WEST Sacramento Levee Improvement Program

Board of Senior Consultants

Comments and Recommendations Following Meeting No. 1 of the Board of Senior Consultants on September 29-30, 2009

Report Prepared by:

Board of Senior Consultants:

Dr. David T. Williams
Dr. Ray E. Martin
Mr. George L. Sills

October 23, 2009

October 21, 2009

Mr. Ken Ruzich
General Manager
West Sacramento Area Flood Control Agency (WSAFCA)
1110 W. Capitol Ave.
Sacramento, CA 95691

Dear Mr. Ruzick:

I. Introduction

This report presents the comments and recommendations for the West Sacramento Levee Improvement Program by the Program's Board of Senior Consultants (Board) following a meeting held for the Board on September 29-30, 2009. This meeting was the first formal meeting of the Board and was held to provide initial information to the Board to facilitate expert, independent review to WSAFCA and its partners of the analyses and designs being developed as part of the effort to provide 200-year flood protection to the Program.

During this meeting, presentations were made to the Board regarding the following subjects (the agenda is attachment 1):

- Draft Problem Identification Report (HDR)
- Draft Alternatives Analysis Report (HDR)
- Survey Control (KSN)
- Hydraulic Analysis Report (MBK)
- Introduction to EIP sites (DWR, RD 900, HDR)
- CHP Academy EIP Site

    1. Geotechnical Basis of Design (Kleinfelder)
    2. 60% Plans & Specifications (HDR)

- Rivers EIP Site

    1. Geotechnical Basis of Design (Kleinfelder)
    2. 60% Plans and Specifications (HDR)

A site visit to project site was conducted on September 30, 2009. The following comments are related to the documents reviewed before the meeting, the issues raised during the meeting, and BOSC responses to the "Charge to the Board" shown in Attachment 3.

II. General Comments

A. The proposal by NWH for refinement of the wind and wave analysis for the CHP site appears reasonable.

B. The Board would like to have assurances that the hydraulic models will be properly adjusted in conformance to the adopted datum.

C. WSAFCA is urged to coordinate with SAFCA at locations that both have levees being raised in adjacent areas.

D. The Board would like to see the planned coordination activities related to the Emergency Action Plans (EAP) as well as the preliminary, draft and final EAP documents.

E. The Board would like to see the efforts by MBK to make adjustments to their hydraulic models to account for sea level rise (per requirements by the COE).

F. The Board would like to examine the Risk and Uncertainty Analysis being performed by MBK.

The following are specific comments related to submitted reports and plan documents.

III. Alternatives Analysis (AA) Report by HDR

A. The "References" cited in this report should be corrected to the correct numbering.

B. A more thorough review will be made later.

IV. Kleinfelder Geotechnical Basis of Design Reports (BOD)

A. General

1. The purpose of the Alternatives Analysis (AA) is *"This report analyses the system problems and opportunities and expresses desired outcomes as planning objectives."* The recommended alternatives included in the AA should be noted in the BOD reports.

2. The permeability values selected for the various fine grained soils appear to be too high by perhaps an order of magnitude. The geotechnical engineer should review these values against published values for similar soils. The impact of lowering the permeability by an order of magnitude should be tested in sensitivity analyses for various reaches to evaluate the impact.

The use of a no flow boundary on the landside edge of the seepage models rather than a constant head boundary needs to be reanalyzed. The designer should make analyses using a "no flow" boundary condition and compare it to a "constant head" boundary at the same location. The screen that allows the designer to view the flow arrows should be viewed and compared. Then the distance from the levee toe for each condition should be shortened and compared. A recent draft paper titled "Levee Seepage Analysis using Blanket Theory and Finite Element Analysis" (see references section) is a good reference that discusses some of these issues. This paper generally discusses comparison of a blocked exist comparison and compares areas of New Orleans where the general location of the "constant head" area is known. In areas like West Sacramento where this is not known, the "no flow" assumption at great distances may be the appropriate assumption. By examining the flow arrows, this may be better determined. The geotechnical engineer should re-evaluate several reaches to evaluate the impact. In all areas, some sections should be checked using USACE blanket theory.

3. Additional subsurface investigation should be considered in any reach where it becomes apparent that insufficient information is available to adequately defend a technical decision. CPT's are likely the best choice for "filling in the data gaps" since they can be performed quickly at a relatively low cost compared to the potential construction cost savings that may be achieve.

