CALIFORNIA CENTRAL VALLEY
FLOOD CONTROL
ASSOCIATION

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January 20, 2011

Via email: DeltaPlanComment@deltacouncil.ca.gov

Delta Stewardship Council
980 Ninth St., Ste. 1500
Sacramento, CA 95814

SUBJECT: Comments on Flood Risk White Paper

Dear Council Members:

The attached comments are submitted on behalf of the California Central Valley Flood Control Association (CCVFCA) on the Delta Stewardship Council's (DSC) Flood risk White Paper.

The CCVFCA appreciates the time and effort the DSC has invested in preparing the Delta Plan, including the level of effort devoted to flood protection, control, management and levee design issues. Since 1926 the CCVFCA has been actively involved in advancing and advocating for effective flood protection and management throughout the Central Valley, including the Delta and its members will be greatly affected by the actions, projects and plans that the Council undertakes pursuant to the development of the Delta Plan.

We have organized the attached comments by page number with supporting documentation to correct deficiencies in the white paper regarding current condition of Delta levees, areas experiencing ongoing subsidence, relying on inaccurate information in DRMS, and general sustainability of the Delta.

We appreciate the opportunity to provide these comments and would be glad to provide greater detail on any particular issue if requested. If you have any questions regarding these comments, please contact CCVFCA's engineer, Gilbert Cosio, at (916) 456-4400.

Sincerely,

Melinda Terry
Executive Director

Comments to the Flood Risk White Paper Delta Stewardship Council October 18, 2010

1. Page No. ES-1, Lines 22 through 29: This section discusses the un-sustainability of business as usual. One of the problems with the recent studies that have been performed on Delta levees is that they don't adequately look at the state of the levees in the mid-1980's and the improvements to the levees after the increased funding provided by SB34 and subsequent legislation. This is a key issue due to the fact that the increased funding provided by Props 1E and 84 (2006) will set the stage for future levee condition. The fact of the matter is at the end of the 2006 proposition funding, levees will be in a much more advanced state. This should be considered by the Delta Stewardship Council in the development of its plan. Plate 1 shows the major improvements within the past 20 years where central Delta levees have been raised several feet in some areas. Based on these types of improvements and funding provided over the past 20 years, we are confident the levees will be in a much better state following expenditure of Propositions 1E and 84 funding.

2. Page No. ES-2, Lines 27 through 33: This section deals with the question on who owns levees in the Delta. Lines 27 and 28 indicate that in some instances the reclamation district owns the levee. In regard to our experience, there is only one reclamation district that actually owns the property under a levee. All the others have written or implied easements authorizing them to operate and maintain the levee but do not have fee title of ownership.

3. Page No. ES-3, Lines 8 through 11: These lines answer the question regarding the effect of sea level rise on the Delta levees. We would like to inform the Delta Stewardship Council that reclamation districts are planning for sea level rise. In fact, under the State Delta Levees Program, studies have been performed defining the amount of work that must be performed to keep up with the sea level rise. The study was conducted under levee engineering grants from the Delta Levees Program. We can provide this study to you if DWR has not already done so.

4. Page No. ES-3 Lines 12 through 18: This question and answer concerns subsidence in whether it is still occurring in the Delta. The answer uses the word, "widespread", in describing the occurrence of peat oxidation in the Delta. This type of description leads one to believe that the entire Delta is subject to oxidation which is not true. We have been reviewing the LiDAR data produced by the Department of Water Resources in 2007. In comparing this elevation data to the USGS Quadrangle maps, which were surveyed between 1974 and 1976, we have found that in over 30 years between the two surveys, subsidence did not occur in areas that are currently at elevation minus 10 feet below sea level, and above. In fact, in regard to problems associated with subsidence, such as drainage, we are only finding problems that subsidence is most likely occurring on lands currently below elevation 12 feet NGVD; and in some areas, this may be as low as minus 15 feet NGVD. The attached Plate 2 shows the amount of land in the Delta that is situated below elevation minus 12 feet NGVD. The total acreage when below this elevation is approximately 96,000 acres. Therefore, based on the total acreage of the Delta being approximately 700,000 acres, the actual area that has any possibility of

subsiding at this time is less than 14% of the entire Delta. If lands below elevation minus 15 feet NGVD are the only grounds subsiding at this time, that number drops considerably to 57,000 acres or 8.1% of the entire Delta. Therefore, to use the word, "widespread", in describing the occurrence of subsidence may give the false impression that the entire Delta has issues in regard to subsidence. In addition, for the amount of acres that are actually subsiding, the second question should be whether subsidence effects stability of levees and the answer based on our experience based on surveys and geotechnical evaluation in the Delta is that it does not significantly impact levees. The simple answer is that the subsidence that is currently occurring is situated landward of the effective structural foundation of the levee. There are cases where subsidence is close enough to the levee where it could impact stability but these are not common. We do not believe a stability analysis has ever been performed using real survey data in an area known for subsidence that shows that the subsidence will effect the structural stability of levee. The reports that have been citing the fact that subsidence is a significant stressor are only basing this on theory and not actual data.

5. Page ES-3, Lines 19 through 29: This question and answer discuss the Delta Risk Management Strategy and whether the analysis is acceptable. The answer quotes a section of the CALFED Science Program's Independent Review Panel's of the Revised Phase I Report which indicates that the report is appropriate for informing policy makers and others. However, that quote is taken out of context from the executive summary of the Independent Review Panel's Report. The Report goes on to say in the lines immediately following that quote that, "This conclusion however is subject to some

important caveats. First, the IRP cautions users of this revised DRMS Phase I Report that future estimates of consequences must be viewed as projections that can provide relative indicators of directions of effects, not predictions to be interpreted literally. Second, anyone using the results of the DRMS scenarios must be aware that ecosystem effects are not fully captured in the analysis, and that, in particular, the lack of ecosystem consequences reported does not imply small ecosystem impacts." The IRP Report goes on to describe a lot of the issues regarding DRMS and the error involved in the analysis. The Delta Stewardship Council should be aware of the uncertainties regarding DRMS. Therefore, enclosed as Exhibit A is the entire 20 pages of the IRP Review Panel's Report. Emphasis has been added to draw your attention to important caveats.

6. ES-3, Lines 30 through 41: This question and answer discuss the assistance afforded to Delta levees in the event of a disaster. One form of assistance is from the Federal Emergency Management Agency (FEMA). It describes FEMA grants as pertaining to levees that protect a given area and meet the Hazard Mitigation Plan (HMP) standard. This answer also describes that there are currently very few areas or islands that have all their levees up to this standard. This answer is a little bit deceiving because of the fact that most Delta levees meet or exceed the minimum HMP standard. The issue that came up during the 2005-2006 Flood was that some areas did not specifically meet the HMP standard over 100% of its levee system. However, most non-project levees were brought above the HMP standard during the 1990s. Due to the fact that this standard is a geometric standard, and not a stability standard, districts have to work to maintain this standard. The districts perform work to the standard when enough levee crown has

consolidated below the standard. An example of how close these levees are to meeting the standard is described in Exhibit B. This exhibit is an appeal by a local reclamation district to FEMA for acceptance of their disaster claim due to the fact that their levee met or exceeded the HMP plan over 99.4% of its entirety. In other words, out of 11.2 miles of levee, only 351 feet were found to be below this minimum HMP standard and that most of that was one inch or less below the standard. Enclosed as Exhibit C is a letter from the State Office of Emergency Services (now CalEMA), supporting the district in its request for appeal of the FEMA denial of its claim. Enclosed as Exhibit D is an example of surveys documenting verification of HMP compliance prior to the current flood season.

7. Page No. 2-11, Lines 10 through 23: The list of lands protected by federal project levees is incomplete. The list should include islands such as Pearson District, Tyler Island, Walnut Grove, levees of the Yolo Bypass, Twitchell Island and Maintenance Area 9. This section should also be expanded to discuss the amount of acres protected by these project levees to give an indication of the significance of the project levees on the overall flood protection of the Delta.

8. Page No. 3 -1, Line 11: State Highways 220, 84, and 5 should be added to this list.

9. Page No.3-1 Line 22 and 23: Similar to previous comment regarding unsubstantiated general subsidence data.

10. Page No. 3-8, Lines 14 through 17: These lines discuss the levee failures that occurred in 1997. They state that Table 3-1 does not include failures along the San Joaquin River where it enters the Delta. This is not quite true. Table 3-1 does include levees that are not significant to the water quality of the State because they protect upland areas along the San Joaquin which would drain naturally as the flood waters recede. For instance, in Table 3-1 it cites McMullen Ranch, Paradise Junction, River Junction, Walthall Tract, Weatherbee Lake, and Pescadero Tract. It also lists islands that have either restricted elevation levees or levees that are not designed to withhold flood waters such as McCormack Williamson Tract, Prospect Island, and Glanville Tract. Glanville Tract's back levee is actually a railroad embankment; and therefore, during certain periods of time, it will fail because it is not designed to hold back water. In essence, use of the above islands in estimating future levee breaks is not acceptable since these islands breached for reasons other than failing when water exceeded their design capacity and do not impact the water quality of the Delta.

11. Page No. 5-7, Lines 9 through 30: This section describes the levee risk due to flooding. In our opinion, the DRMS study is erroneous in assuming that the frequency of flooding is directly related to the peak day Delta inflow, especially in the most critical area; the central Delta. In the central Delta the channel hydraulics do not control the flood elevations; rather, the tide and surges from storm systems have a more significant influence. Although inflow is a contributing factor, it is not the predominant factor in the central Delta. Table 1 describes this more clearly, comparing recent high tide elevations at the San Joaquin River at Venice Island and the San Joaquin River at Antioch. Note

that although 1986 was the highest peak day inflow, two other floods that do not even appear on the table. (1998 and 2005) had much higher water levels at these two sites.

12. Page No. 5-23, Lines 14 through 20: This section discusses the assumption that DRMS makes regarding "business-as-usual". This is a key area that the Delta Stewardship Council must open up to additional studies and information prior to the completion of DRMS, and subsequent to DRMS, hundreds of millions of dollars have been spent on Delta levees, an assess that should be made to evaluate the change that this work has made in regard to risk reduction.

13. Page No. 5-25, Lines 8 through 15: This area discusses the zone of influence within which subsidence could cause a problem with levee stability. This is a good point; however, based on previous comments herein, we feel that the estimation of ongoing peat subsidence is overstated in DRMS and other studies.

14. Page No. 5-25, Lines 26-35: This section talks about continued subsidence and long-term ground elevations due to subsidence. There are several problems with the DRMS estimate in regard to long-term subsidence. First, there seems to be no regard to the bottom of the organic layer. For instance, DRMS estimates that by 2100, Empire Tract will have a landside elevation of -30 feet NGVD. In reality, nowhere within Empire Tract does the peat extend below -25 feet NGVD. In addition, there are other factors that would contribute to the cessation of subsidence and areas that are not considered. As ground subsides, areas become too wet to farm; and therefore, farming ceases. These

areas appear sporadically in the current Delta and will continue to expand as subsidence continues. However, once the land is out of production, it remains moist; and subsidence will essentially halt. In addition, at some point, it would become uneconomical to continue farming certain areas because of the cost to keep them dry enough to farm. More studies should be performed in this regard.

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2526/DRAFT COMMENTS FLOOD RISK DELTA STEWARDSHIP COUNSEL OCT 18 2011-01-06.DOC

TABLE 1

Annual Peak Tides in Central Delta Compared To Peak Daily Inflow (February 1986)

San Joaquin River at Venice Island		San Joaquin River at Antioch		
Stage Ft.-NGVD	**Flood "Return Period"**	**Stage Ft.-NGVD**	**Flood "Return Period"**	**Date**
7.04	50	6.37	60	Dec. 2005
7.16	70	6.34	45	Feb. 1998
6.67	20	6.01	17	Feb. 1986

Notes:

1. "Flood Return Period" from stage-frequency curves from "Sacramento-San Joaquin Delta, California, Special Study, Hydrology", U.S. Army Corps of Engineers, February 1992.

2. From the same stage-frequency curves, the 10-year peak annual stage at Venice Island is 6.3 and the 100-year peak annual stage is 7.4.

3. From the same stage frequency curves, the 10-year peak annual stage at Antioch is 5.8 and the 100-year peak annual stage is 6.5.

