	9.0	0.002	1438.4	17000	0.0	2.0	2.0	10.0
12195	10.0	5.5	10.6	12.5	2.0	0.0	0	0.0	1	0.0	0	0.0	1	10.3	0.001	1389.3	17000	0.0	2.0	1.5	10.0
11995	10.0	6.2	12.7	13.7	2.0	0.0	0	0.0	1	0.0	0	0.0	1	9.8	0.002	1281.1	17000	0.0	2.0	2.2	10.0
11780	10.0	6.1	12.5	14.4	2.0	0.0	0	0.0	1	0.0	0	0.0	1	9.4	0.001	1400.9	17000	0.0	2.0	2.1	10.0
11605	10.0	6.7	14.1	13.7	2.0	0.0	0	0.0	1	0.0	0	0.0	1	8.7	0.002	1282.9	17000	0.0	2.0	2.7	10.0
11405	10.0	6.3	13.2	15.1	2.0	0.0	0	0.0	1	0.0	0	0.0	1	10.1	0.002	1130.2	17000	0.0	2.0	2.3	10.0
11180	12.5	7.7	16.6	13.9	2.0	0.0	0	0.0	1	0.0	0	0.0	1	10.6	0.003	835.7	17000	0.0	2.0	3.7	12.5
11015	14.0	10.3	19.1	13.3	2.0	1.4	0	0.0	1	0.0	0	0.0	1	11.0	0.004	679.4	17000	0.0	2.0	4.9	14.0
10835	14.0	10.8	21.9	10.9	2.0	1.4	0	0.0	1	0.0	0	0.0	1	8.2	0.007	790.4	17000	0.0	2.0	5.4	14.0
10575	14.0	9.1	24.1	7.5	2.0	1.4	0	0.0	1	0.0	0	0.0	1	5.3	0.016	1108.8	17000	0.0	2.0	3.7	14.0
10390	14.0	9.8	22.7	8.8	2.0	1.4	0	0.0	1	0.0	0	0.0	1	5.8	0.008	1247.1	17000	0.0	2.0	4.4	14.0
10225	12.5	9.7	17.8	9.5	2.0	1.4	0	0.0	1	0.0	0	0.0	1	5.9	0.007	1373.8	17000	0.0	2.0	4.3	12.5
10000	10.0	8.4	14.9	11.1	2.0	1.4	0	0.0	1	0.0	0	0.0	1	6.6	0.004	1488.0	17000	0.0	2.0	3.0	10.0
9820	14.0	10.1	18.6	10.0	2.0	1.4	0	0.0	1	0.0	0	0.0	1	5.7	0.008	1336.6	17000	0.0	2.0	4.7	14.0
9595	10.0	8.3	14.6	10.3	2.0	1.4	0	0.0	1	0.0	0	0.0	1	6.6	0.005	1619.7	17000	0.0	2.0	2.9	10.0
9385	18.0	8.9	15.8	9.5	2.0	1.4	0	0.0	1	0.0	0	0.0	1	5.3	0.006	1770.4	17000	0.2	2.0	3.4	18.0
9220	18.0	9.2	16.4	8.9	2.0	1.4	0	0.0	1	0.0	0	0.0	1	4.9	0.008	1771.4	17000	0.1	2.0	3.6	18.0
9025	18.0	8.9	15.9	8.9	2.0	1.4	0	0.0	1	0.0	0	0.0	1	5.5	0.005	1736.9	17000	0.1	2.0	3.4	18.0
MAX=	21.0	19.7			8.1	2.9						0.0					17000.0	11.3	2.0	8.3	21.0
MIN=	8.0	4.8			2.0	0.0						0.0					3000.0	0.0	2.0	0.5	8.0

CALCULATIONS FOR TOTAL TOE-DOWN BY INDIVIDUAL ADJUSTMENT COMPONENT BASED ON LACH&SM W/ SAM -- SANTA CLARA RIVER EXISTING CONDITIONS STRAIGHT-INSIDE CURVED REACH, Q_{100} n=0.025

SECTION	Z_{MAX}=	Z_{TOT}=	V (FPS)	FLOW DEPTH (FT)	Z_{DEG}+	Z_{GS}+	PIER TYPE	B	ABUT TYPE	A	SOFT	Z_{LS}+	BEND COEFF	HYD DEPTH	E SLOPE	TOP WIDTH	RADIUS	Z_{BS}+	Z_f+	H/2	Z_{DM}=
46195	14.0	11.1	21.7	18.1	2.8	0.0	0	0.0	1	0.0	0	0.0	0	11.7	0.005	453.0	9000	0.0	2.0	6.3	14.0
46020	14.0	12.7	24.1	18.1	2.8	0.0	0	0.0	1	0.0	0	0.0	0	9.2	0.009	520.9	9000	0.0	2.0	7.9	14.0
45545	14.0	10.4	20.3	19.2	2.8	0.0	0	0.0	1	0.0	0	0.0	0	12.7	0.004	446.7	9000	0.0	2.0	5.6	14.0
45030	14.0	13.1	26.1	16.5	2.8	0.0	0	0.0	1	0.0	0	0.0	0	9.0	0.011	492.5	9000	0.0	2.0	8.3	14.0
44585	14.0	9.8	19.2	21.1	2.8	0.0	0	0.0	1	0.0	0	0.0	0	11.3	0.004	531.9	9000	0.0	2.0	5.0	14.0
44210	14.0	12.5	26.2	15.4	2.8	0.0	0	0.0	1	0.0	0	0.0	0	9.7	0.009	452.6	9000	0.0	2.0	7.7	14.0
43820	15.4	15.4	19.9	19.5	8.1	0.0	0	0.0	1	0.0	0	0.0	0	12.1	0.004	476.5	9000	0.0	2.0	5.3	14.0
43610	17.0	17.0	26.7	13.8	8.1	0.0	0	0.0	1	0.0	0	0.0	0	9.6	0.010	450.6	9000	0.0	2.0	6.9	14.0
43410	15.8	15.8	28.8	11.3	8.1	0.0	0	0.0	1	0.0	0	0.0	0	7.4	0.011	583.4	9000	0.0	2.0	5.7	14.0
43200	16.3	16.3	26.1	12.4	8.1	0.0	0	0.0	1	0.0	0	0.0	0	6.7	0.011	689.2	9000	0.0	2.0	6.2	14.0
42975	15.5	15.5	26.6	10.8	8.1	0.0	0	0.0	1	0.0	0	0.0	0	5.9	0.016	735.1	9000	0.0	2.0	5.4	14.0
42815	15.4	15.4	24.1	10.6	8.1	0.0	0	0.0	1	0.0	0	0.0	0	5.5	0.016	878.5	9000	0.0	2.0	5.3	14.0
42590	14.6	14.6	22.6	8.9	8.1	0.0	0	0.0	1	0.0	0	0.0	0	5.1	0.014	1023.2	9000	0.0	2.0	4.5	14.0
42430	14.9	14.9	20.8	9.6	8.1	0.0	0	0.0	1	0.0	0	0.0	0	5.9	0.012	940.5	9000	0.0	2.0	4.8	14.0
42215	11.6	11.6	10.4	14.3	8.1	0.0	0	0.0	1	0.0	0	0.0	0	8.5	0.002	1310.4	9000	0.0	2.0	1.5	10.0
41940	11.9	11.9	11.6	14.3	8.1	0.0	0	0.0	1	0.0	0	0.0	0	7.6	0.002	1321.5	9000	0.0	2.0	1.8	10.0
41730	12.0	12.0	11.8	14.7	8.1	0.0	0	0.0	1	0.0	0	0.0	0	8.0	0.002	1229.5	9000	0.0	2.0	1.9	10.0
41460	11.9	11.9	11.5	16.2	8.1	0.0	0	0.0	1	0.0	0	0.0	0	7.6	0.002	1329.0	9000	0.0	2.0	1.8	10.0
41280	12.5	11.2	16.5	14.3	5.2	0.3	0	0.0	1	0.0	0	0.0	0	8.2	0.004	852.1	9000	0.0	2.0	3.7	12.5
41080	14.0	12.8	19.9	12.1	5.2	0.3	0	0.0	1	0.0	0	0.0	0	6.7	0.007	874.2	9000	0.0	2.0	5.3	14.0
40825	14.0	11.9	18.0	11.5	5.2	0.3	0	0.0	1	0.0	0	0.0	0	6.2	0.007	1039.9	9000	0.0	2.0	4.4	14.0
40585	12.5	11.4	17.0	11.7	5.2	0.3	0	0.0	1	0.0	0	0.0	0	6.8	0.006	1005.9	9000	0.0	2.0	3.9	12.5
40335	10.0	9.2	11.1	14.5	5.2	0.3	0	0.0	1	0.0	0	0.0	0	7.1	0.002	1504.8	9000	0.0	2.0	1.7	10.0
40130	10.0	9.2	11.2	15.1	5.2	0.3	0	0.0	1	0.0	0	0.0	0	6.9	0.002	1636.5	9000	0.0	2.0	1.7	10.0
39945	10.0	8.9	10.3	16.1	5.2	0.3	0	0.0	1	0.0	0	0.0	0	7.6	0.001	1648.1	9000	0.0	2.0	1.4	10.0
39755	12.5	10.7	15.4	13.5	5.2	0.3	0	0.0	1	0.0	0	0.0	0	6.6	0.003	1251.4	9000	0.0	2.0	3.2	12.5
39605	14.0	12.6	19.4	11.4	5.2	0.3	0	0.0	1	0.0	0	0.0	0	5.8	0.007	1100.6	9000	0.0	2.0	5.1	14.0
39310	12.5	11.0	16.0	12.4	5.2	0.3	0	0.0	1	0.0	0	0.0	0	6.8	0.004	1204.5	9000	0.0	2.0	3.5	12.5
39100	10.0	9.6	12.4	14.1	5.2	0.3	0	0.0	1	0.0	0	0.0	0	7.8	0.002	1294.8	9000	0.0	2.0	2.1	10.0
38925	10.0	9.3	11.4	14.5	5.2	0.3	0	0.0	1	0.0	0	0.0	0	9.0	0.002	1181.3	9000	0.0	2.0	1.8	10.0
38710	10.0	6.2	10.6	15.9	2.7	0.0	0	0.0	1	0.0	0	0.0	0	10.8	0.001	1043.1	9000	0.0	2.0	1.5	10.0
38475	12.5	9.0	17.8	14.0	2.7	0.0	0	0.0	1	0.0	0	0.0	0	8.8	0.004	755.4	9000	0.0	2.0	4.3	12.5
38300	14.0	9.6	22.7	9.8	2.7	0.0	0	0.0	1	0.0	0	0.0	0	7.4	0.010	688.1	9000	0.0	2.0	4.9	14.0
38065	10.0	7.4	14.1	14.2	2.7	0.0	0	0.0	1	0.0	0	0.0	0	12.0	0.002	678.3	9000	0.0	2.0	2.7	10.0
37810	14.0	9.2	18.2	12.2	2.7	0.0	0	0.0	1	0.0	0	0.0	0	10.2	0.004	622.3	9000	0.0	2.0	4.5	14.0
37655	14.0	9.8	21.2	10.3	2.7	0.0	0	0.0	1	0.0	0	0.0	0	7.4	0.009	735.9	9000	0.0	2.0	5.1	14.0
37390	14.0	7.8	23.9	6.1	2.7	0.0	0	0.0	1	0.0	0	0.0	0	5.4	0.017	892.2	9000	0.0	2.0	3.1	14.0
37135	12.5	8.6	17.0	8.0	2.7	0.0	0	0.0	1	0.0	0	0.0	0	6.4	0.006	1088.9	9000	0.0	2.0	3.9	12.5
36930	14.0	8.6	18.3	7.9	2.7	0.0	0	0.0	1	0.0	0	0.0	0	6.0	0.007	1112.0	9000	0.0	2.0	3.9	14.0
36735	12.5	7.7	15.0	9.6	2.7	0.0	0	0.0	1	0.0	0	0.0	0	6.8	0.004	1195.7	9000	0.0	2.0	3.0	12.5
36515	12.5	8.5	16.7	9.6	2.7	0.0	0	0.0	1	0.0	0	0.0	0	5.5	0.006	1306.1	9000	0.0	2.0	3.8	12.5
36265	10.0	7.0	13.0	11.2	2.7	0.0	0	0.0	1	0.0	0	0.0	0	6.4	0.003	1373.1	9000	0.0	2.0	2.3	10.0
36080	10.0	7.9	12.5	11.7	3.2	0.6	0	0.0	1	0.0	0	0.0	0	6.4	0.004	1455.4	9000	0.0	2.0	2.1	10.0
35845	10.0	7.4	10.9	13.5	3.2	0.6	0	0.0	1	0.0	0	0.0	0	7.4	0.002	1496.2	9000	0.0	2.0	1.6	10.0
35725	10.0	8.7	14.7	13.0	3.2	0.6	0	0.0	1	0.0	0	0.0	0	6.3	0.003	1431.2	9000	0.0	2.0	2.9	10.0
35515	12.5	9.7	17.1	11.9	3.2	0.6	0	0.0	1	0.0	0	0.0	0	5.7	0.005	1353.4	9000	0.0	2.0	3.9	12.5
35245	10.0	8.6	14.5	12.5	3.2	0.6	0	0.0	1	0.0	0	0.0	0	5.8	0.003	1555.5	9000	0.0	2.0	2.8	10.0
35040	14.0	10.9	19.5	10.7	3.2	0.6	0	0.0	1	0.0	0	0.0	0	5.5	0.005	1355.9	9000	0.0	2.0	5.1	14.0
34860	14.0	10.2	18.1	10.1	3.2	0.6	0	0.0	1	0.0	0	0.0	0	4.8	0.008	1338.9	9000	0.0	2.0	4.4	14.0
34720	14.0	10.2	18.2	9.3	3.2	0.6	0	0.0	1	0.0	0	0.0	0	4.5	0.009	1411.5	9000	0.0	2.0	4.4	14.0
34495	14.0	10.2	18.1	8.9	3.2	0.6	0	0.0	1	0.0	0	0.0	0	5.0	0.009	1277.2	9000	0.0	2.0	4.4	14.0
34310	12.5	9.9	17.6	9.0	3.2	0.6	0	0.0	1	0.0	0	0.0	0	5.7	0.005	1280.8	9000	0.0	2.0	4.2	12.5
34090	12.5	9.7	17.2	8.6	3.2	0.6	0	0.0	1	0.0	0	0.0	0	5.4	0.007	1267.8	9000	0.0	2.0	4.0	12.5
33880	12.5	8.7	15.8	9.8	3.4	0.0	0	0.0	1	0.0	0	0.0	0	5.6	0.005	1310.6	9000	0.0	2.0	3.3	12.5
33710	12.5	9.1	16.5	9.4	3.4	0.0	0	0.0	1	0.0	0	0.0	0	5.2	0.007	1355.1	9000	0.0	2.0	3.7	12.5
33500	12.5	8.7	15.8	9.5	3.4	0.0	0	0.0	1	0.0	0	0.0	0	5.4	0.006	1474.3	9000	0.0	2.0	3.4	12.5
33310	12.5	8.8	15.9	9.1	3.4	0.0	0	0.0	1	0.0	0	0.0	0	4.2	0.006	1744.5	9000	0.0	2.0	3.4	12.5
33115	12.5	8.6	15.5	8.7	3.4	0.0	0	0.0	1	0.0	0	0.0	0	4.8	0.009	1573.2	9000	0.0	2.0	3.3	12.5
32795	10.0	7.4	12.2	11.0	3.4	0.0	0	0.0	1	0.0	0	0.0	0	5.5	0.003	1732.9	9000	0.0	2.0	2.0	10.0
32605	10.0	8.0	14.1	11.5	3.4	0.0	0	0.0	1	0.0	0	0.0	0	6.2	0.004	1344.6	9000	0.0	2.0	2.7	10.0
32265	12.5	7.8	16.7	10.2	2.0	0.0	0	0.0	1	0.0	0	0.0	0	4.6	0.007	1829.9	9000	0.0	2.0	3.8	12.5
31875	10.0	5.6	10.9	11.0	2.0	0.0	0	0.0	1	0.0	0	0.0	0	5.2	0.004	2482.2	9000	0.0	2.0	1.6	10.0
31585	12.5	7.7	16.6	9.8	2.0	0.0	0	0.0	1	0.0	0	0.0	0	4.0	0.009	2120.3	9000	0.0	2.0	3.7	12.5
31360	8.0	5.3	9.8	13.9	2.0	0.0	0	0.0	1	0.0	0	0.0	0	7.8	0.001	1884.4	9000	0.0	2.0	1.3	8.0
31060	8.0	4.8	7.9	15.9	2.0	0.0	0	0.0	1	0.0	0	0.0	0	10.5	0.001	1711.5	9000	0.0	2.0	0.8	8.0
30720	8.0	4.6	6.4	18.0	2.0	0.0	0	0.0	1	0.0	0	0.0	0	11.6	0.000	1891.7	9000	0.0	2.0	0.6	8.0
30445	8.0	4.5	6.0	19.9	2.0	0.0	0	0.0	1	0.0	0	0.0	0	13.1	0.000	1783.7	9000	0.0	2.0	0.5	8.0
30095	8.0	4.6	6.6	21.7	2.0	0.0	0	0.0	1	0.0	0	0.0	0	12.7	0.000	1730.3	9000	0.0	2.0	0.6	8.0
29815	8.0	4.8	7.7	22.4	2.0	0.0	0	0.0	1	0.0	0	0.0	0	11.7	0.000	1675.2	9000	0.0	2.0	0.8	8.0
29565	8.0	4.7	7.4	23.3	2.0	0.0	0	0.0	1	0.0	0	0.0	0	11.8	0.000	1717.4	9000	0.0	2.0	0.7	8.0
29385	8.0	5.0	8.5	24.0	2.0	0.0	0	0.0	1	0.0	0	0.0	0	10.8	0.000	1675.1	9000	0.0	2.0	1.0	8.0
29140	10.6	10.6	10.1	24.3	4.4	2.9	0	0.0	1	0.0	0	0.0	0	9.3	0.001	1557.6	9000	0.0	2.0	1.4	10.0
28895	14.5	14.5	19.7	22.4	4.4	2.9	0	0.0	1	0.0	0	0.0	0	8.6	0.002	1062.3	9000	0.0	2.0	5.2	14.0
28695	17.3	17.3	27.5	16.0	4.4	2.9	0	0.0	1	0.0	0	0.0	0	9.4	0.009	544.9	9000	0.0	2.0	8.0	14.0
28500	16.1	16.1	28.6	13.6	4.4	2.9	0	0.0	1	0.0	0	0.0	0	9.8	0.010	503.7	9000	0.0	2.0	6.8	14.0
28280	15.2	15.2	29.7	11.8	4.4	2.9	0	0.0	1	0.0	0	0.0	0	8.8	0.011	549.3	9000	0.0	2.0	5.9	14.0
28080	15.0	15.0	28.1	11.4	4.4	2.9	0	0.0	1	0.0	0	0.0	0	9.2	0.011	547.6	9000	0.0	2.0	5.7	14.0
27925	13.6	13.6	18.0	17.5	4.4	2.9	0	0.0	1	0.0	0	0.0	0	13.0	0.002	612.7	9000	0.0	2.0	4.3	12.5
27725	15.0	15.0	20.5	16.3	4.4	2.9	0	0.0	1	0.0	0	0.0	0	12.1	0.003	587.1	9000	0.0	2.0	5.7	14.0
27545	15.9	15.9	24.7	13.2	4.4	2.9	0	0.0	1	0.0	0	0.0	0	9.5	0.007	613.0	9000	0.0	2.0	6.6	14.0
27335	15.3	15.3	25.5	12.0	4.4	2.9	0	0.0	1	0.0	0	0.0	0	8.1	0.008	691.0	9000	0.0	2.0	6.0	14.0
27155	15.9	15.9	22.3	13.2	4.4	2.9	0	0.0	1	0.0	0	0.0	0	8.0	0.005	856.6	9000	0.0	2.0	6.6	14.0
26990	14.0	10.0	23.5	11.2	2.0	0.4	0	0.0	1	0.0	0	0.0	0	6.0	0.010	1008.2	9000	0.0	2.0	5.6	14.0
26780	14.0	9.9	23.9	11.0	2.0	0.4	0	0.0	1	0.0	0	0.0	0	5.6	0.010	1131.7	9000	0.0	2.0	5.5	14.0
26575	14.0	9.9	21.0	11.0	2.0	0.4	0	0.0	1	0.0	0	0.0	0	5.5	0.013	1216.4	3000	0.0	2.0	5.5	14.0
26355	12.5	7.8	15.8	13.4	2.0	0.4	0	0.0	1	0.0	0	0.0	0	7.5	0.003	1282.4	3000	0.0	2.0	3.4	12.5
26170	12.5	8.8	18.0	13.0	2.0	0.4	0	0.0	1	0.0	0	0.0	0	6.8	0.004	1347.9	3000	0.0	2.0	4.4	12.5
25965	12.5	8.7	17.9	13.0	2.0	0.4	0	0.0	1	0.0	0	0.0	0	7.0	0.004	1288.3	3000	0.0	2.0	4.3	12.5

DEFINITIONS

V(FPS) =VELOCITY IN FEET PER SECOND
Z_{TOT}=TOTAL POTENTIAL VERTICAL ADJUSTMENT IN FEET
Z_{DEG}=LONG TERM DEGRADATION IN FEET
Z_{GS}=GENERAL SCOUR IN FEET FROM SAM
Z_{LS}=LOCAL SCOUR IN FEET
PIER TYPE=PIER SHAPE FACTOR; IF NO PIERS=**0**
=SQUARE NOSE; **0.9** ROUND NOSE; **0.9** CYLINDER;
1.0 SHARP NOSE; **0.9** GROUP OF CYLINDERS
FLOW DEPTH=WATER DEPTH IN CHANNEL IN FEET
B=WIDTH OF PIERS IN FEET; NO PIER=0
ABUT TYPE=VERT WALL FACTOR; IF VERT=**2**; NON VERT=**1**
A=ABUTMENT PROTRUSION INTO FLOW PATH IN FEET
SOFT = SOFT BOTTOM AT A BRIDGE OR AN ABUTMENT
= HARD BOTTOM; **1** = SOFT BOTTOM
Z_{BS}=BEND SCOUR IN FEET
BEND COEFF=BEND COEFFICIENT; IF NO BEND=0, BEND=1
HYD DEPTH=HYDRAULIC DEPTH IN FEET
E SLOPE=ENERGY SLOPE, UNITLESS
TOP WIDTH=CHANNEL TOP WIDTH IN FEET
RADIUS=RADIUS OF CURVATURE TO CENTERLINE IN FEET
Z_f=LOW-FLOW INCISEMENT IN FEET, MEASURED OR 2'; VALUE **NOT LESS THAN 2'**
H=BEDFORM HEIGHT IN FEET, LIMITED TO FLOW DEPTH AFTER KENNEDY (1963)
Z_{DM}=CUT OFF DEPTH REQUIRED BY LACFCDDM

GENERAL

THIS SPREADSHEET IS DESIGNED TO CALCULATE SCOUR PROTECTION (TOE DOWN) BASED ON LADPW COUNTY HYDROLOGY MANUAL (1991) PAGES 5.2-5.8 AND ASSOCIATED APPENDICES (SEDIMENTATION MANUAL). ALL VELOCITIES ARE IN FPS, WITH A MAXIMUM VALUE LIMITED BY THE EQUATION. THE PRESENT VERSION (10/04) WILL CALCULATE UP TO 50 VELOCITIES AT ONE TIME. LONG TERM DEGRADATION IS USER SUPPLIED. GENERAL SCOUR IS TAKEN FROM APPENDIX Q3, INTERPOLATED. LOCAL SCOUR AT BENDS AND ABUTMENTS ARE BASED ON LADWP EQUATIONS FOUND IN APP Q12. BEND SCOUR IS BASED ON EQUATIONS IN APPENDIX Q12. A LONGITUDINAL EXTENT BASED ON SECONDARY CURRENTS IS NOT INCLUDED. BEDFORM HEIGHT IS BASED ON EQUATIONS IN APPENDIX Q13. JULY 2005 REVISION INCLUDES CALCULATION FOR CUT OFF DEPTH BASED ON LOS ANGELES COUNTY FLOOD CONTROL DISTRICT DESIGN MANUAL. THE CALCULATION DOES NOT CONSIDER ADJUSTMENTS TO CUT OFF DEPTH BASED ON TABLE F-06 THE OCTOBER 2005 REVISION INCLUDES ADDITIONAL TOEDOWN AT BRIDGES/ABUTMENTS WITH SOFT BOTTOMS.