4. Cross section should be developed using test borings and CPTs located at the section of within 100 ft from the section. Plotting borings and CPTs located up to 1,000 ft from the section is not acceptable and could lead to false conclusions. If additional data is needed to complete a perceived critical cross section, it should be obtained along the cross section.

5. The geotechnical engineer should make an effort to obtain all available data from other sources to enhance the quality of product. The missing construction data, apparently available from the Corps, concerning the 1999 construction of the soil bentonite (SB) wall and drained stability berm at the CHP Academy Site is a case in point.

6. Because the levee will be constructed with clay material, there is no need to show, or have constructed, the complex section for the levee-SB wall detail shown in design documents.

7. Why are settlement plates being required? SAFCA, in their levee improvement project utilized plates and found that there was insignificant settling after 30 days and longer.

8. Cut-off walls in excess of 95 feet can be and have been properly constructed using a combination of a longarm trackhoe and crane with a clam bucket working together.

9. Where practical, landside levee slopes should be a minimum of a 1V on 3H slope.

V. CHP Academy Site

A. Sacramento Bypass South Levee

1. The location of the transition from a deep (EL -45) SB wall to a shallow (El +5) SB wall at Station 47+00 appears to be arbitrary. Based on the data available, it can be argued that this transition should occur anywhere between about Station 37+00 to 54+00. This appears to be an example of a case where additional CPT data would be very helpful. There are no field investigation data from about Station 36+50 to about Station 45+50. CPT soundings, at 200-foot intervals, in this range would be very helpful in evaluating this reach of levee. From Station 46+00 to 54+00, there appears to be sufficient data but it should be reevaluated after the additional CPT data is obtained prior to making a final recommendation on the location of the transition. Why specify a 1 on 5 trench slope in this area? A much flatter one would be as good and easier to construct.

2. The recommended overlapping of the existing SB wall with the proposed SB wall by 300 feet appears excessive since it is based upon the premise that the location of the end of the existing SB wall is not known precisely. Every effort should be made to obtain information from USACE to locate this trench. Then test pits should be excavated to determine the location. Consideration should also be given to making a direct connection with a perpendicular SB wall that extends beyond the base of both walls by about 10 feet. This would require construction of a platform across the existing SB wall at the levee degrade elevation.

3. The condition of the drain under the berm that has been hypothesized to be clogged should be exposed in several test pits to evaluate its condition before concluding that it must be assumed to be clogged in the seepage analysis. Also, designers should perform a check to insure that the material that was placed in this berm meets current day requirement and is engineered properly.

4. Consideration should be given to the need, or not, of a drain under the concrete slope protection.

B. 90% Draft Specifications

1. General, Para. 1.1. In the third paragraph, last sentence “whall” should be “shall”. In the last paragraph, restoration material is said to come from a borrow area. What about material from the levee degrade?

2. Submittals, Para. 1.6. Numerous submittals are referenced “for approval”, recommend as many of these as can be changed to “for information only”. We have told them in the Specs what we want, it is up to the Contractor to provide it and the owner can be held responsible if they approve something and it does not work.

3. Qualifications, Para. 1.7.1. Permeability is listed as $5x10^{-7}$ cm/sec; I would recommend what is more standard specification $1x10^{-6}$ cm/sec.

4. Bentonite, Para. 2.2. Recommend including the term "or equivalent" after the term "premium grade Wyoming-type bentonite".

5. Soil, Para. 2.8. These sieve requirements are very restrictive and unnecessary; would recommend the designer to change the No. 40 to read "25 – 90", and the No. 200 to read "20 - 60".

6. A paragraph about "Soil Bentonite Trench Backfill" should be added within this Number 2 section. This paragraph should include recommendations for uniformity, maximum particle-size, slump, and unit weight.

7. General Para. 3.3.1. Recommend that the designer change the permeability to $1 x10^{-6}$ cm/sec.

8. Trench Excavation Para. 3.3.2. The lead-in trench appears steep, designer should consider 2H: 1V. The requirements for a step down in the trench bottom should be added to this paragraph. More overlapping requirements should be added to the last paragraph of this write-up.

