DELTA LEVEES CASE STUDY

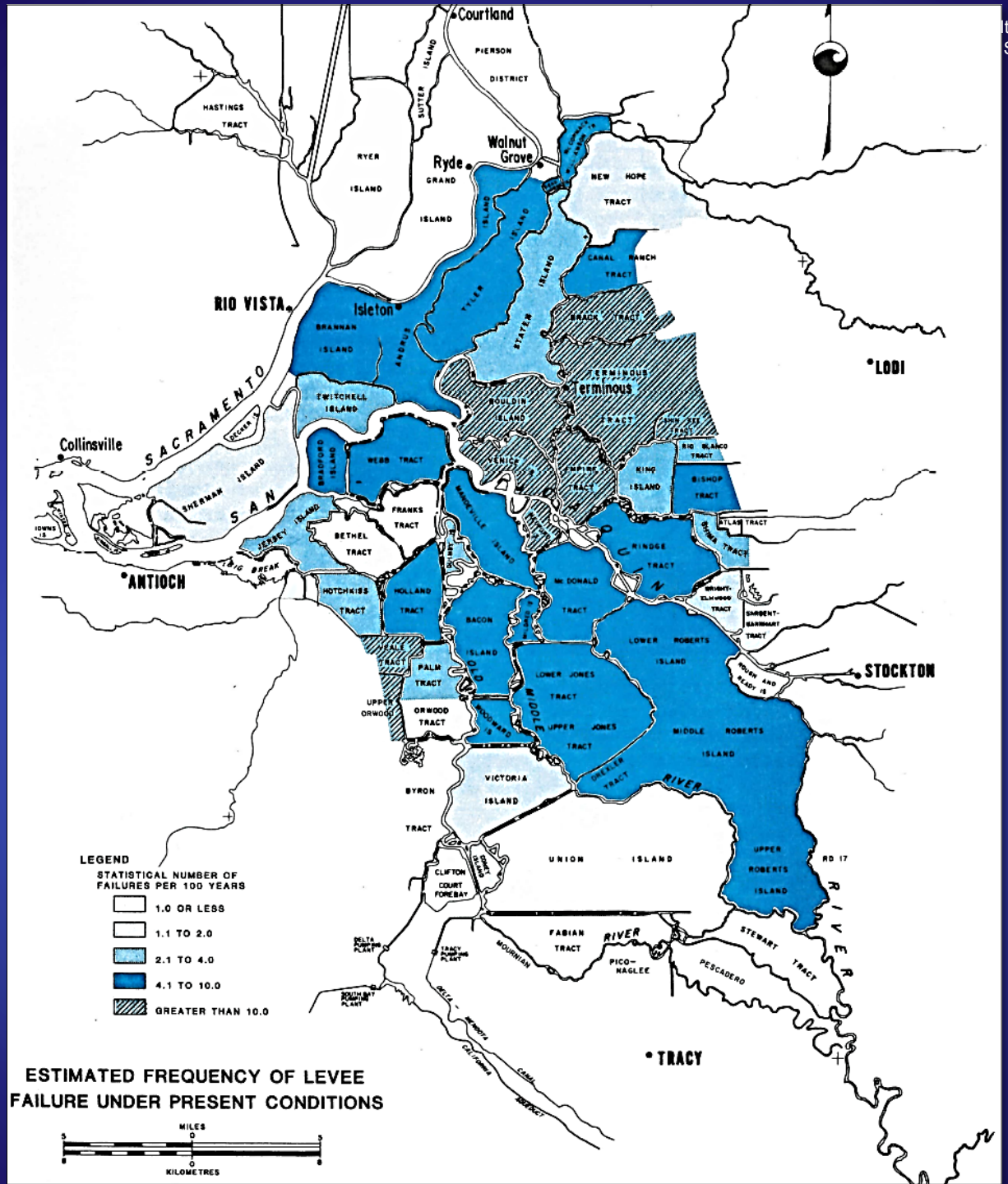
Presentation to the

Delta Stewardship Council

September 24, 2015

Gilbert Cosio

MBK Engineers


Courtland
PIERSON DISTRICT
SUTTER ISLAND
HASTINGS TRACT
RYER ISLAND
Ryde
GRAND ISLAND
Walnut Grove
NEW HOPE TRACT
CANAL RANCH TRACT
RIO VISTA
Isleton
BRANNAN ISLAND
ANDRUS
TYLER ISLAND
STATEN ISLAND
BRACK TRACT
LODI
TERMINOUS
Terminous
TRACT
SACRAMENTO
SWITCHELL ISLAND
BOULDIN ISLAND
Collinsville
SHERMAN ISLAND
BRADFORD ISLAND
WEBB TRACT
VENICE
EMPIRE TRACT
KING ISLAND
BISHOP TRACT
SAN
JERSEY ISLAND
BETHEL TRACT
FRANKS TRACT
MANDEVILLE ISLAND
RINDGE TRACT
ATLAS TRACT
ANTIOCH
BIG BREAK
HOTCHKISS TRACT
HOLLAND TRACT
BACON ISLAND
McDONALD TRACT
LOWER ROBERTS ISLAND
STOCKTON
PALM TRACT
OLD
LOWER JONES TRACT
UPPER ORWOOD
ORWOOD TRACT
MIDDLE
UPPER JONES TRACT
MIDDLE ROBERTS ISLAND
VICTORIA ISLAND
BYRON TRACT
RIVER
UNION ISLAND
UPPER ROBERTS ISLAND
RD 17
CLIFTON COURT FOREBAY
FABIAN TRACT
MOURNIAN
PICO-NAGLEE
PESCADERO
STEWART TRACT
TRACY
LEGEND
STATISTICAL NUMBER OF FAILURES PER 100 YEARS
1.0 OR LESS
1.1 TO 2.0
2.1 TO 4.0
4.1 TO 10.0
GREATER THAN 10.0
ESTIMATED FREQUENCY OF LEVEE FAILURE UNDER PRESENT CONDITIONS
MILES
KILOMETRES