COLOR CODES

OUTPUT
DATA FROM HEC-RAS
USER SUPPLIED DATA
INTERMEDIATE CALCULATIONS (INDIVIDUAL SHEETS ONLY)

DESIGNED BY DAVID A JAFFE, PHD, PE
PACIFIC ADVANCED CIVIL ENGINEERING, INC
OCTOBER, 2004
OCTOBER 2005, REVISED

SECTION	Z_{MAX}=	Z_{TOT}=	V (FPS)	FLOW DEPTH (FT)	Z_{DEQ}+	Z_{GS}+	PIER TYPE	B	ABUT TYPE	A	SOFT	Z_{LS}+	BEND COEFF	HYD DEPTH	E SLOPE	TOP WIDTH	RADIUS	Z_{BS}+	Z_L+	H/2	Z_{DM}=
25785	14.0	9.6	19.5	11.7	2.0	0.4	0	0.0	1	0.0	0	0.0	0	6.2	0.005	1336.9	3000	0.0	2.0	5.2	14.0
25600	14.0	10.0	20.6	11.3	2.0	0.4	0	0.0	1	0.0	0	0.0	0	5.2	0.006	1596.5	3000	0.0	2.0	5.6	14.0
25425	14.0	9.8	20.0	11.3	2.0	0.4	0	0.0	1	0.0	0	0.0	0	4.4	0.008	1773.8	3000	0.0	2.0	5.4	14.0
25215	10.0	7.2	14.5	13.6	2.0	0.4	0	0.0	1	0.0	0	0.0	0	6.1	0.003	1748.6	3000	0.0	2.0	2.8	10.0
25000	12.5	8.5	17.4	12.2	2.0	0.4	0	0.0	1	0.0	0	0.0	0	4.4	0.006	2103.2	3000	0.0	2.0	4.1	12.5
24795	14.0	8.9	19.0	11.4	2.0	0.0	0	0.0	1	0.0	0	0.0	0	3.9	0.007	2311.7	3000	0.0	2.0	4.9	14.0
24550	14.0	9.4	21.3	10.8	2.0	0.0	0	0.0	1	0.0	0	0.0	0	3.8	0.009	2227.0	3000	0.0	2.0	5.4	14.0
24335	10.0	6.8	14.5	13.1	2.0	0.0	0	0.0	1	0.0	0	0.0	0	5.7	0.003	2089.5	3000	0.0	2.0	2.8	10.0
24115	14.0	8.8	18.8	11.1	2.0	0.0	0	0.0	1	0.0	0	0.0	0	4.5	0.008	2015.8	3000	0.0	2.0	4.8	14.0
23975	14.0	8.9	19.0	10.2	2.0	0.0	0	0.0	1	0.0	0	0.0	0	4.6	0.008	1913.7	3000	0.0	2.0	4.9	14.0
23755	12.5	7.8	16.7	10.9	2.0	0.0	0	0.0	1	0.0	0	0.0	0	5.1	0.006	1935.4	3000	0.0	2.0	3.8	12.5
23565	10.0	6.8	14.5	12.7	2.0	0.0	0	0.0	1	0.0	0	0.0	0	5.6	0.004	2039.5	3000	0.0	2.0	2.8	10.0
23365	12.5	7.9	17.0	10.8	2.0	0.0	0	0.0	1	0.0	0	0.0	0	5.4	0.006	1781.4	3000	0.0	2.0	3.9	12.5
23180	10.0	6.3	13.2	11.8	2.0	0.0	0	0.0	1	0.0	0	0.0	0	6.6	0.002	2084.2	3000	0.0	2.0	2.3	10.0
23000	8.0	5.1	8.9	13.0	2.0	0.0	0	0.0	1	0.0	0	0.0	0	7.7	0.001	2069.1	3000	0.0	2.0	1.1	8.0
22790	8.0	5.2	9.4	13.1	2.0	0.0	0	0.0	1	0.0	0	0.0	0	7.8	0.001	1949.0	3000	0.0	2.0	1.2	8.0
22600	10.0	5.7	11.4	14.1	2.0	0.0	0	0.0	1	0.0	0	0.0	0	7.9	0.001	1865.2	3000	0.0	2.0	1.7	10.0
22415	10.0	5.9	11.8	14.1	2.0	0.0	0	0.0	1	0.0	0	0.0	0	8.1	0.002	1705.6	3000	0.0	2.0	1.9	10.0
22195	10.0	7.3	14.1	13.7	2.0	0.6	0	0.0	1	0.0	0	0.0	0	7.8	0.003	1322.2	3000	0.0	2.0	2.7	10.0
22010	12.5	8.1	16.0	14.4	2.0	0.6	0	0.0	1	0.0	0	0.0	0	7.3	0.003	1328.0	3000	0.0	2.0	3.5	12.5
21790	14.0	9.8	19.7	11.6	2.0	0.6	0	0.0	1	0.0	0	0.0	0	6.5	0.006	1145.7	3000	0.0	2.0	5.2	14.0
21615	14.0	8.9	21.4	8.5	2.0	0.6	0	0.0	1	0.0	0	0.0	0	5.8	0.010	1161.3	3000	0.0	2.0	4.3	14.0
21440	14.0	9.4	20.1	9.7	2.0	0.6	0	0.0	1	0.0	0	0.0	0	5.0	0.008	1574.6	3000	0.0	2.0	4.8	14.0
21225	14.0	9.7	19.5	10.6	2.0	0.6	0	0.0	1	0.0	0	0.0	0	3.9	0.008	2217.7	3000	0.0	2.0	5.1	14.0
21020	14.0	9.0	20.8	8.9	2.0	0.6	0	0.0	1	0.0	0	0.0	0	4.6	0.009	1676.4	3000	0.0	2.0	4.4	14.0
20845	12.5	8.5	17.1	10.4	2.0	0.6	0	0.0	1	0.0	0	0.0	0	4.2	0.006	2369.3	3000	0.0	2.0	3.9	12.5
20595	12.5	7.7	15.2	10.9	2.0	0.6	0	0.0	1	0.0	0	0.0	0	4.7	0.003	2463.7	3000	0.0	2.0	3.1	12.5
20435	10.0	6.9	12.9	12.2	2.0	0.6	0	0.0	1	0.0	0	0.0	0	5.4	0.002	2582.7	3000	0.0	2.0	2.3	10.0
20280	10.0	7.2	14.0	11.8	2.0	0.6	0	0.0	1	0.0	0	0.0	0	5.0	0.003	2589.6	3000	0.0	2.0	2.6	10.0
20070	14.0	9.2	20.2	9.2	2.0	0.6	0	0.0	1	0.0	0	0.0	0	4.7	0.009	1767.5	3000	0.0	2.0	4.6	14.0
19855	12.5	8.3	17.8	9.9	2.0	0.0	0	0.0	1	0.0	0	0.0	0	4.8	0.006	1975.1	3000	0.0	2.0	4.3	12.5
19630	12.5	8.3	17.9	8.9	2.0	0.0	0	0.0	1	0.0	0	0.0	0	4.9	0.006	1836.2	3000	0.0	2.0	4.3	12.5
19440	10.0	5.9	11.9	12.1	2.0	0.0	0	0.0	1	0.0	0	0.0	0	6.5	0.002	2095.3	3000	0.0	2.0	1.9	10.0
19240	10.0	6.6	13.9	11.4	2.0	0.0	0	0.0	1	0.0	0	0.0	0	5.6	0.003	2091.7	3000	0.0	2.0	2.6	10.0
19050	10.0	5.6	11.0	12.9	2.0	0.0	0	0.0	1	0.0	0	0.0	0	6.7	0.002	2160.8	3000	0.0	2.0	1.6	10.0
18830	10.0	5.5	10.7	14.6	2.0	0.0	0	0.0	1	0.0	0	0.0	0	7.1	0.002	2094.4	3000	0.0	2.0	1.5	10.0
18650	8.0	5.3	9.9	15.0	2.0	0.0	0	0.0	1	0.0	0	0.0	0	8.0	0.001	2022.7	3000	0.0	2.0	1.3	8.0
18475	8.0	4.9	8.1	16.6	2.0	0.0	0	0.0	1	0.0	0	0.0	0	9.4	0.001	1944.4	3000	0.0	2.0	0.9	8.0
18290	8.0	5.0	8.7	16.8	2.0	0.0	0	0.0	1	0.0	0	0.0	0	9.3	0.001	1843.7	3000	0.0	2.0	1.0	8.0
18025	8.0	4.8	7.8	18.2	2.0	0.0	0	0.0	1	0.0	0	0.0	0	11.5	0.001	1610.9	17000	0.0	2.0	0.8	8.0
17785	8.0	5.0	8.7	19.8	2.0	0.0	0	0.0	1	0.0	0	0.0	0	11.6	0.001	1417.5	17000	0.0	2.0	1.0	8.0
17510	10.0	7.8	14.0	18.0	2.0	1.2	0	0.0	1	0.0	0	0.0	0	8.5	0.002	1243.6	17000	0.0	2.0	2.6	10.0
17360	12.5	9.1	17.0	16.9	2.0	1.2	0	0.0	1	0.0	0	0.0	0	8.9	0.004	936.6	17000	0.0	2.0	3.9	12.5
17110	14.0	11.6	21.7	15.4	2.0	1.2	0	0.0	1	0.0	0	0.0	0	5.6	0.006	1274.3	17000	0.0	2.0	6.4	14.0
16970	14.0	12.0	22.9	13.6	2.0	1.2	0	0.0	1	0.0	0	0.0	0	5.7	0.008	1125.6	17000	0.0	2.0	6.8	14.0
16720	14.0	9.7	25.2	9.0	2.0	1.2	0	0.0	1	0.0	0	0.0	0	4.1	0.018	1404.6	17000	0.0	2.0	4.5	14.0
16515	14.0	10.0	21.5	9.5	2.0	1.2	0	0.0	1	0.0	0	0.0	0	4.3	0.012	1622.6	17000	0.0	2.0	4.8	14.0
16305	14.0	10.0	21.5	9.6	2.0	1.2	0	0.0	1	0.0	0	0.0	0	4.2	0.011	1812.8	17000	0.0	2.0	4.8	14.0
16130	12.5	8.7	16.1	10.2	2.0	1.2	0	0.0	1	0.0	0	0.0	0	5.2	0.005	1945.1	17000	0.0	2.0	3.5	12.5
15960	12.5	8.6	15.8	9.3	2.0	1.2	0	0.0	1	0.0	0	0.0	0	4.1	0.011	2180.9	17000	0.0	2.0	3.4	12.5
15745	10.0	6.8	10.9	10.6	2.0	1.2	0	0.0	1	0.0	0	0.0	0	5.7	0.003	2279.0	17000	0.0	2.0	1.6	10.0
15540	10.0	6.8	11.0	10.6	2.0	1.2	0	0.0	1	0.0	0	0.0	0	5.8	0.003	2324.2	17000	0.0	2.0	1.6	10.0
15335	10.0	7.4	12.7	10.5	2.0	1.2	0	0.0	1	0.0	0	0.0	0	4.9	0.005	2302.1	17000	0.0	2.0	2.2	10.0
15125	12.5	8.1	16.2	9.6	2.0	0.6	0	0.0	1	0.0	0	0.0	0	5.5	0.007	1618.5	17000	0.0	2.0	3.5	12.5
14900	10.0	7.5	14.5	10.4	2.0	0.6	0	0.0	1	0.0	0	0.0	0	6.1	0.004	1704.5	17000	0.0	2.0	2.9	10.0
14720	12.5	8.4	16.8	9.3	2.0	0.6	0	0.0	1	0.0	0	0.0	0	5.1	0.008	1763.5	17000	0.0	2.0	3.8	12.5
14480	10.0	7.3	14.3	10.2	2.0	0.6	0	0.0	1	0.0	0	0.0	0	6.0	0.004	1801.7	17000	0.0	2.0	2.7	10.0
14315	10.0	7.6	14.8	9.4	2.0	0.6	0	0.0	1	0.0	0	0.0	0	5.2	0.006	1868.1	17000	0.0	2.0	3.0	10.0
14090	10.0	7.2	13.8	9.0	2.0	0.6	0	0.0	1	0.0	0	0.0	0	5.9	0.005	1766.8	17000	0.0	2.0	2.6	10.0
13850	12.5	7.9	15.6	8.4	2.0	0.6	0	0.0	1	0.0	0	0.0	0	5.3	0.007	1727.3	17000	0.0	2.0	3.3	12.5
13635	12.5	7.8	15.4	10.3	2.0	0.6	0	0.0	1	0.0	0	0.0	0	6.4	0.004	1691.9	17000	0.0	2.0	3.2	12.5
13425	12.5	8.6	17.3	8.3	2.0	0.6	0	0.0	1	0.0	0	0.0	0	4.5	0.009	1854.4	17000	0.0	2.0	4.0	12.5
13190	10.0	6.6	12.2	9.5	2.0	0.6	0	0.0	1	0.0	0	0.0	0	6.4	0.003	1847.3	17000	0.0	2.0	2.0	10.0
13030	10.0	6.7	14.2	9.6	2.0	0.0	0	0.0	1	0.0	0	0.0	0	6.5	0.003	1763.0	17000	0.0	2.0	2.7	10.0
12835	10.0	6.4	13.3	10.1	2.0	0.0	0	0.0	1	0.0	0	0.0	0	7.3	0.003	1607.5	17000	0.0	2.0	2.4	10.0
12615	10.0	6.1	12.4	10.9	2.0	0.0	0	0.0	1	0.0	0	0.0	0	8.7	0.002	1471.0	17000	0.0	2.0	2.1	10.0
12395	10.0	6.0	12.3	11.5	2.0	0.0	0	0.0	1	0.0	0	0.0	0	9.0	0.002	1438.4	17000	0.0	2.0	2.0	10.0
12195	10.0	5.5	10.6	12.5	2.0	0.0	0	0.0	1	0.0	0	0.0	0	10.3	0.001	1389.3	17000	0.0	2.0	1.5	10.0
11995	10.0	6.2	12.7	13.7	2.0	0.0	0	0.0	1	0.0	0	0.0	0	9.8	0.002	1281.1	17000	0.0	2.0	2.2	10.0
11780	10.0	6.1	12.5	14.4	2.0	0.0	0	0.0	1	0.0	0	0.0	0	9.4	0.001	1400.9	17000	0.0	2.0	2.1	10.0
11605	10.0	6.7	14.1	13.7	2.0	0.0	0	0.0	1	0.0	0	0.0	0	8.7	0.002	1282.9	17000	0.0	2.0	2.7	10.0
11405	10.0	6.3	13.2	15.1	2.0	0.0	0	0.0	1	0.0	0	0.0	0	10.1	0.002	1130.2	17000	0.0	2.0	2.3	10.0
11180	12.5	7.7	16.6	13.9	2.0	0.0	0	0.0	1	0.0	0	0.0	0	10.6	0.003	835.7	17000	0.0	2.0	3.7	12.5
11015	14.0	10.3	19.1	13.3	2.0	1.4	0	0.0	1	0.0	0	0.0	0	11.0	0.004	679.4	17000	0.0	2.0	4.9	14.0
10835	14.0	10.8	21.9	10.9	2.0	1.4	0	0.0	1	0.0	0	0.0	0	8.2	0.007	790.4	17000	0.0	2.0	5.4	14.0
10575	14.0	9.1	24.1	7.5	2.0	1.4	0	0.0	1	0.0	0	0.0	0	5.3	0.016	1108.8	17000	0.0	2.0	3.7	14.0
10390	14.0	9.8	22.7	8.8	2.0	1.4	0	0.0	1	0.0	0	0.0	0	5.8	0.008	1247.1	17000	0.0	2.0	4.4	14.0
10225	12.5	9.7	17.8	9.5	2.0	1.4	0	0.0	1	0.0	0	0.0	0	5.9	0.007	1373.8	17000	0.0	2.0	4.3	12.5
10000	10.0	8.4	14.9	11.1	2.0	1.4	0	0.0	1	0.0	0	0.0	0	6.6	0.004	1488.0	17000	0.0	2.0	3.0	10.0
9820	14.0	10.1	18.6	10.0	2.0	1.4	0	0.0	1	0.0	0	0.0	0	5.7	0.008	1336.6	17000	0.0	2.0	4.7	14.0
9595	10.0	8.3	14.6	10.3	2.0	1.4	0	0.0	1	0.0	0	0.0	0	6.6	0.005	1619.7	17000	0.0	2.0	2.9	10.0
9385	12.5	8.8	15.8	9.5	2.0	1.4	0	0.0	1	0.0	0	0.0	0	5.3	0.006	1770.4	17000	0.0	2.0	3.4	12.5
9220	12.5	9.0	16.4	8.9	2.0	1.4	0	0.0	1	0.0	0	0.0	0	4.9	0.008	1771.4	17000	0.0	2.0	3.6	12.5
9025	12.5	8.8	15.9	8.9	2.0	1.4	0	0.0	1	0.0	0	0.0	0	5.5	0.005	1736.9	17000	0.0	2.0	3.4	12.5
MAX=	17.3	17.3			8.1	2.9						0.0					17000.0	0.0	2.0	8.3	14.0
MIN=	8.0	4.5			2.0	0.0						0.0					3000.0	0.0	2.0	0.5	8.0

CALCULATIONS FOR TOTAL TOE-DOWN BY INDIVIDUAL ADJUSTMENT COMPONENT BASED ON LACH&SM W/ SAM -- SANTA CLARA RIVER PROPOSED CONDITIONS OUTSIDE CURVED REACH Q_{CAP} n=0.025

SECTION	Z_{MAX}=	Z_{TOT}=	V (FPS)	FLOW DEPTH (FT)	Z_{DEG}+	Z_{GS}+	PIER TYPE	B	ABUT TYPE	A	SOFT	Z_{LS}+	BEND COEFF	HYD DEPTH	E SLOPE	TOP WIDTH	RADIUS	Z_{BS}+	Z_I+	H/2	Z_{DM}=
46195	14.0	11.1	21.7	18.1	2.8	0.0	0	0.0	1	0.0	0	0.0	1	11.7	0.005	453.0	9000	0.0	2.0	6.3	14.0
46020	14.0	12.7	24.1	18.1	2.8	0.0	0	0.0	1	0.0	0	0.0	1	9.2	0.009	520.9	9000	0.0	2.0	7.9	14.0
45545	14.0	10.4	20.3	19.2	2.8	0.0	0	0.0	1	0.0	0	0.0	1	12.7	0.004	446.7	9000	0.0	2.0	5.6	14.0
45030	14.0	13.1	26.1	16.5	2.8	0.0	0	0.0	1	0.0	0	0.0	1	9.0	0.011	492.5	9000	0.0	2.0	8.3	14.0
44585	14.0	9.8	19.2	21.1	2.8	0.0	0	0.0	1	0.0	0	0.0	1	11.3	0.004	531.9	9000	0.0	2.0	5.0	14.0
44210	14.0	12.5	26.2	15.4	2.8	0.0	0	0.0	1	0.0	0	0.0	1	9.7	0.009	452.6	9000	0.0	2.0	7.7	14.0
43820	15.4	15.4	19.9	19.5	8.1	0.0	0	0.0	1	0.0	0	0.0	1	12.1	0.004	476.5	9000	0.0	2.0	5.3	14.0
43610	17.0	17.0	26.7	13.8	8.1	0.0	0	0.0	1	0.0	0	0.0	1	9.6	0.010	450.6	9000	0.0	2.0	6.9	14.0
43410	15.8	15.8	28.8	11.3	8.1	0.0	0	0.0	1	0.0	0	0.0	1	7.4	0.011	583.4	9000	0.0	2.0	5.7	14.0
43200	16.3	16.3	26.1	12.4	8.1	0.0	0	0.0	1	0.0	0	0.0	1	6.7	0.011	689.2	9000	0.0	2.0	6.2	14.0
42975	15.5	15.5	26.6	10.8	8.1	0.0	0	0.0	1	0.0	0	0.0	1	5.9	0.016	735.1	9000	0.0	2.0	5.4	14.0
42815	15.5	15.5	23.9	10.7	8.1	0.0	0	0.0	1	0.0	0	0.0	1	5.6	0.016	864.3	9000	0.0	2.0	5.4	14.0
42590	21.0	15.1	22.4	9.2	8.1	0.0	0	0.0	1	0.0	0	0.0	1	5.2	0.014	1013.1	9000	0.4	2.0	4.6	21.0
42430	21.0	15.4	19.6	10.7	8.1	0.0	0	0.0	1	0.0	0	0.0	1	6.4	0.009	915.8	9000	0.1	2.0	5.2	21.0
42215	21.0	15.2	18.5	11.2	8.1	0.0	0	0.0	1	0.0	0	0.0	1	6.1	0.009	1019.0	9000	0.5	2.0	4.6	21.0
41940	15.0	13.4	11.6	14.3	8.1	0.0	0	0.0	1	0.0	0	0.0	1	7.7	0.002	1284.2	9000	1.4	2.0	1.8	15.0
41730	15.0	13.2	11.8	14.7	8.1	0.0	0	0.0	1	0.0	0	0.0	1	8.2	0.002	1190.9	9000	1.2	2.0	1.9	15.0
41460	15.0	12.8	11.6	16.2	8.1	0.0	0	0.0	1	0.0	0	0.0	1	9.1	0.002	1093.5	9000	0.9	2.0	1.8	15.0
41280	12.5	10.9	16.4	14.4	5.2	0.1	0	0.0	1	0.0	0	0.0	1	8.3	0.004	852.3	9000	0.0	2.0	3.6	12.5
41080	14.0	12.7	19.9	12.1	5.2	0.1	0	0.0	1	0.0	0	0.0	1	6.7	0.008	874.1	9000	0.0	2.0	5.4	14.0
40825	21.0	12.2	18.0	11.5	5.2	0.1	0	0.0	1	0.0	0	0.0	1	6.2	0.007	1040.4	9000	0.5	2.0	4.4	21.0
40585	18.0	11.6	17.0	11.7	5.2	0.1	0	0.0	1	0.0	0	0.0	1	6.8	0.006	1005.8	9000	0.4	2.0	3.9	18.0
40335	15.0	10.2	10.5	15.1	5.2	0.1	0	0.0	1	0.0	0	0.0	1	8.8	0.002	1249.6	9000	1.4	2.0	1.5	15.0
40130	15.0	10.3	11.3	15.5	5.2	0.1	0	0.0	1	0.0	0	0.0	1	8.8	0.002	1195.6	9000	1.3	2.0	1.7	15.0
39945	15.0	10.2	11.0	16.3	5.2	0.1	0	0.0	1	0.0	0	0.0	1	9.3	0.002	1173.3	9000	1.3	2.0	1.6	15.0
39755	12.5	11.0	16.5	13.3	5.2	0.1	0	0.0	1	0.0	0	0.0	1	8.1	0.004	894.5	9000	0.0	2.0	3.7	12.5
39605	14.0	12.5	19.7	11.5	5.2	0.1	0	0.0	1	0.0	0	0.0	1	7.1	0.007	849.7	9000	0.0	2.0	5.2	14.0
39310	18.0	11.2	16.5	12.7	5.2	0.1	0	0.0	1	0.0	0	0.0	1	8.1	0.004	931.1	9000	0.2	2.0	3.7	18.0
39100	14.0	12.5	20.9	10.4	5.2	0.1	0	0.0	1	0.0	0	0.0	1	7.2	0.009	761.1	9000	0.0	2.0	5.2	14.0
38925	10.0	9.5	12.8	14.3	5.2	0.1	0	0.0	1	0.0	0	0.0	1	10.3	0.002	873.5	9000	0.0	2.0	2.2	10.0
38710	10.0	6.7	12.0	15.6	2.7	0.0	0	0.0	1	0.0	0	0.0	1	11.7	0.002	820.3	9000	0.0	2.0	2.0	10.0
38475	12.5	9.0	17.9	14.0	2.7	0.0	0	0.0	1	0.0	0	0.0	1	9.8	0.004	659.7	9000	0.0	2.0	4.3	12.5
38300	14.0	9.8	22.5	10.3	2.7	0.0	0	0.0	1	0.0	0	0.0	1	7.7	0.010	666.3	9000	0.0	2.0	5.1	14.0
38065	10.0	7.6	14.5	14.0	2.7	0.0	0	0.0	1	0.0	0	0.0	1	12.0	0.002	658.4	9000	0.0	2.0	2.9	10.0
37810	14.0	9.2	18.2	12.2	2.7	0.0	0	0.0	1	0.0	0	0.0	1	10.2	0.004	618.2	9000	0.0	2.0	4.5	14.0
37655	14.0	10.0	20.9	10.5	2.7	0.0	0	0.0	1	0.0	0	0.0	1	7.8	0.008	706.7	9000	0.0	2.0	5.3	14.0
37390	14.0	8.0	23.7	6.5	2.7	0.0	0	0.0	1	0.0	0	0.0	1	5.9	0.015	823.8	9000	0.0	2.0	3.3	14.0
37135	12.5	8.4	16.6	9.3	2.7	0.0	0	0.0	1	0.0	0	0.0	1	8.5	0.005	821.4	9000	0.0	2.0	3.7	12.5
36930	14.0	8.8	19.8	8.1	2.7	0.0	0	0.0	1	0.0	0	0.0	1	7.2	0.008	812.4	9000	0.0	2.0	4.1	14.0
36735	12.5	8.2	16.1	9.8	2.7	0.0	0	0.0	1	0.0	0	0.0	1	8.0	0.005	896.9	9000	0.0	2.0	3.5	12.5
36515	15.0	7.3	12.9	12.0	2.7	0.0	0	0.0	1	0.0	0	0.0	1	9.0	0.002	994.7	9000	0.4	2.0	2.2	15.0
36265	15.0	7.7	12.3	12.5	2.7	0.0	0	0.0	1	0.0	0	0.0	1	7.9	0.003	1176.0	9000	0.9	2.0	2.1	15.0
36080	22.9	22.9	14.7	11.6	3.2	0.7	0.9	2.0	1	0.0	0	13.3	1	6.7	0.006	1176.0	9000	0.9	2.0	2.9	15.0
35845	15.0	9.2	11.0	13.6	3.2	0.7	0	0.0	1	0.0	0	0.0	1	7.9	0.002	1401.7	9000	1.7	2.0	1.6	15.0
35725	15.0	10.7	15.0	13.0	3.2	0.7	0	0.0	1	0.0	0	0.0	1	6.5	0.004	1377.9	9000	1.8	2.0	3.0	15.0
35515	18.0	11.5	17.1	12.0	3.2	0.7	0	0.0	1	0.0	0	0.0	1	6.0	0.005	1354.8	9000	1.7	2.0	3.9	18.0
35245	18.0	11.4	17.3	11.3	3.2	0.7	0	0.0	1	0.0	0	0.0	1	5.5	0.006	1328.3	9000	1.5	2.0	4.0	18.0
35040	21.0	12.7	19.6	10.7	3.2	0.7	0	0.0	1	0.0	0	0.0	1	5.5	0.006	1354.8	9000	1.7	2.0	5.2	21.0
34860	21.0	11.6	18.4	10.0	3.2	0.7	0	0.0	1	0.0	0	0.0	1	4.9	0.009	1285.7	9000	1.2	2.0	4.6	21.0
34720	21.0	11.8	18.4	9.2	3.2	0.7	0	0.0	1	0.0	0	0.0	1	4.5	0.009	1411.2	9000	1.4	2.0	4.6	21.0
34495	18.0	10.9	17.4	9.0	3.2	0.7	0	0.0	1	0.0	0	0.0	1	5.2	0.009	1283.9	9000	1.0	2.0	4.1	18.0
34310	18.0	10.8	16.8	9.3	3.2	0.7	0	0.0	1	0.0	0	0.0	1	5.9	0.005	1308.5	9000	1.2	2.0	3.8	18.0
34090	18.0	10.8	17.0	8.6	3.2	0.7	0	0.0	1	0.0	0	0.0	1	5.3	0.007	1295.5	9000	1.0	2.0	3.9	18.0
33880	18.0	10.2	16.6	9.3	3.4	0.0	0	0.0	1	0.0	0	0.0	1	5.3	0.007	1318.4	9000	1.2	2.0	3.7	18.0
33710	18.0	9.9	15.4	9.7	3.4	0.0	0	0.0	1	0.0	0	0.0	1	5.5	0.005	1372.1	9000	1.3	2.0	3.2	18.0
33500	18.0	10.4	16.2	9.3	3.4	0.0	0	0.0	1	0.0	0	0.0	1	5.1	0.007	1496.0	9000	1.5	2.0	3.5	18.0
33310	18.0	10.9	15.8	9.0	3.4	0.0	0	0.0	1	0.0	0	0.0	1	4.2	0.006	1770.4	9000	2.1	2.0	3.4	18.0
33115	15.0	9.0	10.4	10.6	3.4	0.0	0	0.0	1	0.0	0	0.0	1	6.1	0.003	1847.3	9000	2.1	2.0	1.4	15.0
32795	15.0	9.9	13.0	10.6	3.4	0.0	0	0.0	1	0.0	0	0.0	1	5.2	0.004	1735.6	9000	2.3	2.0	2.3	15.0
32605	15.0	10.5	14.4	11.1	3.4	0.0	0	0.0	1	0.0	0	0.0	1	5.0	0.005	1699.9	9000	2.3	2.0	2.8	15.0
32265	18.0	9.9	15.9	10.5	2.0	0.0	0	0.0	1	0.0	0	0.0	1	4.8	0.006	1853.2	9000	2.5	2.0	3.4	18.0
31875	15.0	9.1	12.4	10.4	2.0	0.0	0	0.0	1	0.0	0	0.0	1	4.7	0.006	2409.2	9000	3.0	2.0	2.1	15.0
31585	15.0	8.6	10.9	11.9	2.0	0.0	0	0.0	1	0.0	0	0.0	1	5.9	0.003	2182.2	9000	3.0	2.0	1.6	15.0
31360	15.0	8.3	10.3	13.5	2.0	0.0	0	0.0	1	0.0	0	0.0	1	7.4	0.002	1878.7	9000	2.8	2.0	1.4	15.0
31060	12.0	7.5	8.2	15.5	2.0	0.0	0	0.0	1	0.0	0	0.0	1	10.1	0.001	1708.2	9000	2.6	2.0	0.9	12.0
30720	12.0	7.9	6.7	17.5	2.0	0.0	0	0.0	1	0.0	0	0.0	1	11.2	0.001	1888.6	9000	3.3	2.0	0.6	12.0
30445	12.0	7.9	6.3	19.5	2.0	0.0	0	0.0	1	0.0	0	0.0	1	12.7	0.000	1779.7	9000	3.3	2.0	0.5	12.0
30095	12.0	8.1	6.7	21.3	2.0	0.0	0	0.0	1	0.0	0	0.0	1	13.4	0.000	1622.7	9000	3.5	2.0	0.6	12.0
29815	12.0	7.7	7.7	21.9	2.0	0.0	0	0.0	1	0.0	0	0.0	1	13.5	0.000	1433.2	9000	2.9	2.0	0.8	12.0
29565	12.0	7.1	7.4	22.9	2.0	0.0	0	0.0	1	0.0	0	0.0	1	14.8	0.000	1323.8	9000	2.4	2.0	0.7	12.0
29385	12.0	7.0	8.3	23.6	2.0	0.0	0	0.0	1	0.0	0	0.0	1	14.4	0.000	1237.4	9000	2.1	2.0	0.9	12.0
29140	12.0	10.4	9.2	24.1	4.4	1.6	0	0.0	1	0.0	0	0.0	1	14.1	0.001	1087.2	9000	1.2	2.0	1.1	12.0
28895	21.0	13.5	18.8	22.5	4.4	1.6	0	0.0	1	0.0	0	0.0	1	9.9	0.002	972.1	9000	0.8	2.0	4.8	21.0
28695	15.0	15.0	28.9	14.0	4.4	1.6	0	0.0	1	0.0	0	0.0	1	5.4	0.025	899.4	9000	0.0	2.0	7.0	14.0
28500	14.7	14.7	22.4	16.1	4.4	1.6	0	0.0	1	0.0	0	0.0	1	11.4	0.006	552.2	9000	0.0	2.0	6.8	14.0
28280	21.0	13.6	29.6	10.8	4.4	1.6	0	0.0	1	0.0	0	0.0	1	5.8	0.013	944.5	9000	0.3	2.0	5.4	21.0
28080	15.0	9.9	11.3	19.1	4.4	1.6	0	0.0	1	0.0	0	0.0	1	14.7	0.001	926.4	9000	0.2	2.0	1.7	15.0
27925	10.3	10.3	13.1	19.3	4.4	1.6	0	0.0	1	0.0	0	0.0	1	13.8	0.001	866.6	9000	0.0	2.0	2.3	10.0
27725	14.0	12.9	19.0	16.7	4.4	1.6	0	0.0	1	0.0	0	0.0	1	10.4	0.003	786.6	9000	0.0	2.0	4.9	14.0
27545	15.0	15.0	22.9	14.1	4.4	1.6	0	0.0	1	0.0	0	0.0	1	9.9	0.005	643.2	9000	0.0	2.0	7.0	14.0
27335	14.1	14.1	24.6	12.3	4.4	1.6	0	0.0	1	0.0	0	0.0	1	8.3	0.008	703.5	9000	0.0	2.0	6.2	14.0
27155	14.0	12.9	19.1	14.8	4.4	1.6	0	0.0	1	0.0	0	0.0	1	9.2	0.003	888.4	9000	0.0	2.0	4.9	14.0
26990	21.0	11.2	22.6	11.5	2.0	1.3	0	0.0	1	0.0	0	0.0	1	6.8	0.011	922.3	9000	0.1	2.0	5.7	21.0
26780	21.0	11.6	23.1	11.3	2.0	1.3	0	0.0	1	0.0	0	0.0	1	6.2	0.009	1043.3	9000	0.6	2.0	5.6	21.0
26575	21.0	16.0	20.7	11.1	2.0	1.3	0	0.0	1	0.0	0	0.0	1	5.7	0.012	1187.3	3000	5.2	2.0	5.6	21.0
26355	18.0	15.4	15.9	13.4	2.0	1.3	0	0.0	1	0.0	0	0.0	1	7.5	0.004	1260.4	3000	6.7	2.0	3.4	18.0
26170	18.0	16.6	17.0	13.5	2.0	1.3	0	0.0	1	0.0	0	0.0	1	7.6	0.003	1269.0	3000	7.4	2.0	3.9	18.0
25965	21.0	17.1	18.2	12.9	2.0	1.3	0	0.0	1	0.0	0	0.0	1	6.9	0.004	1281.3	3000	7.3	2.0	4.5	21.0
25785	21.0	16.7	18.9	12.1	2.0	1.3	0	0.0	1	0.0	0	0.0	1	6.9	0.005	1219.7	3000	6.5	2.0	4.8	21.0
25600	21.0	15.9	18.5	12.4	2.0	1.3	0	0.0	1	0.0	0	0.0	1	7.6	0.005	1109.4	3000	6.0	2.0	4.6	21.0