9. Mixing Backfill, Para. 3.3.9. Why was a clay-lined and bermed impoundment excluded?

10. Placement of Backfill, Para. 3.3.10. Designer should consider the above referenced lead-in trench recommendation.

11. A paragraph about "Reconstructing Levee in Case of Highwater" should be added within this Number 3 section.

12. SB slurry cutoff Trench Construction, Para. 3.4.2. The designer should consider removing the requirement for a piece of equipment to dig the full depth in a single pass. With today's technology, two pieces of equipment can be used and still construct a good trench.

13. Mixing and Delivering Slurry, Para. 3.4.3. The Agency is to approve this equipment. Why? The Specifications clearly tell the contractor what they are required to perform. They are in the business to build trenches and know how to get this done. If you want to look at it, then put it in as "Information Only".

14. Permeability, Para. 3.5.3. Recommend that the designer change the permeability to 1 x10-6 cm/sec.

15. Wet-Bulk Sampling, Para. 3.7.2. It appears contract has excessive sampling requirements.

16. Slurry Properties, Para. 3.8.4.3. Sampling depths should be changed to require a sample taken at 10 ft., mid-depth, and 5 ft. from trench bottom.

17. Slump Testing, Para. 3.8.4.5. Slump is to be between 5 to 7 inches; designers may want to consider 4 to 7 inches.

C. Volume 1

1. Existing Cutoff Walls, Para 2.7.1. Designers should find what type material was used for the construction of these slurry walls.

2. Existing Stability Berms and Drains, Para 2.7.2. The types and specification for this material should be determined and the designer should determine if they meet current standards.

3. Table 4.1. Why is the "Exploration Location Device" listed as "Unknown"?

4. It would appear that Tables 5.9, 5.14, 5.19, and 5.24 could be combined for easier comparison. Likewise Tables 5.10, 5.11, 5.12, and 5.13; Tables 5.15, 5.16, 5.17, 5.18; Tables 5.20, 5.21, 5.22, 5.23; Tables 5.25, 5.26, 5.27, 5.28; and Tables 5.31 series

5. Cutoff Wall Windows, Para 5.2.5. Recommend designers consider a positive connection rather than an overlap be constructed at this site.

6. Slurry Cutoff Wall Design, Para. 6.6.1. Consider a permeability of 1 x 10^{-6} cm/sec. The report discusses large settlements on the order of 1 foot per 20 feet of depth that has been documented by USACE. Could the BOSC be furnished a copy of this data to review? Also, the work at Natomas is referenced with respect to the time of consolidation, but not with respect to the amount of settlement.

7. Embankment Fill Material, Para 6.8. Recommend CH material, with LL < 55, be added and SM material be deleted. The California Code of Regulations, Title 23. Waters, Division 1. Reclamation Board, Article 8 Standards, Section 120. Levees, Subsection (a), Page 4.15. states "(12) Impervious material, with twenty (20) percent or more of its passing the No. 200 sieve, and having a plasticity index of eight (8) or more, and having a liquid limit of less than (50), must be used for construction of new levees and the reconstruction of existing levees. Special construction details (e.g., 4:1 slopes) may be substituted where these soil properties are not readily attainable. Where the design of a new levee construction utilizes zones of various requirements of this subdivision does not apply." The Agency should be requested to permit use of material with LL < 55 since a 3H on 1V levee slope will be used we would really be in compliance with these rules. This has been requested and approved in other local projects.

8. Table 6.3. Designers should consider changing LL to < 55 and PI between 8 - 40.

9. Compaction Requirements, Para. 6.9. The designers should consider moisture between -1 to +3 of optimum moisture content.

10. Table 6.5. Why are vibrating wire piezometers specified? Open tube type of piezometers, as listed in the document, are more appropriate.

D. Volume 1 and 2, CHP Academy Site, Appendices

1. Appendix B, CUTX Tests. The test on Plate B-5 does not list the total and effective stress parameters. Could these be added as shown on Plate B-4.?

2. Appendix D, Analysis Parameters Selection. The section titled Analysis Methodology in Appendix D1 should be modified if it is decided that the present use of a no flow boundary at the land side boundary is found to be inappropriate.

3. Appendix D, Analysis Parameters Selection. Appendix D2 is titled Strength Parameter Selection for Stability Analyses. Correlations for cohesionless soils are discussed. It appears that no distinction is made between the N-values obtained when using the SPT, California or Modified California samplers in conjunction with the use of the SPT hammer energy to drive these samplers. Since these different samplers produce different uncorrected N-values in the same material it seems inappropriate to use them interchangeably. It appears they should be separated into three separate data bases. The geotechnical engineer should review this practice and provide an explanation.

