Restoration of the Salton Sea

Volume 2: Embankment Designs and Optimization Study

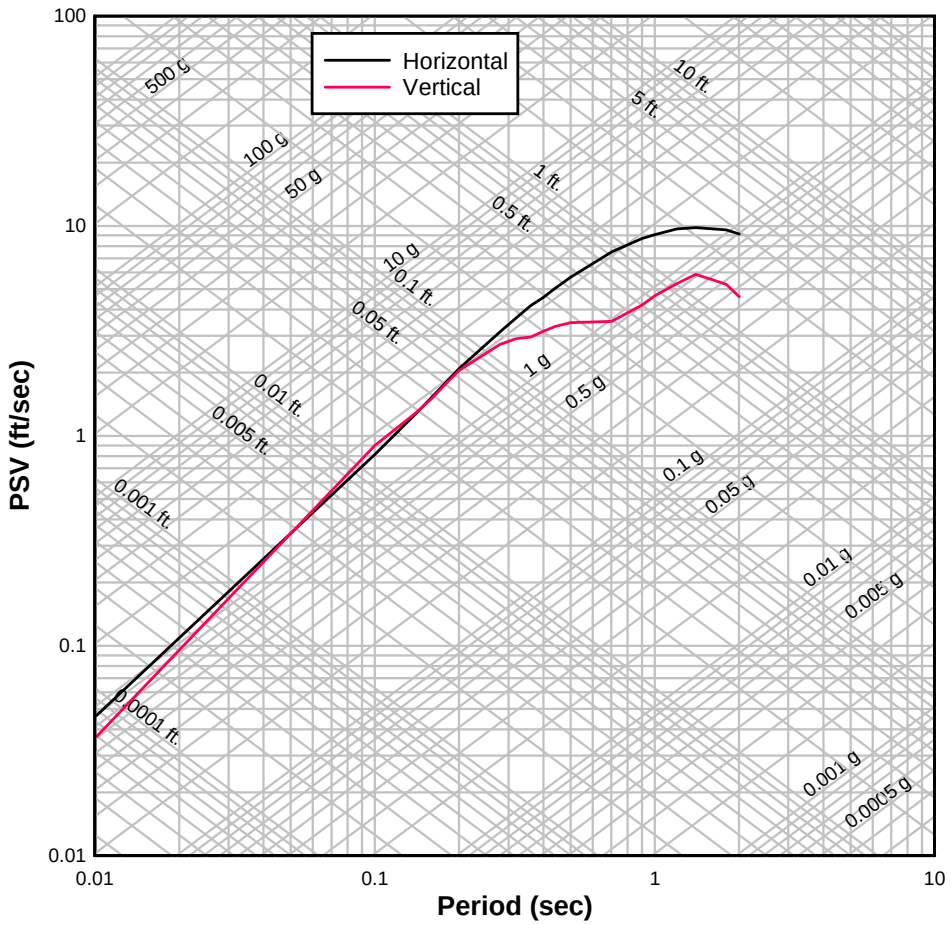
Appendix 2C: Deformation Analyses

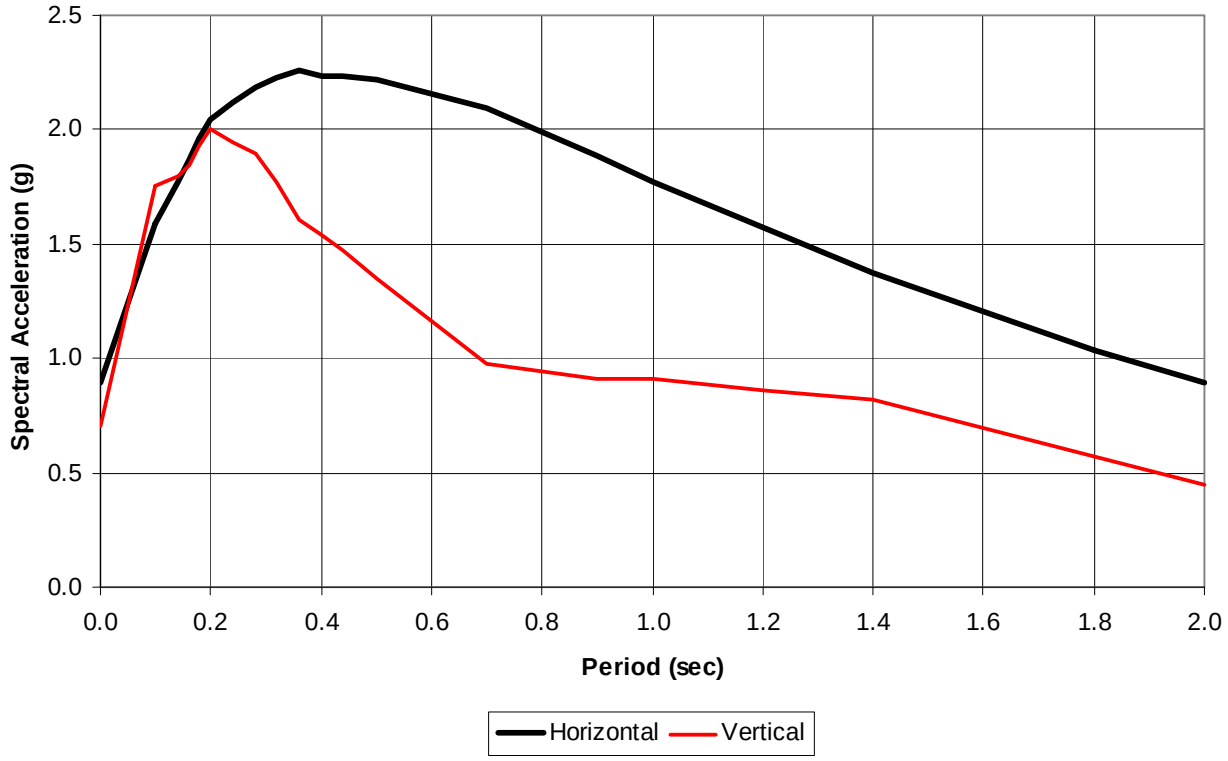
Figures

Prepared for:
U.S. Department of the Interior
Bureau of Reclamation
Lower Colorado Region
Boulder City, Nevada

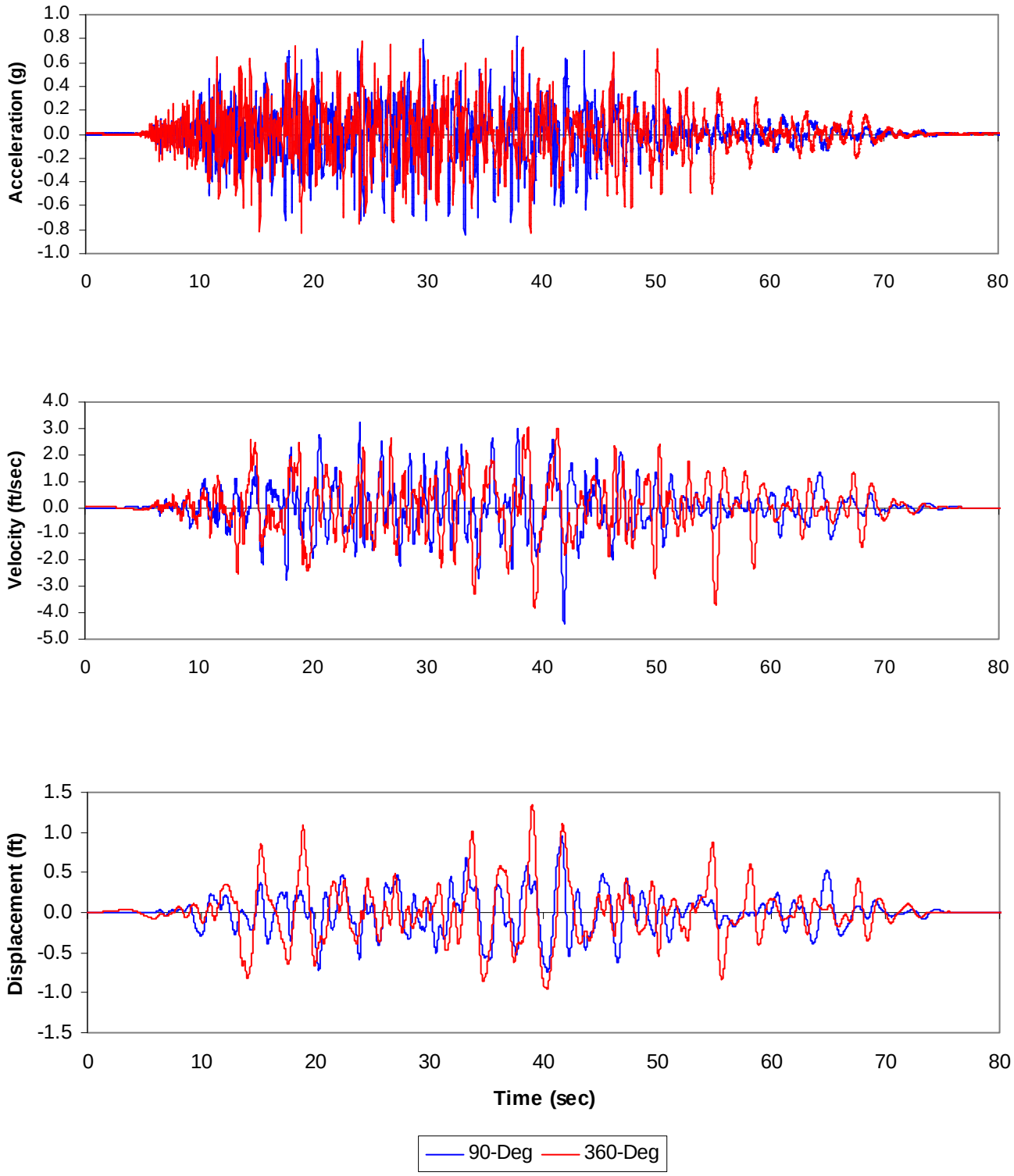
Prepared by:
Kleinfelder, Inc.
Golden, CO 80401
Project No. 71100

May 2007



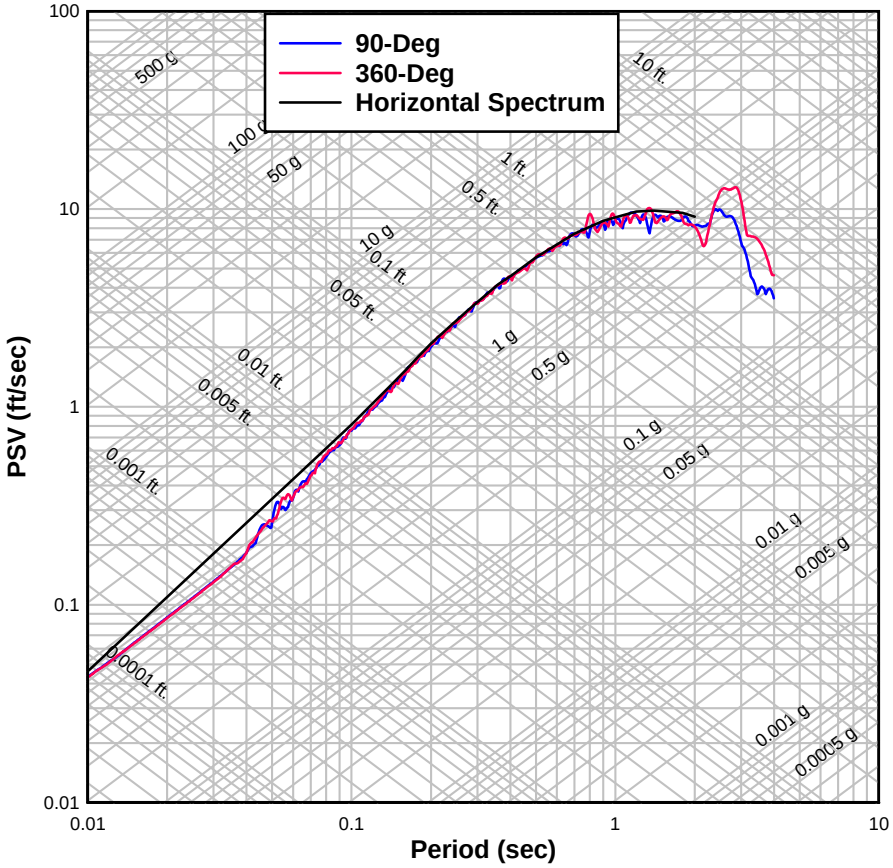


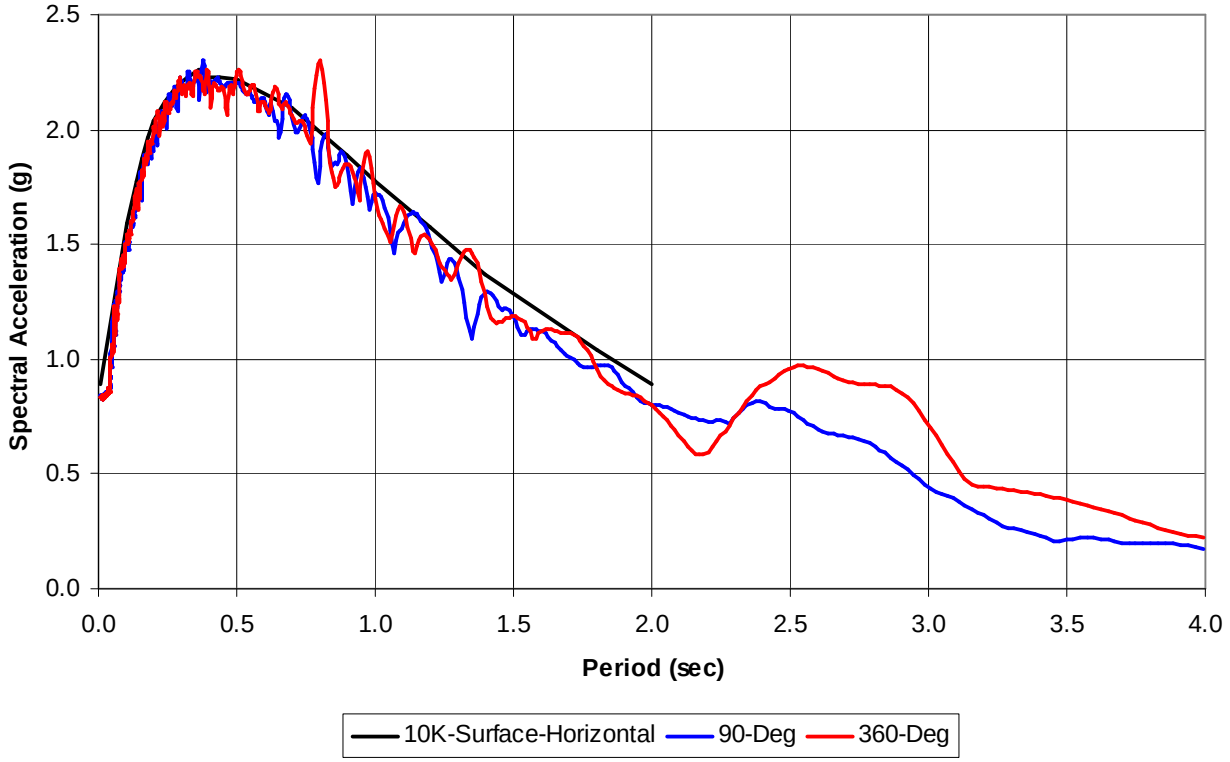
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analysis			SITE-SPECIFIC UNIFORM HAZARD SPECTRA - SURFACE
K L E I N F E L D E R	Project 71100	By Z. Zafir	August 2006	**Figure C.2.1**



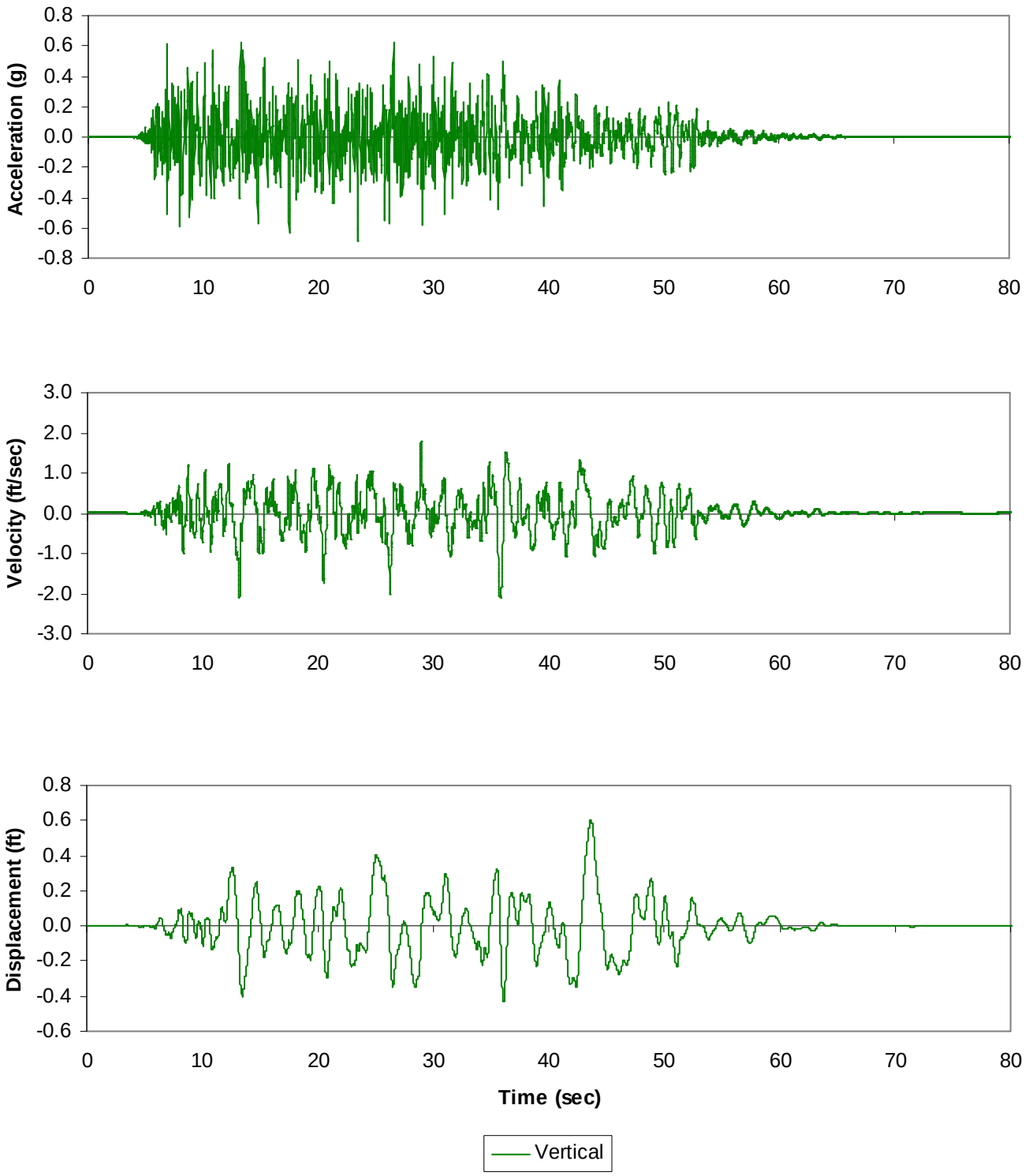
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analysis	TIME HISTORIES SPECTRA MATCHED 10K AIRPORT - SURFACE
K L E I N F E L D E R	Project 71100 / By Z. Zafir / August 2006	**Figure C.2.2**

Surface 10k Airport

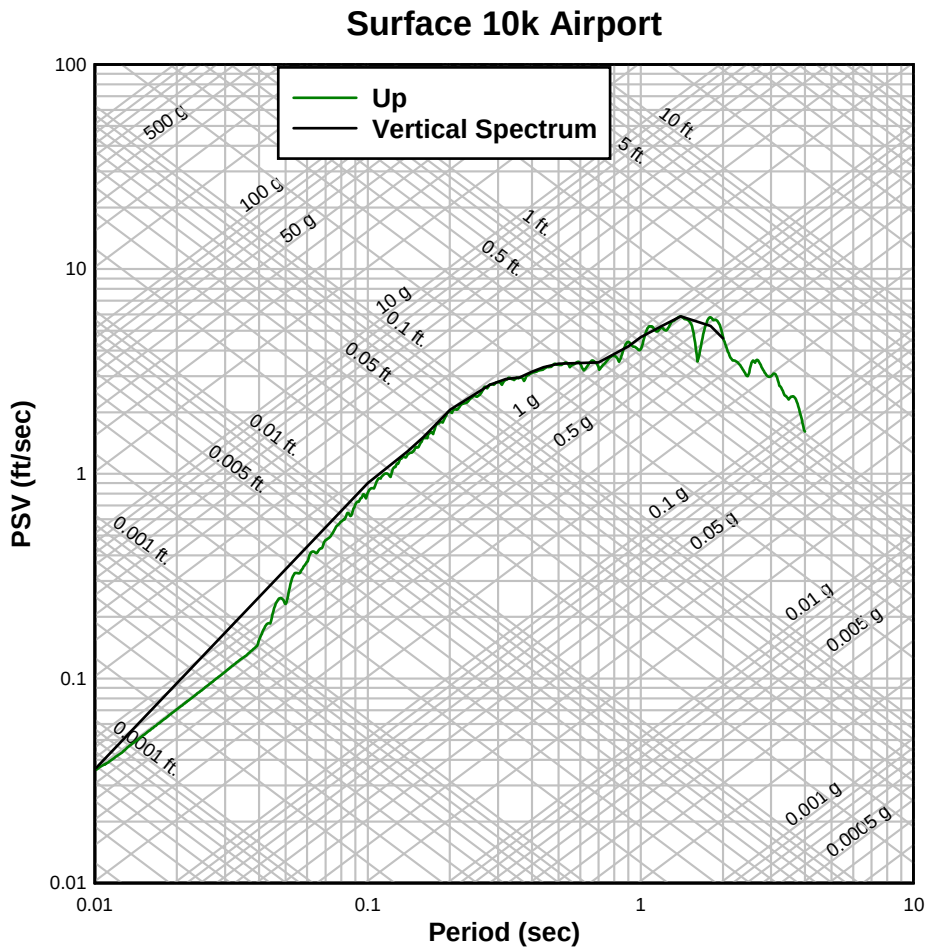


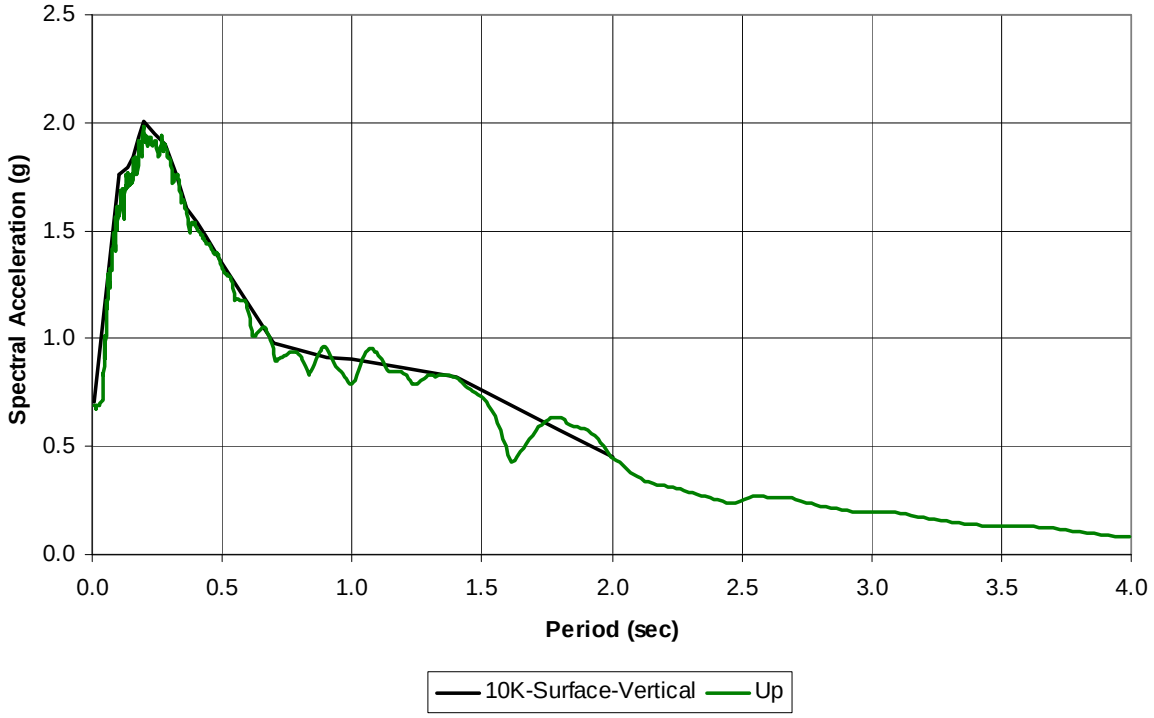


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analysis	RESPONSE SPECTRA SPECTRA MATCHED 10K AIRPORT – SURFACE
K L E I N F E L D E R	Project 71100 / By Z. Zafir / August 2006	**Figure C.2.3**

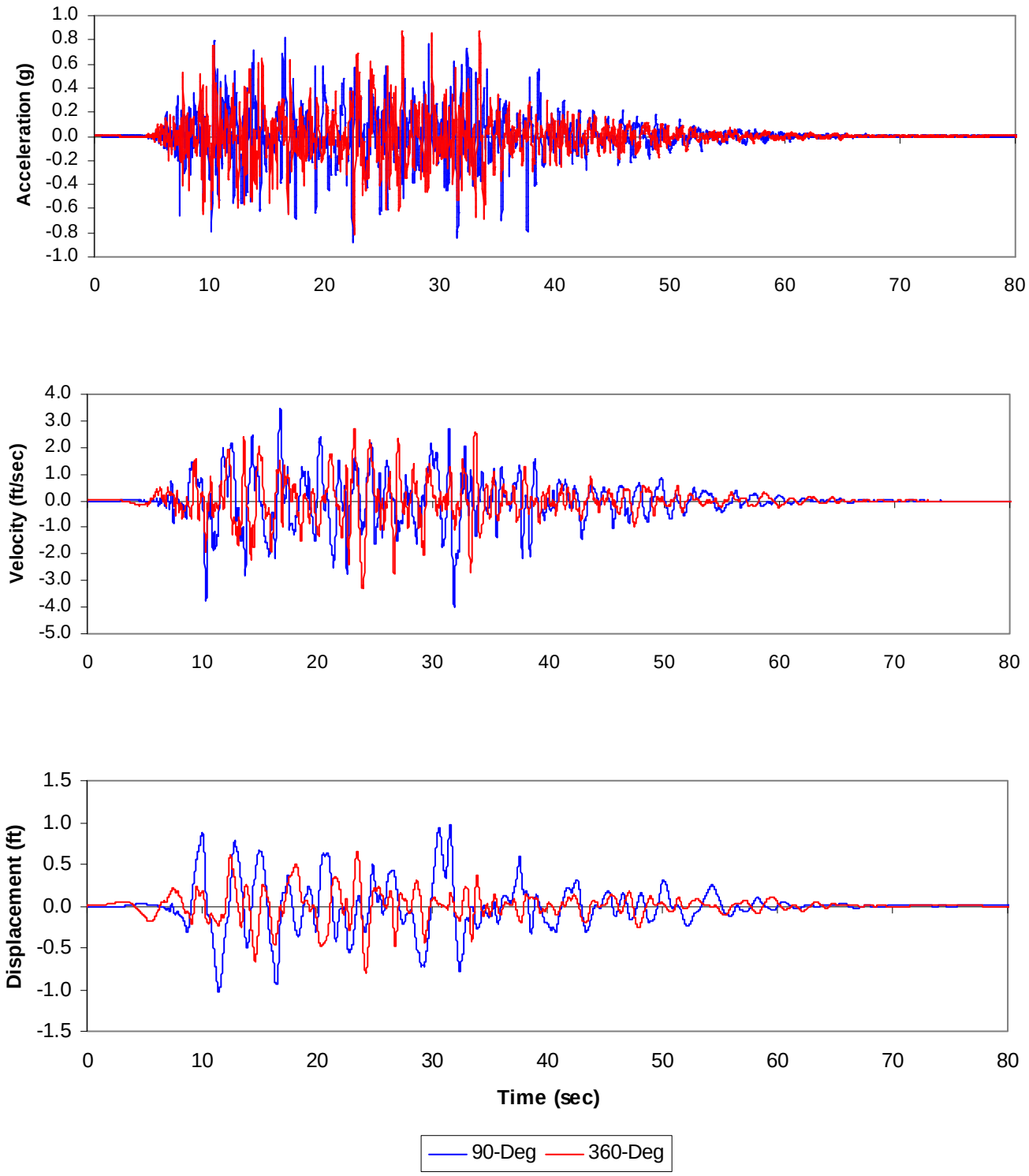


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analysis	TIME HISTORIES SPECTRA MATCHED 10K AIRPORT - SURFACE
K L E I N F E L D E R	Project 71100 / By Z. Zafir / August 2006	**Figure C.2.4**

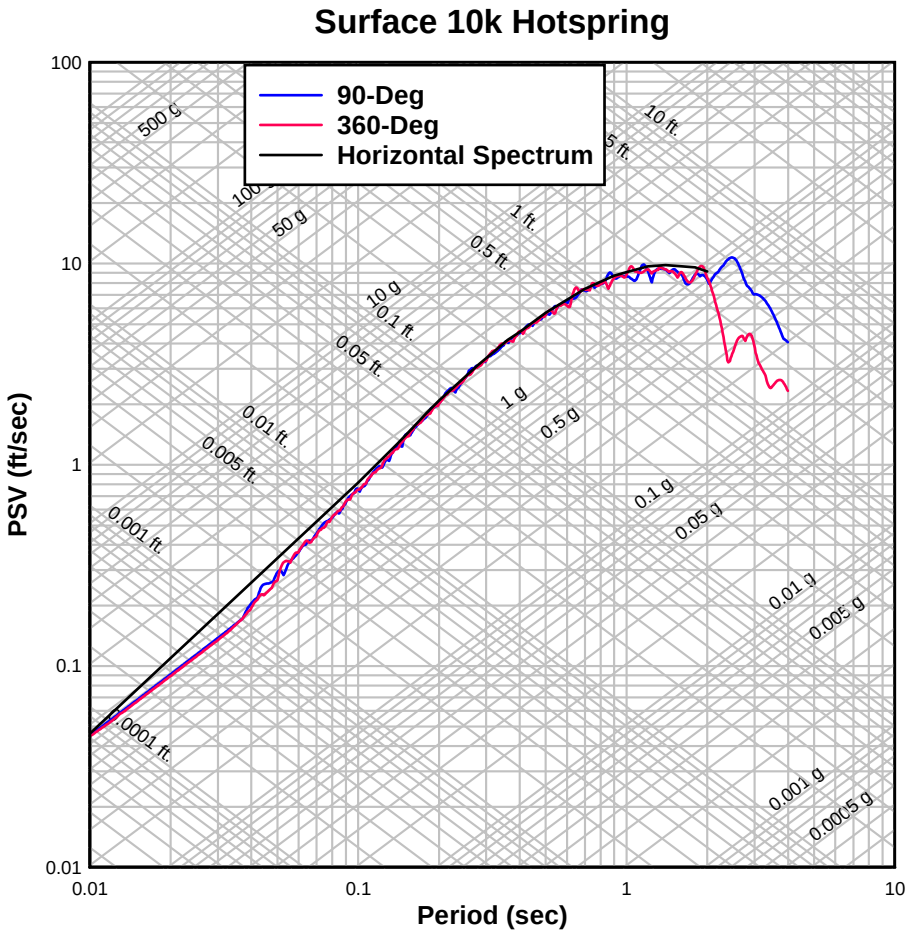


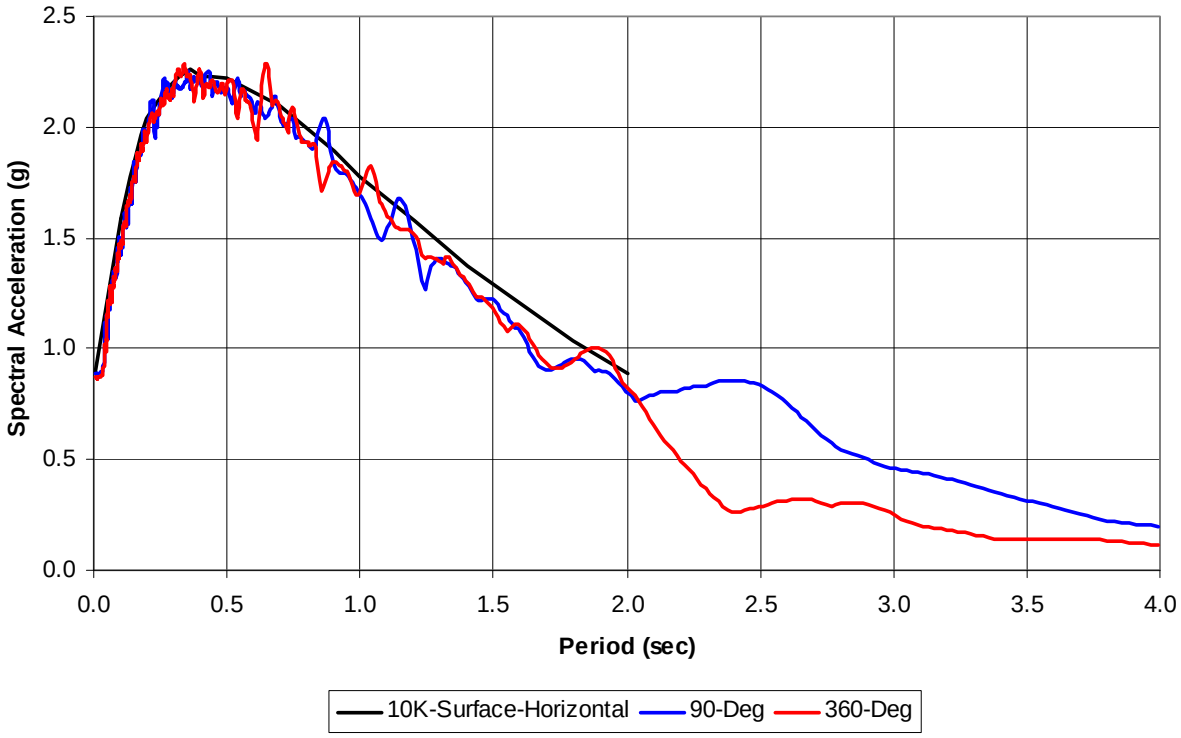


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analysis		RESPONSE SPECTRA SPECTRA MATCHED 10K AIRPORT – SURFACE
KLEINFELDER	Project 71100	By Z. Zafir	August 2006	**Figure C.2.5**

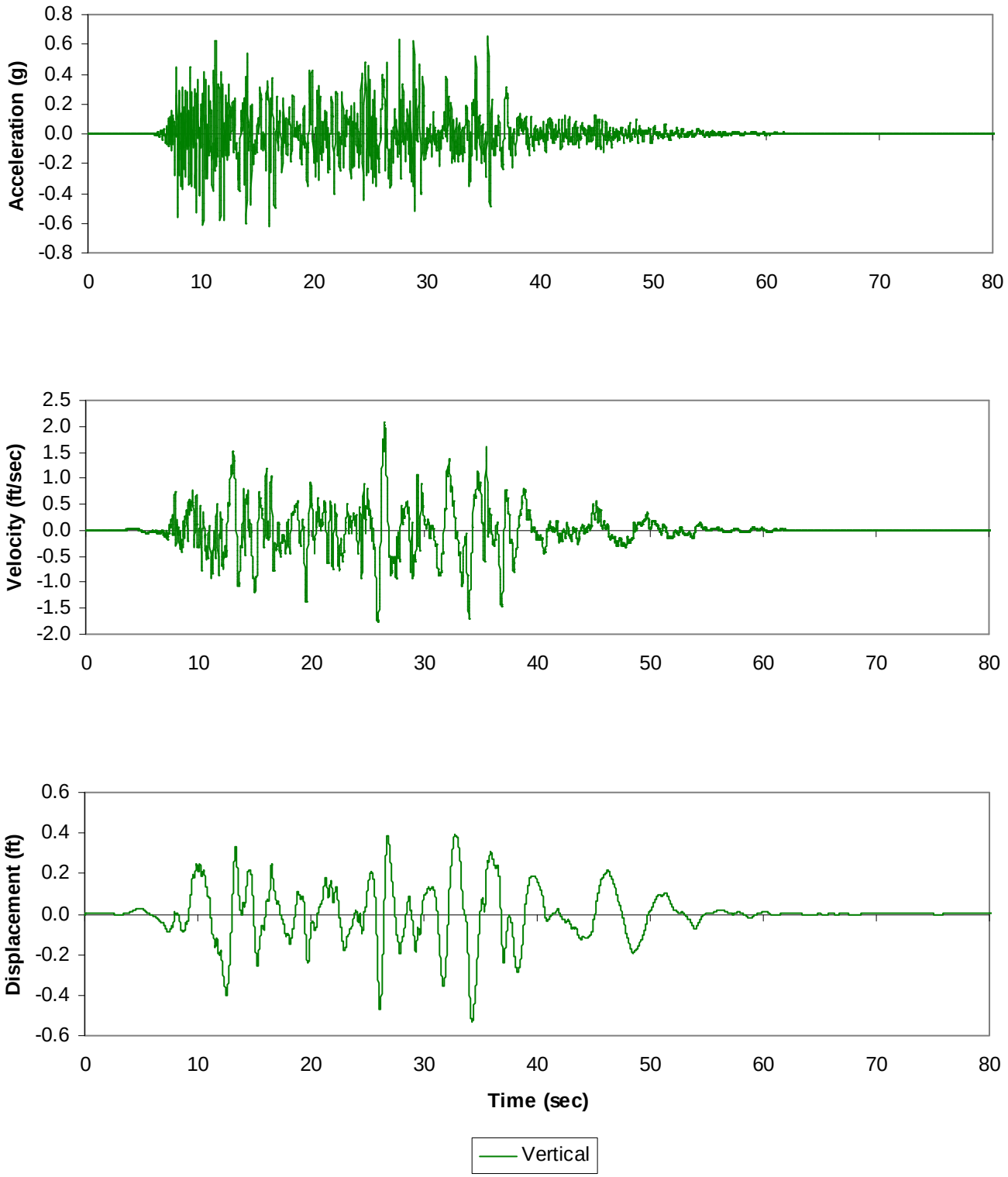


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analysis			TIME HISTORIES SPECTRA MATCHED 10K HOTSPRING - SURFACE
K L E I N F E L D E R	Project 71100	By Z. Zafir	August 2006	**Figure C.2.6**



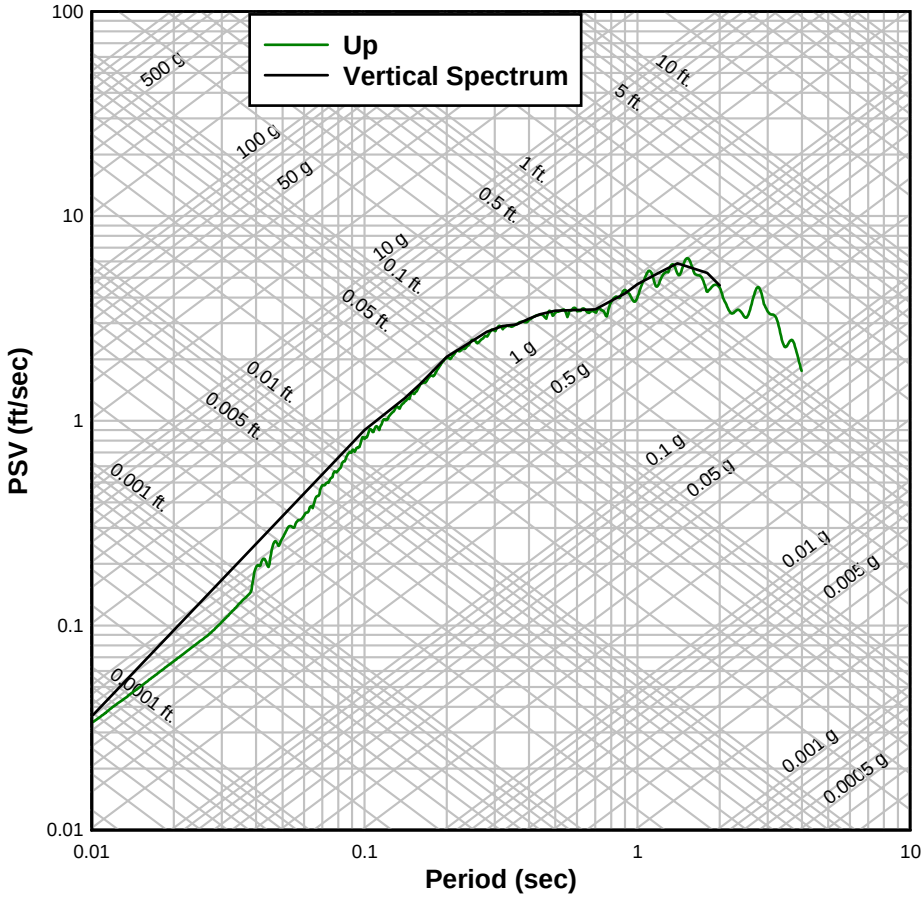


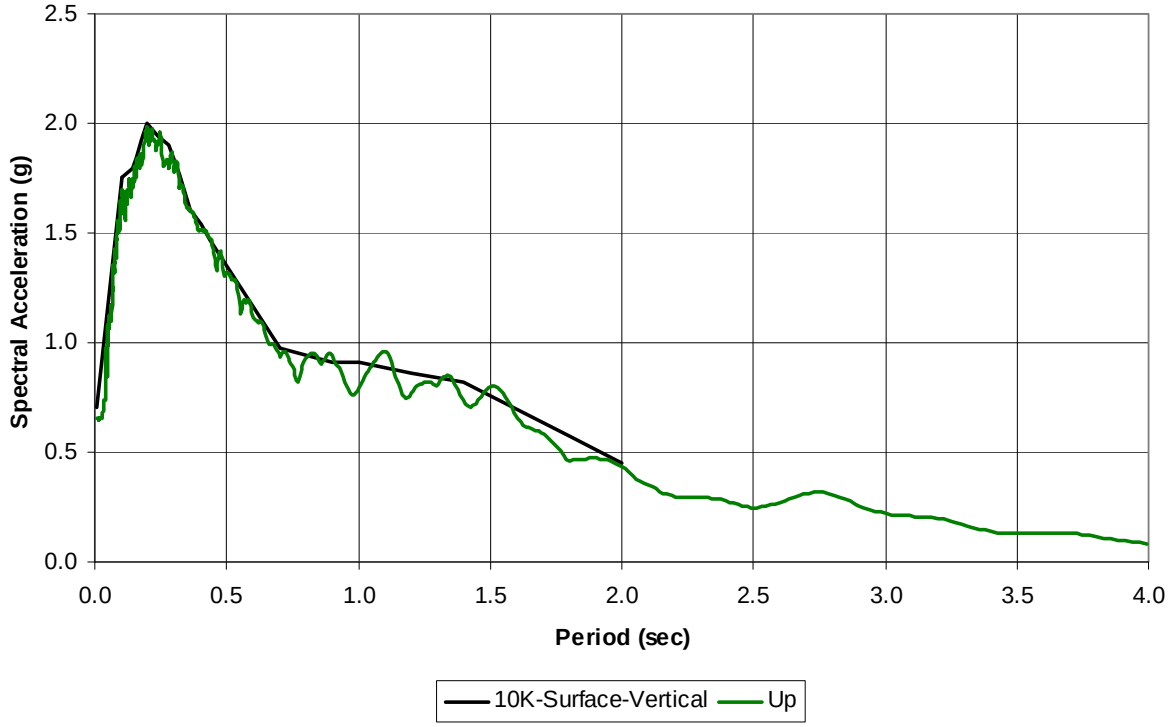
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analysis	RESPONSE SPECTRA SPECTRA MATCHED 10K HOTSPRING – SURFACE
K L E I N F E L D E R	Project 71100 / By Z. Zafir / August 2006	**Figure C.2.7**



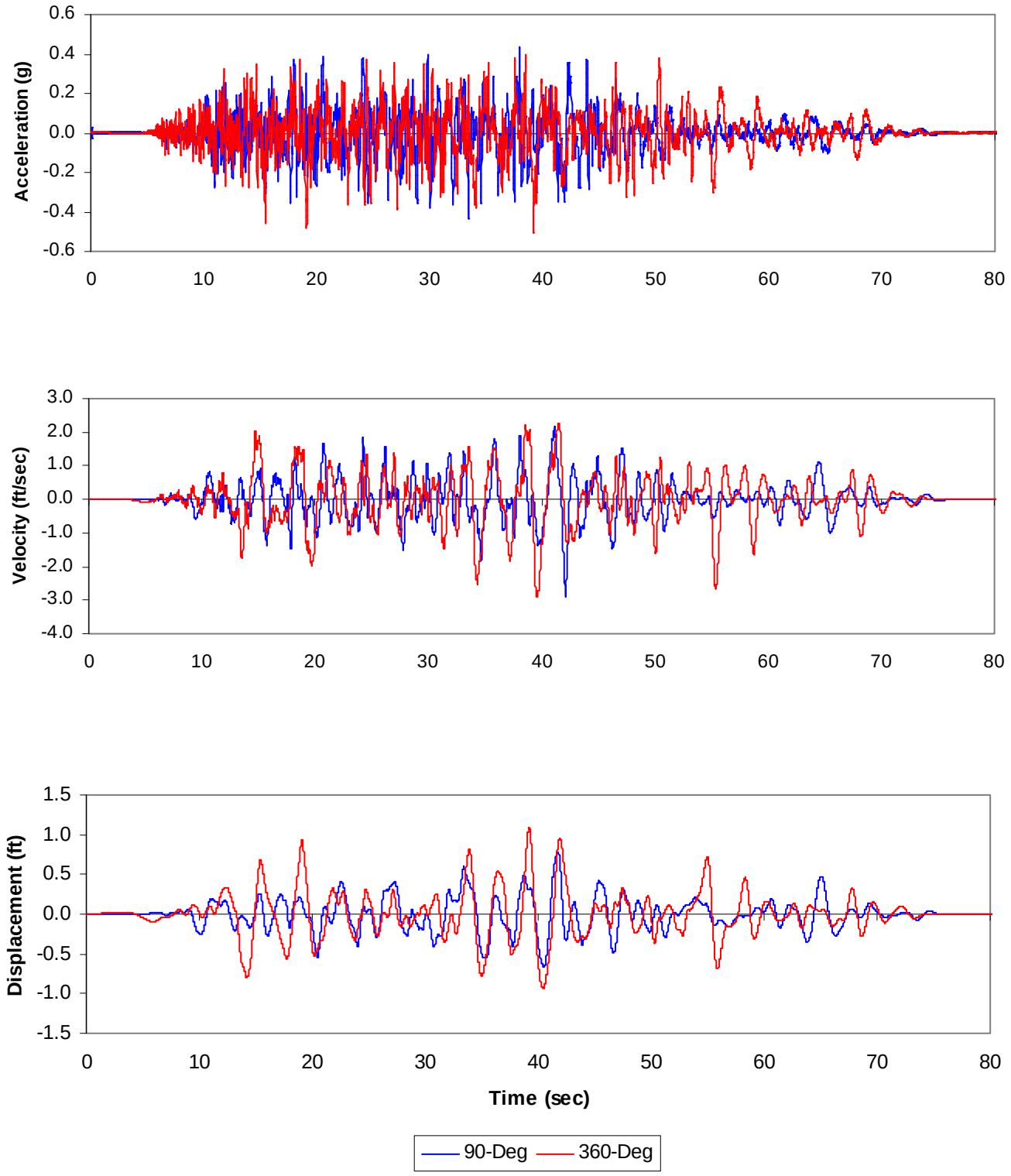
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analysis			TIME HISTORIES SPECTRA MATCHED 10K HOTSPRING - SURFACE
K L E I N F E L D E R	Project 71100	By Z. Zafir	August 2006	**Figure C.2.8**

Surface 10k Hotspring



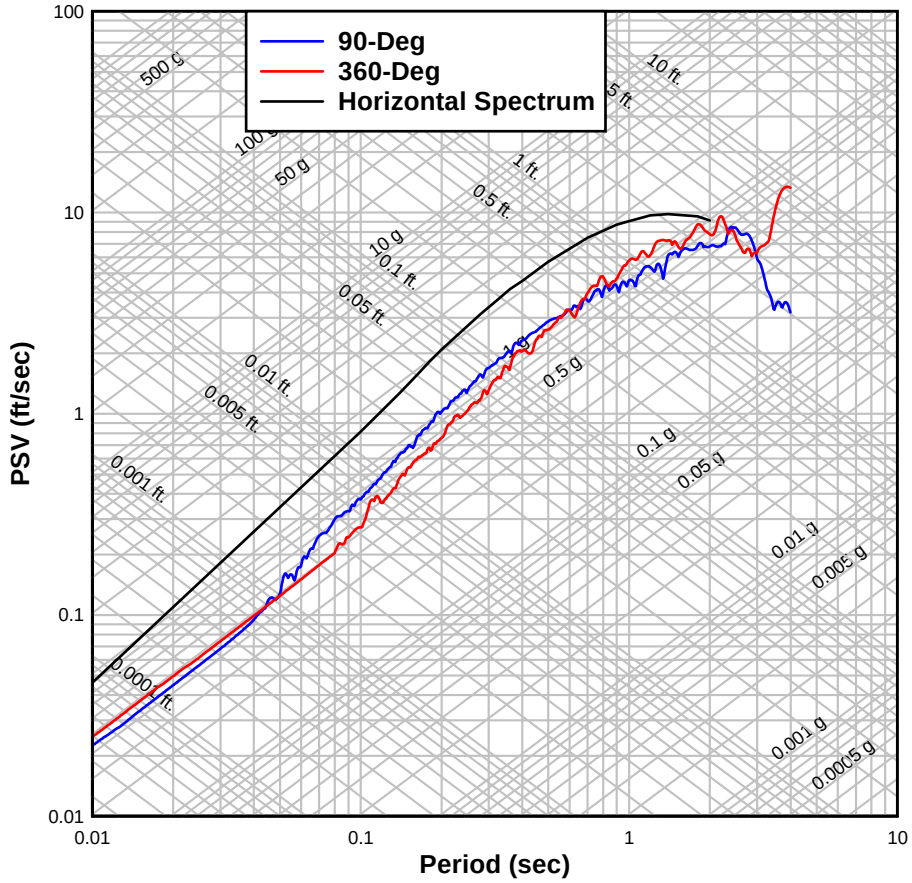


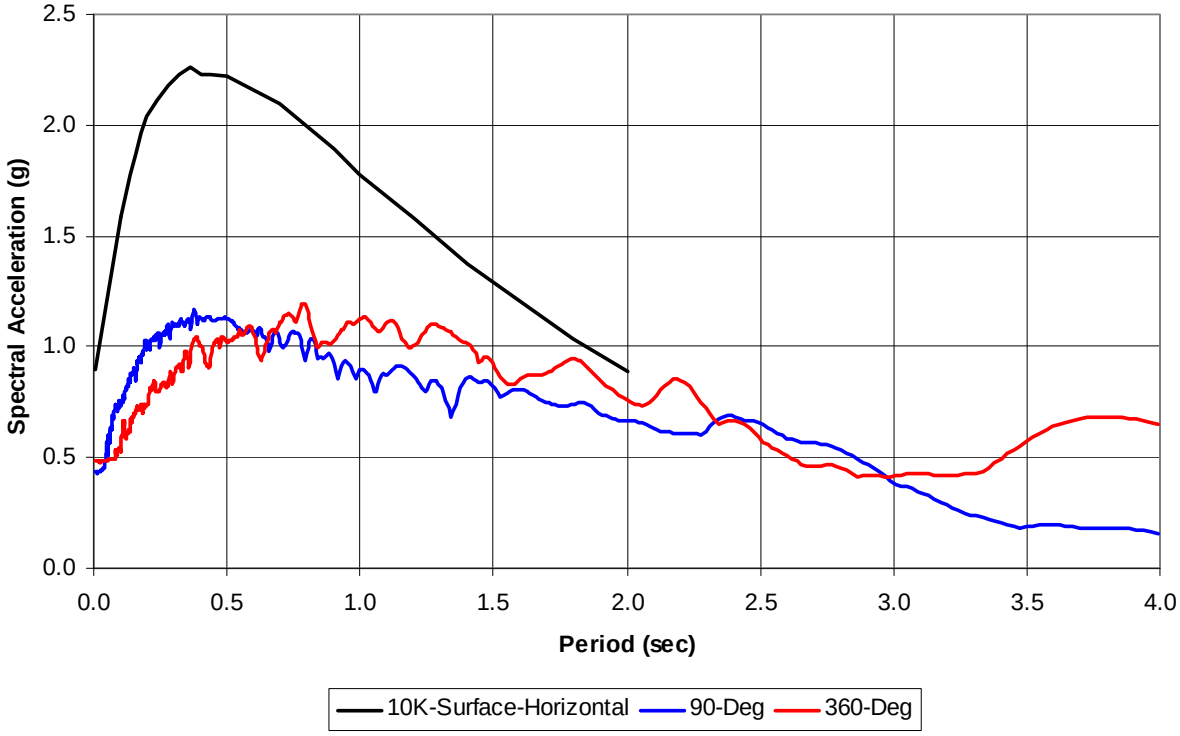
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analysis			RESPONSE SPECTRA SPECTRA MATCHED 10K AIRPORT – SURFACE
KLEINFELDER	Project 71100	By Z. Zafir	August 2006	**Figure C.2.9**