DELTA LEVEE BREAKS 1980-1986

Holland Tract

Webb Tract

Lower Jones Tract

McDonald Island

Mildred Island

Venice Island

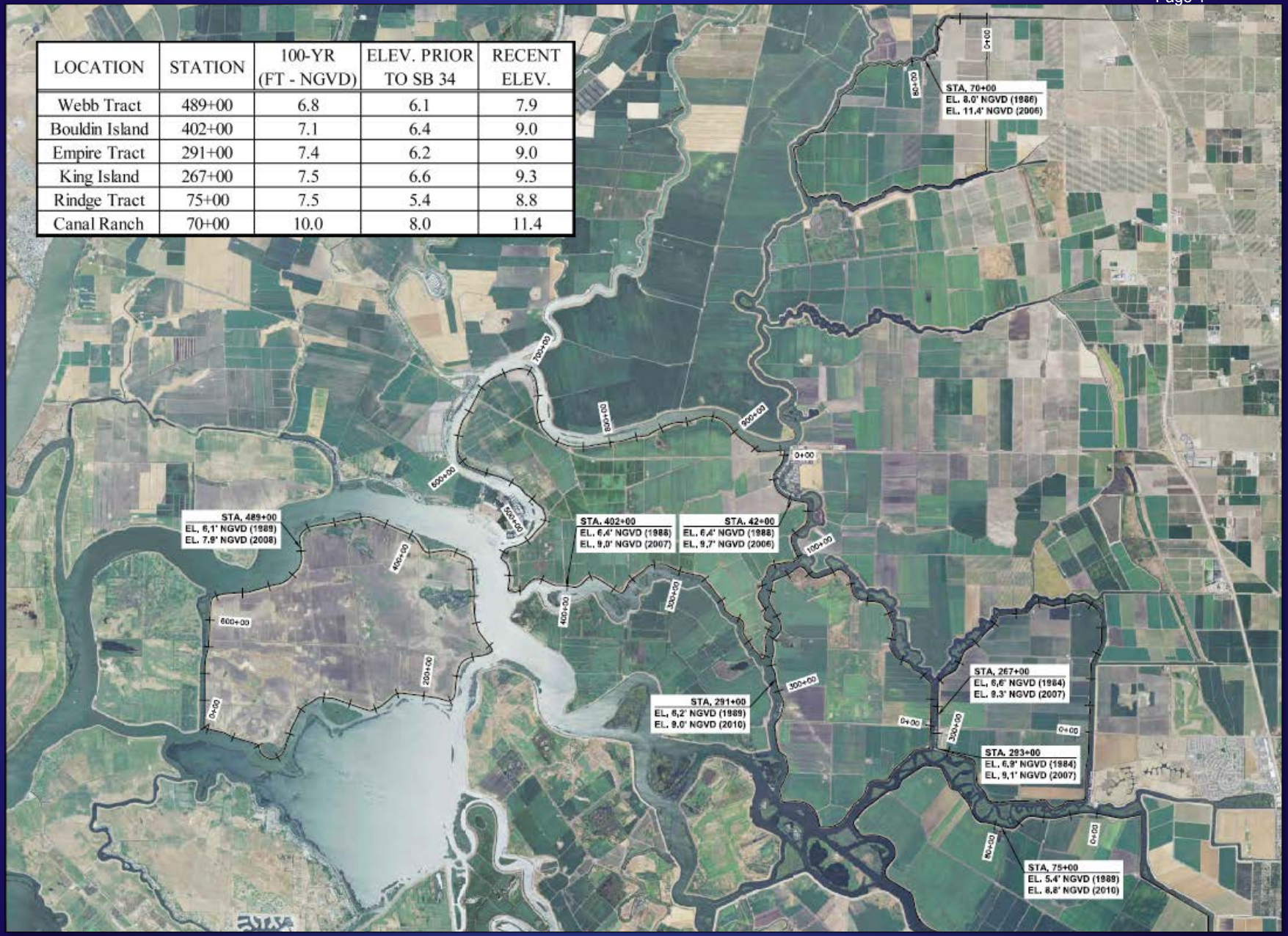
Little Franks Tract

Bradford Island

Tyler Island

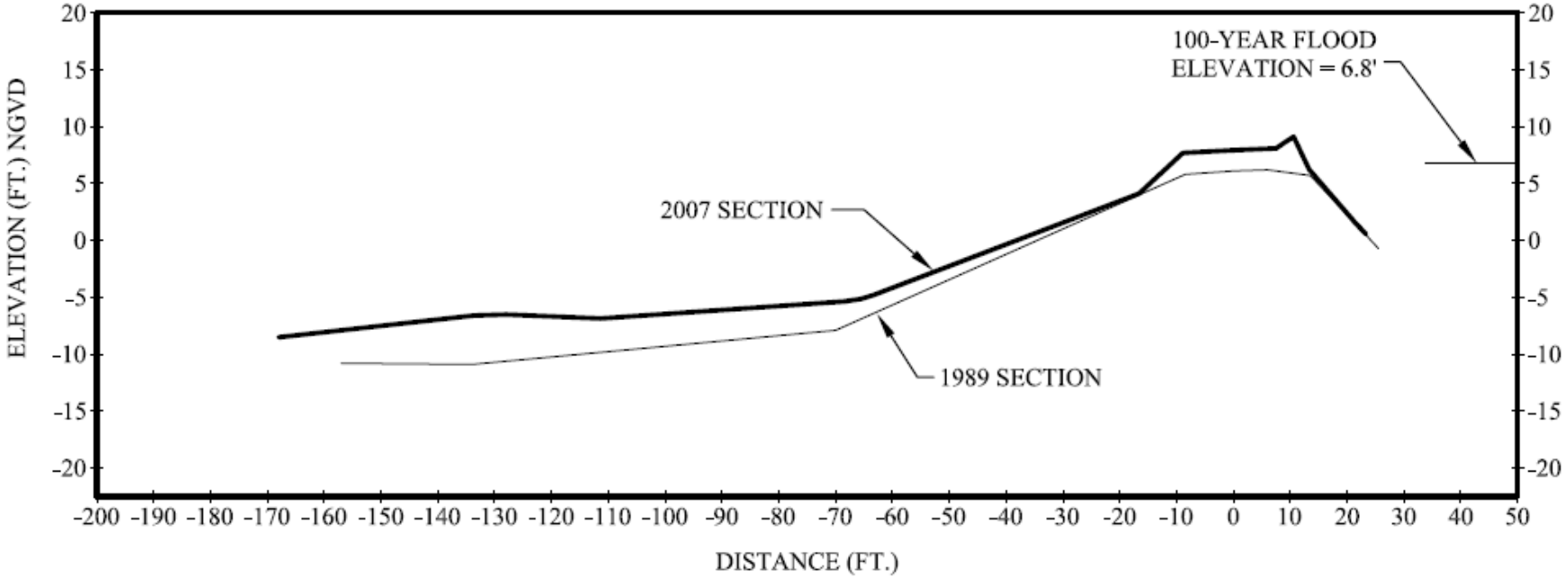
New Hope Tract

LOCATION	STATION	100-YR (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	10.0	8.0	11.4