4. Appendix D, Analysis Parameters Selection. The selection of shear strength parameters is somewhat confusing. It appears that the effective friction angles were selected based solely on correlations with N-value data rather than considering laboratory test data. Also, if the soils are saturated and normally consolidated shouldn't the effective cohesion be assumed to be zero (0)? The second line in Table D2.3 lists the cohesion in ksf rather than psf. Also, why is boring 93-2A not included?

5. Appendices F through N Plates should be presented to include sections with proper borings so that the BOSC can evaluate stratification. Why are vertical stratification changes used? The natural soils could not possibly exist as shown. Wouldn't sloped stratification lines be more realistic? Also, would it not be appropriate to a assume cohesion = 0 psf in these analyses? The design strengths used in the analysis needs to be explained. For example, the drain rock has a phi angle of 36, and the SM has 35. Does the designer really think that these are appropriate strengths? Please explain how the phreactic surface shown within the levee sections were developed.

VI. The Rivers Site

A. Sacramento River West North Levee

1. Cross section A-A' at Station 87+50 includes four borings, KRV-09-11B, -12B, -13B, and -14B, which have been projected to the section from 650 to 1100 feet

downstream. There is no justification for this projection. If additional borings or CPTs are needed to define the section, they should be obtained.

2. During the meeting, it was noted that the seepage analysis for Cross section A-A' was completed by assuming that only the 5-foot thick upper Stratum 3, defined as weathered clay, was the blanket. The underlying Stratum 4 was defined as sandy silt with 50 to 70 percent fines. It is apparent from CPT WM0004_004C that both Stratum 3 and 4 are the same material. If they were both assumed to have a permeability of $1x10^{-5}$ cm/sec, the blanket would be about 22 feet thick. Based on the present assumption, a SB wall to El -95 is required. It is likely that if the blanket is assumed to be 22 feet thick, that this SB wall may not be necessary. The geotechnical engineer should reconsider this cross section based on the suggestions noted above.

3. From levee Stations 102+00 to 115+00, studies along River Crest Drive should be conduct to determine the most cost effective method of providing adequate underseepage protection. A relief well system should be considered.

B. Volume 1

1. General. Why is the format for this report different from the format of the CHP report? Recommend using one format for all these reports, and the CHP report seems to have a good format.

2. Table 2.6. Expanding this table to include the exit gradients in table 2.7, 2.8, and 2.9 would make for easier review.

3. Table 2.10. Combining this table with Table 2.12, 2.14, and 2.16 would make for easier review.

4. Table 2.11. Combining this table with Table 2.13, 2.15, and 2.17 would make for easier review.

5. Soil-Cement Bentonite Cutoff Wall, Para. 3.5.1. The designers should consider a permeability of 1×10^{-6}.

6. Soil-Bentonite Cutoff Wall, Para. 3.5.2. The designers should consider a permeability of 1×10^{-6}. This paragraph also discusses settlement of a SB Cutoff Wall in the order of 1 foot of settlement per 20 feet of wall depth and references USACE. Could the BOSC be furnished of this report? Also, this paragraph references the short duration of settlement measured in the Natomas project, but does not mention the relatively small amount of settlement.

7. Embankment Fill Criteria, Para. 3.7. This paragraph lists SM as acceptable Levee embankment. The designers should consider eliminating this material and adding CH with LL < 55.

8. Table 3.3. Designers should consider revising of LL and changing PI to 8-40.

9. Compaction requirements, Para. 3.8. Designers should consider modification to the moisture content range as discussed above.

10. Instrumentation, Para. 3.10. Why are settlement plates planned?

11. Table 3.5. Why are vibrating wire piezometers proposed?

12. Typical Cutoff Wall Configuration, Plate 3-1 and 3-2. Designers should reconsider impervious clay cap detail. The material the clay cap will be made out of the material the levee will be made of will be so close to the same that you cannot tell them apart. The Designer will just be charging an excessive fee.

13. Typical Piezometer Detail, Plates 3-4a and 3-4b. The three piezometers are shown installed in one bore hole. This is not even legal in most states. Each piezometer should have its own bore hole.