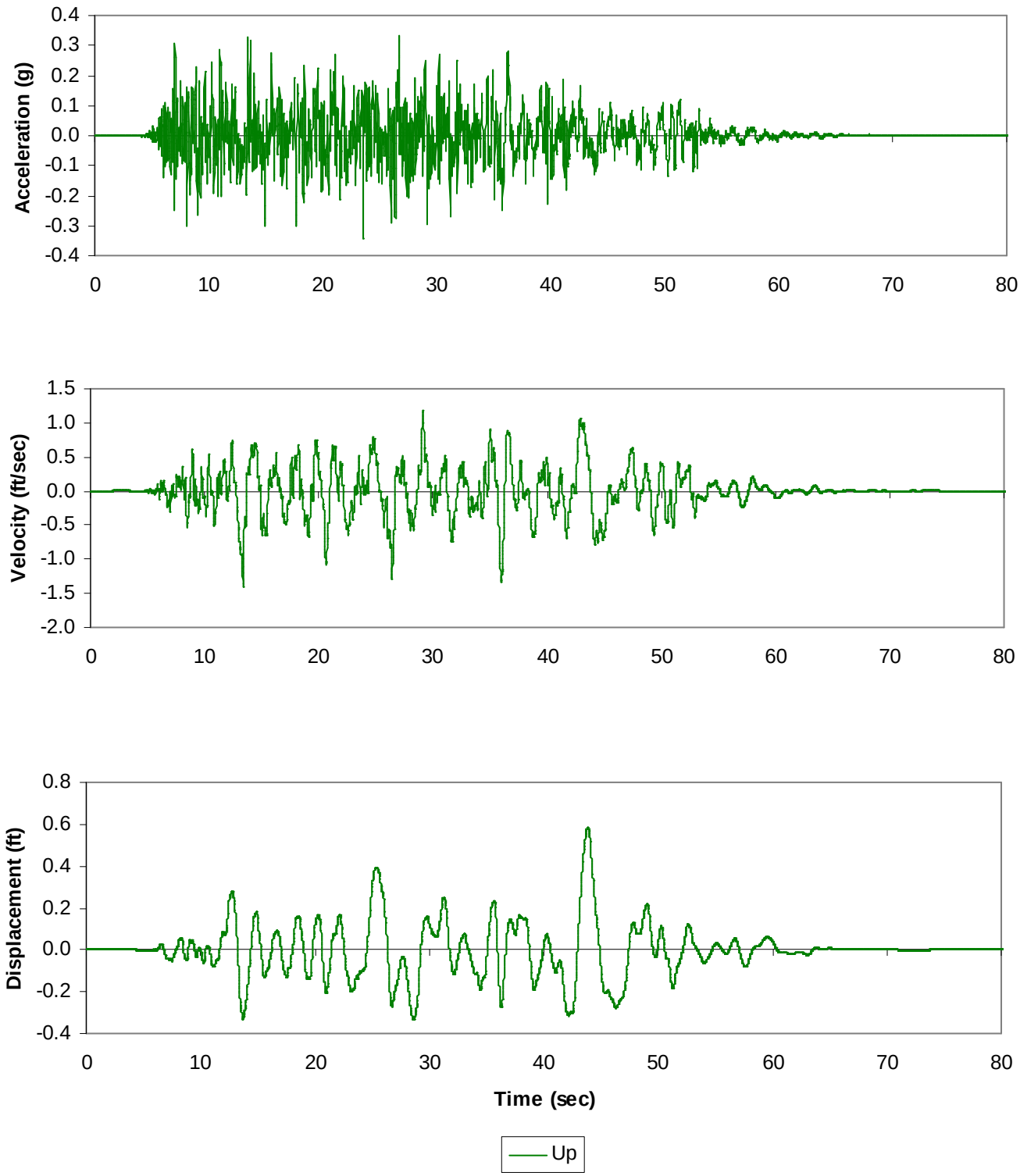
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analysis	TIME HISTORIES 10K AIRPORT - DECONVOLVED
K L E I N F E L D E R	Project 71100 / By Z. Zafir / August 2006	**Figure C.2.10**

Deconvolved 10k Airport

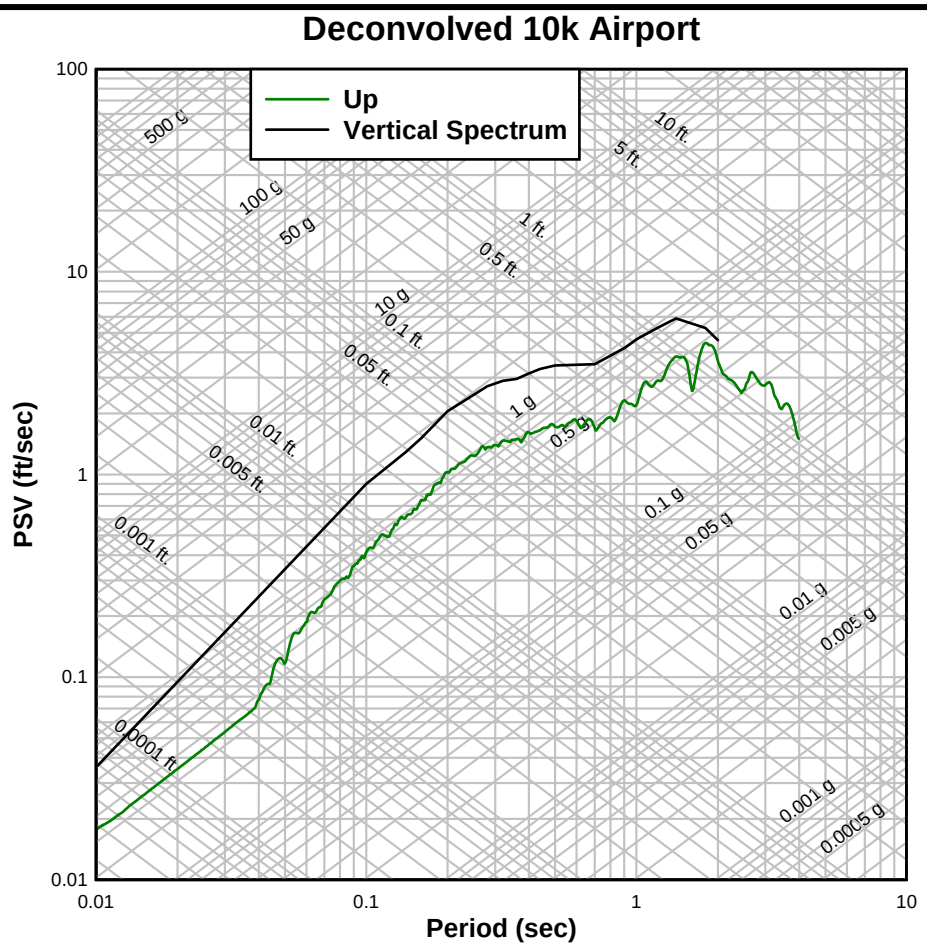


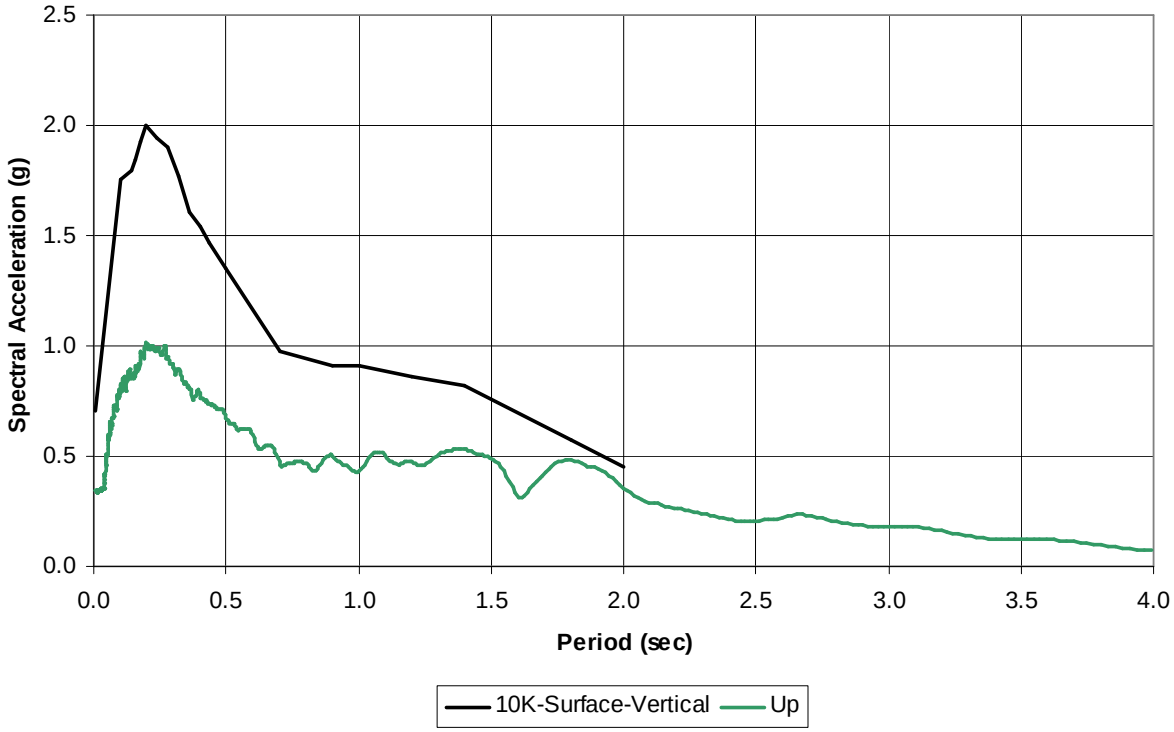


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analysis			RESPONSE SPECTRA 10K AIRPORT – DECONVOLVED
KLEINFELDER	Project 71100	By Z. Zafir	August 2006	**Figure C.2.11**

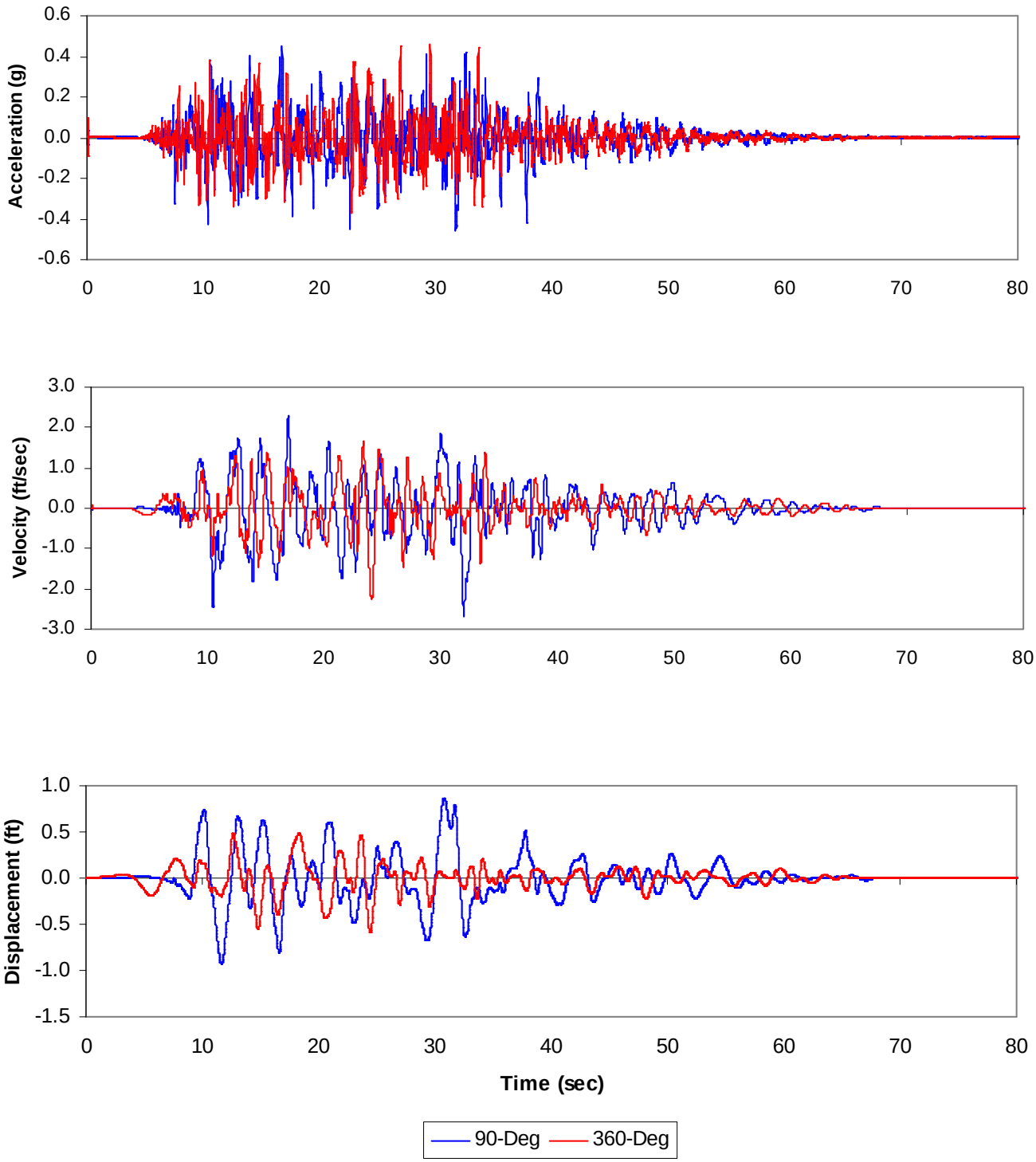


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analysis			TIME HISTORIES 10K AIRPORT - DECONVOLVED
K L E I N F E L D E R	Project 71100	By Z. Zafir	August 2006	**Figure C.2.12**

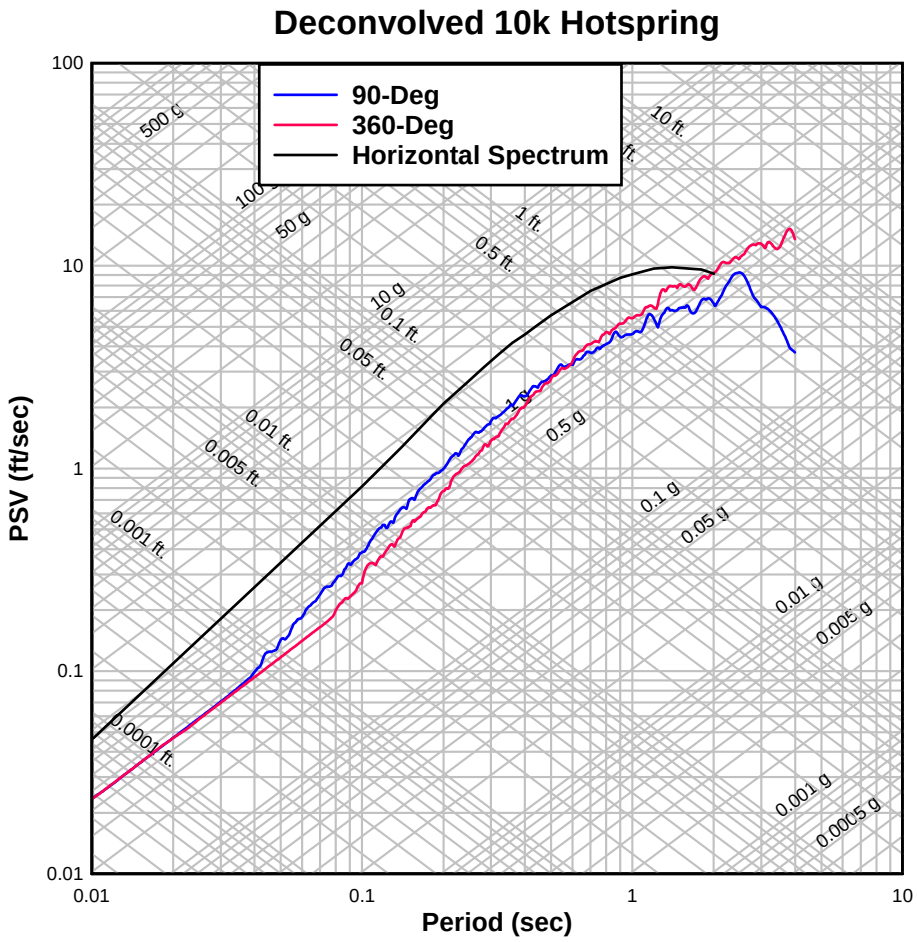


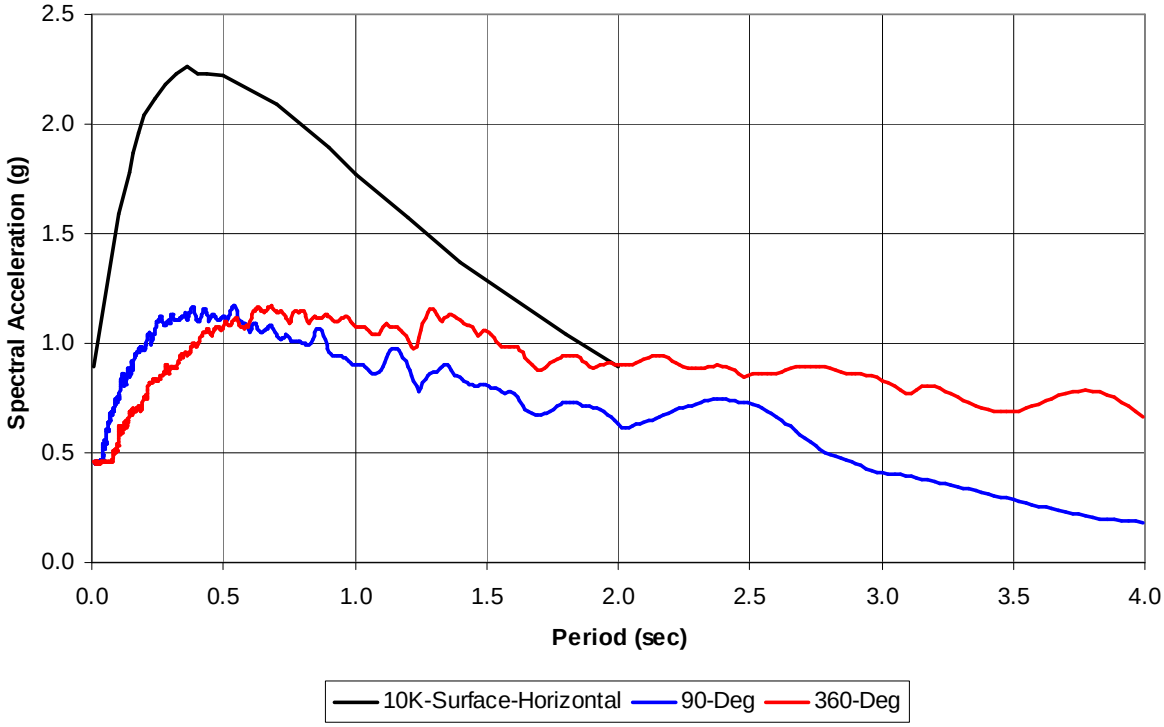


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analysis	RESPONSE SPECTRA 10K AIRPORT – DECONVOLVED
KLEINFELDER	Project 71100 / By Z. Zafir / August 2006	**Figure C.2.13**

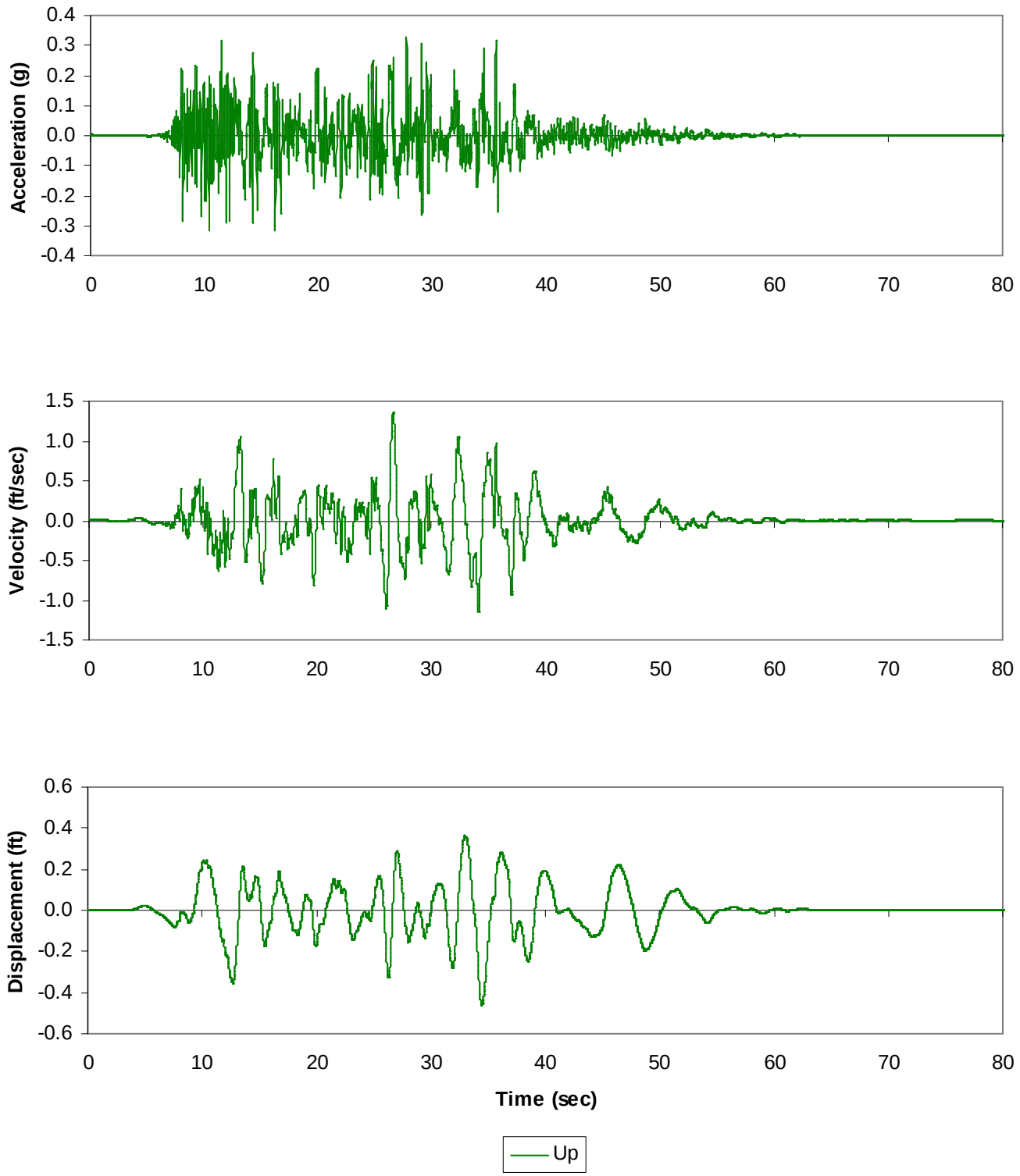


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analysis			TIME HISTORIES 10K HOTSPRING - DECONVOLVED
K L E I N F E L D E R	Project 71100	By Z. Zafir	August 2006	**Figure C.2.14**



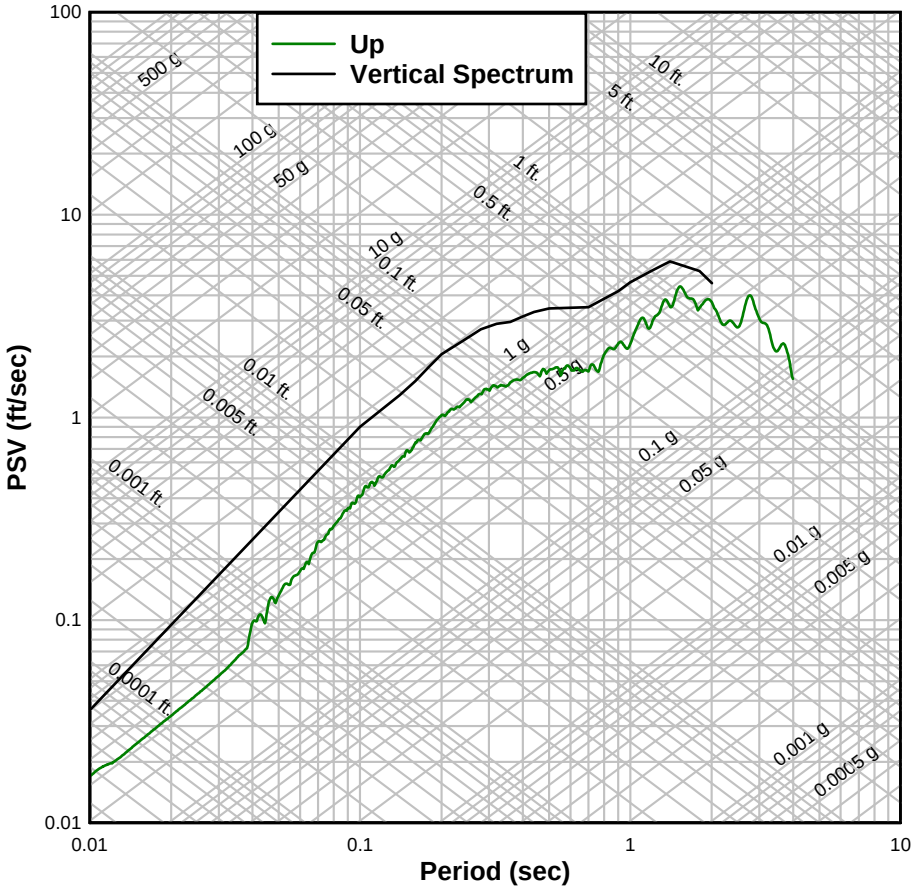


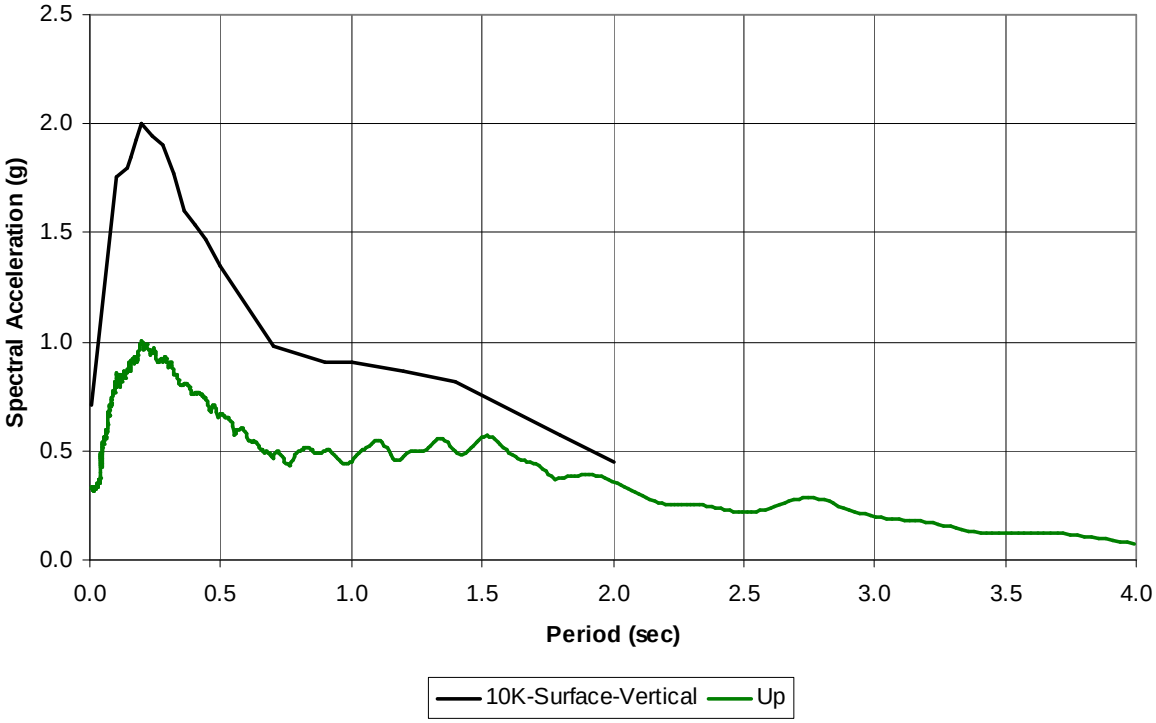
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analysis			RESPONSE SPECTRA 10K HOTSPRING – DECONVOLVED
KLEINFELDER	Project 71100	By Z. Zafir	August 2006	**Figure C.2.15**



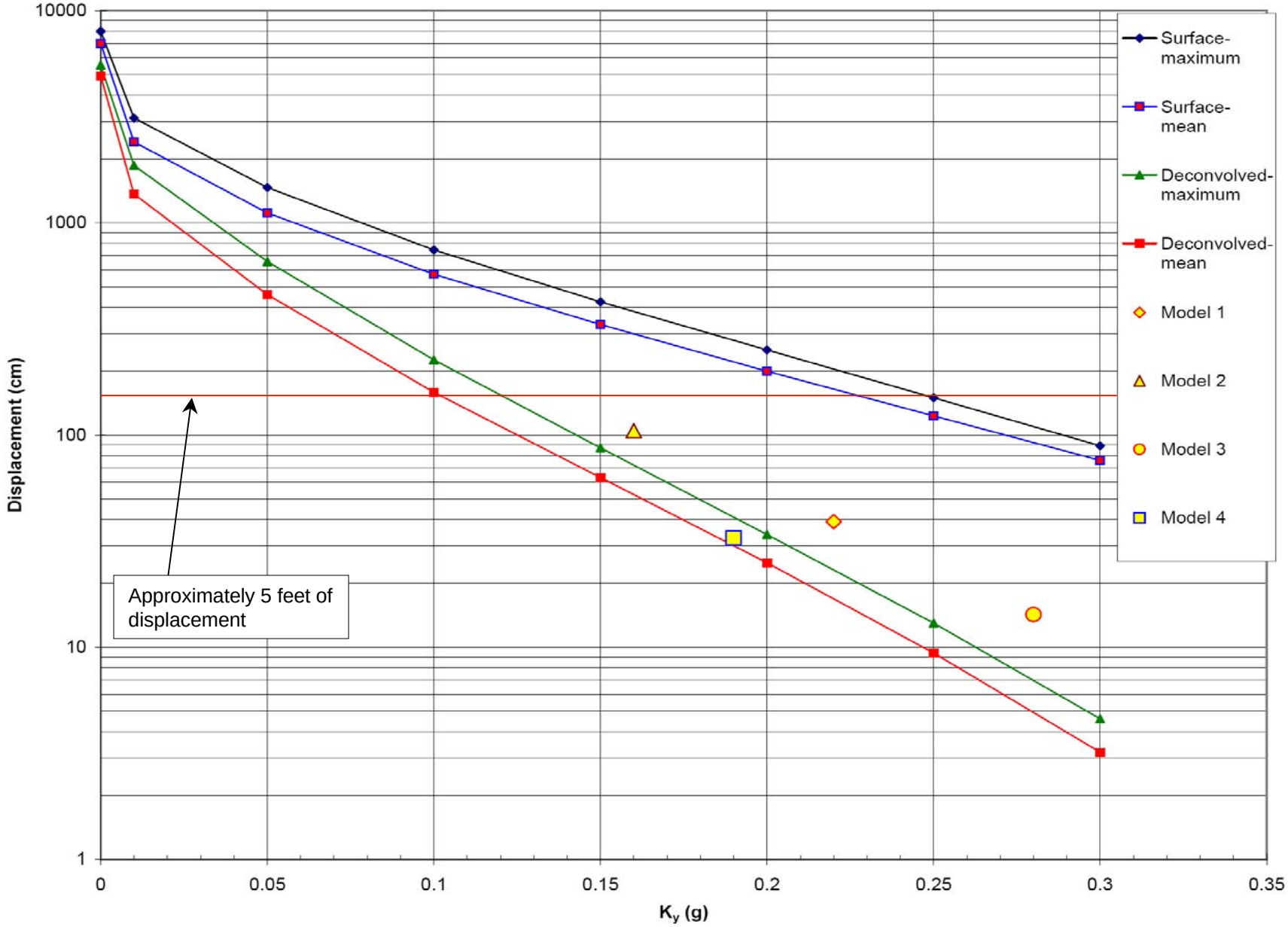
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analysis			TIME HISTORIES 10K HOTSPRING - DECONVOLVED
K L E I N F E L D E R	Project 71100	By Z. Zafir	August 2006	**Figure C.2.16**

Deconvolved 10k Hotspring

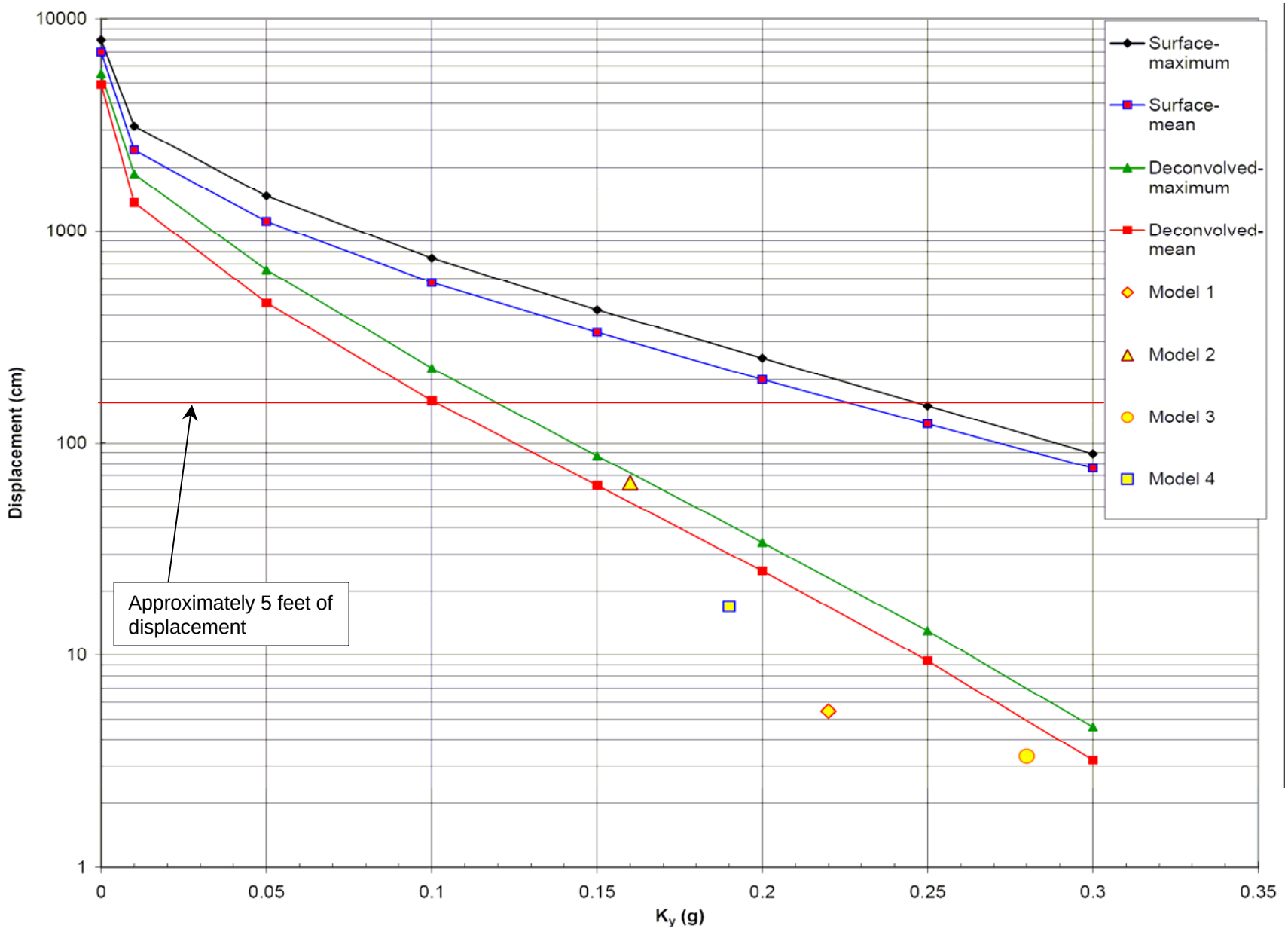




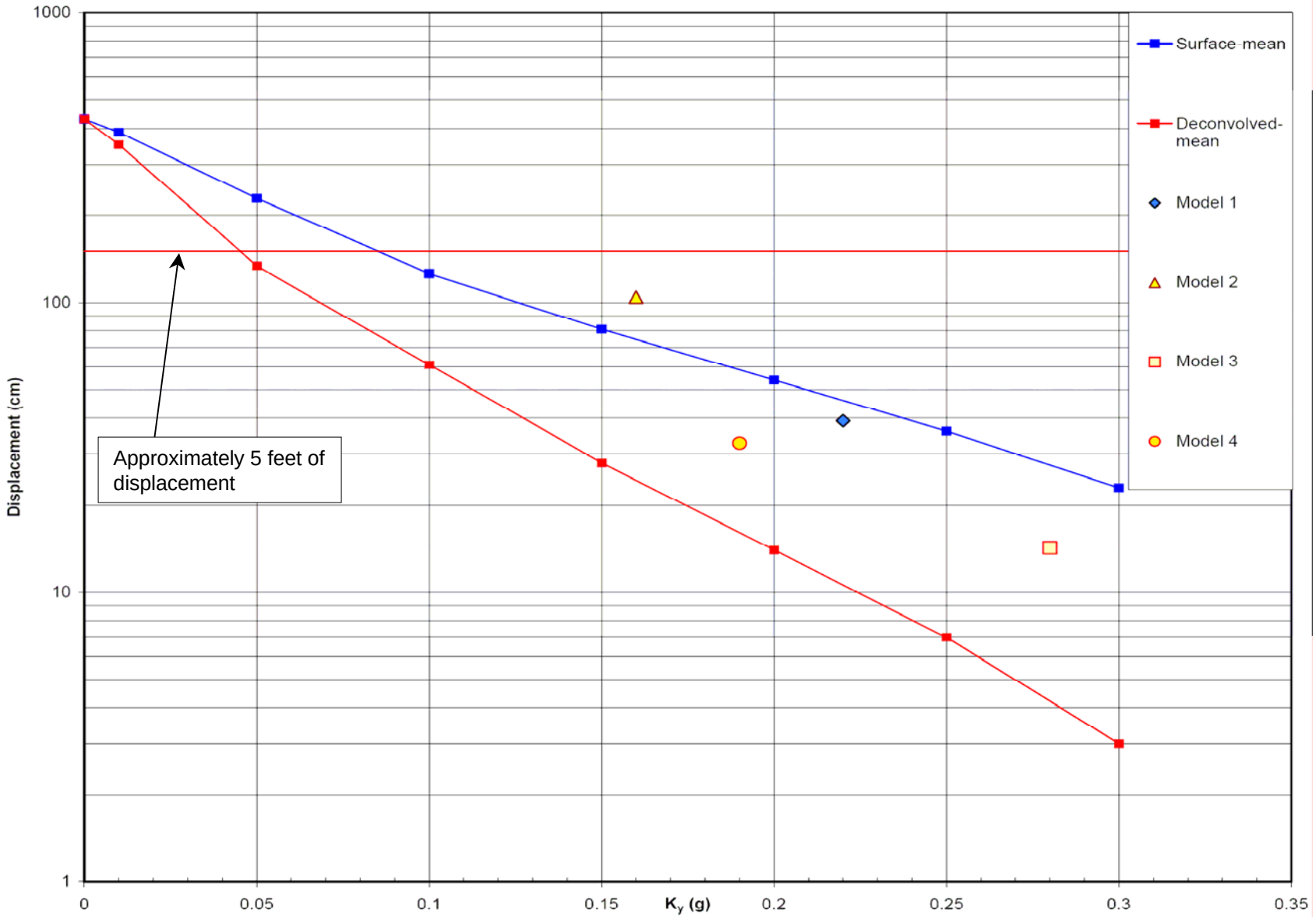
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analysis			RESPONSE SPECTRA 10K AIRPORT – DECONVOLVED
KLEINFELDER	Project 71100	By Z. Zafir	August 2006	**Figure C.2.17**



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Newmark and FLAC (Average) Displacements vs. Critical (Yield) Acceleration
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.3.1**

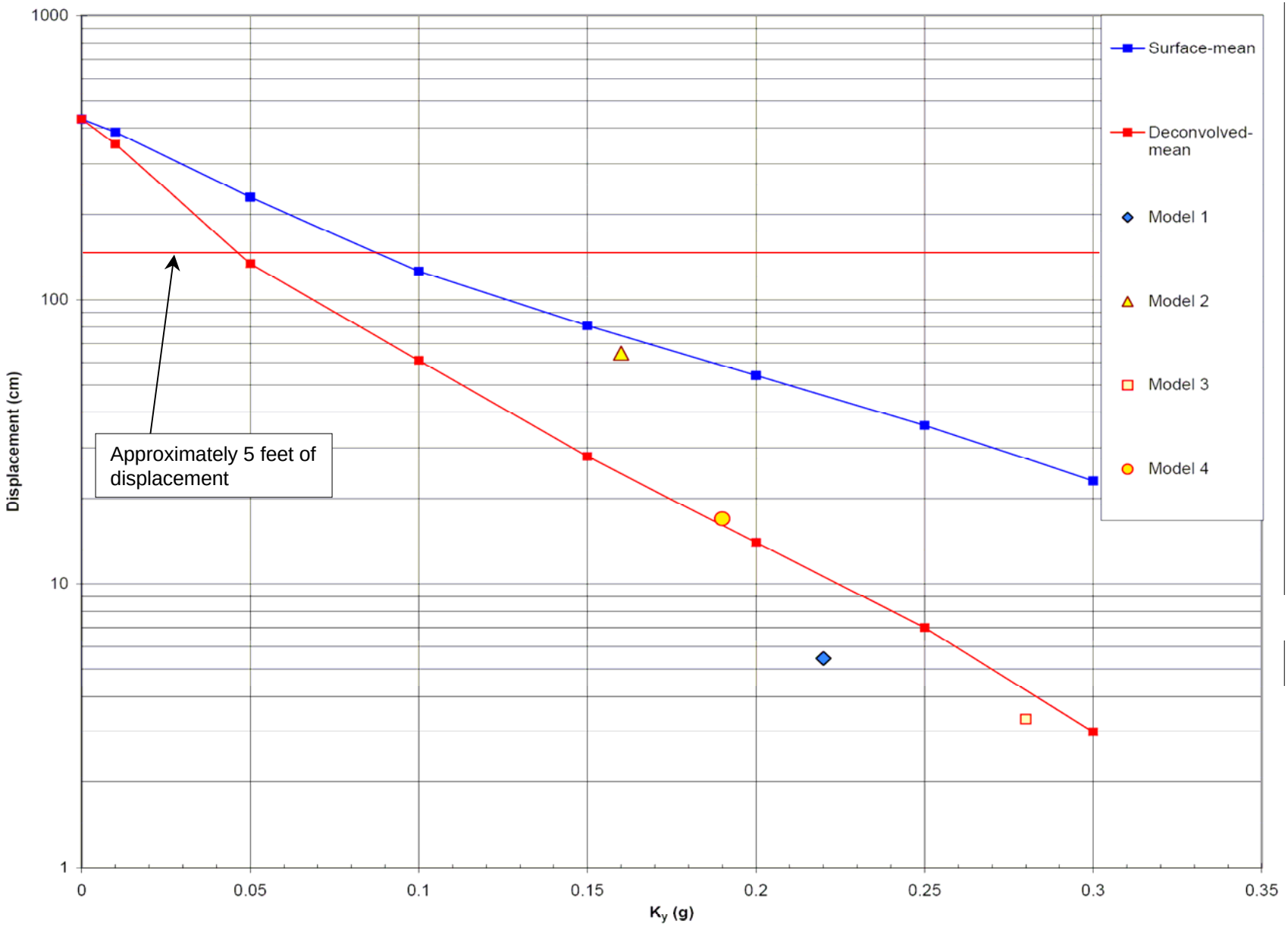


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Newmark and FLAC (Minimum) Displacements vs. Critical (Yield) Acceleration
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.3.2**



$M_W = 7.4$

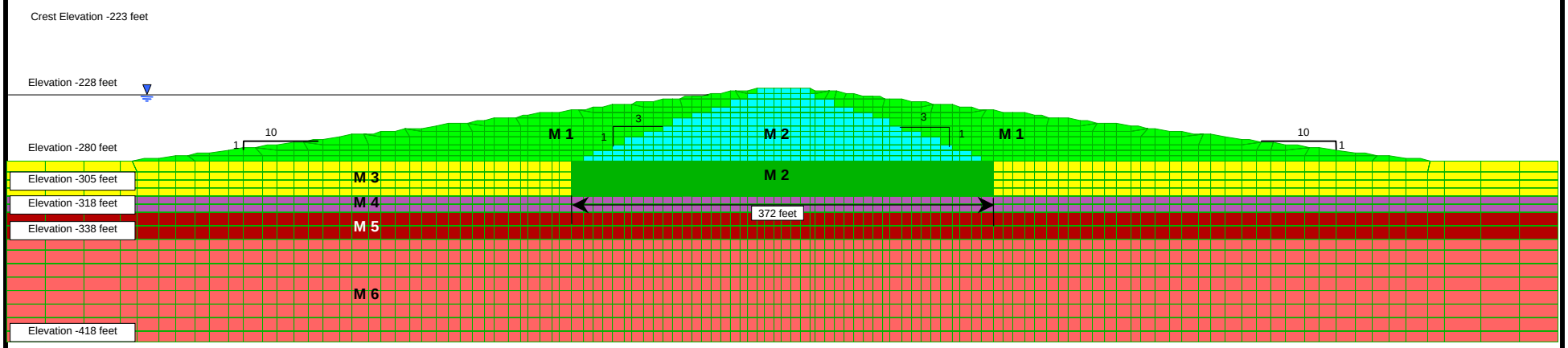
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses		Makdisi-Seed and FLAC (Average) Displacements vs. Critical (Yield) Acceleration
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.3.3**



$M_W = 7.4$

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses		Makdisi-Seed and FLAC (Minimum) Displacements vs. Critical (Yield) Acceleration
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.3.4**

Material No.	Soil Description
M1	Shell
M2	Stone Columns
M3	Soft Lacustrine
M4	Stiff Lacustrine
M5	Stiff Lacustrine
M6	Stiff Lacustrine



All Elevations
Mean Sea Level

United States
Department of the Interior
Bureau of Reclamation

KLEINFELDER

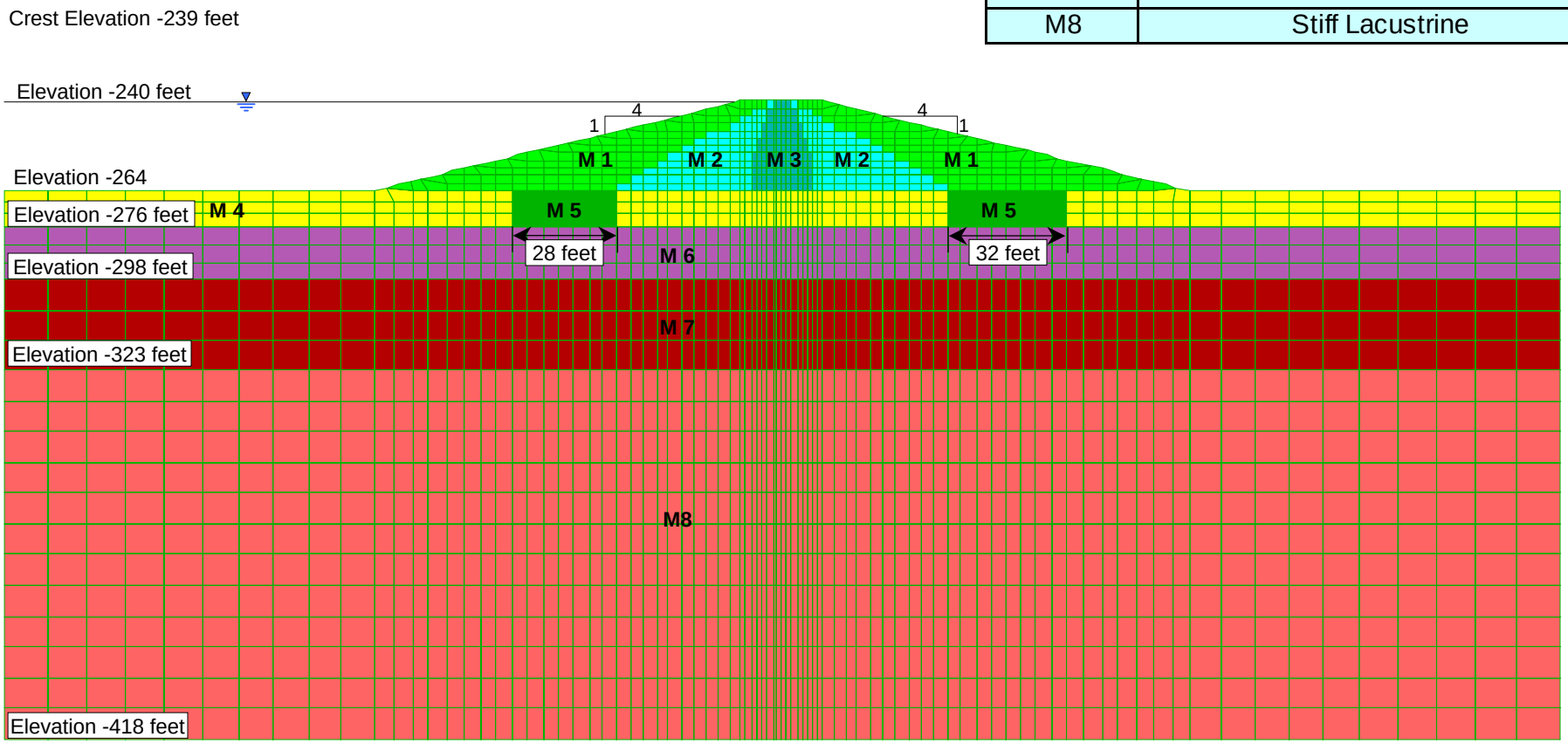
SALTON SEA RESTORATION PROJECT
EMBANKMENT DESIGNS AND
OPTIMIZATION STUDY
Appendix 2C – Deformation Analyses

Project 71100 | By S. Anderson | August 2006

Finite Difference Grid
and Material Distribution
for Models 1 & 2

FIGURE C.4.1

Material No.	Soil Description
M1	Rockfill
M2	Fine Rockfill
M3	Core (clean sand and gravel)-NonLique
M4	Untreated alluvium NonLique
M5	Jet Grouted Alluvium
M6	Stiff Lacustrine
M7	Stiff Lacustrine
M8	Stiff Lacustrine



All Elevations
Mean Sea Level

United States
Department of the Interior
Bureau of Reclamation

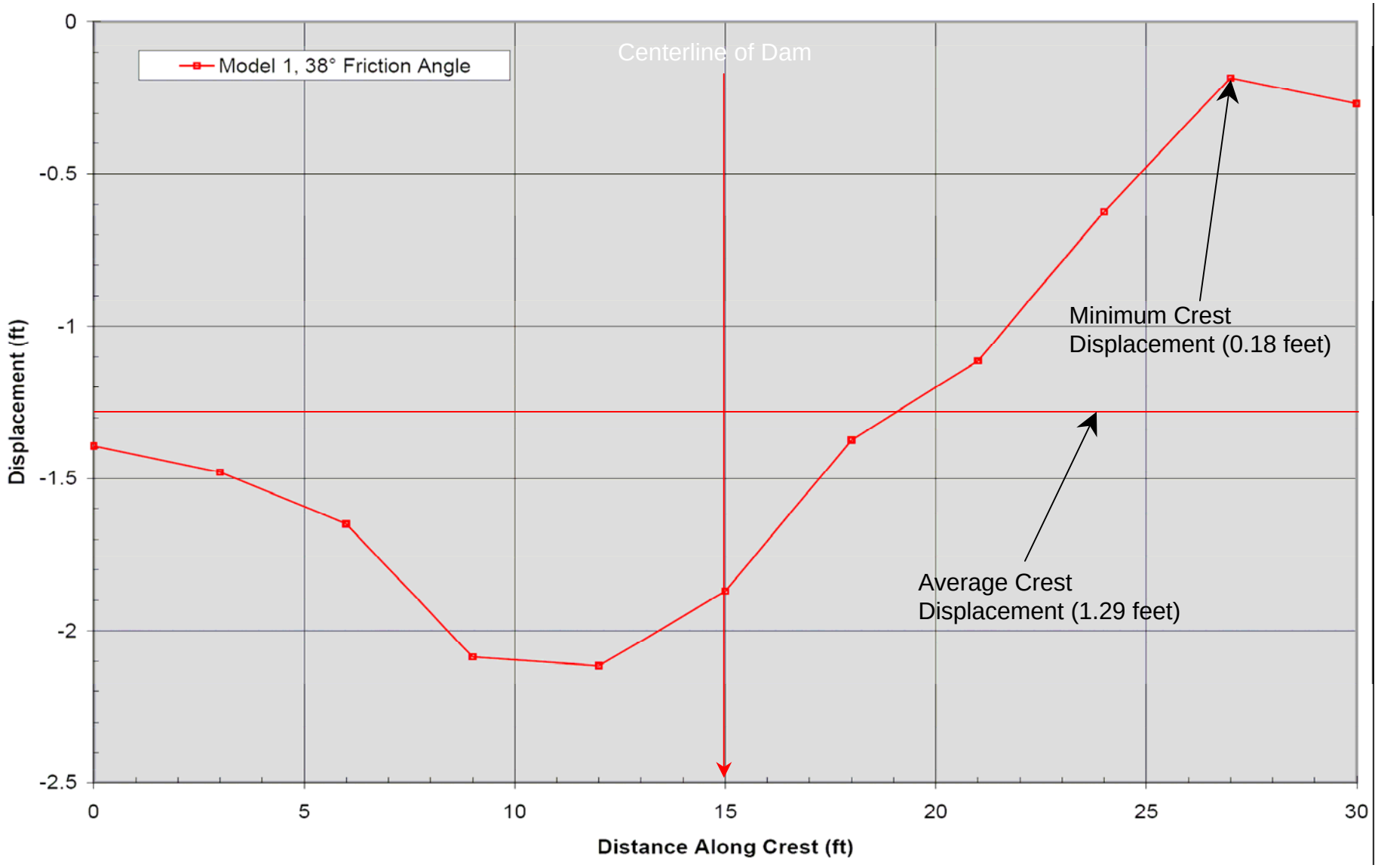
K L E I N F E L D E R

SALTON SEA RESTORATION PROJECT
EMBANKMENT DESIGNS AND
OPTIMIZATION STUDY
Appendix 2C – Deformation Analyses

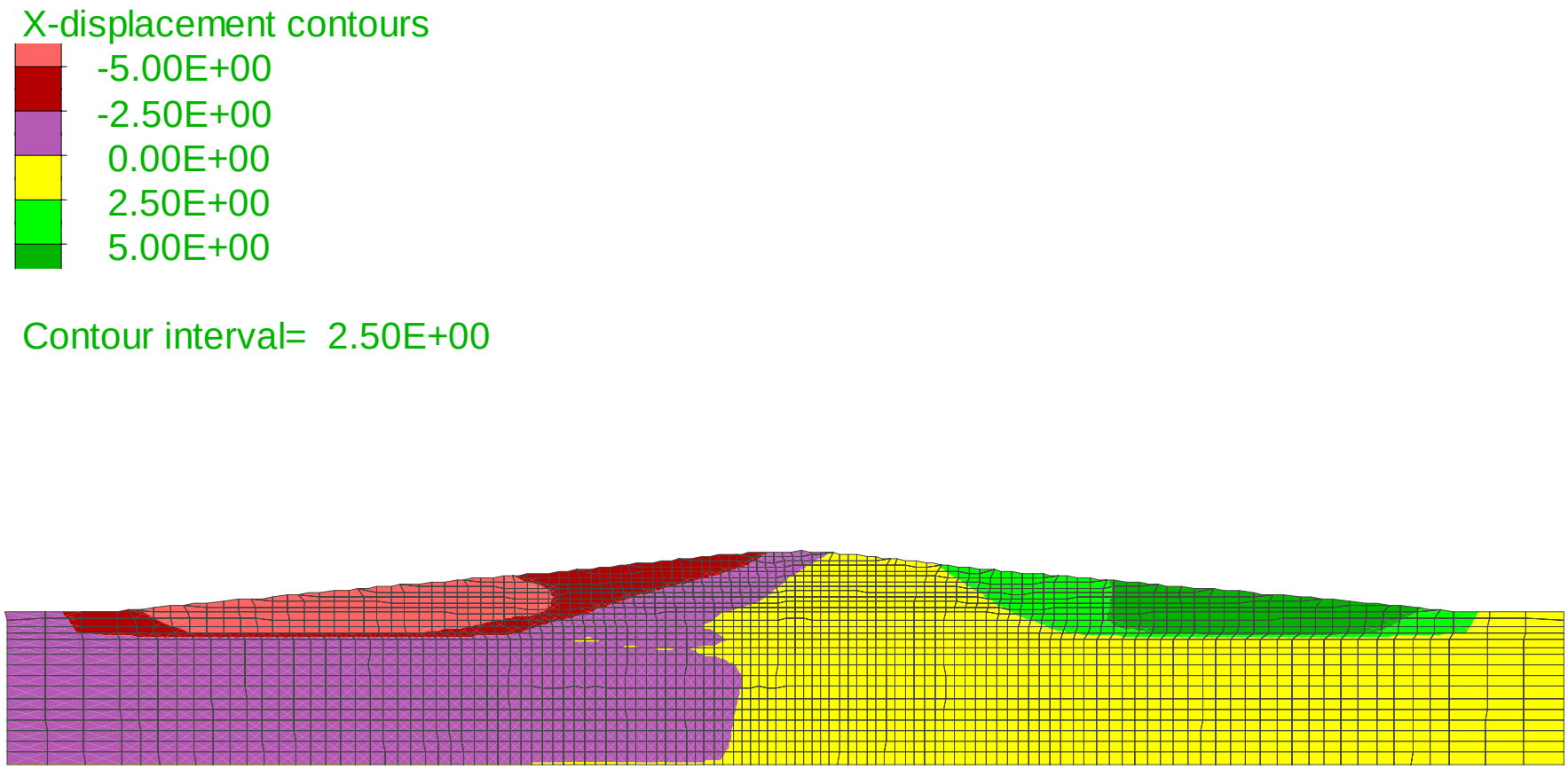
Project 71100 | By S. Anderson | August 2006