DEFINITIONS

V(FPS) =VELOCITY IN FEET PER SECOND
Z_{TOT}=TOTAL POTENTIAL VERTICAL ADJUSTMENT IN FEET
Z_{DEG}=LONG TERM DEGRADATION IN FEET
Z_{GS}=GENERAL SCOUR IN FEET FROM SAM
Z_{LS}=LOCAL SCOUR IN FEET
PIER TYPE=PIER SHAPE FACTOR; IF NO PIERS=**0**
=SQUARE NOSE; **0.9** ROUND NOSE; **0.9** CYLINDER;
1.0 SHARP NOSE; **0.9** GROUP OF CYLINDERS
FLOW DEPTH=WATER DEPTH IN CHANNEL IN FEET
B=WIDTH OF PIERS IN FEET; NO PIER=0
ABUT TYPE=VERT WALL FACTOR; IF VERT=**2**; NON VERT=**1**
A=ABUTMENT PROTRUSION INTO FLOW PATH IN FEET
SOFT = SOFT BOTTOM AT A BRIDGE OR AN ABUTMENT
= HARD BOTTOM; **1** = SOFT BOTTOM
Z_{BS}=BEND SCOUR IN FEET
BEND COEFF=BEND COEFFICIENT; IF NO BEND=0, BEND=1
HYD DEPTH=HYDRAULIC DEPTH IN FEET
E SLOPE=ENERGY SLOPE, UNITLESS
TOP WIDTH=CHANNEL TOP WIDTH IN FEET
RADIUS=RADIUS OF CURVATURE TO CENTERLINE IN FEET
Z_I=LOW-FLOW INCISEMENT IN FEET, MEASURED OR 2'; VALUE **NOT LESS THAN 2'**
H=BEDFORM HEIGHT IN FEET, LIMITED TO FLOW DEPTH AFTER KENNEDY (1963)
Z_{DM}=CUT OFF DEPTH REQUIRED BY LACFCDDM

GENERAL

THIS SPREADSHEET IS DESIGNED TO CALCULATE SCOUR PROTECTION (TOE DOWN) BASED ON LADPW COUNTY HYDROLOGY MANUAL (1991) PAGES 5.2-5.8 AND ASSOCIATED APPENDICES (SEDIMENTATION MANUAL). ALL VELOCITIES ARE IN FPS, WITH A MAXIMUM VALUE LIMITED BY THE EQUATION. THE PRESENT VERSION (10/04) WILL CALCULATE UP TO AT ONE TIME. LONG TERM DEGRADATION IS USER SUPPLIED. GENERAL SCOUR IS TAKEN FROM APPENDIX Q3, INTERPOLATED. LOCAL SCOUR AT BENDS AND ABUTMENTS ARE BASED ON LADWP EQUATIONS FOUND IN APP Q12. BEND SCOUR IS BASED ON EQUATIONS IN APPENDIX Q12. A LONGITUDINAL EXTENT BASED ON SECONDARY CURRENTS IS NOT INCLUDED. BEDFORM HEIGHT IS BASED ON EQUATIONS IN APPENDIX Q13. JULY 2005 REVISION INCLUDES CALCULATION FOR CUT OFF DEPTH BASED ON LOS ANGELES COUNTY FLOOD CONTROL DISTRICT DESIGN MANUAL. THE CALCULATION DOES NOT CONSIDER ADJUSTMENTS TO CUT OFF DEPTH BASED ON TABLE F-06 THE OCTOBER 2005 REVISION INCLUDES ADDITIONAL TOEDOWN AT BRIDGES/ABUTMENTS WITH SOFT BOTTOMS.

COLOR CODES

OUTPUT
DATA FROM HEC-RAS
USER SUPPLIED DATA
INTERMEDIATE CALCULATIONS (INDIVIDUAL SHEETS ONLY)

DESIGNED BY DAVID A JAFFE, PHD, PE
PACIFIC ADVANCED CIVIL ENGINEERING, INC
OCTOBER, 2004
OCTOBER 2005, REVISED

SECTION	Z_{MAX}=	Z_{TOT}=	V (FPS)	FLOW DEPTH (FT)	Z_{DEG}+	Z_{GS}+	PIER TYPE	B	ABUT TYPE	A	SOFT	Z_{LS}+	BEND COEFF	HYD DEPTH	E SLOPE	TOP WIDTH	RADIUS	Z_{BS}+	Z_t+	H/2	Z_{DM}=
25425	21.0	15.1	18.3	12.5	2.0	1.3	0	0.0	1	0.0	0	0.0	1	7.1	0.007	1082.2	3000	5.3	2.0	4.5	21.0
25215	15.0	14.0	14.3	14.7	2.0	1.3	0	0.0	1	0.0	0	0.0	1	9.0	0.003	1097.3	3000	6.0	2.0	2.7	15.0
25000	15.0	13.7	13.2	15.5	2.0	1.3	0	0.0	1	0.0	0	0.0	1	10.1	0.002	1062.4	3000	6.0	2.0	2.3	15.0
24795	15.0	12.3	14.1	15.6	2.0	0.0	0	0.0	1	0.0	0	0.0	1	10.5	0.002	957.4	3000	5.6	2.0	2.7	15.0
24550	18.0	12.4	15.1	16.5	2.0	0.0	0	0.0	1	0.0	0	0.0	1	11.0	0.003	856.1	3000	5.4	2.0	3.1	18.0
24335	21.0	13.0	18.2	15.0	2.0	0.0	0	0.0	1	0.0	0	0.0	1	10.1	0.004	764.8	3000	4.5	2.0	4.5	21.0
24115	21.0	13.5	20.0	13.8	2.0	0.0	0	0.0	1	0.0	0	0.0	1	9.4	0.006	754.2	3000	4.1	2.0	5.4	21.0
23975	21.0	13.9	20.8	12.9	2.0	0.0	0	0.0	1	0.0	0	0.0	1	8.7	0.007	783.2	3000	4.1	2.0	5.8	21.0
23755	21.0	13.2	18.1	14.7	2.0	0.0	0	0.0	1	0.0	0	0.0	1	9.7	0.004	815.7	3000	4.8	2.0	4.4	21.0
23565	21.0	14.5	20.2	14.3	2.0	0.0	0	0.0	1	0.0	0	0.0	1	8.2	0.007	850.9	3000	4.9	2.0	5.5	21.0
23365	21.0	14.3	18.4	14.3	2.0	0.0	0	0.0	1	0.0	0	0.0	1	8.7	0.004	939.0	3000	5.7	2.0	4.6	21.0
23180	21.0	15.8	21.9	12.6	2.0	0.0	0	0.0	1	0.0	0	0.0	1	8.0	0.005	916.6	3000	5.5	2.0	6.3	21.0
23000	21.0	13.0	22.0	11.3	2.0	0.0	0	0.0	1	0.0	0	0.0	1	8.2	0.010	784.0	3000	3.4	2.0	5.6	21.0
22790	26.8	26.8	17.9	13.0	2.0	0.0	0.9	2.0	1	0.0	0	14.7	1	10.0	0.005	784.0	3000	3.7	2.0	4.3	18.0
22600	21.0	14.8	19.8	12.8	2.0	0.0	0	0.0	1	0.0	0	0.0	1	7.6	0.006	999.0	3000	5.5	2.0	5.3	21.0
22415	21.0	14.0	21.3	10.8	2.0	0.0	0	0.0	1	0.0	0	0.0	1	6.6	0.010	1039.1	3000	4.6	2.0	5.4	21.0
22195	15.0	13.3	13.6	14.0	2.0	0.2	0	0.0	1	0.0	0	0.0	1	8.7	0.003	1309.6	3000	6.6	2.0	2.5	15.0
22010	18.0	15.3	16.1	14.3	2.0	0.2	0	0.0	1	0.0	0	0.0	1	7.6	0.003	1254.1	3000	7.6	2.0	3.5	18.0
21790	21.0	15.3	19.7	11.6	2.0	0.2	0	0.0	1	0.0	0	0.0	1	6.5	0.006	1144.5	3000	5.9	2.0	5.2	21.0
21615	21.0	12.5	21.3	8.5	2.0	0.2	0	0.0	1	0.0	0	0.0	1	5.8	0.011	1163.0	3000	4.1	2.0	4.3	21.0
21440	18.0	14.1	17.5	11.0	2.0	0.2	0	0.0	1	0.0	0	0.0	1	6.9	0.005	1286.1	3000	5.8	2.0	4.1	18.0
21225	21.0	16.3	18.1	11.7	2.0	0.2	0	0.0	1	0.0	0	0.0	1	5.6	0.005	1559.0	3000	7.7	2.0	4.4	21.0
21020	21.0	12.6	20.3	9.7	2.0	0.2	0	0.0	1	0.0	0	0.0	1	7.8	0.007	903.0	3000	3.6	2.0	4.9	21.0
20845	18.0	15.2	15.1	12.7	2.0	0.2	0	0.0	1	0.0	0	0.0	1	6.7	0.003	1563.7	3000	7.9	2.0	3.1	18.0
20595	15.0	14.1	12.4	13.4	2.0	0.2	0	0.0	1	0.0	0	0.0	1	8.3	0.002	1548.8	3000	7.8	2.0	2.1	15.0
20435	15.0	14.4	12.1	14.3	2.0	0.2	0	0.0	1	0.0	0	0.0	1	8.8	0.001	1528.3	3000	8.3	2.0	2.0	15.0
20280	18.0	15.4	15.6	12.8	2.0	0.2	0	0.0	1	0.0	0	0.0	1	6.8	0.003	1531.3	3000	8.0	2.0	3.3	18.0
20070	21.0	16.8	19.3	11.1	2.0	0.2	0	0.0	1	0.0	0	0.0	1	5.2	0.006	1526.6	3000	7.5	2.0	5.0	21.0
19855	21.0	14.5	20.6	10.2	2.0	0.0	0	0.0	1	0.0	0	0.0	1	6.0	0.008	1205.4	3000	5.4	2.0	5.1	21.0
19630	21.0	12.3	20.6	8.9	2.0	0.0	0	0.0	1	0.0	0	0.0	1	6.6	0.009	1060.3	3000	3.8	2.0	4.4	21.0
19440	15.0	12.2	13.1	13.4	2.0	0.0	0	0.0	1	0.0	0	0.0	1	9.2	0.002	1194.5	3000	5.9	2.0	2.3	15.0
19240	18.0	13.0	15.9	11.9	2.0	0.0	0	0.0	1	0.0	0	0.0	1	7.4	0.004	1216.9	3000	5.6	2.0	3.4	18.0
19050	21.0	14.1	18.8	10.5	2.0	0.0	0	0.0	1	0.0	0	0.0	1	5.8	0.009	1321.4	3000	5.4	2.0	4.8	21.0
18830	15.0	14.5	13.3	14.6	2.0	0.0	0	0.0	1	0.0	0	0.0	1	7.4	0.003	1531.5	3000	8.1	2.0	2.4	15.0
18650	15.0	14.7	12.1	15.0	2.0	0.0	0	0.0	1	0.0	0	0.0	1	8.0	0.002	1604.5	3000	8.8	2.0	2.0	15.0
18475	13.6	13.6	8.9	16.9	2.0	0.0	0	0.0	1	0.0	0	0.0	1	9.9	0.001	1621.5	3000	8.5	2.0	1.1	12.0
18290	14.1	14.1	9.8	16.9	2.0	0.0	0	0.0	1	0.0	0	0.0	1	9.4	0.001	1594.2	3000	8.9	2.0	1.3	12.0
18025	8.0	4.8	7.9	18.5	2.0	0.0	0	0.0	1	0.0	0	0.0	1	11.9	0.001	1520.2	17000	0.0	2.0	0.8	8.0
17785	8.0	5.0	8.5	20.2	2.0	0.0	0	0.0	1	0.0	0	0.0	1	12.0	0.001	1398.1	17000	0.0	2.0	1.0	8.0
17510	10.0	6.9	11.0	19.2	2.0	1.3	0	0.0	1	0.0	0	0.0	1	10.2	0.001	1350.7	17000	0.0	2.0	1.6	10.0
17360	12.5	9.2	17.1	15.9	2.0	1.3	0	0.0	1	0.0	0	0.0	1	8.8	0.004	943.2	17000	0.0	2.0	3.9	12.5
17110	14.0	12.0	22.3	15.2	2.0	1.3	0	0.0	1	0.0	0	0.0	1	5.8	0.007	1175.4	17000	0.0	2.0	6.7	14.0
16970	14.0	12.1	23.1	13.6	2.0	1.3	0	0.0	1	0.0	0	0.0	1	5.9	0.010	1067.0	17000	0.0	2.0	6.8	14.0
16720	14.0	9.9	24.4	9.2	2.0	1.3	0	0.0	1	0.0	0	0.0	1	5.2	0.019	1122.9	17000	0.0	2.0	4.6	14.0
16515	14.0	10.4	19.4	10.4	2.0	1.3	0	0.0	1	0.0	0	0.0	1	5.8	0.010	1249.9	17000	0.0	2.0	5.1	14.0
16305	10.0	7.1	11.6	14.6	2.0	1.3	0	0.0	1	0.0	0	0.0	1	9.4	0.002	1360.5	17000	0.0	2.0	1.8	10.0
16130	12.5	8.6	15.7	12.3	2.0	1.3	0	0.0	1	0.0	0	0.0	1	7.1	0.005	1326.5	17000	0.0	2.0	3.3	12.5
15960	12.5	9.5	17.7	11.0	2.0	1.3	0	0.0	1	0.0	0	0.0	1	5.9	0.008	1386.0	17000	0.0	2.0	4.2	12.5
15745	10.0	7.3	12.3	13.3	2.0	1.3	0	0.0	1	0.0	0	0.0	1	8.4	0.003	1363.9	17000	0.0	2.0	2.0	10.0
15540	10.0	6.8	10.6	13.7	2.0	1.3	0	0.0	1	0.0	0	0.0	1	9.4	0.002	1426.6	17000	0.0	2.0	1.5	10.0
15335	12.5	8.8	16.2	12.1	2.0	1.3	0	0.0	1	0.0	0	0.0	1	8.2	0.006	1064.1	17000	0.0	2.0	3.5	12.5
15125	26.1	26.1	17.9	11.6	2.0	0.4	0.9	4.0	1	0.0	0	17.4	1	8.0	0.007	1000.5	17000	0.0	2.0	4.3	12.5
14900	14.0	9.3	19.3	9.8	2.0	0.4	0	0.0	1	0.0	0	0.0	1	6.3	0.009	1626.5	17000	0.0	2.0	4.9	14.0
14720	21.0	8.9	18.1	9.8	2.0	0.4	0	0.0	1	0.0	0	0.0	1	6.0	0.008	1722.3	17000	0.1	2.0	4.4	21.0
14480	21.0	8.9	19.0	8.9	2.0	0.4	0	0.0	1	0.0	0	0.0	1	5.2	0.010	1726.7	17000	0.1	2.0	4.4	21.0
14315	15.0	7.4	14.0	9.9	2.0	0.4	0	0.0	1	0.0	0	0.0	1	5.8	0.005	1881.0	17000	0.3	2.0	2.6	15.0
14090	15.0	7.3	14.3	8.5	2.0	0.4	0	0.0	1	0.0	0	0.0	1	5.6	0.006	1772.8	17000	0.1	2.0	2.8	15.0
13850	15.0	6.7	12.6	9.7	2.0	0.4	0	0.0	1	0.0	0	0.0	1	6.5	0.004	1741.6	17000	0.1	2.0	2.2	15.0
13635	18.0	7.7	15.5	10.3	2.0	0.4	0	0.0	1	0.0	0	0.0	1	6.3	0.004	1705.8	17000	0.1	2.0	3.2	18.0
13425	21.0	8.6	18.0	7.8	2.0	0.4	0	0.0	1	0.0	0	0.0	1	4.3	0.011	1850.7	17000	0.2	2.0	3.9	21.0
13190	15.0	6.7	12.2	9.5	2.0	0.4	0	0.0	1	0.0	0	0.0	1	6.5	0.003	1847.4	17000	0.3	2.0	2.0	15.0
13030	15.0	6.9	14.2	9.6	2.0	0.0	0	0.0	1	0.0	0	0.0	1	6.5	0.003	1763.0	17000	0.2	2.0	2.7	15.0
12835	10.0	6.4	13.3	10.1	2.0	0.0	0	0.0	1	0.0	0	0.0	1	7.3	0.003	1607.5	17000	0.0	2.0	2.4	10.0
12615	10.0	6.1	12.5	10.9	2.0	0.0	0	0.0	1	0.0	0	0.0	1	8.6	0.002	1470.8	17000	0.0	2.0	2.1	10.0
12395	10.0	6.0	12.3	11.5	2.0	0.0	0	0.0	1	0.0	0	0.0	1	9.0	0.002	1438.1	17000	0.0	2.0	2.0	10.0
12195	10.0	5.5	10.6	12.5	2.0	0.0	0	0.0	1	0.0	0	0.0	1	10.3	0.001	1383.7	17000	0.0	2.0	1.5	10.0
11995	10.0	6.2	12.8	13.6	2.0	0.0	0	0.0	1	0.0	0	0.0	1	9.7	0.002	1280.5	17000	0.0	2.0	2.2	10.0
11780	10.0	6.1	12.6	14.4	2.0	0.0	0	0.0	1	0.0	0	0.0	1	9.3	0.001	1422.2	17000	0.0	2.0	2.1	10.0
11605	10.0	6.6	13.9	13.8	2.0	0.0	0	0.0	1	0.0	0	0.0	1	8.6	0.002	1325.5	17000	0.0	2.0	2.6	10.0
11405	10.0	6.3	13.2	15.1	2.0	0.0	0	0.0	1	0.0	0	0.0	1	10.3	0.002	1114.6	17000	0.0	2.0	2.3	10.0
11180	12.5	7.7	16.6	13.9	2.0	0.0	0	0.0	1	0.0	0	0.0	1	10.6	0.003	835.7	17000	0.0	2.0	3.7	12.5
11015	14.0	10.4	19.1	13.3	2.0	1.5	0	0.0	1	0.0	0	0.0	1	11.0	0.004	679.4	17000	0.0	2.0	4.9	14.0
10835	14.0	10.9	21.9	10.9	2.0	1.5	0	0.0	1	0.0	0	0.0	1	8.2	0.007	790.4	17000	0.0	2.0	5.4	14.0
10575	14.0	9.2	24.1	7.5	2.0	1.5	0	0.0	1	0.0	0	0.0	1	5.3	0.016	1108.8	17000	0.0	2.0	3.7	14.0
10390	14.0	9.9	22.7	8.8	2.0	1.5	0	0.0	1	0.0	0	0.0	1	5.8	0.008	1247.0	17000	0.0	2.0	4.4	14.0
10225	12.5	9.8	17.8	9.5	2.0	1.5	0	0.0	1	0.0	0	0.0	1	5.9	0.007	1374.1	17000	0.0	2.0	4.3	12.5
10000	10.0	8.5	14.9	11.1	2.0	1.5	0	0.0	1	0.0	0	0.0	1	6.6	0.004	1488.0	17000	0.0	2.0	3.0	10.0
9820	14.0	10.2	18.6	10.0	2.0	1.5	0	0.0	1	0.0	0	0.0	1	5.7	0.008	1402.3	17000	0.0	2.0	4.7	14.0
9595	10.0	8.4	14.6	10.3	2.0	1.5	0	0.0	1	0.0	0	0.0	1	6.6	0.005	1619.5	17000	0.0	2.0	2.9	10.0
9385	18.0	9.0	15.8	9.5	2.0	1.5	0	0.0	1	0.0	0	0.0	1	5.3	0.006	1770.4	17000	0.2	2.0	3.4	18.0
9220	18.0	9.3	16.4	8.9	2.0	1.5	0	0.0	1	0.0	0	0.0	1	4.9	0.008	1771.4	17000	0.1	2.0	3.6	18.0
9025	18.0	9.0	15.9	8.9	2.0	1.5	0	0.0	1	0.0	0	0.0	1	5.5	0.005	1736.9	17000	0.1	2.0	3.4	18.0
MAX=	26.8	26.8			8.1	1.6					0.0	17.4					17000.0	8.9	2.0	8.3	21.0
MIN=	8.0	4.8			2.0	0.0					0.0	0.0					3000.0	0.0	2.0	0.5	8.0