C. Volume 1 and 2, Appendices

1. Appendix D, Analysis Parameters Selection. Appendix D1 is titled Seepage Analysis Parameters Selection. Hydraulic conductivity, k, values are noted to have been developed for the Natomas Levee Improvement Program. The issue of apparently low k values for fine grained soils, silts and clays, was raised previously. The appendix discusses anisotropy and notes that kv/kh = 0.25 (kh/kv =4) was used in the seepage analysis for low to medium plasticity clays, silts, sands and silty sands, and sands and clayey sands. The presence of sand layers in a silt or clay stratum, or silt or clay layers in a sand stratum will cause the kh value to be higher than kv value for the overall stratum. However, some borings suggest that some layers are very uniform. In Cross Section A-A' at Station 87+50, Stratum 5 is illustrated in Boring K7B-07-7B, CPT WM0004_004C and CPT WM0004_020C. The CPT logs and fines content included on the boring log suggest that the soil is poorly graded sand (SP) and layers of silt are not indicated. The data from the boring and CPT's suggest that Stratum 5 at this section should perhaps have a kv/kh ratio of 1, rather than 0.25. The geotechnical engineer should review this condition and data from other reaches to be sure that the present general assumption of kv/kh = 0.25 is reasonable in all cases. A sensitivity analysis is recommended to evaluate the impact of this change on the results of the seepage analysis. A brief literature review, which contains different references then cited in Appendix D1 and is in the reference section for your review.

2. Appendix D, Analysis Parameters Selection. The section titled Analysis Methodology in Appendix D1 should be modified if it is decided that the present use of a no flow boundary at the land side boundary is found to be inappropriate.

3. Appendix D, Analysis Parameters Selection. Appendix D2 is titled Strength Parameter Selection for Stability Analyses. Correlations for cohesionless soils are

discussed. It appears that no distinction is made between the N-values obtained when using the SPT, California or Modified California samplers in conjunction with the use of the SPT hammer energy to drive these samplers. Since these different samplers produce different uncorrected N-values in the same material it seems inappropriate to use them interchangeably. It appears they should be separated into three separate data bases. The geotechnical engineer should review this practice and provide an explanation.

4. Appendix D, Analysis Parameters Selection. The selection of shear strength parameters is somewhat confusing. It appears that the effective friction angles were selected based solely on correlations with N-value data rather than considering laboratory test data. Also, if the soils are saturated and normally consolidated shouldn't the effective cohesion be assumed to be zero (0)?

5. Appendix D, Analysis Parameters Selection. The second line in Table D2.3 lists the cohesion in ksf rather than psf.

6. Appendix D, Analysis Parameters Selection. All borings are plotted on Figures D2-2 through D2-10, the Correlated Effective Friction Angles figures. Because there is a large difference between stresses under the center line of the levee and the levee toe, these borings should never be correlated together. Also, the designer should consider that when too many borings are plotted together, the designer could over look a small, weak area.

7. Appendix D, Analysis Parameters Selection. Tables D2.4 through D2.6. Explain the terminology "Estimated Based on Engineering Judgment".

8. Appendix F through N, General. Sections should be drawn with appropriate borings so that the BOSC can determine if proper stratifications have been used. Why are vertical stratification changes used? The natural soils could not possibly exist as shown. Wouldn't sloped stratification lines be more realistic? Also, would it not be appropriate to a assume cohesion = 0 psf in these analyses?

9. Appendix F, General. As mentioned earlier, the permeability used throughout this report appears high.

10. Station 87 + 50. These analyses were performed assuming a thin river side clay blanket. Are the designers sure this will be present?

11. On Section 87 + 50 and 97 + 50, the Slurry Trench appears located on the more land side of the levee, rather than at the center line or toward the river side; please explain.

VII. References

Brandon, T. L., Batool, A., & Jimenez, M. (2009, Sept). Draft. Levee Seepage Analysis using Blanket Theory and Finite Element Analysis. Report submitted to the U. S. Army Corps of Engineers, Vicksburg District, by the Dept. of Civil and Environmental Engineering, Virginia Tech.

Boynton, S. S., & Daniel, D. E. (1985). Hydraulic conductivity tests on compacted clay. *Journal of Geotechnical Engineering , Vol. 111* (No. 4), 465-478.