Finite Difference Grid
and Material Distribution
for Models 3 & 4

FIGURE C.4.2



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Crest Displacements for Model 1
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.1.7**

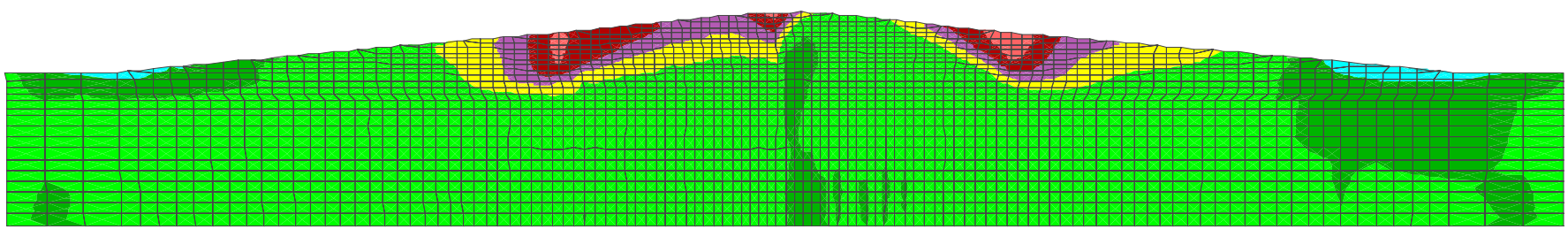


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			X Displacement Mid-Sea Dam Model 1
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.1.1**

Y-displacement contours

-2.00E+00
-1.50E+00
-1.00E+00
-5.00E-01
0.00E+00
5.00E-01
1.00E+00

Contour interval= 5.00E-01

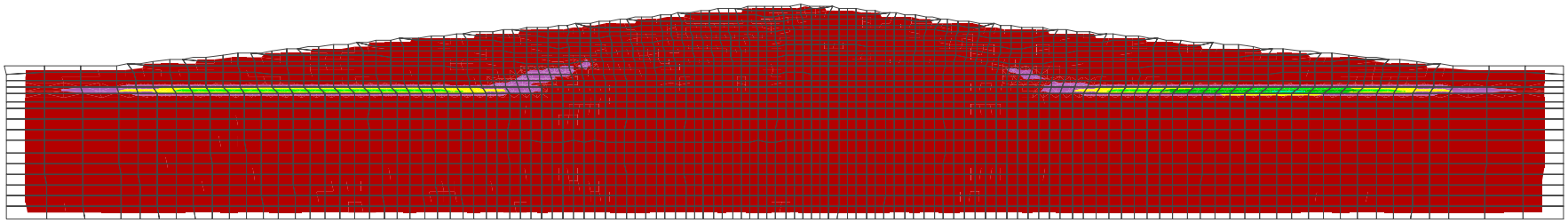


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Y Displacement Mid-Sea Dam Model 1
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.1.2**

Max. shear strain increment

0.00E+00
1.00E-01
2.00E-01
3.00E-01
4.00E-01
5.00E-01

Contour interval= 1.00E-01



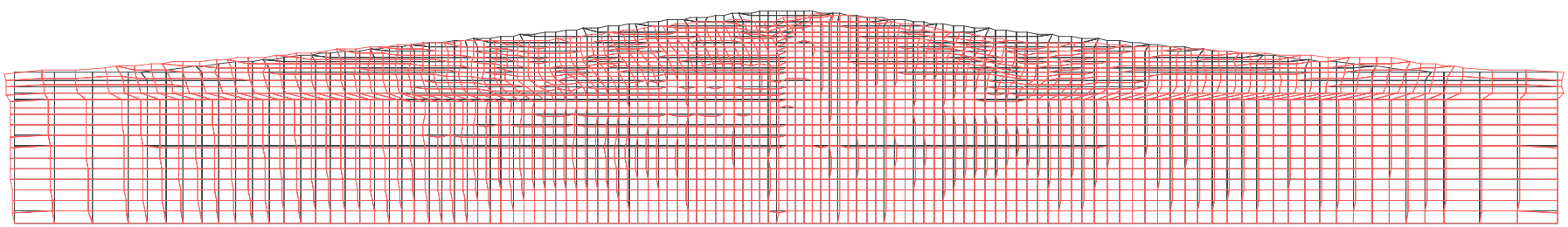
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Shear Strain Increment Mid-Sea Dam Model 1
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.1.3**

Exaggerated Grid Distortion

Magnification = 0.000E+00
Max Disp = 7.181E+00

Exaggerated Grid Distortion

Magnification = 5.000E+00
Max Disp = 7.181E+00



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Deformed vs. Un-deformed Grid Mid-Sea Dam Model 1
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.1.4**

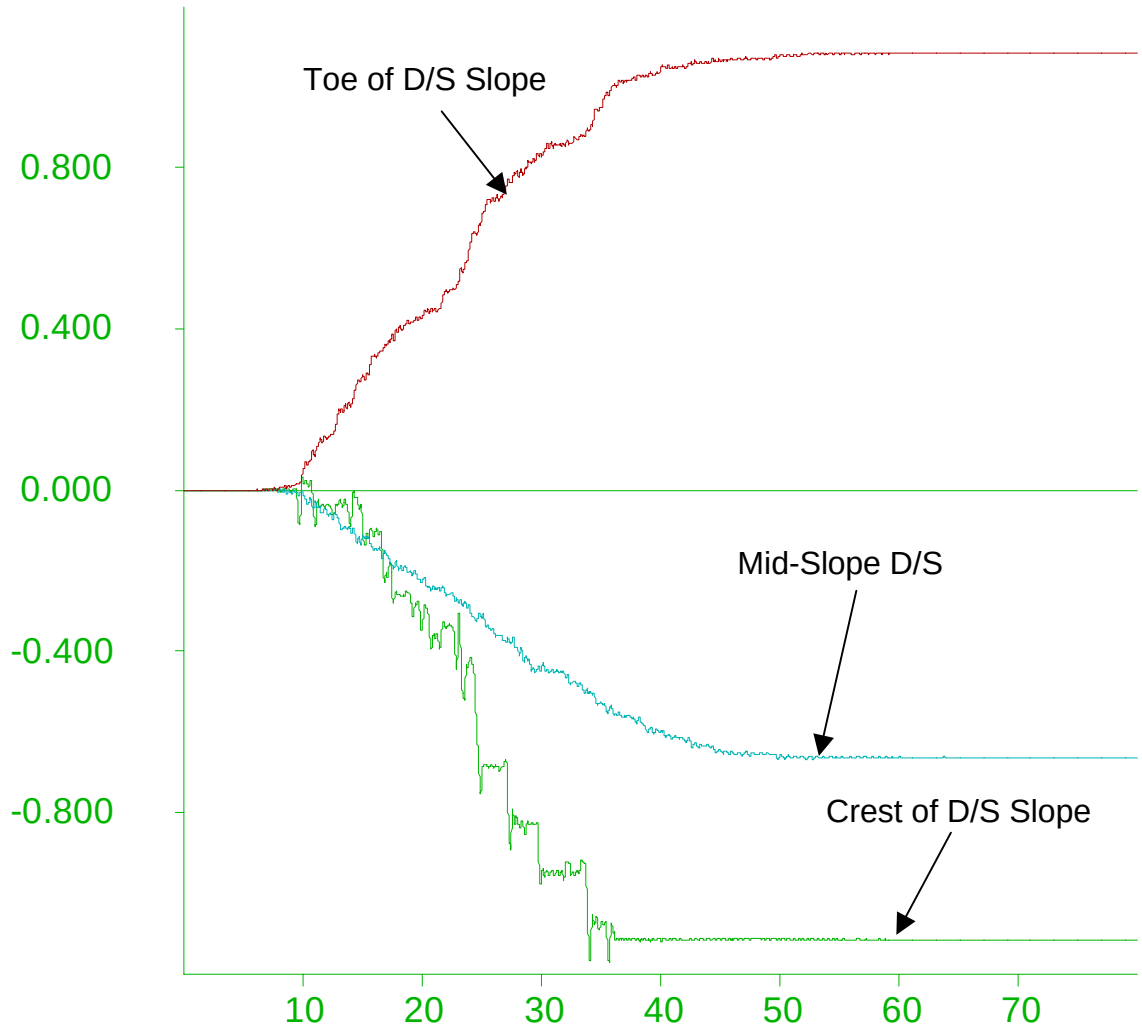
HISTORY PLOT
Y-axis :
17 X displacement(60, 29)
23 X displacement(95, 22)
29 X displacement(111, 17)
X-axis :
1 Dynamic time

X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of X Displacement Mid-Sea Dam Model 1
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.1.5**

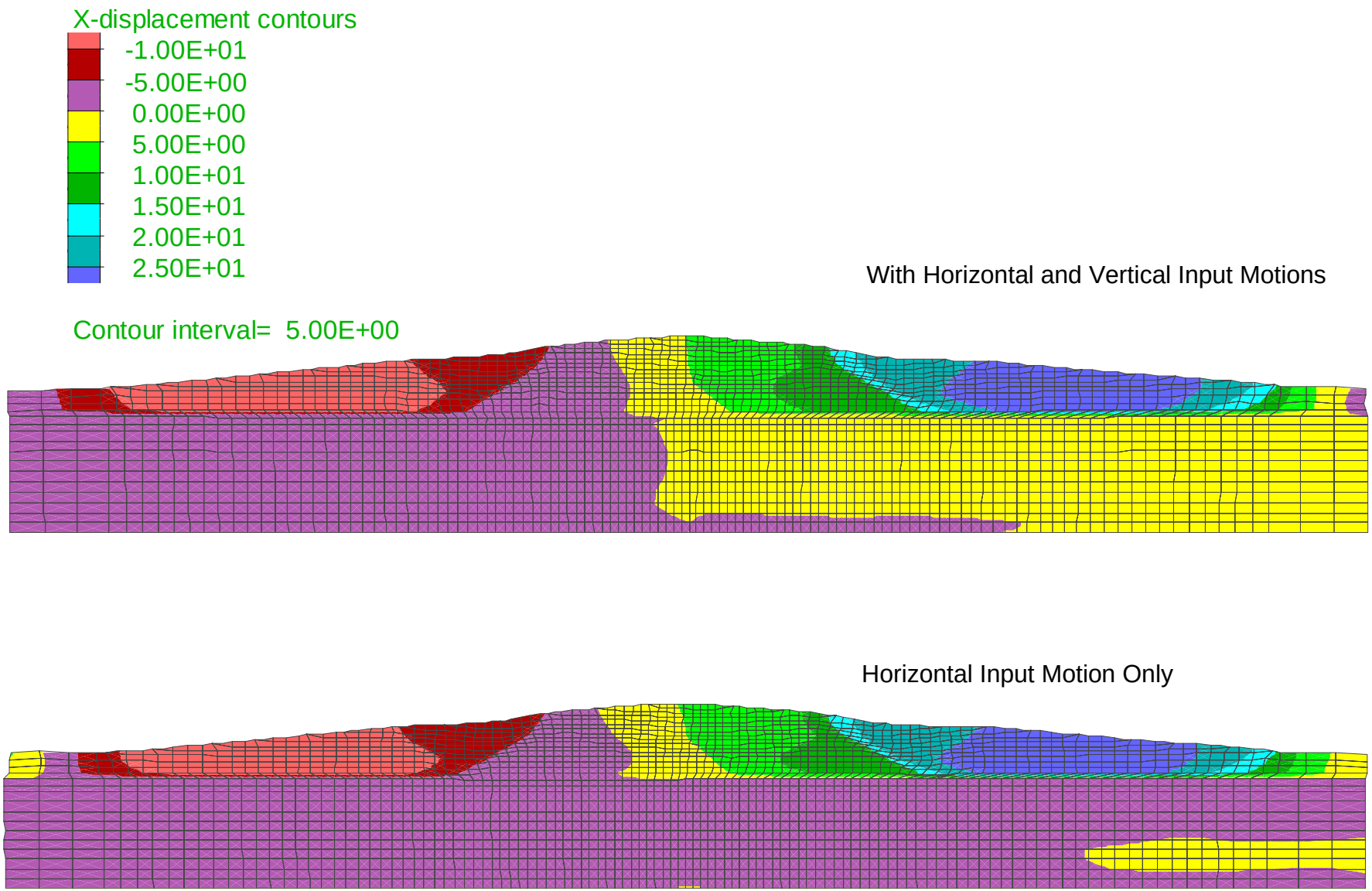
HISTORY PLOT
Y-axis :
18 Y displacement(60, 29)
24 Y displacement(95, 22)
30 Y displacement(111, 17)
X-axis :
1 Dynamic time



X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Graph of Y Displacement Mid-Sea Dam Model 1
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.5.4.1.6**



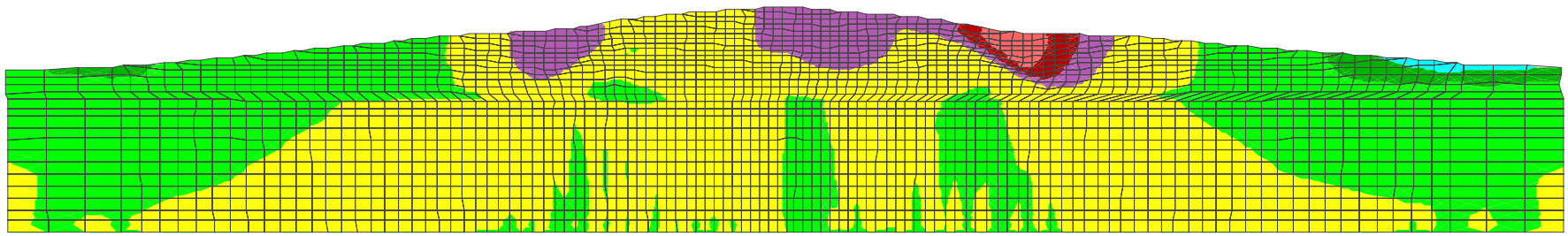
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	X Displacement Mid-Sea Dam Model 2 1,000 psf Cohesion
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.5.4.2.1**

Y-displacement contours

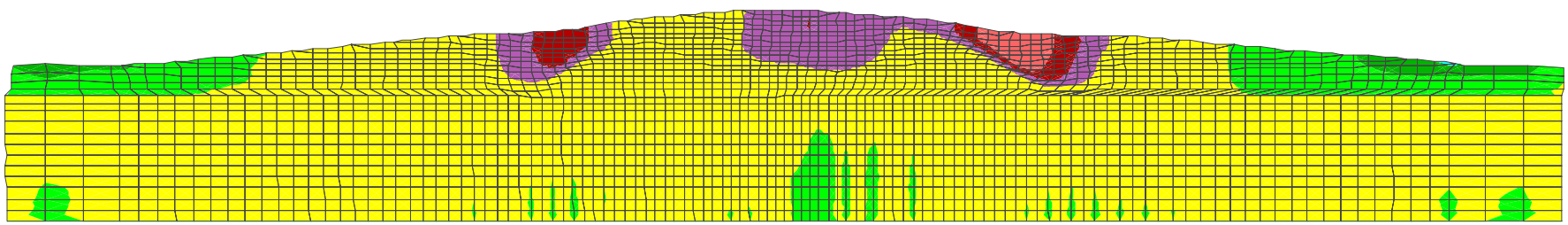
-6.00E+00
-4.00E+00
-2.00E+00
0.00E+00
2.00E+00
4.00E+00
6.00E+00

Contour interval= 2.00E+00

With Horizontal and Vertical Input Motions



Horizontal Input Motion Only



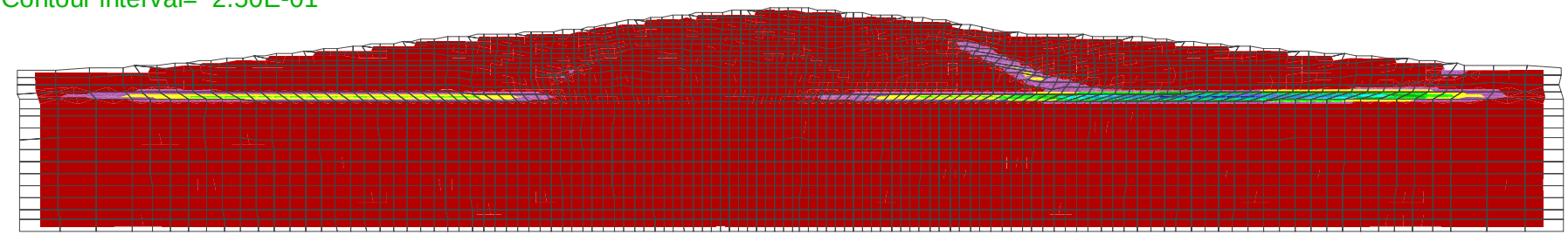
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Y Displacement Mid-Sea Dam Model 2 1,000 psf Cohesion
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.2.2**

Max. shear strain increment

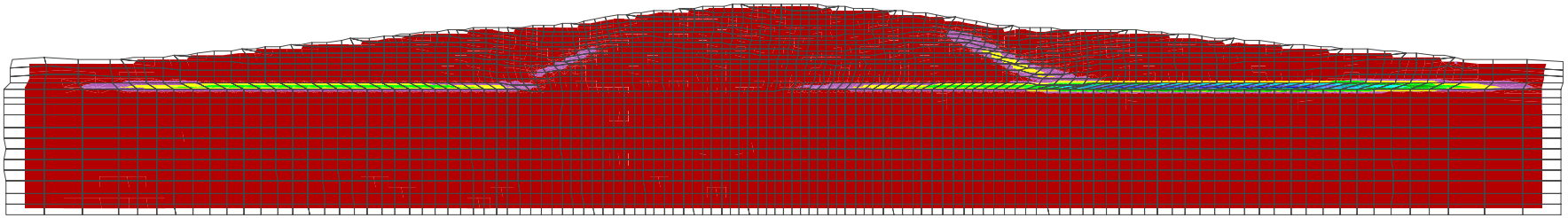
0.00E+00
2.50E-01
5.00E-01
7.50E-01
1.00E+00
1.25E+00
1.50E+00
1.75E+00
2.00E+00

Contour interval= 2.50E-01

With Horizontal and Vertical Input Motions



Horizontal Input Motion Only



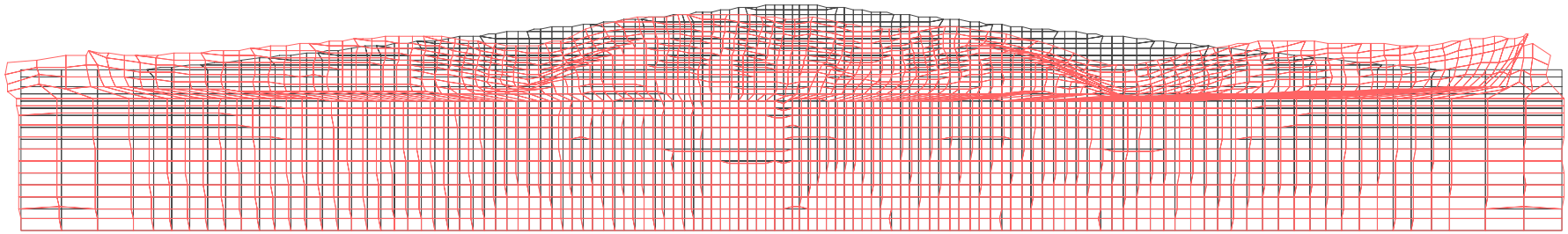
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Shear Strain Increment Mid-Sea Dam Model 2 1,000 psf Cohesion
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.2.3**

Exaggerated Grid Distortion

Magnification = 0.000E+00
Max Disp = 2.772E+01
Exaggerated Grid Distortion

Magnification = 5.000E+00
Max Disp = 2.772E+01

With Horizontal and Vertical Input Motions

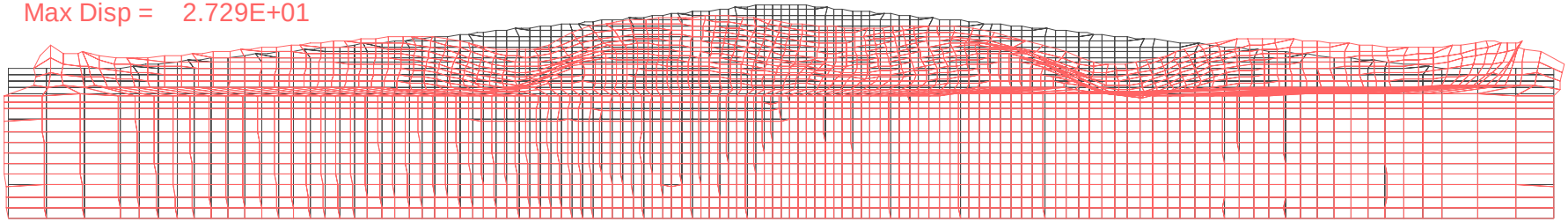


Exaggerated Grid Distortion

Magnification = 0.000E+00
Max Disp = 2.729E+01
Exaggerated Grid Distortion

Magnification = 5.000E+00
Max Disp = 2.729E+01

Horizontal Input Motion Only

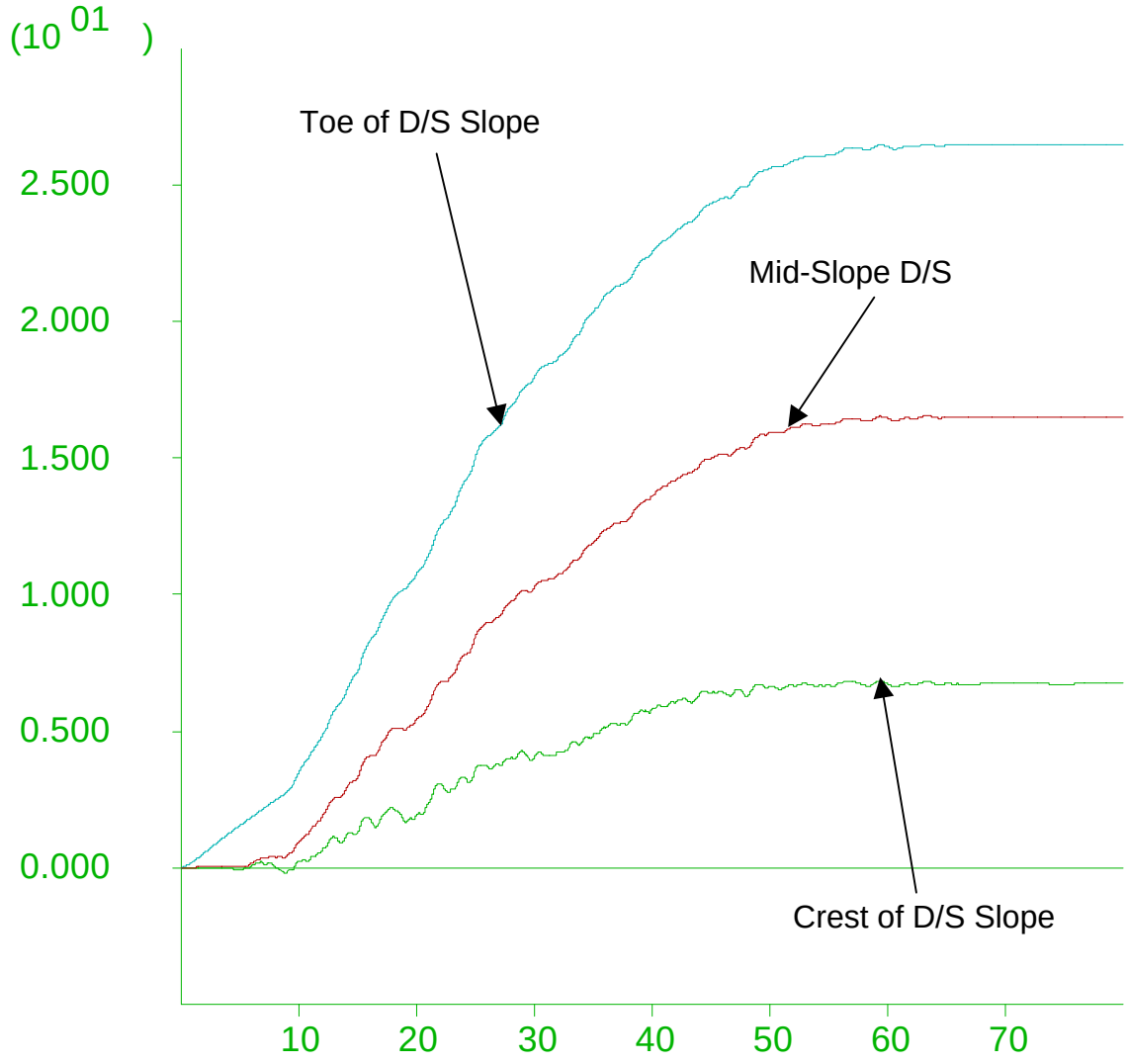


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Deformed vs. Un-deformed Grid Mid-Sea Dam Model 2 1,000 psf Cohesion
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.2.4**

Dynamic Time 8.0000E+01

HISTORY PLOT
Y-axis :
17 X displacement(60, 29)
23 X displacement(95, 22)
29 X displacement(111, 17)
X-axis :
1 Dynamic time

Horizontal Input Motions Only



X – axis, Time (seconds)

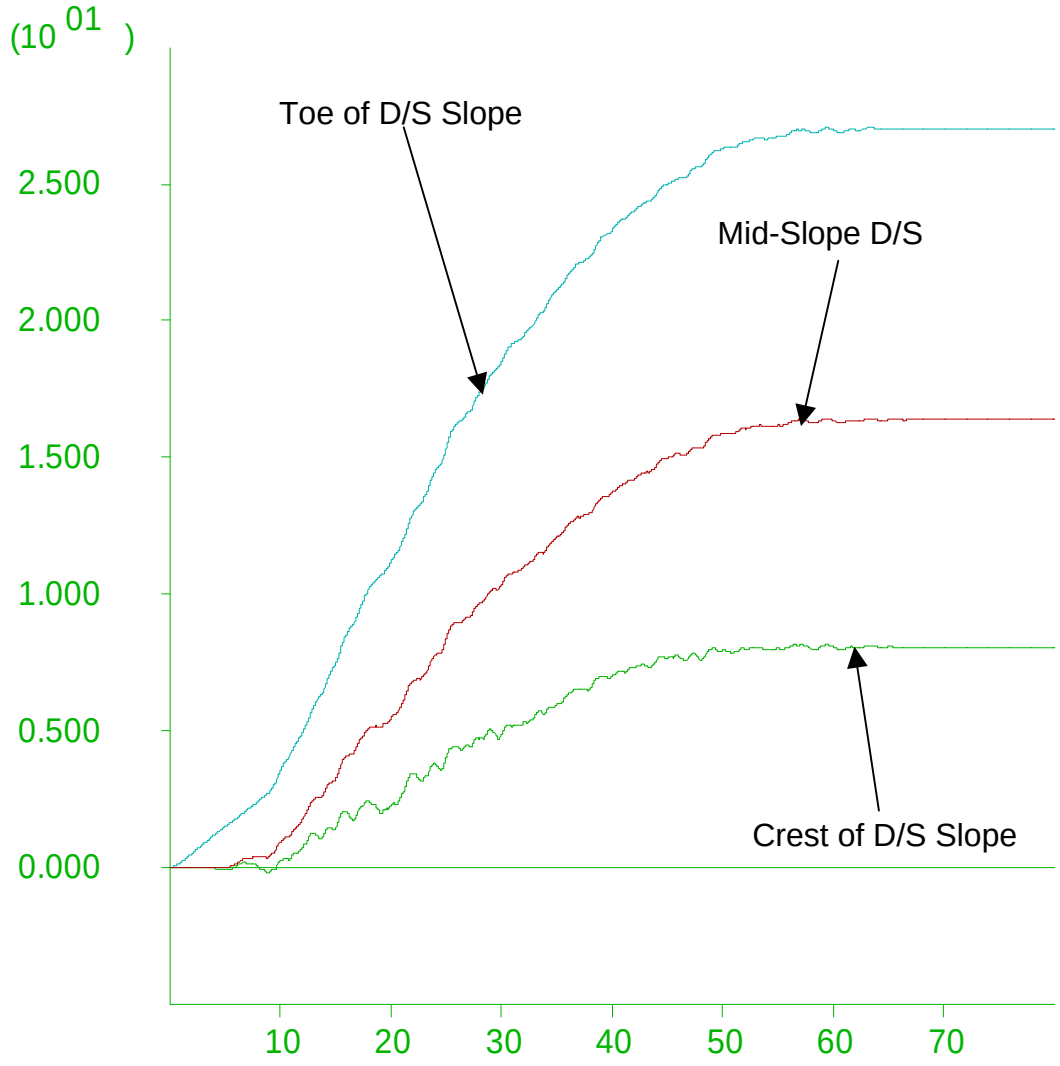
Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of X Displacement Mid-Sea Dam Model 2 1,000 psf Cohesion
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.2.5**

Dynamic Time 8.0000E+01

HISTORY PLOT
Y-axis :
17 X displacement(60, 29)
23 X displacement(95, 22)
29 X displacement(111, 17)
X-axis :
1 Dynamic time

With Horizontal and Vertical Input Motions



X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of X Displacement Mid-Sea Dam Model 2 1,000 psf Cohesion
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.2.6**

Dynamic Time 8.0000E+01

HISTORY PLOT

Y-axis :

18 Y displacement(60, 29)

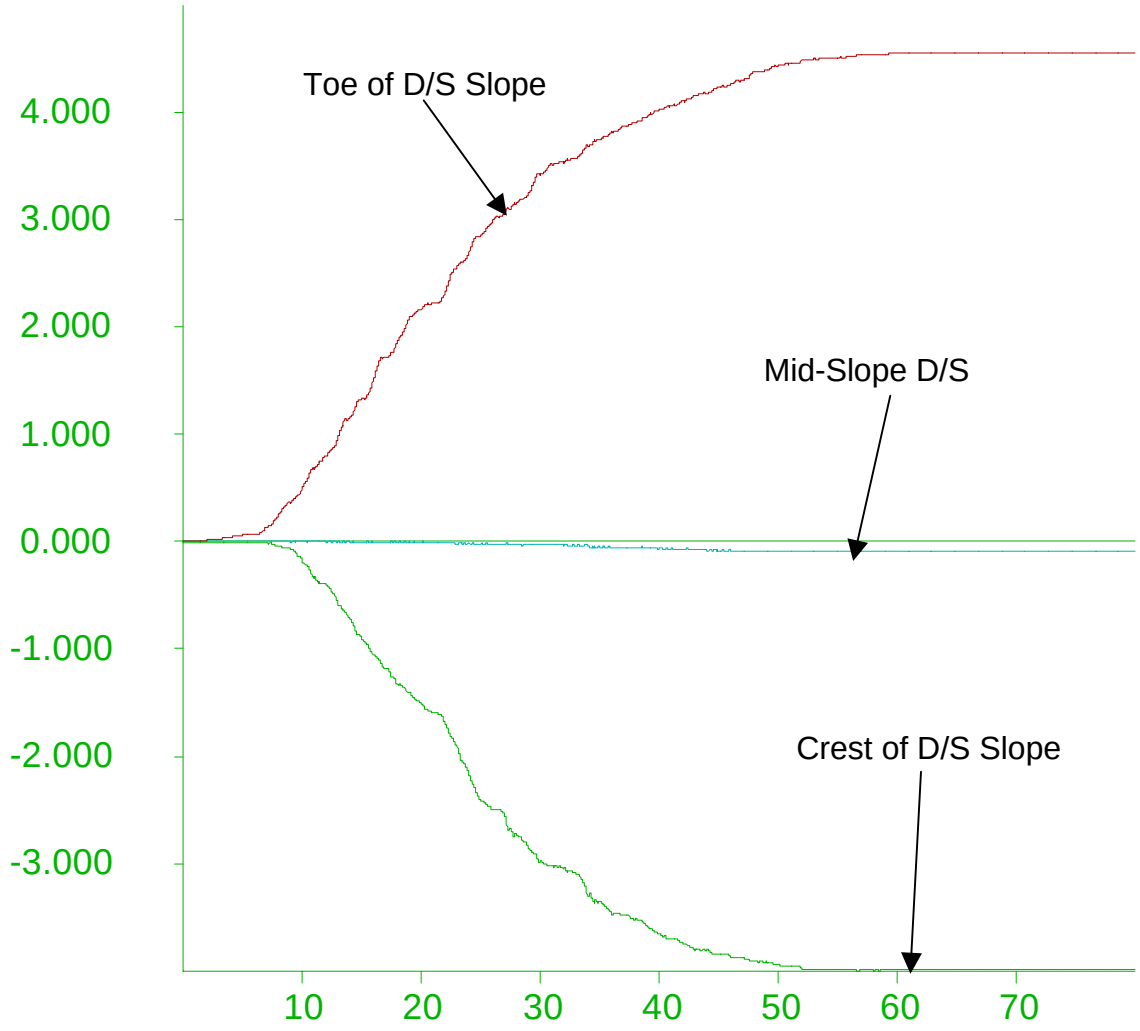
24 Y displacement(95, 22)

30 Y displacement(111, 17)

X-axis :

1 Dynamic time

Horizontal Input Motions Only



X – axis, Time (seconds)

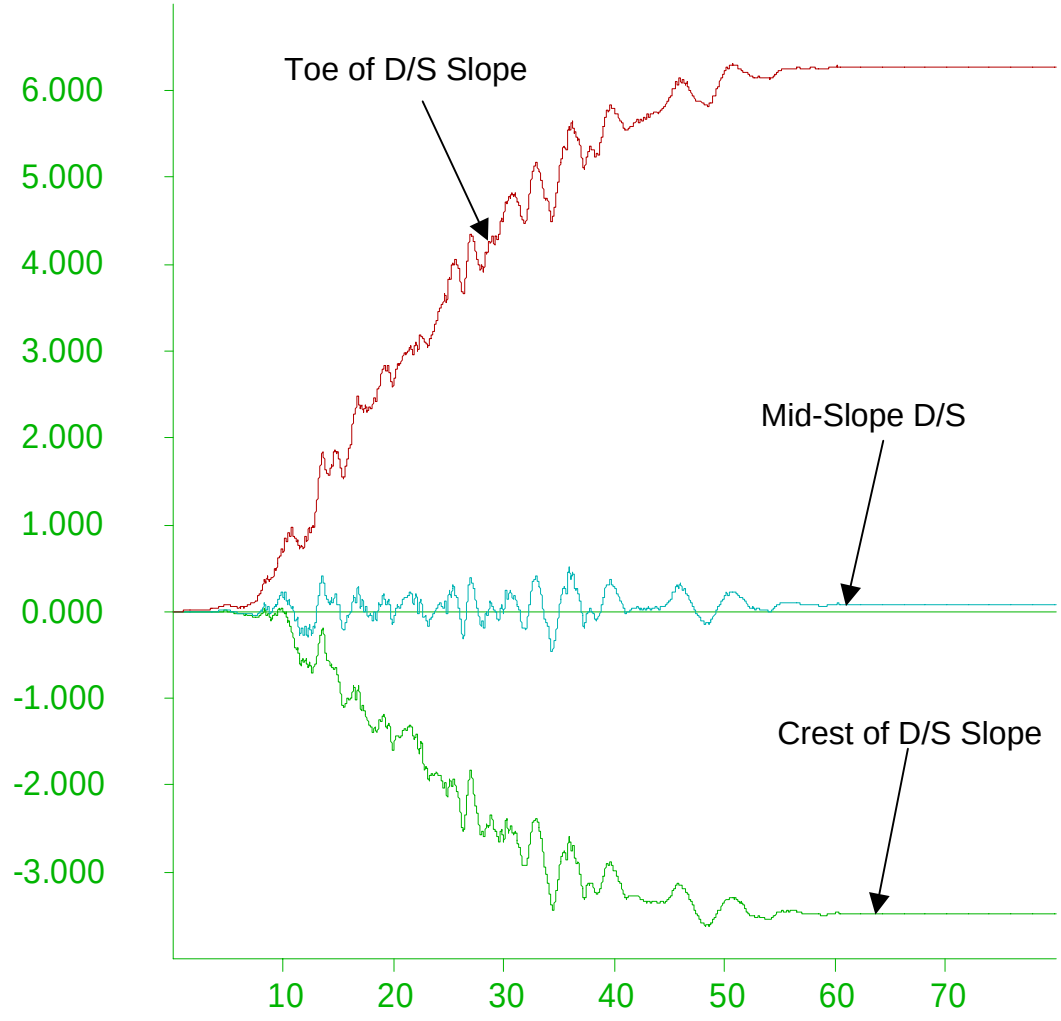
Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of Y Displacement Mid-Sea Dam Model 2 1,000 psf Cohesion
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**Figure C.5.4.2.7**

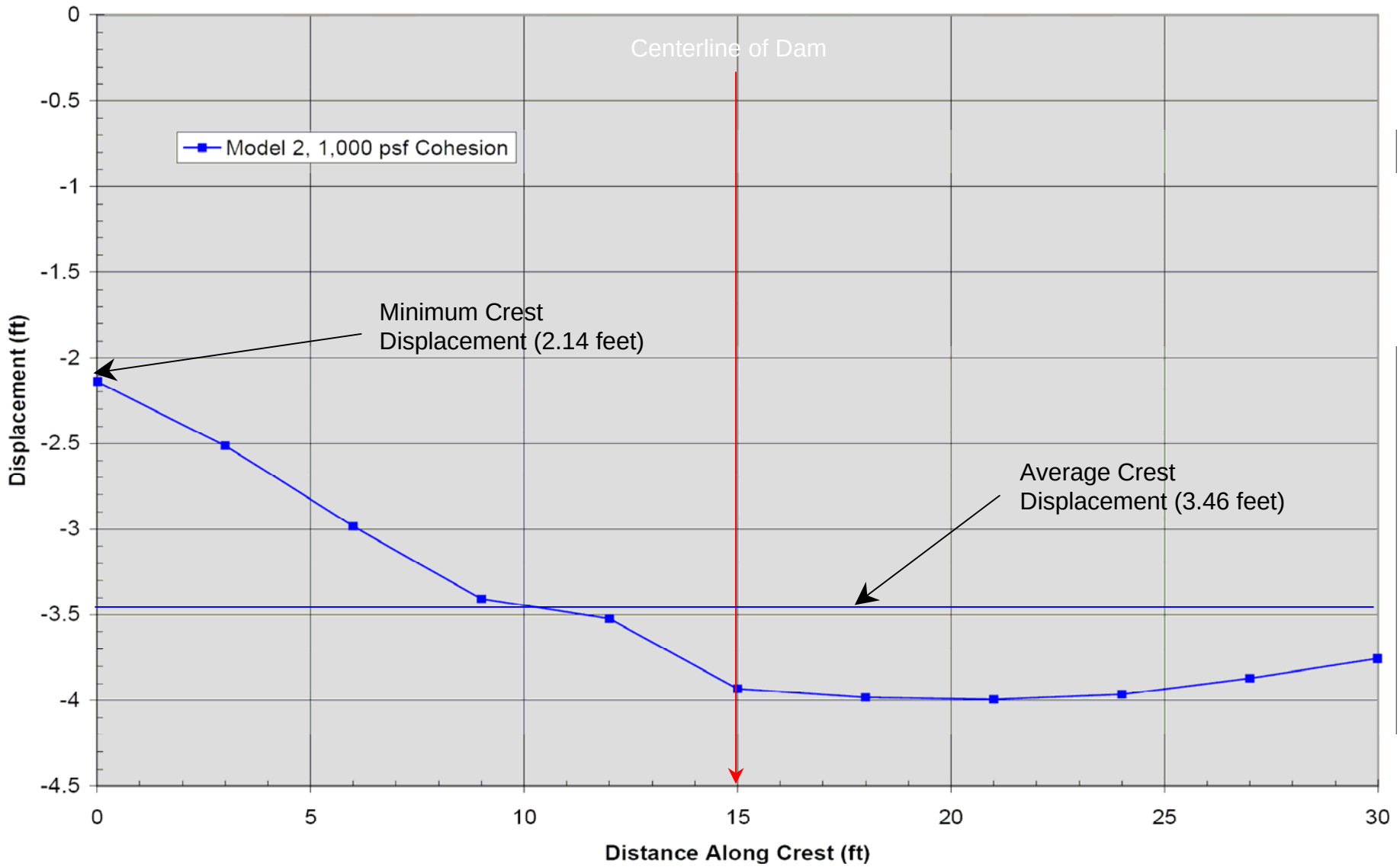
Dynamic Time 8.0000E+01

HISTORY PLOT
Y-axis :
18 Y displacement(60, 29)
24 Y displacement(95, 22)
30 Y displacement(111, 17)
X-axis :
1 Dynamic time

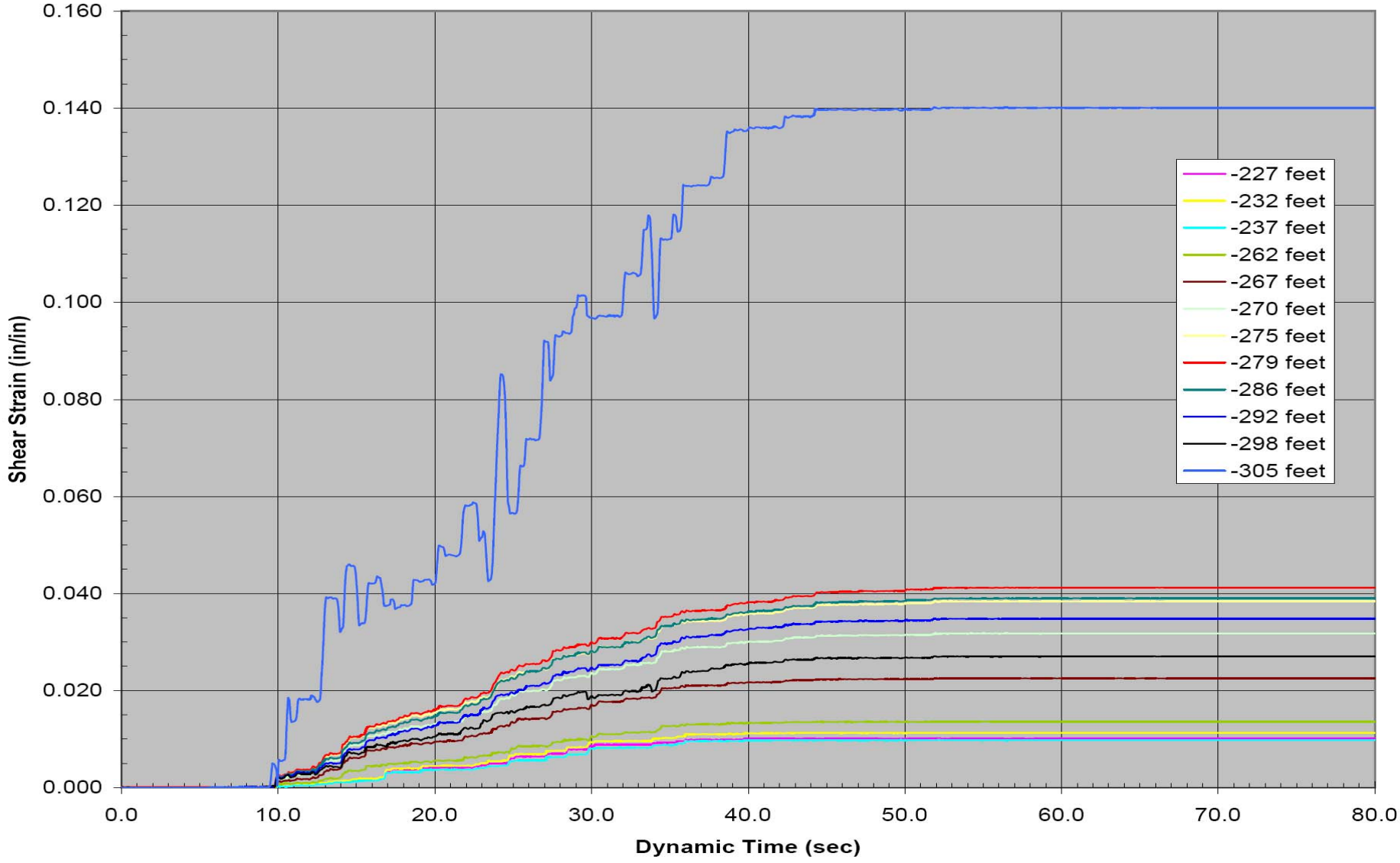
With Horizontal and Vertical Input Motions



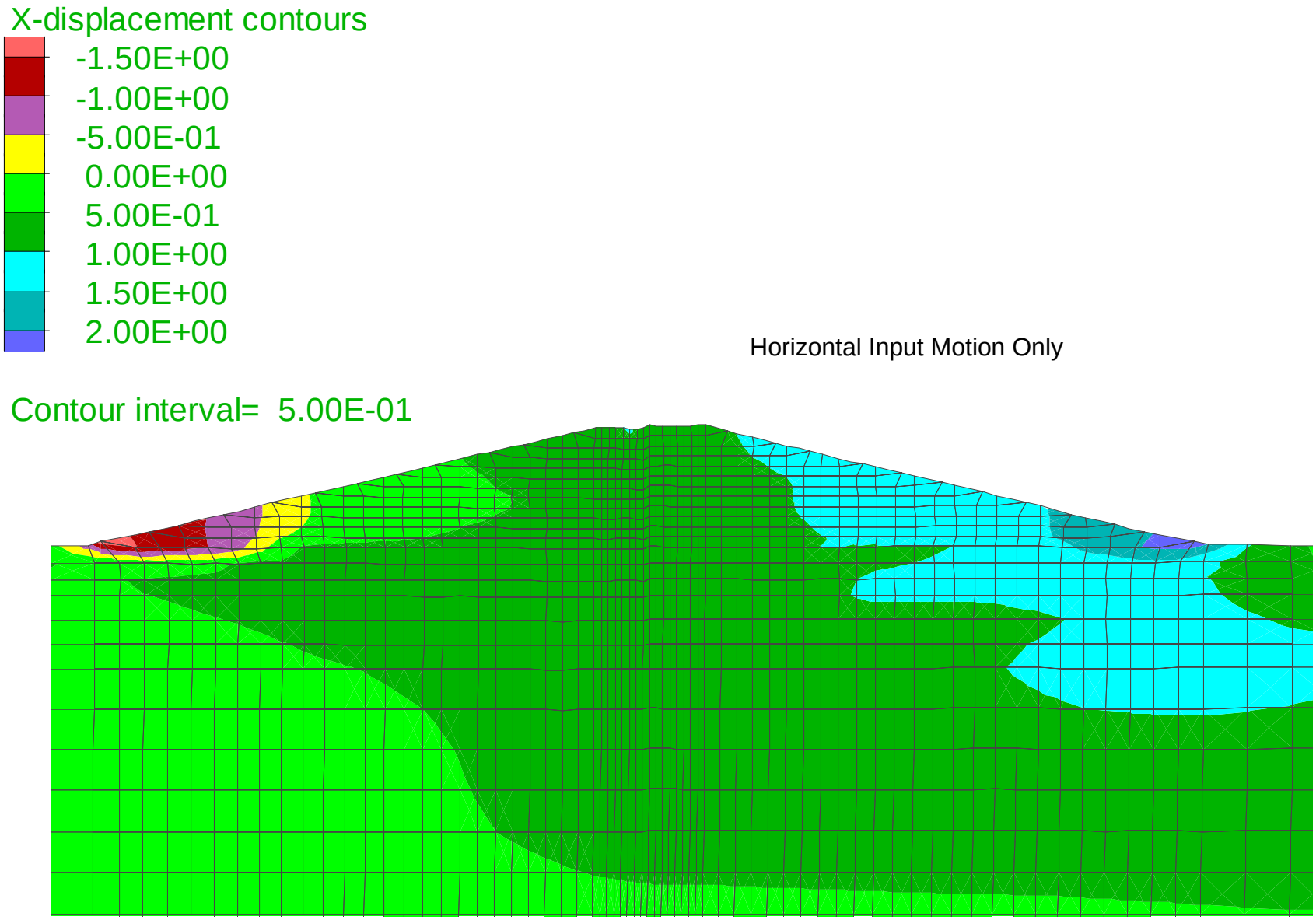
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of Y Displacement Mid-Sea Dam Model 2 1,000 psf Cohesion
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.2.8**



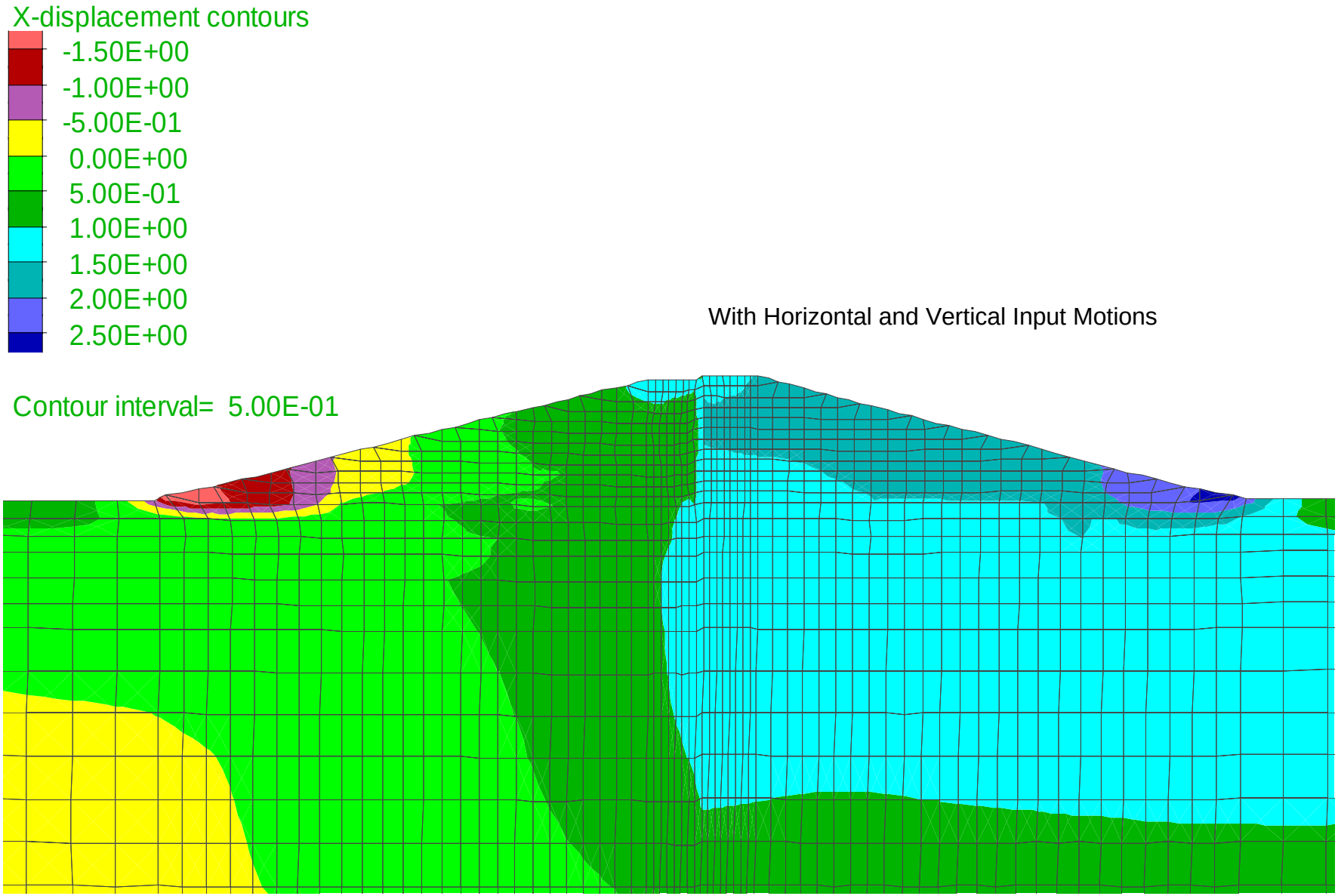
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Crest Displacements for Model 2
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.2.9**



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Shear Strains along Vertical Section at the Centerline of Mid-Sea Dam
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.2.10**



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	X Displacement Perimeter Dike Model 3
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.5.4.3.1**



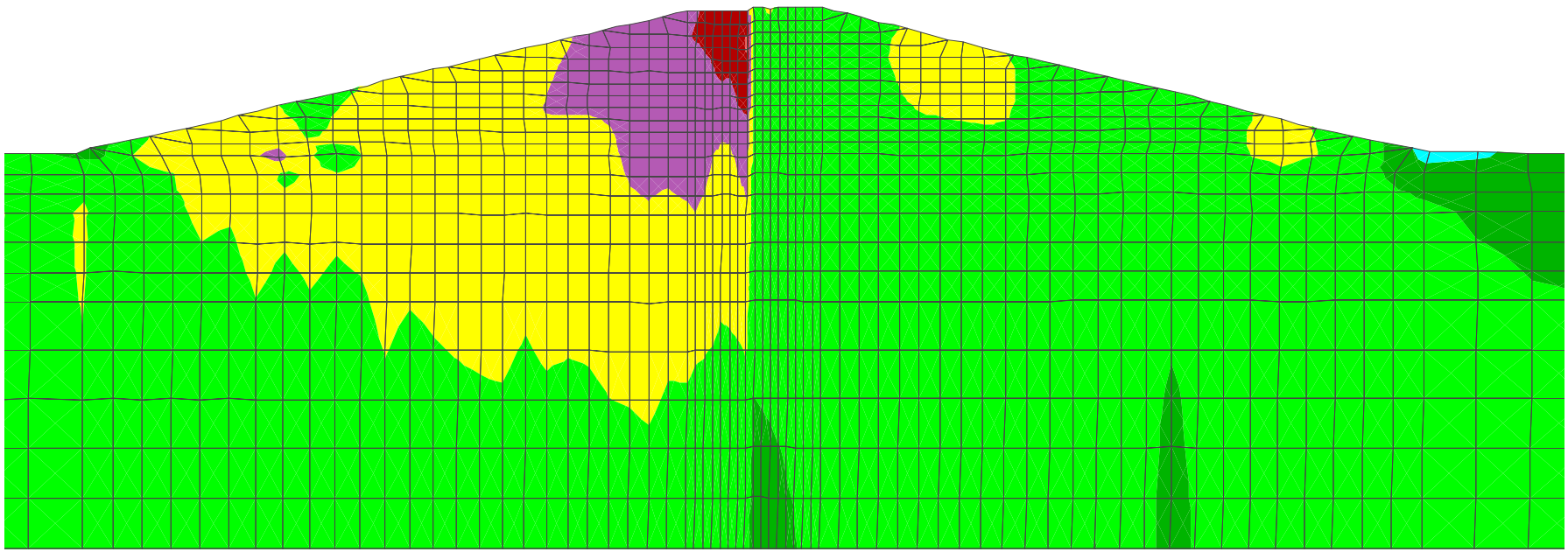
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	X Displacement Perimeter Dike Model 3
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.5.4.3.2**