LOCATION	STATION	100-YR FLOOD (ft - NGVD)	ELEV. PRIOR TO SB 34	RECENT ELEV.
Webb Tract	489+00	6.8	6.1	7.9
Bouldin Island	402+00	7.1	6.4	9.0
Empire Tract	291+00	7.4	6.2	9.0
King Island	267+00	7.5	6.6	9.3
Rindge Tract	75+00	7.5	5.4	8.8
Canal Ranch	70+00	8.5	8.0	9.9

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NO.	DATE	REVISION

DELTA LEVEES PROGRAM
TYPICAL EXAMPLES OF LEVEE IMPROVEMENTS

HISTORIC CROWN ELEVATION COMPARISON

SCALE: 1" = 7000'
JOB NO: 2526
BY: MB/JB
CHK: --
DATE: 01/06/2011

PLATE 1 OF 2 PLATE

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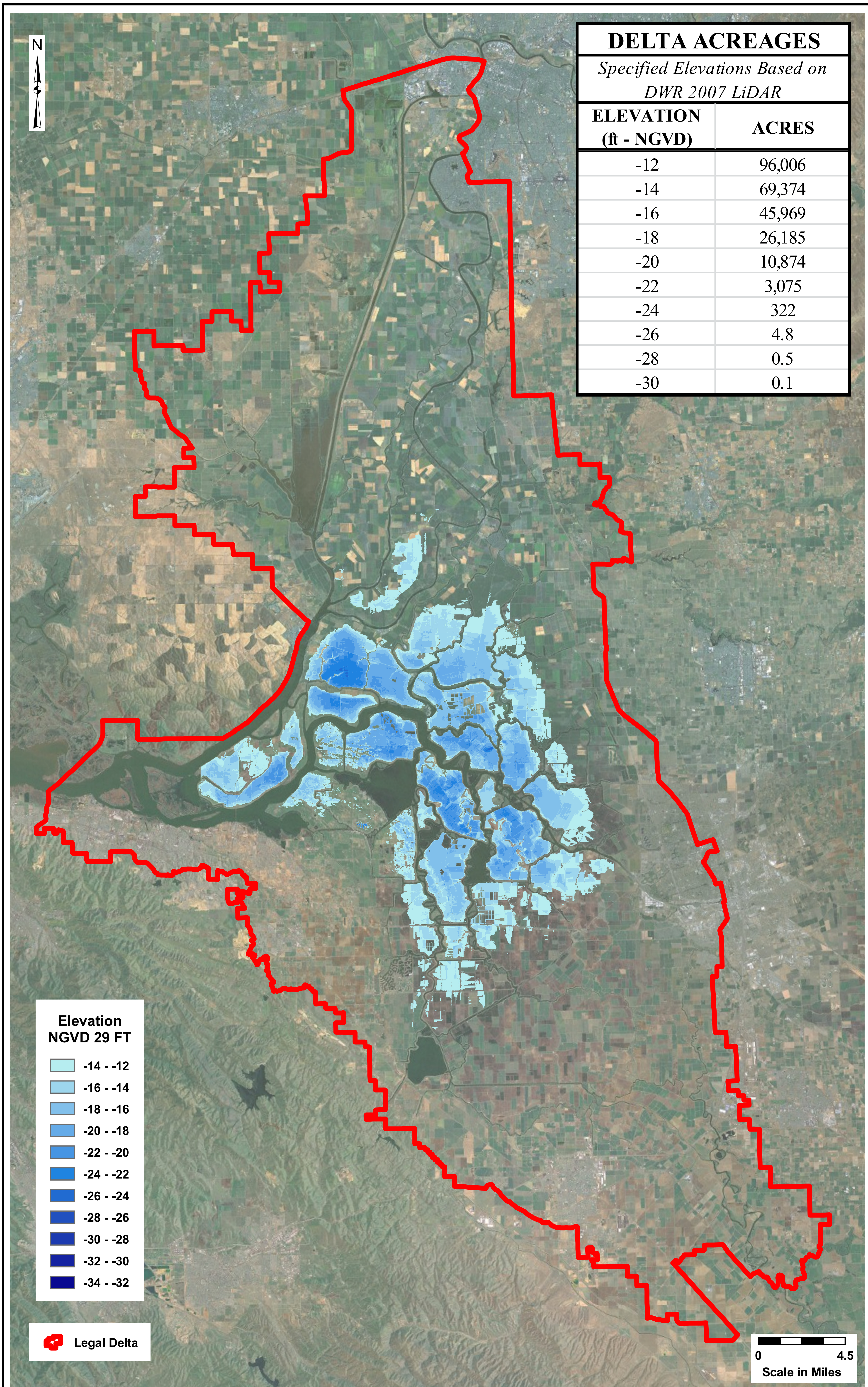

DELTA ACREAGES

Specified Elevations Based on DWR 2007 LiDAR

ELEVATION (ft - NGVD)	ACRES
-12	96,006
-14	69,374
-16	45,969
-18	26,185
-20	10,874
-22	3,075
-24	322
-26	4.8
-28	0.5
-30	0.1

Plate 2

EXHIBIT A

Review of the Delta Risk Management Strategy Phase 1 Report (Draft 4)

(URS Corporation/Jack R. Benjamin & Associates, Inc., July 16, 2008)

Submitted to the CALFED Science Program **by the**

CALFED Science Program Independent Review Panel

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October, 2008

EXECUTIVE SUMMARY

The CALFED Science Program's Independent Review Panel's (IRP) review of the revised Delta Risk Management Strategy (DRMS) Phase 1 Report concludes that the DRMS analysis is now appropriate for use in Phase 2, and is now acceptable for use as a tool for informing policymakers and others regarding potential resource allocations and strategies to address risk in the Delta region. This conclusion, however, is subject to some important caveats. First, the IRP cautions users of this revised DRMS Phase 1 Report that future estimates of consequences must be viewed as projections that can provide relative indicators of directions of effects, not predictions to be interpreted literally. Second, anyone using the results of the DRMS scenarios must be aware that ecosystem effects are not fully captured in the analysis, and that, in particular, the lack of ecosystem consequences reported does not imply small ecosystem impacts. Rather, the IRP notes that some scenarios could result in extremely large ecosystem disturbances, but these impacts will not be quantified because ecosystem consequences are inadequately accounted for in the current DRMS modeling framework. Finally, although the IRP found that most of the analyses were sound and the conceptual models used captured the likely risks to the Delta in the present and future, some questions still remained regarding the details of certain analyses. The most important of these are presented in the main body of the report below, while specific comments and analyses are presented in various Appendices. These must be considered for a full understanding of the IRP's review of the revised DRMS Phase 1 Report. The IRP believes that these caveats require users of the DRMS model framework to exercise due diligence to ensure scientifically credible interpretations of the results.

I. INTRODUCTION

A. Background

This report summarizes the findings and conclusions of the Independent Review Panel's (IRP or Panel) second review of the Delta Risk Management Strategy (DRMS) Phase I Report. The first review was completed by the IRP on August 23, 2007. In the first review, the IRP organized comments into Tier 1 and Tier 2 categories. The IRP identified several major Tier 1 concerns that influenced the primary results and conclusions listed in the first draft of the DRMS Phase 1 Report. The IRP also identified many Tier 2 concerns related to specific analyses in each report section.

In response to that review, the DRMS authors revised their original DRMS Phase 1 Report and submitted a revision of it (Draft 4, July 16, 2008) on July 17, 2008. That fourth draft of the revised DRMS Phase 1 Report is reviewed by the IRP in this document. Throughout this second IRP review, the IRP evaluates whether that revised DRMS Phase 1 Report addressed review comments from the earlier version. No subsequent review by the IRP is anticipated.

B. Review Process

The goals of this review, as detailed in the charge to the Panel (attached here as Appendix 1), were to assess the strengths and weaknesses of the revised DRMS Phase 1 Report, and to determine if the report provides a strong scientific and engineering foundation for further analyses that will lead to strategies for reducing risk in the Delta.

To complete this latest review, the IRP members read the latest (fourth) draft of the revised DRMS Phase 1 Report, with subgroups concentrating on assessing specific sections of the report. The IRP then held a conference call on August 19, 2008, to discuss each Panel member's assessment of the report. All members felt that there were some outstanding questions that would only be cleared up by direct questions to authors. Therefore, we set up a series of fact-finding calls to address four specific issues:

- Aquatic resources modeling
- Levee stability and seismic and flood forcing on levees

- Economics/valuation models
- Transparency and organization of the report

Notes were taken during calls and distributed to the IRP and DRMS authors. Written responses were provided by the DRMS authors to the IRP when additional clarification was needed. The call notes and written responses are presented here as Appendix 2.

The IRP met in Sacramento on September 4 and 5, 2008 to finalize the review and to develop this document. We also met with the DRMS authors and agency representatives to address any outstanding questions from our review and to present preliminary findings from the review process. The meeting was recorded, and the audio is available from the CALFED Science Program.

During the review process, IRP members made many detailed comments on the revised DRMS Phase 1 Report. Editorial comments, which identified inconsistencies, errors, problems of organization, repetitions, and omissions, were collated by CALFED Science Program staff and are provided in Appendix 3. Details on seismicity and seepage issues, in addition to those presented in the main body of the report below, are presented in Appendix 4.

An overview of the Panel's review and the contents of the Appendices were presented verbally to the DRMS authors and agency representatives on September 5, 2008. This present document is the final, written version of the IRP review.

C. Review Focus

The original IRP charge included three major categories and several questions (Appendix 1) that guided assessment of the revised DRMS Phase 1 Report, as follows:

- Information Gathering
- Information Analyses and Results
- Findings and Conclusions

The IRP combined these categories to better assess the revised and greatly expanded DRMS report, as follows. We begin by focusing on the overall adequacy of the DRMS scientific

information and on the overall technical adequacy of the analysis methods and information used for the components of the DRMS analysis related to *causes* of risk (Section II) and modeling of the *consequences* of risk (Section III). We then comment on the reasonableness of the findings and conclusions of the DRMS analysis (Section IV). A separate review of the Executive Summary to accompany the revised DRMS report (not provided to the IRP until late in the review process) is presented in Section V and Appendix 5. Finally, we summarize our main conclusions from the Review (Section VI).

D. General Statement of Review Findings

In the first review of the original DRMS Phase 1 Report (dated August 23, 2007), the IRP concluded that:

> "As written, many of the analyses are generally incomplete and therefore inadequate to serve as a foundation from which to make reasonable policy decisions about future resource allocations concerning strategies for the Delta region. In other words, the Panel believes strongly that the inadequacies in some of the analyses may lead policymakers and others to erroneous conclusions and inappropriate decisions. (Page 3)"

and

> "The Panel seriously questions the usefulness of any Phase 2 analyses that rely on results reported in a Phase 1 draft report that is not significantly revised to address the Panel's Tier 1 comments. (Page 7)"

In this second review, we find the revised DRMS Phase I Report (Draft 4) to be much improved. The DRMS authors successfully addressed many of the IRP's original questions and concerns, and substantially improved the exposition. The IRP has therefore concluded that the revised DRMS Phase 1 Report is acceptable for use as a tool for informing policymakers and others regarding potential resource allocations and strategies to address risk in the Delta region, provided that *some important caveats* (detailed below) are well understood.

The first caveat is common to any broad analysis that relies on a series of linked models. In such analyses, caution is imperative when interpreting scenarios that deviate substantially from baseline conditions. In the case of the DRMS analysis, baseline conditions are the 2005 base - year results. Predictions of conditions 20 to 30 years into the future are inherently highly

uncertain, and reliable predictions of conditions 50 to 100 years into the future are virtually impossible. We therefore caution that future estimates of consequences must be viewed as projections that can indicate potential directions of effects, not predictions to be interpreted literally. In a related issue, the IRP cautions readers and users of the DRMS report to avoid the common mistake of equating precision with accuracy. Precision is the exactness of the reported results. Accuracy is how close the predictions are to truth. The DRMS analysis involves many computer-based calculations that can be reported with very high precision, from which it is often tempting to infer great accuracy. In turn, this could lead to misinterpretation of the DRMS results, and thus to incorrect decisions.

The second caveat is specific to the DRMS analysis and is due to the minimal ecosystem consequences that are actually assessed in the revised DRMS Phase I Report. Estimates of the effect of island flooding on vegetation and wildlife were much reduced from what was described in the methods section of the first draft of the DRMS Phase I Report and in the Impact to Ecosystems Technical Memoranda (TM). Furthermore, there was no assessment of consequences for aquatic resources (i.e., fish). With ecosystem consequences minimally represented in the current DRMS models, and with fish absent from the predictions, the IRP believes this could easily lead to erroneous interpretations of DRMS model results. Thus, anyone using the results of the DRMS scenarios must be very aware that ecosystem effects are not fully captured in the analysis, and that, in particular, the lack of ecosystem consequences reported does not imply small ecosystem impacts. Rather, the IRP notes that some scenarios could result in extremely large ecosystem disturbances, but these impacts will not be quantified because ecosystem consequences are inadequately accounted for in the current DRMS modeling framework.

The IRP believes that these caveats require users of the DRMS model framework to exercise due diligence to ensure scientifically credible interpretations of the results.

II. REVIEW OF ANALYSIS METHODS AND INFORMATION—CAUSES OF RISK TO THE DELTA

A. Seismic Risk Analysis

The approach taken in the DRMS Phase I report to assess seismic risk has two key components: (1) an analysis to predict possible ground motions (seismic hazard), and (2) an analysis to predict levee response to ground motions (levee vulnerability).

Characterization of the seismic hazard used by the DRMS relies primarily on work done by the United States Geological Survey (USGS) and the California Geological Survey (CGS). We find the approach taken by the DRMS to be technically sound and defensible. In particular, the peak ground accelerations associated with return intervals of 100, 500 and 2,500 years at a range of locations across the Delta reported by the DRMS are comparable with published results from earlier studies.

The characterization by the DRMS of levee response to ground motions is also sound and similar to that used by other engineering organizations in the practice of geotechnical earthquake engineering. The predicted response of levees to historical earthquake events, such as the 1980 Livermore and 1906 San Francisco earthquakes, is consistent with available observations.

Therefore, the approach used by the DRMS to model seismic activity meets accepted standards of practice for modeling, and is based on currently available information. The methods and results are clearly presented in the revised DRMS Phase 1 Report, and an adequate description of the methods is provided in the associated Technical Memorandum.

The IRP notes that the predicted frequencies of island failures due to earthquakes in the base-case analysis are significantly higher than the historical record. The DRMS analysis predicts the following frequencies of island failures (Figure 13-2):

- one event per 10 years of having at least one island fail (flood) due to an earthquake;
- one event per 20 years of having at least ten islands fail due to an earthquake; and

- one event per 100 years of having at least 40 islands fail due to an earthquake.

Although there has potentially been seismically induced damage to Delta levees, there have been no known *failures* of islands due to earthquakes in at least the last 100 years. Even if the historical record of earthquakes were extended further back to include the relatively active seismic period between 1850 and 1906, before the modern Delta was developed, there would be at most several events where an earthquake may have caused hypothetical island failures if the Delta were in its present condition. Hence, the frequencies predicted by the DRMS for earthquakes causing one to ten island failures are significantly higher than the historical record suggests.