Carlson, D. (2007). Estimate of Vertical Anisotropy of Hydraulic Conductivity for Northern Louisiana Aquifer from Grain-Size Data. *2007 First Annual Louisiana Groundwater Symposium Transactions*.

Chan, H. R., & Kenney, T. C. (1973). Laboratory Investigation of the permeability ratio of New Liskeard Varved Soil. *Canadian Geotechnical Journal , Vol. 10*, pp. 453-472.

Ladd, C. C., & Wissa, A. E. (1970). *Geology And Engineering Properties of Connecticut Valley Varved Clays With Special Reference To Embankment Construction.* Research Report R70-56, Soils Publ. 264, Massachusetts Institute Of Technology, Department of Civil Engineering.

Mitchell, J. K. (1956). The Fabric Of Natural Clays And Its Relation To Engineering Properties. *Proceedings Of The Highway Research Board , Vol. 35*, pp. 693-713.

Morgenstern, N. R., & Tchalenko, J. S. (1967). Microscopic Structure in Kaolin Subjected To Direct Shear. *Geotechnique , Vol. 17* (No. 4), pp. 309-328.

Olse, H. W. (1962). Hydraulic Flow Through Saturated Clay. *Proceedings Of The Ninth National Conference On Clays And Clay Minerals* , pp. 131-161.

Witt, K. J., & Brauns, J. (1983). Permeability Anisotropy Due To Particle Shape. *Journal of Geotechnical Engineering , Vol. 109* (No. 9), pp. 1181-1187.

VIII. Closing Remarks

The Board has not had time to review all the pertinent documents therefore cannot make a final determination of the adequacy of the design(s). However, the Board feels that from the review of the documents to date and the progress presented in the meeting, the project is well designed and well thought out. The comments and suggestion presented in the report are meant to enhance the project for efficiency and safety. When the additional documents and plans are reviewed, the Board will present another report.

The Board appreciates the efforts of the design team members who prepared and presented numerous valuable summaries of the designs completed to date. The various

presentations and discussions were informative to the Board and helped introduce and clarify the design teams' thought processes. The field trip was also very much appreciated.

The Board looks forward to future meetings, briefings, and discussions on this project.

Very truly yours,

West Sacramento Levee Improvement Program
Board of Senior Consultants

_____	_____
Dr. David T. Williams, P.E. CFM.	**Mr. George L. Sills, P.E.**

_____
Dr. Ray E. Martin, P.E.

Attachments:

Attachment 1: Meeting Agenda
Attachment 2: Charge to the Board
Attachment 3: Instructions to the Board

WEST SACRAMENTO AREA FLOOD CONTROL AGENCY
MEETING AGENDA

WEST SACRAMENTO LEVEE IMPROVEMENT PROGRAM
BOARD OF SENIOR CONSULTANTS
MEETING NO. 1

Date:	September 29-30, 2009	
Time:	8:00 am to 5:00 pm	
Location:	City of West Sacramento City Hall 1110 West Capital Ave., Room 157 West Sacramento, CA 95691	Overflow Parking 1020 West Capital Ave. West Sacramento, CA 95691

DAY 1

II. INTRODUCTION **8:00 AM**

- Welcome and Opening Remarks (WSAFCA)
- Meeting Purpose & Expectations (MBK)
- Agenda Overview (HDR)

III. PROGRAM OVERVIEW **8:30 AM**

- Draft Problem Identification Report (HDR)
- Draft Alternatives Analysis Report (HDR)
- Survey Control (KSN)
- Hydraulic Analysis Report (MBK)

IV. LUNCH *(Catered in City Hall)* **11:30 AM**

- Introduction to EIP sites (DWR, RD 900, HDR)

V. EIP PROJECT REVIEW **1:00 PM**

- CHP Academy EIP Site
  - Geotechnical Basis of Design (Kleinfelder)
  - 60% Plans & Specifications (HDR)
- Rivers EIP Site
  - Geotechnical Basis of Design (Kleinfelder)
  - 60% Plans and Specifications (HDR)

DAY 2

VI. EIP SITE VISIT *(Meet @ City Hall)* **8:30 AM**

- CHP Academy EIP Site
- River EIP Site

VII. LUNCH/BOSC Working Session **11:30 AM – 2:30 PM**

- Note: Design team to be available, as needed, to address BOSC questions

VIII. REVIEW COMMENTS **2:30 PM – 4:30 PM**

- Overview of Comments
- Comment Clarification & Discussion
- Summary of Actions for Comment Resolution