CALCULATIONS FOR TOTAL TOE-DOWN BY INDIVIDUAL ADJUSTMENT COMPONENT BASED ON LACH&SM W/ SAM -- SANTA CLARA RIVER PROPOSED CONDITIONS STRAIGHT-INSIDE CURVED REACH, Q_{50} n=0.025

SECTION	Z_{MAX}=	Z_{TOT}=	V (FPS)	FLOW DEPTH (FT)	Z_{DEG}+	Z_{GS}+	PIER TYPE	B	ABUT TYPE	A	SOFT	Z_{LS}+	BEND COEFF	HYD DEPTH	E SLOPE	TOP WIDTH	RADIUS	Z_{BS}+	Z_F+	H/2	Z_{DM}=
46195	14.0	11.1	21.7	18.1	2.8	0.0	0	0.0	1	0.0	0	0.0	0	11.7	0.005	453.0	9000	0.0	2.0	6.3	14.0
46020	14.0	12.7	24.1	18.1	2.8	0.0	0	0.0	1	0.0	0	0.0	0	9.2	0.009	520.9	9000	0.0	2.0	7.9	14.0
45545	14.0	10.4	20.3	19.2	2.8	0.0	0	0.0	1	0.0	0	0.0	0	12.7	0.004	446.7	9000	0.0	2.0	5.6	14.0
45030	14.0	13.1	26.1	16.5	2.8	0.0	0	0.0	1	0.0	0	0.0	0	9.0	0.011	492.5	9000	0.0	2.0	8.3	14.0
44585	14.0	9.8	19.2	21.1	2.8	0.0	0	0.0	1	0.0	0	0.0	0	11.3	0.004	531.9	9000	0.0	2.0	5.0	14.0
44210	14.0	12.5	26.2	15.4	2.8	0.0	0	0.0	1	0.0	0	0.0	0	9.7	0.009	452.6	9000	0.0	2.0	7.7	14.0
43820	15.4	15.4	19.9	19.5	8.1	0.0	0	0.0	1	0.0	0	0.0	0	12.1	0.004	476.5	9000	0.0	2.0	5.3	14.0
43610	17.0	17.0	26.7	13.8	8.1	0.0	0	0.0	1	0.0	0	0.0	0	9.6	0.010	450.6	9000	0.0	2.0	6.9	14.0
43410	15.8	15.8	28.8	11.3	8.1	0.0	0	0.0	1	0.0	0	0.0	0	7.4	0.011	583.4	9000	0.0	2.0	5.7	14.0
43200	16.3	16.3	26.1	12.4	8.1	0.0	0	0.0	1	0.0	0	0.0	0	6.7	0.011	689.2	9000	0.0	2.0	6.2	14.0
42975	15.5	15.5	26.6	10.8	8.1	0.0	0	0.0	1	0.0	0	0.0	0	5.9	0.016	735.1	9000	0.0	2.0	5.4	14.0
42815	15.5	15.5	23.9	10.7	8.1	0.0	0	0.0	1	0.0	0	0.0	0	5.6	0.016	864.3	9000	0.0	2.0	5.4	14.0
42590	14.7	14.7	22.4	9.2	8.1	0.0	0	0.0	1	0.0	0	0.0	0	5.2	0.014	1013.1	9000	0.0	2.0	4.6	14.0
42430	15.3	15.3	19.6	10.7	8.1	0.0	0	0.0	1	0.0	0	0.0	0	6.4	0.009	915.8	9000	0.0	2.0	5.2	14.0
42215	14.7	14.7	18.5	11.2	8.1	0.0	0	0.0	1	0.0	0	0.0	0	6.1	0.009	1019.0	9000	0.0	2.0	4.6	14.0
41940	11.9	11.9	11.6	14.3	8.1	0.0	0	0.0	1	0.0	0	0.0	0	7.7	0.002	1284.2	9000	0.0	2.0	1.8	10.0
41730	12.0	12.0	11.8	14.7	8.1	0.0	0	0.0	1	0.0	0	0.0	0	8.2	0.002	1190.9	9000	0.0	2.0	1.9	10.0
41460	11.9	11.9	11.6	16.2	8.1	0.0	0	0.0	1	0.0	0	0.0	0	9.1	0.002	1093.5	9000	0.0	2.0	1.8	10.0
41280	12.5	10.9	16.4	14.4	5.2	0.1	0	0.0	1	0.0	0	0.0	0	8.3	0.004	852.3	9000	0.0	2.0	3.6	12.5
41080	14.0	12.7	19.9	12.1	5.2	0.1	0	0.0	1	0.0	0	0.0	0	6.7	0.008	874.1	9000	0.0	2.0	5.4	14.0
40825	14.0	11.7	18.0	11.5	5.2	0.1	0	0.0	1	0.0	0	0.0	0	6.2	0.007	1040.4	9000	0.0	2.0	4.4	14.0
40585	12.5	11.2	17.0	11.7	5.2	0.1	0	0.0	1	0.0	0	0.0	0	6.8	0.006	1005.8	9000	0.0	2.0	3.9	12.5
40335	10.0	8.8	10.5	15.1	5.2	0.1	0	0.0	1	0.0	0	0.0	0	8.8	0.002	1249.6	9000	0.0	2.0	1.5	10.0
40130	10.0	9.0	11.3	15.5	5.2	0.1	0	0.0	1	0.0	0	0.0	0	8.8	0.002	1195.6	9000	0.0	2.0	1.7	10.0
39945	10.0	8.9	11.0	16.3	5.2	0.1	0	0.0	1	0.0	0	0.0	0	9.3	0.002	1173.3	9000	0.0	2.0	1.6	10.0
39755	12.5	11.0	16.5	13.3	5.2	0.1	0	0.0	1	0.0	0	0.0	0	8.1	0.004	894.5	9000	0.0	2.0	3.7	12.5
39605	14.0	12.5	19.7	11.5	5.2	0.1	0	0.0	1	0.0	0	0.0	0	7.1	0.007	849.7	9000	0.0	2.0	5.2	14.0
39310	12.5	11.0	16.5	12.7	5.2	0.1	0	0.0	1	0.0	0	0.0	0	8.1	0.004	931.1	9000	0.0	2.0	3.7	12.5
39100	14.0	12.5	20.9	10.4	5.2	0.1	0	0.0	1	0.0	0	0.0	0	7.2	0.009	761.1	9000	0.0	2.0	5.2	14.0
38925	10.0	9.5	12.8	14.3	5.2	0.1	0	0.0	1	0.0	0	0.0	0	10.3	0.002	873.5	9000	0.0	2.0	2.2	10.0
38710	10.0	6.7	12.0	15.6	2.7	0.0	0	0.0	1	0.0	0	0.0	0	11.7	0.002	820.3	9000	0.0	2.0	2.0	10.0
38475	12.5	9.0	17.9	14.0	2.7	0.0	0	0.0	1	0.0	0	0.0	0	9.8	0.004	659.7	9000	0.0	2.0	4.3	12.5
38300	14.0	9.8	22.5	10.3	2.7	0.0	0	0.0	1	0.0	0	0.0	0	7.7	0.010	666.3	9000	0.0	2.0	5.1	14.0
38065	10.0	7.6	14.5	14.0	2.7	0.0	0	0.0	1	0.0	0	0.0	0	12.0	0.002	658.4	9000	0.0	2.0	2.9	10.0
37810	14.0	9.2	18.2	12.2	2.7	0.0	0	0.0	1	0.0	0	0.0	0	10.2	0.004	618.2	9000	0.0	2.0	4.5	14.0
37655	14.0	10.0	20.9	10.5	2.7	0.0	0	0.0	1	0.0	0	0.0	0	7.8	0.008	706.7	9000	0.0	2.0	5.3	14.0
37390	14.0	8.0	23.7	6.5	2.7	0.0	0	0.0	1	0.0	0	0.0	0	5.9	0.015	823.8	9000	0.0	2.0	3.3	14.0
37135	12.5	8.4	16.6	9.3	2.7	0.0	0	0.0	1	0.0	0	0.0	0	8.5	0.005	821.4	9000	0.0	2.0	3.7	12.5
36930	14.0	8.8	19.8	8.1	2.7	0.0	0	0.0	1	0.0	0	0.0	0	7.2	0.008	812.4	9000	0.0	2.0	4.1	14.0
36735	12.5	8.2	16.1	9.8	2.7	0.0	0	0.0	1	0.0	0	0.0	0	8.0	0.005	896.9	9000	0.0	2.0	3.5	12.5
36515	10.0	6.9	12.9	12.0	2.7	0.0	0	0.0	1	0.0	0	0.0	0	9.0	0.002	994.7	9000	0.0	2.0	2.2	10.0
36265	10.0	6.8	12.3	12.5	2.7	0.0	0	0.0	1	0.0	0	0.0	0	7.9	0.003	1176.0	9000	0.0	2.0	2.1	10.0
36080	22.0	22.0	14.7	11.6	3.2	0.7	0.9	2.0	1	0.0	0	13.3	0	6.7	0.006	1176.0	9000	0.0	2.0	2.9	10.0
35845	10.0	7.5	11.0	13.6	3.2	0.7	0	0.0	1	0.0	0	0.0	0	7.9	0.002	1401.7	9000	0.0	2.0	1.6	10.0
35725	10.0	8.9	15.0	13.0	3.2	0.7	0	0.0	1	0.0	0	0.0	0	6.5	0.004	1377.9	9000	0.0	2.0	3.0	10.0
35515	12.5	9.8	17.1	12.0	3.2	0.7	0	0.0	1	0.0	0	0.0	0	6.0	0.005	1354.8	9000	0.0	2.0	3.9	12.5
35245	12.5	9.9	17.3	11.3	3.2	0.7	0	0.0	1	0.0	0	0.0	0	5.5	0.006	1328.3	9000	0.0	2.0	4.0	12.5
35040	14.0	11.0	19.6	10.7	3.2	0.7	0	0.0	1	0.0	0	0.0	0	5.5	0.006	1354.8	9000	0.0	2.0	5.2	14.0
34860	14.0	10.4	18.4	10.0	3.2	0.7	0	0.0	1	0.0	0	0.0	0	4.9	0.009	1285.7	9000	0.0	2.0	4.6	14.0
34720	14.0	10.4	18.4	9.2	3.2	0.7	0	0.0	1	0.0	0	0.0	0	4.5	0.009	1411.2	9000	0.0	2.0	4.6	14.0
34495	12.5	10.0	17.4	9.0	3.2	0.7	0	0.0	1	0.0	0	0.0	0	5.2	0.009	1283.9	9000	0.0	2.0	4.1	12.5
34310	12.5	9.6	16.8	9.3	3.2	0.7	0	0.0	1	0.0	0	0.0	0	5.9	0.005	1308.5	9000	0.0	2.0	3.8	12.5
34090	12.5	9.7	17.0	8.6	3.2	0.7	0	0.0	1	0.0	0	0.0	0	5.3	0.007	1295.5	9000	0.0	2.0	3.9	12.5
33880	12.5	9.1	16.6	9.3	3.4	0.0	0	0.0	1	0.0	0	0.0	0	5.3	0.007	1318.4	9000	0.0	2.0	3.7	12.5
33710	12.5	8.6	15.4	9.7	3.4	0.0	0	0.0	1	0.0	0	0.0	0	5.5	0.005	1372.1	9000	0.0	2.0	3.2	12.5
33500	12.5	8.9	16.2	9.3	3.4	0.0	0	0.0	1	0.0	0	0.0	0	5.1	0.007	1496.0	9000	0.0	2.0	3.5	12.5
33310	12.5	8.7	15.8	9.0	3.4	0.0	0	0.0	1	0.0	0	0.0	0	4.2	0.006	1770.4	9000	0.0	2.0	3.4	12.5
33115	10.0	6.8	10.4	10.6	3.4	0.0	0	0.0	1	0.0	0	0.0	0	6.1	0.003	1847.3	9000	0.0	2.0	1.4	10.0
32795	10.0	7.7	13.0	10.6	3.4	0.0	0	0.0	1	0.0	0	0.0	0	5.2	0.004	1735.6	9000	0.0	2.0	2.3	10.0
32605	10.0	8.2	14.4	11.1	3.4	0.0	0	0.0	1	0.0	0	0.0	0	5.0	0.005	1699.9	9000	0.0	2.0	2.8	10.0
32265	12.5	7.4	15.9	10.5	2.0	0.0	0	0.0	1	0.0	0	0.0	0	4.8	0.006	1853.2	9000	0.0	2.0	3.4	12.5
31875	10.0	6.1	12.4	10.4	2.0	0.0	0	0.0	1	0.0	0	0.0	0	4.7	0.006	2409.2	9000	0.0	2.0	2.1	10.0
31585	10.0	5.6	10.9	11.9	2.0	0.0	0	0.0	1	0.0	0	0.0	0	5.9	0.003	2182.2	9000	0.0	2.0	1.6	10.0
31360	10.0	5.4	10.3	13.5	2.0	0.0	0	0.0	1	0.0	0	0.0	0	7.4	0.002	1878.7	9000	0.0	2.0	1.4	10.0
31060	8.0	4.9	8.2	15.5	2.0	0.0	0	0.0	1	0.0	0	0.0	0	10.1	0.001	1708.2	9000	0.0	2.0	0.9	8.0
30720	8.0	4.6	6.7	17.5	2.0	0.0	0	0.0	1	0.0	0	0.0	0	11.2	0.001	1888.6	9000	0.0	2.0	0.6	8.0
30445	8.0	4.5	6.3	19.5	2.0	0.0	0	0.0	1	0.0	0	0.0	0	12.7	0.000	1779.7	9000	0.0	2.0	0.5	8.0
30095	8.0	4.6	6.7	21.3	2.0	0.0	0	0.0	1	0.0	0	0.0	0	13.4	0.000	1622.7	9000	0.0	2.0	0.6	8.0
29815	8.0	4.8	7.7	21.9	2.0	0.0	0	0.0	1	0.0	0	0.0	0	13.5	0.000	1433.2	9000	0.0	2.0	0.8	8.0
29565	8.0	4.7	7.4	22.9	2.0	0.0	0	0.0	1	0.0	0	0.0	0	14.8	0.000	1323.8	9000	0.0	2.0	0.7	8.0
29385	8.0	4.9	8.3	23.6	2.0	0.0	0	0.0	1	0.0	0	0.0	0	14.4	0.000	1237.4	9000	0.0	2.0	0.9	8.0
29140	9.1	9.1	9.2	24.1	4.4	1.6	0	0.0	1	0.0	0	0.0	0	14.1	0.001	1087.2	9000	0.0	2.0	1.1	8.0
28895	14.0	12.7	18.8	22.5	4.4	1.6	0	0.0	1	0.0	0	0.0	0	9.9	0.002	972.1	9000	0.0	2.0	4.8	14.0
28695	15.0	15.0	28.9	14.0	4.4	1.6	0	0.0	1	0.0	0	0.0	0	5.4	0.025	899.4	9000	0.0	2.0	7.0	14.0
28500	14.7	14.7	22.4	16.1	4.4	1.6	0	0.0	1	0.0	0	0.0	0	11.4	0.006	552.2	9000	0.0	2.0	6.8	14.0
28280	14.0	13.4	29.6	10.8	4.4	1.6	0	0.0	1	0.0	0	0.0	0	5.8	0.013	944.5	9000	0.0	2.0	5.4	14.0
28080	10.0	9.7	11.3	19.1	4.4	1.6	0	0.0	1	0.0	0	0.0	0	14.7	0.001	926.4	9000	0.0	2.0	1.7	10.0
27925	10.3	10.3	13.1	19.3	4.4	1.6	0	0.0	1	0.0	0	0.0	0	13.8	0.001	866.6	9000	0.0	2.0	2.3	10.0
27725	14.0	12.9	19.0	16.7	4.4	1.6	0	0.0	1	0.0	0	0.0	0	10.4	0.003	786.6	9000	0.0	2.0	4.9	14.0
27545	15.0	15.0	22.9	14.1	4.4	1.6	0	0.0	1	0.0	0	0.0	0	9.9	0.005	643.2	9000	0.0	2.0	7.0	14.0
27335	14.1	14.1	24.6	12.3	4.4	1.6	0	0.0	1	0.0	0	0.0	0	8.3	0.008	703.5	9000	0.0	2.0	6.2	14.0
27155	14.0	12.9	19.1	14.8	4.4	1.6	0	0.0	1	0.0	0	0.0	0	9.2	0.003	888.4	9000	0.0	2.0	4.9	14.0
26990	14.0	11.0	22.6	11.5	2.0	1.3	0	0.0	1	0.0	0	0.0	0	6.8	0.011	922.3	9000	0.0	2.0	5.7	14.0
26780	14.0	10.9	23.1	11.3	2.0	1.3	0	0.0	1	0.0	0	0.0	0	6.2	0.009	1043.3	9000	0.0	2.0	5.6	14.0
26575	14.0	10.9	20.7	11.1	2.0	1.3	0	0.0	1	0.0	0	0.0	0	5.7	0.012	1187.3	3000	0.0	2.0	5.6	14.0
26355	12.5	8.7	15.9	13.4	2.0	1.3	0	0.0	1	0.0	0	0.0	0	7.5	0.004	1260.4	3000	0.0	2.0	3.4	12.5
26170	12.5	9.2	17.0	13.5	2.0	1.3	0	0.0	1	0.0	0	0.0	0	7.6	0.003	1269.0	3000	0.0	2.0	3.9	12.5
25965	14.0	9.8	18.2	12.9	2.0	1.3	0	0.0	1	0.0	0	0.0	0	6.9	0.004	1281.3	3000	0.0	2.0	4.5	14.0

DEFINITIONS

V(FPS) =VELOCITY IN FEET PER SECOND
Z_{TOT}=TOTAL POTENTIAL VERTICAL ADJUSTMENT IN FEET
Z_{DEG}=LONG TERM DEGRADATION IN FEET
Z_{GS}=GENERAL SCOUR IN FEET FROM SAM
Z_{LS}=LOCAL SCOUR IN FEET
PIER TYPE=PIER SHAPE FACTOR; IF NO PIERS=**0**
=SQUARE NOSE; **0.9** ROUND NOSE; **0.9** CYLINDER;
1.0 SHARP NOSE; **0.9** GROUP OF CYLINDERS
FLOW DEPTH=WATER DEPTH IN CHANNEL IN FEET
B=WIDTH OF PIERS IN FEET; NO PIER=0
ABUT TYPE=VERT WALL FACTOR; IF VERT=**2**; NON VERT=**1**
A=ABUTMENT PROTRUSION INTO FLOW PATH IN FEET
SOFT = SOFT BOTTOM AT A BRIDGE OR AN ABUTMENT
= HARD BOTTOM; **1** = SOFT BOTTOM
Z_{BS}=BEND SCOUR IN FEET
BEND COEFF=BEND COEFFICIENT; IF NO BEND=0, BEND=1
HYD DEPTH=HYDRAULIC DEPTH IN FEET
E SLOPE=ENERGY SLOPE, UNITLESS
TOP WIDTH=CHANNEL TOP WIDTH IN FEET
RADIUS=RADIUS OF CURVATURE TO CENTERLINE IN FEET
Z_F=LOW-FLOW INCISEMENT IN FEET, MEASURED OR 2'; VALUE **NOT LESS THAN 2'**
H=BEDFORM HEIGHT IN FEET, LIMITED TO FLOW DEPTH AFTER KENNEDY (1963)
Z_{DM}=CUT OFF DEPTH REQUIRED BY LACFCDDM

GENERAL

THIS SPREADSHEET IS DESIGNED TO CALCULATE SCOUR PROTECTION (TOE DOWN) BASED ON LADPW COUNTY HYDROLOGY MANUAL (1991) PAGES 5.2-5.8 AND ASSOCIATED APPENDICES (SEDIMENTATION MANUAL). ALL VELOCITIES ARE IN FPS, WITH A MAXIMUM VALUE LIMITED BY THE EQUATION. THE PRESENT VERSION (10/04) WILL CALCULATE UP TO 50 VELOCITIES AT ONE TIME. LONG TERM DEGRADATION IS USER SUPPLIED. GENERAL SCOUR IS TAKEN FROM APPENDIX Q3, INTERPOLATED. LOCAL SCOUR AT BENDS AND ABUTMENTS ARE BASED ON LADWP EQUATIONS FOUND IN APP Q12. BEND SCOUR IS BASED ON EQUATIONS IN APPENDIX Q12. A LONGITUDINAL EXTENT BASED ON SECONDARY CURRENTS IS NOT INCLUDED. BEDFORM HEIGHT IS BASED ON EQUATIONS IN APPENDIX Q13. JULY 2005 REVISION INCLUDES CALCULATION FOR CUT OFF DEPTH BASED ON LOS ANGELES COUNTY FLOOD CONTROL DISTRICT DESIGN MANUAL. THE CALCULATION DOES NOT CONSIDER ADJUSTMENTS TO CUT OFF DEPTH BASED ON TABLE F-06 THE OCTOBER 2005 REVISION INCLUDES ADDITIONAL TOEDOWN AT BRIDGES/ABUTMENTS WITH SOFT BOTTOMS.