Y-displacement contours

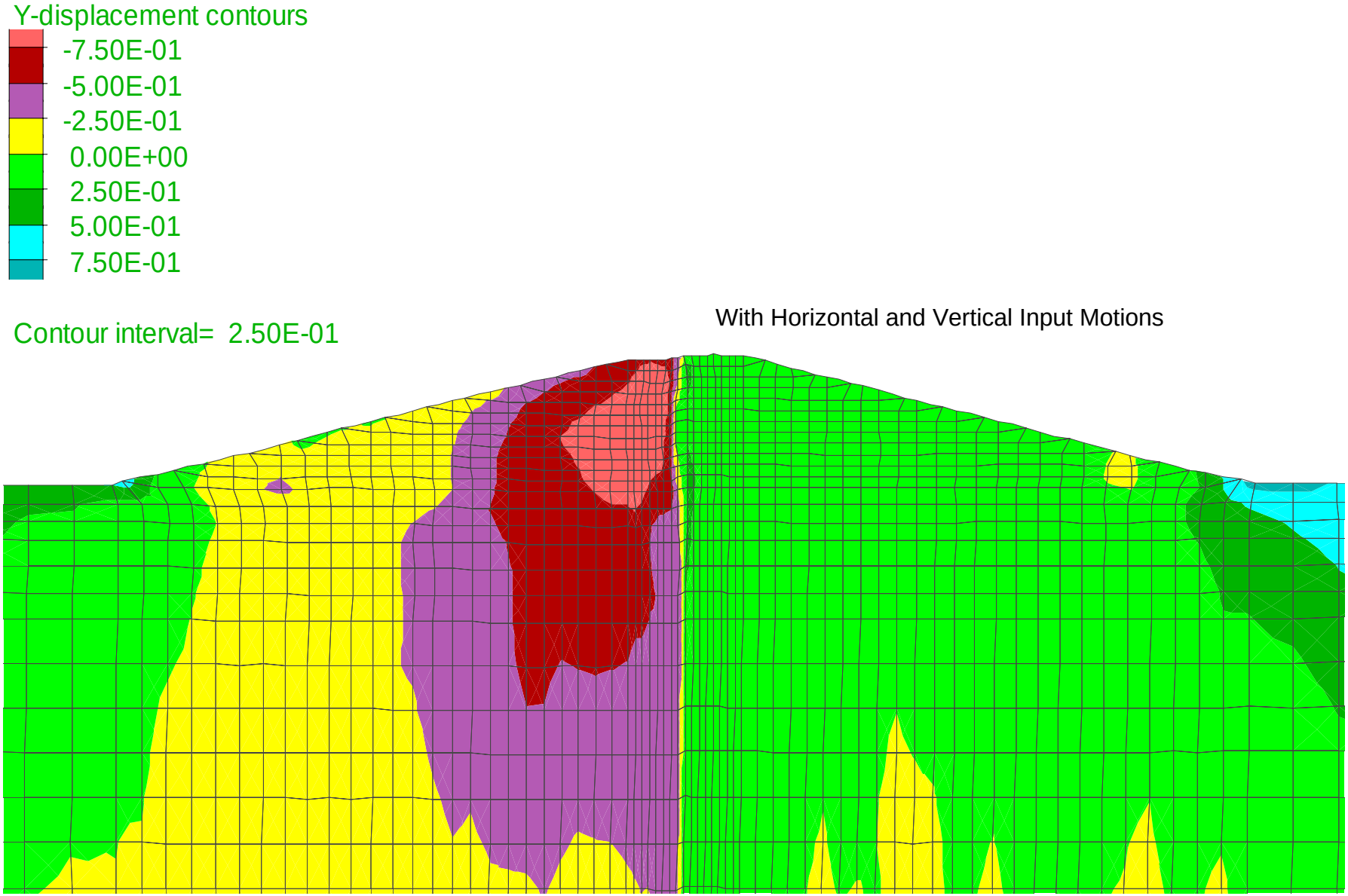
-1.00E+00
-7.50E-01
-5.00E-01
-2.50E-01
0.00E+00
2.50E-01

Contour interval= 2.50E-01

Horizontal Input Motion Only



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Y Displacement Perimeter Dike Model 3
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**Figure C.5.4.3.3**



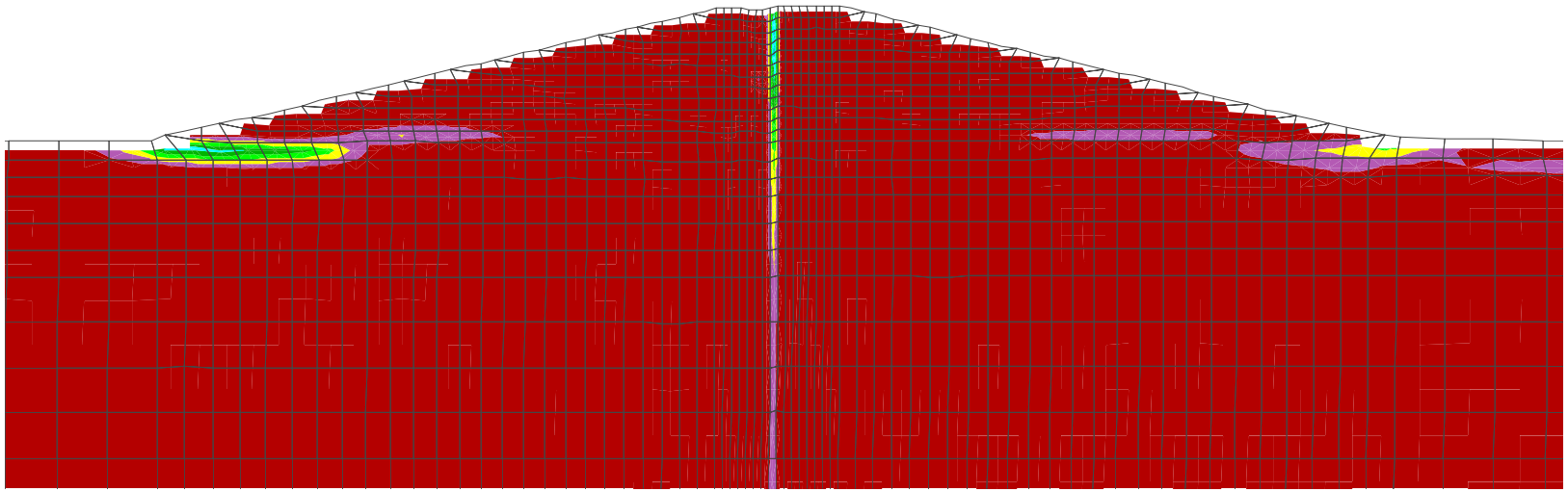
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Y Displacement Perimeter Dike Model 3
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**Figure C.5.4.3.4**

Max. shear strain increment

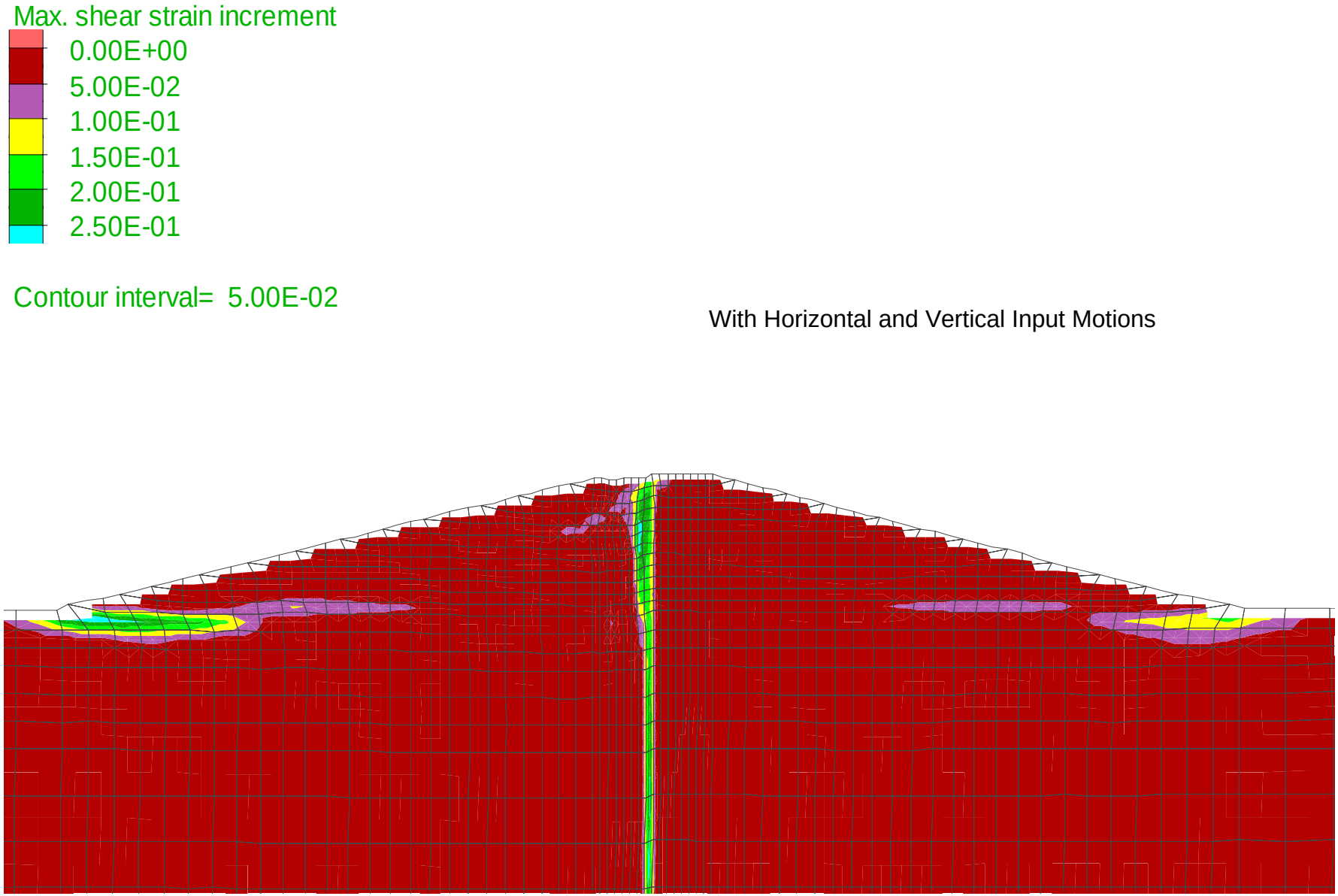
0.00E+00
5.00E-02
1.00E-01
1.50E-01
2.00E-01
2.50E-01
3.00E-01

Contour interval= 5.00E-02

Horizontal Input Motion Only



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Shear Strain Increment Perimeter Dike Model 3
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE D.5.4.3.5**



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Shear Strain Increment Perimeter Dike Model 3
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**Figure C.5.4.3.6**

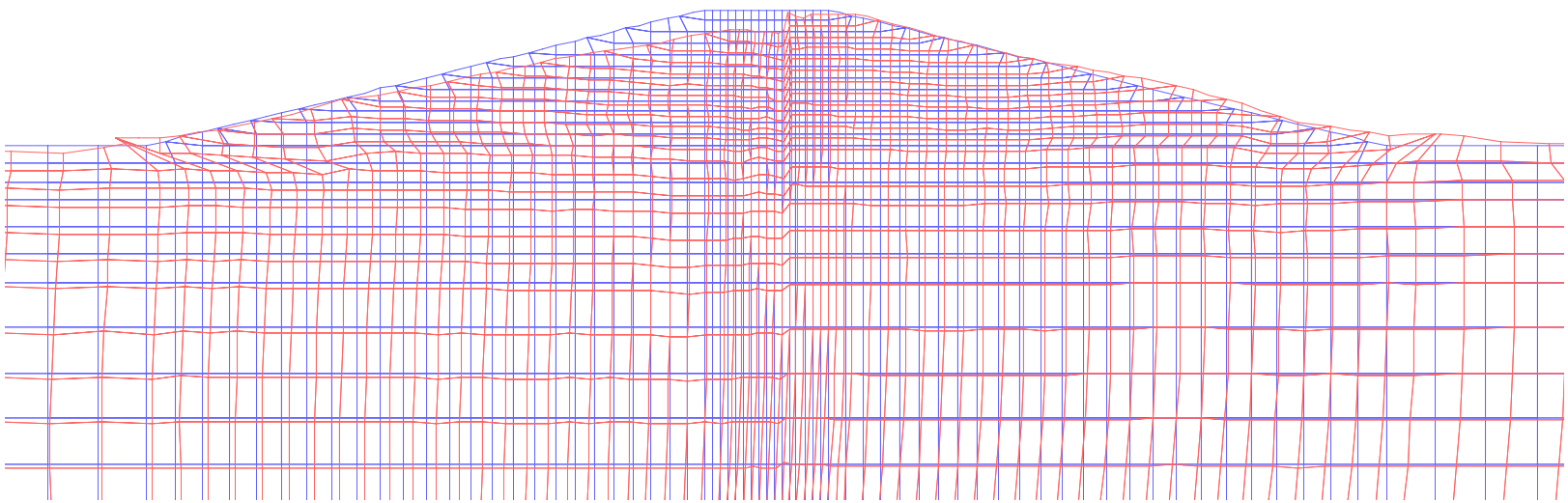
Exaggerated Grid Distortion

Magnification = 0.000E+00
Max Disp = 2.385E+00

Exaggerated Grid Distortion

Magnification = 5.000E+00
Max Disp = 2.385E+00

Horizontal Input Motion Only



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Deformed vs. Un-deformed Grid Perimeter Dike Model 3
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**Figure C.5.4.3.7**

Exaggerated Grid Distortion

Magnification = 0.000E+00

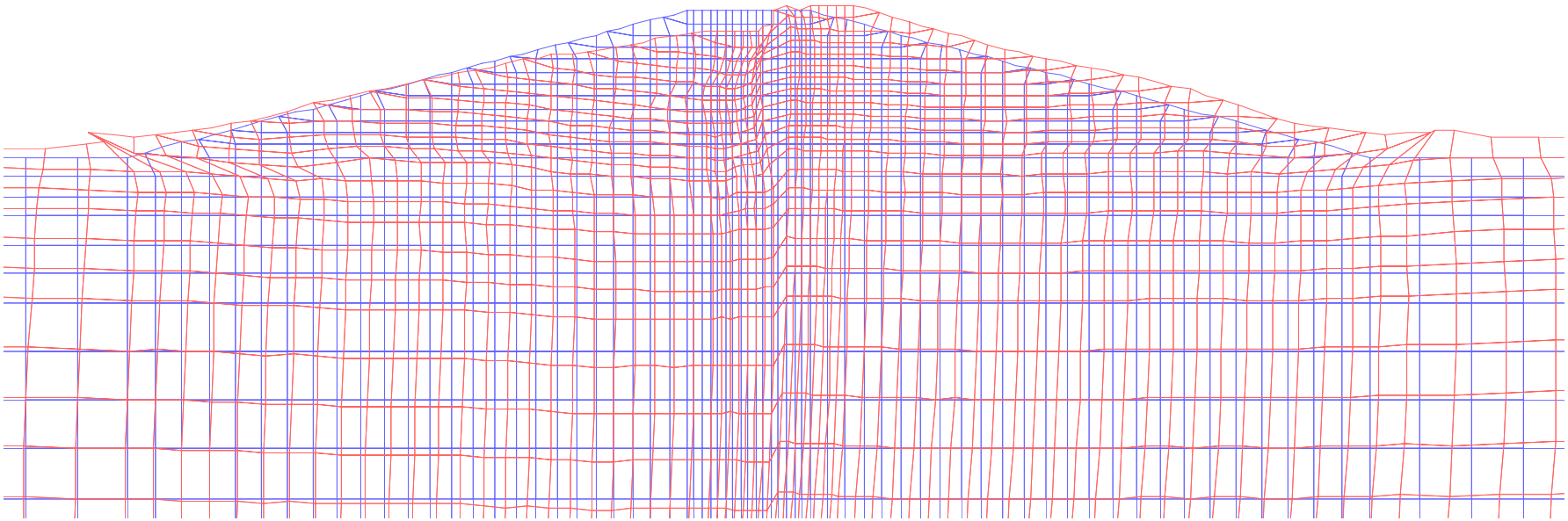
Max Disp = 2.867E+00

Exaggerated Grid Distortion

Magnification = 5.000E+00

Max Disp = 2.867E+00

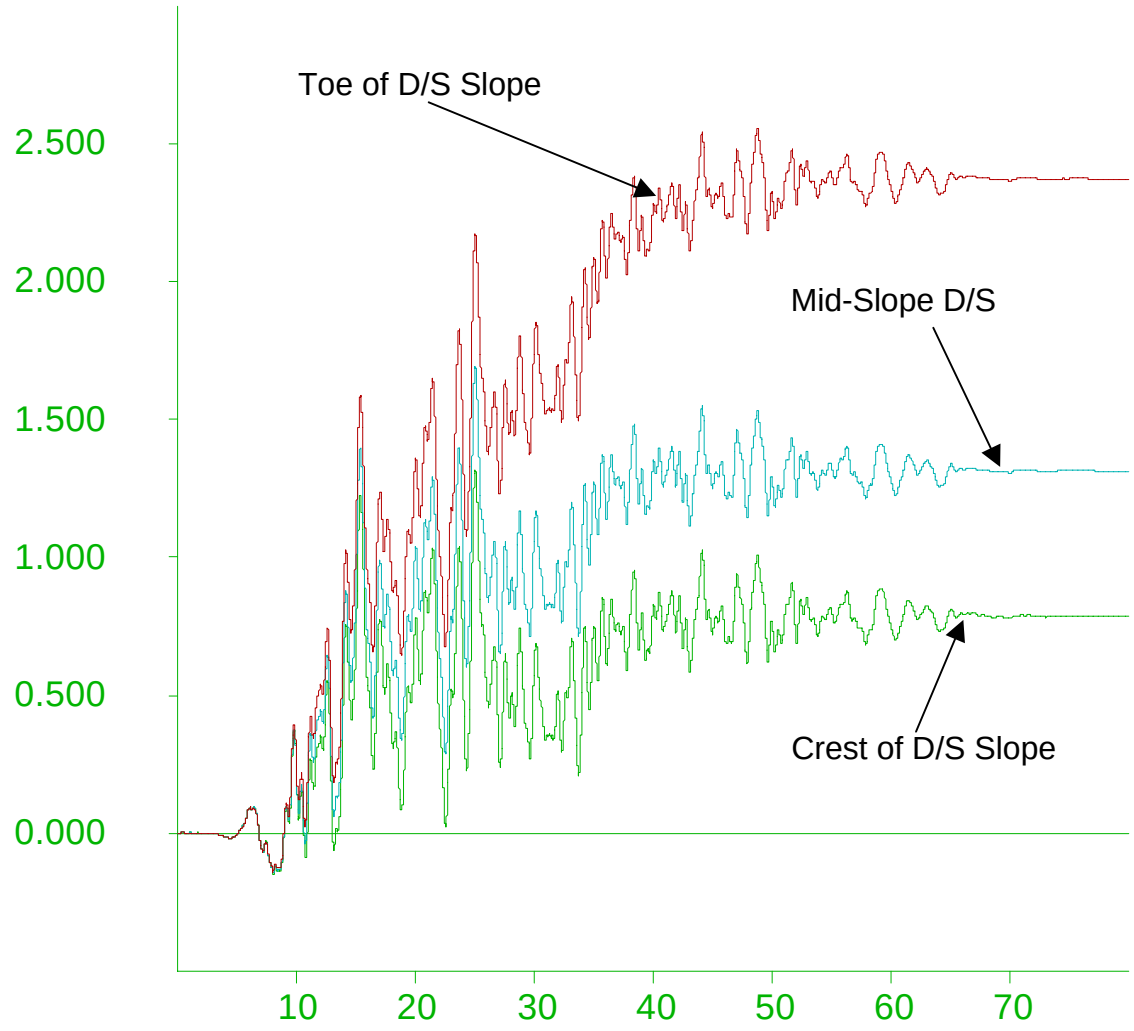
With Horizontal and Vertical Input Motions



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Deformed vs. Un-deformed Grid Perimeter Dike Model 3
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**Figure C.5.4.3.8**

HISTORY PLOT
Y-axis :
22 X displacement(44, 34)
52 X displacement(67, 28)
58 X displacement(76, 22)
X-axis :
1 Dynamic time

Horizontal Input Motions Only



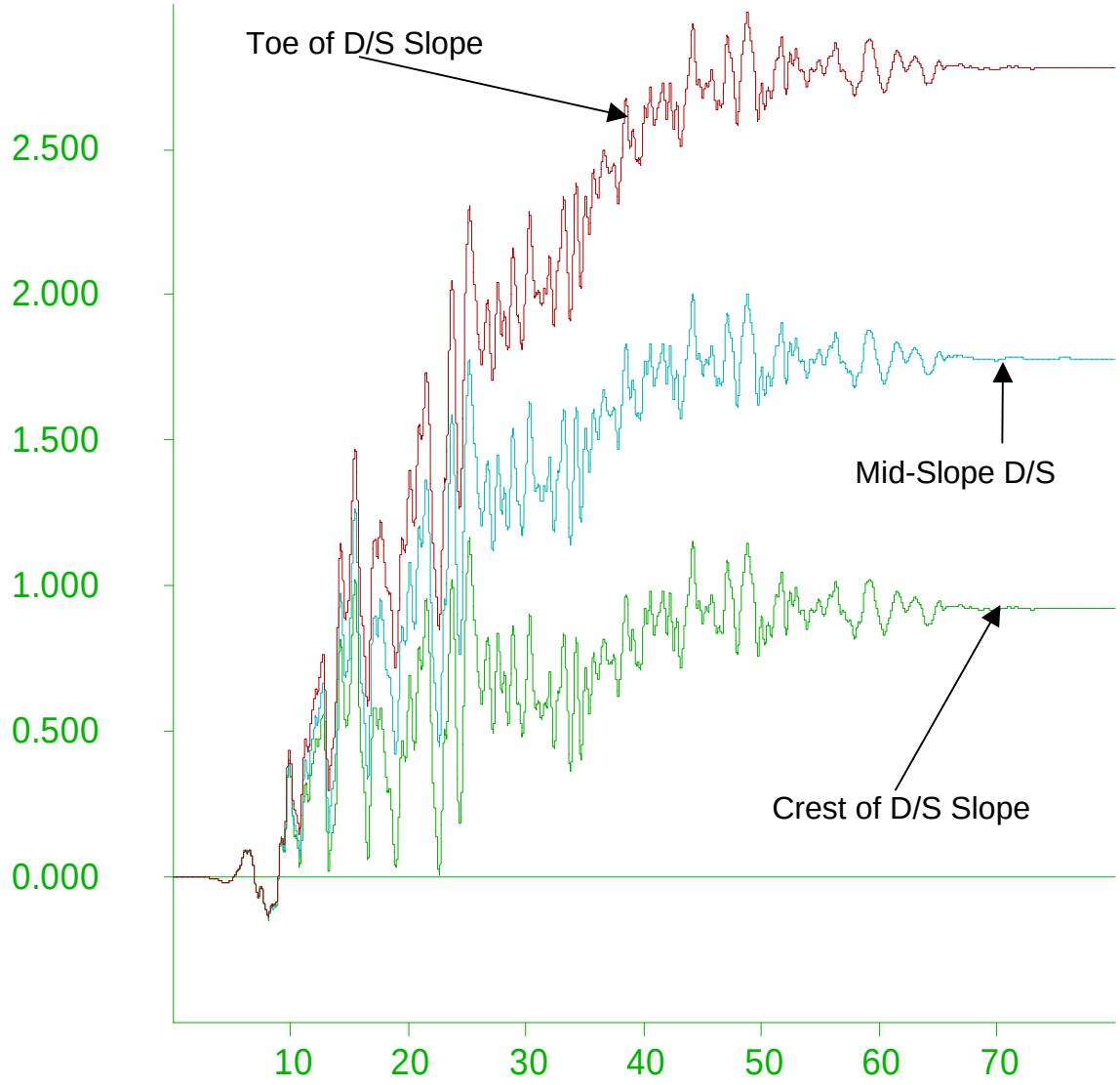
X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Graph of X Displacement Perimeter Dike Model 3
KLEINFELDER	Project 71100 / By S. Anderson / August 2006	**FIGURE C.5.4.3.9**

HISTORY PLOT
Y-axis :
22 X displacement(44, 34)
52 X displacement(67, 28)
58 X displacement(76, 22)
X-axis :
1 Dynamic time

With Horizontal and Vertical Input Motions



X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of X Displacement Perimeter Dike Model 3
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**Figure C.5.4.3.10**

HISTORY PLOT

Y-axis :

23 Y displacement(44, 34)

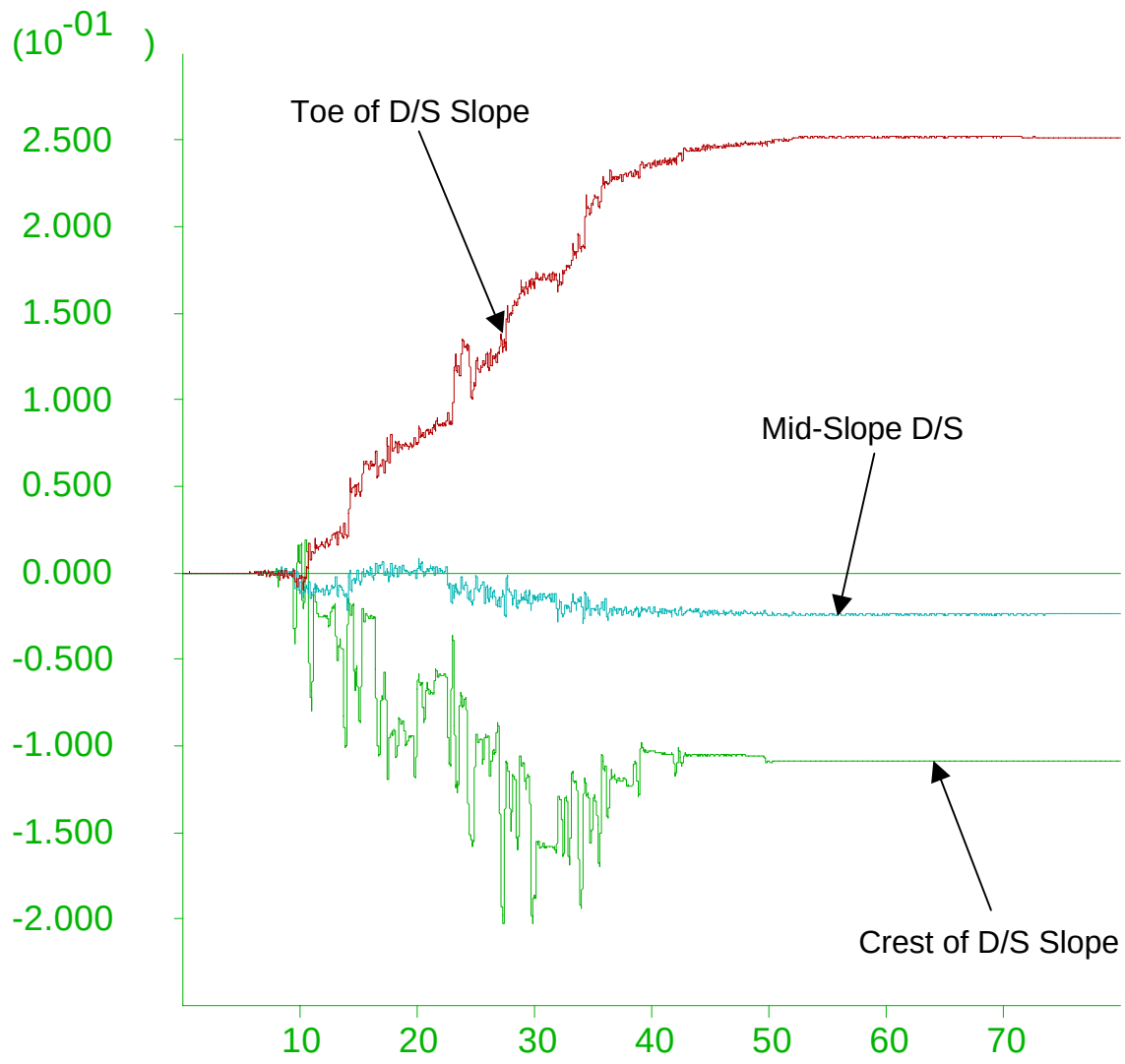
53 Y displacement(67, 28)

59 Y displacement(76, 22)

X-axis :

1 Dynamic time

Horizontal Input Motions Only



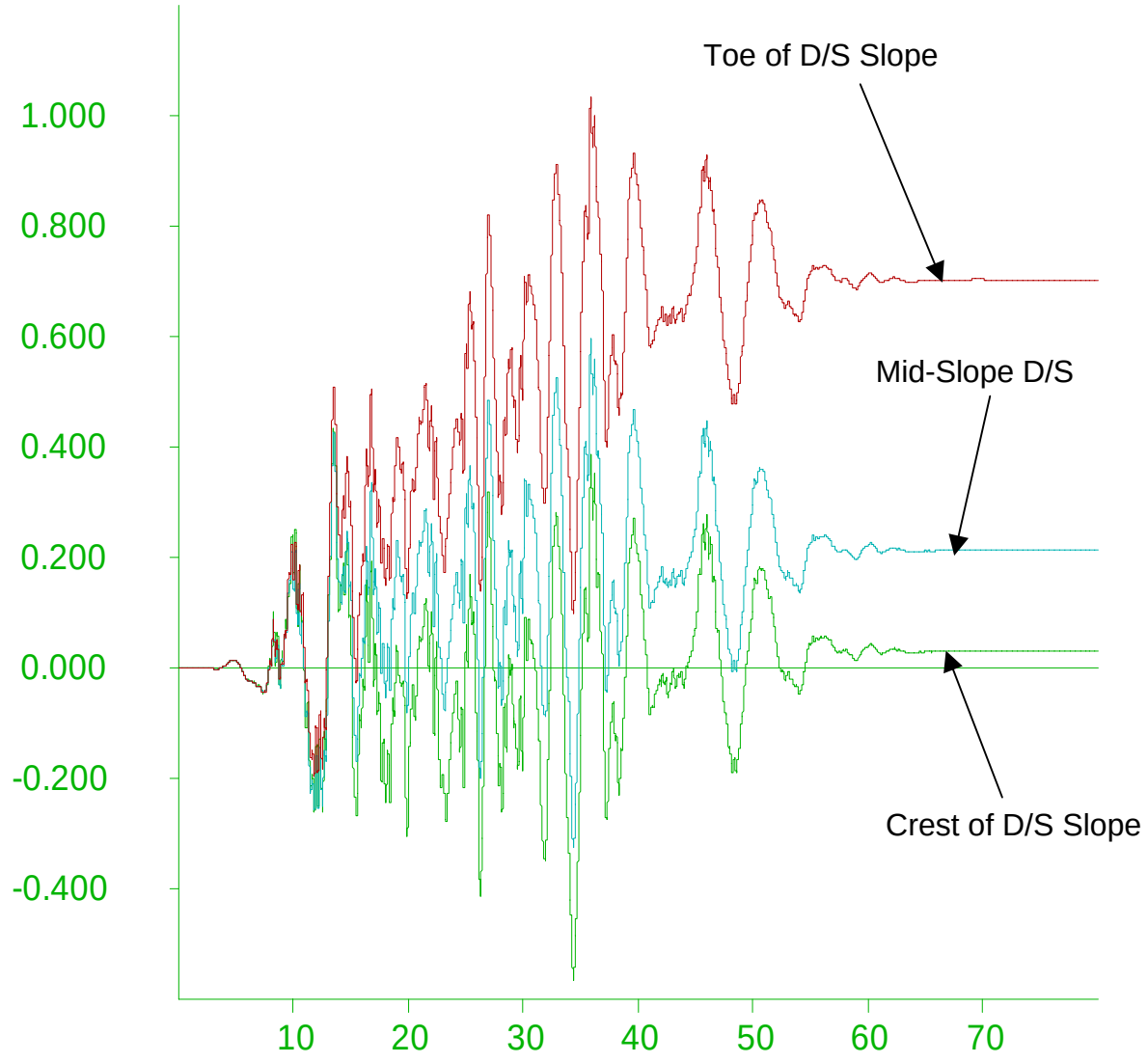
X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Graph of Y Displacement Perimeter Dike Model 3
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.5.4.3.11**

HISTORY PLOT
Y-axis :
23 Y displacement(44, 34)
53 Y displacement(67, 28)
59 Y displacement(76, 22)
X-axis :
1 Dynamic time

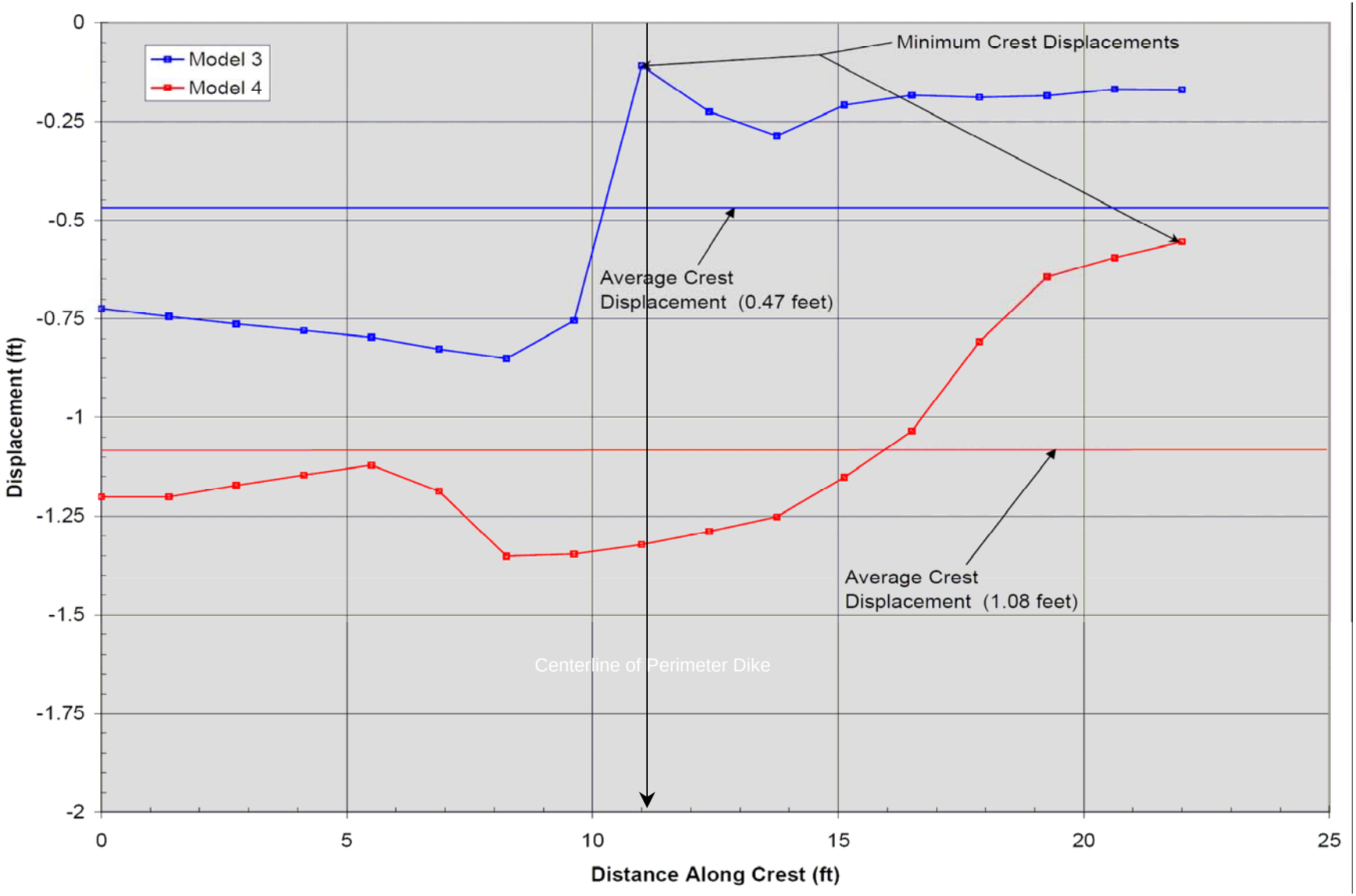
With Horizontal and Vertical Input Motions



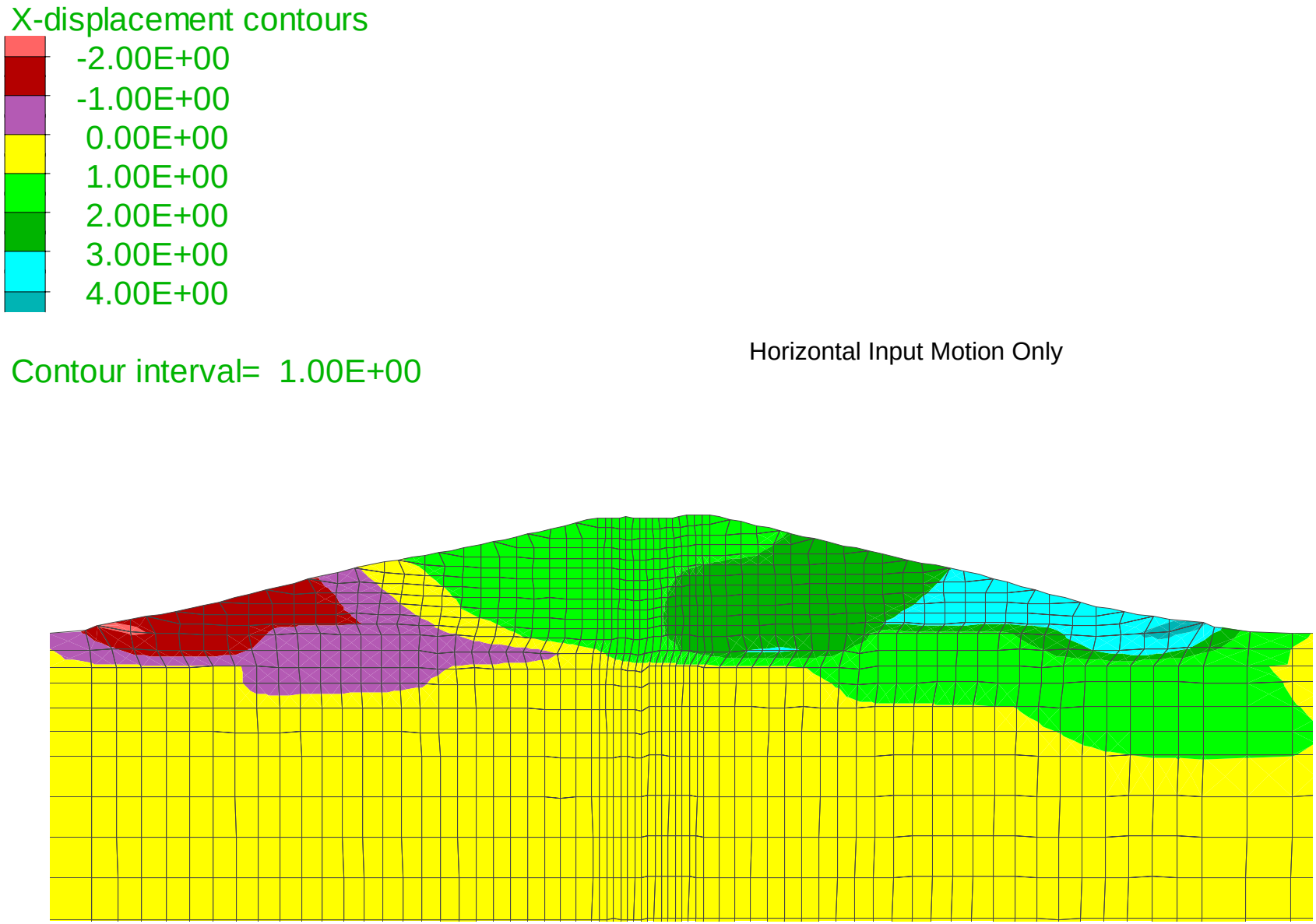
X – axis, Time (seconds)

Y – axis, Deformation (feet)

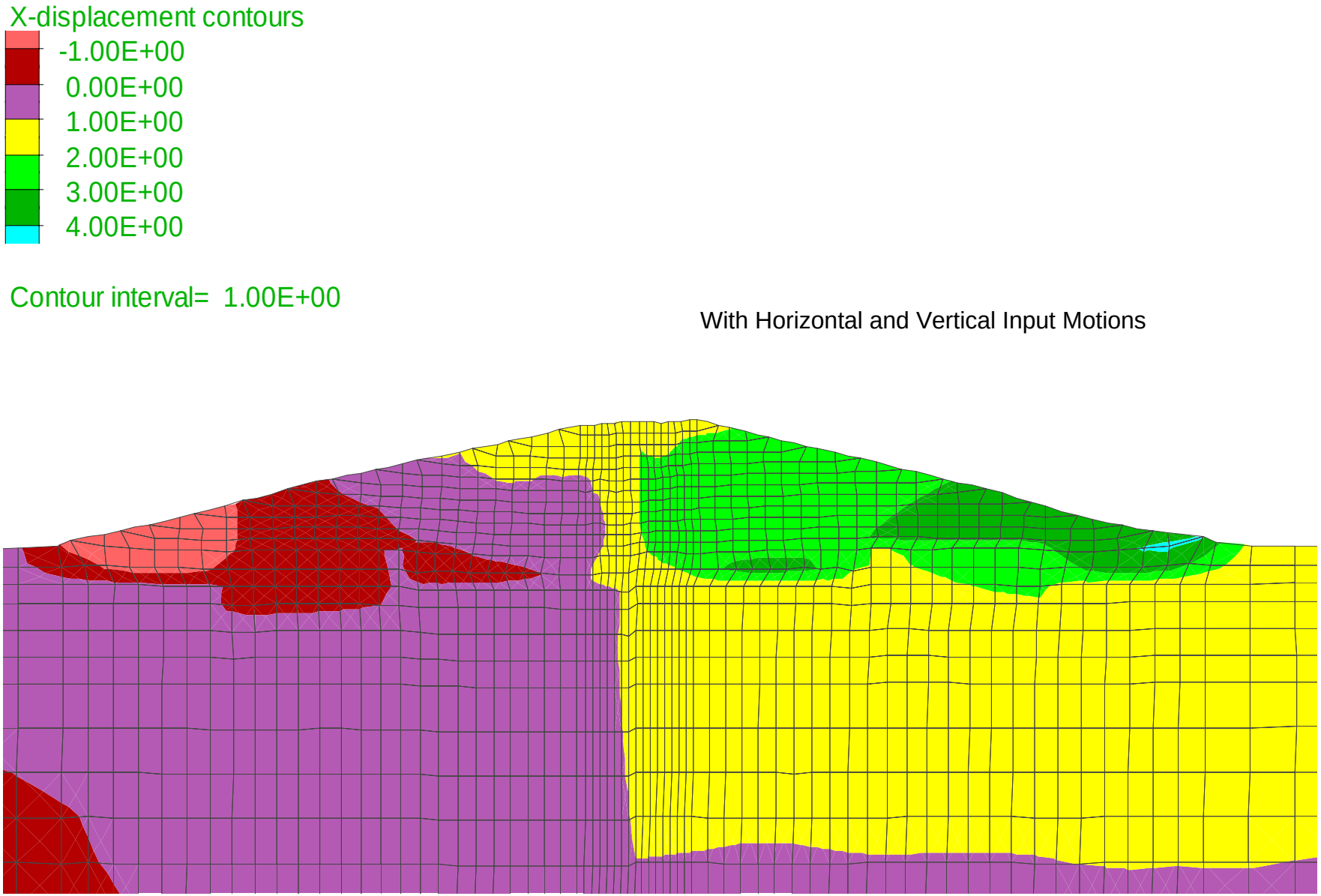
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Graph of Y Displacement Perimeter Dike Model 3
KLEINFELDER	Project 71100 / By S. Anderson / August 2006	**FIGURE C.5.4.3.12**



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Crest Displacements for Models 3 and 4
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.3.13**



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			X Displacement Perimeter Dike Model 4
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.4.1**



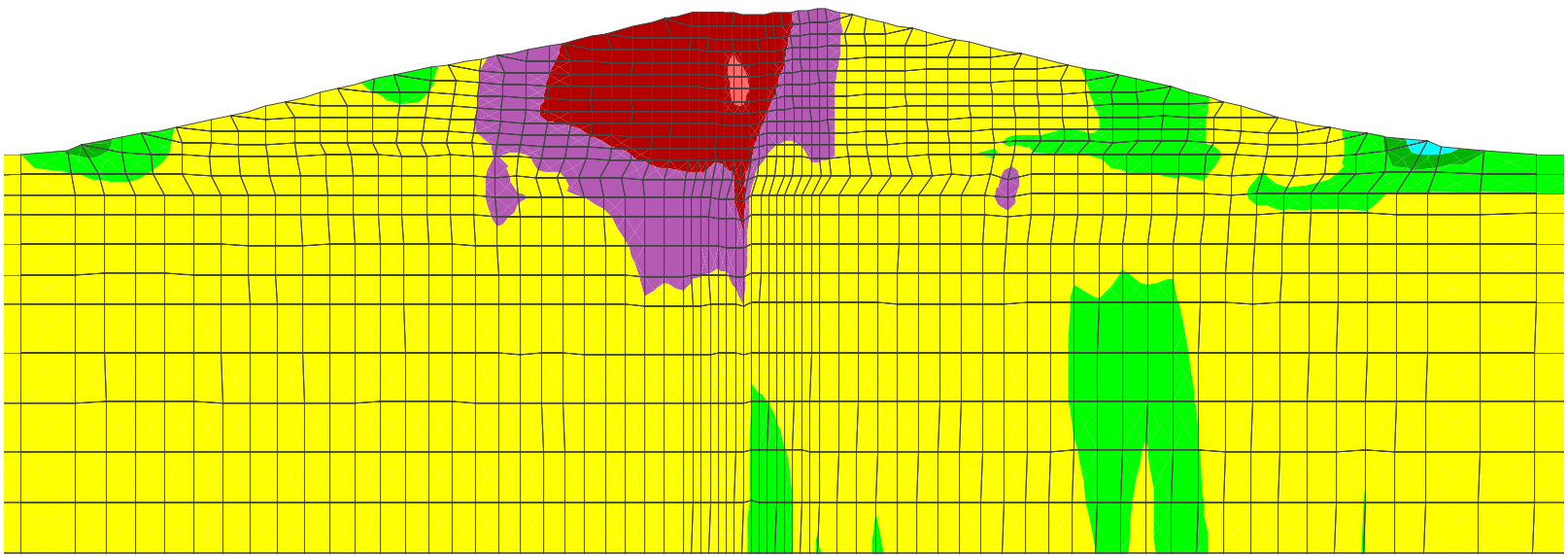
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	X Displacement Perimeter Dike Model 4
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.5.4.4.2**

Y-displacement contours

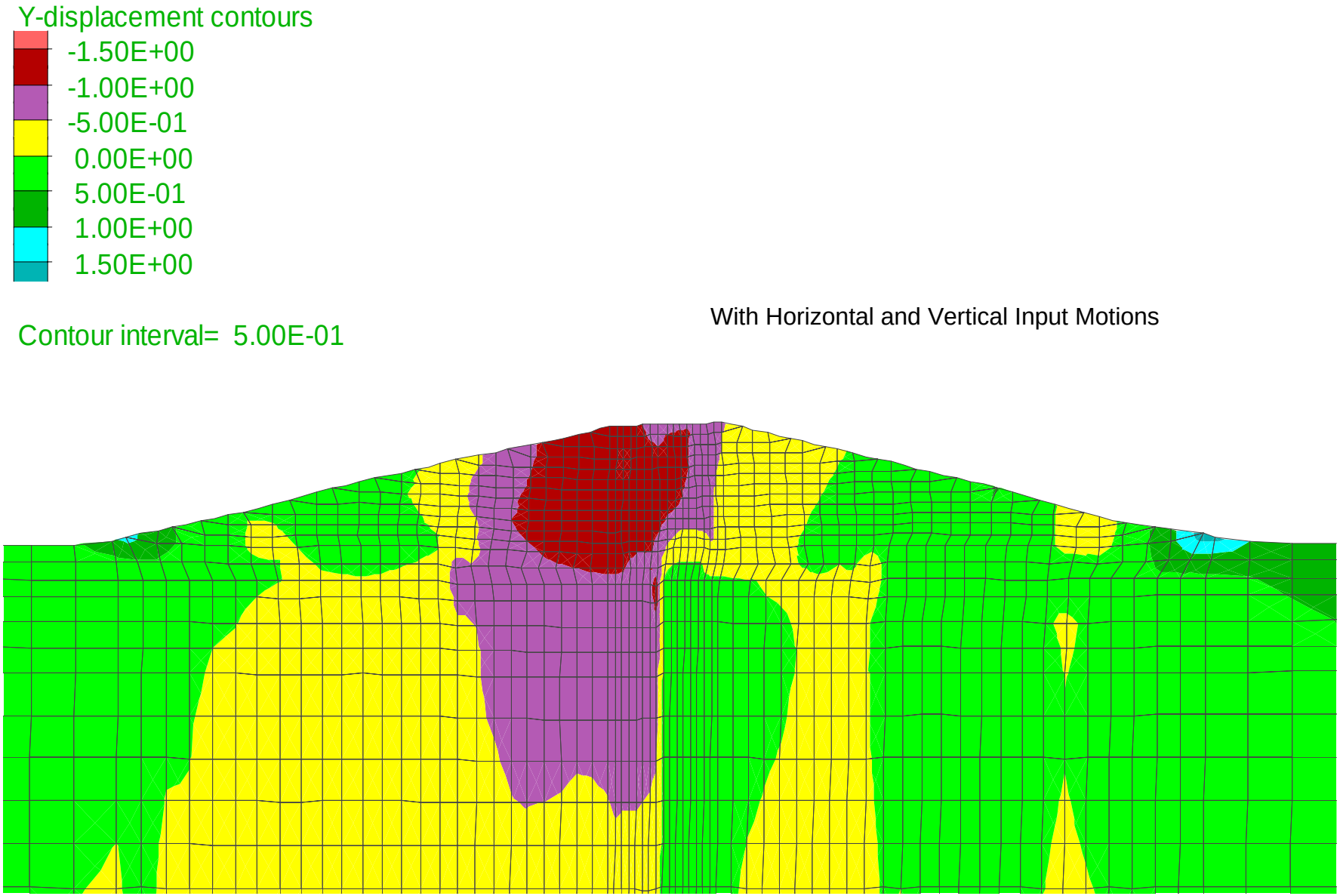
-1.50E+00
-1.00E+00
-5.00E-01
0.00E+00
5.00E-01
1.00E+00

Contour interval= 5.00E-01

Horizontal Input Motion Only



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Y Displacement Perimeter Dike Model 4
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.4.3**



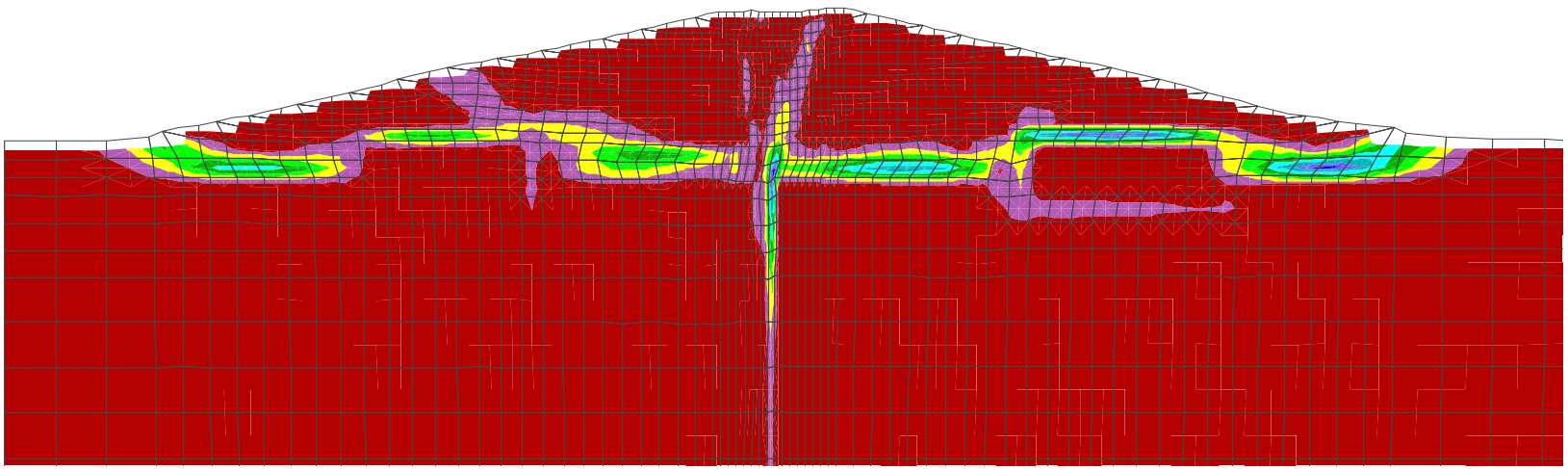
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Y Displacement Perimeter Dike Model 4
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.5.4.4.4**

Max. shear strain increment

0.00E+00
5.00E-02
1.00E-01
1.50E-01
2.00E-01
2.50E-01
3.00E-01
3.50E-01
4.00E-01

Horizontal Input Motion Only

Contour interval= 5.00E-02



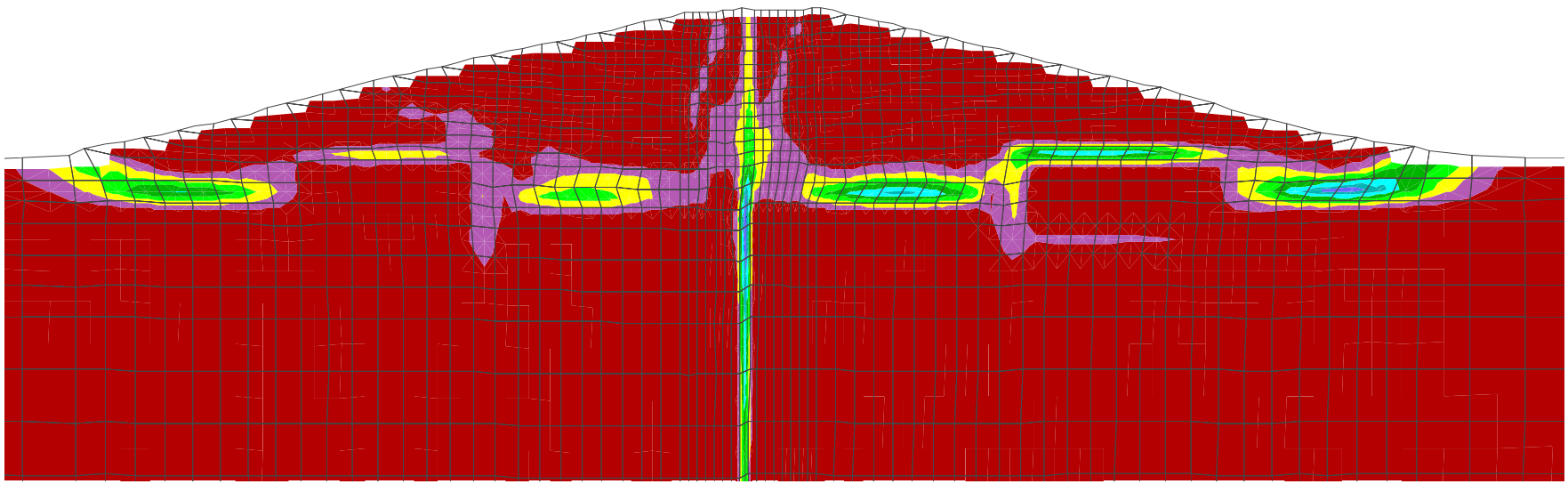
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Shear Strain Increment Perimeter Dike Model 4
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.4.5**