IX. CONCLUSIONS & ACTIONS **4:30 PM – 5:00 PM**

WEST SACRAMENTO LEVEE IMPROVEMENT PROGRAM
BOARD OF SENIOR CONSULTANTS

CHARGE TO THE BOARD

The West Sacramento Area Flood Control Agency (WSAFCA) has assembled this Board of Senior Consultants (Board) to conduct an independent and external expert review of the levee improvements under design by the WSAFCA and its consultants for construction. The Board is charged with confirming that the design investigation and analysis and associated recommendations for levee improvements at each site are acceptable for providing 200-year level of flood protection in an urban environment. The Board shall consider current and relevant regulations, policy, standards, and guidance for the design and construction of flood protection measures in rendering its opinion. The Board shall document its findings that will include, but is not limited to, responding to the instructions provided by WSAFCA. WSAFCA shall be responsible for providing the Board with instructions, the historic data and records, programmatic or planning studies, and design phase data and documentation necessary to understand the technical context and natural setting within which the levee improvement recommendation has been proposed.

WEST SACRAMENTO LEVEE IMPROVEMENT PROGRAM
BOARD OF SENIOR CONSULTANTS

INSTRUCTIONS TO THE BOARD

Note: the Board responses are in Bold

WSAFCA requests that the Board specifically consider the following concerns:

1. Has sufficient geotechnical data (quantity and quality) been collected to adequately characterize each EIP Site and support the levee improvement design alternative recommended?

   For a 60% design level, the Board feels that the geotechnical data is sufficient. However, there appears to be data gaps that should be filled in before the final design is complete. Also, there appears to be opportunities that additional data would help provide a more efficient and cost effective project as discussed in the meeting report.

2. Are the stability and seepage models assembled analyzed for the geotechnical bases of design - including model stratigraphy, material strengths and hydraulic conductivities - considered legitimate representations of the boring log, cone penetration test, and laboratory data collected from the project locations?

   See section "Closing Remarks" from the meeting report.

3. Is the progressive failure analysis for the steady-state condition at the Rivers EIP site viewed as a satisfactory surrogate to flattening the landside slope further to prevent steady-state failures?

   For this widened levee area (Rivers EIP), this appears to be reasonable.

4. Is the hydraulic modeling and the data and assumptions upon which it is based sufficient to establish a 200-year design water surface elevation for the design of the proposed levee improvement projects?

Based upon the initial assessment of the hydraulic models, the design water surface elevations for the 200-year event appear reasonable. However, a more detailed examination of the UNET models needs to be performed.

5. Is the wind and wave analysis sufficient to support the levee crown elevation selected at each site to support providing a 200-year level of flood protection?

A proposal on the methodology has been recently presented to the Board so this item cannot be assessed at this time.

6. Can the recommended construction technique reliably meet the performance specifications necessary to correct the identified levee deficiencies?

If the recommended designs are properly constructed, the Board generally thinks that the levee deficiencies will be corrected. As outlined in the BOSC meeting report, other suggested techniques should be considered.

7. Is the interim level of flood risk increased due to the proposed project termination points? Are any levee deficiencies magnified or created at the temporary or permanent limits of construction?

At the termination of the CHP Academy's levee at the Sacramento River, this corner should be analyzed to insure that the project is not adversely increased under seepage gradients within this corner. Also, the proposed SB wall overlap at this location should be examined per the "Additional Comments" section.

8. Are there any concerns with the recommendations made regarding the permanent relocation and/or replacement of subsurface utilities at each site? Are there any concerns with other surface constraints/encroachments during construction or as part of the proposed post-construction condition at each site?

At this initial meeting, based upon the scant information presented, the Board did not express any concerns. However, the design team should strive to meet current COE criteria.

In providing commentary on these and other matters related to the documents reviewed for these projects, please provide the following where possible:

- A clear statement of the degree of concern;
- The basis of the concern;
- The significance of the concern; and
- The actions needed to resolve the concern

See next section statement

Conclusion statement of the BOARD

Based on the material presented at the initial meeting, the Board did not see any major concerns that would delay the project. Most of the comments described in the meeting report were provided to potentially reduce construction time and costs. The significance of the concern and actions needed to resolve the concerns are presented in the meeting report.