COLOR CODES

OUTPUT
DATA FROM HEC-RAS
USER SUPPLIED DATA
INTERMEDIATE CALCULATIONS (INDIVIDUAL SHEETS ONLY)

DESIGNED BY DAVID A JAFFE, PHD, PE
PACIFIC ADVANCED CIVIL ENGINEERING, INC
OCTOBER, 2004
OCTOBER 2005, REVISED

SECTION	Z_{MAX}=	Z_{TOT}=	V (FPS)	FLOW DEPTH (FT)	Z_{DEQ}+	Z_{GS}+	PIER TYPE	B	ABUT TYPE	A	SOFT	Z_{LS}+	BEND COEFF	HYD DEPTH	E SLOPE	TOP WIDTH	RADIUS	Z_{BS}+	Z_L+	H/2	Z_{DM}=
25785	14.0	10.1	18.9	12.1	2.0	1.3	0	0.0	1	0.0	0	0.0	0	6.9	0.005	1219.7	3000	0.0	2.0	4.8	14.0
25600	14.0	9.9	18.5	12.4	2.0	1.3	0	0.0	1	0.0	0	0.0	0	7.6	0.005	1109.4	3000	0.0	2.0	4.6	14.0
25425	14.0	9.8	18.3	12.5	2.0	1.3	0	0.0	1	0.0	0	0.0	0	7.1	0.007	1082.2	3000	0.0	2.0	4.5	14.0
25215	10.0	8.0	14.3	14.7	2.0	1.3	0	0.0	1	0.0	0	0.0	0	9.0	0.003	1097.3	3000	0.0	2.0	2.7	10.0
25000	10.0	7.6	13.2	15.5	2.0	1.3	0	0.0	1	0.0	0	0.0	0	10.1	0.002	1062.4	3000	0.0	2.0	2.3	10.0
24795	10.0	6.7	14.1	15.6	2.0	0.0	0	0.0	1	0.0	0	0.0	0	10.5	0.002	957.4	3000	0.0	2.0	2.7	10.0
24550	12.5	7.1	15.1	16.5	2.0	0.0	0	0.0	1	0.0	0	0.0	0	11.0	0.003	856.1	3000	0.0	2.0	3.1	12.5
24335	14.0	8.5	18.2	15.0	2.0	0.0	0	0.0	1	0.0	0	0.0	0	10.1	0.004	764.8	3000	0.0	2.0	4.5	14.0
24115	14.0	9.4	20.0	13.8	2.0	0.0	0	0.0	1	0.0	0	0.0	0	9.4	0.006	754.2	3000	0.0	2.0	5.4	14.0
23975	14.0	9.8	20.8	12.9	2.0	0.0	0	0.0	1	0.0	0	0.0	0	8.7	0.007	783.2	3000	0.0	2.0	5.8	14.0
23755	14.0	8.4	18.1	14.7	2.0	0.0	0	0.0	1	0.0	0	0.0	0	9.7	0.004	815.7	3000	0.0	2.0	4.4	14.0
23565	14.0	9.5	20.2	14.3	2.0	0.0	0	0.0	1	0.0	0	0.0	0	8.2	0.007	850.9	3000	0.0	2.0	5.5	14.0
23365	14.0	8.6	18.4	14.3	2.0	0.0	0	0.0	1	0.0	0	0.0	0	8.7	0.004	939.0	3000	0.0	2.0	4.6	14.0
23180	14.0	10.3	21.9	12.6	2.0	0.0	0	0.0	1	0.0	0	0.0	0	8.0	0.005	916.6	3000	0.0	2.0	6.3	14.0
23000	14.0	9.6	22.0	11.3	2.0	0.0	0	0.0	1	0.0	0	0.0	0	8.2	0.010	784.0	3000	0.0	2.0	5.6	14.0
22790	23.0	23.0	17.9	13.0	2.0	0.0	0.9	2.0	1	0.0	0	14.7	0	10.0	0.005	784.0	3000	0.0	2.0	4.3	12.5
22600	14.0	9.3	19.8	12.8	2.0	0.0	0	0.0	1	0.0	0	0.0	0	7.6	0.006	999.0	3000	0.0	2.0	5.3	14.0
22415	14.0	9.4	21.3	10.8	2.0	0.0	0	0.0	1	0.0	0	0.0	0	6.6	0.010	1039.1	3000	0.0	2.0	5.4	14.0
22195	10.0	6.7	13.6	14.0	2.0	0.2	0	0.0	1	0.0	0	0.0	0	8.7	0.003	1309.6	3000	0.0	2.0	2.5	10.0
22010	12.5	7.7	16.1	14.3	2.0	0.2	0	0.0	1	0.0	0	0.0	0	7.6	0.003	1254.1	3000	0.0	2.0	3.5	12.5
21790	14.0	9.4	19.7	11.6	2.0	0.2	0	0.0	1	0.0	0	0.0	0	6.5	0.006	1144.5	3000	0.0	2.0	5.2	14.0
21615	14.0	8.5	21.3	8.5	2.0	0.2	0	0.0	1	0.0	0	0.0	0	5.8	0.011	1163.0	3000	0.0	2.0	4.3	14.0
21440	12.5	8.3	17.5	11.0	2.0	0.2	0	0.0	1	0.0	0	0.0	0	6.9	0.005	1286.1	3000	0.0	2.0	4.1	12.5
21225	14.0	8.6	18.1	11.7	2.0	0.2	0	0.0	1	0.0	0	0.0	0	5.6	0.005	1559.0	3000	0.0	2.0	4.4	14.0
21020	14.0	9.1	20.3	9.7	2.0	0.2	0	0.0	1	0.0	0	0.0	0	7.8	0.007	903.0	3000	0.0	2.0	4.9	14.0
20845	12.5	7.3	15.1	12.7	2.0	0.2	0	0.0	1	0.0	0	0.0	0	6.7	0.003	1563.7	3000	0.0	2.0	3.1	12.5
20595	10.0	6.3	12.4	13.4	2.0	0.2	0	0.0	1	0.0	0	0.0	0	8.3	0.002	1548.8	3000	0.0	2.0	2.1	10.0
20435	10.0	6.2	12.1	14.3	2.0	0.2	0	0.0	1	0.0	0	0.0	0	8.8	0.001	1528.3	3000	0.0	2.0	2.0	10.0
20280	12.5	7.5	15.6	12.8	2.0	0.2	0	0.0	1	0.0	0	0.0	0	6.8	0.003	1531.3	3000	0.0	2.0	3.3	12.5
20070	14.0	9.2	19.3	11.1	2.0	0.2	0	0.0	1	0.0	0	0.0	0	5.2	0.006	1526.6	3000	0.0	2.0	5.0	14.0
19855	14.0	9.1	20.6	10.2	2.0	0.0	0	0.0	1	0.0	0	0.0	0	6.0	0.008	1205.4	3000	0.0	2.0	5.1	14.0
19630	14.0	8.4	20.6	8.9	2.0	0.0	0	0.0	1	0.0	0	0.0	0	6.6	0.009	1060.3	3000	0.0	2.0	4.4	14.0
19440	10.0	6.3	13.1	13.4	2.0	0.0	0	0.0	1	0.0	0	0.0	0	9.2	0.002	1194.5	3000	0.0	2.0	2.3	10.0
19240	12.5	7.4	15.9	11.9	2.0	0.0	0	0.0	1	0.0	0	0.0	0	7.4	0.004	1216.9	3000	0.0	2.0	3.4	12.5
19050	14.0	8.8	18.8	10.5	2.0	0.0	0	0.0	1	0.0	0	0.0	0	5.8	0.009	1321.4	3000	0.0	2.0	4.8	14.0
18830	10.0	6.4	13.3	14.6	2.0	0.0	0	0.0	1	0.0	0	0.0	0	7.4	0.003	1531.5	3000	0.0	2.0	2.4	10.0
18650	10.0	6.0	12.1	15.0	2.0	0.0	0	0.0	1	0.0	0	0.0	0	8.0	0.002	1604.5	3000	0.0	2.0	2.0	10.0
18475	8.0	5.1	8.9	16.9	2.0	0.0	0	0.0	1	0.0	0	0.0	0	9.9	0.001	1621.5	3000	0.0	2.0	1.1	8.0
18290	8.0	5.3	9.8	16.9	2.0	0.0	0	0.0	1	0.0	0	0.0	0	9.4	0.001	1594.2	3000	0.0	2.0	1.3	8.0
18025	8.0	4.8	7.9	18.5	2.0	0.0	0	0.0	1	0.0	0	0.0	0	11.9	0.001	1520.2	17000	0.0	2.0	0.8	8.0
17785	8.0	5.0	8.5	20.2	2.0	0.0	0	0.0	1	0.0	0	0.0	0	12.0	0.001	1398.1	17000	0.0	2.0	1.0	8.0
17510	10.0	6.9	11.0	19.2	2.0	1.3	0	0.0	1	0.0	0	0.0	0	10.2	0.001	1350.7	17000	0.0	2.0	1.6	10.0
17360	12.5	9.2	17.1	15.9	2.0	1.3	0	0.0	1	0.0	0	0.0	0	8.8	0.004	943.2	17000	0.0	2.0	3.9	12.5
17110	14.0	12.0	22.3	15.2	2.0	1.3	0	0.0	1	0.0	0	0.0	0	5.8	0.007	1175.4	17000	0.0	2.0	6.7	14.0
16970	14.0	12.1	23.1	13.6	2.0	1.3	0	0.0	1	0.0	0	0.0	0	5.9	0.010	1067.0	17000	0.0	2.0	6.8	14.0
16720	14.0	9.9	24.4	9.2	2.0	1.3	0	0.0	1	0.0	0	0.0	0	5.2	0.019	1122.9	17000	0.0	2.0	4.6	14.0
16515	14.0	10.4	19.4	10.4	2.0	1.3	0	0.0	1	0.0	0	0.0	0	5.8	0.010	1249.9	17000	0.0	2.0	5.1	14.0
16305	10.0	7.1	11.6	14.6	2.0	1.3	0	0.0	1	0.0	0	0.0	0	9.4	0.002	1360.5	17000	0.0	2.0	1.8	10.0
16130	12.5	8.6	15.7	12.3	2.0	1.3	0	0.0	1	0.0	0	0.0	0	7.1	0.005	1326.5	17000	0.0	2.0	3.3	12.5
15960	12.5	9.5	17.7	11.0	2.0	1.3	0	0.0	1	0.0	0	0.0	0	5.9	0.008	1386.0	17000	0.0	2.0	4.2	12.5
15745	10.0	7.3	12.3	13.3	2.0	1.3	0	0.0	1	0.0	0	0.0	0	8.4	0.003	1363.9	17000	0.0	2.0	2.0	10.0
15540	10.0	6.8	10.6	13.7	2.0	1.3	0	0.0	1	0.0	0	0.0	0	9.4	0.002	1426.6	17000	0.0	2.0	1.5	10.0
15335	12.5	8.8	16.2	12.1	2.0	1.3	0	0.0	1	0.0	0	0.0	0	8.2	0.006	1064.1	17000	0.0	2.0	3.5	12.5
15125	26.1	26.1	17.9	11.6	2.0	0.4	0.9	4.0	1	0.0	0	17.4	0	8.0	0.007	1000.5	17000	0.0	2.0	4.3	12.5
14900	14.0	9.3	19.3	9.8	2.0	0.4	0	0.0	1	0.0	0	0.0	0	6.3	0.009	1626.5	17000	0.0	2.0	4.9	14.0
14720	14.0	8.8	18.1	9.8	2.0	0.4	0	0.0	1	0.0	0	0.0	0	6.0	0.008	1722.3	17000	0.0	2.0	4.4	14.0
14480	14.0	8.8	19.0	8.9	2.0	0.4	0	0.0	1	0.0	0	0.0	0	5.2	0.010	1726.7	17000	0.0	2.0	4.4	14.0
14315	10.0	7.0	14.0	9.9	2.0	0.4	0	0.0	1	0.0	0	0.0	0	5.8	0.005	1881.0	17000	0.0	2.0	2.6	10.0
14090	10.0	7.2	14.3	8.5	2.0	0.4	0	0.0	1	0.0	0	0.0	0	5.6	0.006	1772.8	17000	0.0	2.0	2.8	10.0
13850	10.0	6.6	12.6	9.7	2.0	0.4	0	0.0	1	0.0	0	0.0	0	6.5	0.004	1741.6	17000	0.0	2.0	2.2	10.0
13635	12.5	7.6	15.5	10.3	2.0	0.4	0	0.0	1	0.0	0	0.0	0	6.3	0.004	1705.8	17000	0.0	2.0	3.2	12.5
13425	14.0	8.3	18.0	7.8	2.0	0.4	0	0.0	1	0.0	0	0.0	0	4.3	0.011	1850.7	17000	0.0	2.0	3.9	14.0
13190	10.0	6.4	12.2	9.5	2.0	0.4	0	0.0	1	0.0	0	0.0	0	6.5	0.003	1847.4	17000	0.0	2.0	2.0	10.0
13030	10.0	6.7	14.2	9.6	2.0	0.0	0	0.0	1	0.0	0	0.0	0	6.5	0.003	1763.0	17000	0.0	2.0	2.7	10.0
12835	10.0	6.4	13.3	10.1	2.0	0.0	0	0.0	1	0.0	0	0.0	0	7.3	0.003	1607.5	17000	0.0	2.0	2.4	10.0
12615	10.0	6.1	12.5	10.9	2.0	0.0	0	0.0	1	0.0	0	0.0	0	8.6	0.002	1470.8	17000	0.0	2.0	2.1	10.0
12395	10.0	6.0	12.3	11.5	2.0	0.0	0	0.0	1	0.0	0	0.0	0	9.0	0.002	1438.1	17000	0.0	2.0	2.0	10.0
12195	10.0	5.5	10.6	12.5	2.0	0.0	0	0.0	1	0.0	0	0.0	0	10.3	0.001	1383.7	17000	0.0	2.0	1.5	10.0
11995	10.0	6.2	12.8	13.6	2.0	0.0	0	0.0	1	0.0	0	0.0	0	9.7	0.002	1280.5	17000	0.0	2.0	2.2	10.0
11780	10.0	6.1	12.6	14.4	2.0	0.0	0	0.0	1	0.0	0	0.0	0	9.3	0.001	1422.2	17000	0.0	2.0	2.1	10.0
11605	10.0	6.6	13.9	13.8	2.0	0.0	0	0.0	1	0.0	0	0.0	0	8.6	0.002	1325.5	17000	0.0	2.0	2.6	10.0
11405	10.0	6.3	13.2	15.1	2.0	0.0	0	0.0	1	0.0	0	0.0	0	10.3	0.002	1114.6	17000	0.0	2.0	2.3	10.0
11180	12.5	7.7	16.6	13.9	2.0	0.0	0	0.0	1	0.0	0	0.0	0	10.6	0.003	835.7	17000	0.0	2.0	3.7	12.5
11015	14.0	10.4	19.1	13.3	2.0	1.5	0	0.0	1	0.0	0	0.0	0	11.0	0.004	679.4	17000	0.0	2.0	4.9	14.0
10835	14.0	10.9	21.9	10.9	2.0	1.5	0	0.0	1	0.0	0	0.0	0	8.2	0.007	790.4	17000	0.0	2.0	5.4	14.0
10575	14.0	9.2	24.1	7.5	2.0	1.5	0	0.0	1	0.0	0	0.0	0	5.3	0.016	1108.8	17000	0.0	2.0	3.7	14.0
10390	14.0	9.9	22.7	8.8	2.0	1.5	0	0.0	1	0.0	0	0.0	0	5.8	0.008	1247.0	17000	0.0	2.0	4.4	14.0
10225	12.5	9.8	17.8	9.5	2.0	1.5	0	0.0	1	0.0	0	0.0	0	5.9	0.007	1374.1	17000	0.0	2.0	4.3	12.5
10000	10.0	8.5	14.9	11.1	2.0	1.5	0	0.0	1	0.0	0	0.0	0	6.6	0.004	1488.0	17000	0.0	2.0	3.0	10.0
9820	14.0	10.2	18.6	10.0	2.0	1.5	0	0.0	1	0.0	0	0.0	0	5.7	0.008	1402.3	17000	0.0	2.0	4.7	14.0
9595	10.0	8.4	14.6	10.3	2.0	1.5	0	0.0	1	0.0	0	0.0	0	6.6	0.005	1619.5	17000	0.0	2.0	2.9	10.0
9385	12.5	8.9	15.8	9.5	2.0	1.5	0	0.0	1	0.0	0	0.0	0	5.3	0.006	1770.4	17000	0.0	2.0	3.4	12.5
9220	12.5	9.1	16.4	8.9	2.0	1.5	0	0.0	1	0.0	0	0.0	0	4.9	0.008	1771.4	17000	0.0	2.0	3.6	12.5
9025	12.5	8.9	15.9	8.9	2.0	1.5	0	0.0	1	0.0	0	0.0	0	5.5	0.005	1736.9	17000	0.0	2.0	3.4	12.5
MAX=	26.1	26.1			8.1	1.6				0.0							17000.0		2.0	8.3	14.0
MIN=	8.0	4.5			2.0	0.0				0.0							3000.0		2.0	0.5	8.0

Santa Clara River Fluvial Study

APPENDIX CHAPTER 6.2

LACH&SM Freeboard
Proposed Condition
Curved & Straight Reaches

PACIFIC ADVANCED
CIVIL ENGINEERING, INC.

CALCULATIONS FOR TOTAL FREEBOARD BY INDIVIDUAL ADJUSTMENT COMPONENT BASED ON LACH&SM - SANTA CLARA RIVER PROPOSED CONDITIONS OUTSIDE CURVED REACH Q_{CAP} n=0.085

SECTION	Y_{MAX}	Y_{TOT}=	V (FPS)	FLOW DEPTH (FT)	Y_{AGG}+	Y_{GA}+	CHANNEL TYPE	BOTTOM WIDTH (FT)	TOP WIDTH (FT)	Y_{SE}+	BEND COEFF	SIDE SLOPE	RADIUS	H/2	Y_{DM}
46195	**3.1**	3.1	10.7	28.1	1.0	0.6	2	215.7	750.8	0.0	1	1.5	9000	1.5	2.5
46020	**3.0**	3.0	10.2	30.0	1.0	0.6	2	162.7	570.2	0.0	1	1.5	9000	1.4	2.5
45545	**3.4**	3.4	11.6	27.8	1.0	0.6	2	151.3	524.2	0.0	1	1.5	9000	1.8	2.5
45030	**3.0**	3.0	10.3	29.2	1.0	0.6	2	222.6	558.0	0.0	1	1.5	9000	1.4	2.5
44585	**3.2**	3.2	10.7	28.6	1.0	0.6	2	163.7	654.4	0.0	1	1.5	9000	1.6	2.5
44210	**2.9**	2.9	10.0	27.8	1.0	0.6	2	204.3	620.0	0.0	1	1.5	9000	1.3	2.5
43820	**3.9**	3.9	14.2	24.1	1.0	0.2	2	207.8	528.7	0.0	1	1.5	9000	2.7	2.5
43610	**4.0**	4.0	14.4	21.3	1.0	0.2	2	242.1	536.9	0.0	1	1.5	9000	2.8	2.5
43410	**3.6**	3.6	13.3	19.8	1.0	0.2	2	312.8	729.1	0.0	1	1.5	9000	2.4	2.5
43200	**3.5**	3.5	13.0	19.2	1.0	0.2	2	308.4	779.5	0.0	1	1.5	9000	2.3	2.5
42975	**2.9**	2.9	10.7	19.0	1.0	0.2	2	410.5	955.8	0.1	1	1.5	9000	1.5	2.5
42815	**2.5**	2.4	9.1	18.7	1.0	0.2	2	380.4	1120.8	0.1	1	1.5	9000	1.1	2.5
42590	**2.5**	2.0	7.7	18.4	1.0	0.2	2	451.9	1230.7	0.1	1	1.5	9000	0.8	2.5
42430	**2.5**	2.0	7.6	19.5	1.0	0.2	2	445.9	1334.9	0.1	1	1.5	9000	0.8	2.5
42215	**2.5**	1.8	6.6	20.7	1.0	0.2	2	493.2	1374.6	0.0	1	1.5	9000	0.6	2.5
41940	**2.5**	1.8	6.4	20.6	1.0	0.2	2	454.2	1327.0	0.0	1	1.5	9000	0.5	2.5
41730	**2.5**	1.9	6.9	20.6	1.0	0.2	2	404.1	1221.5	0.0	1	1.5	9000	0.6	2.5
41460	**2.5**	2.0	7.4	21.2	1.0	0.2	2	365.7	1121.0	0.0	1	1.5	9000	0.7	2.5
41280	**2.5**	2.1	8.7	20.8	1.0	0.0	2	342.4	1193.2	0.1	1	1.5	9000	1.0	2.5
41080	**2.5**	2.1	8.6	20.5	1.0	0.0	2	429.5	1136.8	0.1	1	1.5	9000	1.0	2.5
40825	**2.5**	1.8	7.3	19.8	1.0	0.0	2	426.6	1213.0	0.1	1	1.5	9000	0.7	2.5
40585	**2.5**	1.7	7.1	20.3	1.0	0.0	2	404.3	1247.2	0.0	1	1.5	9000	0.7	2.5
40335	**2.5**	1.5	6.1	21.4	1.0	0.0	2	397.2	1288.6	0.0	1	1.5	9000	0.5	2.5
40130	**2.5**	1.6	6.6	21.6	1.0	0.0	2	311.3	1264.5	0.0	1	1.5	9000	0.6	2.5
39945	**2.5**	1.7	6.8	21.9	1.0	0.0	2	293.8	1212.3	0.0	1	1.5	9000	0.6	2.5
39755	**2.5**	2.0	8.6	20.6	1.0	0.0	2	296.7	1088.1	0.1	1	1.5	9000	1.0	2.5
39605	**2.5**	2.0	8.5	20.7	1.0	0.0	2	348.8	1074.7	0.1	1	1.5	9000	1.0	2.5
39310	**2.5**	2.0	8.4	20.2	1.0	0.0	2	323.4	977.3	0.1	1	1.5	9000	1.0	2.5
39100	**2.5**	1.9	8.2	21.1	1.0	0.0	2	436.5	831.5	0.0	1	1.5	9000	0.9	2.5
38925	**2.5**	1.9	7.8	20.8	1.0	0.0	2	422.3	906.7	0.1	1	1.5	9000	0.8	2.5
38710	**2.5**	2.0	8.1	21.2	1.0	0.1	2	394.9	844.1	0.0	1	1.5	9000	0.9	2.5
38475	**2.6**	2.6	10.4	21.0	1.0	0.1	2	375.1	695.3	0.0	1	1.5	9000	1.5	2.5
38300	**2.5**	2.3	9.6	20.3	1.0	0.1	2	407.6	716.8	0.0	1	1.5	9000	1.2	2.5
38065	**2.5**	2.3	9.6	20.1	1.0	0.1	2	569.0	691.3	0.0	1	1.5	9000	1.2	2.5
37810	**2.8**	2.8	11.3	18.4	1.0	0.1	2	546.8	648.4	0.0	1	1.5	9000	1.7	2.5
37655	**2.6**	2.6	10.6	17.9	1.0	0.1	2	348.9	738.9	0.0	1	1.5	9000	1.5	2.5
37390	**2.5**	2.0	8.2	17.5	1.0	0.1	2	803.3	869.1	0.0	1	1.5	9000	0.9	2.5
37135	**2.5**	2.1	8.7	16.8	1.0	0.1	2	564.0	863.7	0.0	1	1.5	9000	1.0	2.5
36930	**2.5**	2.1	8.3	17.7	1.0	0.1	2	708.3	923.7	0.1	1	1.5	9000	0.9	2.5
36735	**2.5**	2.1	8.1	17.6	1.0	0.1	2	633.8	963.2	0.1	1	1.5	9000	0.9	2.5
36515	**2.5**	1.9	7.4	18.6	1.0	0.1	2	532.1	1032.7	0.1	1	1.5	9000	0.7	2.5
36265	**2.5**	1.8	7.1	18.3	1.0	0.1	2	359.0	1176.0	0.0	1	1.5	9000	0.7	2.5
36080	**2.5**	1.9	7.8	17.6	1.0	0.0	2	326.3	1176.0	0.0	1	1.5	9000	0.8	2.5
35845	**2.5**	1.7	7.0	18.1	1.0	0.0	2	376.2	1512.8	0.0	1	1.5	9000	0.7	2.5
35725	**2.5**	1.9	8.0	18.3	1.0	0.0	2	378.2	1488.9	0.1	1	1.5	9000	0.9	2.5
35515	**2.5**	2.0	8.5	17.9	1.0	0.0	2	379.3	1501.0	0.1	1	1.5	9000	1.0	2.5
35245	**2.5**	2.0	8.3	17.0	1.0	0.0	2	414.3	1580.3	0.1	1	1.5	9000	0.9	2.5
35040	**2.5**	2.1	8.8	16.6	1.0	0.0	2	440.9	1491.6	0.1	1	1.5	9000	1.0	2.5
34860	**2.5**	1.9	7.7	16.3	1.0	0.0	2	432.9	1431.5	0.1	1	1.5	9000	0.8	2.5
34720	**2.5**	1.8	7.4	15.8	1.0	0.0	2	545.6	1449.9	0.1	1	1.5	9000	0.7	2.5
34495	**2.5**	1.8	7.2	15.7	1.0	0.0	2	504.6	1461.5	0.1	1	1.5	9000	0.7	2.5
34310	**2.5**	2.0	8.1	15.4	1.0	0.0	2	684.5	1384.9	0.1	1	1.5	9000	0.9	2.5
34090	**2.5**	1.9	7.5	15.0	1.0	0.0	2	787.5	1371.0	0.1	1	1.5	9000	0.8	2.5
33880	**2.5**	2.0	7.3	15.7	1.0	0.2	2	761.0	1482.9	0.1	1	1.5	9000	0.7	2.5
33710	**2.5**	1.9	7.0	15.6	1.0	0.2	2	719.2	1637.9	0.1	1	1.5	9000	0.7	2.5
33500	**2.5**	1.9	7.0	15.3	1.0	0.2	2	666.4	1755.5	0.1	1	1.5	9000	0.7	2.5
33310	**2.5**	1.8	6.2	15.3	1.0	0.2	2	609.9	1828.2	0.1	1	1.5	9000	0.5	2.5
33115	**2.5**	1.7	5.8	15.4	1.0	0.2	2	667.8	1927.1	0.0	1	1.5	9000	0.4	2.5
32795	**2.5**	1.8	6.3	15.7	1.0	0.2	2	697.6	1920.8	0.1	1	1.5	9000	0.5	2.5

DEFINITIONS

Y_{MAX} = GREATER OF THE DM AND S&H HEIGHTS

Y_{TOT}=TOTAL EMBANKMENT PROTECTION IN FEET BASED ON THE H&S

V(FPS) =VELOCITY IN FEET PER SECOND

FLOW DEPTH=WATER DEPTH IN CHANNEL IN FEET

Y_{AGG}=LONG TERM AGGRADATION IN FEET

Y_{GA}=GENERAL AGGRADATION IN FEET FROM SAM

CHANNEL TYPE=CHANNEL SHAPE/FLOW FACTOR:

IF Fr<1, RECTANGULAR = 0; IF Fr>1, RECTANGULAR = 1;
IF Fr<1, TRAPEZOIDAL = 2; IF Fr>1, TRAPEZOIDAL = 3.