Max. shear strain increment

0.00E+00
5.00E-02
1.00E-01
1.50E-01
2.00E-01
2.50E-01
3.00E-01
3.50E-01
4.00E-01

With Horizontal and Vertical Input Motions

Contour interval= 5.00E-02



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Shear Strain Increment Perimeter Dike Model 4
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.4.6**

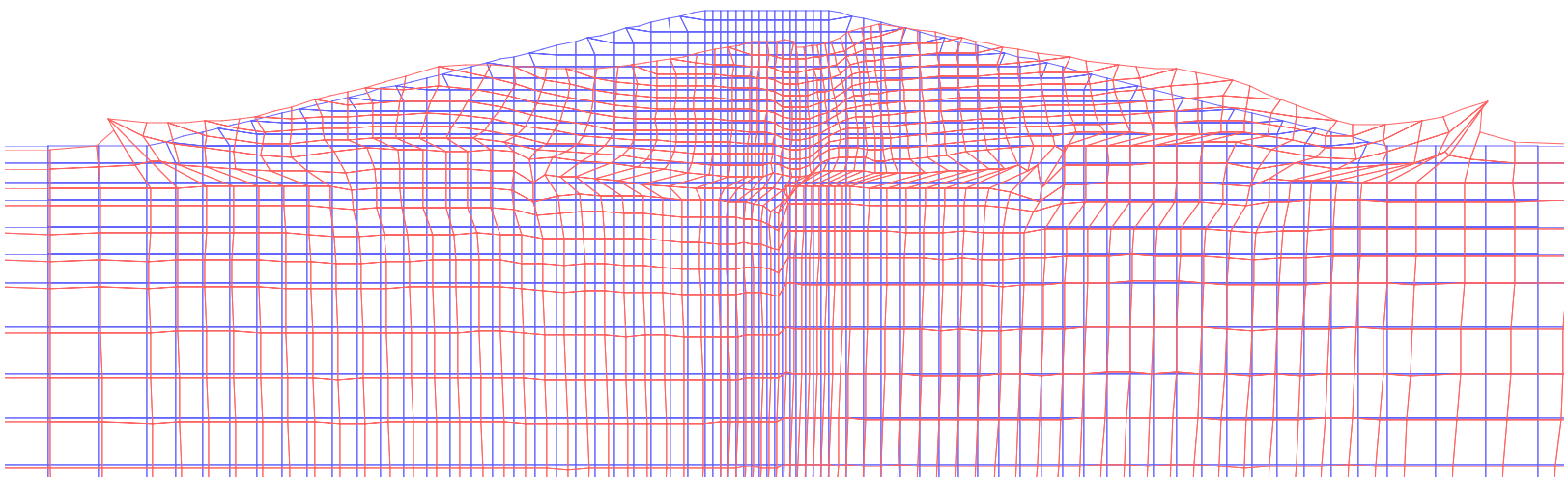
Exaggerated Grid Distortion

Magnification = 0.000E+00
Max Disp = 4.514E+00

Exaggerated Grid Distortion

Magnification = 5.000E+00
Max Disp = 4.514E+00

Horizontal Input Motion Only



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Deformed vs. Un-deformed Grid Perimeter Dike Model 4
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.4.7**

Exaggerated Grid Distortion

Magnification = 0.000E+00

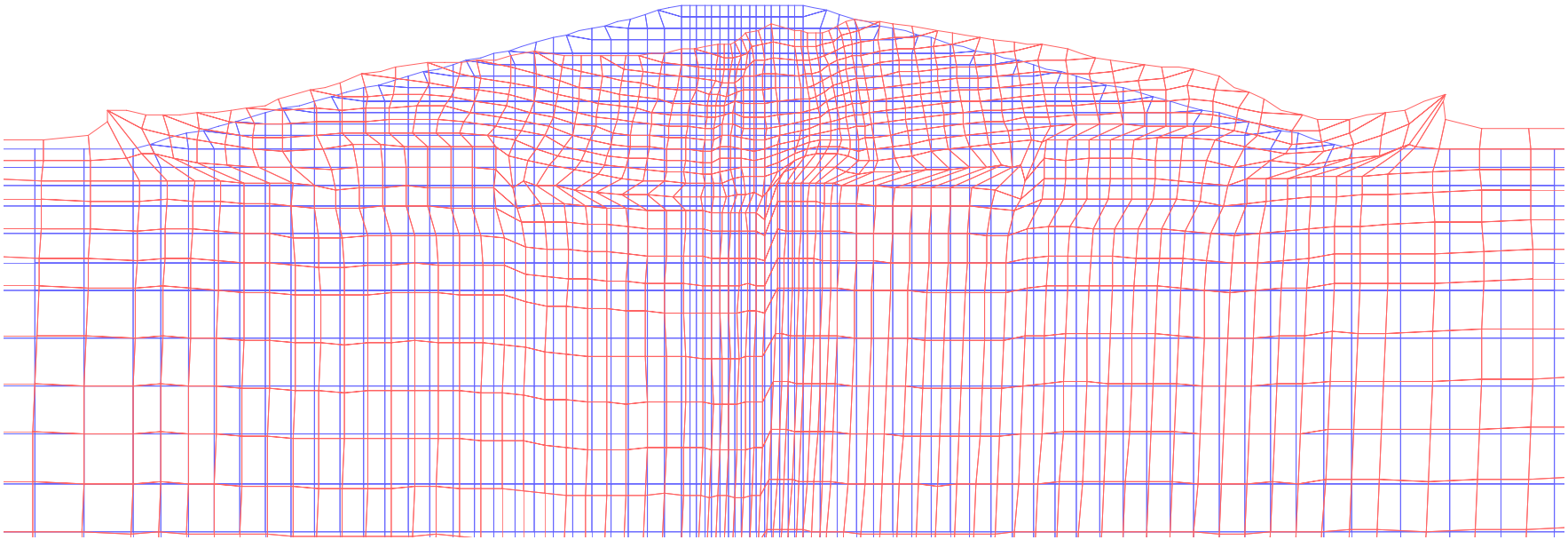
Max Disp = 4.425E+00

Exaggerated Grid Distortion

Magnification = 5.000E+00

Max Disp = 4.425E+00

With Horizontal and Vertical Input Motions



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Deformed vs. Un-deformed Grid Perimeter Dike Model 4
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.4.8**

HISTORY PLOT

Y-axis :

22 X displacement(44, 34)

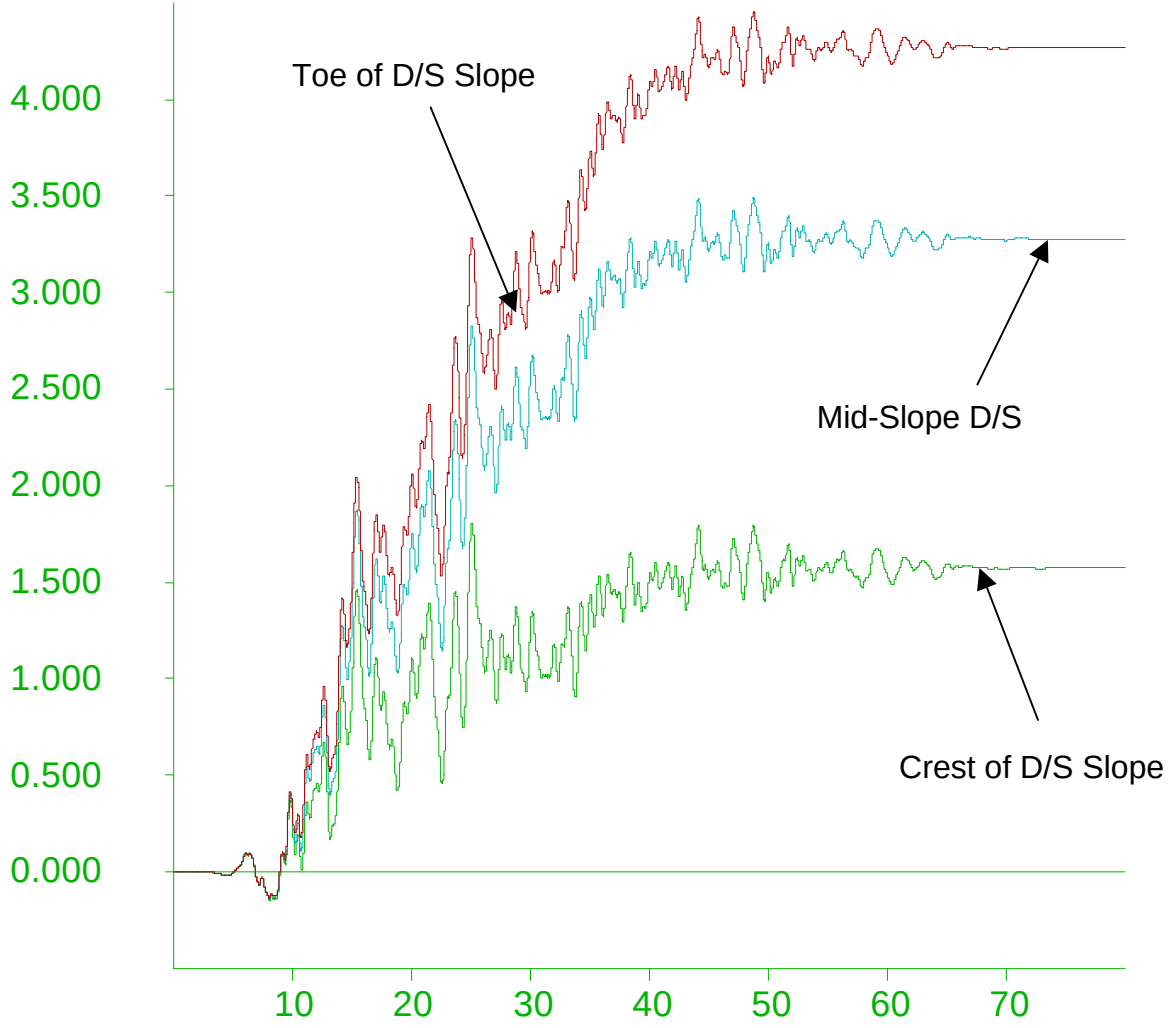
52 X displacement(67, 28)

58 X displacement(76, 22)

X-axis :

1 Dynamic time

Horizontal Input Motions Only



X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Graph of X Displacement Perimeter Dike Model 4
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.5.4.4.9**

HISTORY PLOT

Y-axis :

22 X displacement(44, 34)

52 X displacement(67, 28)

58 X displacement(76, 22)

X-axis :

1 Dynamic time

With Horizontal and Vertical Input Motions

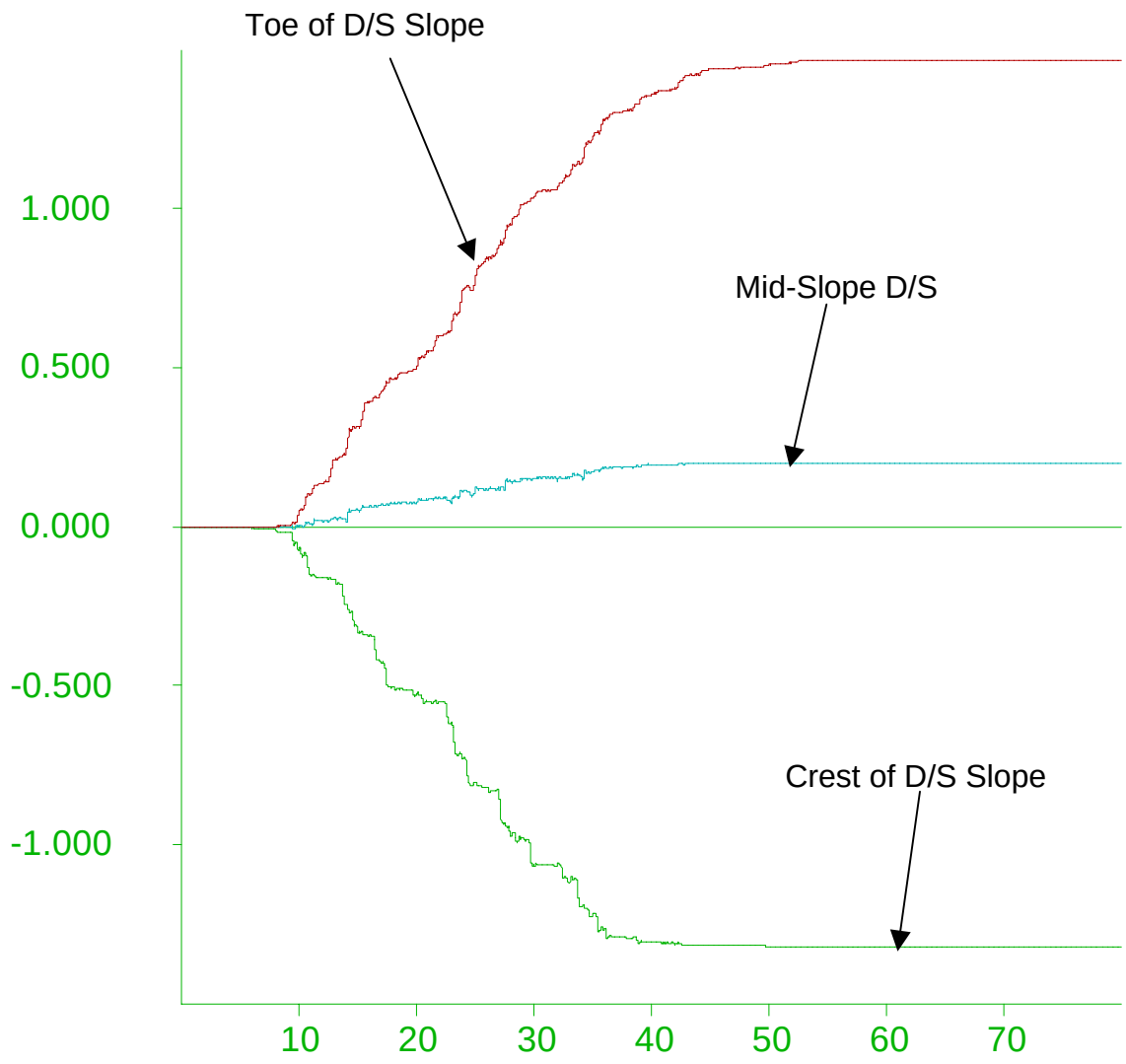
X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses		Graph of X Displacement Perimeter Dike Model 4
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.4.10**

HISTORY PLOT
Y-axis :
23 Y displacement(44, 34)
53 Y displacement(67, 28)
59 Y displacement(76, 22)
X-axis :
1 Dynamic time

Horizontal Input Motions Only



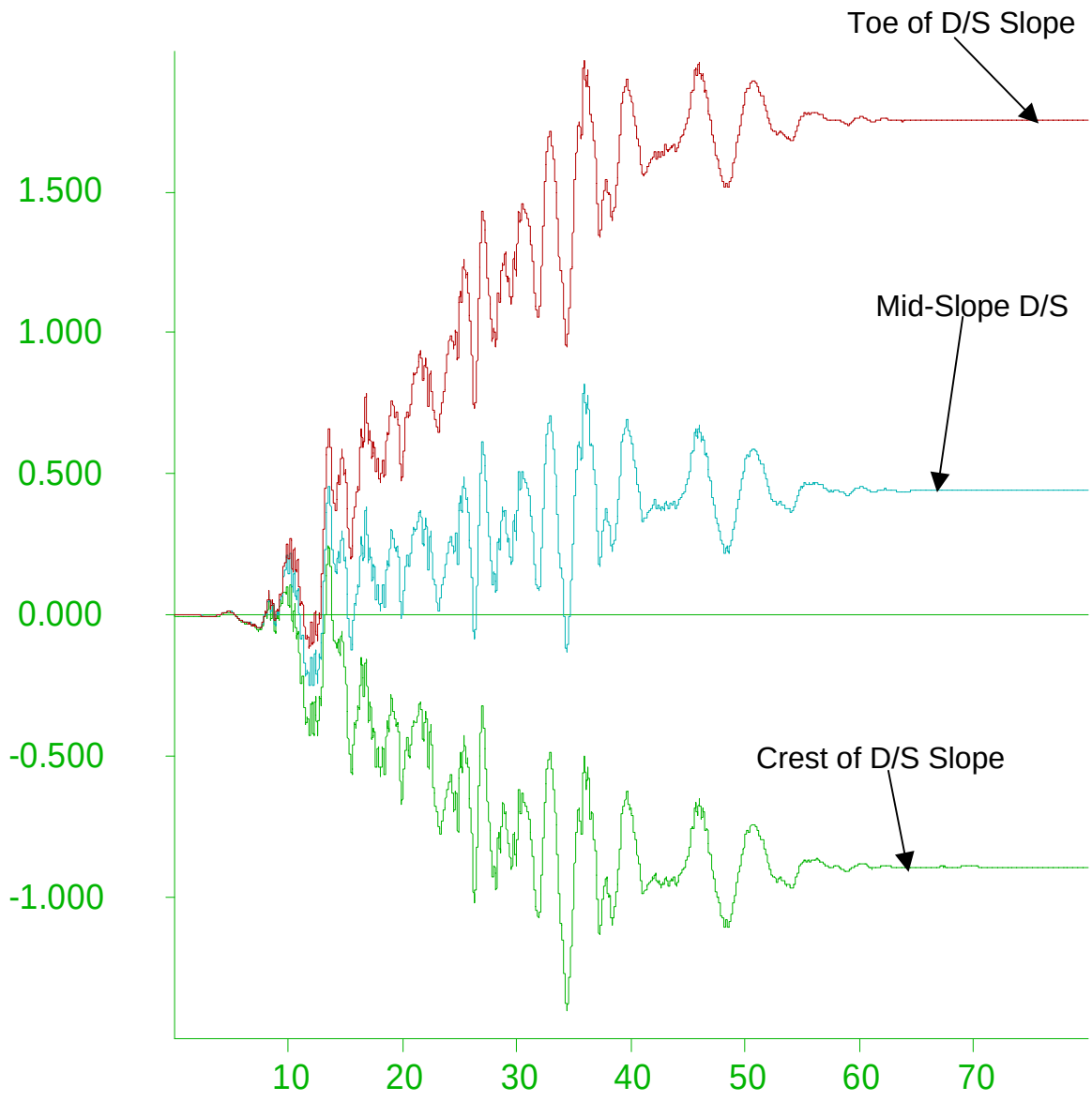
X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Graph of Y Displacement Perimeter Dike Model 4
KLEINFELDER	Project 71100 / By S. Anderson / August 2006	**FIGURE C.5.4.4.11**

HISTORY PLOT
Y-axis :
23 Y displacement(44, 34)
53 Y displacement(67, 28)
59 Y displacement(76, 22)
X-axis :
1 Dynamic time

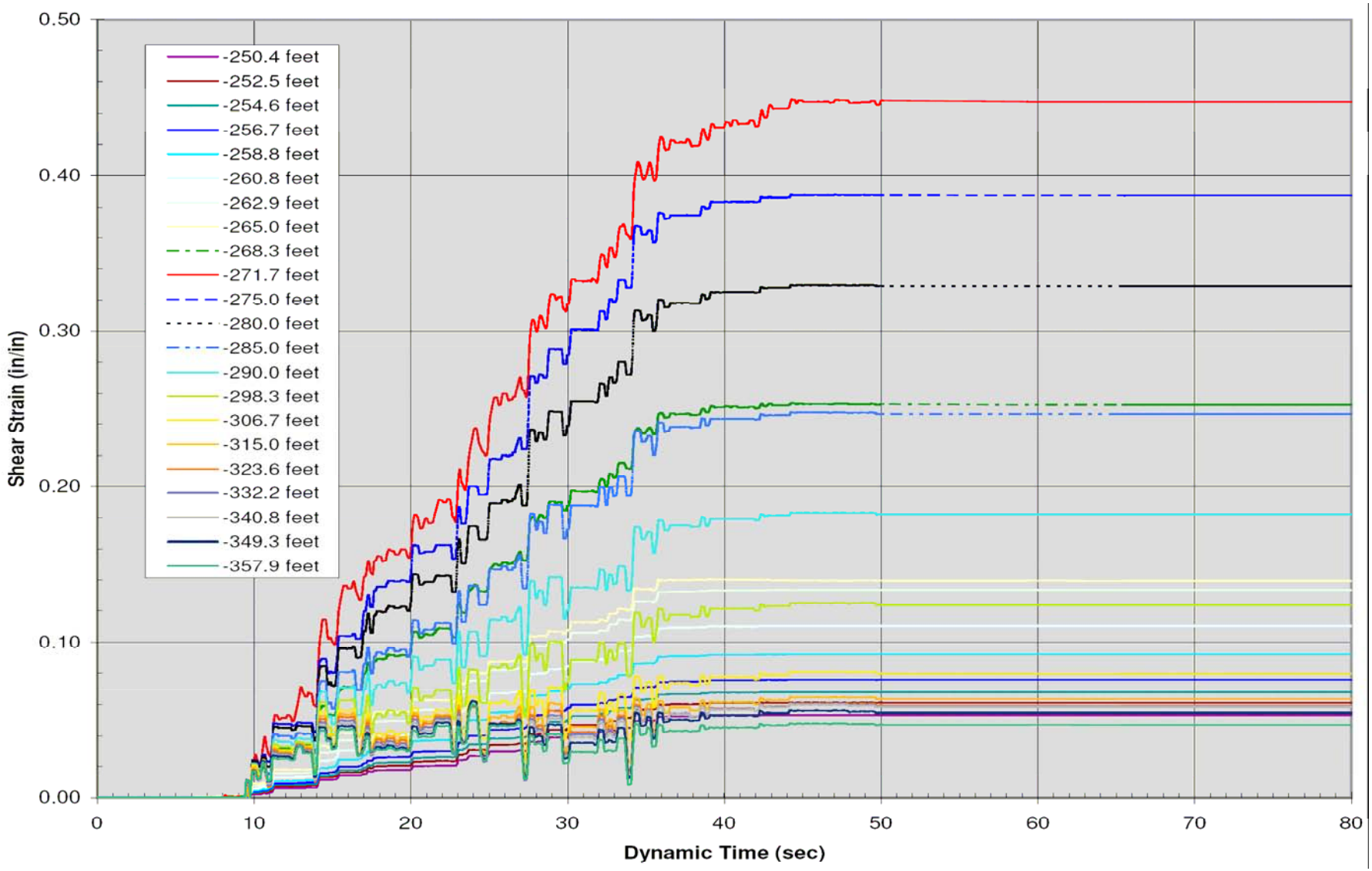
With Horizontal and Vertical Input Motions



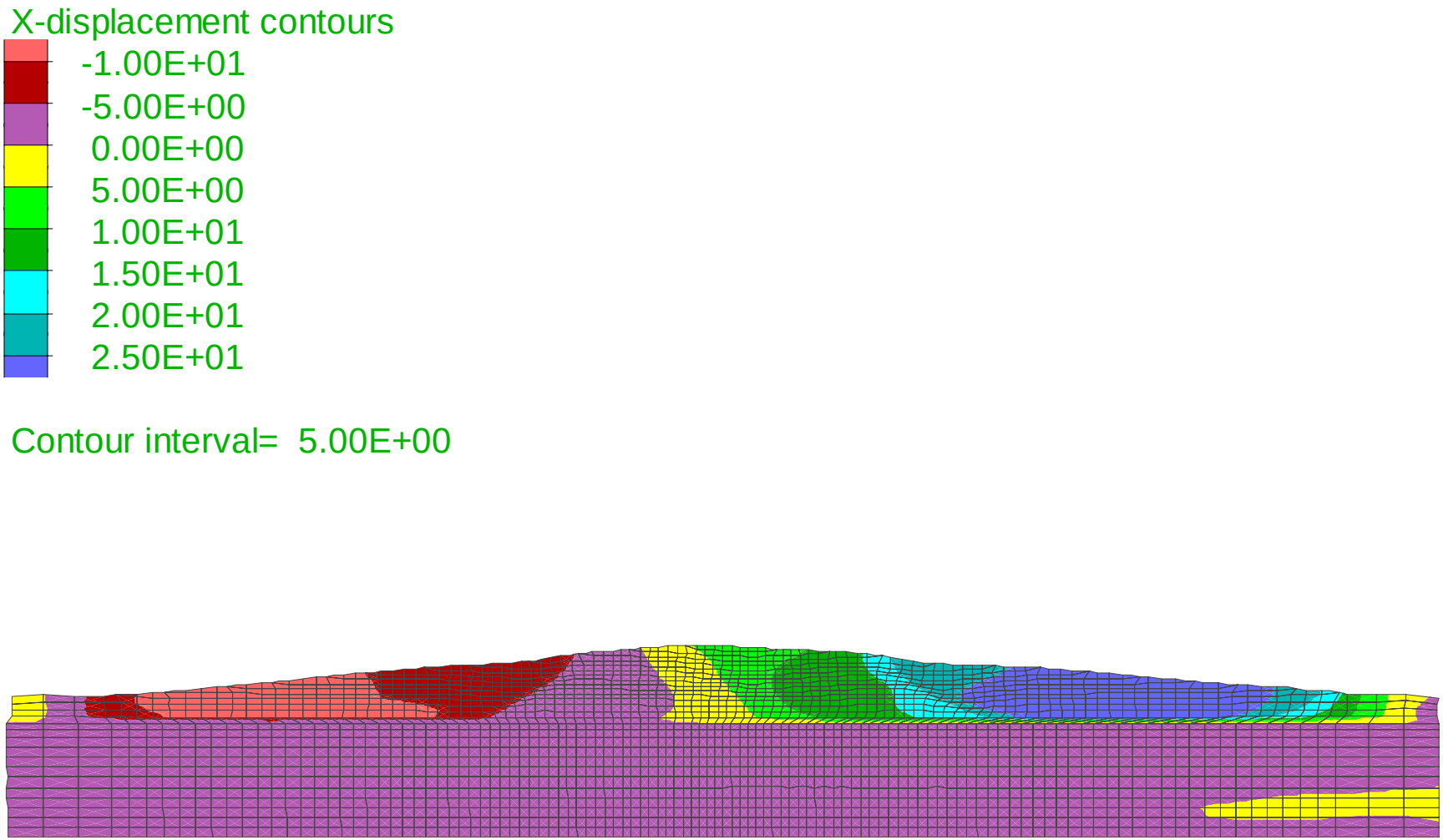
X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of Y Displacement Perimeter Dike Model 4
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**Figure C.5.4.4.12**



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Crest Displacements for Model 1
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.5.4.4.13**

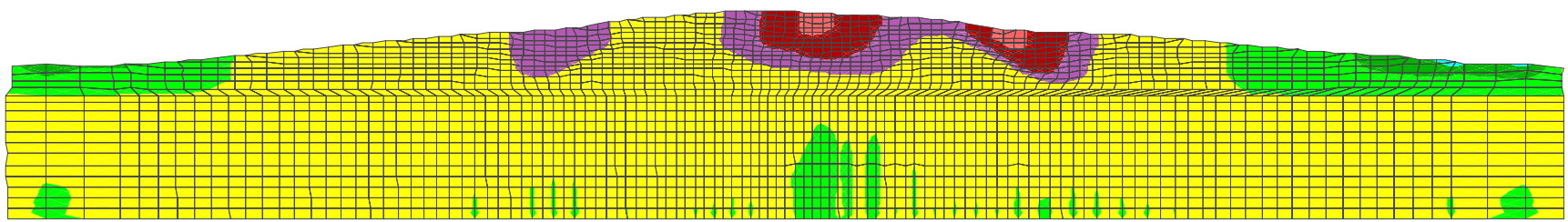


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	X Displacement Mid-Sea Dam Model 2 800 psf Cohesion
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.1**

Y-displacement contours

-6.00E+00
-4.00E+00
-2.00E+00
0.00E+00
2.00E+00
4.00E+00

Contour interval= 2.00E+00

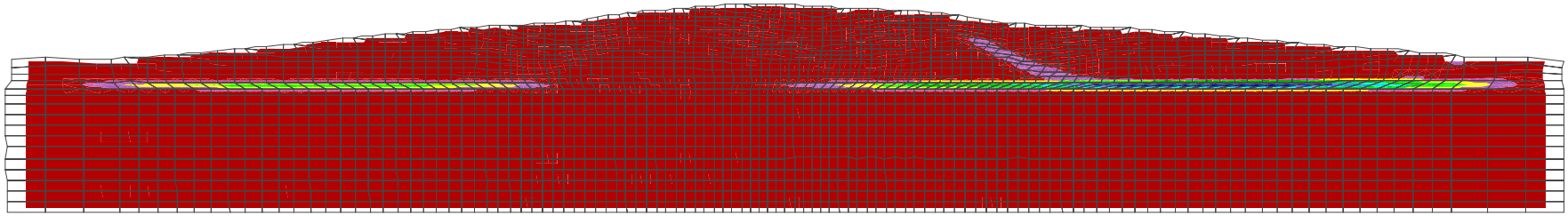


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Y Displacement Mid-Sea Dam Model 2 800 psf Cohesion
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.2**

Max. shear strain increment

0.00E+00
2.50E-01
5.00E-01
7.50E-01
1.00E+00
1.25E+00
1.50E+00
1.75E+00
2.00E+00

Contour interval= 2.50E-01



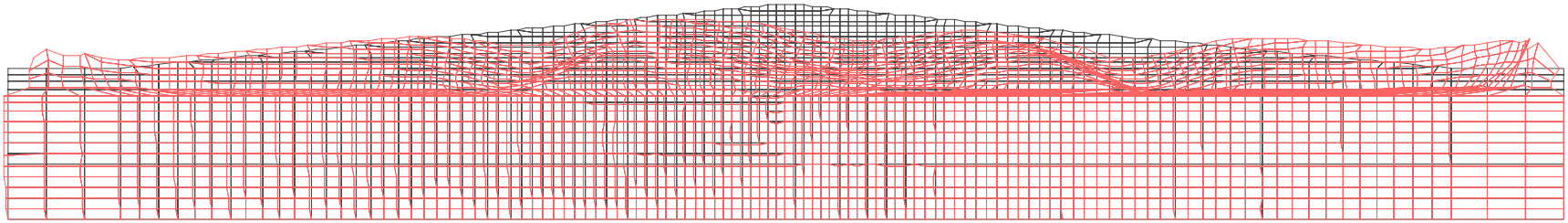
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Shear Strain Increment Mid-Sea Dam Model 2 800 psf Cohesion
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.3**

Exaggerated Grid Distortion

Magnification = 0.000E+00
Max Disp = 2.797E+01

Exaggerated Grid Distortion

Magnification = 5.000E+00
Max Disp = 2.797E+01



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Deformed vs. Un-deformed Grid Mid-Sea Dam Model 2 800 psf Cohesion
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.4**

Dynamic Time 8.0000E+01

HISTORY PLOT

Y-axis :

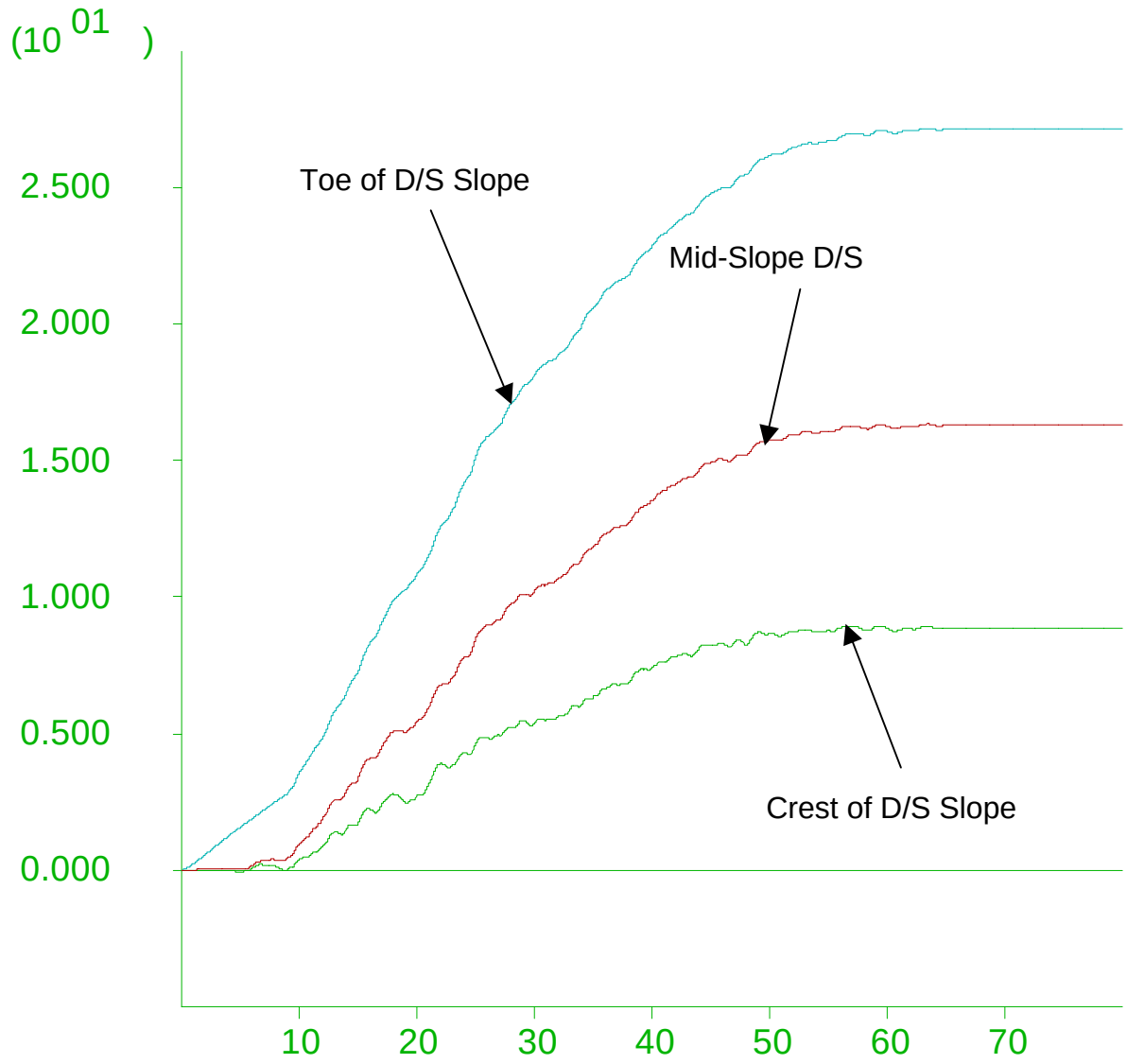
17 X displacement(60, 29)

23 X displacement(95, 22)

29 X displacement(111, 17)

X-axis :

1 Dynamic time



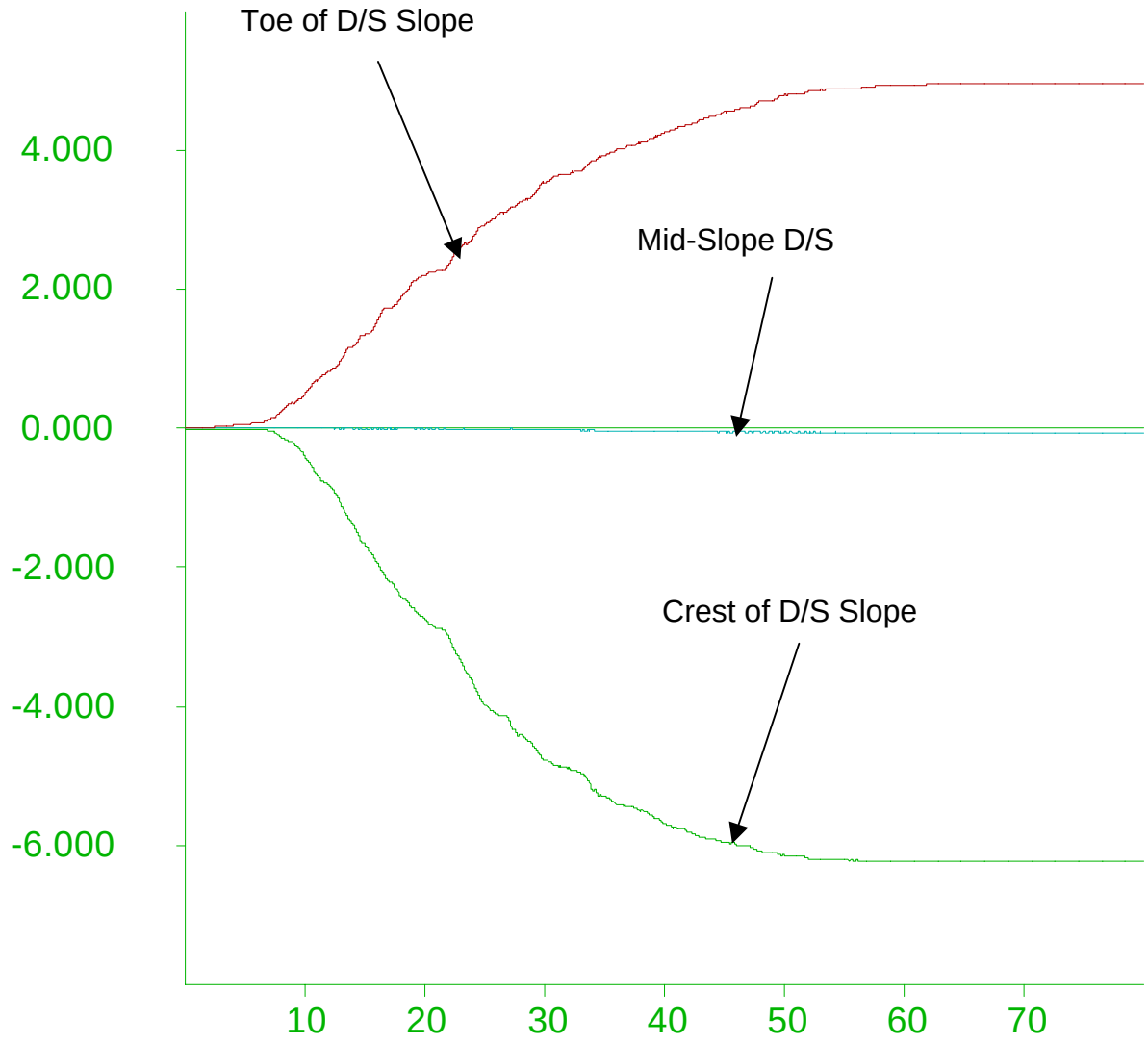
X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Graph of Y Displacement Mid-Sea Dam Model 2 800 psf Cohesion
KLEINFELDER	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.5**

Dynamic Time 8.0000E+01

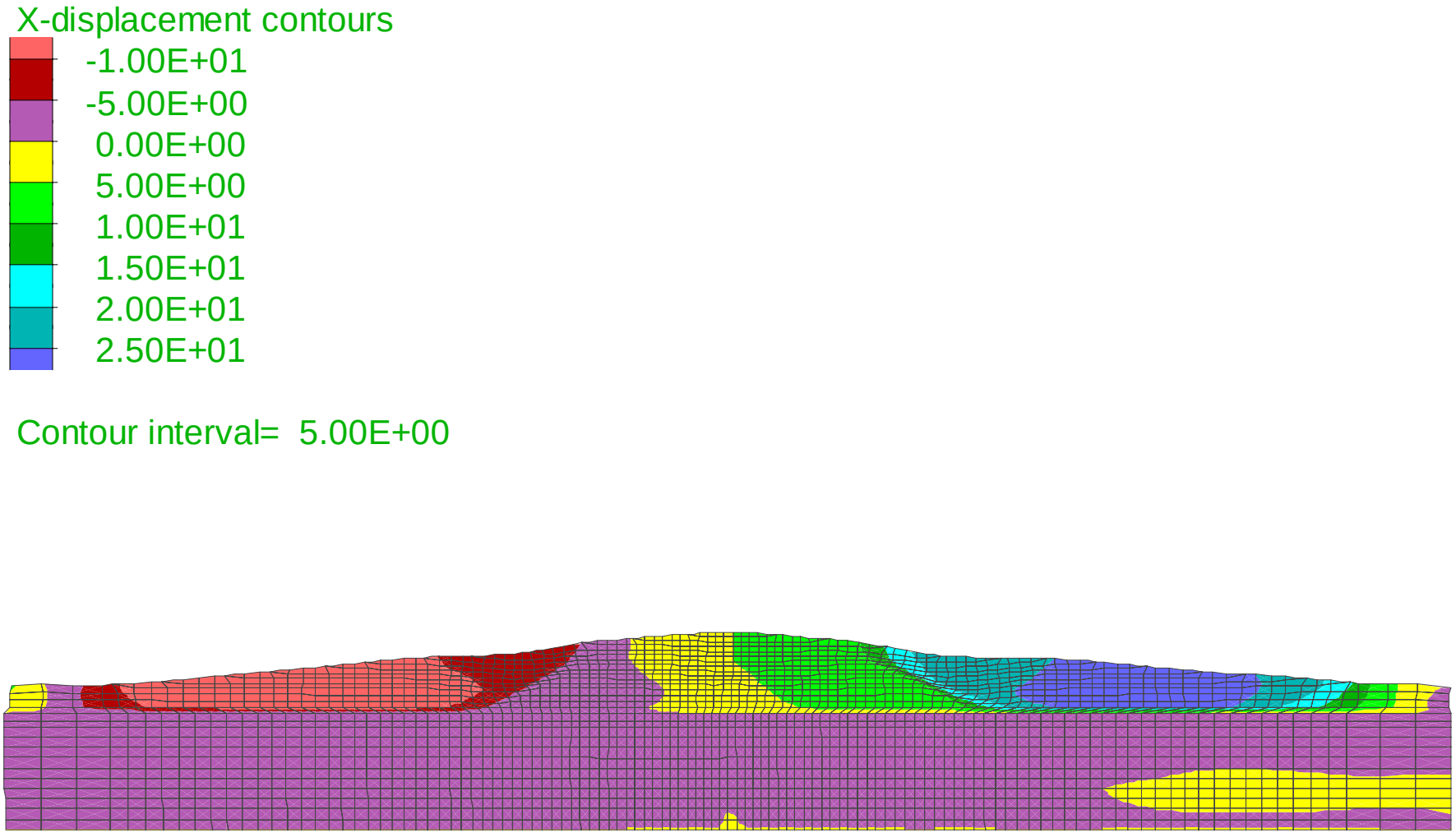
HISTORY PLOT
Y-axis :
18 Y displacement(60, 29)
24 Y displacement(95, 22)
30 Y displacement(111, 17)
X-axis :
1 Dynamic time



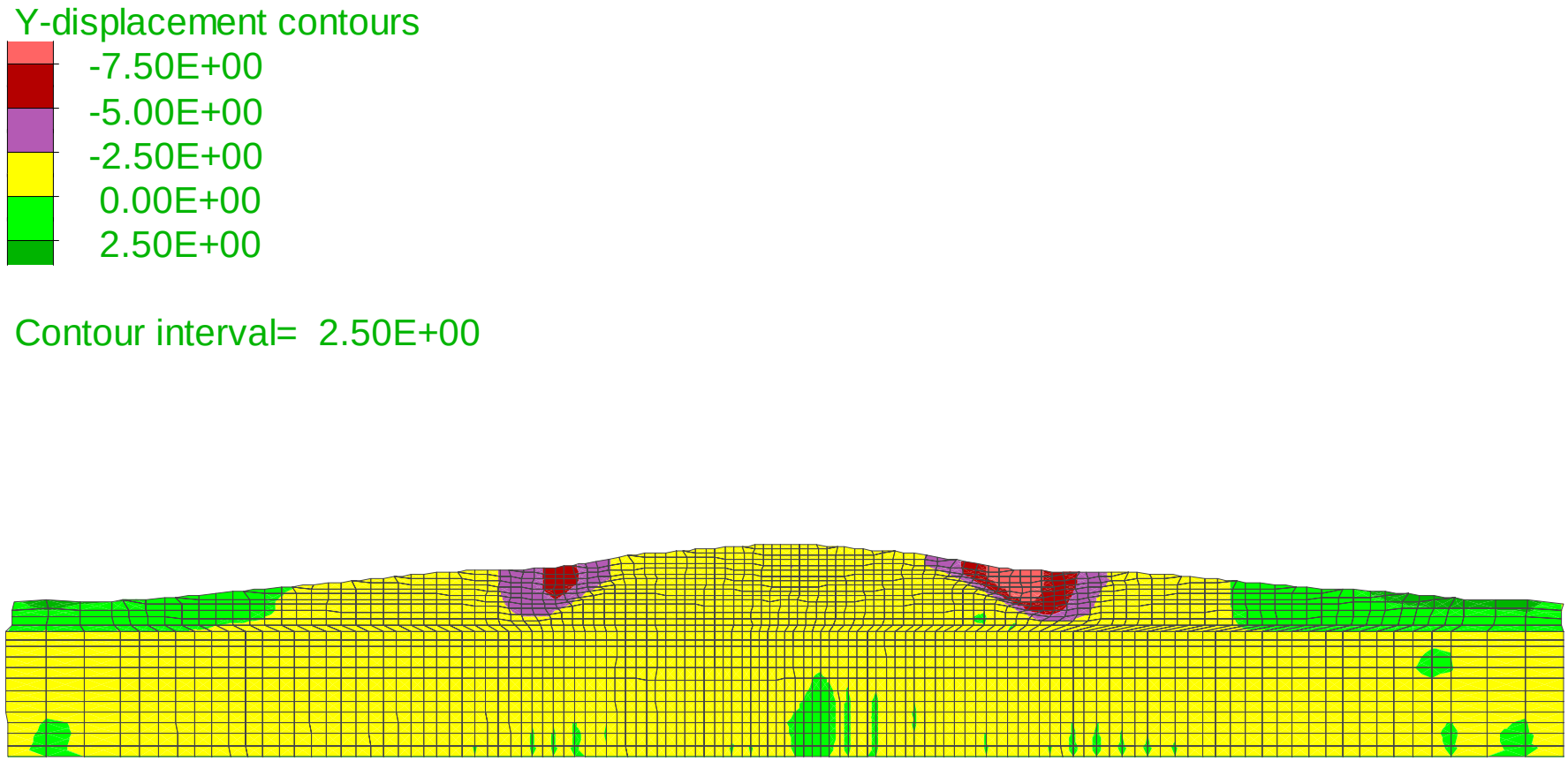
X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses		Graph of Y Displacement Mid-Sea Dam Model 2 800 psf Cohesion
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.6**



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	X Displacement Mid-Sea Dam Model 2 1,200 psf Cohesion
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.7**

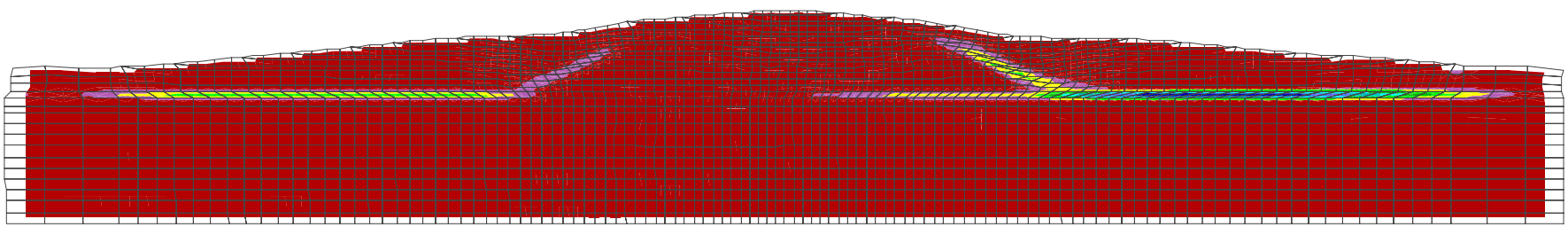


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Y Displacement Mid-Sea Dam Model 2 1,200 psf Cohesion
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.8**

Max. shear strain increment

0.00E+00
2.50E-01
5.00E-01
7.50E-01
1.00E+00
1.25E+00
1.50E+00
1.75E+00
2.00E+00

Contour interval= 2.50E-01



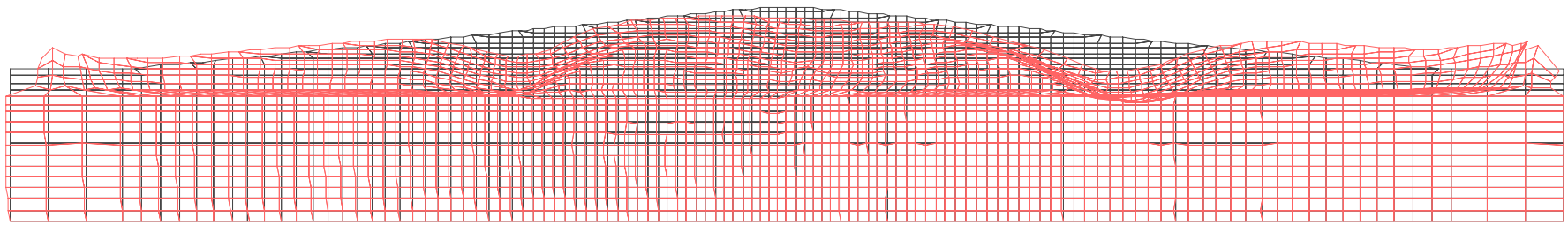
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Shear Strain Increment Mid-Sea Dam Model 2 1,200 psf Cohesion
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.9**

Exaggerated Grid Distortion

Magnification = 0.000E+00
Max Disp = 2.688E+01

Exaggerated Grid Distortion

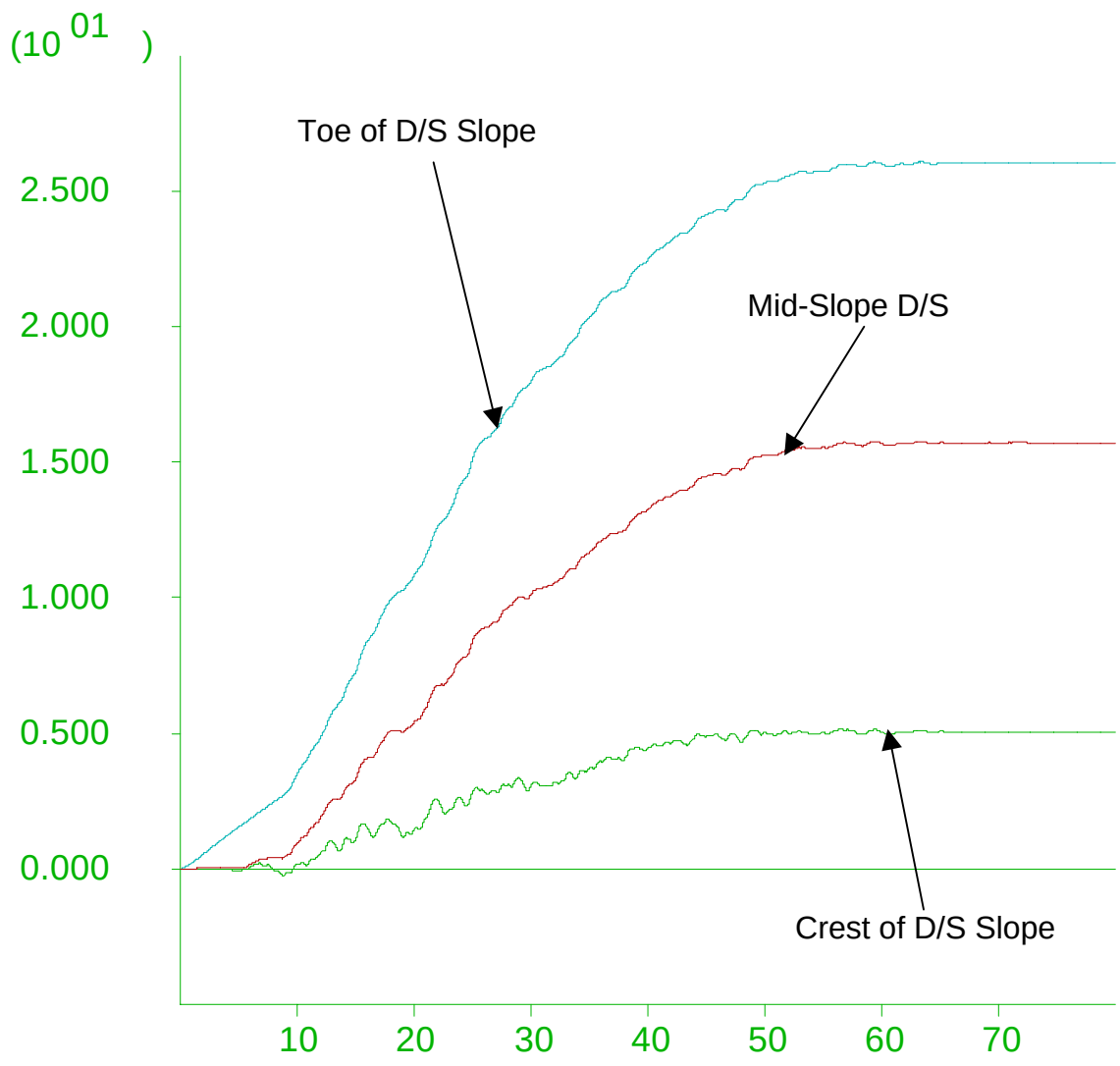
Magnification = 5.000E+00
Max Disp = 2.688E+01



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Deformed vs. Un-deformed Grid Mid-Sea Dam Model 2 1,200 psf Cohesion
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.10**

Dynamic Time 8.0000E+01

HISTORY PLOT
Y-axis :
17 X displacement(60, 29)
23 X displacement(95, 22)
29 X displacement(111, 17)
X-axis :
1 Dynamic time