RD 2026 - WEBB TRACT

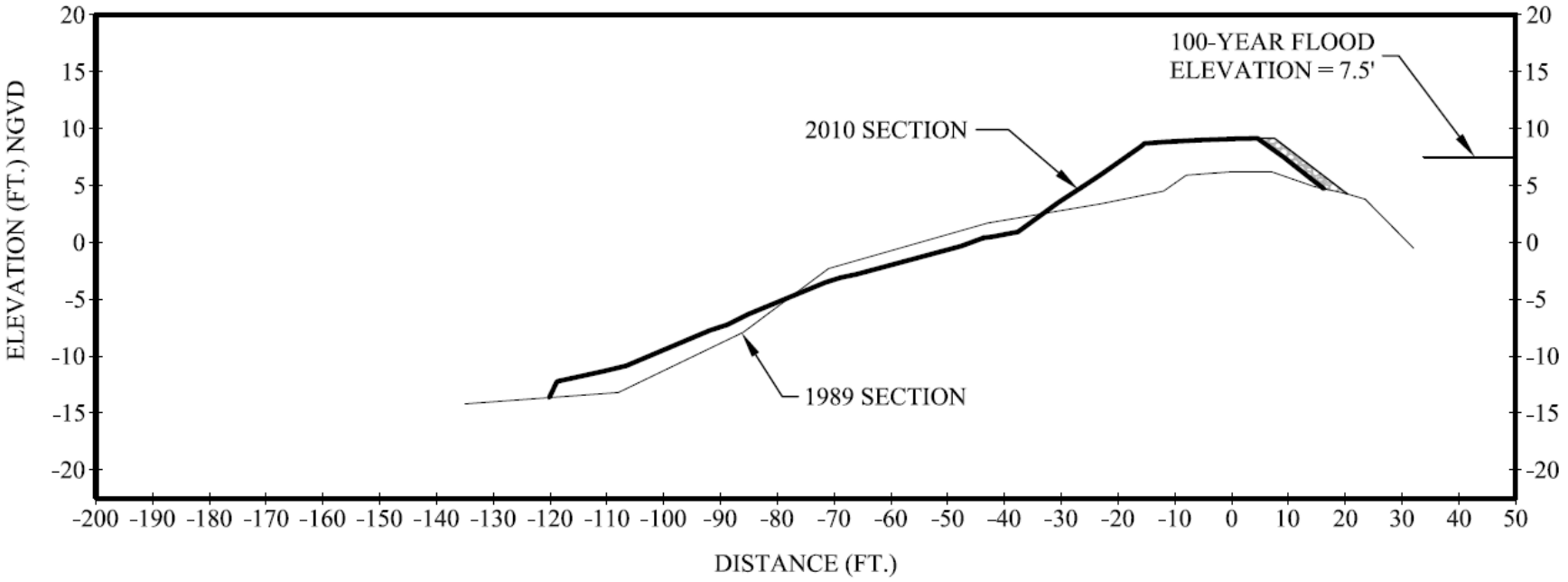
CROSS SECTION STATION 489+00



	1989	2007
CROWN ELEVATION (FT.)	6.1	7.9
FREEBOARD (FT.)	-0.7	1.1
CROWN WIDTH (FT.)	22	16

RD 2029 - EMPIRE TRACT

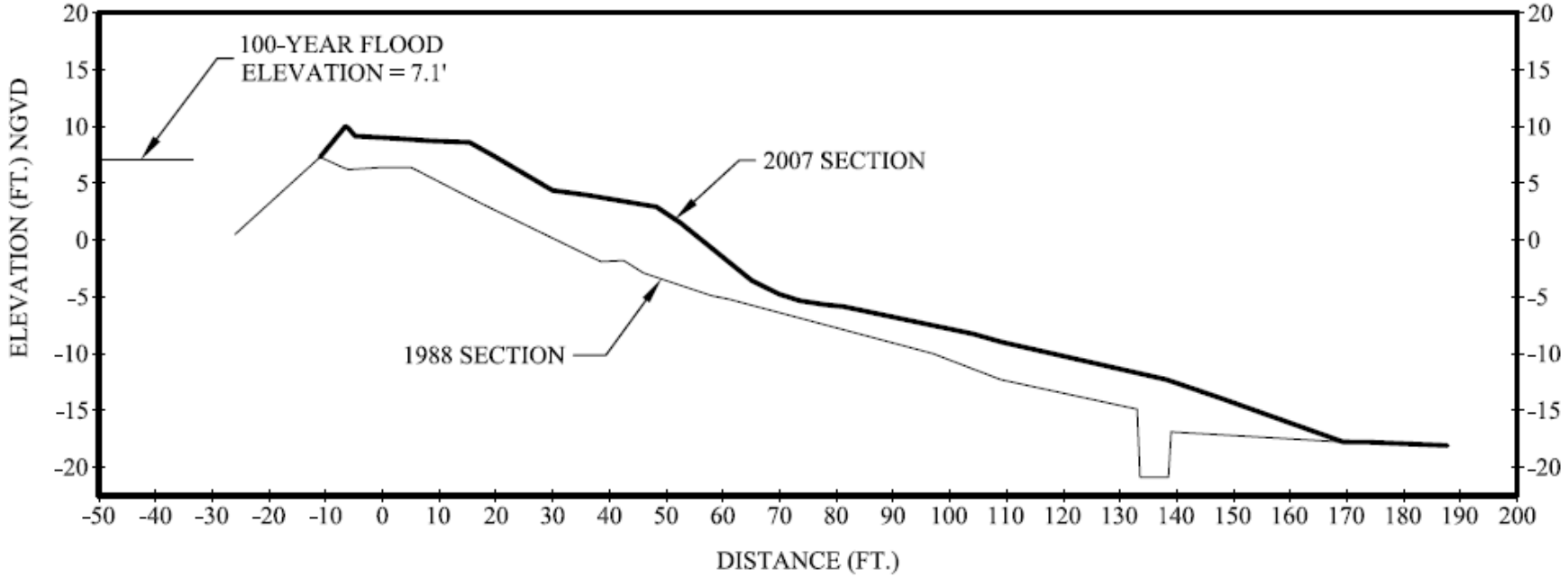
CROSS SECTION STATION 291+00



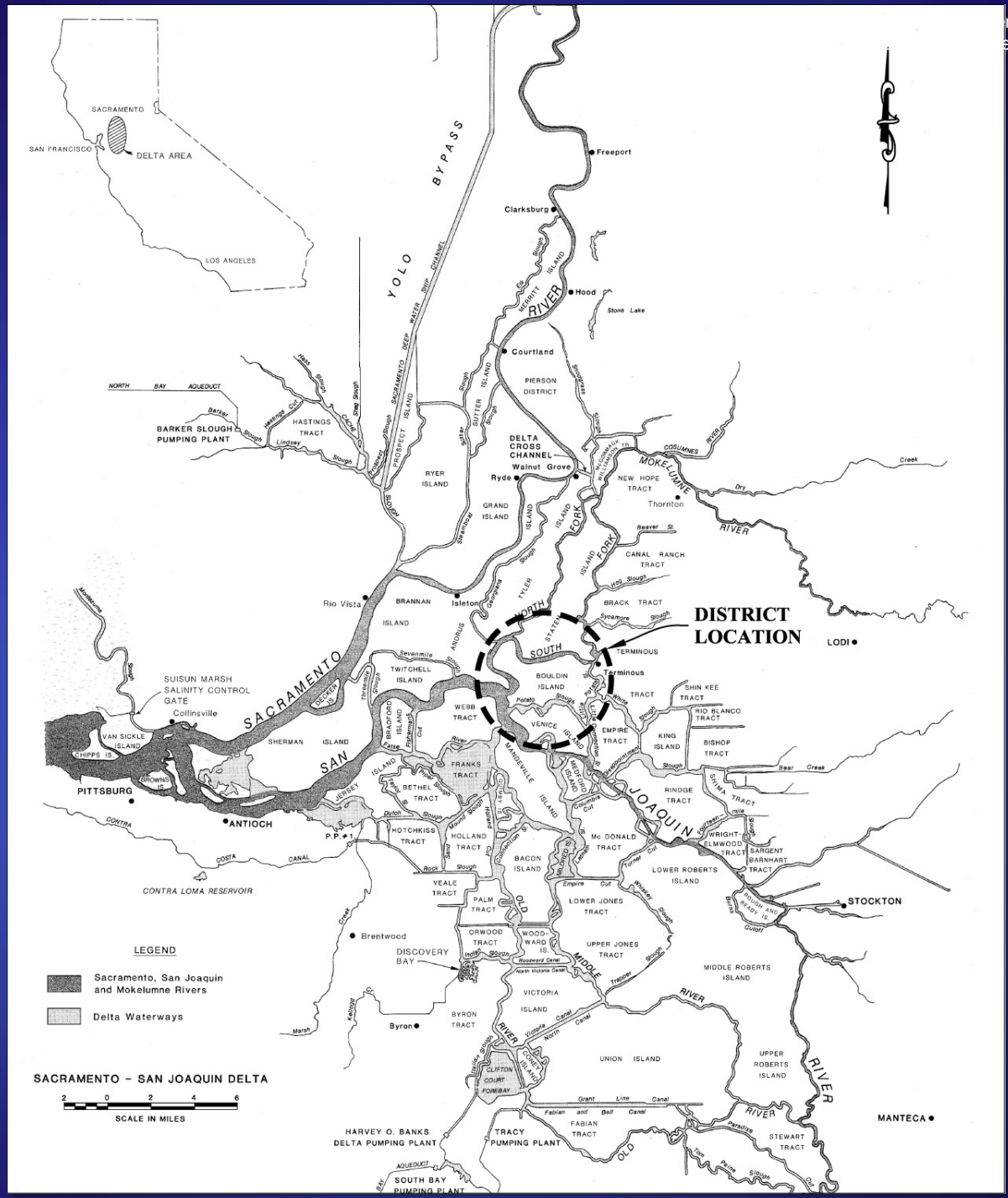
	1989	2010
CROWN ELEVATION (FT.)	6.2	9.1
FREEBOARD (FT.)	-1.3	1.6
CROWN WIDTH (FT.)	15	20

RD 756 - BOULDIN ISLAND

CROSS SECTION STATION 402+00



	1988	2007
CROWN ELEVATION (FT.)	6.4	9.0
FREEBOARD (FT.)	-0.7	1.9
CROWN WIDTH (FT.)	11	20


SACRAMENTO
SAN FRANCISCO
DELTA AREA
LOS ANGELES
YOLO BYPASS
Freeport
Clarksburg
Hood
Stone Lake
Courtland
PIERSON DISTRICT
NORTH BAY AQUEDUCT
BARKER SLOUGH PUMPING PLANT
HASTINGS TRACT
RYER ISLAND
DELTA CROSS CHANNEL
Walnut Grove
Ryde
GRAND ISLAND
NEW HOPE TRACT
Thornton
MOKELUMNE RIVER
CANAL RANCH TRACT
BRACK TRACT
DISTRICT LOCATION
LODI
Rio Vista
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Isleton
TERMINOUS