We recommend that the DRMS predictions of earthquake failures be better put into a historical and practical context in the revised DRMS Phase I Report. This context should include an expanded discussion and an acknowledgment of the potential limitations in the current standard of practice for seismic risk analysis (see Appendix 4 for a detailed discussion on this topic). This should also include widening the confidence bounds on the predicted frequencies (Figure 13-2 in the revised DRMS Phase I Report) to reflect that while the DRMS expects a higher frequency of seismic failures in the future, the *actual* frequency of failures could be similar to the available historical record. Providing readers with a realistic context for these results is particularly important because seismic-induced failures dominate the overall risk for high-consequence events.

B. Flood Risk Analysis

The DRMS report used the appropriate scientific information currently available for flood risk analysis. Data on stream-flow, levee elevation, and levee structure collected from the United States Geological Survey (USGS), the United States Army Corps of Engineers (USACE), the California Department of Water Resources (DWR), and other agencies were used to determine the potential flooding in the Delta. These are the most common and appropriate data used in such analyses. The methods used to collect this information are clearly presented and well-documented in the associated Technical Memorandum (Flood Hazard TM, March 4, 2008).

In general, the IRP identifies no major omissions or limitations to information gathering for the flood risk analysis. However, there is one potential issue related to characterization of levee foundation materials for failure analysis through seepage that may lead the DRMS analysis to under-estimate water seepage through levees. Available permeability values used to calculate seepage were derived from laboratory tests; apparently the field pumping test data was largely ignored (See Table 7 -12 for field data). The IRP believes that the laboratory test data are generally low (that is, on the impermeable side) for both peat and sand. Coupled with a peat permeability anisotropy value on the high side (e.g., Kh/Ky =100 for peat), this pushes up the factors of safety for levee stability when evaluating failure via through or under-seepage. More water is likely to seep through and/or under the levee than the DRMS models predict, but we are not certain how this would specifically affect their final analyses of failure of specific levee reaches.

C. Sunny Day Failures

The DRMS assessment of frequency of levee failures not directly caused by seismic or hydrologic events (that is, "sunny day" failures) is reasonable. It is based on the historical record where there has been approximately, on average, one failure every ten years.

The analysis did not include a potential future increase in sunny day failures owing to continual degradation of the levees, which hold back water 365 days a year. However, this potential limitation does not affect the overall results because single-island failures do not contribute substantially to the overall risks.

III. REVIEW OF ANALYSIS METHODS AND INFORMATION—MODELING OF RISK CONSEQUENCES

A. Life Safety

The IRP finds that the analysis of the effects of flooding events on human safety (fatalities) is performed in a technically competent fashion and clearly communicated. The model used by DRMS has been used by others to assess human risk from major dam failures, and was used recently in a risk analysis of the New Orleans levee system.

B. Economic Analysis

The data, models, and assumptions employed in the revised DRMS Phase I Report for the assessment of economic resources at risk are clearly defined. Given the complexities and large geographical scope of this assessment, the number of potential cost and impact factors contained within the region, and the short time-frame within which to conduct the assessment, the approach used by the DRMS authors, of necessity, relies on a wide array of secondary data and off-the-shelf models. This approach is an accepted procedure for performing the type of broad-scale assessment required for the DRMS effort. The scope of the analysis includes the economic costs and impacts estimated for both the "in-Delta" and "out-of-Delta" regions. A wide range of potential economic effects are quantified, including water quality (salinity) effects arising from levee failures and the consequent effects of these changes in salinity on water exports.

The economic assessment is based on a 2005 base case and employs a "business as usual" (BAU) assumption to predict future impacts. That is, trends in population and economic growth are presumed to continue as currently observed, and decision-makers (e.g., water managers, farmers, builders, regulators, etc.) continue to operate as if things are not changing. We believe this assumption likely overstates economic consequences. Evidence of this is the implicit assumption that after a significant flooding event, all infrastructure and residential dwellings will be rebuilt in exactly the same spatial arrangement as before the event. In some cases, the BAU scenario assumes rebuilding schedules that simply cannot occur within the simulated periodicity of flood events. For this reason, we believe that the economic analysis, while sound for present-year (base case) conditions, seriously overstates estimates of economic costs and impacts beyond 2020.

Although the underlying data and models used to assess the economic consequences of levee failure are subject to (and sometimes compound) errors and uncertainties, we believe the results are scientifically defensible overall for capturing the economic consequences of the base case scenario, as reported in Section 13. We do not feel, however, that the models and assumptions are capable of providing policy-relevant estimates of economic consequences

under any of the future scenarios discussed in Section 14 and in the Executive Summary, a concern to which we return in the discussion of findings.

C. Water Quality

The section of the revised DRMS Phase I Report that addresses Salinity Impacts (WAM – Water Analysis Module) satisfactorily addresses the comments of the first IRP review. In our opinion, it is a technically sound approach for simulating island flooding, water operations and exports, and salinity effects. Most of the IRP's comments from the first review related to the lack of consistency between the WAM TM and what was described in the original DRMS Phase 1 Report, and the general lack of clarity in this original report. As part of the first review, the IRP pieced together what had been done for the WAM component of the DRMS analysis from reports, the TM, and other sources, and had deemed the technical aspects of the WAM to be acceptable. The authors have now addressed the major IRP concerns stated in the first review by updating the report to better reflect the WAM analysis.

D. Flood Risk Analysis

Models used to analyze flooding are appropriate and well documented. The DRMS report and associated TM include adequate information on how the analyses and modeling were conducted. However, the results of these analyses relating to levee failure due to seepage and overtopping are difficult to interpret in some respects. Some levee vulnerability types have very steep fragility curves ("brittle" behavior) related to seepage driven by stage height. Therefore, the potential for failure becomes more sensitive to uncertainty or variability in the stage level. It appears from report figures that the standard deviation between measured and predicted values is not much over 1.5 feet, suggesting good agreement between modeled and measured stage. However, it is not clear from the report and the TM how this variability is accounted for between the model predictions and the actual flood levels; and if they do account for it, how they account for spatial correlations (e.g., if they under-predicted the stage at one island, they may be more likely to under-predict it at other nearby islands). This variability is not explicitly accounted for in the fragility curves—they theoretically represent the probability of failure for a given (known or actual) water surface elevation, not a predicted one. Although this error appears to be small (at Benson Ferry, for example, the 99th percentile value for the

peak annual value, or 100-year elevation, is a little under 1 foot greater due to this error), it could have a notable effect on the probability of failure since the fragility curves are steep for the most vulnerable levees.

Similarly, the fragility curves due to levee overtopping are also steep (Figure 7-75): At 2 feet over the crest, there is a mean probability of failure of 100%; at only 1 foot overtopping, there is a 60 to 90% chance of failure. Therefore, even a small range of uncertainty may make it difficult to predict failure due to overtopping. For the most vulnerable levee classes, this error could have a large effect on probability of failure due to both seepage and overtopping, manifested in future projections of levee failures due to flooding. Figures 13-13a and 13-13b show the mean annual frequency of present and projected future failure for islands from flooding. The highest predicted risk is in the Suisun Marsh, for islands that have never flooded. In contrast, the most commonly flooded islands historically correspond to a relatively low future risk of flooding. This implies that the DRMS models could be over-estimating failure in some areas, and under-estimating failure in other areas. It is not clear how this would affect the DRMS prediction of future risk of levee failure due to flooding under different climate scenarios. The very high increase (up to 10 times an increase) in expected failures of levees in 2100 under some future scenarios of climate change may be an outcome of this modeling uncertainty and the sensitivity of failure to small changes in predicted stage.

E. Ecosystems

The Ecosystem Consequences component of the revised DRMS Phase I Report was significantly reduced in scope relative to the first DRMS Phase I report reviewed by the IRP. In its current form, the revised DRMS Phase 1 Report does not address many of the major IRP review comments that were made on the first DRMS report regarding the ecosystems analysis. This stands in stark contrast to almost all of the other components of the revised DRMS Phase 1 Report, which made were amended significantly to satisfactorily address most IRP first-review comments.

Specifically, in the revised DRMS Phase 1 Report, the Impact to Ecosystem TM appeared to be only partially updated to describe a new aquatic resources analysis that was not implemented.

Furthermore, the description of the vegetation and wildlife impacts in the TM, as noted in the first review, does not match with what was reported in the revised DRMS Phase 1 Report. For example, there are several very large conceptual models shown as flowcharts, both in the TM (Figures 6-20a and 6-20b) and in the revised DRMS Phase 1 Report (Figures 12-14 and 12-15). All these appear to be outdated, identifying many quantitative analyses that are not reported in the results and creating the impression that more was done on ecosystem consequences in the Phase 1 analysis than actually took place.

The revised DRMS Phase I report *does* analyze consequences for wildlife and vegetation. However, only a small fraction of the results promised in the TM and the methods section of the revised report (Section 12) are actually reported in the 2005 Base Year Results section (Section 13) of the report. For example, the only results reported for vegetation are the percent of vegetation that spatially overlaps with the area impact by flooding. The suitability functions and time recovery described in the TM and revised DRMS Phase 1 Report are never actually computed and reported.

The revised TM and DRMS Phase 1 Report outline an entirely new method for analyzing the consequences for aquatic resources, but the method is not implemented. We understand that the impacts to aquatic resources will not be analyzed or included in Phase 2 of the DRMS project. This is an unfortunate choice, because the IRP finds that the completely revised approach to modeling aquatic resources described in the revised TM and DRMS Phase I Report appears to be a good effort to address our first-review concerns about the aquatic resources analysis. In the absence of a systematic modeling approach, the IRP concludes that reliance on a purely qualitative (narrative) approach for assessing risks to aquatic resources, as will likely be used during the Phase 2 work, allows for too much subjectivity, is difficult to peer review, and can be too easily dismissed when contrasted with quantitative results from the other consequences components (e.g., dollars from the economics analysis). Given the important role played by these key fish species in water management and ecosystem restoration, and given that they were targeted specifically for analysis in the DRMS study effort, the omission significantly weakens the usefulness of the revised Phase 1 DRMS Report.

The IRP also notes a pattern of reduction in both the breadth and scope related to the ecosystem consequences as the DRMS project progresses: only limited results for vegetation and wildlife were included in the revised Phase 1 report, and as noted, analyses for aquatic resources were completely omitted. The minimal evaluation of ecosystem consequences restricts the usefulness of the DRMS Phase 1 analysis, and limits the scenarios that can be examined in Phase 2 to those that can be identified from the start as having known or very small aquatic ecosystems impacts.

F. Climate Change Projections

The projections of potential climate change consequences for the Delta used in the revised DRMS Phase I Report are based on the most appropriate scientific information available. The methods used to collect this information are clearly presented and well documented in the associated TM. There are no obvious missing data-sets or information, and no serious limitations on the data used to generate future climate change projections.

If anything, the analysis may be biased toward under-estimating the range and/or magnitude of the potential effects of climate change, for three reasons. First, the "low end" sea-level rise projection, based on extrapolation of historical trends in sea-level rise over the past century, would be higher if derived from the accelerated trends that have been observed in recent decades. Second, for stream-flow and flooding projections, only four scenarios were examined, which truncated the range of possible effects. This is particularly a concern when assessing the effects of a higher emissions future, where nearly all winter precipitation could be expected to fall as rain rather than snow before the end of the century, increasing early season flood risk. Finally, there are multiple mechanisms by which climate can affect a given system. Although sea-level rise and changing stream-flow patterns are the most directly quantifiable, other impacts on atmospheric circulation systems, such as storm frequency and intensity, could also be important. The DRMS Phase I Report accurately notes that climate change may also affect storm frequency and severity, and correctly concludes that it is difficult to develop quantitative projections of this effect. When this effect is eventually quantified, however, the potential impacts of climate change on the Delta are more likely than not to be even more pronounced than currently stated in the report.

G. Model Linkages

The DRMS has constructed an approach to assess the human safety, economic, and ecosystem risks by linking together a series of models that characterize the hazard (e.g., earthquakes and floods), the performance of the levees in response to the hazard (e.g., overtopping and/or breaching), and the consequences to people, property, and the ecology resulting from levee performance. We believe this approach is logical and consistent. However, we do have some concerns.

First, this coupling of models is challenging and difficult to substantiate, due to the following factors:

- There is an extremely large (theoretically infinite) number of possible earthquake and flooding events that need to be considered;
- The levees and islands should be considered as an inter-connected system rather than treated as individual components; and
- The consequences depend not only on how many islands are flooded in an event, but which specific islands are flooded and at what time of year the flood occurs.

How the component models are linked in the DRMS analysis raises concerns about the transparency of the modeling framework. It would be nearly impossible to replicate the DRMS analysis by reading the DRMS Phase 1 Report and TMs alone. Detailed suggestions to improve the clarity of the report are provided in Appendix 3, but these are not sufficient for complete transparency. Because of the complexity of the individual models that have been linked together, ultimately the analysis takes on a "black box" approach, making it difficult to discern directly which input, models, and assumptions are important in the overall outcomes.

For this reason, the IRP recommends that additional sensitivity analyses would be valuable to define the influence of key variables on results and generally increase the transparency of the analysis. Such sensitivity analyses would also help in formulating and then interpreting the upcoming Phase 2 analyses.

IV. ASSESSMENT OF DRMS PHASE 1 FINDINGS AND CONCLUSIONS

A. Risk to Human Life and Safety

The total life safety risk, considering all causes of island failures, corresponds to events with more than ten fatalities occurring once every 10 years, events with more than 100 fatalities occurring once every 50 years, and events with more than 300 fatalities occurring once every 1,500 years. A presentation and discussion of the total life safety risk, in addition to the risk associated with individual causes of island failures, would be a helpful addition to the revised DRMS Phase I Report. For events with fewer than about 300 fatalities, the total life safety risk is governed by hydrologic causes. This conclusion should be stated clearly in the report. The estimated frequencies for fatalities are higher than the historical record; there are no known fatalities from the 166 failures in the Delta that have occurred over the past century. Discussion of this historical context, including how the size of the population at risk today and in the future compares to the past, should be included in the report. Finally, it would be valuable to compare the total life safety risk for this levee system with other similar levee systems (e.g., the New Orleans Hurricane Protection System) and with similar facilities, such as dams.