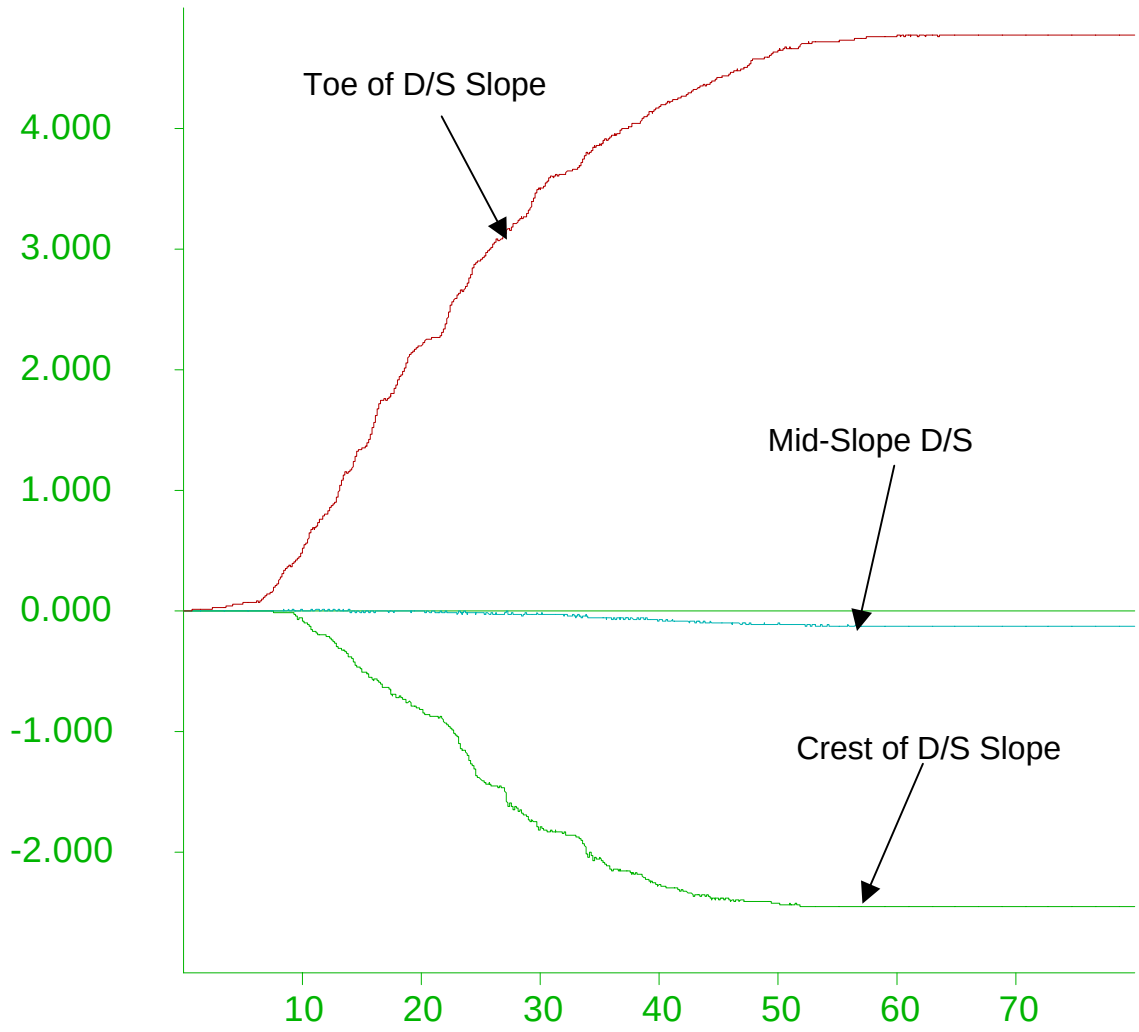
X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of X Displacement Mid-Sea Dam Model 2 1,200 psf Cohesion
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.11**

Dynamic Time 8.0000E+01

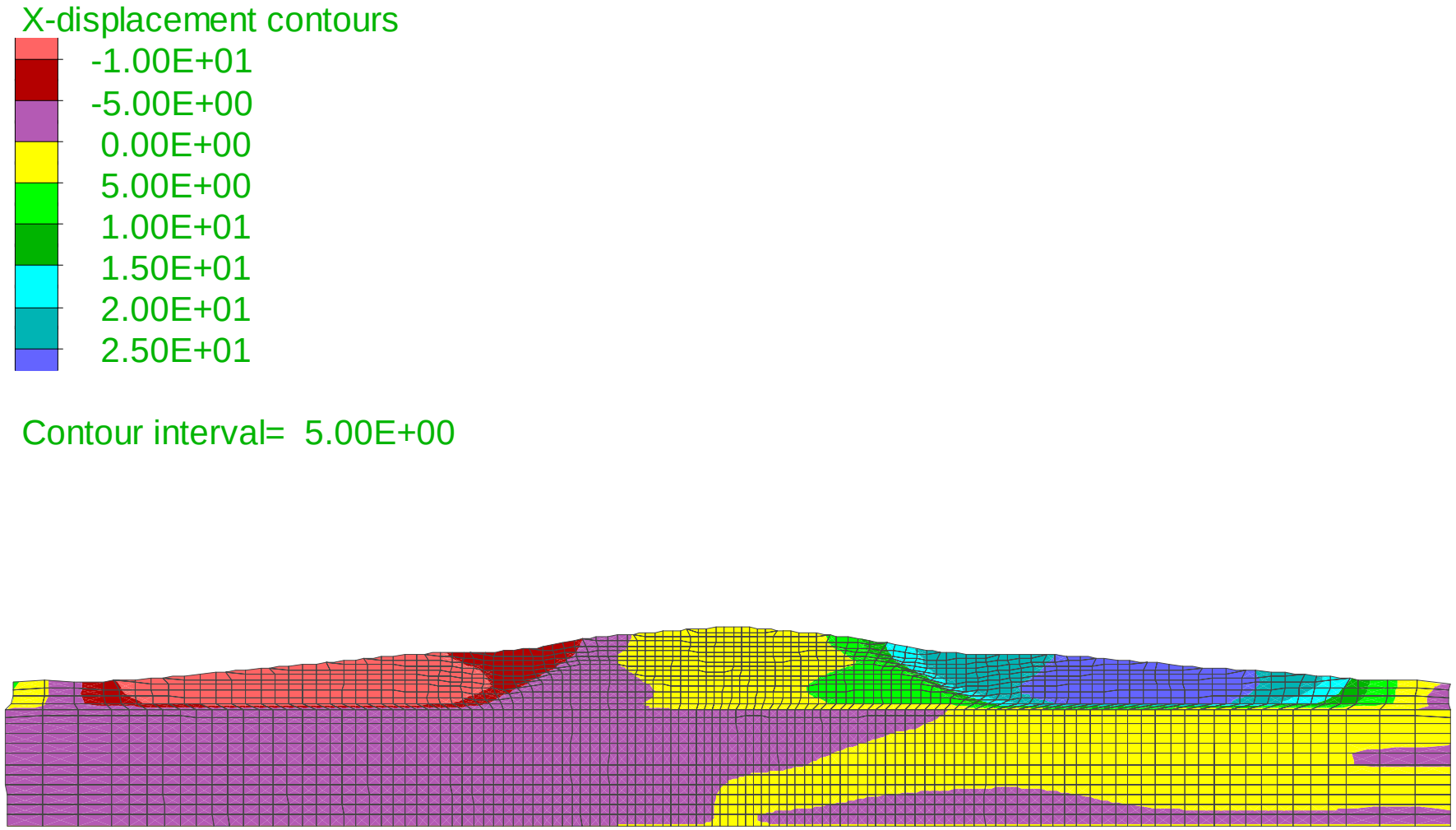
HISTORY PLOT
Y-axis :
18 Y displacement(60, 29)
24 Y displacement(95, 22)
30 Y displacement(111, 17)
X-axis :
1 Dynamic time



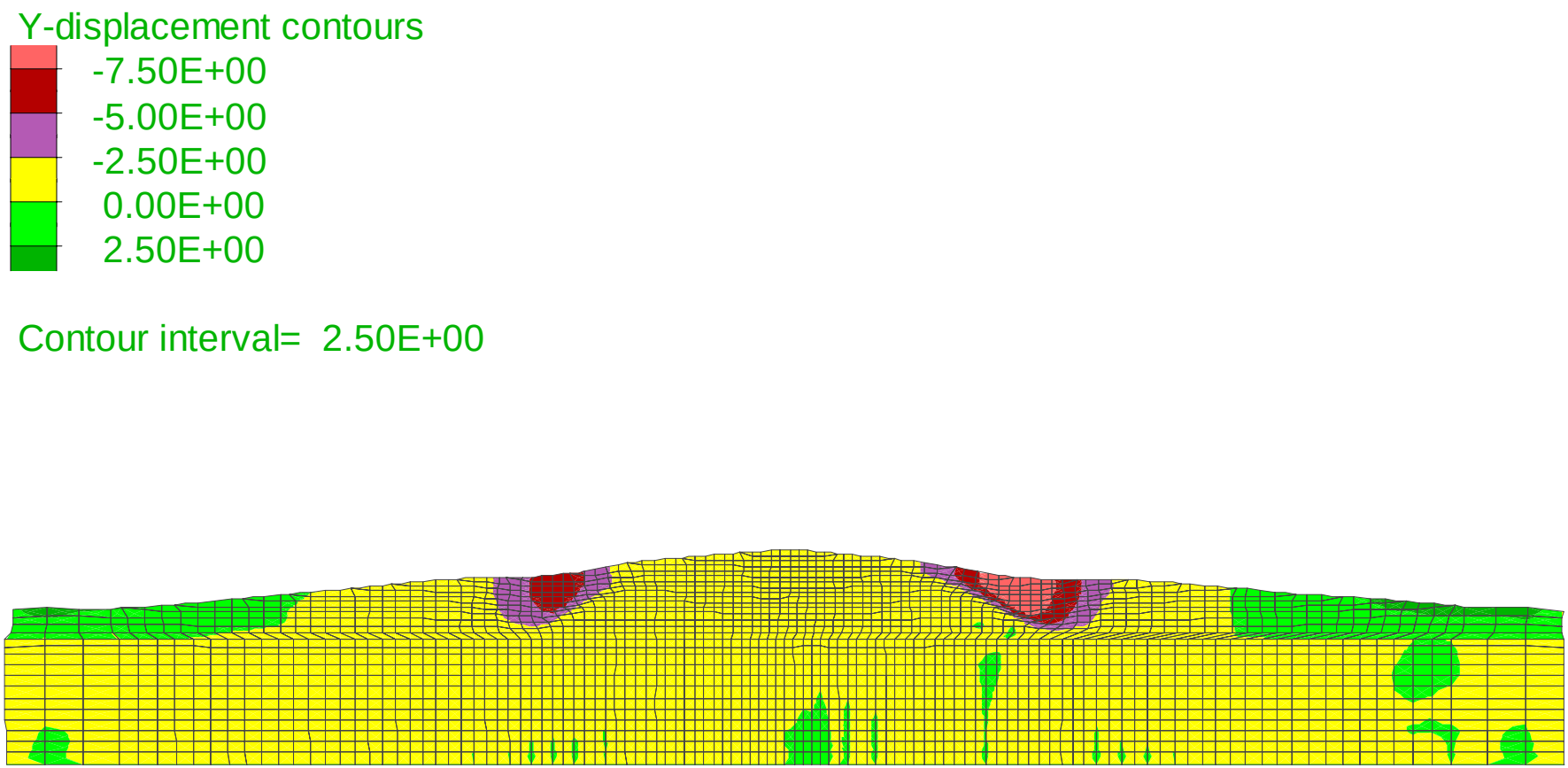
X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of Y Displacement Mid-Sea Dam Model 2 1,200 psf Cohesion
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.12**



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	X Displacement Mid-Sea Dam Model 2 1,400 psf Cohesion
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.13**

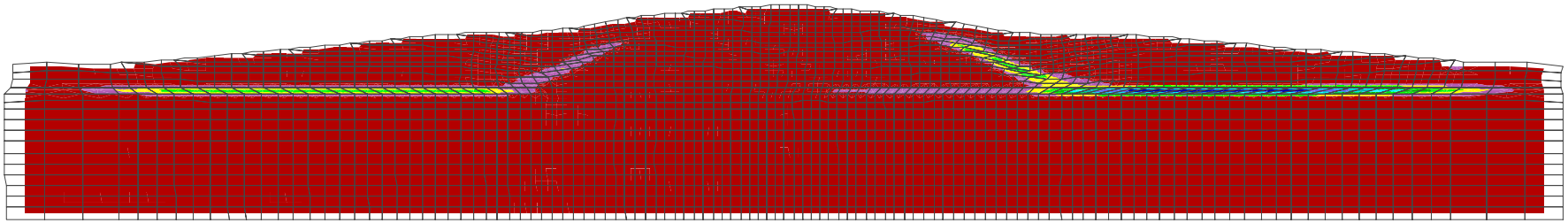


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Y Displacement Mid-Sea Dam Model 2 1,400 psf Cohesion
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.14**

Max. shear strain increment

0.00E+00
2.50E-01
5.00E-01
7.50E-01
1.00E+00
1.25E+00
1.50E+00
1.75E+00
2.00E+00

Contour interval= 2.50E-01



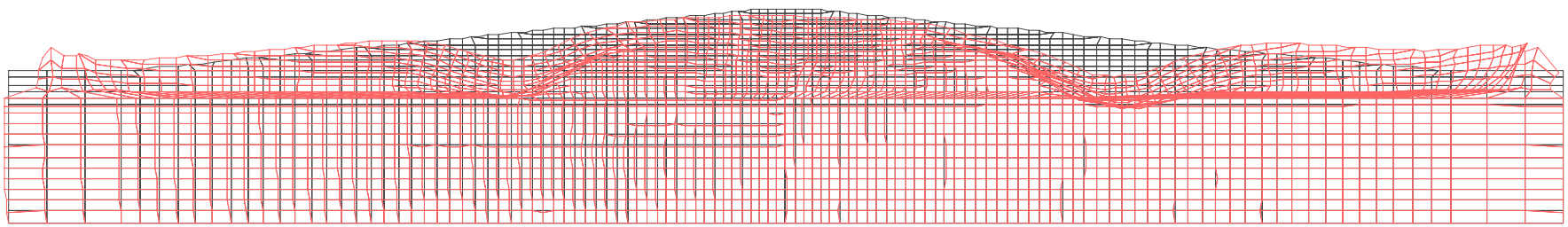
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Shear Strain Increment Mid-Sea Dam Model 2 1,400 psf Cohesion
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.15**

Exaggerated Grid Distortion

Magnification = 0.000E+00
Max Disp = 2.694E+01

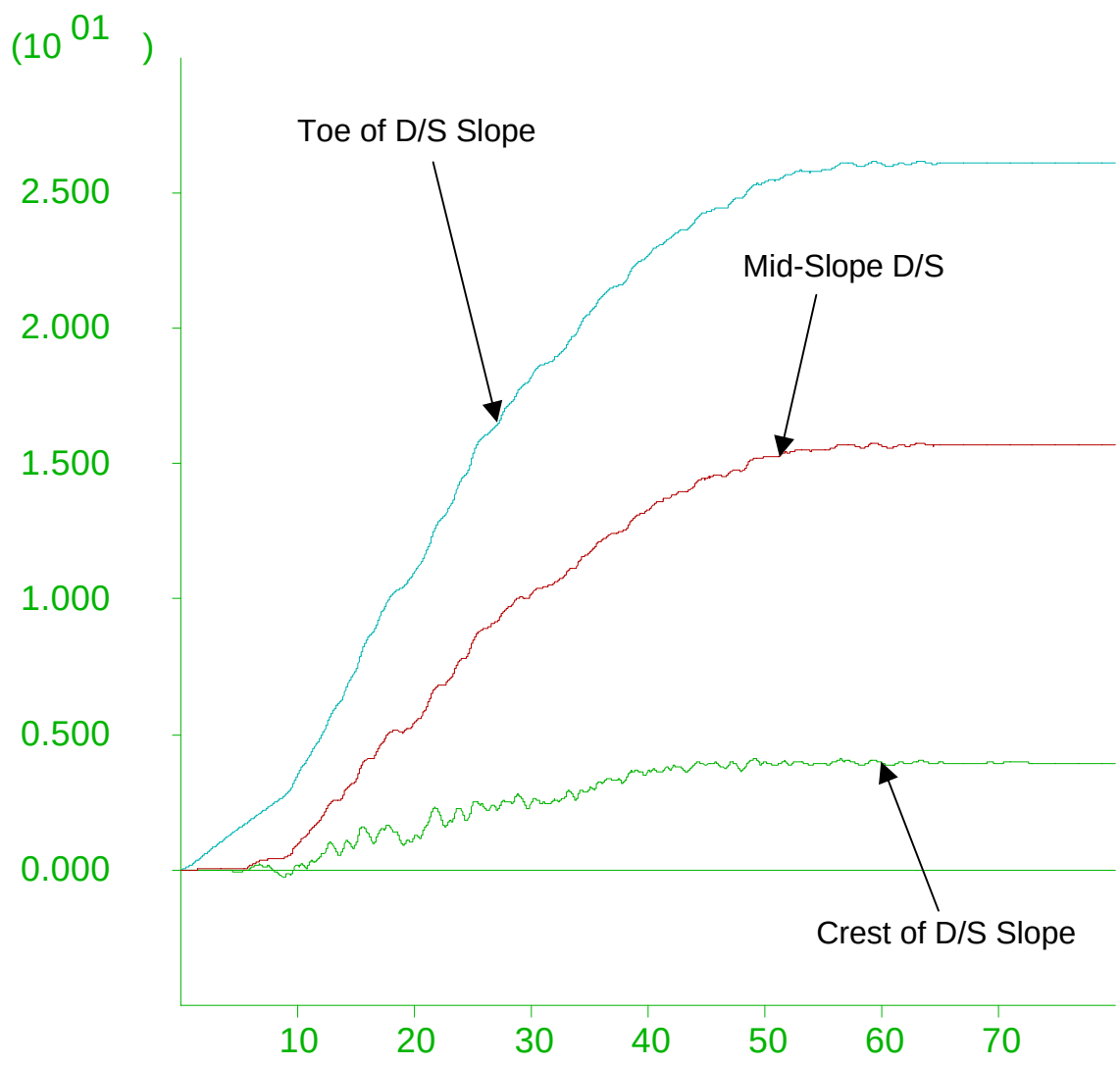
Exaggerated Grid Distortion

Magnification = 5.000E+00
Max Disp = 2.694E+01



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Deformed vs. Un-deformed Grid Mid-Sea Dam Model 2 1,400 psf Cohesion
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.16**

HISTORY PLOT
Y-axis :
17 X displacement(60, 29)
23 X displacement(95, 22)
29 X displacement(111, 17)
X-axis :
1 Dynamic time

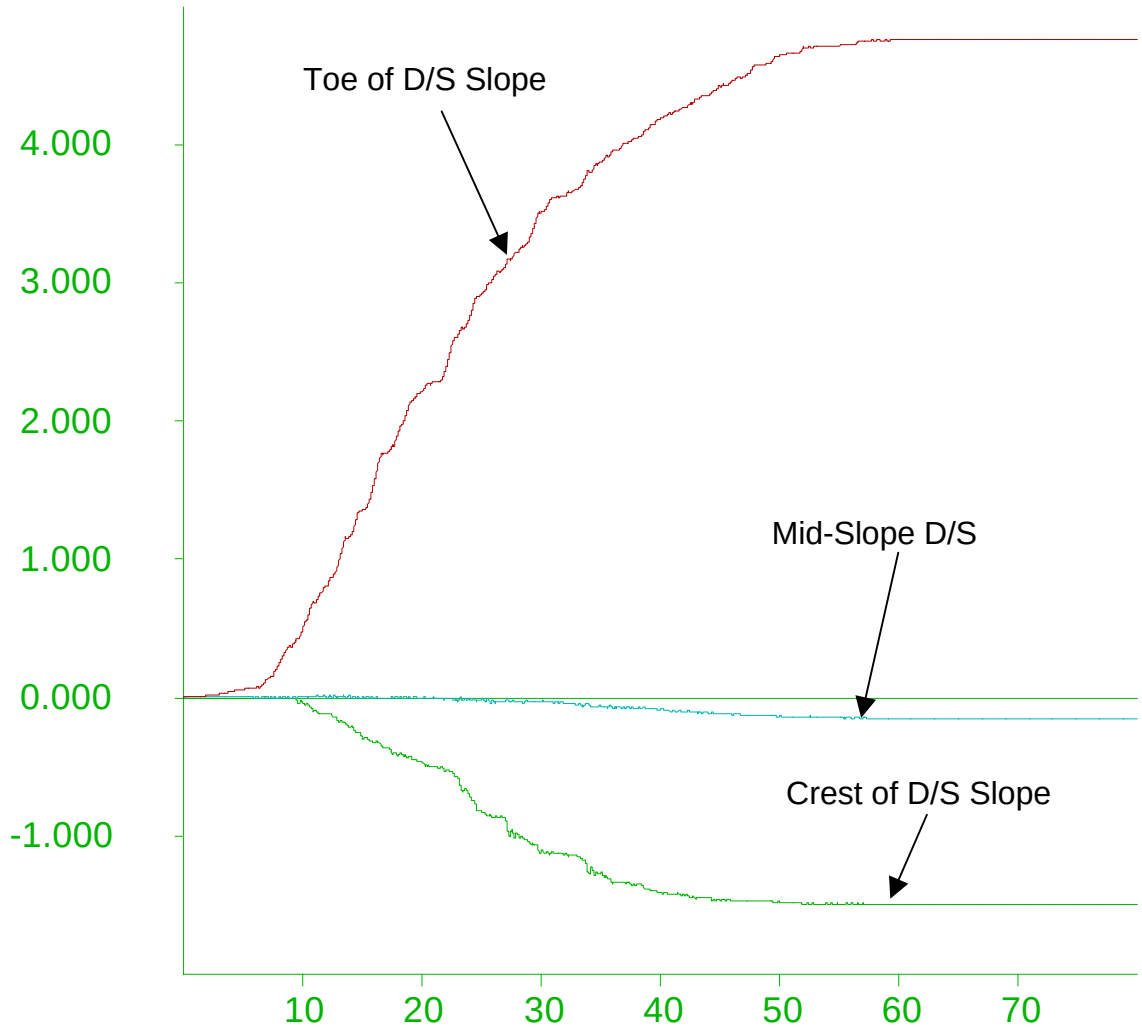


X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of X Displacement Mid-Sea Dam Model 2 1,400 psf Cohesion
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.17**

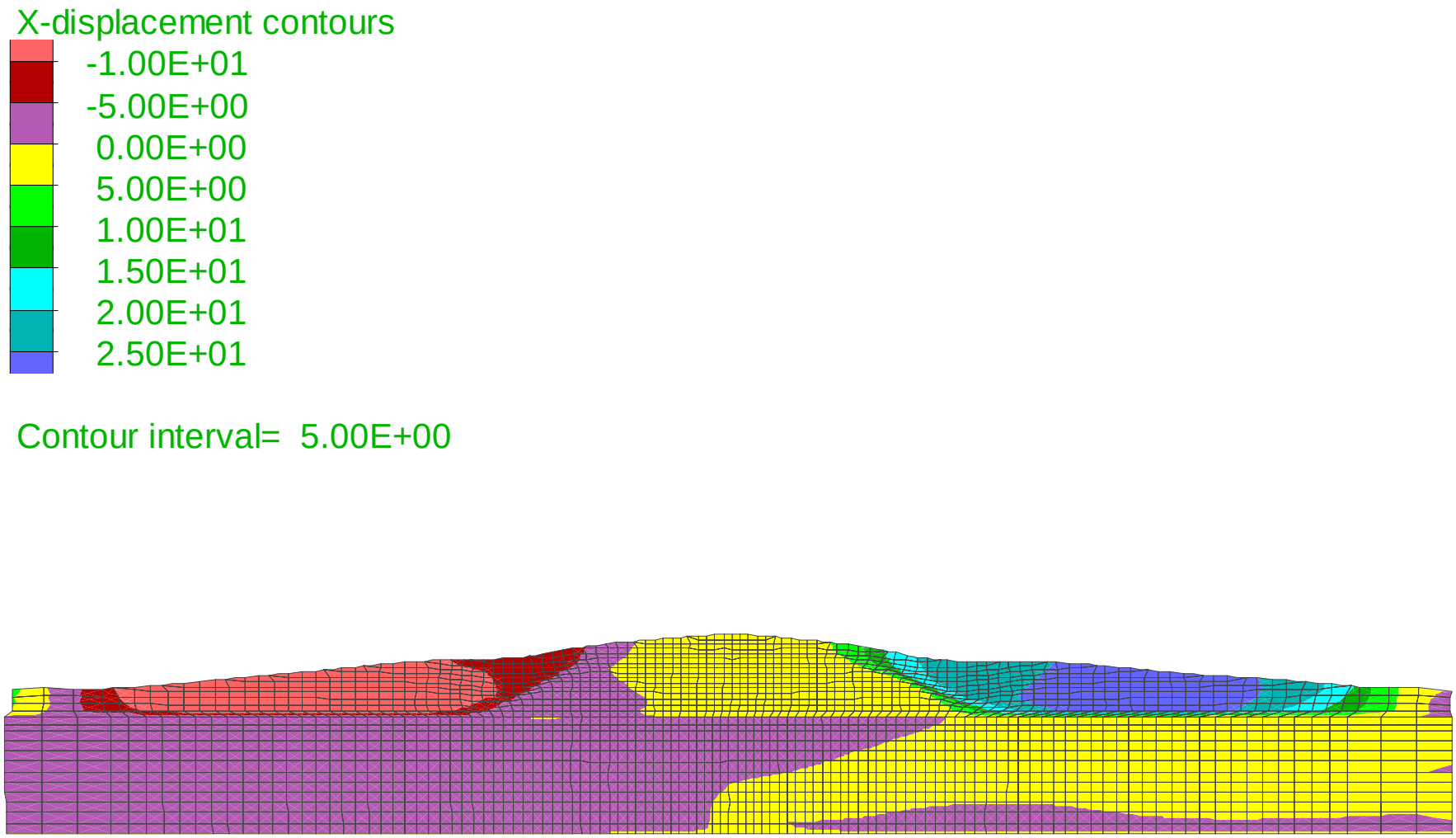
HISTORY PLOT
Y-axis :
18 Y displacement(60, 29)
24 Y displacement(95, 22)
30 Y displacement(111, 17)
X-axis :
1 Dynamic time



X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of Y Displacement Mid-Sea Dam Model 2 1,400 psf Cohesion
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.18**

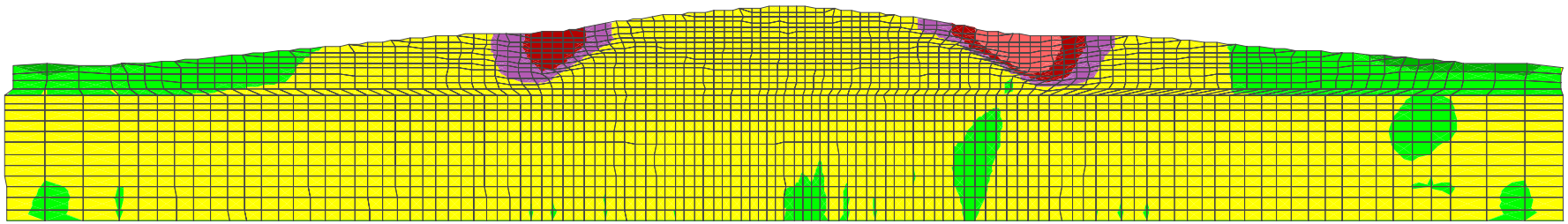


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	X Displacement Mid-Sea Dam Model 2 1,600 psf Cohesion
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.19**

Y-displacement contours

-7.50E+00
-5.00E+00
-2.50E+00
0.00E+00
2.50E+00

Contour interval= 2.50E+00

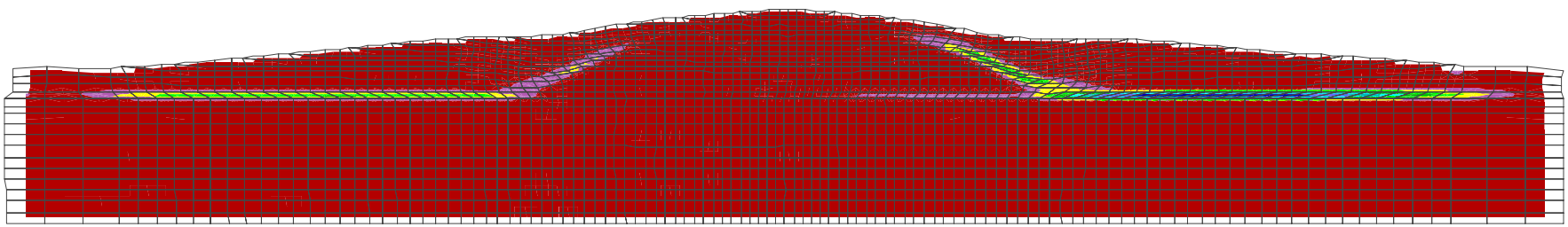


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Y Displacement Mid-Sea Dam Model 2 1,600 psf Cohesion
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.20**

Max. shear strain increment

0.00E+00
2.50E-01
5.00E-01
7.50E-01
1.00E+00
1.25E+00
1.50E+00
1.75E+00
2.00E+00

Contour interval= 2.50E-01



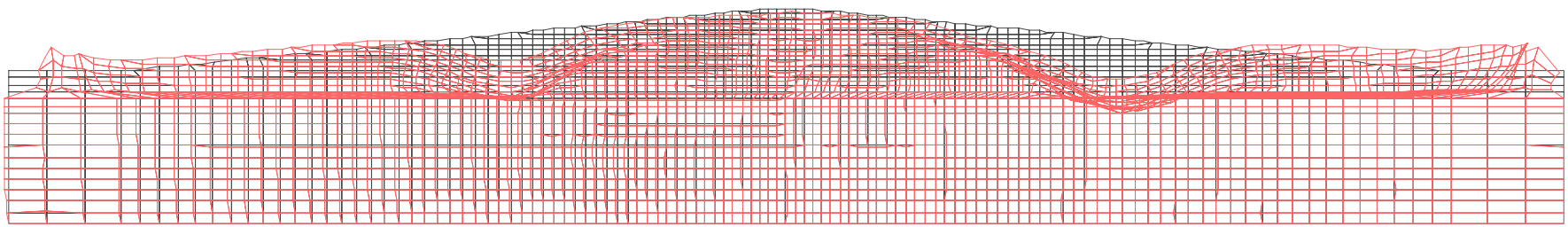
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Shear Strain Increment Mid-Sea Dam Model 2 1,600 psf Cohesion
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.21**

Exaggerated Grid Distortion

Magnification = 0.000E+00
Max Disp = 2.710E+01

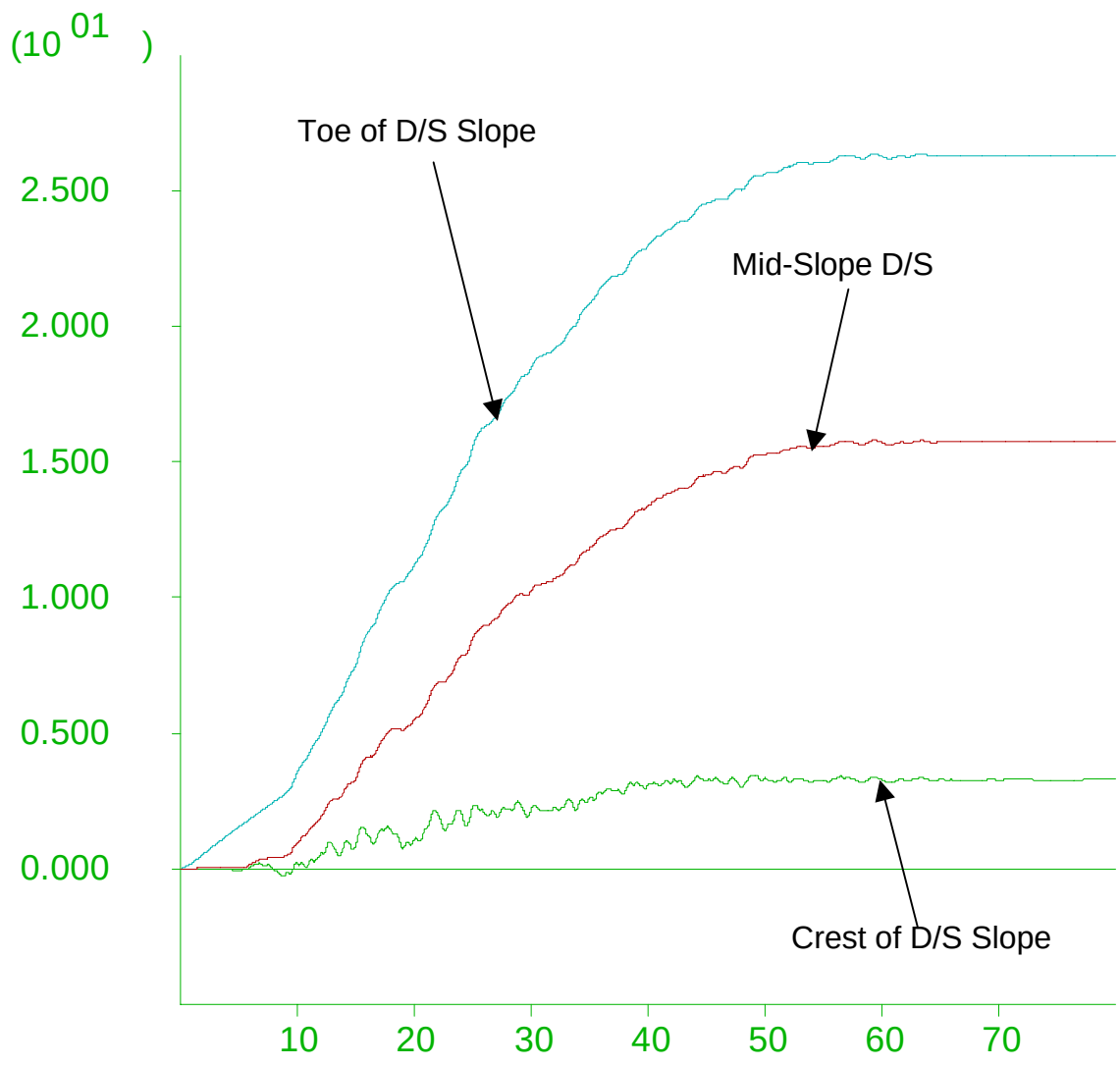
Exaggerated Grid Distortion

Magnification = 5.000E+00
Max Disp = 2.710E+01



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Deformed vs. Un-deformed Grid Mid-Sea Dam Model 2 1,600 psf Cohesion
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.22**

HISTORY PLOT
Y-axis :
17 X displacement(60, 29)
23 X displacement(95, 22)
29 X displacement(111, 17)
X-axis :
1 Dynamic time

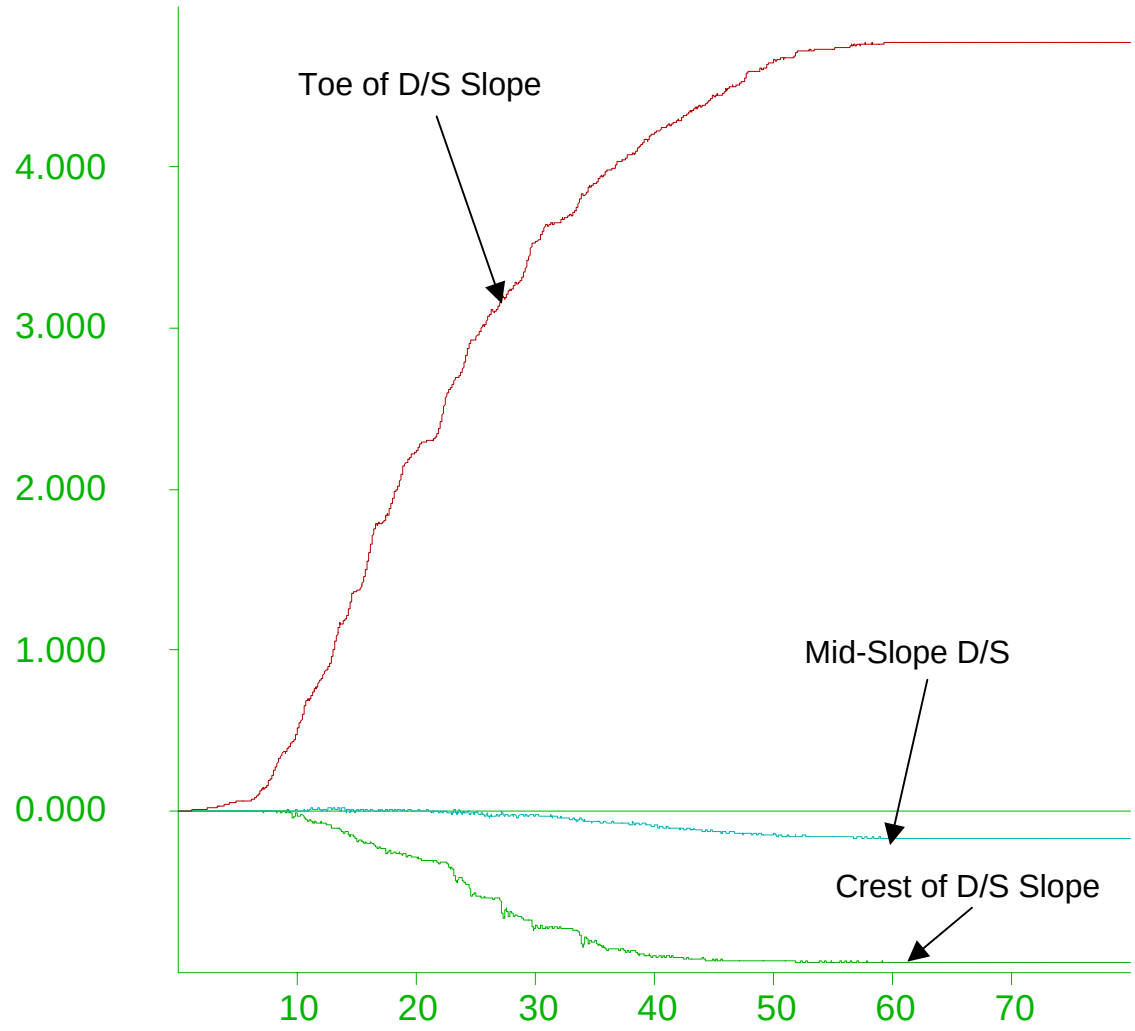


X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of X Displacement Mid-Sea Dam Model 2 1,600 psf Cohesion
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.23**

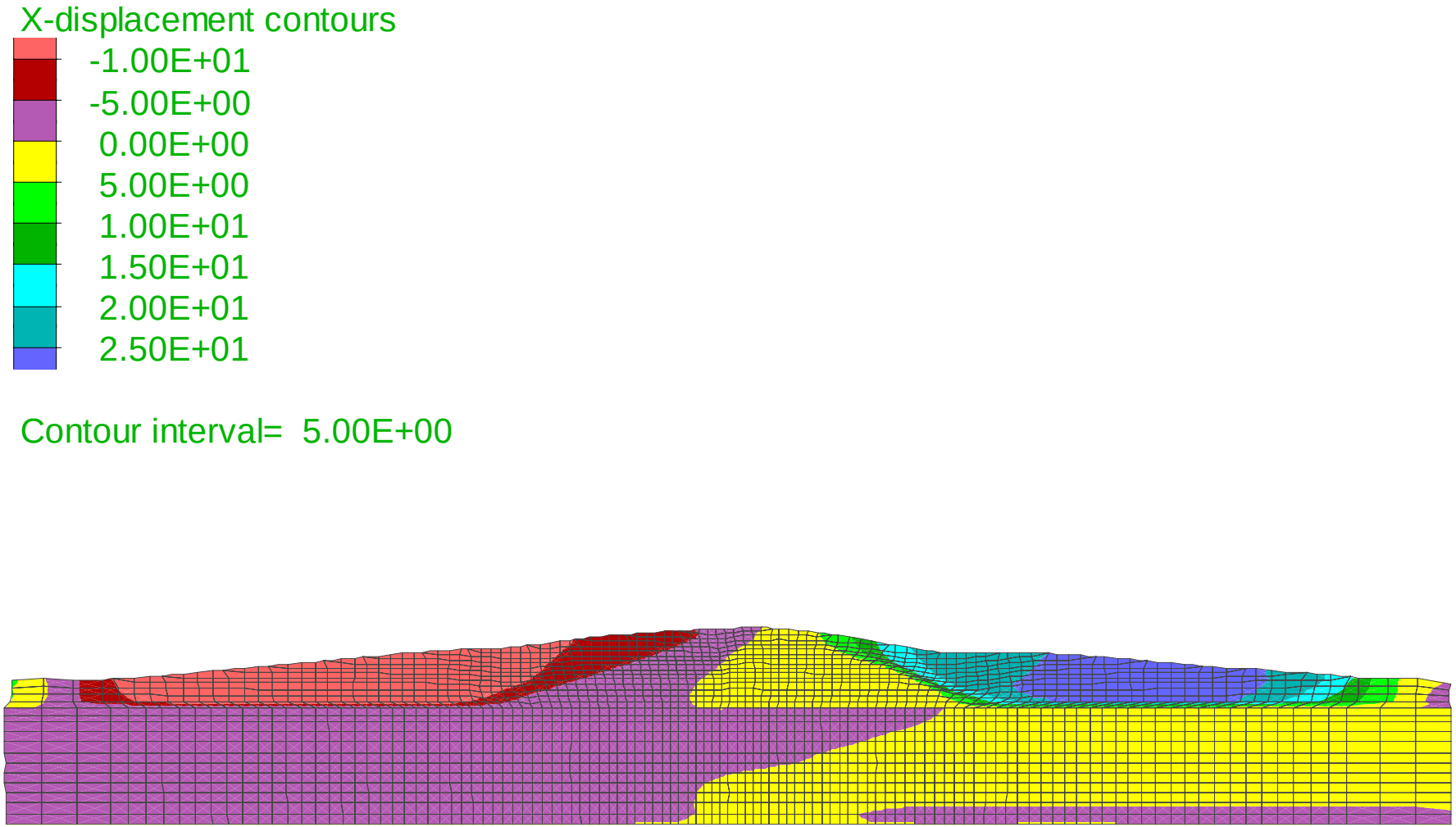
HISTORY PLOT
Y-axis :
18 Y displacement(60, 29)
24 Y displacement(95, 22)
30 Y displacement(111, 17)
X-axis :
1 Dynamic time



X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of Y Displacement Mid-Sea Dam Model 2 1,600 psf Cohesion
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.24**

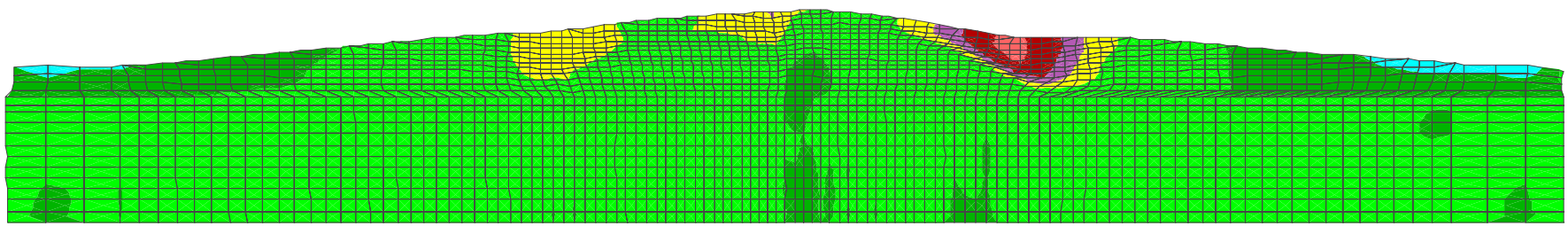


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	X Displacement Mid-Sea Dam Model 2 26 Degree Friction Angle
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.25**

Y-displacement contours

-1.00E+01
-7.50E+00
-5.00E+00
-2.50E+00
0.00E+00
2.50E+00

Contour interval= 2.50E+00

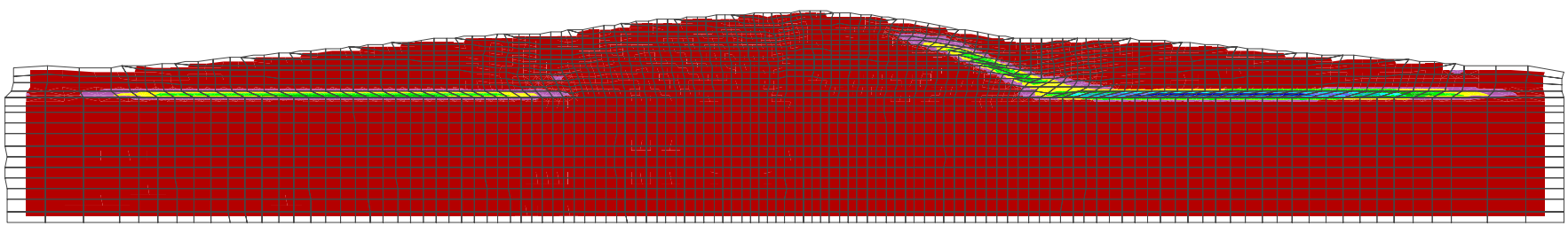


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Y Displacement Mid-Sea Dam Model 2 26 Degree Friction Angle
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.26**

Max. shear strain increment

0.00E+00
2.50E-01
5.00E-01
7.50E-01
1.00E+00
1.25E+00
1.50E+00
1.75E+00
2.00E+00

Contour interval= 2.50E-01



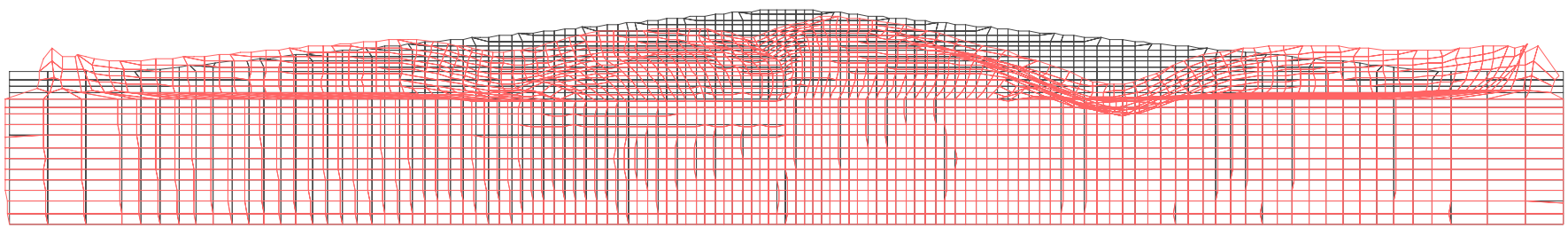
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Shear Strain Increment Mid-Sea Dam Model 2 26 Degree Friction Angle
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.27**

Exaggerated Grid Distortion

Magnification = 0.000E+00
Max Disp = 2.740E+01

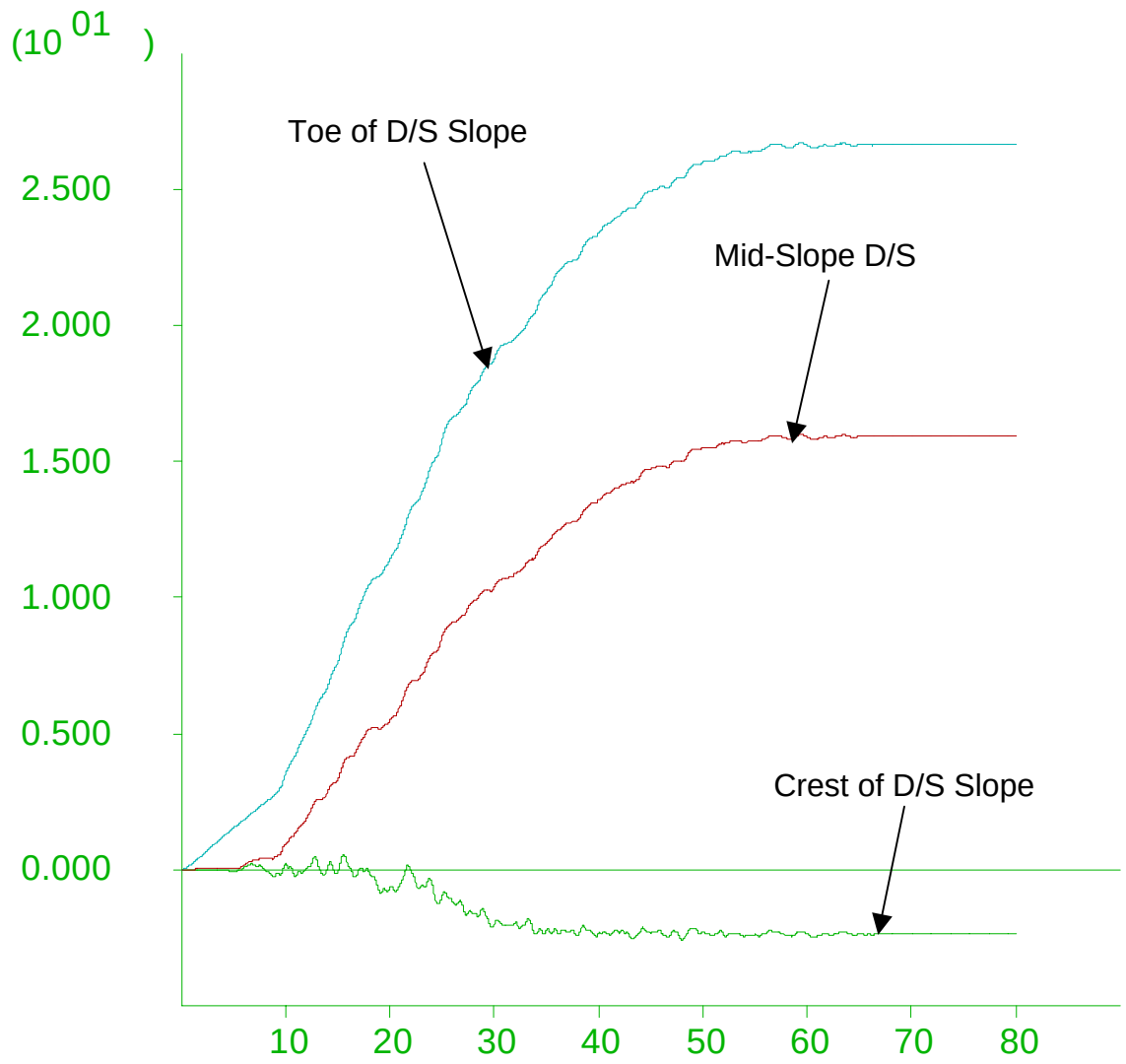
Exaggerated Grid Distortion

Magnification = 5.000E+00
Max Disp = 2.740E+01



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Deformed vs. Un-deformed Grid Mid-Sea Dam Model 2 26 Degree Friction Angle
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.28**

HISTORY PLOT
Y-axis :
17 X displacement(60, 29)
23 X displacement(95, 22)
29 X displacement(111, 17)
X-axis :
1 Dynamic time

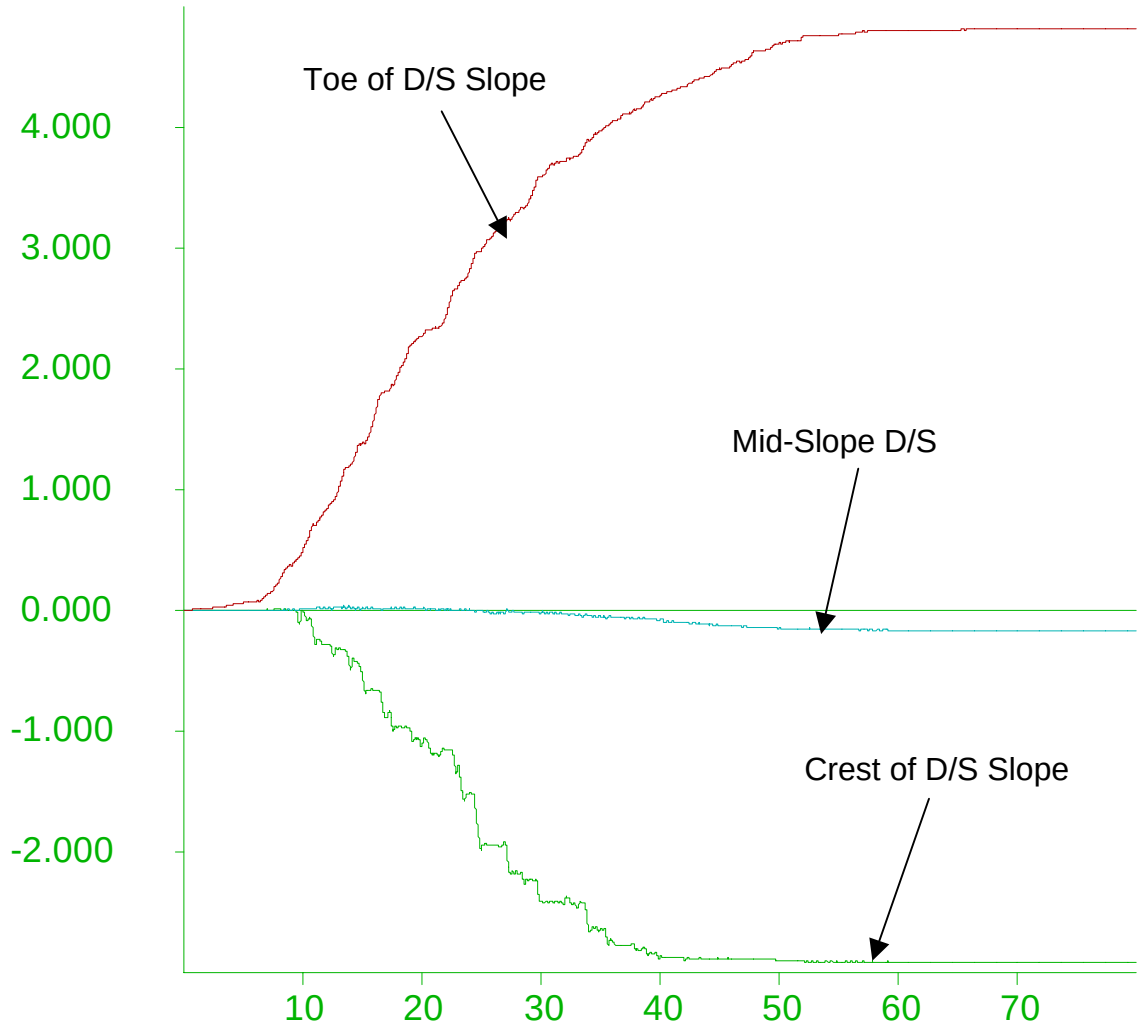


X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Graph of X Displacement Mid-Sea Dam Model 2 26 Degree Fiction Angle
KLEINFELDER	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.29**

HISTORY PLOT
Y-axis :
18 Y displacement(60, 29)
24 Y displacement(95, 22)
30 Y displacement(111, 17)
X-axis :
1 Dynamic time



X – axis, Time (seconds)

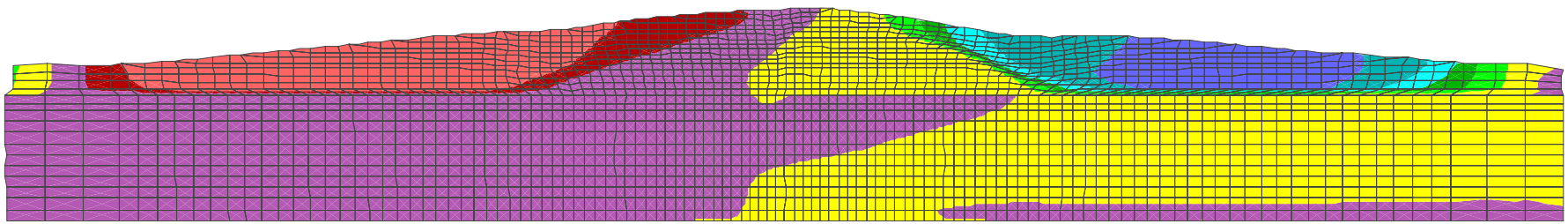
Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of Y Displacement Mid-Sea Dam Model 2 26 Degree Fiction Angle
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.30**