Y_{SE}=SUPER ELEVATION IN FEET

BEND COEFF=BEND COEFFICIENT; IF NO BEND=0, BEND=1

SIDE SLOPE=CHANNEL SIDE SLOPE (H:V), UNITLESS

BOTTOM WIDTH=CHANNEL BOTTOM WIDTH IN FEET, $Q_{2\text{-}YEAR}$ TOP WIDTH

RADIUS=RADIUS OF CURVATURE TO CENTERLINE IN FEET

H/2=HALF BEDFORM HEIGHT IN FEET, LIMITED TO FLOW DEPTH,

Y_{DM} = EMBANKMENT PROTECTION REQUIRED BY THE LACFCDDM IN FEET

<u>GENERAL</u>

THIS SPREADSHEET IS DESIGNED TO CALCULATE TOP PROTECTION (FREE BOARD) BASED ON LACDWP COUNTY HYDROLOGY MANUAL (1991) PAGES 5.8-5.9 AND ASSOCIATED APPENDICES (SEDIMENTATION MANUAL). ALL VELOCITIES ARE IN FPS, WITH NO MAXIMUM VALUE. THE USER SHOULD CONSIDER A PRACTICAL MAXIMUM OF APPROXIMATELY 20-30 FPS. THE PRESENT VERSION (8/05) WILL CALCULATE UP TO 100 VELOCITIES AT ONE TIME. LONG TERM AGGRADATION IS USER SUPPLIED. GENERAL AGGRADATION IS ALSO USER SUPPLIED. SUPER ELEVATION AT BENDS IS BASED ON LACFCDDM EQUATIONS FOUND IN C-3.1. BEDFORM HEIGHT, LIMITED TO FLOW DEPTH AFTER KENNEDY (1963), IS BASED ON EQUATIONS IN APPENDIX Q13. IF FLOW IS SUPERCRITICAL SPREADSHEET REPORTS LACFCDDM TOTAL WALL HEIGHT INSTEAD OF FREEBOARD. LOS ANGELES COUNTY FLOOD CONTROL DISTRICT DESIGN MANUAL (LACFCDDM) VALUES ARE PRESENTED AS A PART OF LACH&SM CALCULATIONS. THE SPREADSHEET CALCULATES THE GREATER OF THE TWO METHODOLOGIES. BOTTOM WIDTH IS BASED ON THE 2-YEAR WATER SURFACE AFTER ACOE PROCEDURES.

<u>COLOR CODES</u>

OUTPUT

DATA FROM HEC-RAS

USER SUPPLIED DATA

INTERMEDIATE CALCULATIONS (INDIVIDUAL SHEETS ONLY)

DESIGNED BY DAVID A JAFFE, PHD, PE
PACIFIC ADVANCED CIVIL ENGINEERING, INC
AUGUST, 2005

SECTION	Y_{MAX}	Y_{TOT}=	V (FPS)	FLOW DEPTH (FT)	Y_{AGG}+	Y_{GA}+	CHANNEL TYPE	BOTTOM WIDTH (FT)	TOP WIDTH (FT)	Y_{SE}+	BEND COEFF	SIDE SLOPE	RADIUS	H/2	Y_{DM}
32605	2.5	1.7	6.1	16.7	1.0	0.2	2	652.8	2407.4	0.1	1	1.5	9000	0.5	2.5
32265	2.5	2.2	5.5	17.2	1.0	0.8	2	651.0	2840.2	0.0	1	1.5	9000	0.4	2.5
31875	2.5	2.2	5.3	16.6	1.0	0.8	2	562.0	2593.1	0.0	1	1.5	9000	0.4	2.5
31585	2.5	2.2	5.0	18.7	1.0	0.8	2	619.5	2377.5	0.0	1	1.5	9000	0.3	2.5
31360	2.5	2.2	5.5	19.9	1.0	0.8	2	672.2	1959.5	0.0	1	1.5	9000	0.4	2.5
31060	2.5	2.2	5.1	21.2	1.0	0.8	2	955.0	1975.9	0.1	1	1.5	9000	0.3	2.5
30720	2.5	2.1	4.6	22.5	1.0	0.8	2	772.7	1911.5	0.0	1	1.5	9000	0.3	2.5
30445	2.5	2.1	4.6	24.1	1.0	0.8	2	700.9	1841.8	0.0	1	1.5	9000	0.3	2.5
30095	2.5	2.2	5.2	25.5	1.0	0.8	2	617.1	1637.3	0.0	1	1.5	9000	0.4	2.5
29815	2.5	2.3	6.1	25.8	1.0	0.8	2	551.1	1445.2	0.0	1	1.5	9000	0.5	2.5
29565	2.5	2.3	6.0	26.3	1.0	0.8	2	461.8	1334.9	0.0	1	1.5	9000	0.5	2.5
29385	2.5	2.5	6.8	26.6	1.0	0.8	2	381.5	1249.1	0.0	1	1.5	9000	0.6	2.5
29140	2.5	1.9	7.9	26.4	1.0	0.0	2	217.2	1095.0	0.0	1	1.5	9000	0.8	2.5
28895	4.8	4.8	16.5	23.8	1.0	0.0	2	201.9	978.0	0.1	1	1.5	9000	3.7	2.5
28695	2.5	2.3	9.4	24.9	1.0	0.0	2	269.6	951.6	0.1	1	1.5	9000	1.2	2.5
28500	3.1	3.1	12.0	23.0	1.0	0.0	2	326.0	1039.5	0.1	1	1.5	9000	1.9	2.5
28280	2.5	2.1	8.7	23.8	1.0	0.0	2	379.1	1003.9	0.1	1	1.5	9000	1.0	2.5
28080	2.5	2.0	8.3	24.1	1.0	0.0	2	416.6	945.4	0.1	1	1.5	9000	0.9	2.5
27925	2.5	2.2	9.6	24.1	1.0	0.0	2	402.0	884.9	0.0	1	1.5	9000	1.2	2.5
27725	2.9	2.9	11.9	23.1	1.0	0.0	2	386.2	811.8	0.0	1	1.5	9000	1.9	2.5
27545	3.1	3.1	12.4	22.3	1.0	0.0	2	409.6	852.5	0.0	1	1.5	9000	2.1	2.5
27335	2.7	2.7	10.9	22.0	1.0	0.0	2	422.5	937.2	0.1	1	1.5	9000	1.6	2.5
27155	2.9	2.9	11.4	21.0	1.0	0.0	2	452.4	978.1	0.1	1	1.5	9000	1.8	2.5
26990	2.5	2.3	9.4	20.4	1.0	0.0	2	440.9	1020.9	0.1	1	1.5	9000	1.2	2.5
26780	2.5	2.1	8.8	21.3	1.0	0.0	2	527.5	1106.5	0.1	1	1.5	9000	1.0	2.5
26575	2.5	1.9	7.3	21.5	1.0	0.0	2	513.5	1243.6	0.2	1	1.5	3000	0.7	2.5
26355	2.5	2.0	7.4	21.6	1.0	0.0	2	601.4	1294.5	0.2	1	1.5	3000	0.9	2.5
26170	2.5	2.3	7.7	21.9	1.0	0.0	2	457.8	1301.2	0.2	1	1.5	3000	1.1	2.5
25965	2.6	2.6	7.5	22.2	1.0	0.0	2	568.4	1313.2	0.2	1	1.5	3000	1.3	2.5
25785	2.7	2.7	7.5	22.0	1.0	0.0	2	550.9	1256.9	0.3	1	1.5	3000	1.4	2.5
25600	2.5	2.5	7.8	22.3	1.0	0.0	2	478.1	1149.9	0.2	1	1.5	3000	1.3	2.5
25425	2.5	2.5	7.3	23.1	1.0	0.0	2	399.8	1138.3	0.2	1	1.5	3000	1.3	2.5
25215	2.5	2.4	7.3	23.3	1.0	0.0	2	444.6	1133.6	0.2	1	1.5	3000	1.2	2.5
25000	2.5	2.5	7.3	23.5	1.0	0.0	2	453.1	1093.8	0.2	1	1.5	3000	1.3	2.5
24795	3.7	3.7	8.0	23.5	1.9	0.2	2	391.4	986.5	0.3	1	1.5	3000	1.3	2.5
24550	3.6	3.6	8.9	24.1	1.9	0.2	2	334.0	887.1	0.3	1	1.5	3000	1.2	2.5
24335	3.9	3.9	9.9	23.5	1.9	0.2	2	337.2	800.3	0.3	1	1.5	3000	1.5	2.5
24115	3.8	3.8	10.0	23.0	1.9	0.2	2	422.7	793.2	0.3	1	1.5	3000	1.4	2.5
23975	3.5	3.5	9.7	22.6	1.9	0.2	2	354.1	828.2	0.2	1	1.5	3000	1.2	2.5
23755	3.2	3.2	9.9	22.7	1.9	0.2	2	333.9	939.2	0.2	1	1.5	3000	1.0	2.5
23565	3.7	3.7	9.4	23.6	1.9	0.2	2	322.2	941.5	0.3	1	1.5	3000	1.3	2.5
23365	3.5	3.5	9.4	22.4	1.9	0.2	2	329.4	987.4	0.3	1	1.5	3000	1.1	2.5
23180	3.2	3.2	9.6	22.5	1.9	0.2	2	400.7	975.5	0.2	1	1.5	3000	0.9	2.5
23000	3.3	3.3	9.5	22.0	1.9	0.2	2	407.6	784.0	0.3	1	1.5	3000	0.9	2.5
22790	3.1	3.1	10.6	20.0	1.9	0.2	2	425.5	784.0	0.2	1	1.5	3000	0.9	2.5
22600	3.2	3.2	10.2	19.8	1.9	0.2	2	386.7	1050.2	0.3	1	1.5	3000	0.8	2.5
22415	3.2	3.2	9.3	18.9	1.9	0.2	2	422.3	1091.6	0.2	1	1.5	3000	0.8	2.5
22195	2.5	2.4	8.4	19.1	1.4	0.0	2	371.3	1464.0	0.3	1	1.5	3000	0.8	2.5
22010	2.5	2.5	9.8	19.4	1.4	0.0	2	471.8	1735.1	0.3	1	1.5	3000	0.8	2.5
21790	2.6	2.6	9.0	18.4	1.4	0.0	2	549.9	1778.4	0.2	1	1.5	3000	1.0	2.5
21615	2.6	2.6	8.0	16.9	1.4	0.0	2	563.1	1687.7	0.3	1	1.5	3000	0.9	2.5
21440	2.5	2.4	8.2	17.8	1.4	0.0	2	638.9	1653.0	0.2	1	1.5	3000	0.8	2.5
21225	2.5	2.4	8.0	18.7	1.4	0.0	2	352.4	1600.8	0.2	1	1.5	3000	0.7	2.5
21020	2.5	2.3	7.8	18.6	1.4	0.0	2	675.0	1607.4	0.2	1	1.5	3000	0.7	2.5
20845	2.5	2.3	7.9	18.7	1.4	0.0	2	613.7	1605.1	0.2	1	1.5	3000	0.8	2.5
20595	2.5	2.1	7.5	18.6	1.4	0.0	2	744.5	1600.4	0.1	1	1.5	3000	0.6	2.5
20435	2.5	2.1	7.9	18.8	1.4	0.0	2	765.2	1613.5	0.1	1	1.5	3000	0.6	2.5
20280	2.5	2.1	8.7	18.1	1.4	0.0	2	439.6	1636.3	0.1	1	1.5	3000	0.6	2.5
20070	2.5	1.9	8.3	18.6	1.4	0.0	2	602.4	1797.8	0.1	1	1.5	3000	0.5	2.5
19855	3.0	3.0	7.7	19.1	1.0	1.4	2	585.9	1809.6	0.1	1	1.5	3000	0.5	2.5
19630	2.9	2.9	7.4	18.6	1.0	1.4	2	634.2	1833.7	0.0	1	1.5	3000	0.5	2.5
19440	3.0	3.0	7.2	19.9	1.0	1.4	2	536.3	1986.1	0.0	1	1.5	3000	0.6	2.5

SECTION	Y_{MAX}	Y_{TOT}=	V (FPS)	FLOW DEPTH (FT)	Y_{AGG}+	Y_{GA}+	CHANNEL TYPE	BOTTOM WIDTH (FT)	TOP WIDTH (FT)	Y_{SE}+	BEND COEFF	SIDE SLOPE	RADIUS	H/2	Y_{DM}
19240	**3.4**	3.4	7.6	19.4	1.0	1.4	2	445.4	1738.0	0.0	1	1.5	3000	1.0	2.5
19050	**4.1**	4.1	6.7	20.2	1.0	1.4	2	418.1	1753.4	0.0	1	1.5	3000	1.7	2.5
18830	**4.1**	4.1	6.8	21.4	1.0	1.4	2	338.9	1684.0	0.0	1	1.5	3000	1.6	2.5
18650	**4.0**	4.0	6.7	21.2	1.0	1.4	2	339.7	1686.2	0.0	1	1.5	3000	1.6	2.5
18475	**3.4**	3.4	5.8	22.3	1.0	1.4	2	336.6	1665.9	0.0	1	1.5	3000	1.0	2.5
18290	**3.2**	3.2	6.3	22.1	1.0	1.4	2	365.1	1631.9	0.0	1	1.5	3000	0.8	2.5
18025	**3.1**	3.1	5.8	22.9	1.0	1.4	2	380.4	1557.4	0.0	1	1.5	17000	0.7	2.5
17785	**3.2**	3.2	6.4	24.0	1.0	1.4	2	389.3	1444.1	0.0	1	1.5	17000	0.8	2.5
17510	**2.5**	1.7	8.4	22.4	1.0	0.0	2	326.3	1398.9	0.0	1	1.5	17000	0.7	2.5
17360	**2.5**	1.7	11.1	20.3	1.0	0.0	2	223.6	1303.3	0.0	1	1.5	17000	0.7	2.5
17110	**2.5**	1.6	11.0	21.5	1.0	0.0	2	228.7	1229.6	0.0	1	1.5	17000	0.6	2.5
16970	**2.5**	2.1	10.7	20.3	1.0	0.0	2	235.7	1196.0	0.0	1	1.5	17000	1.1	2.5
16720	**2.5**	2.3	8.5	18.8	1.0	0.0	2	260.0	1182.0	0.0	1	1.5	17000	1.3	2.5
16515	**2.5**	2.1	7.7	19.2	1.0	0.0	2	296.5	1303.8	0.0	1	1.5	17000	1.1	2.5
16305	**2.5**	2.0	7.1	20.4	1.0	0.0	2	304.6	1395.5	0.0	1	1.5	17000	1.0	2.5
16130	**2.5**	1.7	7.7	19.4	1.0	0.0	2	323.4	1368.9	0.0	1	1.5	17000	0.7	2.5
15960	**2.5**	1.6	7.1	19.6	1.0	0.0	2	294.6	1437.6	0.0	1	1.5	17000	0.6	2.5
15745	**2.5**	1.6	7.0	19.6	1.0	0.0	2	295.8	1401.3	0.0	1	1.5	17000	0.6	2.5
15540	**2.5**	1.6	6.6	19.2	1.0	0.0	2	344.9	2361.2	0.0	1	1.5	17000	0.6	2.5
15335	**2.5**	1.7	8.9	18.8	1.0	0.0	2	348.6	1064.1	0.0	1	1.5	17000	0.7	2.5
15125	**2.5**	1.4	9.8	18.0	1.0	0.0	2	437.3	1053.5	0.0	1	1.5	17000	0.4	2.5
14900	**2.5**	1.4	8.8	16.7	1.0	0.0	2	584.1	2233.1	0.0	1	1.5	17000	0.4	2.5
14720	**2.5**	1.5	8.5	16.4	1.0	0.0	2	532.9	2020.9	0.0	1	1.5	17000	0.5	2.5
14480	**2.5**	1.5	7.4	16.4	1.0	0.0	2	819.8	1851.8	0.0	1	1.5	17000	0.5	2.5
14315	**2.5**	1.6	6.8	16.0	1.0	0.0	2	1014.4	1944.1	0.0	1	1.5	17000	0.6	2.5
14090	**2.5**	1.6	6.7	14.8	1.0	0.0	2	787.4	1816.2	0.0	1	1.5	17000	0.6	2.5
13850	**2.5**	1.6	6.6	15.6	1.0	0.0	2	582.7	1774.9	0.0	1	1.5	17000	0.6	2.5
13635	**2.5**	1.8	7.3	16.5	1.0	0.0	2	631.2	1818.0	0.0	1	1.5	17000	0.7	2.5
13425	**2.5**	1.8	5.7	16.8	1.0	0.0	2	576.3	1936.1	0.0	1	1.5	17000	0.7	2.5
13190	**2.5**	1.9	5.6	17.1	1.0	0.0	2	713.9	1911.1	0.0	1	1.5	17000	0.8	2.5
13030	**4.2**	4.2	6.0	17.6	1.0	2.1	2	712.9	1863.7	0.1	1	1.5	17000	1.0	2.5
12835	**4.7**	4.7	6.2	18.0	1.0	2.1	2	799.4	1775.1	0.1	1	1.5	17000	1.5	2.5
12615	**5.2**	5.2	6.5	18.3	1.0	2.1	2	741.8	1566.5	0.0	1	1.5	17000	2.1	2.5
12395	**5.1**	5.1	6.7	18.7	1.0	2.1	2	738.1	1543.0	0.0	1	1.5	17000	2.0	2.5
12195	**4.2**	4.2	6.5	19.1	1.0	2.1	2	990.8	1463.7	0.0	1	1.5	17000	1.1	2.5
11995	**4.1**	4.1	7.4	20.3	1.0	2.1	2	589.4	1448.5	0.0	1	1.5	17000	1.0	2.5
11780	**4.0**	4.0	7.3	20.6	1.0	2.1	2	590.4	1460.8	0.0	1	1.5	17000	0.9	2.5
11605	**4.0**	4.0	7.9	20.3	1.0	2.1	2	587.6	1417.5	0.0	1	1.5	17000	0.9	2.5
11405	**3.9**	3.9	8.7	20.6	1.0	2.1	2	579.7	1144.9	0.0	1	1.5	17000	0.8	2.5
11180	**3.9**	3.9	10.7	19.7	1.0	2.1	2	580.2	1009.2	0.0	1	1.5	17000	0.8	2.5
11015	**3.8**	3.8	12.6	18.7	3.1	0.0	2	519.8	851.0	0.0	1	1.5	17000	0.7	2.5
10835	**3.7**	3.7	12.2	17.1	3.1	0.0	2	510.4	1073.0	0.0	1	1.5	17000	0.6	2.5
10575	**3.8**	3.8	9.1	16.1	3.1	0.0	2	534.5	1322.2	0.0	1	1.5	17000	0.7	2.5
10390	**3.1**	3.1	8.6	17.1	3.1	0.0	2	598.1	1517.0	0.0	1	1.5	17000	0.0	2.5
10225	**3.1**	3.1	8.0	16.6	3.1	0.0	2	606.9	1543.4	0.0	1	1.5	17000	0.0	2.5
10000	**3.1**	3.1	8.1	16.6	3.1	0.0	2	685.3	1626.0	0.0	1	1.5	17000	0.0	2.5
9820	**3.1**	3.1	7.9	17.4	3.1	0.0	2	773.4	1648.8	0.0	1	1.5	17000	0.0	2.5
9595	**3.1**	3.1	7.8	16.1	3.1	0.0	2	698.1	1719.6	0.0	1	1.5	17000	0.0	2.5
9385	**3.1**	3.1	7.2	15.6	3.1	0.0	2	694.0	1799.3	0.0	1	1.5	17000	0.0	2.5
9220	**3.1**	3.1	6.8	15.6	3.1	0.0	2	645.1	1853.4	0.0	1	1.5	17000	0.0	2.5
9025	**3.1**	3.1	7.0	15.6	3.1	0.0	2	537.6	1822.9	0.0	1	1.5	17000	0.0	2.5
MAX=	**5.2**	5.2			3.1					0.3				3.7	2.5
MIN=	**2.5**	1.4			1.0					0.0				0.0	2.5

CALCULATIONS FOR TOTAL FREEBOARD BY INDIVIDUAL ADJUSTMENT COMPONENT BASED ON LACH&SM - SANTA CLARA RIVER PROPOSED CONDITIONS STRAIGHT-INSIDE CURVED REACH Q_{CAP} n=0.085