B. Economic Results

The economic costs and impacts reported in Section 13 of the revised DRMS Phase I Report are based on generating events within the seismic, flood, and sunny day analyses (e.g., see Figures 13-21a and Figure 13-21b). We have three concerns and suggestions to improve the reader's understanding of these results. First, it would be helpful if the estimates were given some context relative to other economic measures of similar events reported in the literature. For example, how does the upper-bound estimate of $40 billion compare with the overall value of economic activity within the region; and how does it compare with losses sustained from previous earthquakes in California?

Second, while we accept that the general approach of using linked models is scientifically defensible, we believe that this communicates an inherent, upward bias to the resulting economic costs and impact curves. The upward bias results from the potential compounding of assumptions across the various linked models, as well as the assumption of "business as usual"

in the base case. Assumptions that err on the side of over-predicting effects may be reasonable for each model, but these assumptions are compounded as the output of one model is passed as input to the next model. At each step, the over-prediction gets amplified until it reaches the economics consequences. We do not feel, however, that this negates the utility of the economic consequences for use in policy decisions surrounding near-term consequences of levee failure (i.e., the base case results reported in Section 13).

Third, we have little trust in the economic consequences predicted for the future scenarios (years 2050, 2100, 2200), as reported in Section 14 and in the Executive Summary. While we understand that the DRMS authors were charged with performing such assessments, the magnitude of the uncertainty embedded in forecasting economic conditions beyond more than a few decades is too great to make these estimates useful for policy decisions.

C. Water Quality

Findings and conclusions regarding the effects of island failures on water quality reported in Section 13 of the revised DRMS Phase I Report and the Executive Summary are supported by the analyses. Most findings and conclusions about the WAM (Water Analysis Module) predictions of water quality effects are reported as they affect the economics. The accuracy of the statements about water quality is thus only as good as the economic calculations that use the WAM output as inputs. We also note that dissolved organic carbon and methylmercury are specifically discussed in the Executive Summary, but no actual analyses are provided in the narrative report or in a particular TM. Dissolved organic carbon and methylmercury are discussed in Section 11.7 of the revised DRMS Phase 1 Report entitled "Other Water Quality Impacts", which states that they are not currently included in the WAM. Because only salinity is included in any comprehensive way, "water quality" should be defined very specifically, or the term should be replaced with "salinity" to better represent the actual analyses.

D. Ecosystems

The minimal ecosystem consequences reported in the revised DRMS Phase 1 report are reflected by the limited findings and conclusions presented in Section 13 and in the Executive Summary. No conclusions were reported for aquatic resources. The Executive Summary makes

the non-conclusive statement that "Levee failure and island flooding caused by earthquakes can have both adverse and beneficial impacts on the aquatic ecosystem." The findings and conclusions for vegetation and wildlife accurately reflect the results of the analyses performed, but the scope of the analyses was extremely limited, and so the conclusions are too general for practical use. For example, the Executive Summary concludes that a multiple island failure could cause large losses of non-native vegetation and large losses of wildlife habitat, including several species of concern. Although we agree that these findings and conclusions concerning ecosystem consequences are accurate, they are accurate simply because the statements are very general. The IRP therefore concludes that the findings and conclusions about ecosystem consequences reported in the revised DRMS Phase1 Report fail to provide information useful for resource-allocation decisions and other related policy issues.

V. REVIEW OF THE DRMS EXECUTIVE SUMMARY

The executive summary is critically important, as it is the single document most likely to be read. For this reason the IRP conducted a detailed review of the executive summary (Appendix 5). The goal of the detailed comments presented in Appendix 5 are to ensure the summary accurately reflects the technical report; does not make any unsubstantiated statements; and is factual, precise, and accurate.

In general, the IRP feels that the executive summary approach is the right one. The summary is in the most part accurate (although we do caution against the use of language such as "can" and "will" that implies absolute certainty), and in general represents a major improvement over previous efforts. It is fairly concise, but could be made more so through eliminating repetitious text, and tightening up and increasing the precision of the language used. In light of the overwhelming importance of the executive summary, the IRP encourages the Department of Water Resources to seriously consider these comments and make the recommended changes to the executive summary.

VI. CONCLUSIONS

The IRP concludes that the revised DRMS Phase 1 report is acceptable for use in Phase 2 as a tool to inform policymakers and others about potential resource allocations and strategies to address risk in the Delta region.

In comparison to the initial draft of the DRMS Phase 1 Report, the current report is much improved. The DRMS authors should be commended for their efforts on the revised analyses and report. With the sole exception of ecosystem consequences, we find that the revised report adequately addresses both the Tier 1 and Tier 2 comments from the first IRP review.

This second IRP review, however, does highlight some major issues still outstanding. First is the reduced role of ecosystem consequences. The minimal vegetation and wildlife analyses and the complete lack of fish effects severely handicaps the ability of the DRMS analysis to estimate likely impacts on ecosystems. Second, because the final conclusions of the report rely on a series of linked models, caution is imperative when interpreting scenarios that deviate substantially from baseline conditions. Predictions of conditions far into the future are highly uncertain, and should be considered as indicators of effects, not precise predictions of future conditions. Finally, although the IRP found that most of the analyses were sound and the conceptual models used captured the likely risks to the Delta in the present and future, some questions still remained regarding the details of certain analyses.

These concerns must be considered by users of the DRMS model framework, as they exercise due diligence to ensure scientifically credible interpretations of the results to be obtained during the Phase 2 study effort and beyond.

EXHIBIT B

MBK ENGINEERS
Water Resources • Flood Control • Water Rights

ANGUS NORMAN MURRAY
1913 - 1985

JOSEPH D. COUNTRYMAN, P.E.
GILBERT COSIO, JR., P.E.
MARC VAN CAMP, P.E.

CONSULTANTS:
JOSEPH I. BURNS, P.E.
DONALD E. KIENLEN, P.E.

June 12, 2007

Mr. Charles Rabamad
State Public Assistance Officer
Governor's Office of Emergency Services
Response & Recovery Division
Recovery Branch, Public Assistance Section
3650 Schriever Avenue
Mather, CA 95655

Re: SECOND APPEAL
FEMA 1628 DR
OES ID: 077-91031 FEMA ID: 077-UB01P-00
SUBGRANTEE: Reclamation District No. 2033
Project Worksheet Nos. 1080, 693, and 714

Dear Mr. Rabamad:

On behalf of Reclamation District No.2033, Brack Tract, a second appeal is hereby made with regard to the determinations made by FEMA concerning Federal Notification Package Nos. 127 and 129 for Project Worksheet Nos. 1080, 693, and 714 with regard to the determination of compliance with the State Flood Hazard Mitigation Plan (HMP) for the Sacramento-San Joaquin Delta, Dated September 15, 1983, and the subsequent 1987 Amendment No. 5 (Amendment 5) to the State Plan. Described below, and attached hereto, are data addressing the issues raised by FEMA in its denial of the first appeal.

We have reviewed the FEMA denial of the first appeal. As described below, we have found that the denial overstates the degree to which the levee is below HMP, uses language which misleads one to think that large areas are below HMP, and underestimates the difficulty in locating and raising sites to close to the HMP minimum.

The FEMA denial describes "large sections of the levee system were found to be below the base flood elevation as defined in the HMP." It appears that FEMA is suggesting that the levees are below the base flood elevation. However, the HMP minimum is 1-foot of freeboard above the 100-year frequency flood elevation established by the Corps of Engineers. The 100-year flood elevation is also known as the base flood elevation, so we are confused regarding what FEMA refers to as the base flood elevation. FEMA describes "large sections of the levee system" as being below the HMP minimum. This description is based on the 445 feet of levee

they noted as below HMP by 1-2 inches. We have checked our electronic files, which indicate that these nine sites only total 351 feet; and are all around 0.1 feet, or less, below HMP (see attached table). This 351 feet constitutes only 0.6% of the 10.8 miles of levee maintained by RD 2033. In other words, 99.4% of the levee system met, or exceeded, the HMP minimum prior to FEMA 1628.

Also, all of the nine subject low sites are less than 100 feet in length. The HMP requires that centerline profile points be reported at 100-foot intervals. The latest GPS technology records points much more often than 100-foot intervals. Therefore, it is likely none of these sites would have shown up at all if RD 2033 had reported only 100-foot intervals. These sites are so small, that even using GPS technology, it would be difficult to even locate them for rehabilitation work; and therefore, would be very difficult to rehabilitate.

RD No. 2033 has a history of actively maintaining its levee to the HMP standards. In four of the five years preceding FEMA 1628, the District performed HMP crown elevation and gravel road projects. This work involved 35,000 lineal feet of levee. In addition, in May 2006, immediately following FEMA 1628, District raised 4,320 lineal feet of levee, which was located during its post-disaster levee crown survey.

As evidenced by the history of RD 2033's participation in the State Delta Levees Subventions Program, the District has consistently surveyed and maintained its levee to meet HMP standards. As a result, 99.~~6~~4% of its levee met, or exceeded, the HMP minimum prior to FEMA 1628. The spirit and intent of the HMP was to rehabilitate and maintain the levee system. We would argue RD 2044 has performed this task as envisioned; and hereby appeal FEMA's denial of its first appeal.

If you have any questions, or require additional information, please call me at 916/456-4400.

Sincerely,
MBK ENGINEERS
R.D. No. 2033 Engineering Consultant

Gilbert Cosio, Jr.

GC/pp
4315.9/CHARLES RABAMAD 2007-06-12.DOC

cc: R.D. No. 2033
c/o Eric Merlo
Mr. Jim Dooley, OES

Profile HMP Deficiency Data

Reclamation District No.2033 - Brack Tract

Actual discrepancies and lengths

North Levee Unit: Mokelumne R. and Hog Slough

May 31, 2007

From FEMA rejection letter				*Digital CAD review from MBK*			
		Estimated		*Actual*			*Maximum*
FEMA STATIONS		LENGTH	Inches Below	MBK STATIONS		LENGTH	Inches Below
31+00	31+25	25	1	30+63	31+19	56	0.456
93+50	94+25	75	2	93+94	94+24	30	1.044
174+00	175+25	125	2	174+53	175+51	98	0.768
183+75	184+00	25	2	184+05	184+47	42	0.840
187+00	187+50	50	2	187+05	187+29	24	1.284
192+00	192+50	50	2	191+35	191+59	24	1.261
202+50	203+00	50	2	201+86	202+23	37	0.505
TOTALS		**400**		**TOTALS**		**311**	

With 4.6 mi. of levees, 311' total at 8 sites show deficiencies of 1.284", or less

South Levee Unit: Mokelumne R. and Sycamore Slough

May 31, 2007

From FEMA rejection letter				*Digital CAD review from MBK*			
		Estimated		*Actual*			*Maximum*
FEMA STATIONS		LENGTH	Inches Below	MBK STATIONS		LENGTH	Inches Below
65+00	65+20	20	2	64+97	65+17	20	1.200
137+00	137+25	25	2	137+10	137+40	30	1.200
TOTALS		**45**		**TOTALS**		**50**	

With 6.6 mi. of levees, 50' total at 2 sites show deficiencies of 1.2", or less

* The FEMA rejection letter assumes that the entire length listed is below the HMP elevation at the listed deficiency, when in actuality, they are representing the lowest point in the profile which only accounts for a small portion of the section. The average deficiency would be much smaller.

** The MBK review 'Maximum Inches Below' value represents the lowest point in the FEMA specified site locations below HMP

EXHIBIT C

STATE OF CALIFORNIA ARN J SCHWARZENEGGER, Governor

GOVERNOR'S OFFICE OF EMERGENCY SERVICES
RESPONSE AND RECOVERY DIVISION
3650 SCHRIEVER AVENUE
MATHER, CALIFORNIA 95655
PHONE: (916) 845-8532 FAX: (916) 845-8511

OES CALIFORNIA Governor's Office of Emergency Services

COPY

AUG 07 2007

Mr. Carlos J. Castrillo
Assistant Administrator, Disaster Assistance Directorate

Through: Ms. Nancy Ward, Regional Director
Federal Emergency Management Agency, Region IX
1111 Broadway Street, Suite 1200
Oakland, California 94607

Dear Mr. Castrillo:

SUBJECT: SECOND APPEAL – PWS 1080, 693, AND 714
FEMA-1628-DR 2005-2006 WINTER STORMS
OES ID: 077-91031 FEMA ID: 077-UB01P-00
SUBGRANTEE: RECLAMATION DISTRICT NO. 2033, BRACK TRACT
OES LOG: 142041 FEMA LOG: NONE

On June 13, 2007, the Governor's Office of Emergency Services (OES) received the enclosed letter dated June 12, 2007, from Reclamation District No. 2033, Brack Tract (district). The purpose of the letter is to submit a second appeal of the Federal Emergency Management Agency's (FEMA) denial of funding for Project Worksheets (PW) 1080, 693, and 714.

Background

As a result of the 2005-2006 Winter Storms (FEMA-1628-DR) FEMA prepared the following PWs:

- PW 1080 was prepared in the amount of $14,571 to fund the emergency protective measures taken to protect the levee and reduce the threat to public and private property.
- PW 693 was prepared in the amount of $79,785 to fund the emergency protective measures taken on the levee.
- PW 714 was prepared in the amount of $62,175 to fund the repairs to the levee road.

FEMA stated in the General Comments section of each PW that the district is not in compliance with California's Flood Hazard Mitigation Plan (HPM) for the Sacramento-San Joaquin Delta. Therefore, FEMA determined the district is ineligible for public assistance funding.

The district appealed this determination arguing the concept of substantial compliance and asserting that a maintenance project in June 2005 produced a survey that indicates the district met the HMP minimum. However, FEMA denied the district's first appeal stating that the district received one time funding in a prior disaster and large sections of the levee system were found to be below the base flood elevation as defined in the HMP.