X-displacement contours

-1.00E+01
-5.00E+00
0.00E+00
5.00E+00
1.00E+01
1.50E+01
2.00E+01
2.50E+01

Contour interval= 5.00E+00

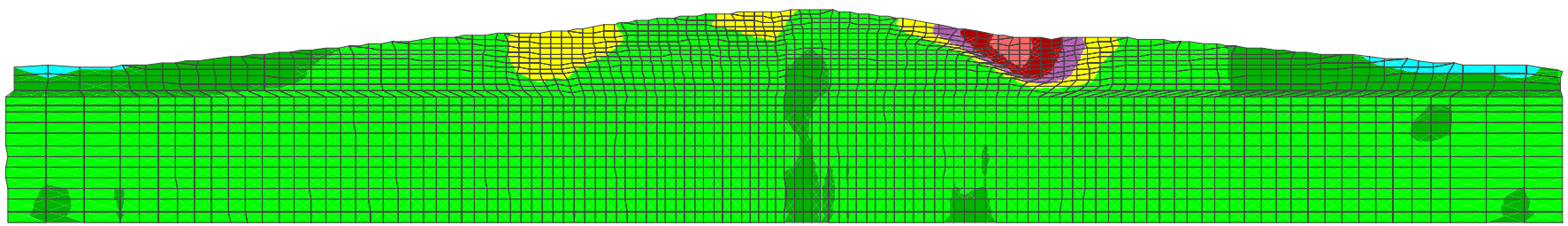


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			X Displacement Mid-Sea Dam Model 2 28 Degree Friction Angle
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.31**

Y-displacement contours

-1.00E+01
-7.50E+00
-5.00E+00
-2.50E+00
0.00E+00
2.50E+00

Contour interval= 2.50E+00

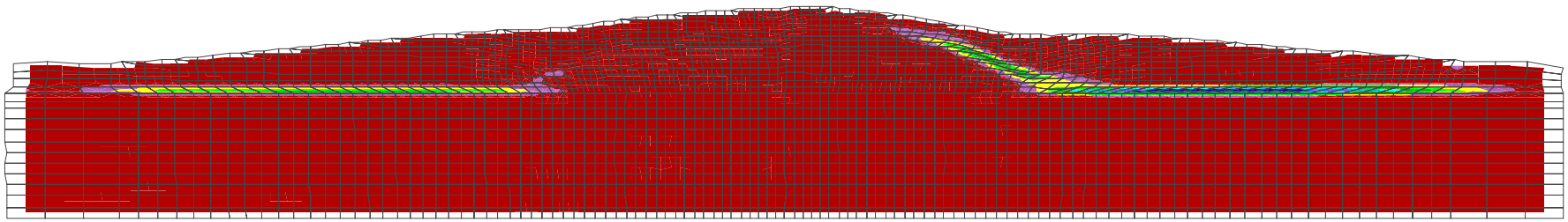


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Y Displacement Mid-Sea Dam Model 2 28 Degree Friction Angle
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.32**

Max. shear strain increment

0.00E+00
2.50E-01
5.00E-01
7.50E-01
1.00E+00
1.25E+00
1.50E+00
1.75E+00
2.00E+00

Contour interval= 2.50E-01



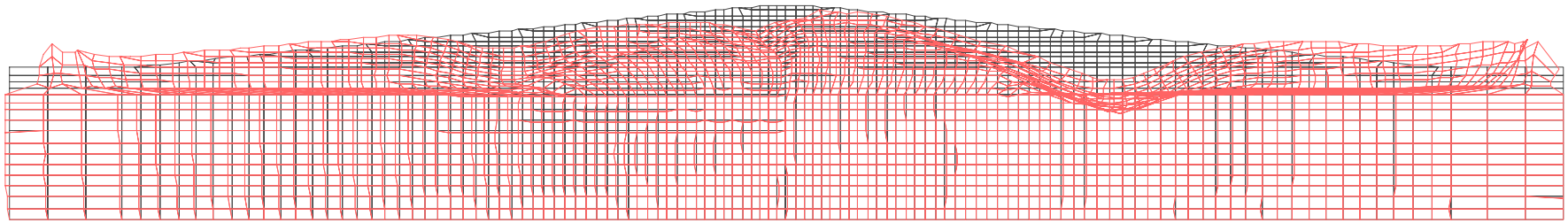
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Shear Strain Increment Mid-Sea Dam Model 2 28 Degree Friction Angle
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.33**

Exaggerated Grid Distortion

Magnification = 0.000E+00
Max Disp = 2.738E+01

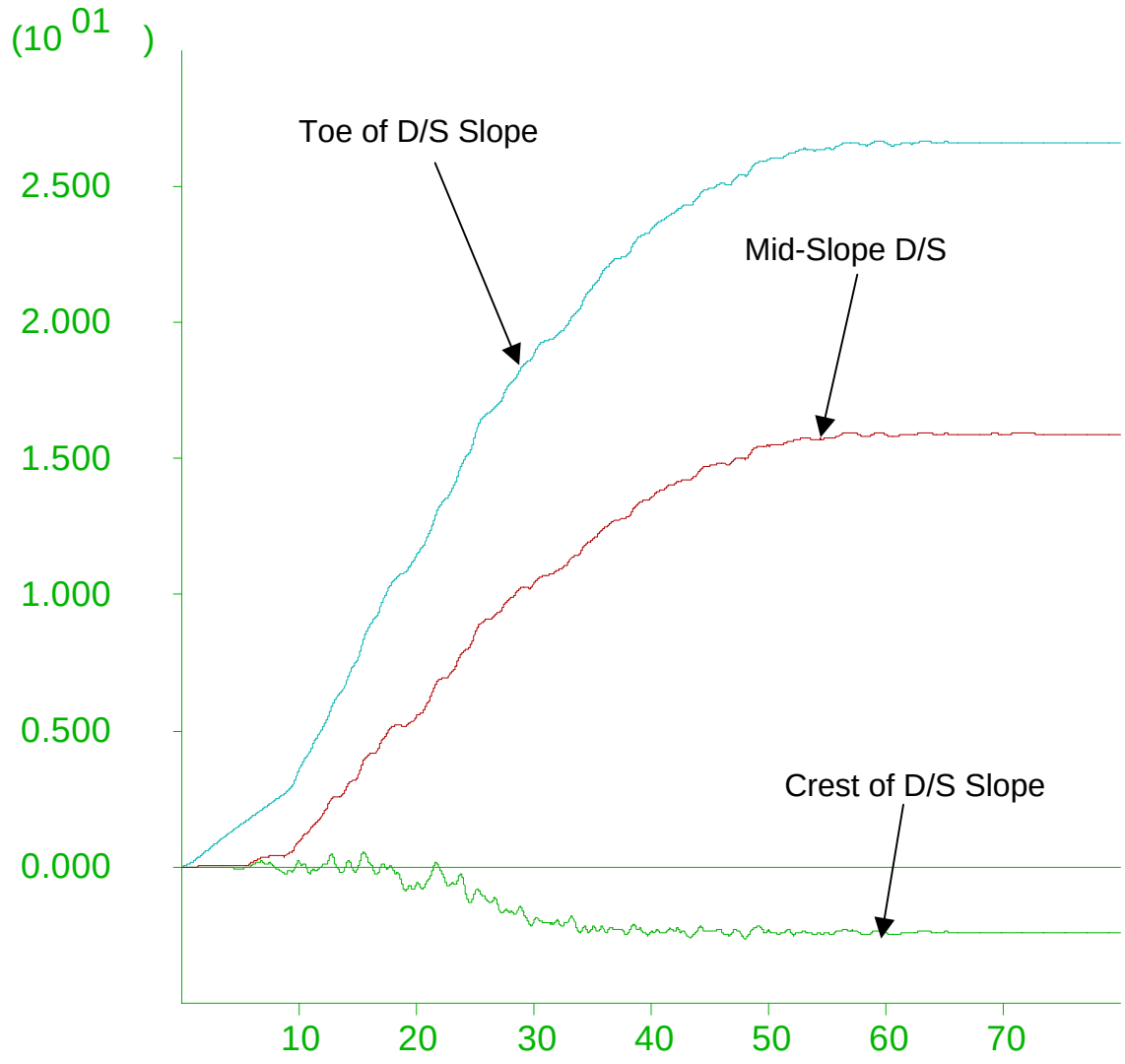
Exaggerated Grid Distortion

Magnification = 5.000E+00
Max Disp = 2.738E+01



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Deformed vs. Un-deformed Grid Mid-Sea Dam Model 2 28 Degree Friction Angle
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.34**

HISTORY PLOT
Y-axis :
17 X displacement(60, 29)
23 X displacement(95, 22)
29 X displacement(111, 17)
X-axis :
1 Dynamic time

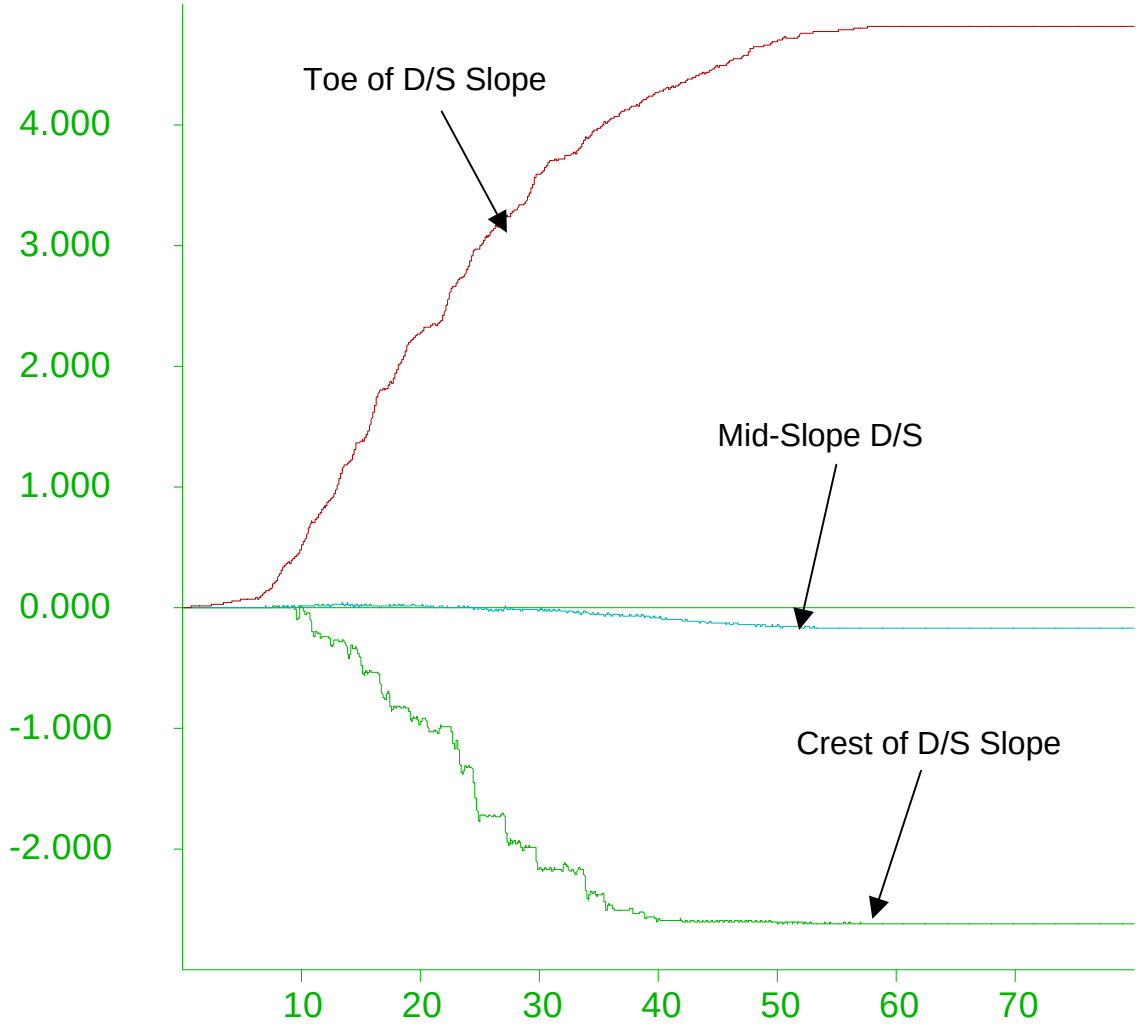


X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Graph of X Displacement Mid-Sea Dam Model 2 28 Degree Fiction Angle
KLEINFELDER	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.35**

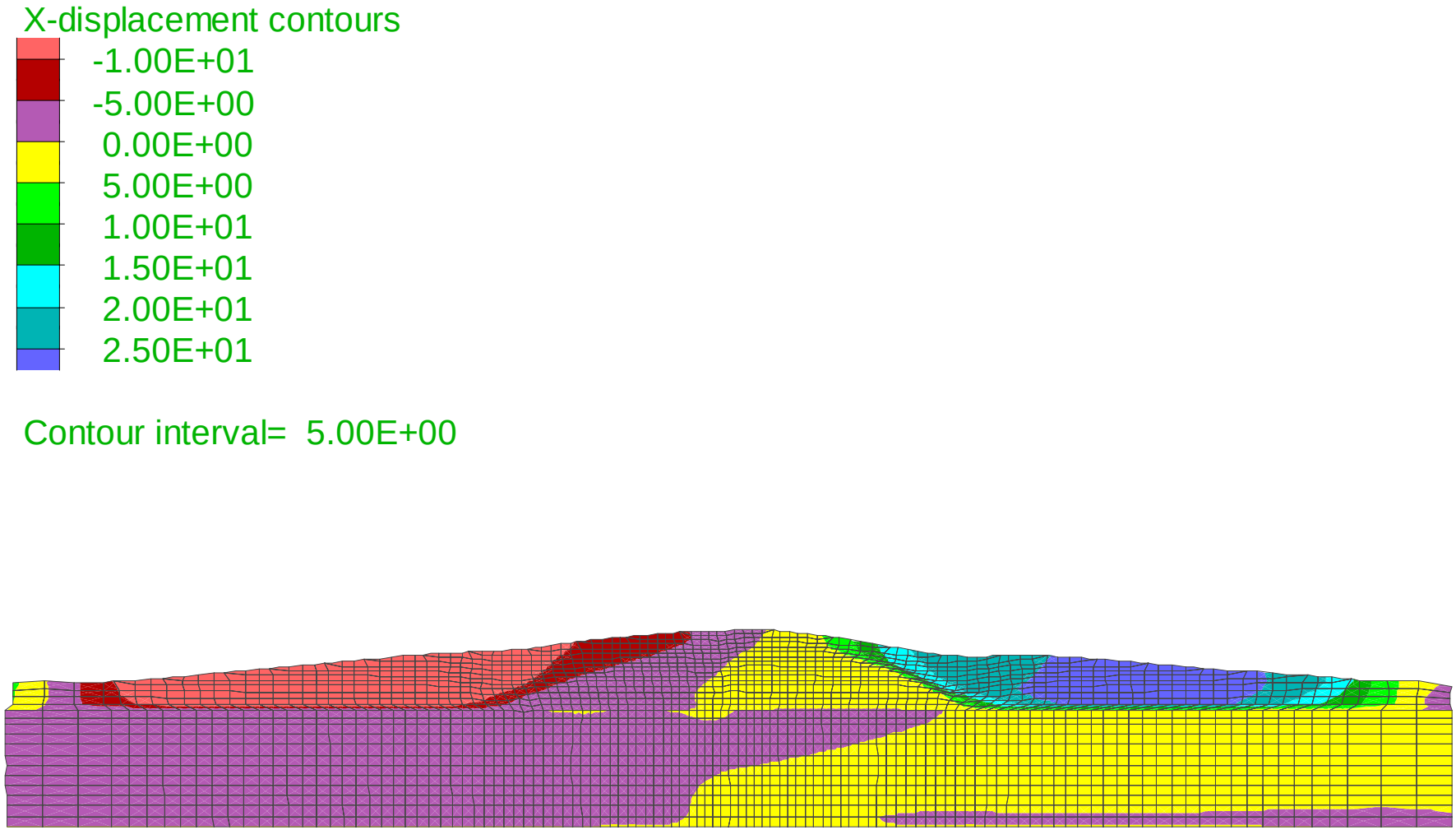
HISTORY PLOT
Y-axis :
18 Y displacement(60, 29)
24 Y displacement(95, 22)
30 Y displacement(111, 17)
X-axis :
1 Dynamic time



X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of Y Displacement Mid-Sea Dam Model 2 28 Degree Fiction Angle
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.36**

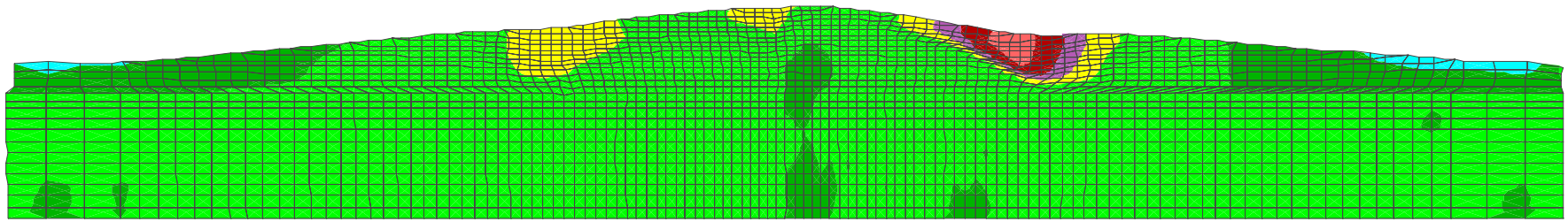


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			X Displacement Mid-Sea Dam Model 2 30 Degree Friction Angle
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.37**

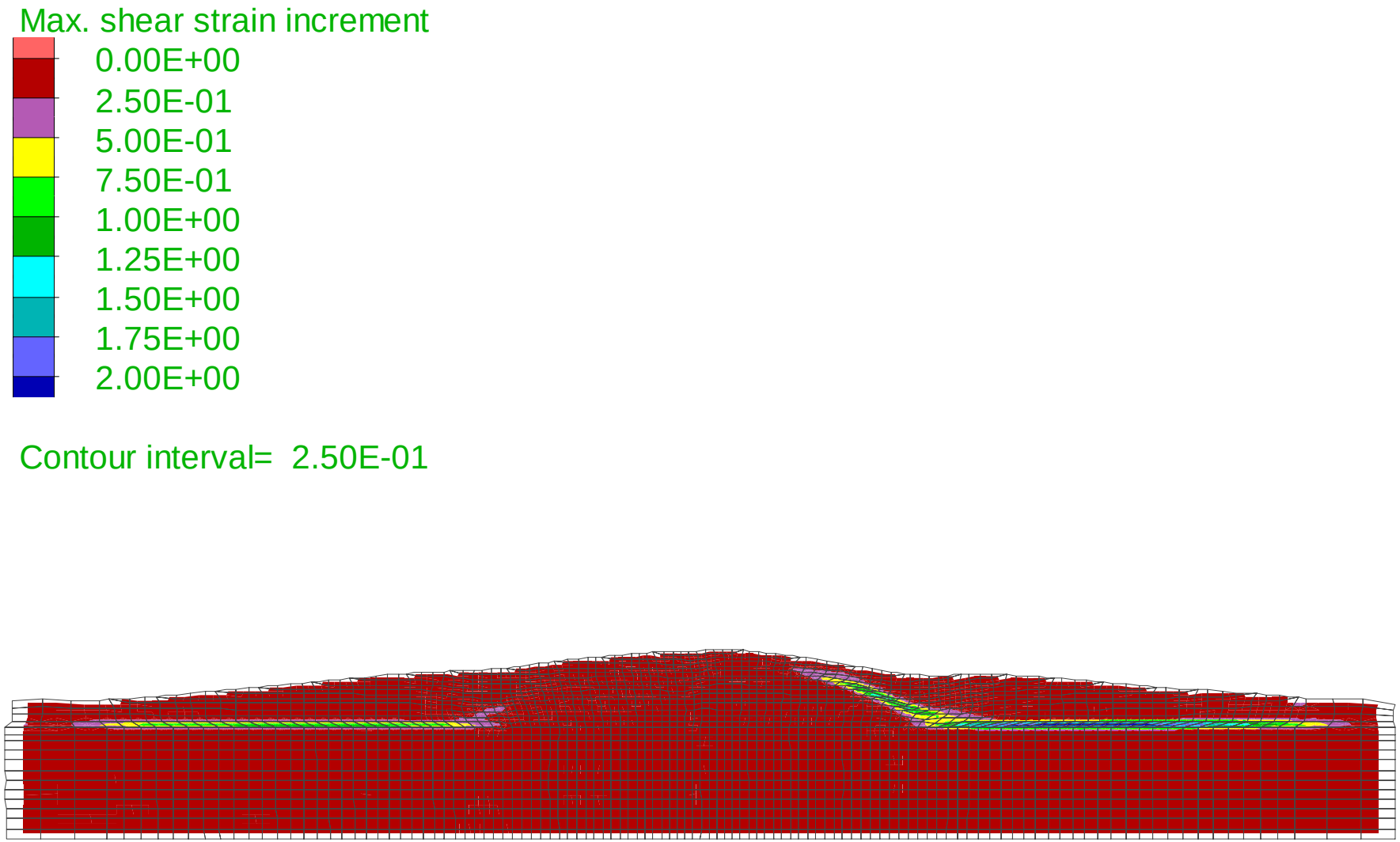
Y-displacement contours

-1.00E+01
-7.50E+00
-5.00E+00
-2.50E+00
0.00E+00
2.50E+00

Contour interval= 2.50E+00



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Y Displacement Mid-Sea Dam Model 2 30 Degree Friction Angle
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.38**



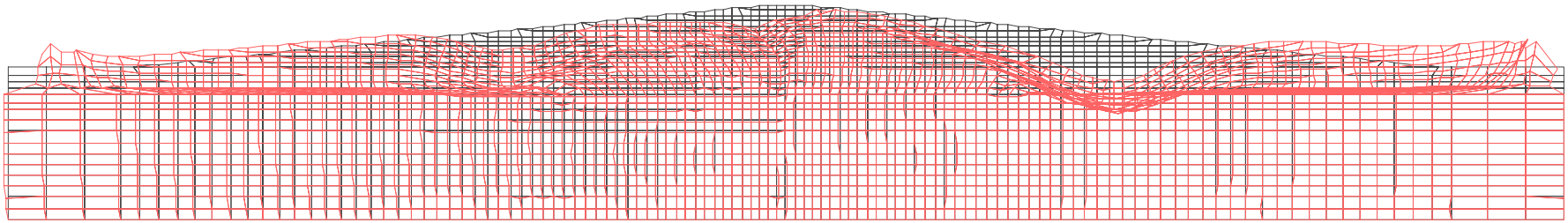
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Shear Strain Increment Mid-Sea Dam Model 2 30 Degree Friction Angle
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.39**

Exaggerated Grid Distortion

Magnification = 0.000E+00
Max Disp = 2.735E+01

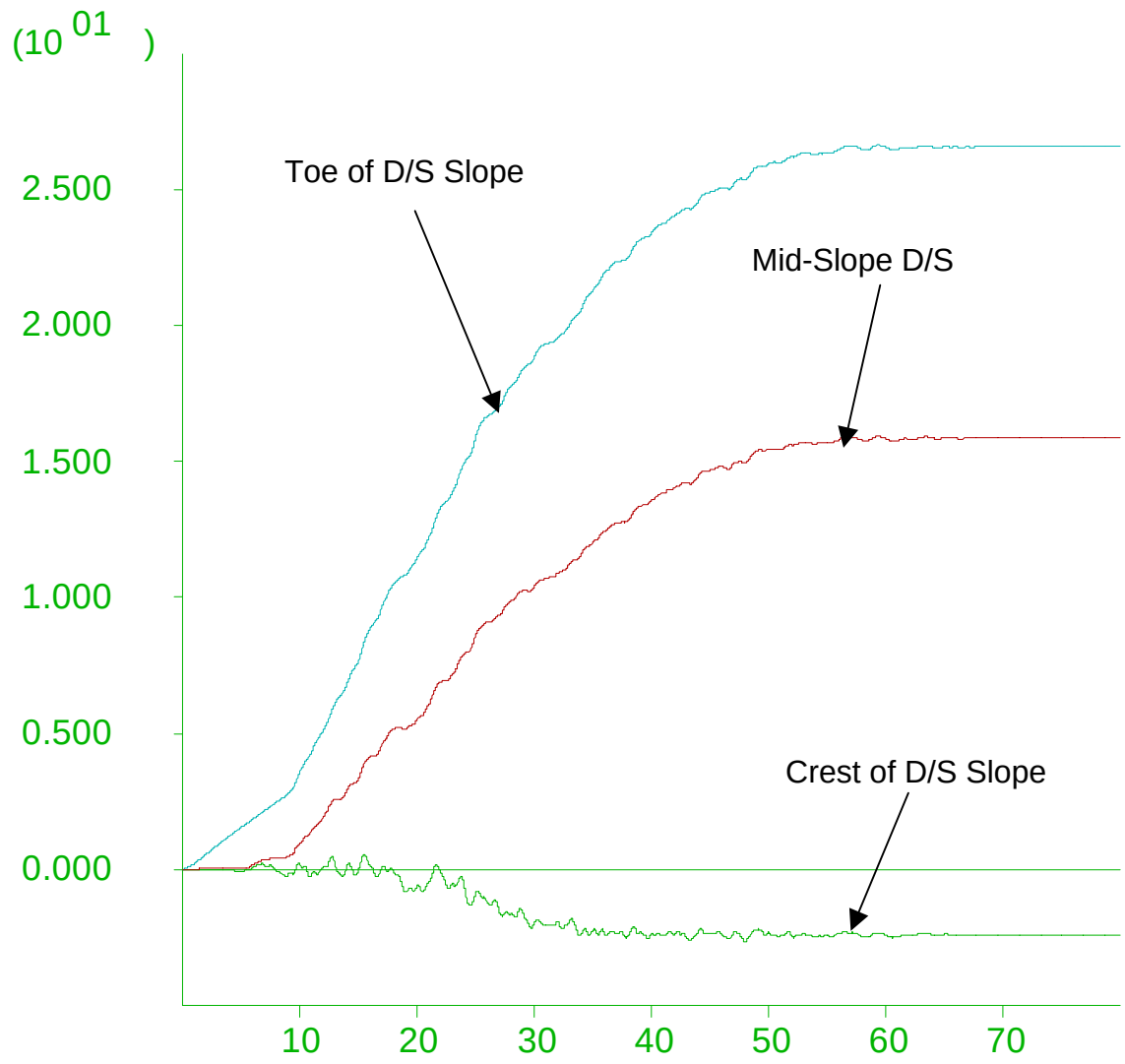
Exaggerated Grid Distortion

Magnification = 5.000E+00
Max Disp = 2.735E+01



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Deformed vs. Un-deformed Grid Mid-Sea Dam Model 2 30 Degree Friction Angle
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.40**

HISTORY PLOT
Y-axis :
17 X displacement(60, 29)
23 X displacement(95, 22)
29 X displacement(111, 17)
X-axis :
1 Dynamic time

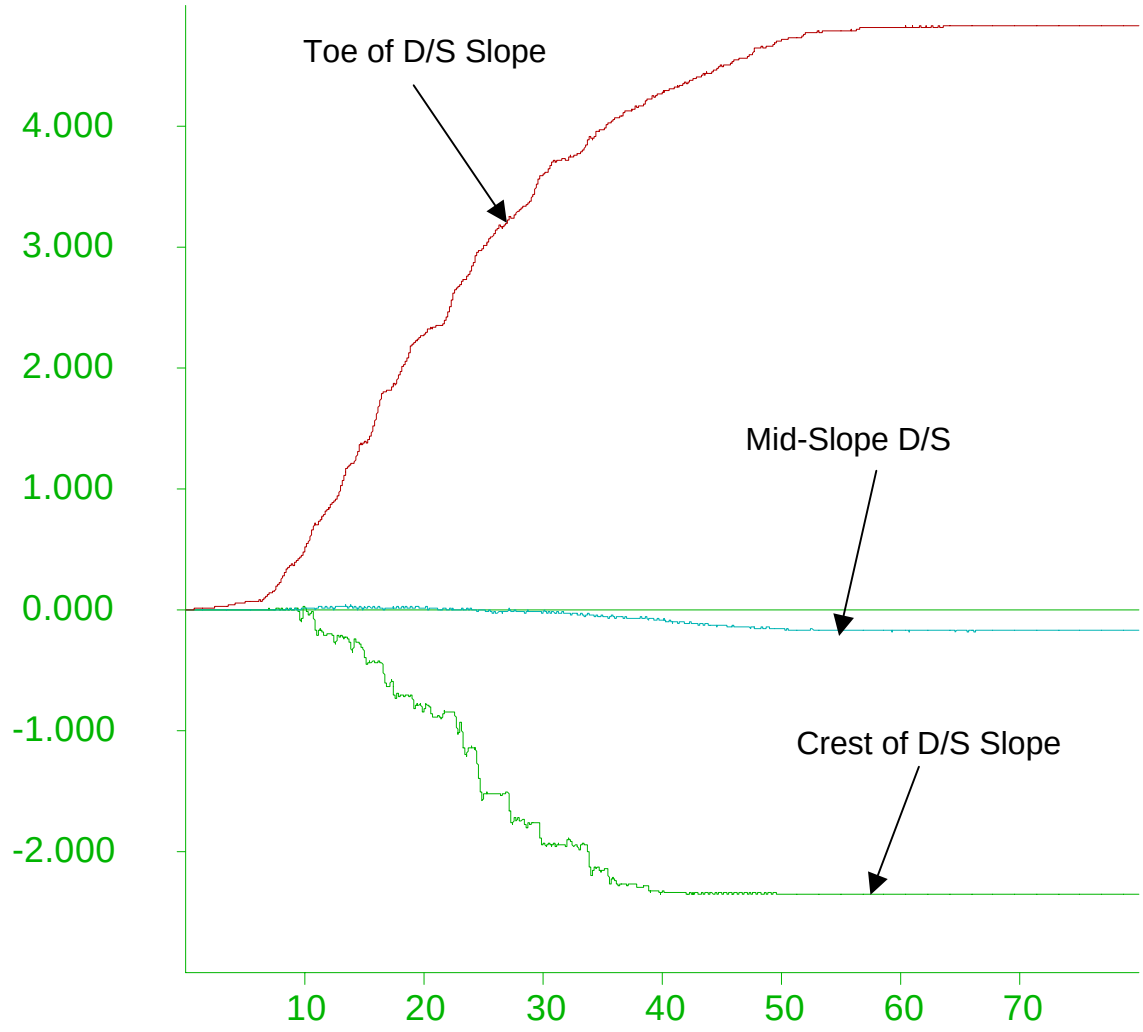


X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Graph of X Displacement Mid-Sea Dam Model 2 30 Degree Fiction Angle
KLEINFELDER	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.41**

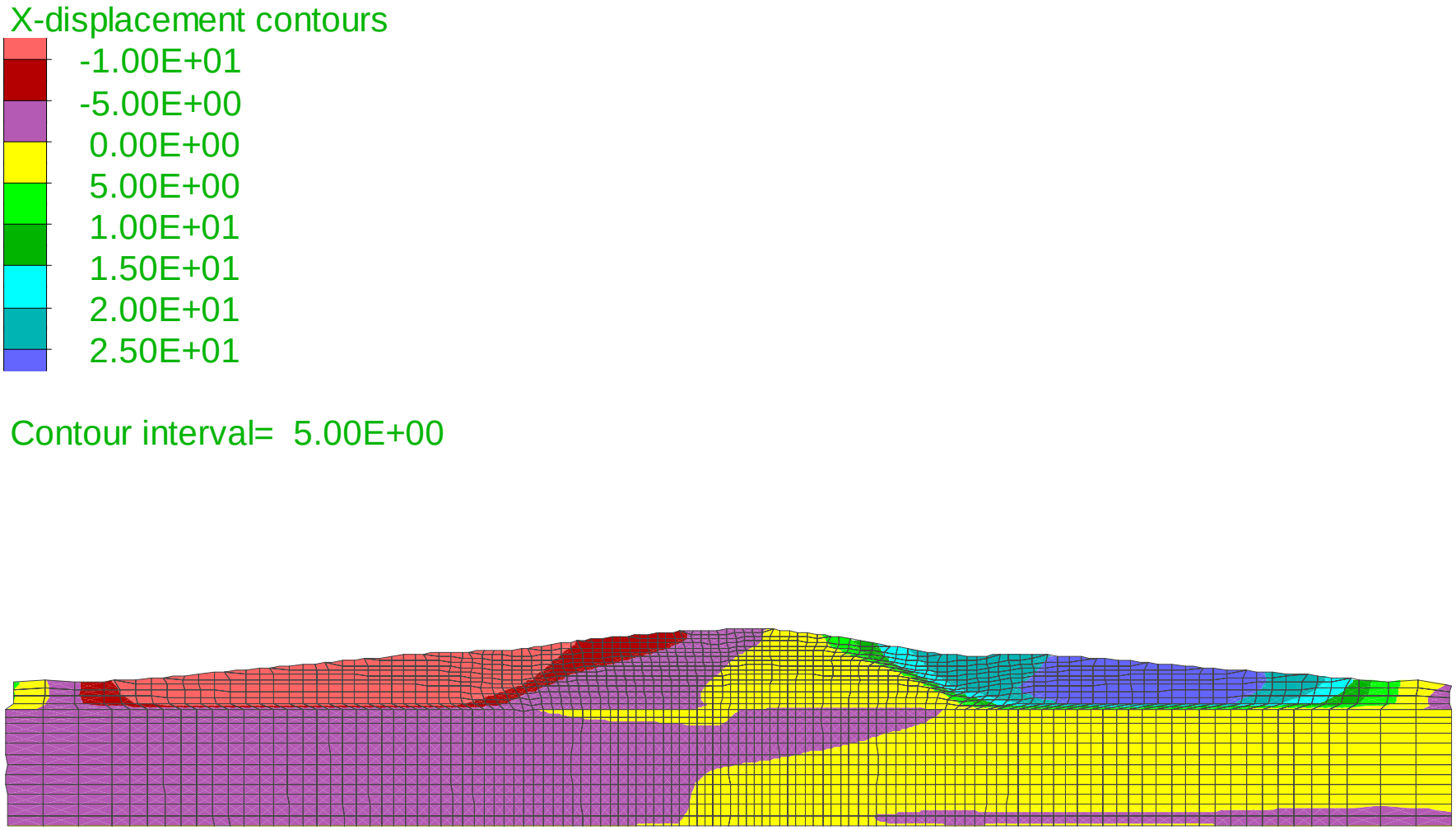
HISTORY PLOT
Y-axis :
18 Y displacement(60, 29)
24 Y displacement(95, 22)
30 Y displacement(111, 17)
X-axis :
1 Dynamic time



X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of Y Displacement Mid-Sea Dam Model 2 30 Degree Fiction Angle
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.42**

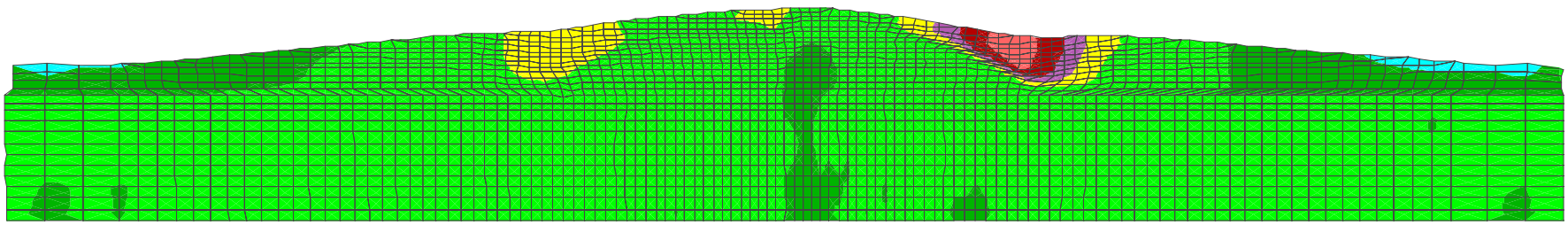


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	X Displacement Mid-Sea Dam Model 2 32 Degree Friction Angle
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.43**

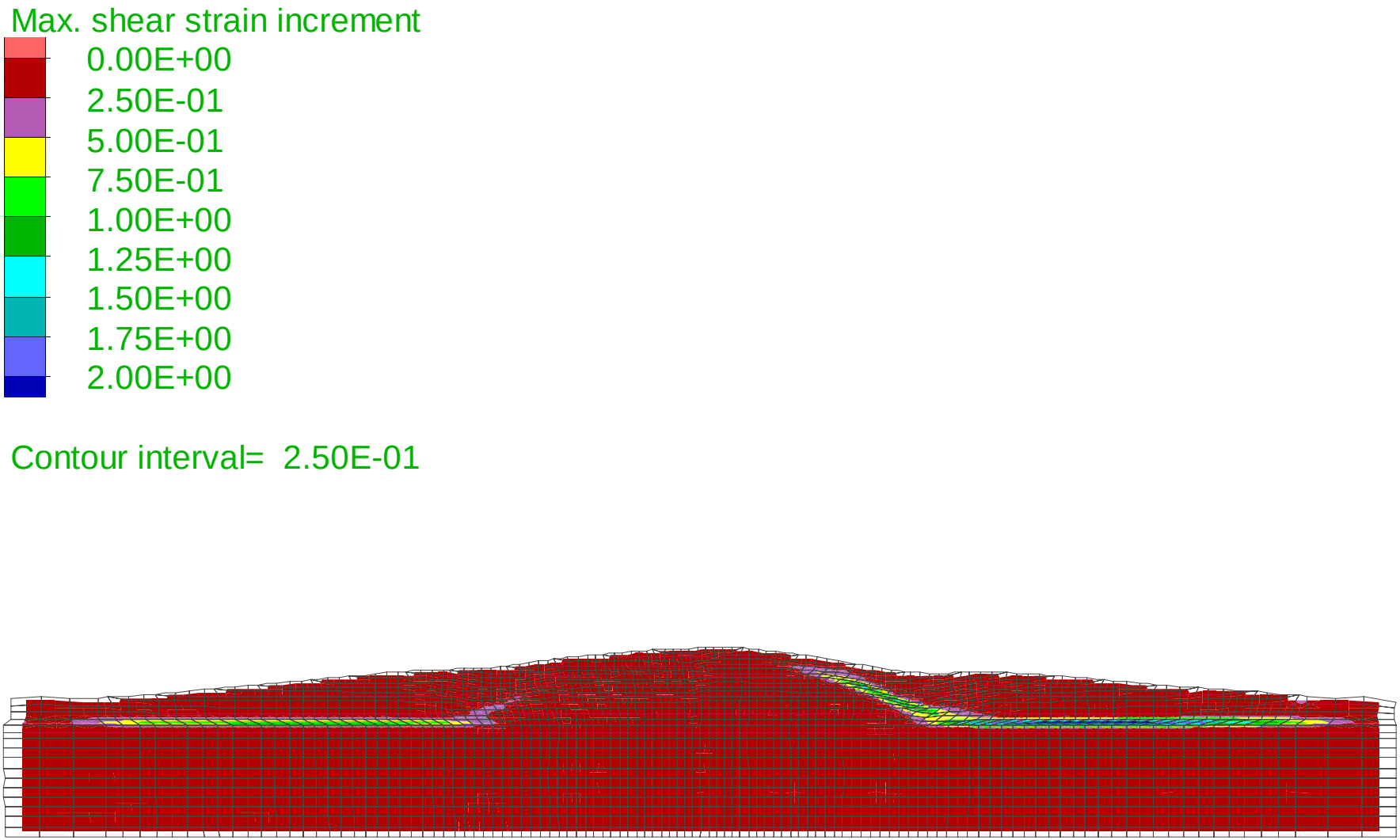
Y-displacement contours

-1.00E+01
-7.50E+00
-5.00E+00
-2.50E+00
0.00E+00
2.50E+00

Contour interval= 2.50E+00



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Y Displacement Mid-Sea Dam Model 2 32 Degree Friction Angle
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.44**



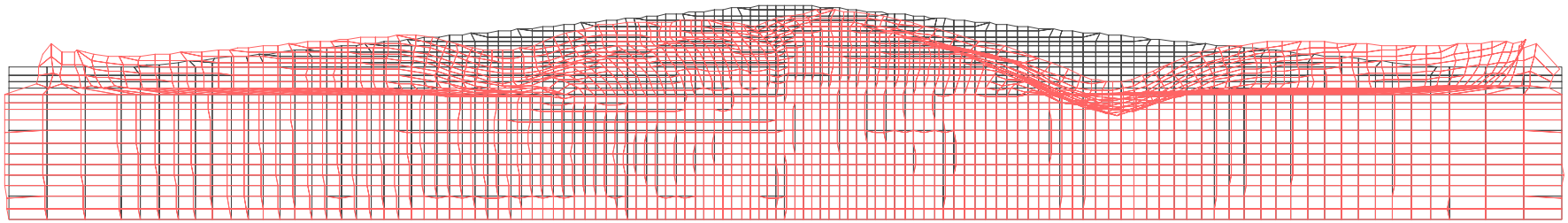
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Shear Strain Increment Mid-Sea Dam Model 2 32 Degree Friction Angle
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.45**

Exaggerated Grid Distortion

Magnification = 0.000E+00
Max Disp = 2.735E+01

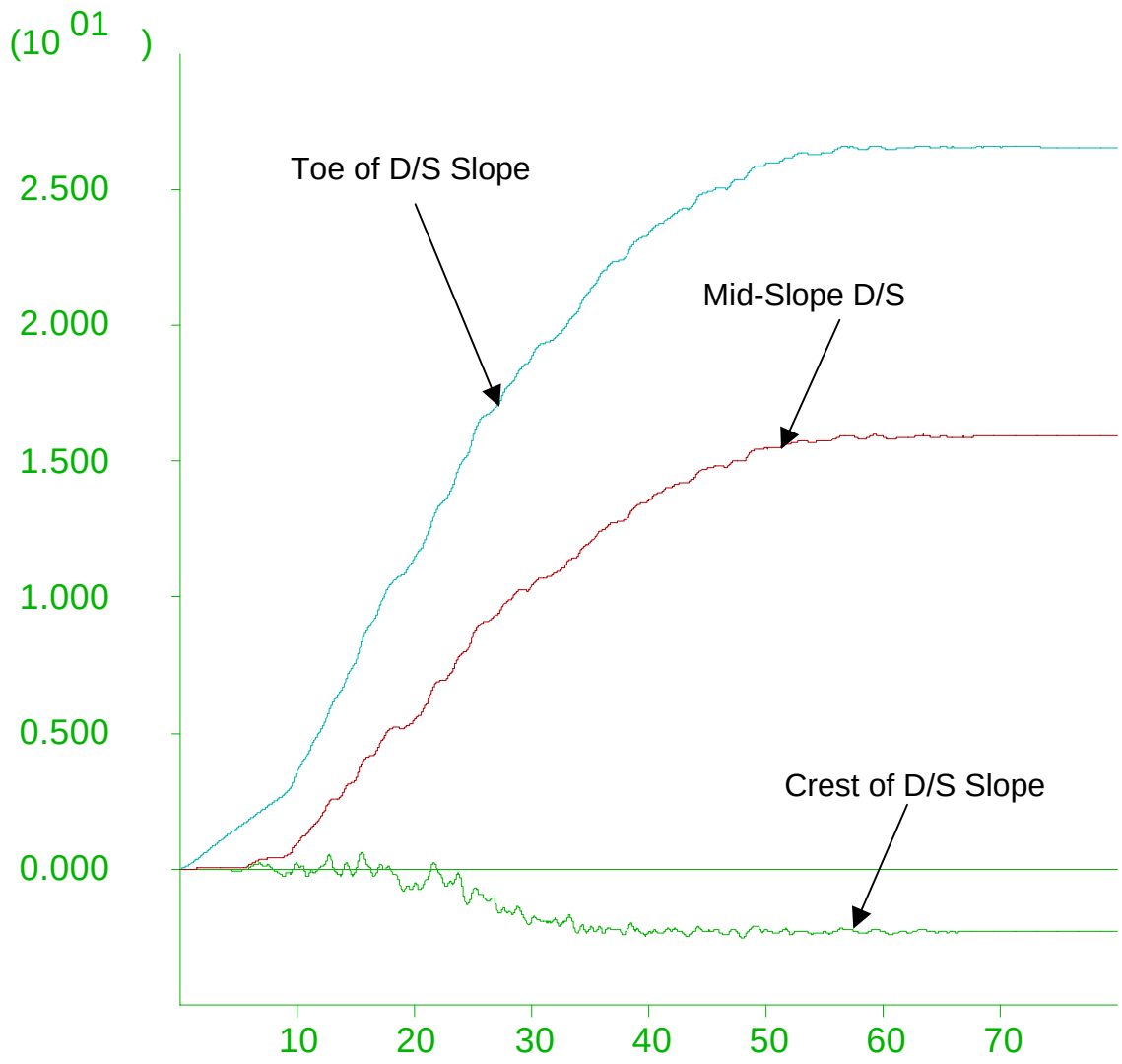
Exaggerated Grid Distortion

Magnification = 5.000E+00
Max Disp = 2.735E+01



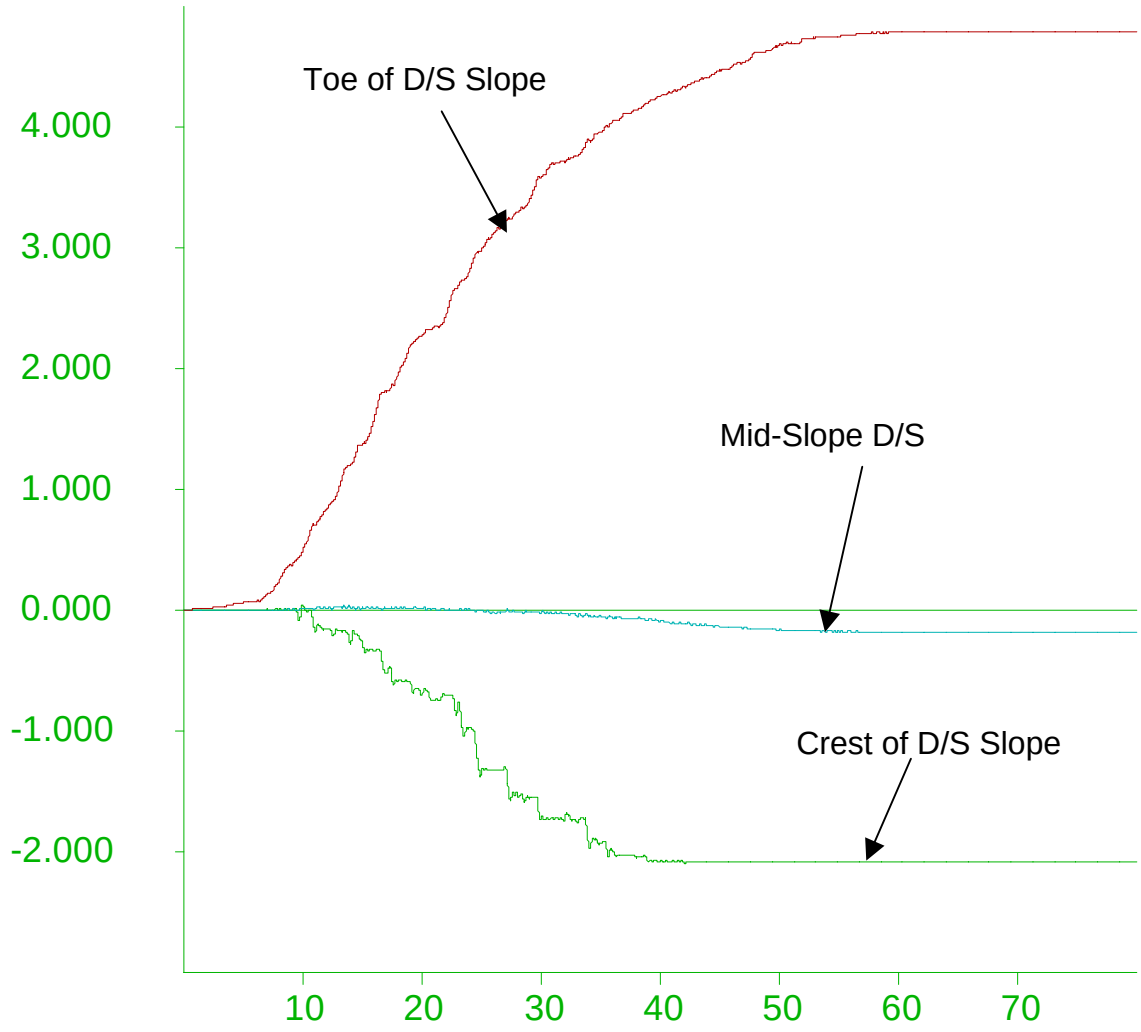
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Deformed vs. Un-deformed Grid Mid-Sea Dam Model 2 32 Degree Friction Angle
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.46**

HISTORY PLOT
Y-axis :
17 X displacement(60, 29)
23 X displacement(95, 22)
29 X displacement(111, 17)
X-axis :
1 Dynamic time



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Graph of X Displacement Mid-Sea Dam Model 2 32 Degree Fiction Angle
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.47**

HISTORY PLOT
Y-axis :
18 Y displacement(60, 29)
24 Y displacement(95, 22)
30 Y displacement(111, 17)
X-axis :
1 Dynamic time

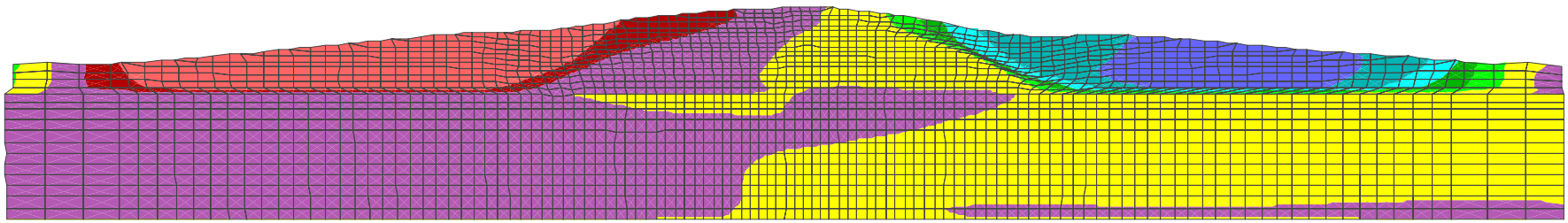


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of Y Displacement Mid-Sea Dam Model 2 32 Degree Fiction Angle
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.48**

X-displacement contours

-1.00E+01
-5.00E+00
0.00E+00
5.00E+00
1.00E+01
1.50E+01
2.00E+01
2.50E+01

Contour interval= 5.00E+00

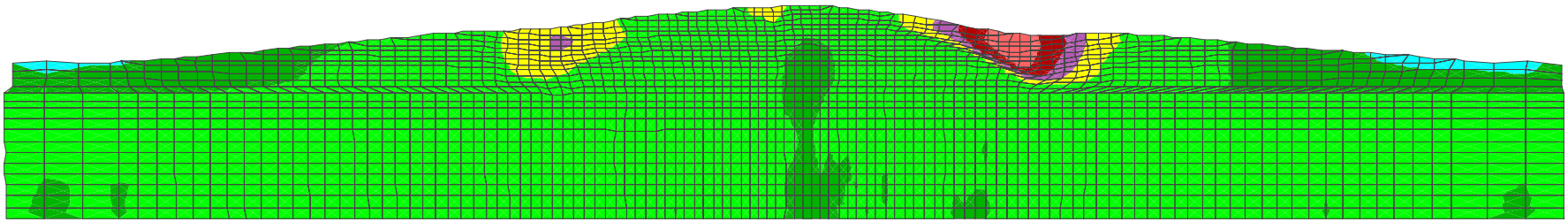


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			X Displacement Mid-Sea Dam Model 2 34 Degree Friction Angle
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.49**

Y-displacement contours

-1.00E+01
-7.50E+00
-5.00E+00
-2.50E+00
0.00E+00
2.50E+00

Contour interval= 2.50E+00

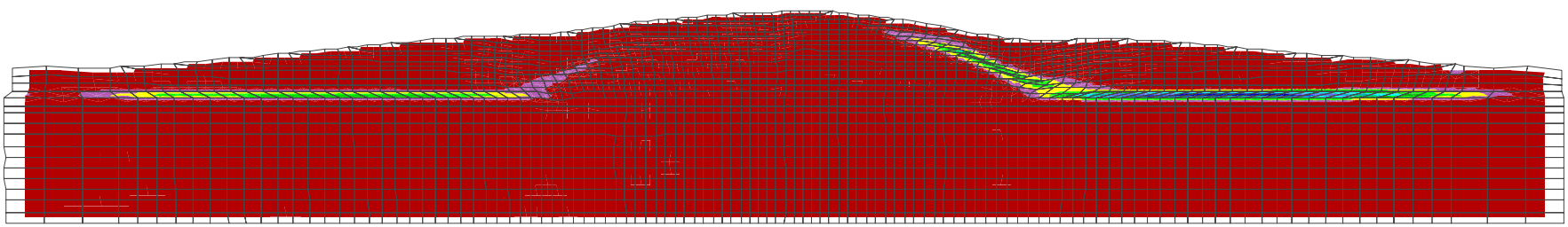


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Y Displacement Mid-Sea Dam Model 2 34 Degree Friction Angle
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.50**

Max. shear strain increment

0.00E+00
2.50E-01
5.00E-01
7.50E-01
1.00E+00
1.25E+00
1.50E+00
1.75E+00
2.00E+00

Contour interval= 2.50E-01



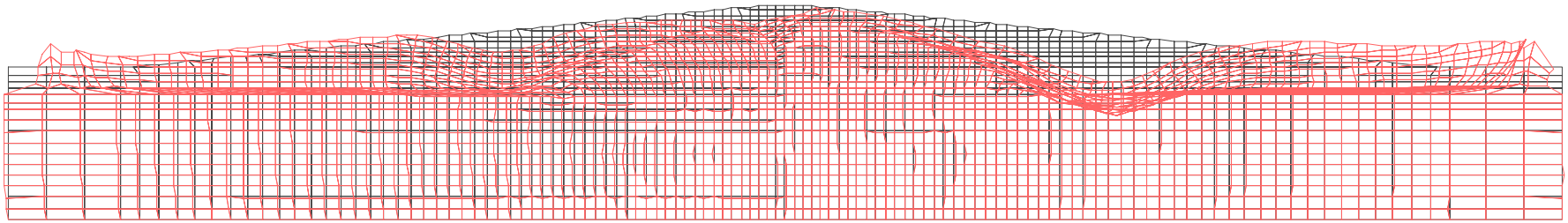
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Shear Strain Increment Mid-Sea Dam Model 2 34 Degree Friction Angle
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.51**