SUISUN MARSH SALINITY CONTROL GATE
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MANDEVILLE ISLAND
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RINDGE TRACT
BETHEL ISLAND
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ANTIOCH
P.P. #1
HOTCHKISS TRACT
HOLLAND TRACT
Mc DONALD TRACT
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SARGENT-BARNHART TRACT
BACON ISLAND
LOWER ROBERTS ISLAND
CONTRA COSTA CANAL
CONTRA LOMA RESERVOIR
VEALE TRACT
PALM TRACT
LOWER JONES TRACT
STOCKTON
Brentwood
ORWOOD TRACT
WOODWARD IS.
UPPER JONES TRACT
DISCOVERY BAY
MIDDLE RIVER
MIDDLE ROBERTS ISLAND
VICTORIA ISLAND
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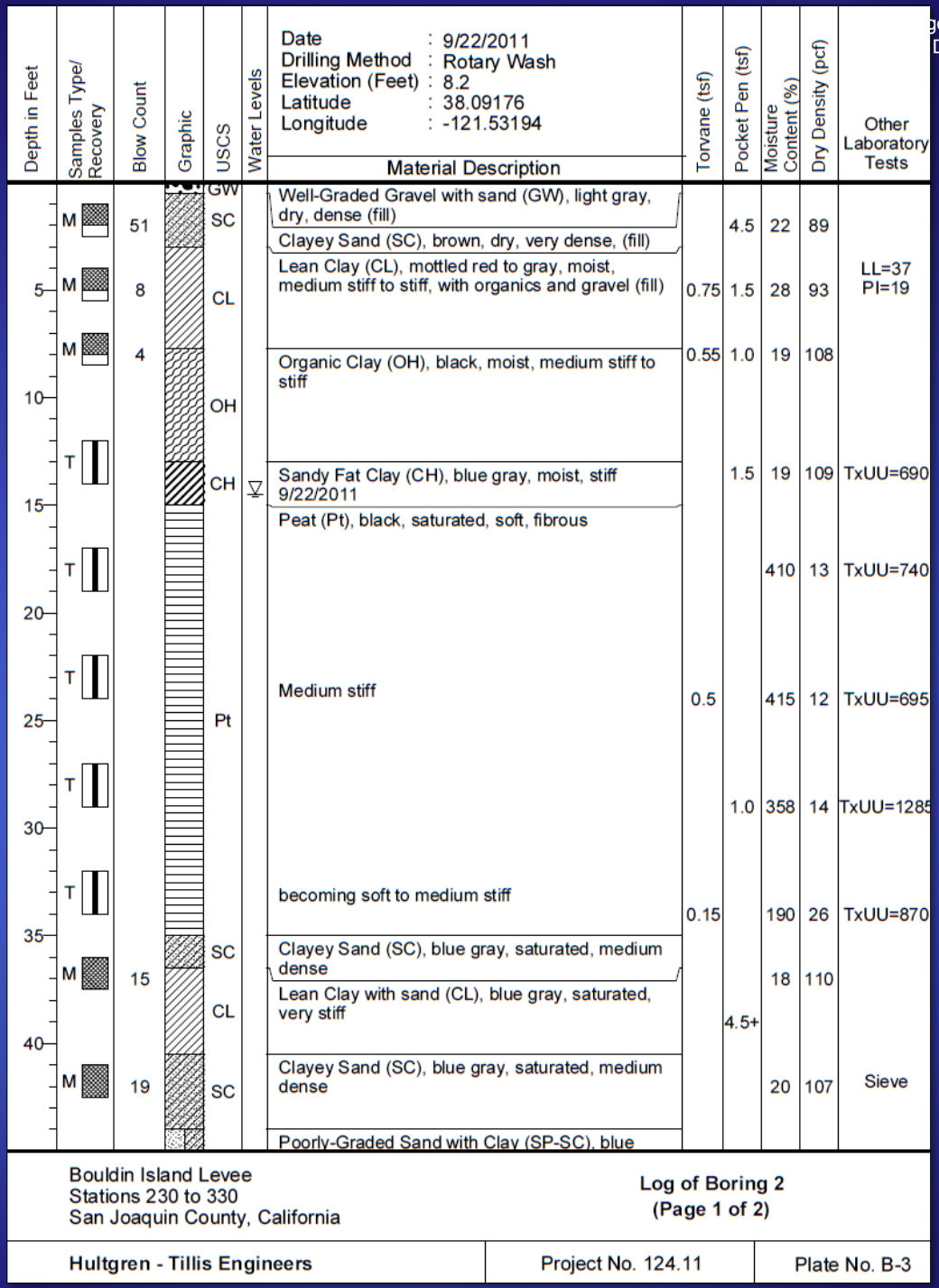
Fabian and Bell Canal
FABIAN TRACT
STEWART TRACT
MANTECA
HARVEY O. BANKS DELTA PUMPING PLANT
TRACY PUMPING PLANT
SOUTH BAY AQUEDUCT
SOUTH BAY PUMPING PLANT
LEGEND
Sacramento, San Joaquin and Mokelumne Rivers
Delta Waterways
SACRAMENTO – SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES



Bouldin Island Levee
Stations 230 to 330
San Joaquin County, California

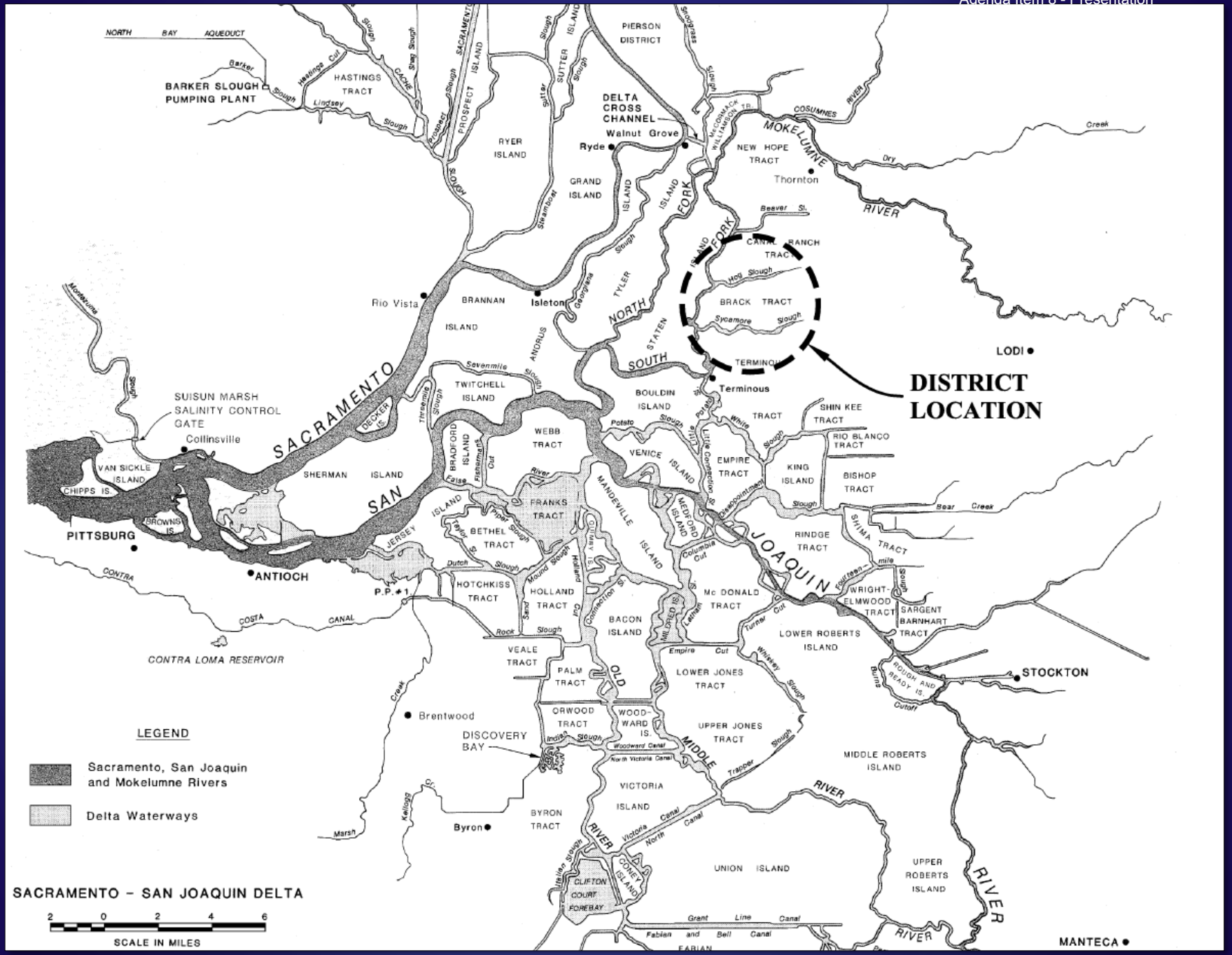
Log of Boring 2
(Page 1 of 2)

Hultgren - Tillis Engineers	Project No. 124.11	Plate No. B-3

Date : 9/22/2011
Drilling Method : Rotary Wash
Elevation (Feet) : 8.2
Latitude : 38.09176
Longitude : -121.53194

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
	M	17		SP-SC		gray, saturated, medium dense					
						Lean Clay (CL), blue gray, saturated, stiff to very stiff		2.0	24 25	102 101	
50				CL							
	M	18								32	

Bottom of boring at 52.5 feet
Groundwater encountered during rotary wash drilling method