AUG 0 / 2007

Analysis

The district reviewed it records and determined it was denied FEMA assistance in both 1995 and 1997, thereby making the district a first-time participant and eligible for public assistance funding.

Nonetheless, the district contends that FEMA "overstates the degree to which the levee is below HMP, uses language which misleads one to think that large areas are below HMP, and underestimates the difficulty in locating and raising sites to [*sic*] to the HMP minimum." The district articulates that the "FEMA denial describes 'large sections of the levee system were found to be below the base flood elevation as defined in the HMP' making it appear that FEMA is suggesting that the levees are below the base flood elevation." The HMP minimum is 1-foot of freeboard above the 100-year frequency flood elevation established by the U.S. Army Corps of Engineers. The 100-year flood elevation is also known as the base flood elevation.

FEMA describes "large sections of the levee system" as being below the HMP minimum, based on the 445 feet of levee they noted as below HMP by one to two inches. The district asserts that a review of its electronic files indicates that the nine sites total 351 feet and are all around 0.1 feet or less below HMP. The district provided a table to demonstrate its determination. The district articulates that this 351 feet constitutes only 0.6 percent of the 10.8 miles of levee it maintains. In other words, 99.4 percent of the levee system met or exceeded the HMP minimum prior to the FEMA-1628-DR event.

The county asserts that the nine subject low sites are less than 100 feet in length. The HMP requires that centerline profile points be reported at 100-foot intervals. The latest global positioning system (GPS) technology records points much more often than 100-foot intervals. Therefore, it is likely none of these sites would have shown up at all if the district had reported only 100-foot intervals. The district opines that the sites are so small that it would be difficult to locate them for rehabilitation work, even using GPS technology.

The district has a history of actively maintaining its levee to the HMP standards. In four of the five years preceeding the FEMA-1628-DR event, the district performed HMP crown elevation and gravel road projects, involving 35,000 lineal feet of levee. In addition, in May 2006, immediately following the FEMA-1628-DR event, the district raised 4,320 lineal feet of levee located during its post-disaster levee crown survey.

The district contends, as evidenced by the history of its participation in the State Delta Levees Subventions Program, it has consistently surveyed and maintained its levee to meet HMP standards. As a result, 99.6 percent of its levee met or exceeded the HMP minimum prior to the disaster event. The district opines that the spirit and intent of the HMP was to rehabilitate and maintain the levee system, and argues that it has performed this task as envisioned.

AUG 0 7 2007

Recommendation

The district has complied with *Title 44* of the *Code of Federal Regulations (44 CFR), Section 206.206*. In addition, the district performed the work in accordance with *44 CFR, Sections 206.225 and 206.226*. OES also notes that the district has not received public assistance funding in a previous disaster event. Therefore, OES recommends that FEMA reconsider its determination and provide funding in the amount of $14,571 for PW 1080, and $79,785 for PW 693, to restore the levee to its predisaster function and capacity. While OES strongly believes the permanent repairs PW 714 was prepared to address should have been determined eligible at the time of preparation, OES is unable to support the appeal for PW 714, since a first appeal was not submitted as defined by *44 CFR, Section 206.206*.

If you require additional information regarding this correspondence, please contact Mr. Charles Rabamad, Public Assistance Officer, at (916) 845-8205 or Mr. Doug Lashmett, Program Manager, at (916) 845-8225.

Sincerely,

PAUL JACKS
Governor's Authorized Representative

Enclosure

c: Mr. Eric Merlo, Chairman of the Board, Reclamation District No. 2033, Brack Tract
Mr. Gilbert Cosio, Engineering Consultant, Reclamation District No. 2033, Brack Tract
Mr. Robert J. Fenton, Director, Response and Recovery Division, FEMA/Enclosure

tds

EXHIBIT D

MBK ENGINEERS

Water Resources • Flood Control • Water Rights

MEMORANDUM

Date: November 2, 2010

To: File – RD 2037
Gilbert Cosio, Jr.

From: Michael Moncrief

Subject: **HMP Verification, Levee Profile Review**

Gilbert,

We reviewed and updated our files based on the As-Built Survey performed after the recent HMP Roadway Improvement Project completed by AM Stephens Construction. The most recent full surveys performed for the District are:

Full Island Profile Survey: March 2010, includes GPS levee alignment
As-Built Profile Survey: September 2010, includes As-built from Spring HMP project and recent As-built from site between 512+00 and 517+00

The District continually maintains their levee crown roadway with new road base and continual moisture conditioning and occasional grading of the crown to minimize rutting and washboard conditions. Any as-built data taken was incorporated into the profile survey data; which includes the recent project from early October.

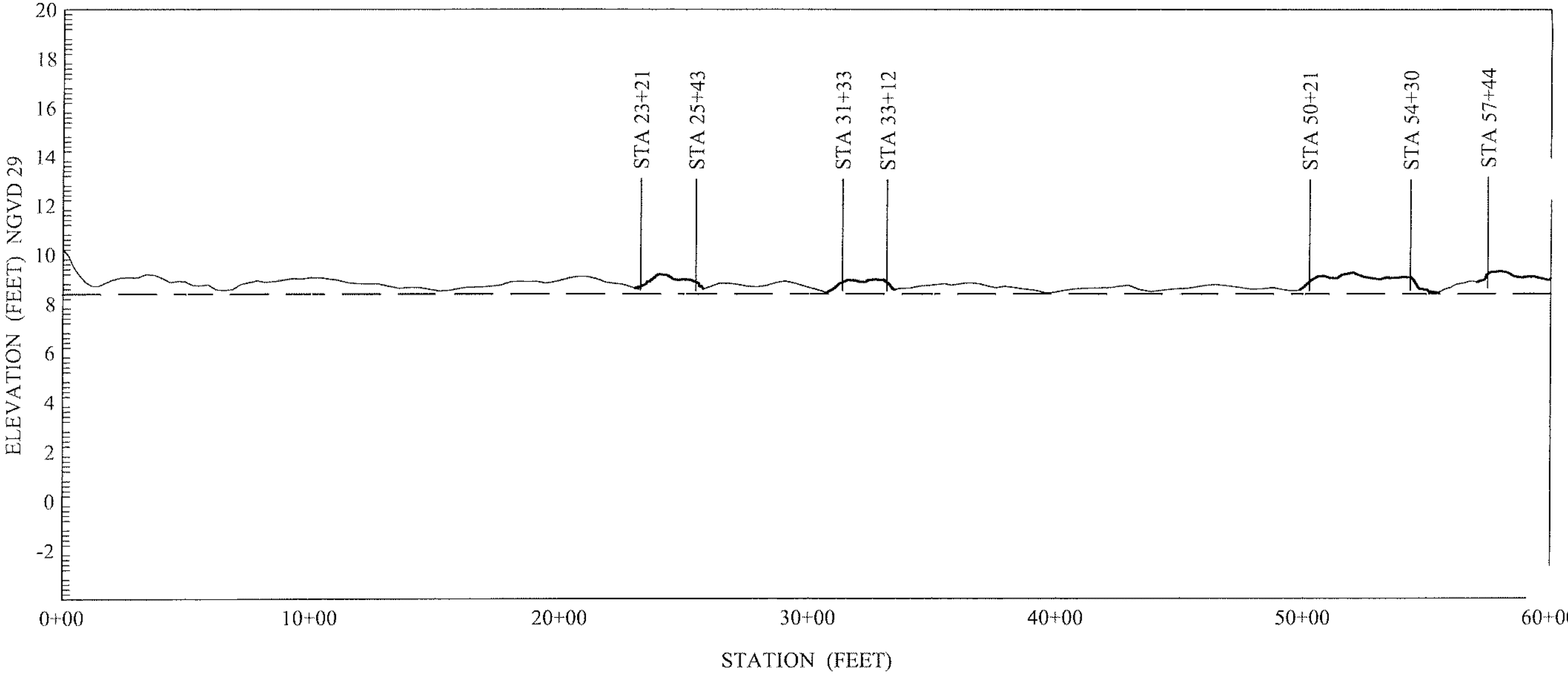
The most recent compiled levee centerline profiles have been processed utilizing AutoCAD Civil 3D software, incorporating field data collected from GPS survey data. Collected centerline data points are downloaded to generate a profile of the levee centerline alignment. This is used to determine levee elevations which need to be improved. Similarly, the As-Built survey collects data points along levee improvement sites, and new profile alignments at those sites are generated.

With this level of detail, and the method listed above, the profiles show that there are no locations along the levee profile which are below the required minimum HMP elevations listed for the District. There are however many locations which show the levee elevation at the required HMP elevation, which will have to be addressed potentially, once the levee is re-surveyed in a few years time.

Michael Moncrief

MM/
4325.6/MEMO TO FILE 11.02.2010

RD 2037 - Rindge Tract
Levee Centerline Profile 0+00 - 60+00



Profile Sheet No. 1 of 14

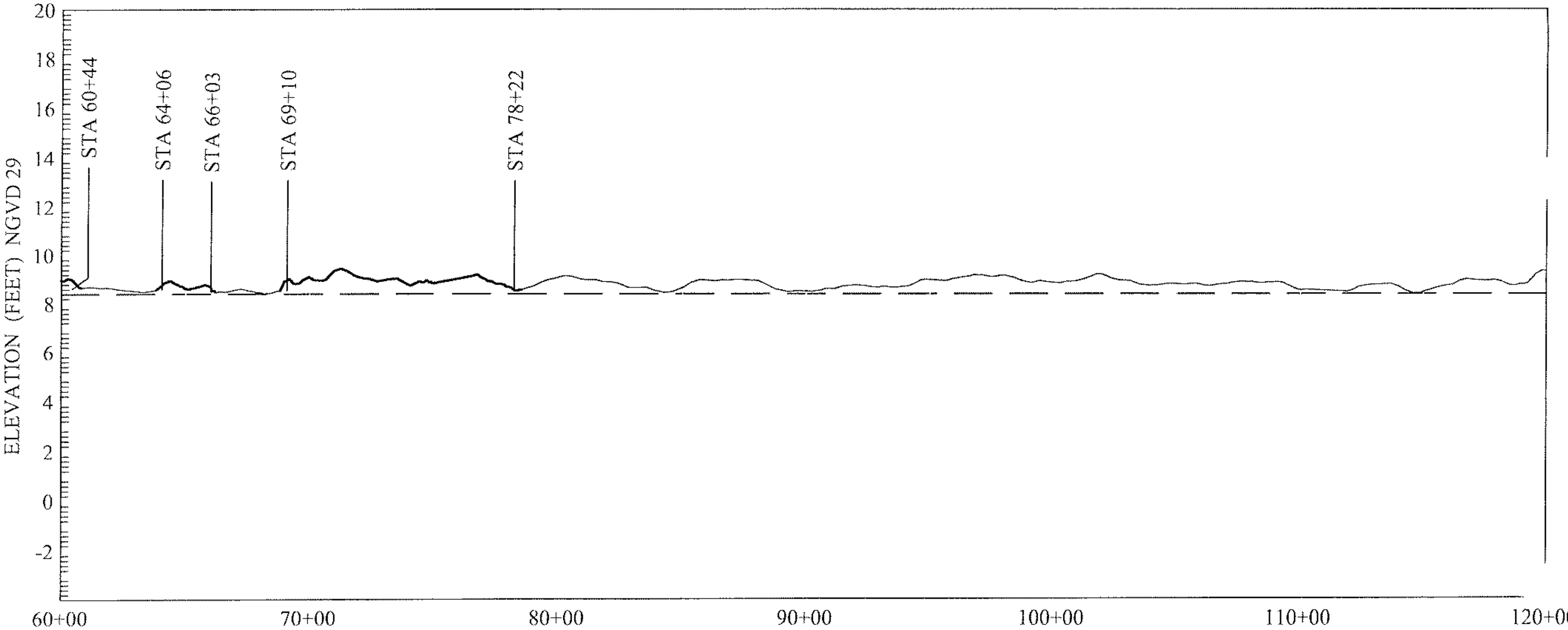
Legend

————	Existing Grade at Levee Centerline (03/2010)
— — —	HMP Design Elevation
━━━━	As-Built Elevation

MBK ENGINEERS

1771 Tribute Road, Suite A
Sacramento, California 95815
Phone: (916) 456-4400 • Fax: (916) 456-0253

RD 2037 - Rindge Tract
Levee Centerline Profile 60+00 - 120+00



Profile Sheet No. 2 of 14

Legend

———	Existing Grade at Levee Centerline (03/2010)
— — —	HMP Design Elevation
━━━	As-Built Elevation