SECTION	Y_{MAX}	Y_{TOT}=	V (FPS)	FLOW DEPTH (FT)	Y_{AGG}+	Y_{GA}+	CHANNEL TYPE	BOTTOM WIDTH (FT)	TOP WIDTH (FT)	Y_{SE}+	BEND COEFF	SIDE SLOPE	RADIUS	H/2	Y_{DM}
46195	**3.1**	3.1	10.7	28.1	1.0	0.6	2	215.7	750.8	0.0	0	1.5	9000	1.5	2.5
46020	**3.0**	3.0	10.2	30.0	1.0	0.6	2	162.7	570.2	0.0	0	1.5	9000	1.4	2.5
45545	**3.4**	3.4	11.6	27.8	1.0	0.6	2	151.3	524.2	0.0	0	1.5	9000	1.8	2.5
45030	**3.0**	3.0	10.3	29.2	1.0	0.6	2	222.6	558.0	0.0	0	1.5	9000	1.4	2.5
44585	**3.2**	3.2	10.7	28.6	1.0	0.6	2	163.7	654.4	0.0	0	1.5	9000	1.6	2.5
44210	**2.9**	2.9	10.0	27.8	1.0	0.6	2	204.3	620.0	0.0	0	1.5	9000	1.3	2.5
43820	**3.9**	3.9	14.2	24.1	1.0	0.2	2	207.8	528.7	0.0	0	1.5	9000	2.7	2.5
43610	**4.0**	4.0	14.4	21.3	1.0	0.2	2	242.1	536.9	0.0	0	1.5	9000	2.8	2.5
43410	**3.6**	3.6	13.3	19.8	1.0	0.2	2	312.8	729.1	0.0	0	1.5	9000	2.4	2.5
43200	**3.5**	3.5	13.0	19.2	1.0	0.2	2	308.4	779.5	0.0	0	1.5	9000	2.3	2.5
42975	**2.7**	2.7	10.7	19.0	1.0	0.2	2	410.5	955.8	0.0	0	1.5	9000	1.5	2.5
42815	**2.5**	2.3	9.1	18.7	1.0	0.2	2	380.4	1120.8	0.0	0	1.5	9000	1.1	2.5
42590	**2.5**	2.0	7.7	18.4	1.0	0.2	2	451.9	1230.7	0.0	0	1.5	9000	0.8	2.5
42430	**2.5**	2.0	7.6	19.5	1.0	0.2	2	445.9	1334.9	0.0	0	1.5	9000	0.8	2.5
42215	**2.5**	1.8	6.6	20.7	1.0	0.2	2	493.2	1374.6	0.0	0	1.5	9000	0.6	2.5
41940	**2.5**	1.7	6.4	20.6	1.0	0.2	2	454.2	1327.0	0.0	0	1.5	9000	0.5	2.5
41730	**2.5**	1.8	6.9	20.6	1.0	0.2	2	404.1	1221.5	0.0	0	1.5	9000	0.6	2.5
41460	**2.5**	1.9	7.4	21.2	1.0	0.2	2	365.7	1121.0	0.0	0	1.5	9000	0.7	2.5
41280	**2.5**	2.0	8.7	20.8	1.0	0.0	2	342.4	1193.2	0.0	0	1.5	9000	1.0	2.5
41080	**2.5**	2.0	8.6	20.5	1.0	0.0	2	429.5	1136.8	0.0	0	1.5	9000	1.0	2.5
40825	**2.5**	1.7	7.3	19.8	1.0	0.0	2	426.6	1213.0	0.0	0	1.5	9000	0.7	2.5
40585	**2.5**	1.7	7.1	20.3	1.0	0.0	2	404.3	1247.2	0.0	0	1.5	9000	0.7	2.5
40335	**2.5**	1.5	6.1	21.4	1.0	0.0	2	397.2	1288.6	0.0	0	1.5	9000	0.5	2.5
40130	**2.5**	1.6	6.6	21.6	1.0	0.0	2	311.3	1264.5	0.0	0	1.5	9000	0.6	2.5
39945	**2.5**	1.6	6.8	21.9	1.0	0.0	2	293.8	1212.3	0.0	0	1.5	9000	0.6	2.5
39755	**2.5**	2.0	8.6	20.6	1.0	0.0	2	296.7	1088.1	0.0	0	1.5	9000	1.0	2.5
39605	**2.5**	2.0	8.5	20.7	1.0	0.0	2	348.8	1074.7	0.0	0	1.5	9000	1.0	2.5
39310	**2.5**	2.0	8.4	20.2	1.0	0.0	2	323.4	977.3	0.0	0	1.5	9000	1.0	2.5
39100	**2.5**	1.9	8.2	21.1	1.0	0.0	2	436.5	831.5	0.0	0	1.5	9000	0.9	2.5
38925	**2.5**	1.8	7.8	20.8	1.0	0.0	2	422.3	906.7	0.0	0	1.5	9000	0.8	2.5
38710	**2.5**	2.0	8.1	21.2	1.0	0.1	2	394.9	844.1	0.0	0	1.5	9000	0.9	2.5
38475	**2.6**	2.6	10.4	21.0	1.0	0.1	2	375.1	695.3	0.0	0	1.5	9000	1.5	2.5
38300	**2.5**	2.3	9.6	20.3	1.0	0.1	2	407.6	716.8	0.0	0	1.5	9000	1.2	2.5
38065	**2.5**	2.3	9.6	20.1	1.0	0.1	2	569.0	691.3	0.0	0	1.5	9000	1.2	2.5
37810	**2.8**	2.8	11.3	18.4	1.0	0.1	2	546.8	648.4	0.0	0	1.5	9000	1.7	2.5
37655	**2.6**	2.6	10.6	17.9	1.0	0.1	2	348.9	738.9	0.0	0	1.5	9000	1.5	2.5
37390	**2.5**	2.0	8.2	17.5	1.0	0.1	2	803.3	869.1	0.0	0	1.5	9000	0.9	2.5
37135	**2.5**	2.1	8.7	16.8	1.0	0.1	2	564.0	863.7	0.0	0	1.5	9000	1.0	2.5
36930	**2.5**	2.0	8.3	17.7	1.0	0.1	2	708.3	923.7	0.0	0	1.5	9000	0.9	2.5
36735	**2.5**	2.0	8.1	17.6	1.0	0.1	2	633.8	963.2	0.0	0	1.5	9000	0.9	2.5
36515	**2.5**	1.8	7.4	18.6	1.0	0.1	2	532.1	1032.7	0.0	0	1.5	9000	0.7	2.5
36265	**2.5**	1.8	7.1	18.3	1.0	0.1	2	359.0	1176.0	0.0	0	1.5	9000	0.7	2.5
36080	**2.5**	1.8	7.8	17.6	1.0	0.0	2	326.3	1176.0	0.0	0	1.5	9000	0.8	2.5
35845	**2.5**	1.7	7.0	18.1	1.0	0.0	2	376.2	1512.8	0.0	0	1.5	9000	0.7	2.5
35725	**2.5**	1.9	8.0	18.3	1.0	0.0	2	378.2	1488.9	0.0	0	1.5	9000	0.9	2.5
35515	**2.5**	2.0	8.5	17.9	1.0	0.0	2	379.3	1501.0	0.0	0	1.5	9000	1.0	2.5
35245	**2.5**	1.9	8.3	17.0	1.0	0.0	2	414.3	1580.3	0.0	0	1.5	9000	0.9	2.5
35040	**2.5**	2.0	8.8	16.6	1.0	0.0	2	440.9	1491.6	0.0	0	1.5	9000	1.0	2.5
34860	**2.5**	1.8	7.7	16.3	1.0	0.0	2	432.9	1431.5	0.0	0	1.5	9000	0.8	2.5
34720	**2.5**	1.7	7.4	15.8	1.0	0.0	2	545.6	1449.9	0.0	0	1.5	9000	0.7	2.5
34495	**2.5**	1.7	7.2	15.7	1.0	0.0	2	504.6	1461.5	0.0	0	1.5	9000	0.7	2.5
34310	**2.5**	1.9	8.1	15.4	1.0	0.0	2	684.5	1384.9	0.0	0	1.5	9000	0.9	2.5
34090	**2.5**	1.8	7.5	15.0	1.0	0.0	2	787.5	1371.0	0.0	0	1.5	9000	0.8	2.5
33880	**2.5**	1.9	7.3	15.7	1.0	0.2	2	761.0	1482.9	0.0	0	1.5	9000	0.7	2.5
33710	**2.5**	1.9	7.0	15.6	1.0	0.2	2	719.2	1637.9	0.0	0	1.5	9000	0.7	2.5
33500	**2.5**	1.9	7.0	15.3	1.0	0.2	2	666.4	1755.5	0.0	0	1.5	9000	0.7	2.5
33310	**2.5**	1.7	6.2	15.3	1.0	0.2	2	609.9	1828.2	0.0	0	1.5	9000	0.5	2.5
33115	**2.5**	1.6	5.8	15.4	1.0	0.2	2	667.8	1927.1	0.0	0	1.5	9000	0.4	2.5
32795	**2.5**	1.7	6.3	15.7	1.0	0.2	2	697.6	1920.8	0.0	0	1.5	9000	0.5	2.5

DEFINITIONS

Y_{MAX} = GREATER OF THE DM AND S&H HEIGHTS

Y_{TOT}=TOTAL EMBANKMENT PROTECTION IN FEET BASED ON THE H&S

V(FPS) =VELOCITY IN FEET PER SECOND

FLOW DEPTH=WATER DEPTH IN CHANNEL IN FEET

Y_{AGG}=LONG TERM AGGRADATION IN FEET

Y_{GA}=GENERAL AGGRADATION IN FEET FROM SAM

CHANNEL TYPE=CHANNEL SHAPE/FLOW FACTOR:

IF Fr<1, RECTANGULAR = 0; IF Fr>1, RECTANGULAR = 1;
IF Fr<1, TRAPEZOIDAL = 2; IF Fr>1, TRAPEZOIDAL = 3.

Y_{SE}+SUPER ELEVATION IN FEET

BEND COEFF=BEND COEFFICIENT; IF NO BEND=0, BEND=1

SIDE SLOPE=CHANNEL SIDE SLOPE (H:V), UNITLESS

BOTTOM WIDTH=CHANNEL BOTTOM WIDTH IN FEET, $Q_{2\text{-}YEAR}$ TOP WIDTH

RADIUS=RADIUS OF CURVATURE TO CENTERLINE IN FEET

H/2=HALF BEDFORM HEIGHT IN FEET, LIMITED TO FLOW DEPTH,

Y_{DM} = EMBANKMENT PROTECTION REQUIRED BY THE LACFCDDM IN FEET

<u>GENERAL</u>

THIS SPREADSHEET IS DESIGNED TO CALCULATE TOP PROTECTION (FREE BOARD) BASED ON LACDWP COUNTY HYDROLOGY MANUAL (1991) PAGES 5.8-5.9 AND ASSOCIATED APPENDICES (SEDIMENTATION MANUAL). ALL VELOCITIES ARE IN FPS, WITH NO MAXIMUM VALUE. THE USER SHOULD CONSIDER A PRACTICAL MAXIMUM OF APPROXIMATELY 20-30 FPS. THE PRESENT VERSION (8/05) WILL CALCULATE UP TO 100 VELOCITIES AT ONE TIME. LONG TERM AGGRADATION IS USER SUPPLIED. GENERAL AGGRADATION IS ALSO USER SUPPLIED. SUPER ELEVATION AT BENDS IS BASED ON LACFCDDM EQUATIONS FOUND IN C-3.1. BEDFORM HEIGHT, LIMITED TO FLOW DEPTH AFTER KENNEDY (1963), IS BASED ON EQUATIONS IN APPENDIX Q13. IF FLOW IS SUPERCRITICAL SPREADSHEET REPORTS LACFCDDM TOTAL WALL HEIGHT INSTEAD OF FREEBOARD. LOS ANGELES COUNTY FLOOD CONTROL DISTRICT DESIGN MANUAL (LACFCDDM) VALUES ARE PRESENTED AS A PART OF LACH&SM CALCULATIONS. THE SPREADSHEET CALCULATES THE GREATER OF THE TWO METHODOLOGIES. BOTTOM WIDTH IS BASED ON THE 2-YEAR WATER SURFACE AFTER ACOE PROCEDURES.

<u>COLOR CODES</u>

OUTPUT

DATA FROM HEC-RAS

USER SUPPLIED DATA

INTERMEDIATE CALCULATIONS (INDIVIDUAL SHEETS ONLY)

DESIGNED BY DAVID A JAFFE, PHD, PE
PACIFIC ADVANCED CIVIL ENGINEERING, INC
AUGUST, 2005

SECTION	Y_{MAX}	Y_{TOT}=	V (FPS)	FLOW DEPTH (FT)	Y_{AGG}+	Y_{GA}+	CHANNEL TYPE	BOTTOM WIDTH (FT)	TOP WIDTH (FT)	Y_{SE}+	BEND COEFF	SIDE SLOPE	RADIUS	H/2	Y_{DM}
32605	2.5	1.7	6.1	16.7	1.0	0.2	2	652.8	2407.4	0.0	0	1.5	9000	0.5	2.5
32265	2.5	2.2	5.5	17.2	1.0	0.8	2	651.0	2840.2	0.0	0	1.5	9000	0.4	2.5
31875	2.5	2.2	5.3	16.6	1.0	0.8	2	562.0	2593.1	0.0	0	1.5	9000	0.4	2.5
31585	2.5	2.1	5.0	18.7	1.0	0.8	2	619.5	2377.5	0.0	0	1.5	9000	0.3	2.5
31360	2.5	2.2	5.5	19.9	1.0	0.8	2	672.2	1959.5	0.0	0	1.5	9000	0.4	2.5
31060	2.5	2.1	5.1	21.2	1.0	0.8	2	955.0	1975.9	0.0	0	1.5	9000	0.3	2.5
30720	2.5	2.1	4.6	22.5	1.0	0.8	2	772.7	1911.5	0.0	0	1.5	9000	0.3	2.5
30445	2.5	2.1	4.6	24.1	1.0	0.8	2	700.9	1841.8	0.0	0	1.5	9000	0.3	2.5
30095	2.5	2.2	5.2	25.5	1.0	0.8	2	617.1	1637.3	0.0	0	1.5	9000	0.4	2.5
29815	2.5	2.3	6.1	25.8	1.0	0.8	2	551.1	1445.2	0.0	0	1.5	9000	0.5	2.5
29565	2.5	2.3	6.0	26.3	1.0	0.8	2	461.8	1334.9	0.0	0	1.5	9000	0.5	2.5
29385	2.5	2.4	6.8	26.6	1.0	0.8	2	381.5	1249.1	0.0	0	1.5	9000	0.6	2.5
29140	2.5	1.8	7.9	26.4	1.0	0.0	2	217.2	1095.0	0.0	0	1.5	9000	0.8	2.5
28895	4.7	4.7	16.5	23.8	1.0	0.0	2	201.9	978.0	0.0	0	1.5	9000	3.7	2.5
28695	2.5	2.2	9.4	24.9	1.0	0.0	2	269.6	951.6	0.0	0	1.5	9000	1.2	2.5
28500	2.9	2.9	12.0	23.0	1.0	0.0	2	326.0	1039.5	0.0	0	1.5	9000	1.9	2.5
28280	2.5	2.0	8.7	23.8	1.0	0.0	2	379.1	1003.9	0.0	0	1.5	9000	1.0	2.5
28080	2.5	1.9	8.3	24.1	1.0	0.0	2	416.6	945.4	0.0	0	1.5	9000	0.9	2.5
27925	2.5	2.2	9.6	24.1	1.0	0.0	2	402.0	884.9	0.0	0	1.5	9000	1.2	2.5
27725	2.9	2.9	11.9	23.1	1.0	0.0	2	386.2	811.8	0.0	0	1.5	9000	1.9	2.5
27545	3.1	3.1	12.4	22.3	1.0	0.0	2	409.6	852.5	0.0	0	1.5	9000	2.1	2.5
27335	2.6	2.6	10.9	22.0	1.0	0.0	2	422.5	937.2	0.0	0	1.5	9000	1.6	2.5
27155	2.8	2.8	11.4	21.0	1.0	0.0	2	452.4	978.1	0.0	0	1.5	9000	1.8	2.5
26990	2.5	2.2	9.4	20.4	1.0	0.0	2	440.9	1020.9	0.0	0	1.5	9000	1.2	2.5
26780	2.5	2.0	8.8	21.3	1.0	0.0	2	527.5	1106.5	0.0	0	1.5	9000	1.0	2.5
26575	2.5	1.7	7.3	21.5	1.0	0.0	2	513.5	1243.6	0.0	0	1.5	3000	0.7	2.5
26355	2.5	1.9	7.4	21.6	1.0	0.0	2	601.4	1294.5	0.0	0	1.5	3000	0.9	2.5
26170	2.5	2.1	7.7	21.9	1.0	0.0	2	457.8	1301.2	0.0	0	1.5	3000	1.1	2.5
25965	2.5	2.3	7.5	22.2	1.0	0.0	2	568.4	1313.2	0.0	0	1.5	3000	1.3	2.5
25785	2.5	2.4	7.5	22.0	1.0	0.0	2	550.9	1256.9	0.0	0	1.5	3000	1.4	2.5
25600	2.5	2.3	7.8	22.3	1.0	0.0	2	478.1	1149.9	0.0	0	1.5	3000	1.3	2.5
25425	2.5	2.3	7.3	23.1	1.0	0.0	2	399.8	1138.3	0.0	0	1.5	3000	1.3	2.5
25215	2.5	2.2	7.3	23.3	1.0	0.0	2	444.6	1133.6	0.0	0	1.5	3000	1.2	2.5
25000	2.5	2.3	7.3	23.5	1.0	0.0	2	453.1	1093.8	0.0	0	1.5	3000	1.3	2.5
24795	3.4	3.4	8.0	23.5	1.9	0.2	2	391.4	986.5	0.0	0	1.5	3000	1.3	2.5
24550	3.3	3.3	8.9	24.1	1.9	0.2	2	334.0	887.1	0.0	0	1.5	3000	1.2	2.5
24335	3.6	3.6	9.9	23.5	1.9	0.2	2	337.2	800.3	0.0	0	1.5	3000	1.5	2.5
24115	3.5	3.5	10.0	23.0	1.9	0.2	2	422.7	793.2	0.0	0	1.5	3000	1.4	2.5
23975	3.3	3.3	9.7	22.6	1.9	0.2	2	354.1	828.2	0.0	0	1.5	3000	1.2	2.5
23755	3.1	3.1	9.9	22.7	1.9	0.2	2	333.9	939.2	0.0	0	1.5	3000	1.0	2.5
23565	3.4	3.4	9.4	23.6	1.9	0.2	2	322.2	941.5	0.0	0	1.5	3000	1.3	2.5
23365	3.2	3.2	9.4	22.4	1.9	0.2	2	329.4	987.4	0.0	0	1.5	3000	1.1	2.5
23180	3.0	3.0	9.6	22.5	1.9	0.2	2	400.7	975.5	0.0	0	1.5	3000	0.9	2.5
23000	3.0	3.0	9.5	22.0	1.9	0.2	2	407.6	784.0	0.0	0	1.5	3000	0.9	2.5
22790	3.0	3.0	10.6	20.0	1.9	0.2	2	425.5	784.0	0.0	0	1.5	3000	0.9	2.5
22600	2.9	2.9	10.2	19.8	1.9	0.2	2	386.7	1050.2	0.0	0	1.5	3000	0.8	2.5
22415	2.9	2.9	9.3	18.9	1.9	0.2	2	422.3	1091.6	0.0	0	1.5	3000	0.8	2.5
22195	2.5	2.2	8.4	19.1	1.4	0.0	2	371.3	1464.0	0.0	0	1.5	3000	0.8	2.5
22010	2.5	2.2	9.8	19.4	1.4	0.0	2	471.8	1735.1	0.0	0	1.5	3000	0.8	2.5
21790	2.5	2.4	9.0	18.4	1.4	0.0	2	549.9	1778.4	0.0	0	1.5	3000	1.0	2.5
21615	2.5	2.3	8.0	16.9	1.4	0.0	2	563.1	1687.7	0.0	0	1.5	3000	0.9	2.5
21440	2.5	2.2	8.2	17.8	1.4	0.0	2	638.9	1653.0	0.0	0	1.5	3000	0.8	2.5
21225	2.5	2.1	8.0	18.7	1.4	0.0	2	352.4	1600.8	0.0	0	1.5	3000	0.7	2.5
21020	2.5	2.1	7.8	18.6	1.4	0.0	2	675.0	1607.4	0.0	0	1.5	3000	0.7	2.5
20845	2.5	2.2	7.9	18.7	1.4	0.0	2	613.7	1605.1	0.0	0	1.5	3000	0.8	2.5
20595	2.5	2.0	7.5	18.6	1.4	0.0	2	744.5	1600.4	0.0	0	1.5	3000	0.6	2.5
20435	2.5	2.0	7.9	18.8	1.4	0.0	2	765.2	1613.5	0.0	0	1.5	3000	0.6	2.5
20280	2.5	2.0	8.7	18.1	1.4	0.0	2	439.6	1636.3	0.0	0	1.5	3000	0.6	2.5
20070	2.5	1.9	8.3	18.6	1.4	0.0	2	602.4	1797.8	0.0	0	1.5	3000	0.5	2.5
19855	2.9	2.9	7.7	19.1	1.0	1.4	2	585.9	1809.6	0.0	0	1.5	3000	0.5	2.5
19630	2.9	2.9	7.4	18.6	1.0	1.4	2	634.2	1833.7	0.0	0	1.5	3000	0.5	2.5
19440	3.0	3.0	7.2	19.9	1.0	1.4	2	536.3	1986.1	0.0	0	1.5	3000	0.6	2.5

SECTION	Y_{MAX}	Y_{TOT}=	V (FPS)	FLOW DEPTH (FT)	Y_{AGG}+	Y_{CA}+	CHANNEL TYPE	BOTTOM WIDTH (FT)	TOP WIDTH (FT)	Y_{SE}+	BEND COEFF	SIDE SLOPE	RADIUS	H/2	Y_{DM}
19240	**3.4**	3.4	7.6	19.4	1.0	1.4	2	445.4	1738.0	0.0	0	1.5	3000	1.0	2.5
19050	**4.1**	4.1	6.7	20.2	1.0	1.4	2	418.1	1753.4	0.0	0	1.5	3000	1.7	2.5
18830	**4.0**	4.0	6.8	21.4	1.0	1.4	2	338.9	1684.0	0.0	0	1.5	3000	1.6	2.5
18650	**4.0**	4.0	6.7	21.2	1.0	1.4	2	339.7	1686.2	0.0	0	1.5	3000	1.6	2.5
18475	**3.4**	3.4	5.8	22.3	1.0	1.4	2	336.6	1665.9	0.0	0	1.5	3000	1.0	2.5
18290	**3.2**	3.2	6.3	22.1	1.0	1.4	2	365.1	1631.9	0.0	0	1.5	3000	0.8	2.5
18025	**3.1**	3.1	5.8	22.9	1.0	1.4	2	380.4	1557.4	0.0	0	1.5	17000	0.7	2.5
17785	**3.2**	3.2	6.4	24.0	1.0	1.4	2	389.3	1444.1	0.0	0	1.5	17000	0.8	2.5
17510	**2.5**	1.7	8.4	22.4	1.0	0.0	2	326.3	1398.9	0.0	0	1.5	17000	0.7	2.5
17360	**2.5**	1.7	11.1	20.3	1.0	0.0	2	223.6	1303.3	0.0	0	1.5	17000	0.7	2.5
17110	**2.5**	1.6	11.0	21.5	1.0	0.0	2	228.7	1229.6	0.0	0	1.5	17000	0.6	2.5
16970	**2.5**	2.1	10.7	20.3	1.0	0.0	2	235.7	1196.0	0.0	0	1.5	17000	1.1	2.5
16720	**2.5**	2.3	8.5	18.8	1.0	0.0	2	260.0	1182.0	0.0	0	1.5	17000	1.3	2.5
16515	**2.5**	2.1	7.7	19.2	1.0	0.0	2	296.5	1303.8	0.0	0	1.5	17000	1.1	2.5
16305	**2.5**	2.0	7.1	20.4	1.0	0.0	2	304.6	1395.5	0.0	0	1.5	17000	1.0	2.5
16130	**2.5**	1.7	7.7	19.4	1.0	0.0	2	323.4	1368.9	0.0	0	1.5	17000	0.7	2.5
15960	**2.5**	1.6	7.1	19.6	1.0	0.0	2	294.6	1437.6	0.0	0	1.5	17000	0.6	2.5
15745	**2.5**	1.6	7.0	19.6	1.0	0.0	2	295.8	1401.3	0.0	0	1.5	17000	0.6	2.5
15540	**2.5**	1.6	6.6	19.2	1.0	0.0	2	344.9	2361.2	0.0	0	1.5	17000	0.6	2.5
15335	**2.5**	1.7	8.9	18.8	1.0	0.0	2	348.6	1064.1	0.0	0	1.5	17000	0.7	2.5
15125	**2.5**	1.4	9.8	18.0	1.0	0.0	2	437.3	1053.5	0.0	0	1.5	17000	0.4	2.5
14900	**2.5**	1.4	8.8	16.7	1.0	0.0	2	584.1	2233.1	0.0	0	1.5	17000	0.4	2.5
14720	**2.5**	1.5	8.5	16.4	1.0	0.0	2	532.9	2020.9	0.0	0	1.5	17000	0.5	2.5
14480	**2.5**	1.5	7.4	16.4	1.0	0.0	2	819.8	1851.8	0.0	0	1.5	17000	0.5	2.5
14315	**2.5**	1.6	6.8	16.0	1.0	0.0	2	1014.4	1944.1	0.0	0	1.5	17000	0.6	2.5
14090	**2.5**	1.6	6.7	14.8	1.0	0.0	2	787.4	1816.2	0.0	0	1.5	17000	0.6	2.5
13850	**2.5**	1.6	6.6	15.6	1.0	0.0	2	582.7	1774.9	0.0	0	1.5	17000	0.6	2.5
13635	**2.5**	1.7	7.3	16.5	1.0	0.0	2	631.2	1818.0	0.0	0	1.5	17000	0.7	2.5
13425	**2.5**	1.7	5.7	16.8	1.0	0.0	2	576.3	1936.1	0.0	0	1.5	17000	0.7	2.5
13190	**2.5**	1.8	5.6	17.1	1.0	0.0	2	713.9	1911.1	0.0	0	1.5	17000	0.8	2.5
13030	**4.1**	4.1	6.0	17.6	1.0	2.1	2	712.9	1863.7	0.0	0	1.5	17000	1.0	2.5
12835	**4.6**	4.6	6.2	18.0	1.0	2.1	2	799.4	1775.1	0.0	0	1.5	17000	1.5	2.5
12615	**5.2**	5.2	6.5	18.3	1.0	2.1	2	741.8	1566.5	0.0	0	1.5	17000	2.1	2.5
12395	**5.1**	5.1	6.7	18.7	1.0	2.1	2	738.1	1543.0	0.0	0	1.5	17000	2.0	2.5
12195	**4.2**	4.2	6.5	19.1	1.0	2.1	2	990.8	1463.7	0.0	0	1.5	17000	1.1	2.5
11995	**4.1**	4.1	7.4	20.3	1.0	2.1	2	589.4	1448.5	0.0	0	1.5	17000	1.0	2.5
11780	**4.0**	4.0	7.3	20.6	1.0	2.1	2	590.4	1460.8	0.0	0	1.5	17000	0.9	2.5
11605	**4.0**	4.0	7.9	20.3	1.0	2.1	2	587.6	1417.5	0.0	0	1.5	17000	0.9	2.5
11405	**3.9**	3.9	8.7	20.6	1.0	2.1	2	579.7	1144.9	0.0	0	1.5	17000	0.8	2.5
11180	**3.9**	3.9	10.7	19.7	1.0	2.1	2	580.2	1009.2	0.0	0	1.5	17000	0.8	2.5
11015	**3.8**	3.8	12.6	18.7	3.1	0.0	2	519.8	851.0	0.0	0	1.5	17000	0.7	2.5
10835	**3.7**	3.7	12.2	17.1	3.1	0.0	2	510.4	1073.0	0.0	0	1.5	17000	0.6	2.5
10575	**3.8**	3.8	9.1	16.1	3.1	0.0	2	534.5	1322.2	0.0	0	1.5	17000	0.7	2.5
10390	**3.1**	3.1	8.6	17.1	3.1	0.0	2	598.1	1517.0	0.0	0	1.5	17000	0.0	2.5
10225	**3.1**	3.1	8.0	16.6	3.1	0.0	2	606.9	1543.4	0.0	0	1.5	17000	0.0	2.5
10000	**3.1**	3.1	8.1	16.6	3.1	0.0	2	685.3	1626.0	0.0	0	1.5	17000	0.0	2.5
9820	**3.1**	3.1	7.9	17.4	3.1	0.0	2	773.4	1648.8	0.0	0	1.5	17000	0.0	2.5
9595	**3.1**	3.1	7.8	16.1	3.1	0.0	2	698.1	1719.6	0.0	0	1.5	17000	0.0	2.5
9385	**3.1**	3.1	7.2	15.6	3.1	0.0	2	694.0	1799.3	0.0	0	1.5	17000	0.0	2.5
9220	**3.1**	3.1	6.8	15.6	3.1	0.0	2	645.1	1853.4	0.0	0	1.5	17000	0.0	2.5
9025	**3.1**	3.1	7.0	15.6	3.1	0.0	2	537.6	1822.9	0.0	0	1.5	17000	0.0	2.5
MAX=	**5.2**	5.2			3.1					0.0				3.7	2.5
MIN=	**2.5**	1.4			1.0					0.0				0.0	2.5

Santa Clara River Fluvial Study

APPENDIX CHAPTER 6.3

Summary of Appendix 6
Toedown & Freeboard
Proposed Condition
Curved & Straight Reaches

PACIFIC ADVANCED
CIVIL ENGINEERING, INC.