DISTRICT LOCATION
SACRAMENTO – SAN JOAQUIN DELTA
LEGEND
Sacramento, San Joaquin and Mokelumne Rivers
Delta Waterways
SCALE IN MILES
2 0 2 4 6
NORTH BAY AQUEDUCT
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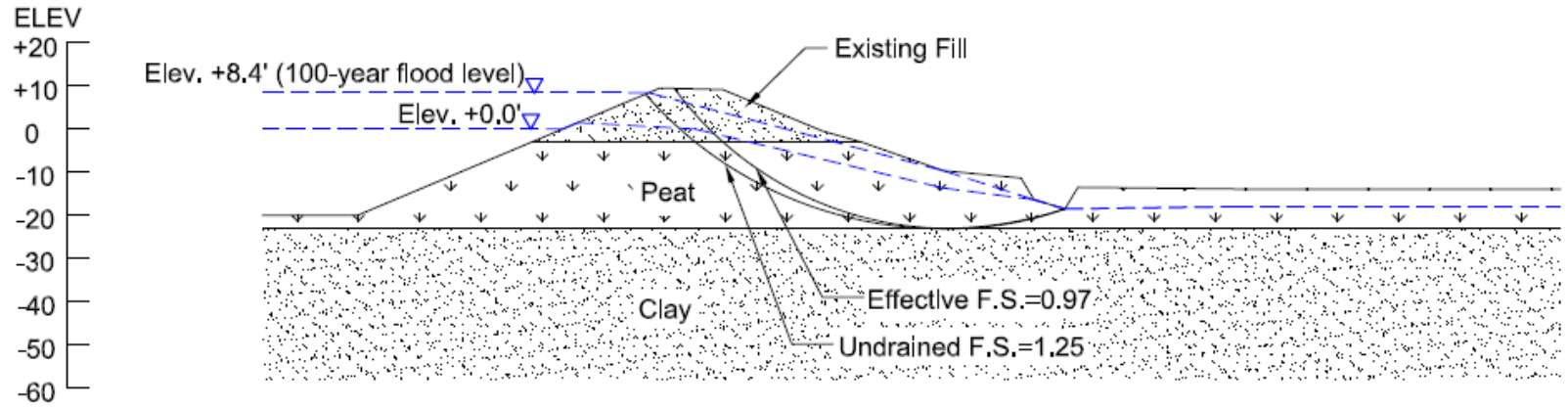
VICTORIA ISLAND
BYRON TRACT
Byron
UNION ISLAND
UPPER ROBERTS ISLAND
CLIFTON COURT FOREBAY
COREY ISLAND
Grant Line Canal
Fabian and Bell Canal
MANTECA



SOIL PARAMETERS

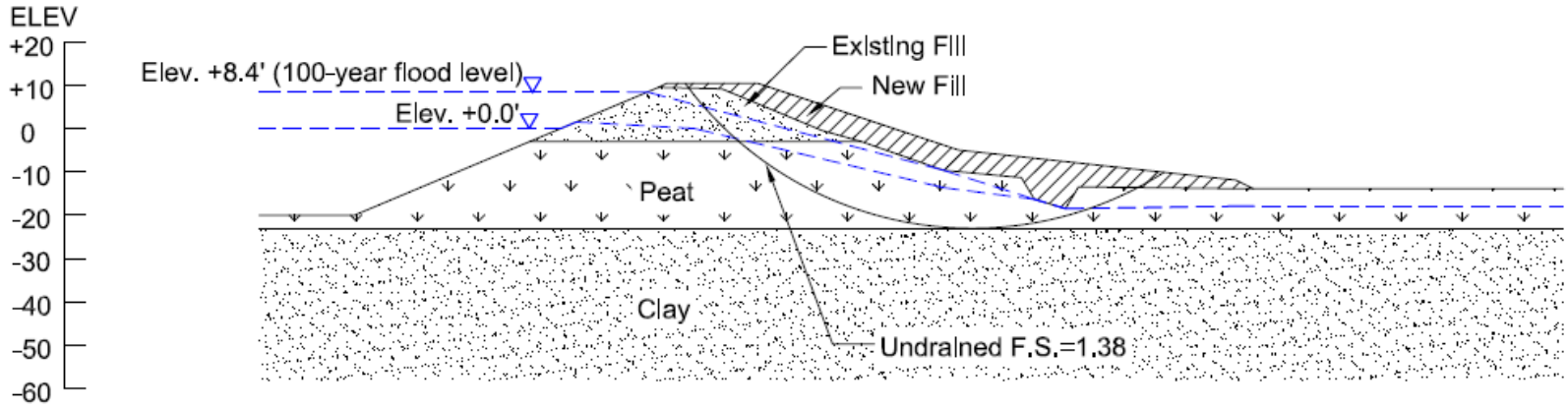
Soil Type	Unit Weight (pcf)	Undrained Strength		Effective Strength	
		Cohesion (psf)	Friction Angle (°)	Cohesion (psf)	Friction Angle (°)
Existing Fill	115	-	-	50	32
Peat	70	140	20	100	32
Clay	125	1000	0	50	30
New Fill	115	-	-	50	32

SCALE
0 40 feet
1 inch = 40 feet

Brack Tract
Stations 0 to 75 (North) and 0 to 45 (South)
San Joaquin County, California

Slope Stability Results
Existing Configuration
Station North 30

Hultgren - Tillis Engineers | Project No. 665.04 | Plate No. A-6



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SCALE
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1 inch = 40 feet

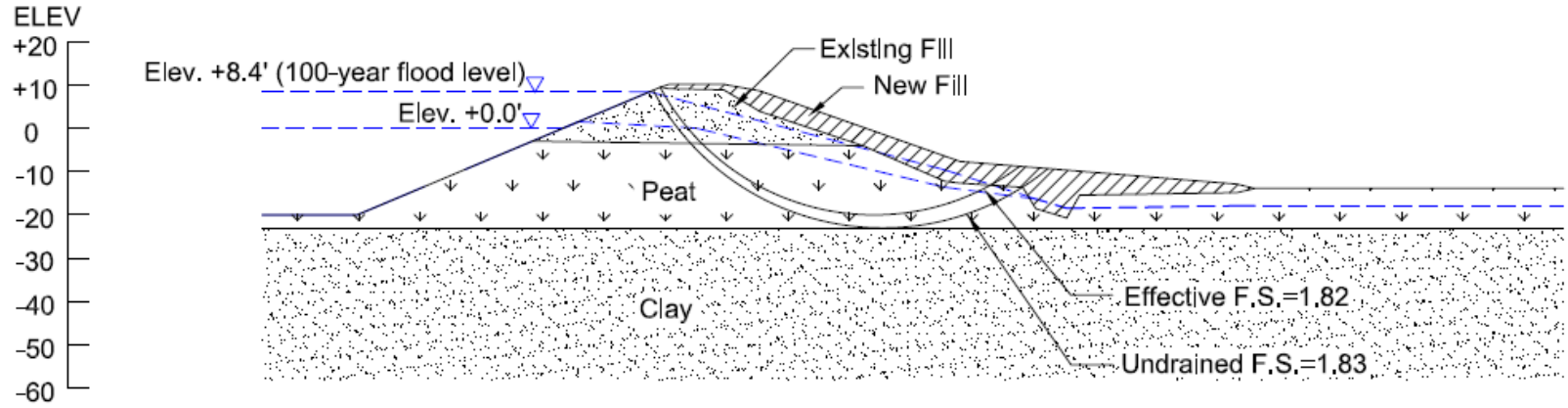
Brack Tract
Stations 0 to 75 (North) and 0 to 45 (South)
San Joaquin County, California