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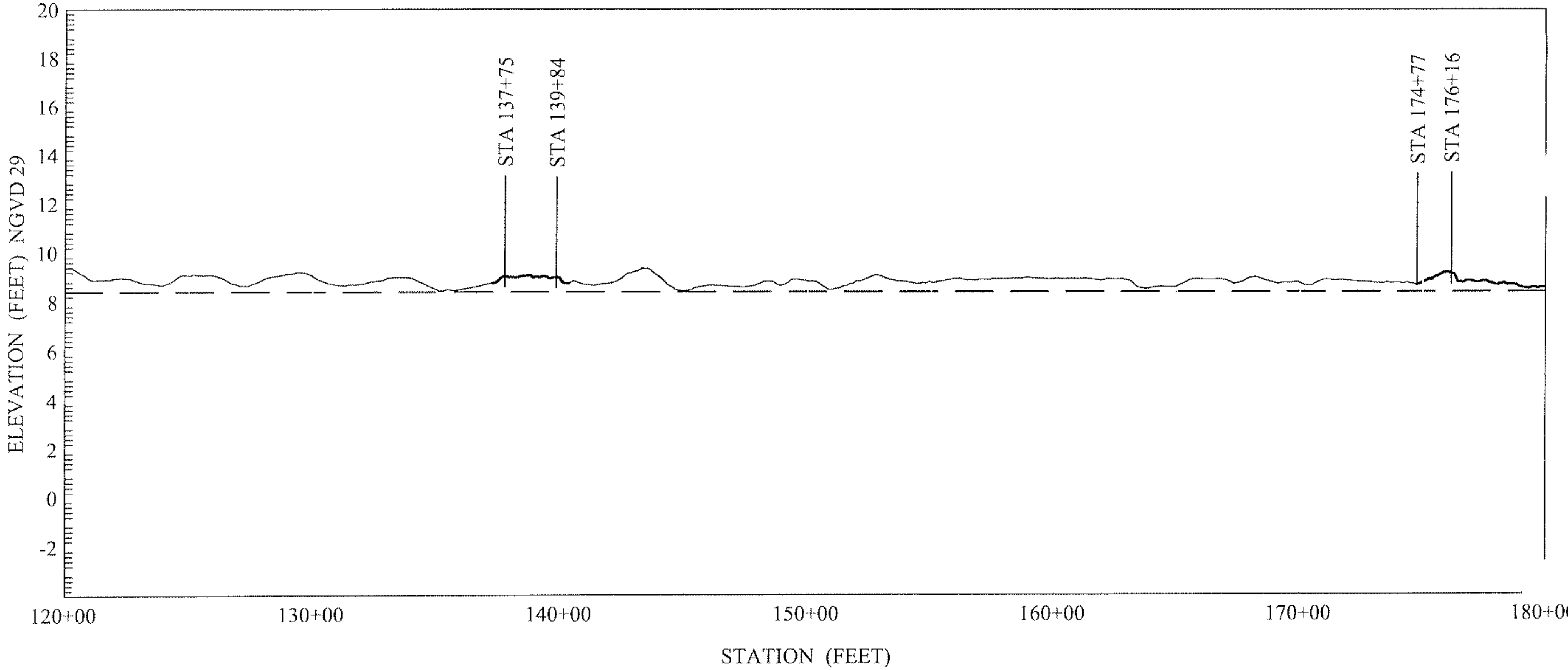
RD 2037 - Rindge Tract
Levee Centerline Profile 120+00 - 180+00



Profile Sheet No. 3 of 14

Legend

———	Existing Grade at Levee Centerline (03/2010)
— — —	HMP Design Elevation
━━━	As-Built Elevation

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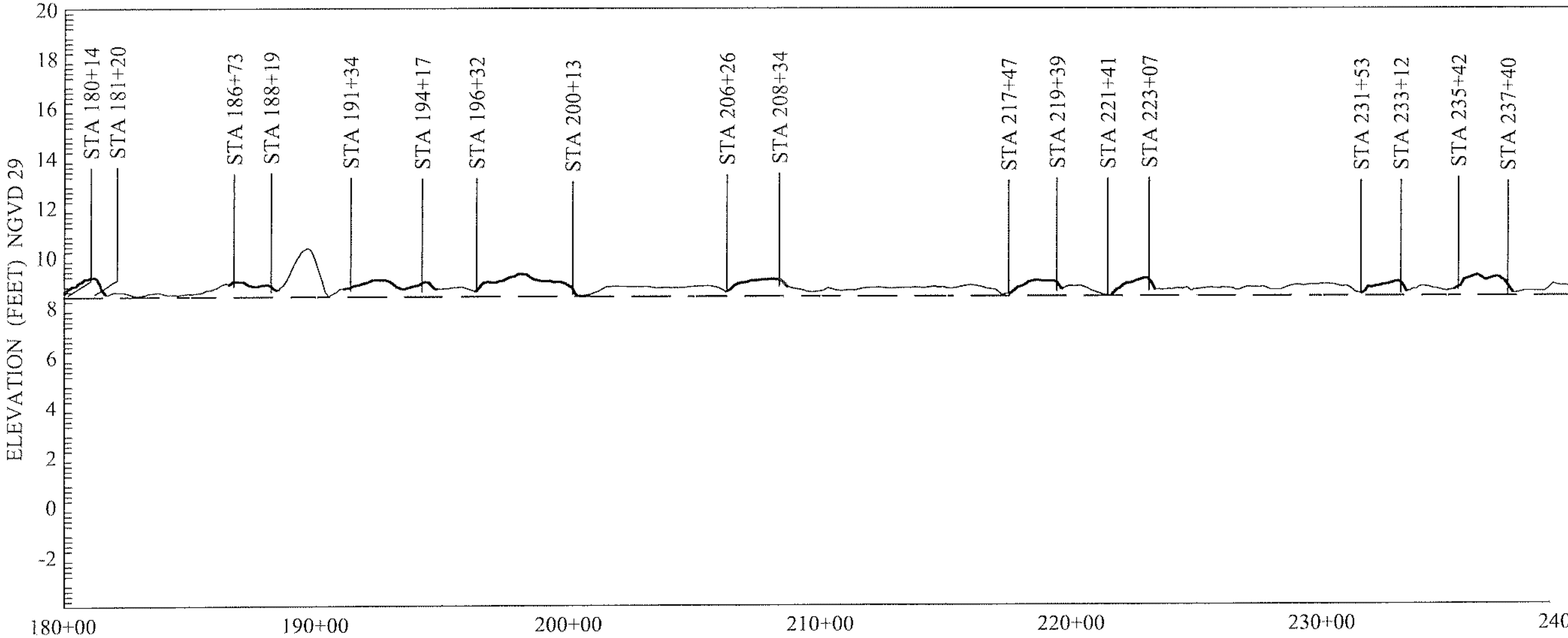
RD 2037 - Rindge Tract
Levee Centerline Profile 180+00 - 240+00



Profile Sheet No. 4 of 14

Legend

- Existing Grade at Levee Centerline (03/2010)
- HMP Design Elevation
- As-Built Elevation

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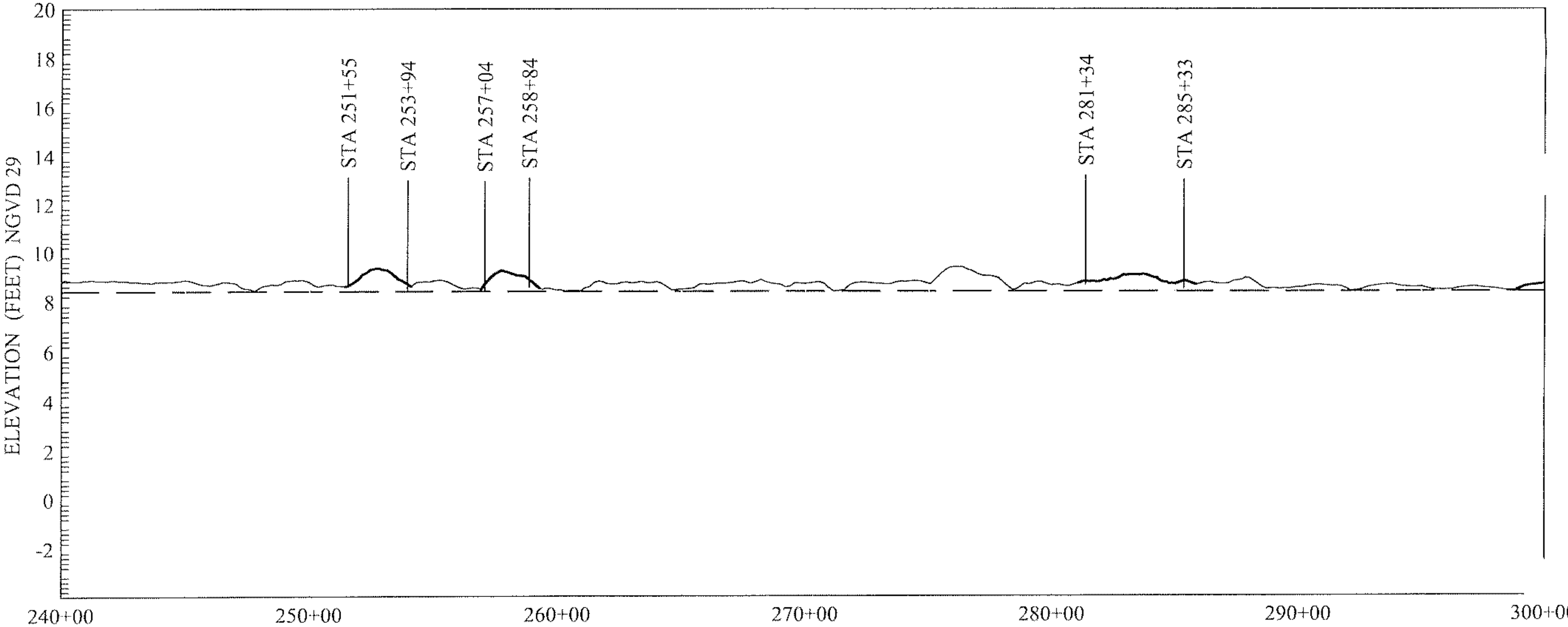
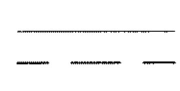
RD 2037 - Rindge Tract
Levee Centerline Profile 240+00 - 300+00



Profile Sheet No. 5 of 14

Legend



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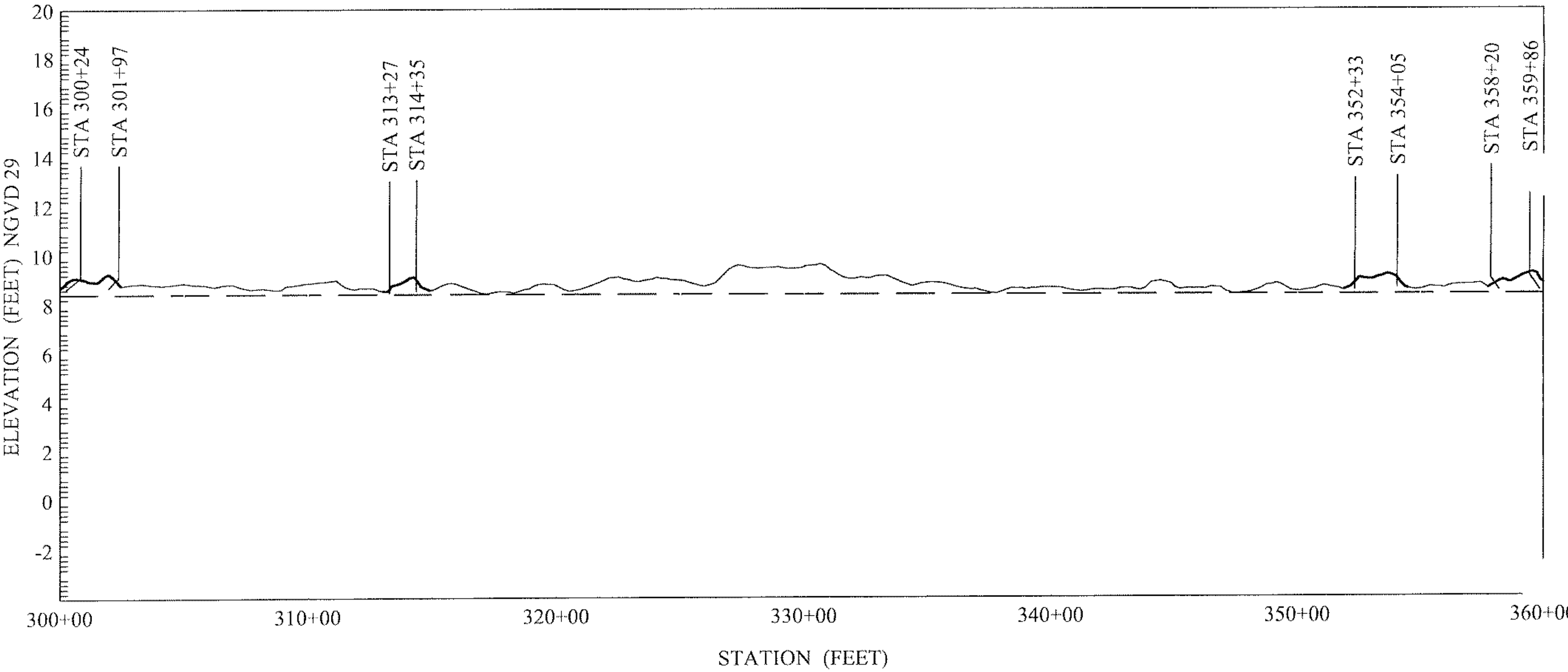
RD 2037 - Rindge Tract
Levee Centerline Profile 300+00 - 360+00



Profile Sheet No. 6 of 14

Legend

———	Existing Grade at Levee Centerline (03/2010)
— — —	HMP Design Elevation
━━━	As-Built Elevation