Table A6.3: Santa Clara River Appendix 6 Summary of Proposed Toe-down & Freeboard (ft)											
Subreach	HEC-RAS Station	Z_{99} [2]	Outside Curved Reach		Straight-Inside Curved Reach		WSE	Outside Curved Reach		Straight-Inside Curved Reach	
			Total Degradation (H&S w/ SAM) [3]	Proposed Toe-down Elevation [1,4]	Total Degradation (H&S w/ SAM) [3]	Proposed Toe-down Elevation [1,4]		Total Freeboard (H&S w/ SAM) [3]	Proposed Top of Levee Elevation [2]	Total Freeboard (H&S w/ SAM) [4]	Proposed Top of Levee Elevation [1]
SRA1	46195	1035.0	11.1	1023.9	11.1	1023.9	1063.1	3.1	1066.3	3.1	1066.3
	46020	1032.0	12.7	1019.3	12.7	1019.3	1062.0	3.0	1065.0	3.0	1065.0
	45545	1030.0	10.4	1019.6	10.4	1019.6	1057.9	3.4	1061.3	3.4	1061.3
	45030	1025.0	13.1	1011.9	13.1	1011.9	1054.2	3.0	1057.3	3.0	1057.3
	44585	1022.0	9.8	1012.2	9.8	1012.2	1050.6	3.2	1053.8	3.2	1053.8
	44210	1020.0	12.5	1007.5	12.5	1007.5	1047.8	2.9	1050.8	2.9	1050.8
SRA2	43820	1018.0	15.4	1002.6	15.4	1002.6	1042.1	3.9	1046.0	3.9	1046.0
	43610	1017.0	17.0	1000.0	17.0	1000.0	1038.3	4.0	1042.2	4.0	1042.2
	43410	1016.0	15.8	1000.2	15.8	1000.2	1035.8	3.6	1039.4	3.6	1039.4
	43200	1014.0	16.3	997.7	16.3	997.7	1033.2	3.5	1036.7	3.5	1036.7
	42975	1012.0	15.5	996.5	15.5	996.5	1031.0	2.9	1033.8	2.7	1033.7
	42815	1011.0	15.5	995.5	15.5	995.5	1029.7	2.5	1032.2	2.5	1032.2
	42590	1010.0	15.1	994.9	14.7	995.3	1028.4	2.5	1030.9	2.5	1030.9
	42430	1008.0	15.4	992.6	15.3	992.7	1027.5	2.5	1030.0	2.5	1030.0
	42215	1006.0	15.2	990.8	14.7	991.3	1026.7	2.5	1029.2	2.5	1029.2
	41940	1005.0	13.4	991.6	11.9	993.1	1025.6	2.5	1028.1	2.5	1028.1
	41730	1004.0	13.2	990.8	12.0	992.0	1024.6	2.5	1027.1	2.5	1027.1
	41460	1002.0	12.8	989.2	11.9	990.1	1023.2	2.5	1025.7	2.5	1025.7
SRA3	41280	1001.0	10.9	990.1	10.9	990.1	1021.8	2.5	1024.3	2.5	1024.3
	41080	1000.0	12.7	987.3	12.7	987.3	1020.5	2.5	1023.0	2.5	1023.0
	40825	999.5	12.2	987.3	11.7	987.8	1019.3	2.5	1021.8	2.5	1021.8
	40585	998.0	11.6	986.4	11.2	986.8	1018.3	2.5	1020.8	2.5	1020.8
	40335	996.0	10.2	985.8	8.8	987.2	1017.4	2.5	1019.9	2.5	1019.9
	40130	995.0	10.3	984.7	9.0	986.0	1016.6	2.5	1019.1	2.5	1019.1
	39945	994.0	10.2	983.8	8.9	985.1	1015.9	2.5	1018.4	2.5	1018.4
	39755	994.0	11.0	983.0	11.0	983.0	1014.6	2.5	1017.1	2.5	1017.1
	39605	993.0	12.5	980.5	12.5	980.5	1013.7	2.5	1016.2	2.5	1016.2
	39310	992.0	11.2	980.8	11.0	981.0	1012.2	2.5	1014.7	2.5	1014.7
	39100	990.0	12.5	977.5	12.5	977.5	1011.1	2.5	1013.6	2.5	1013.6
	38925	989.5	9.5	980.0	9.5	980.0	1010.3	2.5	1012.8	2.5	1012.8
SRA4	38710	988.0	6.7	981.3	6.7	981.3	1009.2	2.5	1011.7	2.5	1011.7
	38475	986.0	9.0	977.0	9.0	977.0	1007.0	2.6	1009.5	2.6	1009.5
	38300	985.5	9.8	975.7	9.8	975.7	1005.8	2.5	1008.3	2.5	1008.3
	38065	984.0	7.6	976.4	7.6	976.4	1004.1	2.5	1006.6	2.5	1006.6
	37810	983.0	9.2	973.8	9.2	973.8	1001.4	2.8	1004.2	2.8	1004.2
	37655	982.0	10.0	972.0	10.0	972.0	999.9	2.6	1002.5	2.6	1002.5
	37390	981.0	8.0	973.0	8.0	973.0	998.5	2.5	1001.0	2.5	1001.0
	37135	980.0	8.4	971.6	8.4	971.6	996.8	2.5	999.3	2.5	999.3
	36930	978.0	8.8	969.3	8.8	969.3	995.7	2.5	998.2	2.5	998.2
	36735	977.0	8.2	968.8	8.2	968.8	994.6	2.5	997.1	2.5	997.1
	36515	975.0	7.3	967.7	6.9	968.1	993.6	2.5	996.1	2.5	996.1
	36265	974.0	7.7	966.3	6.8	967.2	992.3	2.5	994.8	2.5	994.8
SRB1	36080	973.0	22.9	950.1	22.0	951.0	990.6	2.5	993.1	2.5	993.1
	35845	971.0	9.2	961.8	7.5	963.5	989.1	2.5	991.6	2.5	991.6
	35725	970.0	10.7	959.3	8.9	961.1	988.3	2.5	990.8	2.5	990.8
	35515	969.0	11.5	957.5	9.8	959.2	986.9	2.5	989.4	2.5	989.4
	35245	968.0	11.4	956.6	9.9	958.1	985.0	2.5	987.5	2.5	987.5
	35040	967.0	12.7	954.3	11.0	956.0	983.6	2.5	986.1	2.5	986.1
	34860	966.0	11.6	954.4	10.4	955.6	982.3	2.5	984.8	2.5	984.8
	34720	965.5	11.8	953.7	10.4	955.1	981.3	2.5	983.8	2.5	983.8
	34495	964.0	10.9	953.1	10.0	954.0	979.7	2.5	982.2	2.5	982.2
	34310	963.0	10.8	952.2	9.6	953.4	978.4	2.5	980.9	2.5	980.9
	34090	962.0	10.8	951.2	9.7	952.3	977.0	2.5	979.5	2.5	979.5
SRB2	33880	960.0	10.2	949.8	9.1	950.9	975.7	2.5	978.2	2.5	978.2
	33710	959.0	9.9	949.1	8.6	950.4	974.6	2.5	977.1	2.5	977.1
	33500	958.0	10.4	947.6	8.9	949.1	973.3	2.5	975.8	2.5	975.8
	33310	957.0	10.9	946.1	8.7	948.3	972.3	2.5	974.8	2.5	974.8
	33115	956.0	9.0	947.0	6.8	949.2	971.4	2.5	973.9	2.5	973.9
	32795	954.0	9.9	944.1	7.7	946.3	969.7	2.5	972.2	2.5	972.2
	32605	952.0	10.5	941.5	8.2	943.8	968.7	2.5	971.2	2.5	971.2
SRC1	32265	950.0	9.9	940.1	7.4	942.6	967.2	2.5	969.7	2.5	969.7
	31875	949.0	9.1	939.9	6.1	942.9	965.6	2.5	968.1	2.5	968.1
	31585	946.0	8.6	937.4	5.6	940.4	964.7	2.5	967.2	2.5	967.2
	31360	944.0	8.3	935.7	5.4	938.6	963.9	2.5	966.4	2.5	966.4
	31060	942.0	7.5	934.5	4.9	937.1	963.2	2.5	965.7	2.5	965.7
	30720	940.0	7.9	932.1	4.6	935.4	962.5	2.5	965.0	2.5	965.0
	30445	938.0	7.9	930.1	4.5	933.5	962.1	2.5	964.6	2.5	964.6
	30095	936.0	8.1	927.9	4.6	931.4	961.5	2.5	964.0	2.5	964.0
	29815	935.0	7.7	927.3	4.8	930.2	960.8	2.5	963.3	2.5	963.3
	29565	934.0	7.1	926.9	4.7	929.3	960.3	2.5	962.8	2.5	962.8
	29385	933.0	7.0	926.0	4.9	928.1	959.6	2.5	962.1	2.5	962.1
SRC2	29140	932.0	10.4	921.6	9.1	922.9	958.4	2.5	960.9	2.5	960.9
	28895	930.0	13.5	916.5	12.7	917.3	953.8	4.8	958.6	4.7	958.5
	28695	928.0	15.0	913.0	15.0	913.0	952.9	2.5	955.4	2.5	955.4
	28500	927.5	14.7	912.8	14.7	912.8	950.5	3.1	953.5	2.9	953.4
	28280	926.0	13.6	912.4	13.4	912.6	949.8	2.5	952.3	2.5	952.3
	28080	925.0	9.9	915.1	9.7	915.3	949.1	2.5	951.6	2.5	951.6
	27925	924.0	10.3	913.7	10.3	913.7	948.1	2.5	950.6	2.5	950.6
	27725	923.0	12.9	910.1	12.9	910.1	946.1	2.9	949.0	2.9	949.0
	27545	922.0	15.0	907.0	15.0	907.0	944.3	3.1	947.4	3.1	947.4
	27335	921.0	14.1	906.9	14.1	906.9	943.0	2.7	945.7	2.6	945.6
	27155	920.5	12.9	907.6	12.9	907.6	941.5	2.9	944.4	2.8	944.2
SRC3	26990	920.0	11.2	908.8	11.0	909.0	940.4	2.5	942.9	2.5	942.9
	26780	918.0	11.6	906.4	10.9	907.1	939.3	2.5	941.8	2.5	941.8
	26575	917.0	16.0	901.0	10.9	906.1	938.5	2.5	941.0	2.5	941.0
	26355	916.0	15.4	900.6	8.7	907.3	937.6	2.5	940.1	2.5	940.1
	26170	915.0	16.6	898.4	9.2	905.8	936.9	2.5	939.4	2.5	939.4
	25965	914.0	17.1	896.9	9.8	904.2	936.2	2.6	938.8	2.5	938.7
	25785	913.5	16.7	896.8	10.1	903.4	935.5	2.7	938.2	2.5	938.0
	25600	912.5	15.9	896.6	9.9	902.6	934.8	2.5	937.3	2.5	937.3
	25425	911.0	15.1	895.9	9.8	901.2	934.1	2.5	936.7	2.5	936.6
	25215	910.0	14.0	896.0	8.0	902.0	933.3	2.5	935.8	2.5	935.8
	25000	909.0	13.7	895.3	7.6	901.4	932.5	2.5	935.0	2.5	935.0
SRC4	24795	908.0	12.3	895.7	6.7	901.3	931.5	3.7	935.2	3.4	934.9
	24550	906.0	12.4	893.6	7.1	898.9	930.1	3.6	933.6	3.3	933.4
	24335	905.0	13.0	892.0	8.5	896.5	928.5	3.9	932.4	3.6	932.1
	24115	904.0	13.5	890.5	9.4	894.6	927.0	3.8	930.8	3.5	930.5
	23975	903.5	13.9	889.6	9.8	893.7	926.1	3.5	929.7	3.3	929.4
	23755	902.0	13.2	888.8	8.4	893.6	924.7	3.2	927.9	3.1	927.8
	23565	900.0	14.5	885.5	9.5	890.5	923.6	3.7	927.3	3.4	927.0
	23365	900.0	14.3	885.7	8.6	891.4	922.4	3.5	925.9	3.2	925.6
	23180	899.0	15.8	883.2	10.3	888.7	921.5	3.2	924.6	3.0	924.4
	23000	898.0	13.0	885.0	9.6	888.4	920.0	3.3	923.3	3.0	923.0
	22790	897.5	26.8	870.7	23.0	874.5	917.5	3.1	920.6	3.0	920.5
	22600	896.0	14.8	881.2	9.3	886.7	915.8	3.2	919.0	2.9	918.7
	22415	895.5	14.0	881.5	9.4	886.1	914.4	3.2	917.6	2.9	917.4

1 - Phase 1 Analysis

2 - Minimum 1999 Bed Elevation

3 - Toe-down based on LA County Hydrology & Sedimentation Manual; Freeboard based on max of LA County Hydrology & Sedimentation Manual and LA County Design Manual, as per Hydrology & Sedimentation Manual

4 - Final design of levee will include detailed bridge analysis

Table A6.3: Santa Clara River Summary of Proposed Toe-down & Freeboard (ft) continued

Subreach	HEC-RAS Station	Z_{99} [2]	Outside Curved Reach		Straight-Inside Curved Reach		WSE	Outside Curved Reach		Straight-Inside Curved Reach	
			Total Degradation (H&S w/ SAM) [3]	Proposed Toe-down Elevation [1,4]	Total Degradation (H&S w/ SAM) [3]	Proposed Toe-down Elevation [1,4]		Total Freeboard (H&S w/ SAM) [3]	Proposed Top of Levee Elevation [2]	Total Freeboard (H&S w/ SAM) [4]	Proposed Top of Levee Elevation [1]
SRD1	22195	894.0	13.3	880.7	6.7	887.3	913.1	2.5	915.6	2.5	915.6
	22010	892.0	15.3	876.7	7.7	884.3	911.4	2.5	913.9	2.5	913.9
	21790	891.5	15.3	876.2	9.4	882.1	909.9	2.6	912.6	2.5	912.4
	21615	892.0	12.5	879.5	8.5	883.5	908.9	2.6	911.5	2.5	911.4
	21440	890.0	14.1	875.9	8.3	881.7	907.8	2.5	910.3	2.5	910.3
	21225	888.0	16.3	871.7	8.6	879.4	906.7	2.5	909.2	2.5	909.2
	21020	887.0	12.6	874.4	9.1	877.9	905.6	2.5	908.1	2.5	908.1
	20845	886.0	15.2	870.8	7.3	878.7	904.7	2.5	907.2	2.5	907.2
	20595	885.0	14.1	870.9	6.3	878.7	903.6	2.5	906.1	2.5	906.1
	20435	884.0	14.4	869.6	6.2	877.8	902.8	2.5	905.3	2.5	905.3
	20280	883.7	15.4	868.3	7.5	876.2	901.8	2.5	904.3	2.5	904.3
	20070	882.0	16.8	865.2	9.2	872.8	900.6	2.5	903.1	2.5	903.1
SRD2	19855	880.5	14.5	866.0	9.1	871.4	899.6	3.0	902.6	2.9	902.5
	19630	880.0	12.3	867.7	8.4	871.6	898.6	2.9	901.5	2.9	901.5
	19440	878.0	12.2	865.8	6.3	871.7	897.9	3.0	900.8	3.0	900.8
	19240	877.5	13.0	864.5	7.4	870.1	896.9	3.4	900.3	3.4	900.2
	19050	876.0	14.1	861.9	8.8	867.2	896.2	4.1	900.3	4.1	900.3
	18830	874.0	14.5	859.5	6.4	867.6	895.4	4.1	899.4	4.0	899.4
	18650	873.5	14.7	858.8	6.0	867.5	894.7	4.0	898.7	4.0	898.7
	18475	872.0	13.6	858.4	5.1	866.9	894.3	3.4	897.6	3.4	897.6
	18290	871.5	14.1	857.4	5.3	866.2	893.6	3.2	896.8	3.2	896.8
	18025	870.0	4.8	865.2	4.8	865.2	892.9	3.1	895.9	3.1	895.9
	17785	868.0	5.0	863.0	5.0	863.0	892.0	3.2	895.2	3.2	895.2
SRD3	17510	868.0	6.9	861.1	6.9	861.1	890.4	2.5	892.9	2.5	892.9
	17360	868.0	9.2	858.8	9.2	858.8	888.3	2.5	890.8	2.5	890.8
	17110	864.0	12.0	852.0	12.0	852.0	885.5	2.5	888.0	2.5	888.0
	16970	863.7	12.1	851.6	12.1	851.6	884.0	2.5	886.5	2.5	886.5
	16720	863.5	9.9	853.6	9.9	853.6	882.3	2.5	884.8	2.5	884.8
	16515	862.0	10.4	851.6	10.4	851.6	881.2	2.5	883.7	2.5	883.7
	16305	860.0	7.1	852.9	7.1	852.9	880.4	2.5	882.9	2.5	882.9
	16130	860.0	8.6	851.4	8.6	851.4	879.4	2.5	881.9	2.5	881.9
	15960	859.0	9.5	849.5	9.5	849.5	878.6	2.5	881.1	2.5	881.1
	15745	858.0	7.3	850.7	7.3	850.7	877.6	2.5	880.1	2.5	880.1
	15540	857.5	6.8	850.7	6.8	850.7	876.7	2.5	879.2	2.5	879.2
	15335	856.0	8.8	847.2	8.8	847.2	874.8	2.5	877.3	2.5	877.3
SRE1	15125	854.0	26.1	827.9	26.1	827.9	872.0	2.5	874.5	2.5	874.5
	14900	853.0	9.3	843.7	9.3	843.7	869.7	2.5	872.2	2.5	872.2
	14720	852.0	8.9	843.1	8.8	843.2	868.4	2.5	870.9	2.5	870.9
	14480	850.5	8.9	841.6	8.8	841.7	866.9	2.5	869.4	2.5	869.4
	14315	850.0	7.4	842.6	7.0	843.0	866.0	2.5	868.5	2.5	868.5
	14090	850.0	7.3	842.7	7.2	842.8	864.8	2.5	867.3	2.5	867.3
	13850	848.0	6.7	841.3	6.6	841.4	863.6	2.5	866.1	2.5	866.1
	13635	846.0	7.7	838.3	7.6	838.4	862.5	2.5	865.0	2.5	865.0
	13425	845.0	8.6	836.4	8.3	836.7	861.8	2.5	864.3	2.5	864.3
	13190	844.0	6.7	837.3	6.4	837.6	861.1	2.5	863.6	2.5	863.6
SRE2	13030	843.0	6.9	836.1	6.7	836.3	860.6	4.2	864.8	4.1	864.8
	12835	842.0	6.4	835.6	6.4	835.6	860.0	4.7	864.7	4.6	864.7
	12615	841.0	6.1	834.9	6.1	834.9	859.3	5.2	864.6	5.2	864.6
	12395	840.0	6.0	834.0	6.0	834.0	858.7	5.1	863.8	5.1	863.8
	12195	839.0	5.5	833.5	5.5	833.5	858.1	4.2	862.3	4.2	862.3
	11995	837.0	6.2	830.8	6.2	830.8	857.3	4.1	861.4	4.1	861.4
	11780	836.0	6.1	829.9	6.1	829.9	856.6	4.0	860.5	4.0	860.5
	11605	835.5	6.6	828.9	6.6	828.9	855.8	4.0	859.8	4.0	859.8
	11405	834.0	6.3	827.7	6.3	827.7	854.6	3.9	858.6	3.9	858.6
	11180	833.0	7.7	825.3	7.7	825.3	852.7	3.9	856.6	3.9	856.6
SRE3	11015	831.5	10.4	821.1	10.4	821.1	850.2	3.8	854.0	3.8	854.0
	10835	831.0	10.9	820.1	10.9	820.1	848.1	3.7	851.8	3.7	851.8
	10575	830.0	9.2	820.8	9.2	820.8	846.1	3.8	849.9	3.8	849.9
	10390	828.0	9.9	818.1	9.9	818.1	845.1	3.1	848.2	3.1	848.2
	10225	827.5	9.8	817.7	9.8	817.7	844.1	3.1	847.2	3.1	847.2
	10000	826.0	8.5	817.5	8.5	817.5	842.6	3.1	845.7	3.1	845.7
	9820	824.0	10.2	813.8	10.2	813.8	841.4	3.1	844.5	3.1	844.5
	9595	823.8	8.4	815.4	8.4	815.4	839.9	3.1	843.0	3.1	843.0
	9385	823.0	9.0	814.0	8.9	814.1	838.6	3.1	841.7	3.1	841.7
	9220	822.0	9.3	812.7	9.1	812.9	837.6	3.1	840.7	3.1	840.7
	9025	821.0	9.0	812.0	8.9	812.1	836.6	3.1	839.7	3.1	839.7

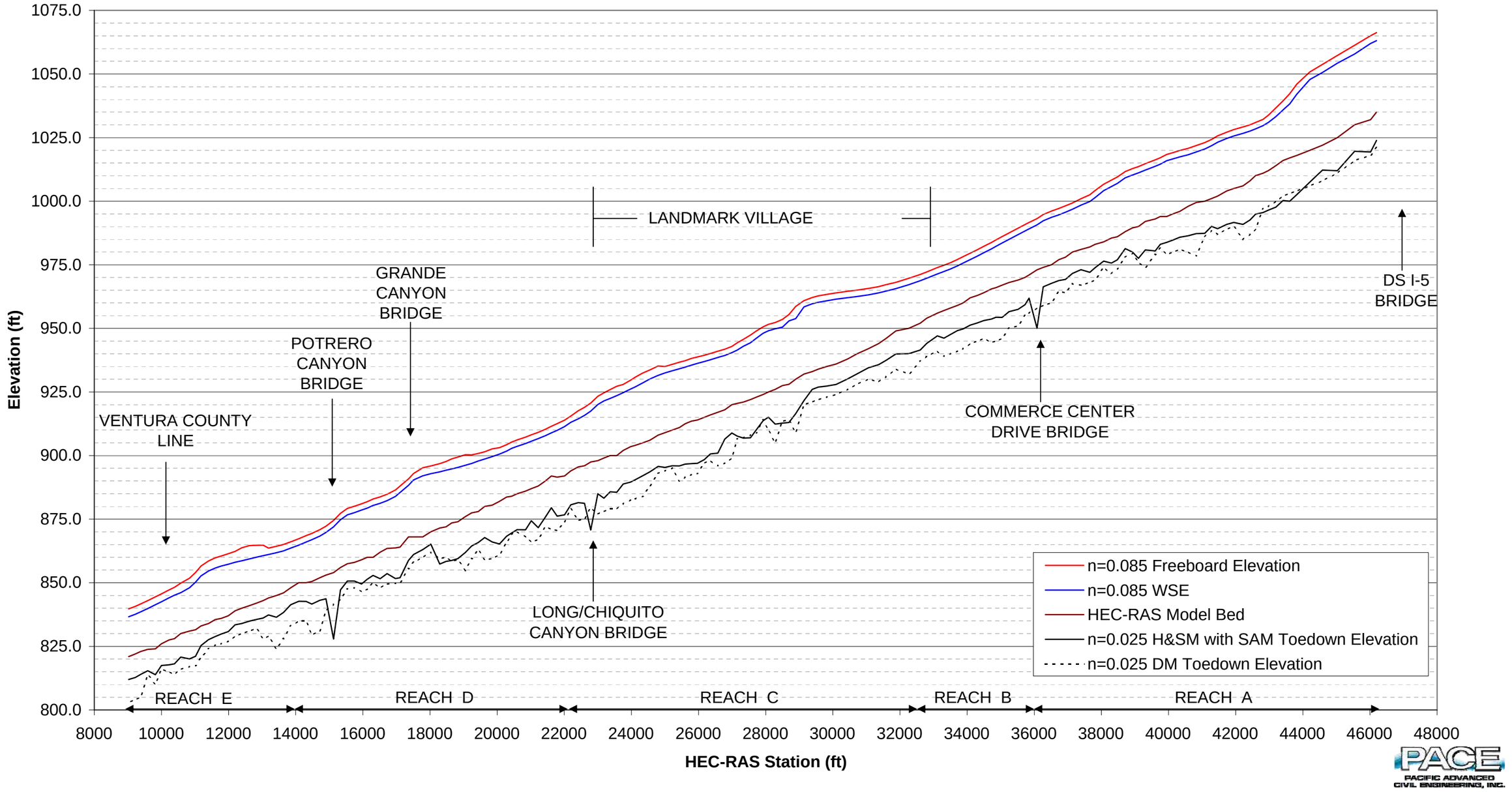
1 - Phase 1 Analysis

2 - Minimum 1999 Bed Elevation

3 - Toe-down based on LA County Hydrology & Sedimentation Manual; Freeboard based on max of LA County Hydrology & Sedimentation Manual and LA County Design Manual, as per Hydrology & Sedimentation Manual

4 - Final design of levee will include detailed bridge analysis

Figure A6.3: Santa Clara River Appendix 6 Summary of Proposed Conditions Outside Curved Reach Toedown & Freeboard



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