Slope Stability Results
End-of-Construction
Station North 30

Hultgren - Tillis Engineers

Project No. 665.04

Plate No. A-7



SOIL PARAMETERS

Soil Type	Unit Weight (pcf)	Undrained Strength		Effective Strength	
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SCALE
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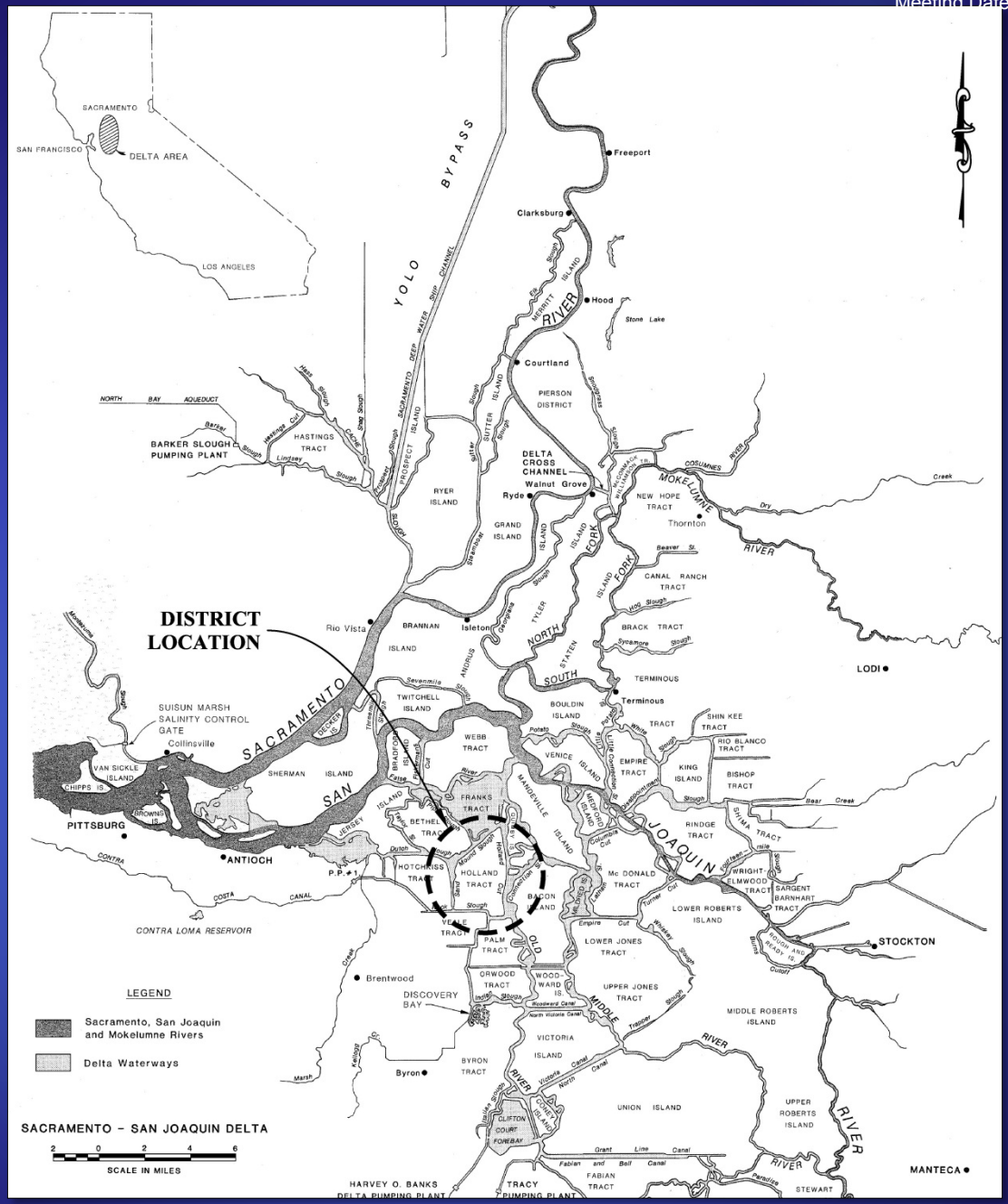
1 Inch = 40 feet

Brack Tract
Stations 0 to 75 (North) and 0 to 45 (South)
San Joaquin County, California

Slope Stability Results
Long-Term Consolidated
Station North 30

Hultgren - Tillis Engineers | Project No. 665.04 | Plate No. A-8


DISTRICT LOCATION
SACRAMENTO
SAN FRANCISCO
DELTA AREA
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JOAQUIN
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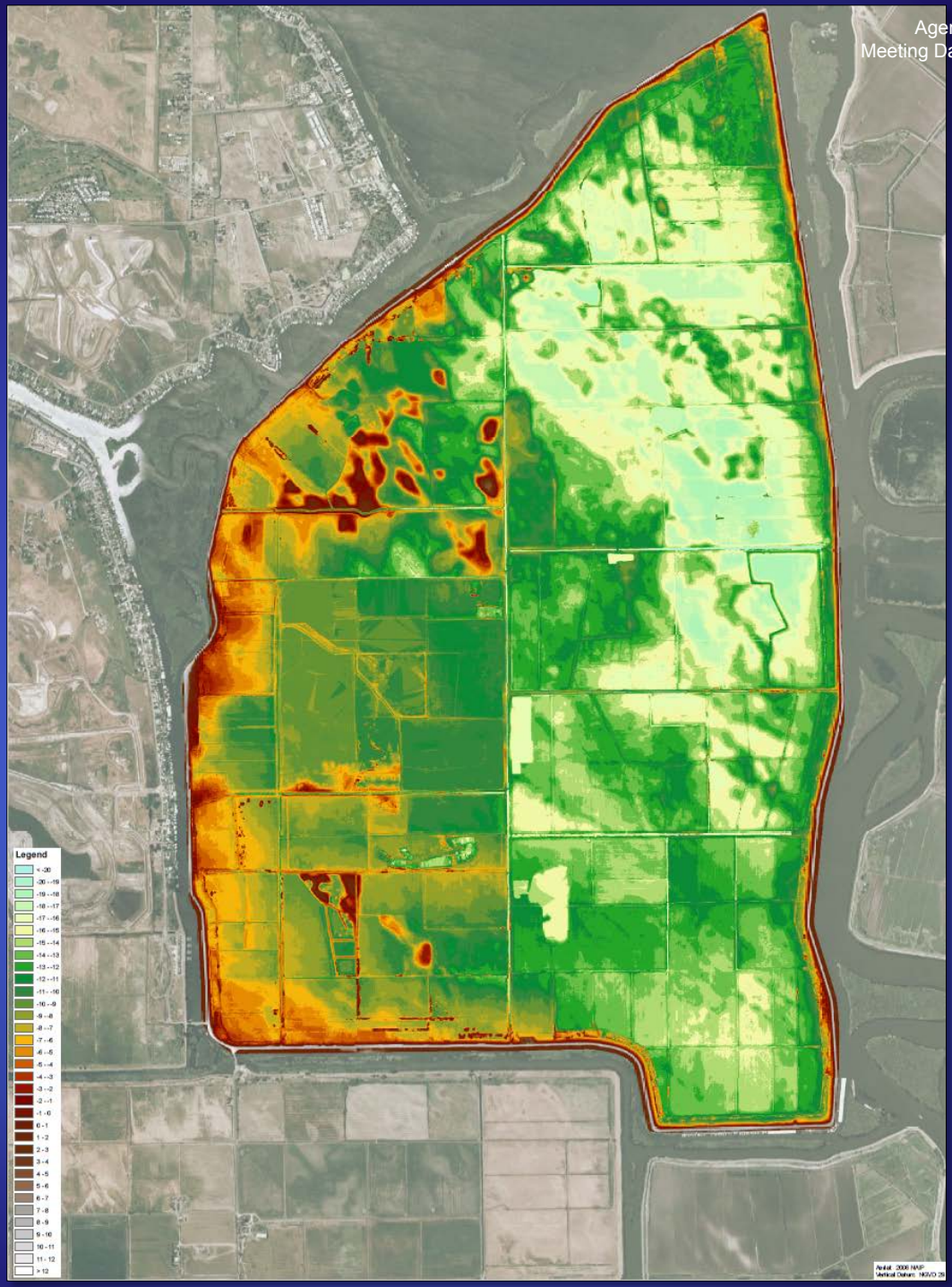
Sacramento, San Joaquin and Mokelumne Rivers
Delta Waterways
SACRAMENTO – SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES

180+00
200+00
220+00
240+00
260+00
280+00
300+00
320+00
340+00
360+00
380+00
400+00
420+00
440+00
460+00
480+00
500+00
520+00
540+00
560+00
578+56
0+00
20+00
40+00
60+00
80+00
100+00
120+00
140+00
160+00
Image Source: 2009 NAIP imagery (1m resolution)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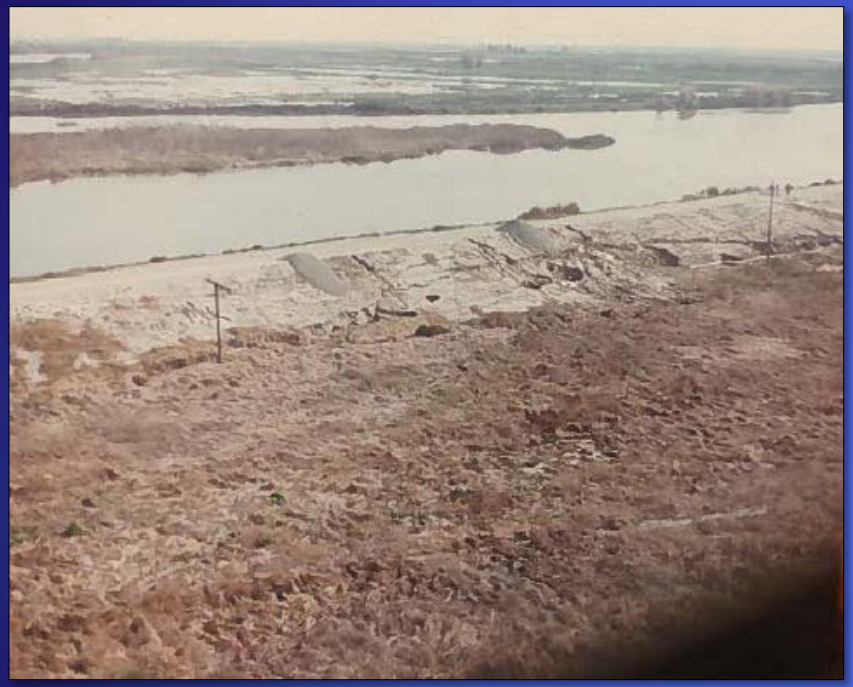
-12 - -11
-11 - -10
-10 - -9
-9 - -8
-8 - -7
-7 - -6
-6 - -5
-5 - -4
-4 - -3
-3 - -2
-2 - -1
-1 - 0
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9
9 - 10
10 - 11
11 - 12
> 12

HOLLAND TRACT - JANUARY 1980

HOLLAND TRACT - JANUARY 1983

HOLLAND TRACT - JANUARY 1983



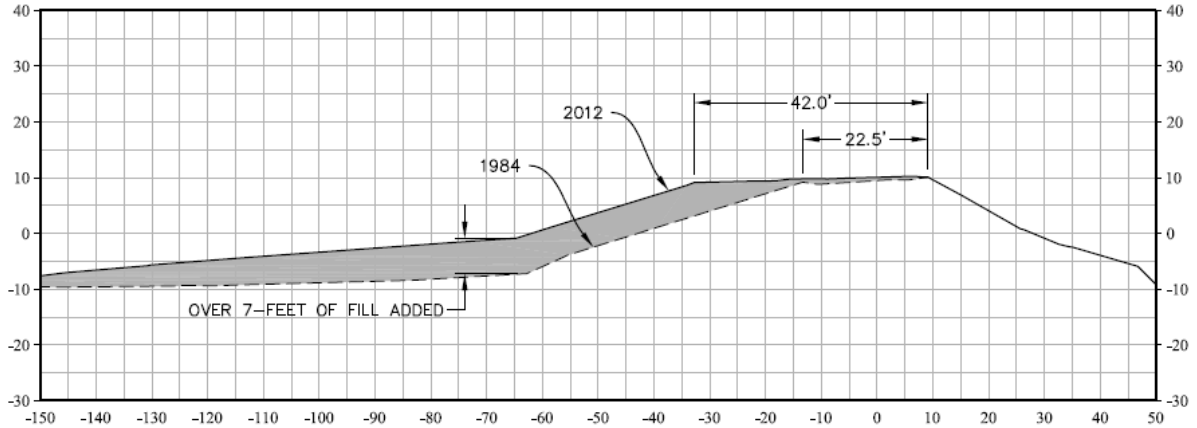
HOLLAND TRACT - JANUARY 1983

HOLLAND TRACT – JUNE 1990

HOLLAND TRACT – JUNE 1990

HOLLAND TRACT

CROSS SECTION AT STATION 128+00



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

RECLAMATION DISTRICT NO. 2025
HOLLAND TRACT

COMPARISON OF 1984 AND 2012

NO.	DATE	REVISION

SCALE:	1" = 20'
JOB NO:	2526
BY:	AR
CHK:	GC
DATE:	11/09/12

SHEET 1 OF 1 SHEETS

Summary of Holland Tract Costs 1988-2014

- One of the Eight Western Islands
- Ability to pay study found 7% local ability to pay
- East levee along Old River
- Local borrow material
- Total of 11 levee miles

Total Expenditures (including 27 years of maintenance):	**$18.51 million**
Subventions Total:	$8.91 million
Special Projects Total:	$9.60 million
Local Cost Share:	$2.32 million
State Cost Share:	$16.19 million