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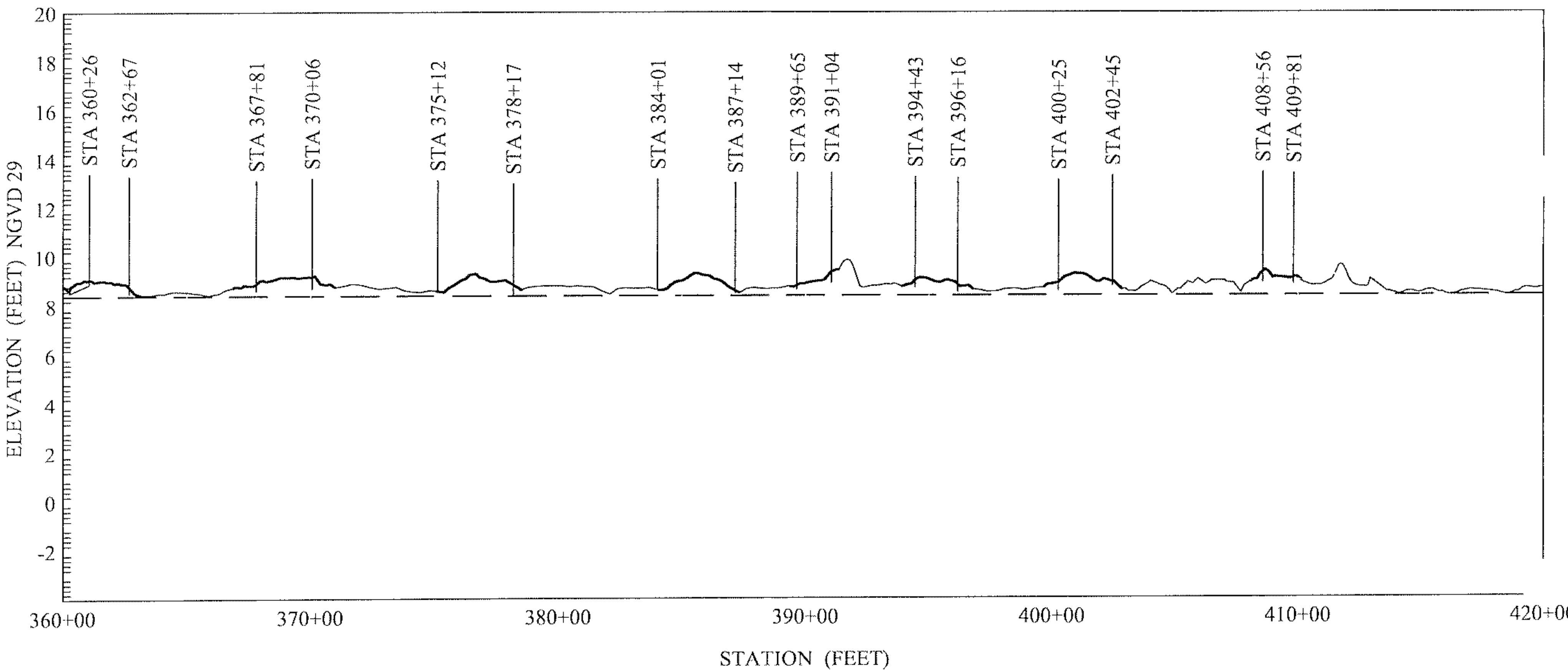
RD 2037 - Rindge Tract
Levee Centerline Profile 360+00 - 420+00



Profile Sheet No. 7 of 14

Legend

————	Existing Grade at Levee Centerline (03/2010)
— — —	HMP Design Elevation
━━━━	As-Built Elevation

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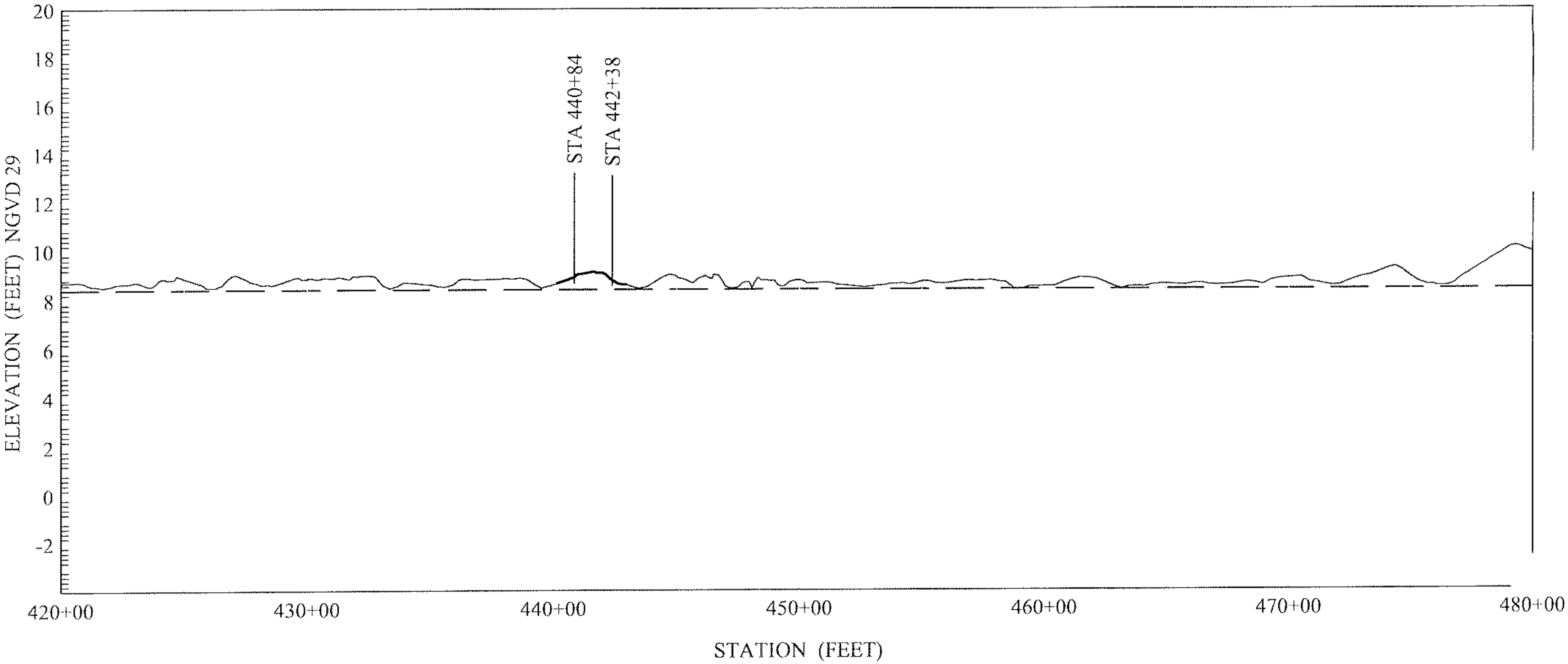
RD 2037 - Rindge Tract
Levee Centerline Profile 420+00 - 480+00



Profile Sheet No. 8 of 14

Legend

Existing Grade at Levee Centerline (03/2010)
HMP Design Elevation
As-Built Elevation

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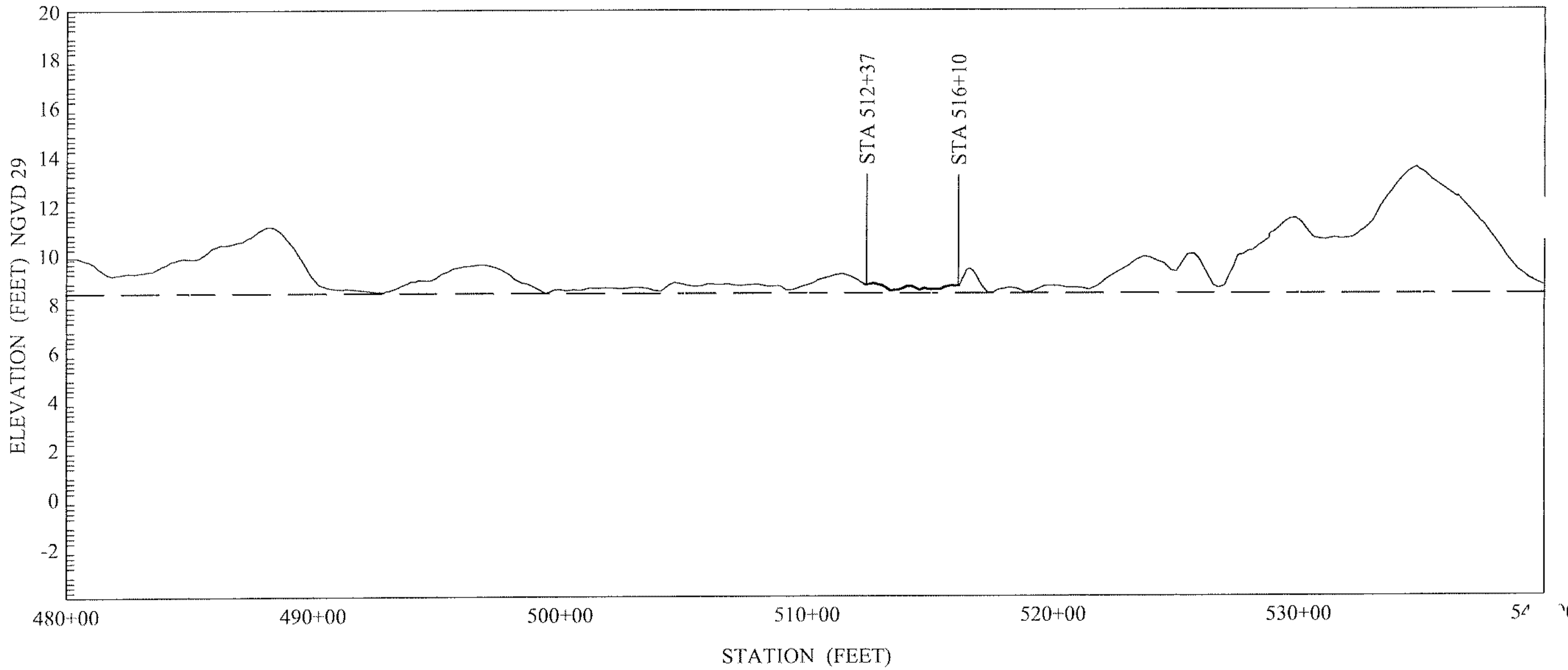
RD 2037 - Rindge Tract
Levee Centerline Profile 480+00 - 540+00



Profile Sheet No. 9 of 14

Legend

————	Existing Grade at Levee Centerline (03/2010)
— — —	HMP Design Elevation
━━━━	As-Built Elevation

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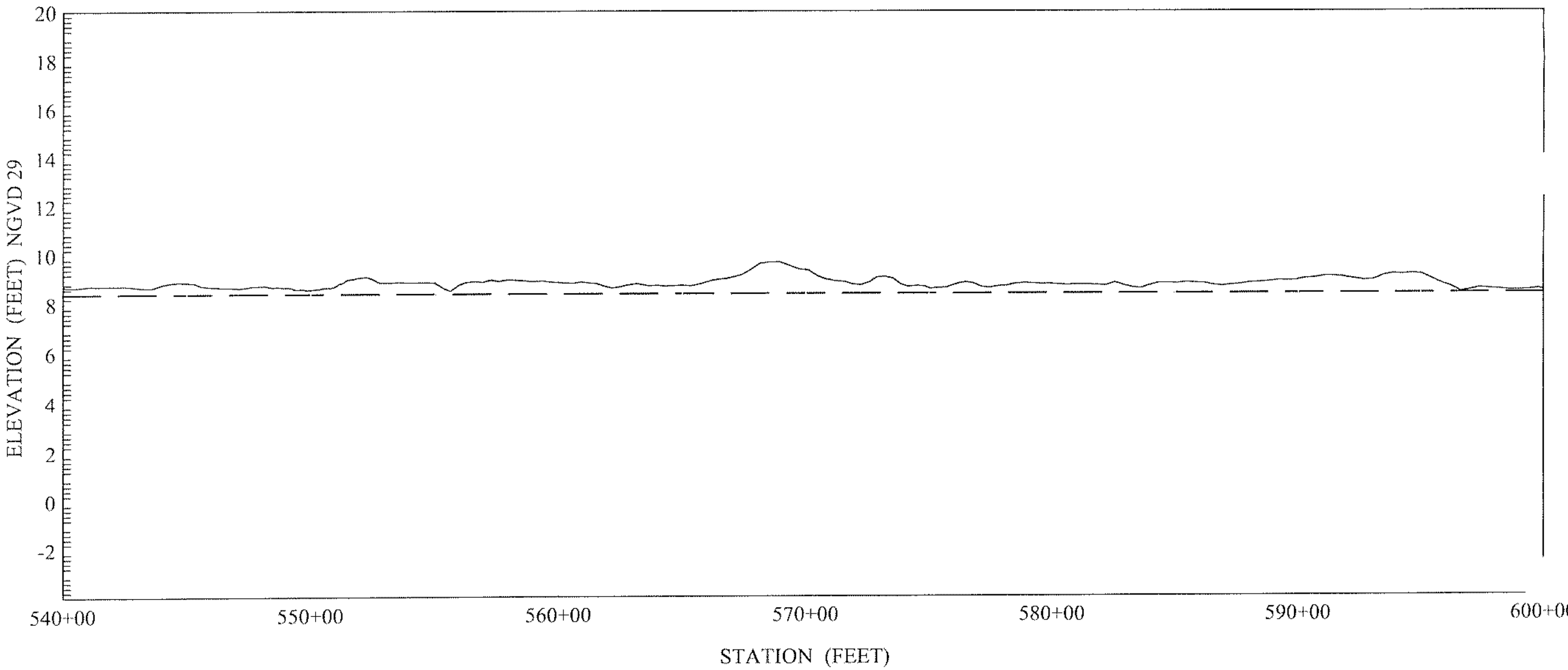
RD 2037 - Rindge Tract
Levee Centerline Profile 540+00 - 600+00



Profile Sheet No. 10 of 14

Legend

————	Existing Grade at Levee Centerline (03/2010)
— — —	HMP Design Elevation
————	As-Built Elevation

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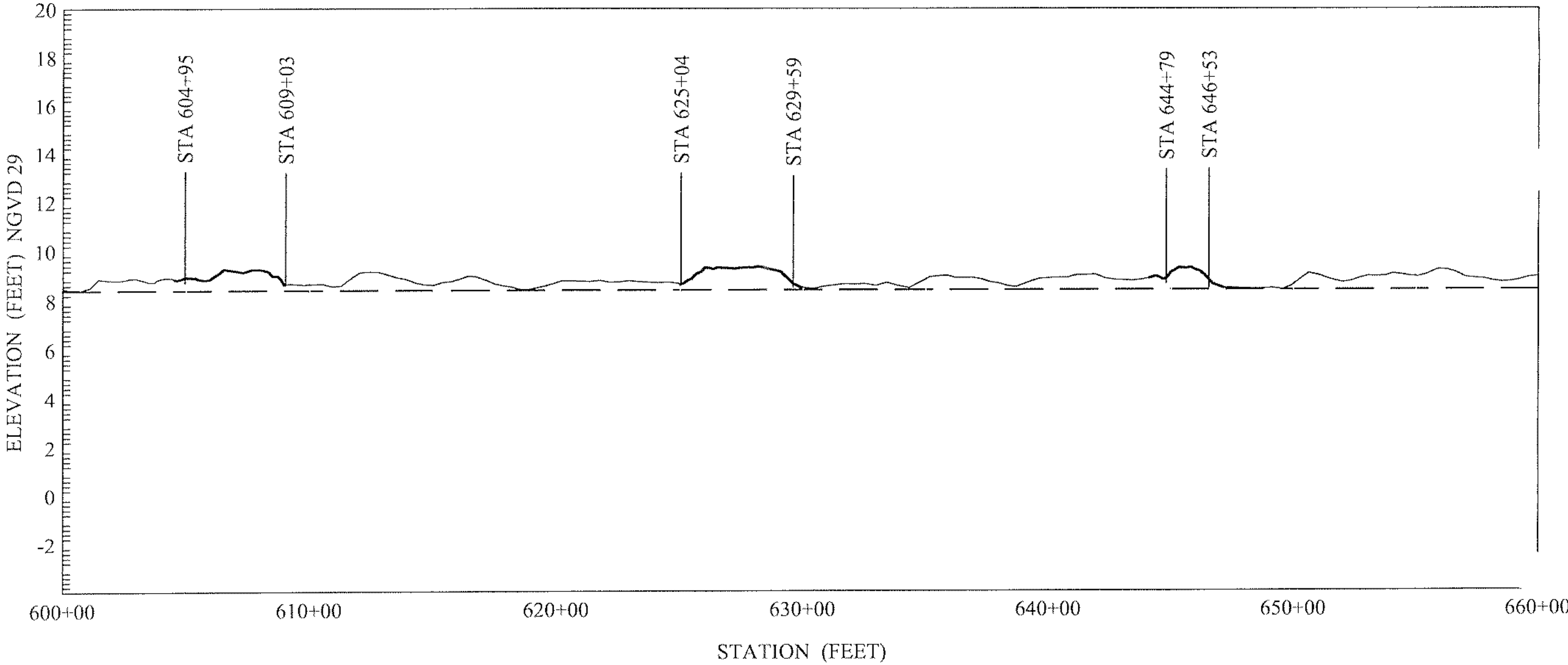
RD 2037 - Rindge Tract
Levee Centerline Profile 600+00 - 660+00



Profile Sheet No. 11 of 14

Legend

- Existing Grade at Levee Centerline (03/2010)
- HMP Design Elevation
- As-Built Elevation

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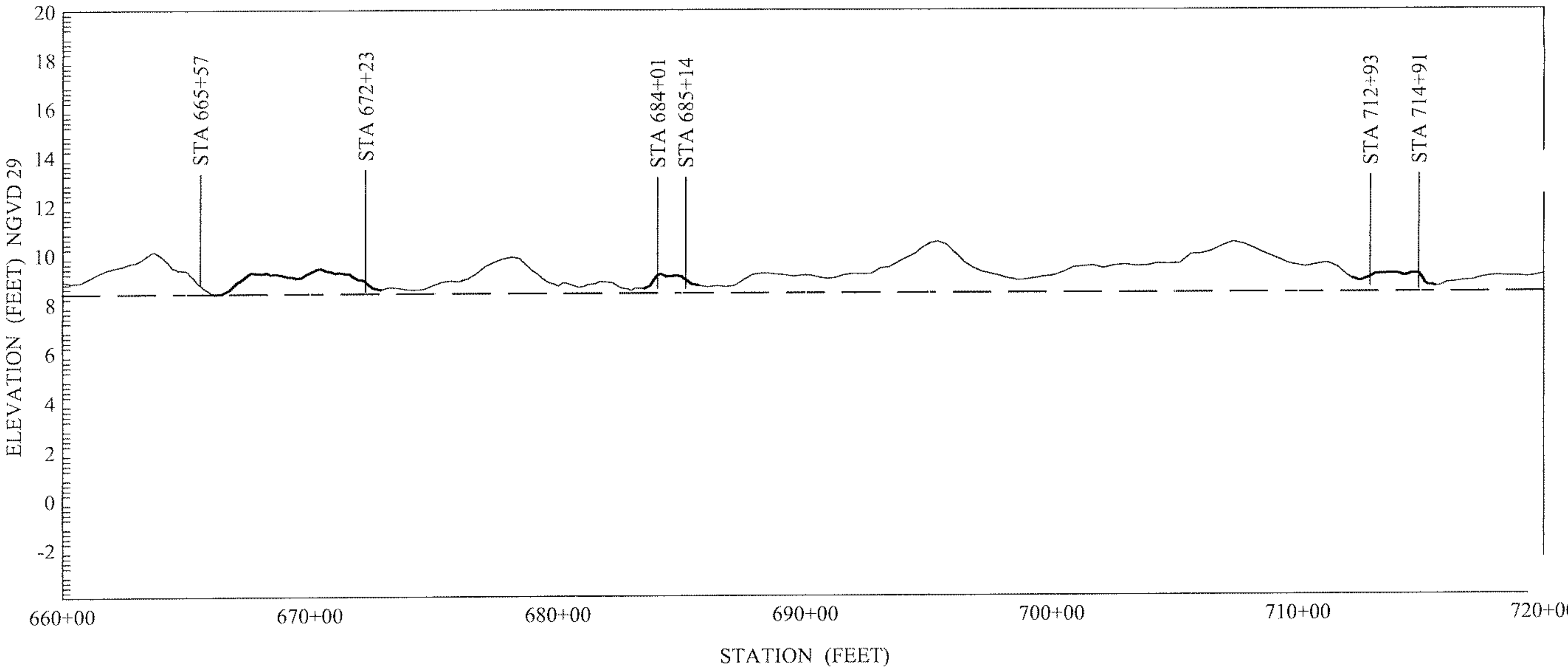
RD 2037 - Rindge Tract
Levee Centerline Profile 660+00 - 720+00



Profile Sheet No. 12 of 14

Legend

———	Existing Grade at Levee Centerline (03/2010)
— — —	HMP Design Elevation
———	As-Built Elevation

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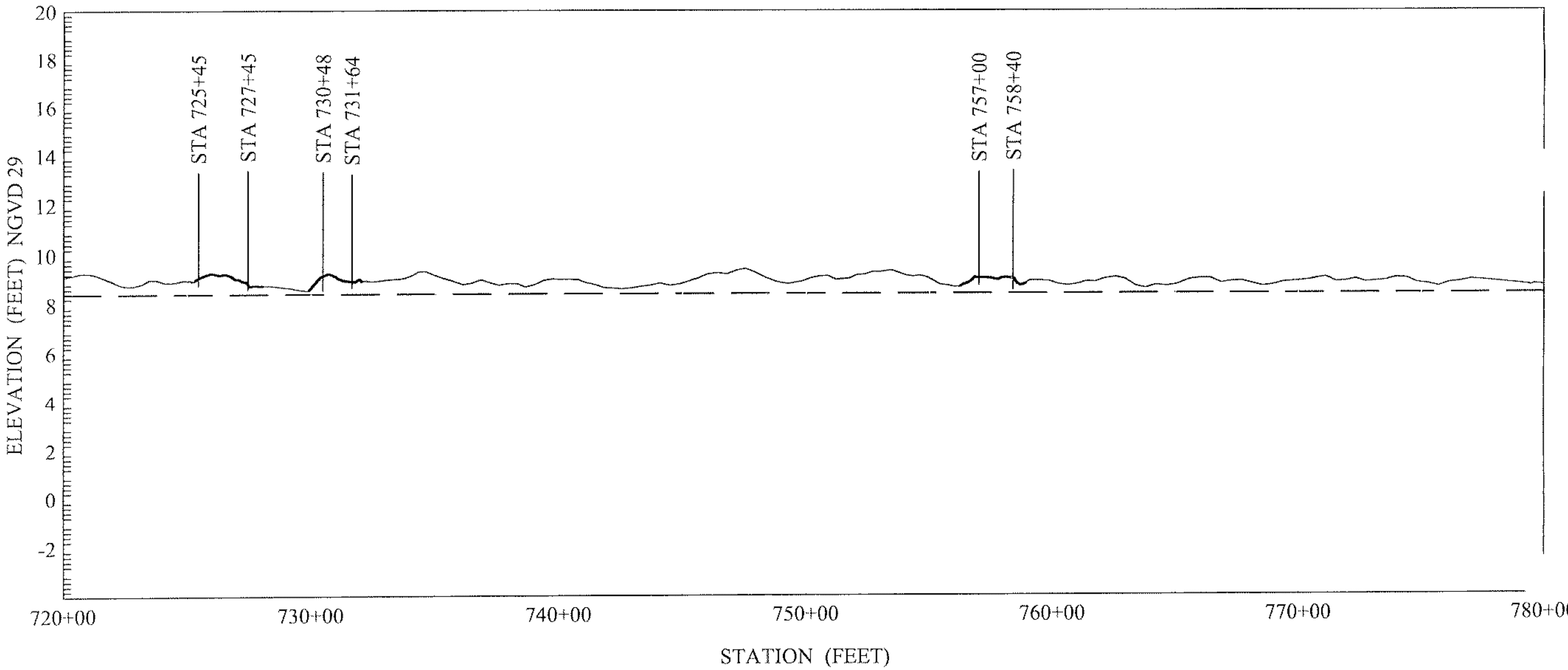
RD 2037 - Rindge Tract
Levee Centerline Profile 720+00 - 780+00



Profile Sheet No. 13 of 14

Legend

- Existing Grade at Levee Centerline (03/2010)
- HMP Design Elevation
- As-Built Elevation

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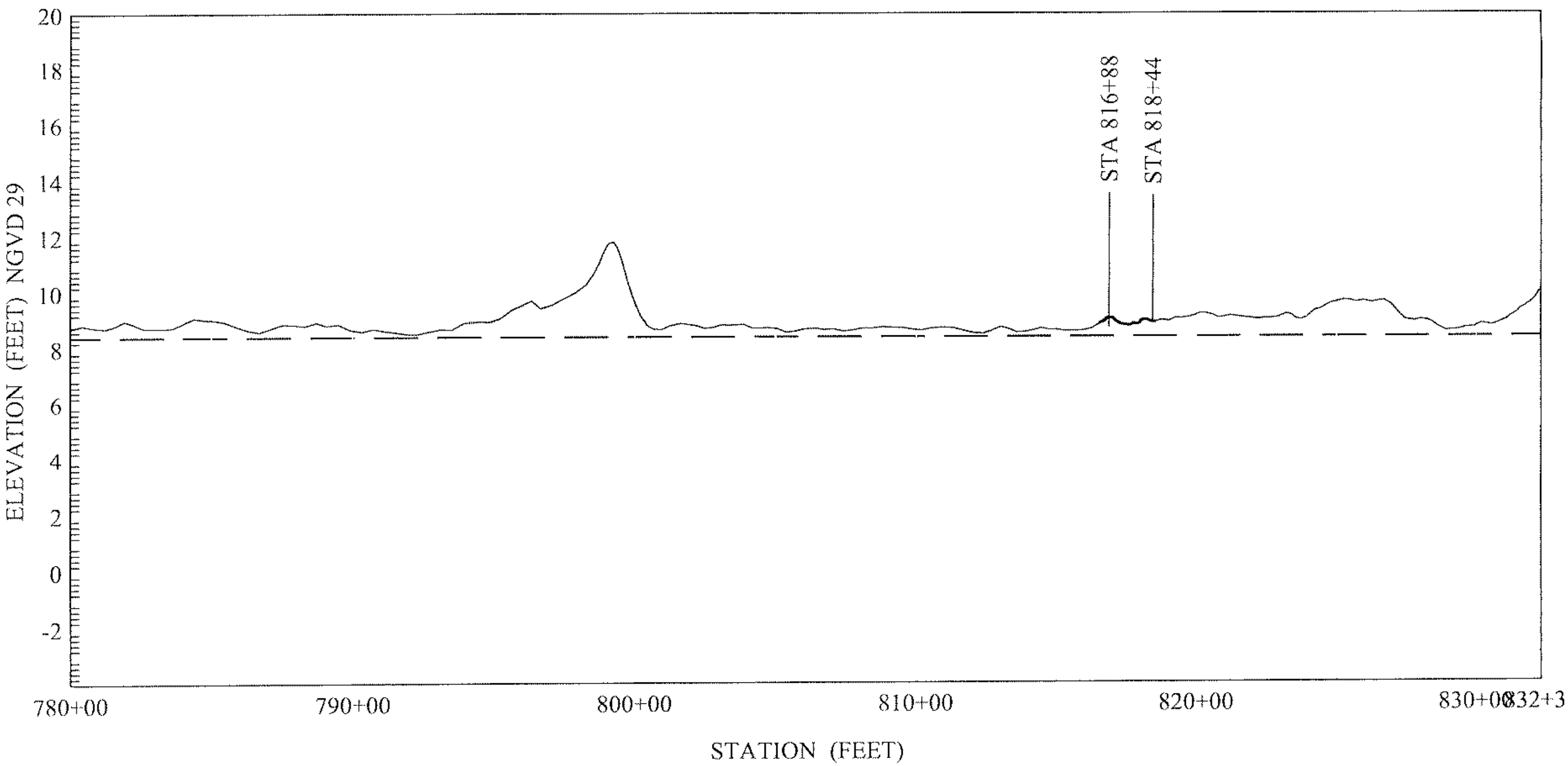
RD 2037 - Rindge Tract
Levee Centerline Profile 780+00 - 832+31



Profile Sheet No. 14 of 14

Legend

Existing Grade at Levee Centerline (03/2010)
HMP Design Elevation
As-Built Elevation

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