Exaggerated Grid Distortion

Magnification = 0.000E+00
Max Disp = 2.732E+01

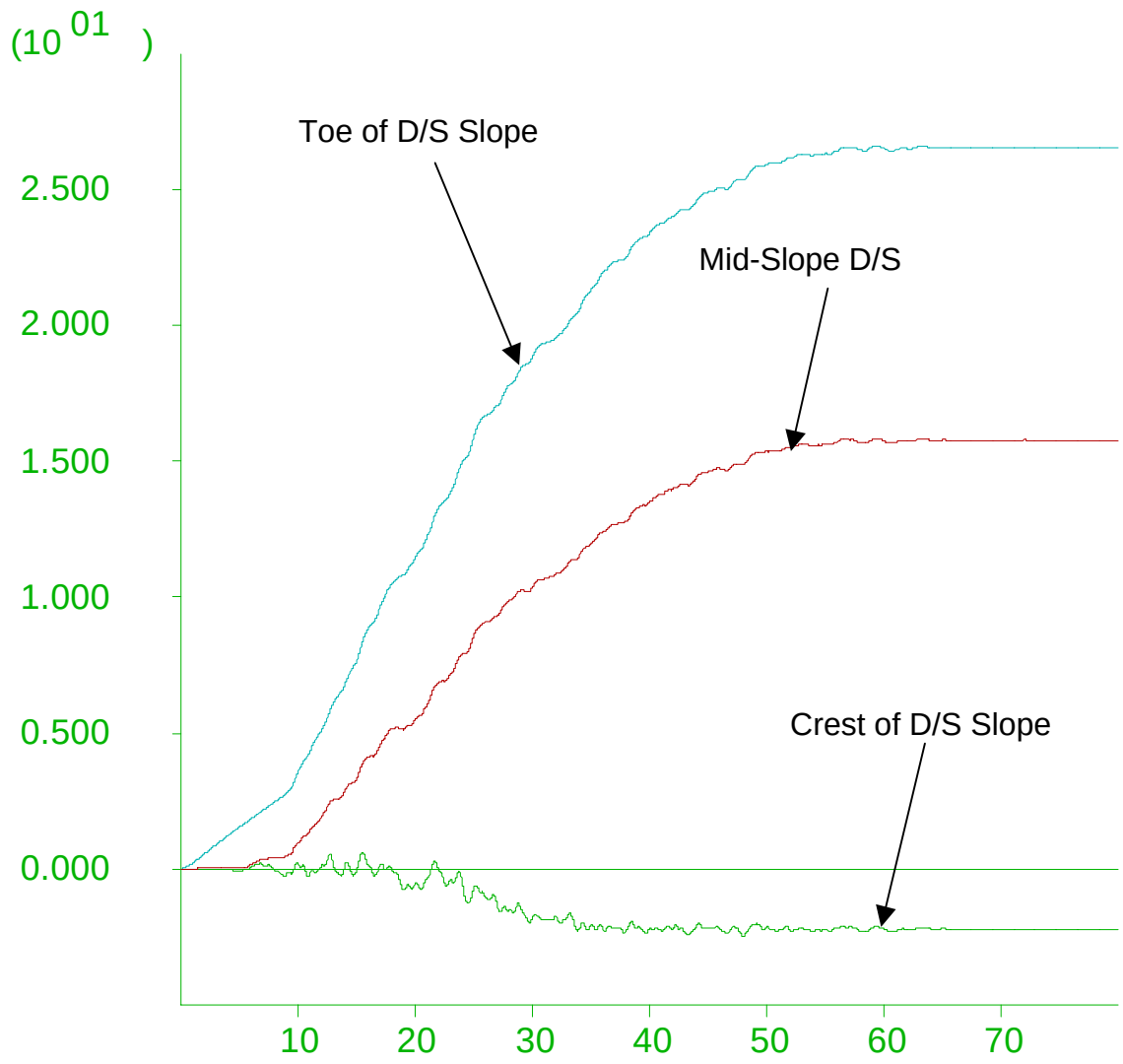
Exaggerated Grid Distortion

Magnification = 5.000E+00
Max Disp = 2.732E+01



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Deformed vs. Un-deformed Grid Mid-Sea Dam Model 2 34 Degree Friction Angle
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.52**

HISTORY PLOT
Y-axis :
17 X displacement(60, 29)
23 X displacement(95, 22)
29 X displacement(111, 17)
X-axis :
1 Dynamic time

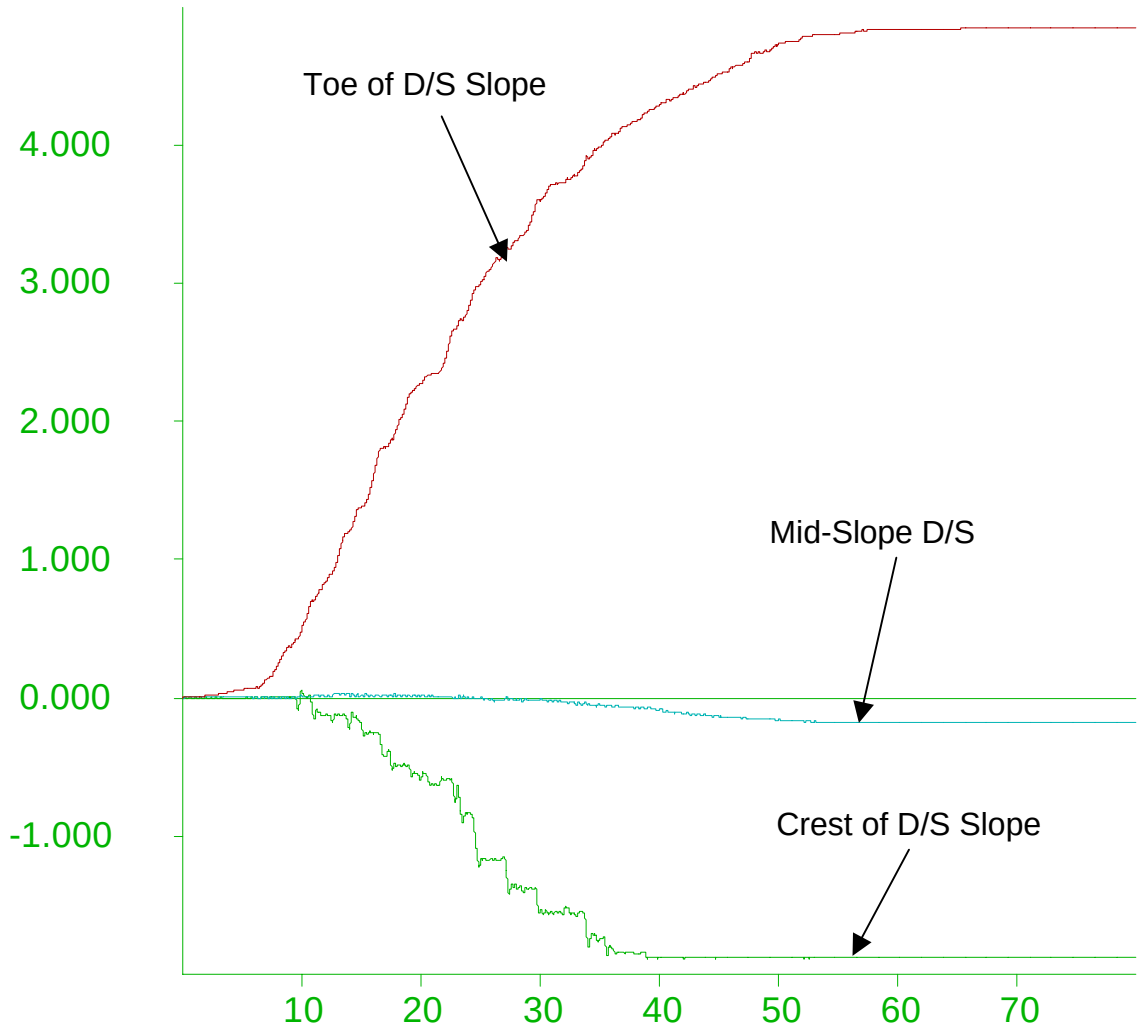


X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of X Displacement Mid-Sea Dam Model 2 34 Degree Fiction Angle
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.53**

HISTORY PLOT
Y-axis :
18 Y displacement(60, 29)
24 Y displacement(95, 22)
30 Y displacement(111, 17)
X-axis :
1 Dynamic time



X – axis, Time (seconds)

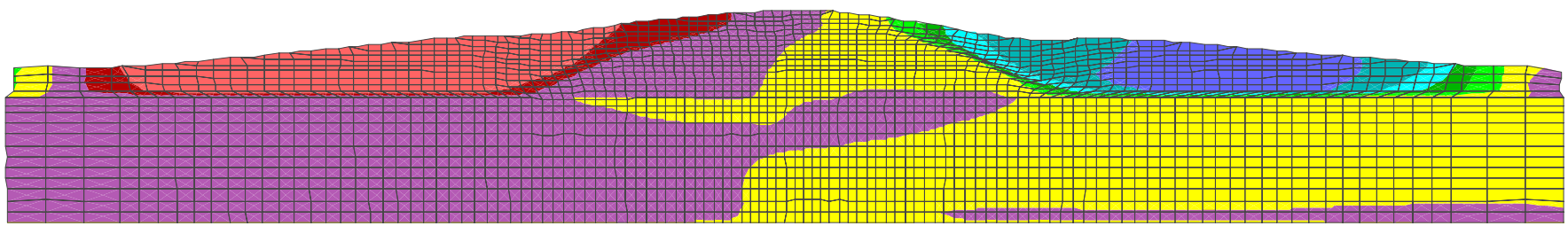
Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of Y Displacement Mid-Sea Dam Model 2 34 Degree Fiction Angle
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.54**

X-displacement contours

-1.00E+01
-5.00E+00
0.00E+00
5.00E+00
1.00E+01
1.50E+01
2.00E+01
2.50E+01

Contour interval= 5.00E+00

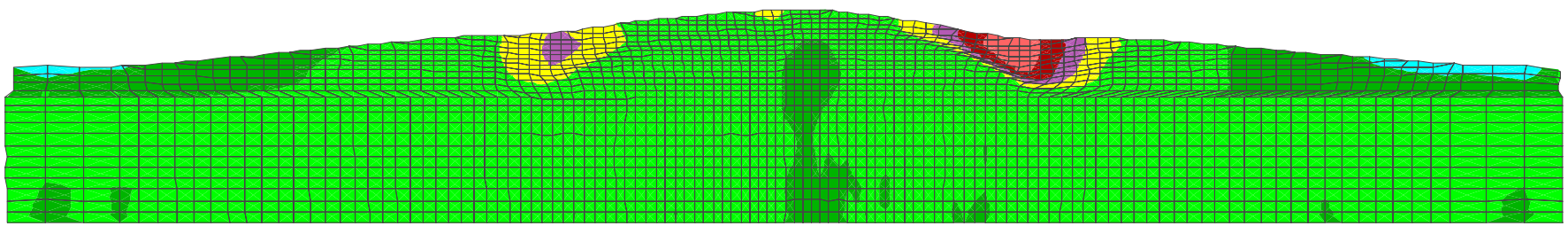


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	X Displacement Mid-Sea Dam Model 2 36 Degree Friction Angle
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.55**

Y-displacement contours

-1.00E+01
-7.50E+00
-5.00E+00
-2.50E+00
0.00E+00
2.50E+00
5.00E+00

Contour interval= 2.50E+00

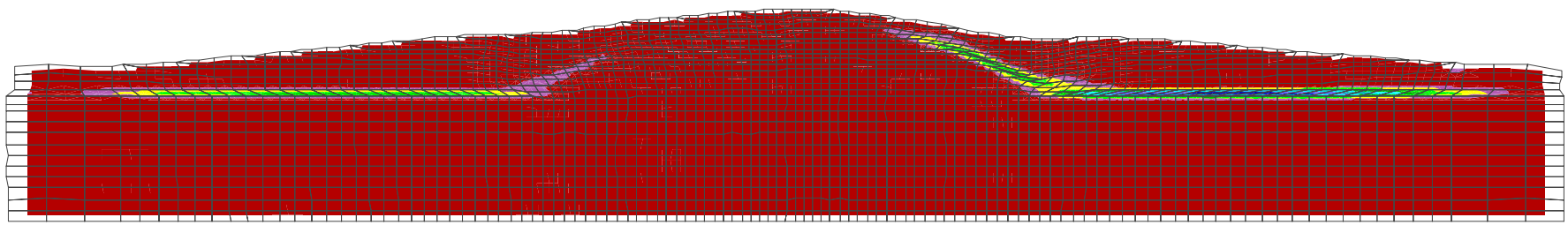


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Y Displacement Mid-Sea Dam Model 2 36 Degree Friction Angle
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.56**

Max. shear strain increment

0.00E+00
2.50E-01
5.00E-01
7.50E-01
1.00E+00
1.25E+00
1.50E+00
1.75E+00
2.00E+00

Contour interval= 2.50E-01



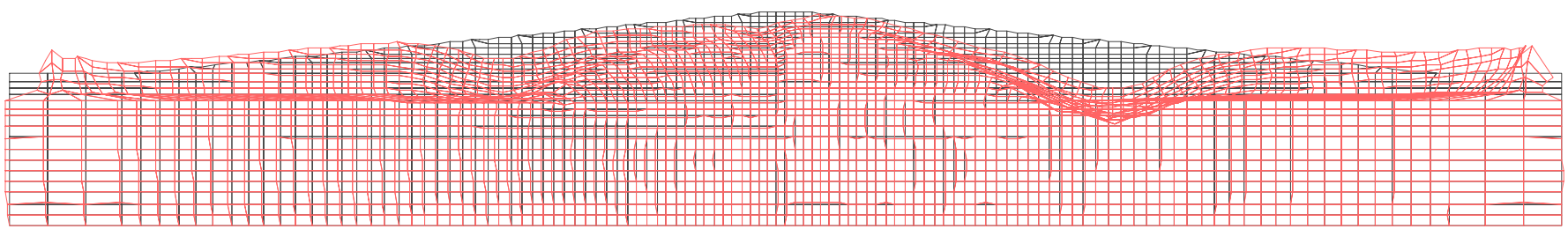
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Shear Strain Increment Mid-Sea Dam Model 2 36 Degree Friction Angle
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.57**

Exaggerated Grid Distortion

Magnification = 0.000E+00
Max Disp = 2.733E+01

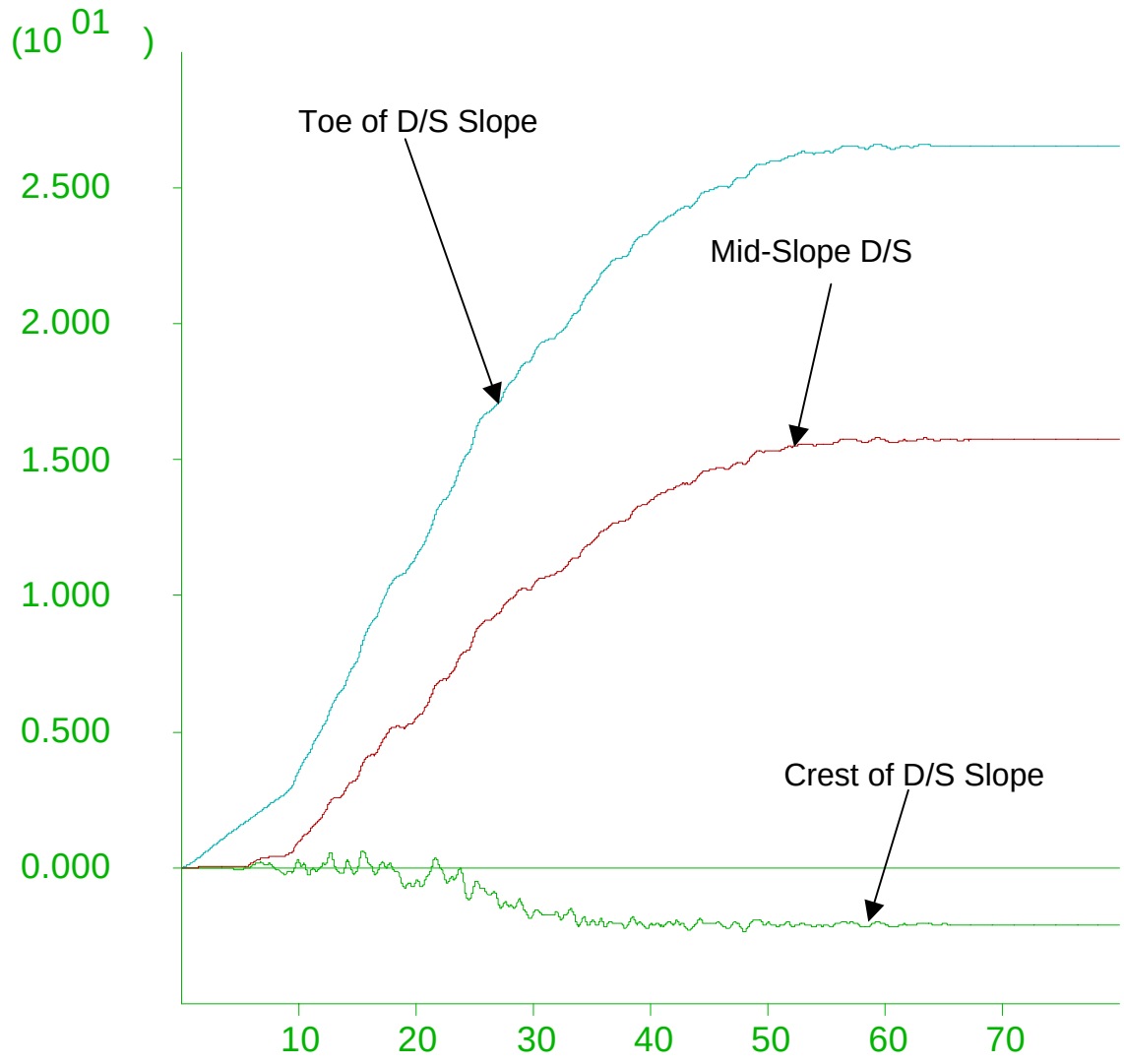
Exaggerated Grid Distortion

Magnification = 5.000E+00
Max Disp = 2.733E+01



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Deformed vs. Un-deformed Grid Mid-Sea Dam Model 2 36 Degree Friction Angle
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.58**

HISTORY PLOT
Y-axis :
17 X displacement(60, 29)
23 X displacement(95, 22)
29 X displacement(111, 17)
X-axis :
1 Dynamic time

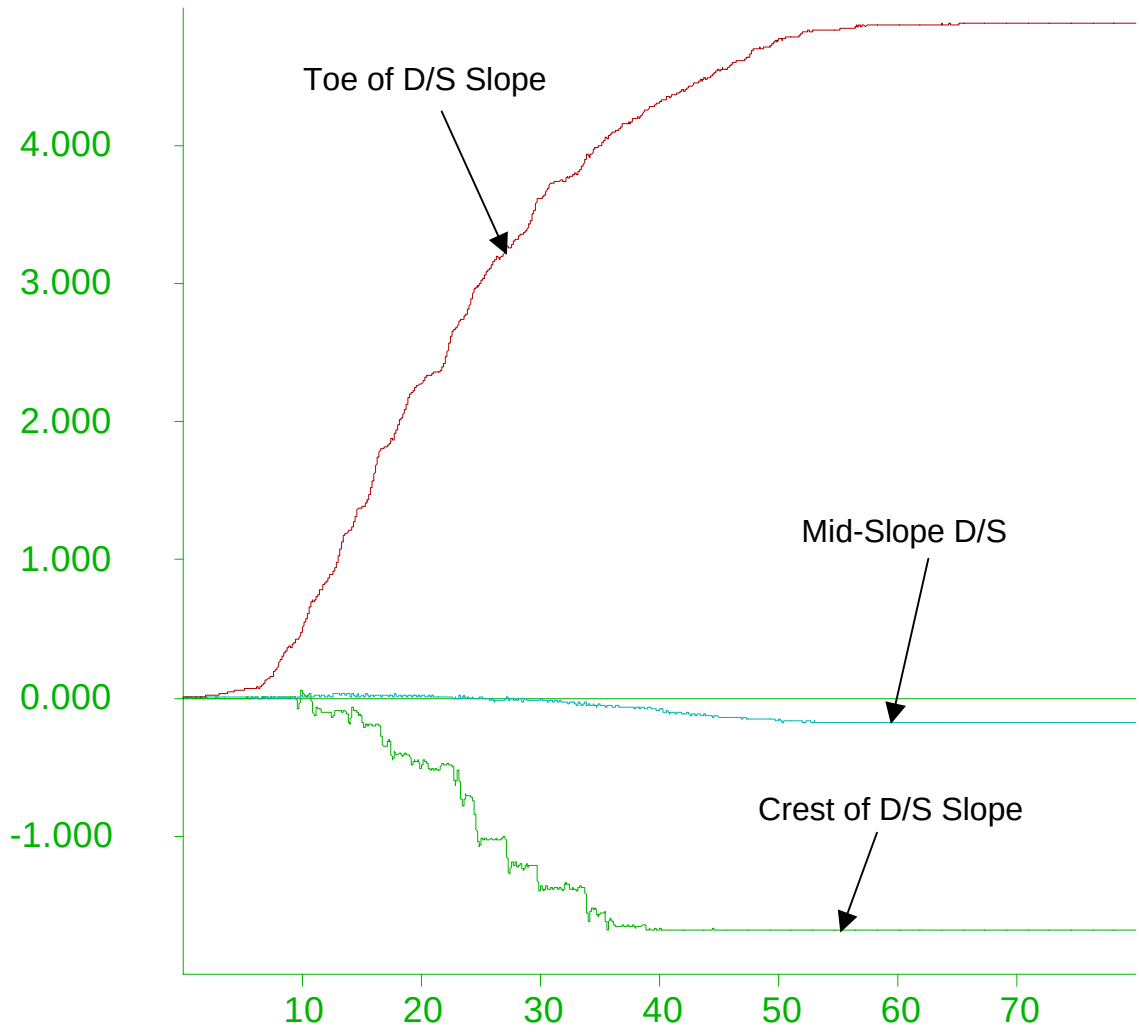


X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of X Displacement Mid-Sea Dam Model 2 36 Degree Friction Angle
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.59**

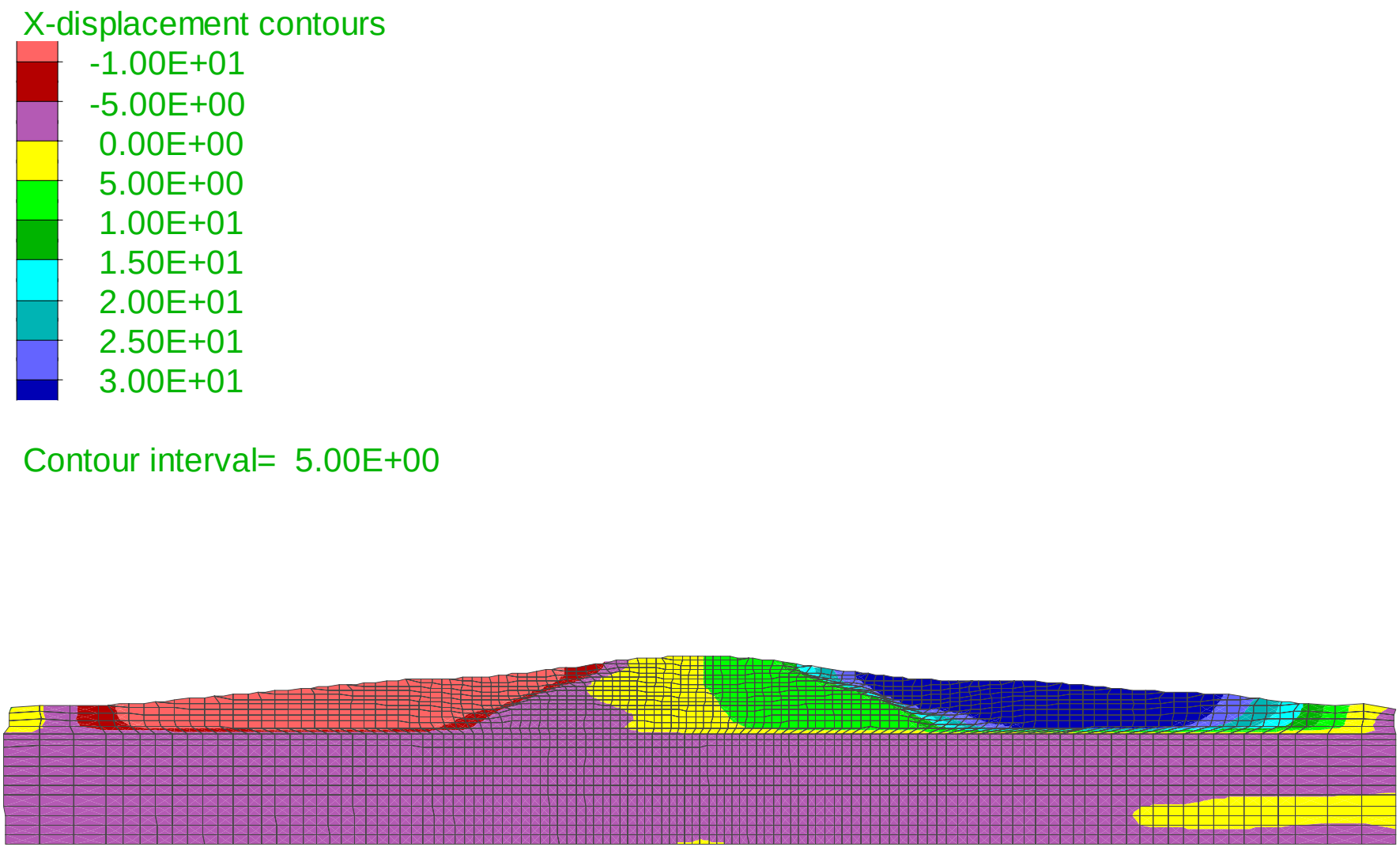
HISTORY PLOT
Y-axis :
18 Y displacement(60, 29)
24 Y displacement(95, 22)
30 Y displacement(111, 17)
X-axis :
1 Dynamic time



X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of Y Displacement Mid-Sea Dam Model 2 36 Degree Fiction Angle
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.60**

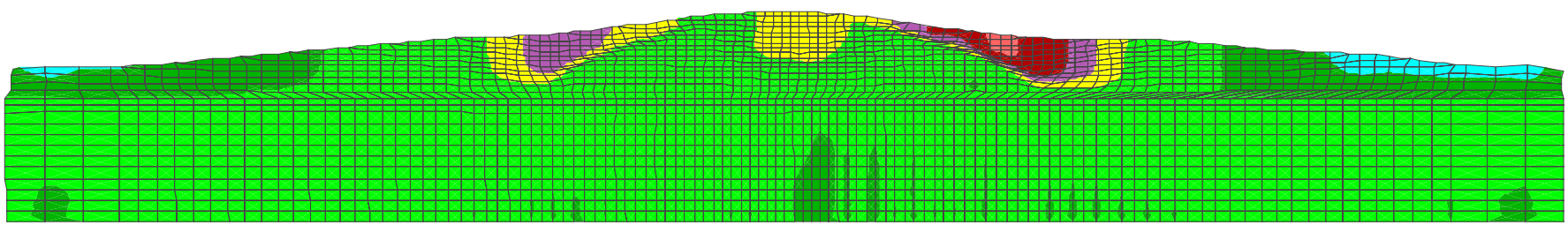


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	X Displacement Mid-Sea Dam Model 2 200 psf Shell
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.61**

Y-displacement contours

-1.00E+01
-7.50E+00
-5.00E+00
-2.50E+00
0.00E+00
2.50E+00

Contour interval= 2.50E+00

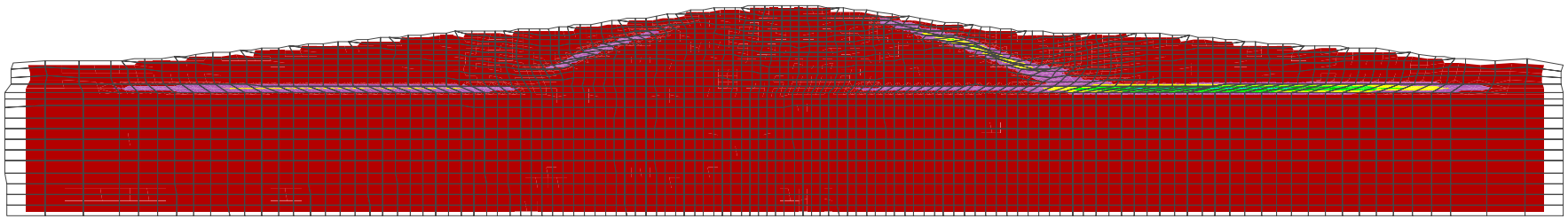


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Y Displacement Mid-Sea Dam Model 2 200 psf Shell
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.62**

Max. shear strain increment

0.00E+00
5.00E-01
1.00E+00
1.50E+00
2.00E+00
2.50E+00

Contour interval= 5.00E-01



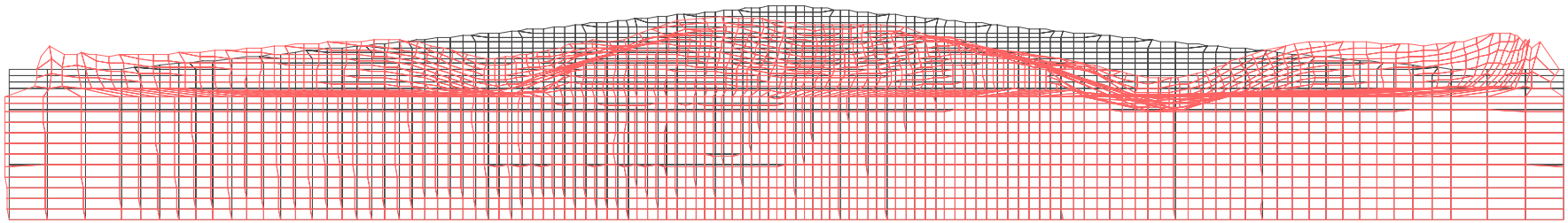
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Shear Strain Increment Mid-Sea Dam Model 2 200 psf Shell
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.63**

Exaggerated Grid Distortion

Magnification = 0.000E+00
Max Disp = 3.430E+01

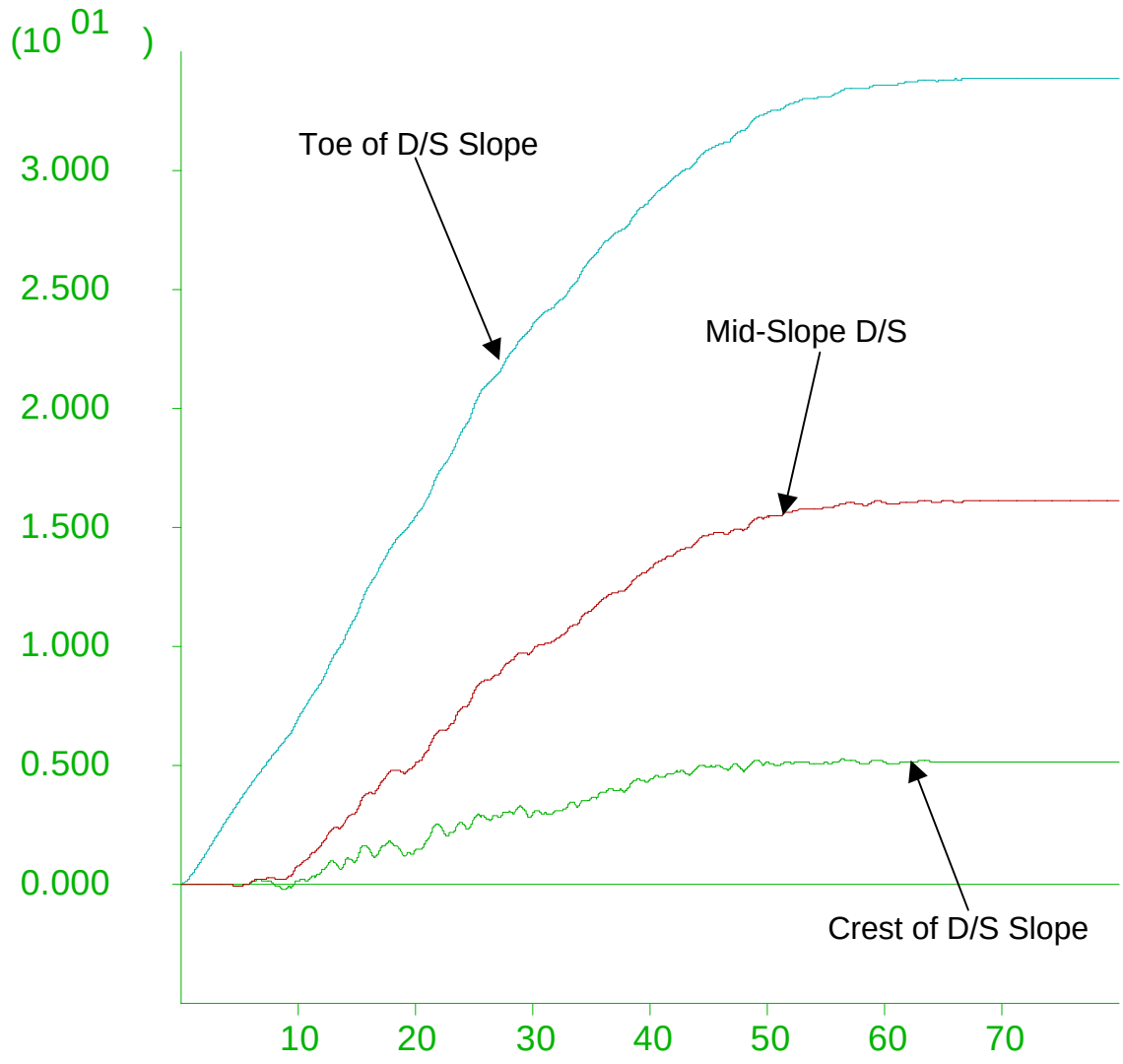
Exaggerated Grid Distortion

Magnification = 5.000E+00
Max Disp = 3.430E+01



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Deformed vs. Un-deformed Grid Mid-Sea Dam Model 2 200 psf Shell
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.64**

HISTORY PLOT
Y-axis :
17 X displacement(60, 29)
23 X displacement(95, 22)
29 X displacement(111, 17)
X-axis :
1 Dynamic time

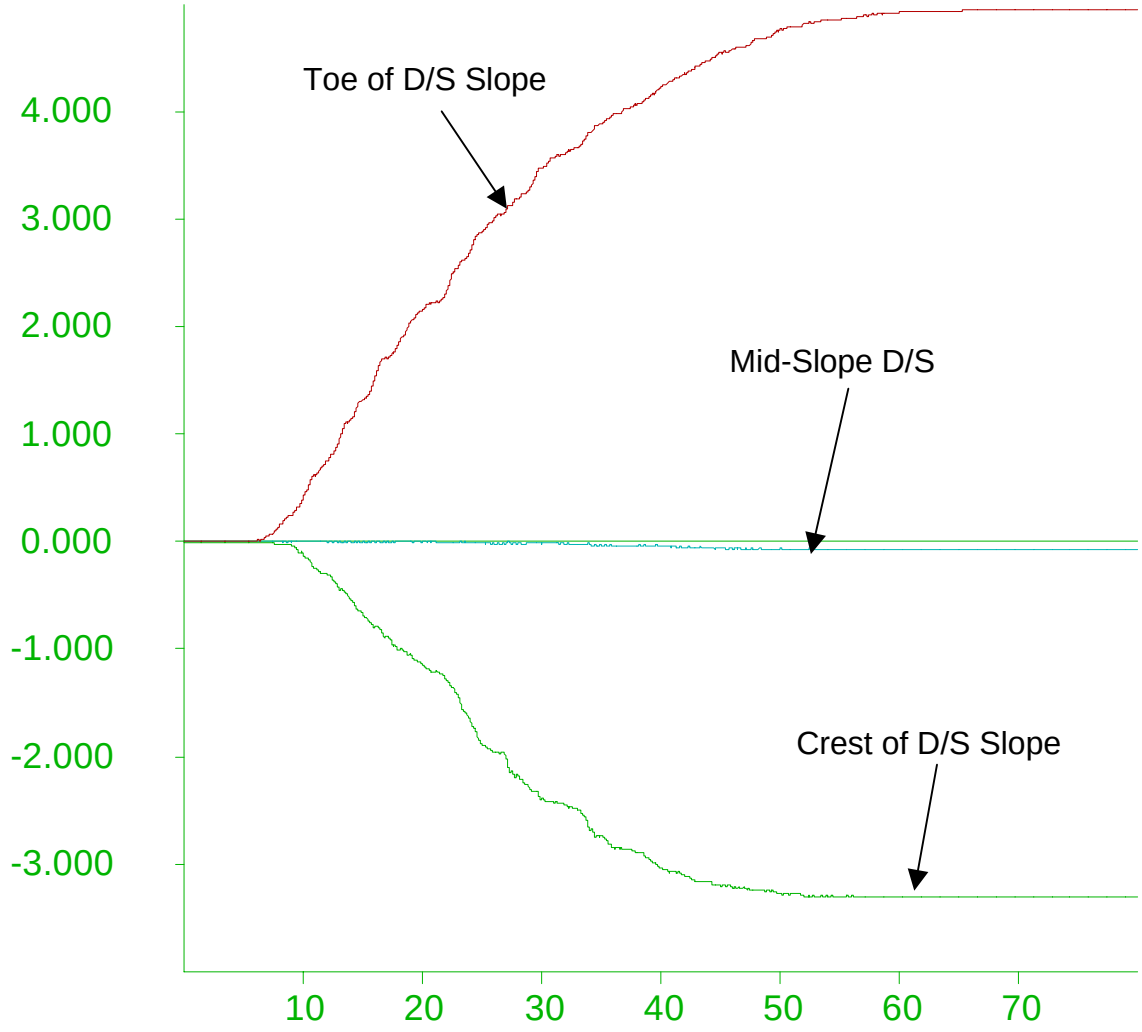


X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Graph of X Displacement Mid-Sea Dam Model 2 200 psf Shell
KLEINFELDER	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.65**

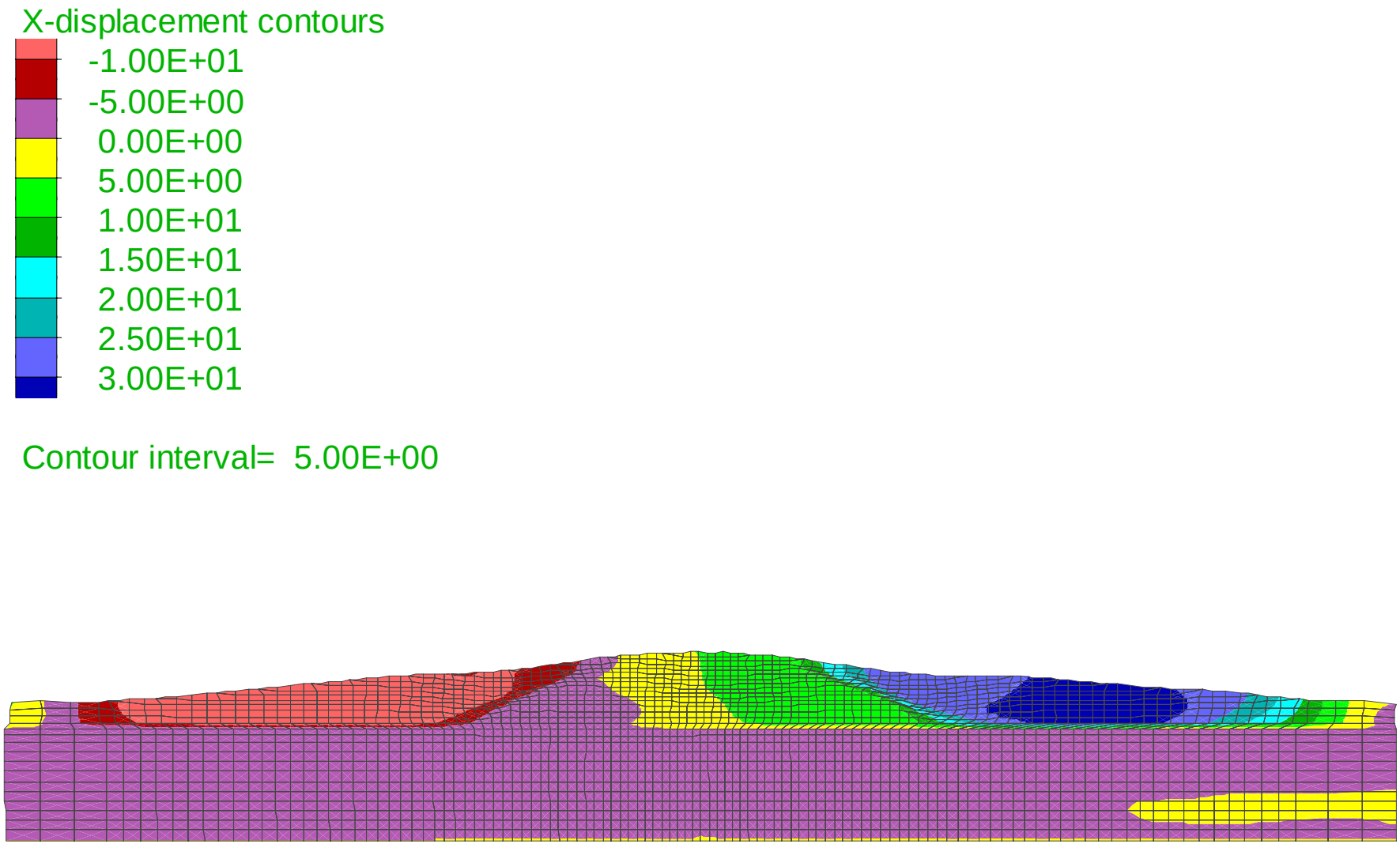
HISTORY PLOT
Y-axis :
18 Y displacement(60, 29)
24 Y displacement(95, 22)
30 Y displacement(111, 17)
X-axis :
1 Dynamic time



X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Graph of Y Displacement Mid-Sea Dam Model 2 200 psf Shell
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.66**

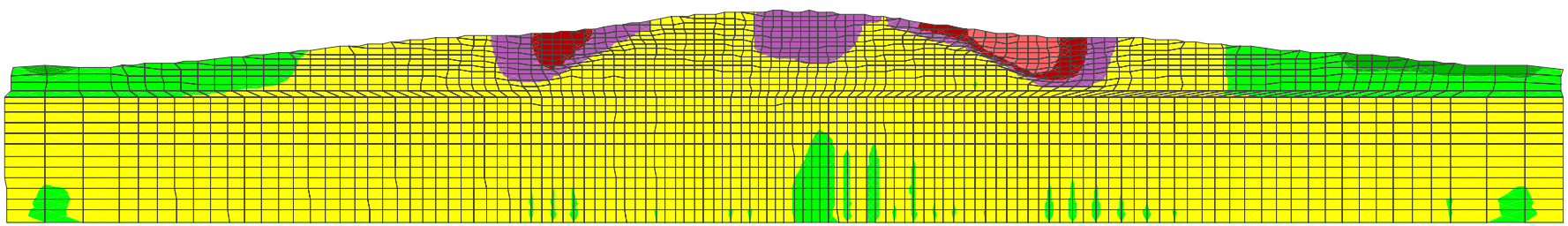


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	X Displacement Mid-Sea Dam Model 2 300 psf Shell
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.67**

Y-displacement contours

-7.50E+00
-5.00E+00
-2.50E+00
0.00E+00
2.50E+00

Contour interval= 2.50E+00

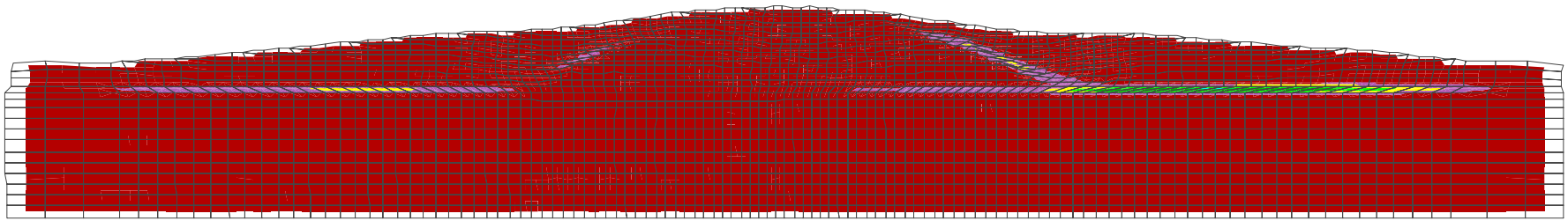


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Y Displacement Mid-Sea Dam Model 2 300 psf Shell
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.68**

Max. shear strain increment

0.00E+00
5.00E-01
1.00E+00
1.50E+00
2.00E+00
2.50E+00

Contour interval= 5.00E-01



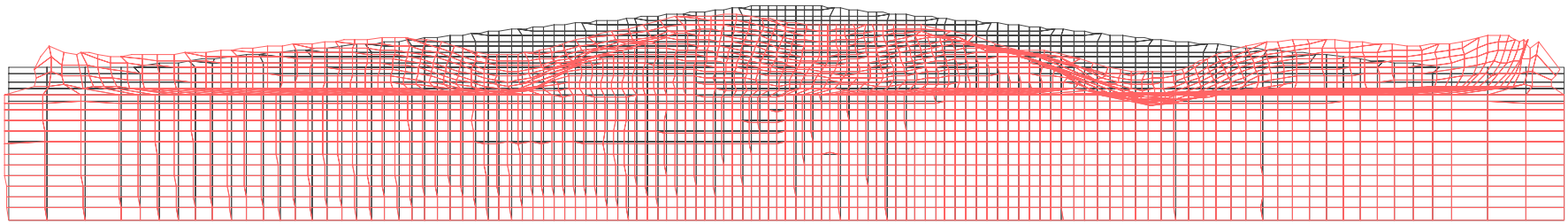
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Shear Strain Increment Mid-Sea Dam Model 2 300 psf Shell
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.69**

Exaggerated Grid Distortion

Magnification = 0.000E+00
Max Disp = 3.130E+01

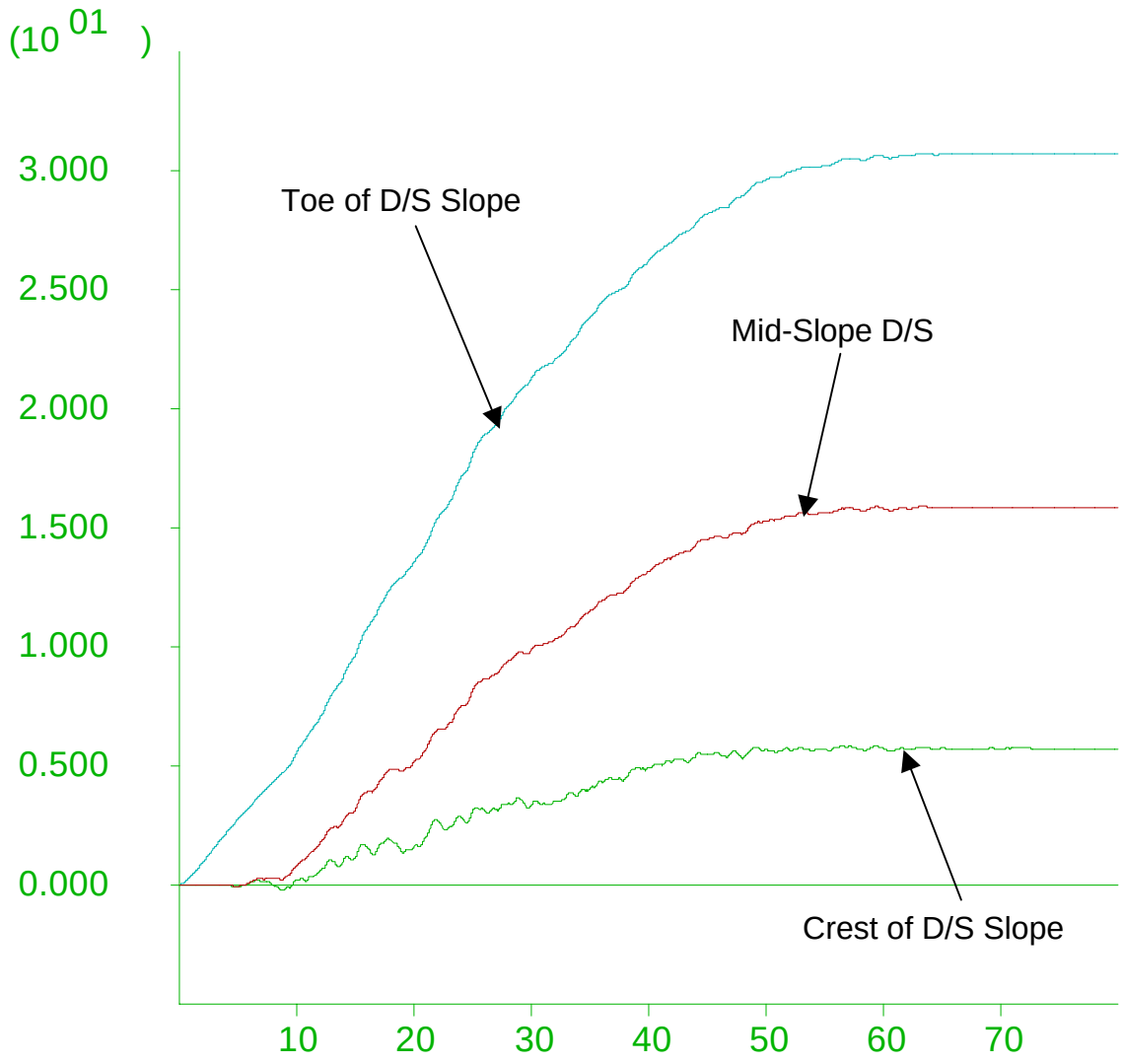
Exaggerated Grid Distortion

Magnification = 5.000E+00
Max Disp = 3.130E+01



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Deformed vs. Un-deformed Grid Mid-Sea Dam Model 2 300 psf Shell
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.70**

HISTORY PLOT
Y-axis :
17 X displacement(60, 29)
23 X displacement(95, 22)
29 X displacement(111, 17)
X-axis :
1 Dynamic time

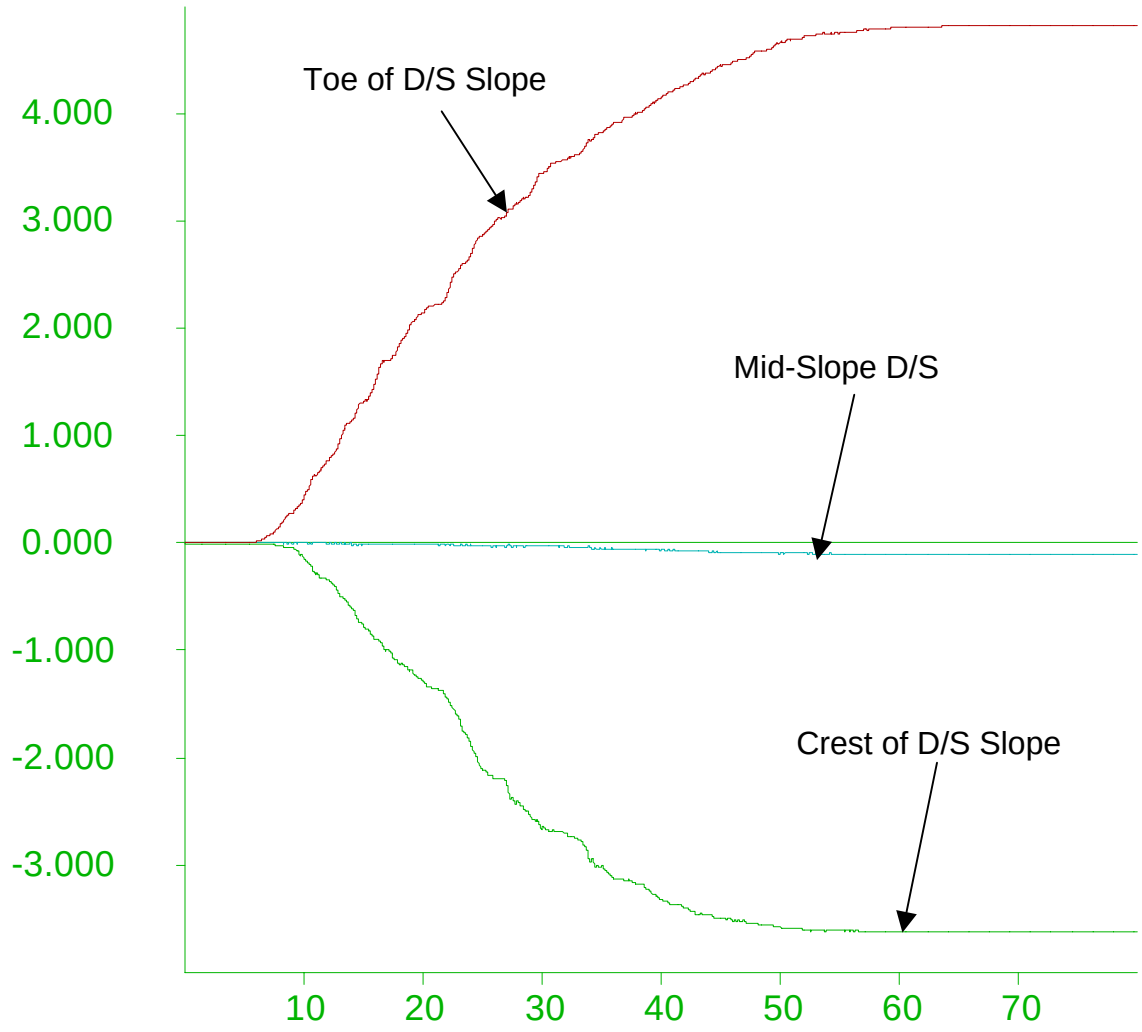


X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Graph of X Displacement Mid-Sea Dam Model 2 300 psf Shell
KLEINFELDER	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.71**

HISTORY PLOT
Y-axis :
18 Y displacement(60, 29)
24 Y displacement(95, 22)
30 Y displacement(111, 17)
X-axis :
1 Dynamic time



X – axis, Time (seconds)

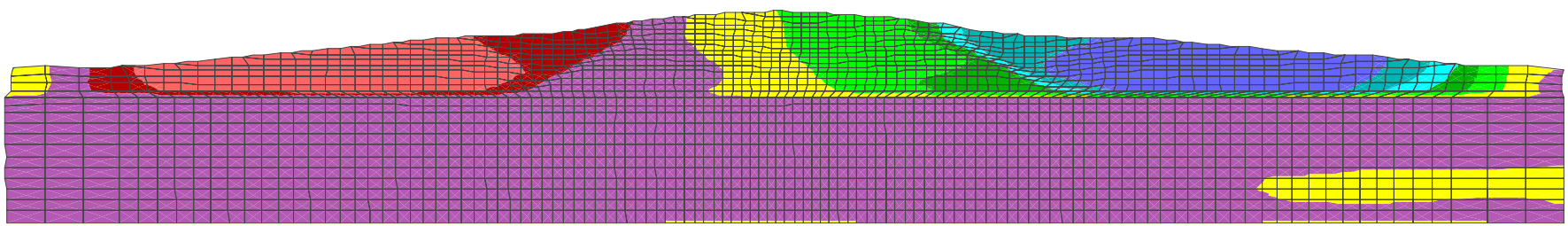
Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of Y Displacement Mid-Sea Dam Model 2 300 psf Shell
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.72**

X-displacement contours

-1.00E+01
-5.00E+00
0.00E+00
5.00E+00
1.00E+01
1.50E+01
2.00E+01
2.50E+01

Contour interval= 5.00E+00

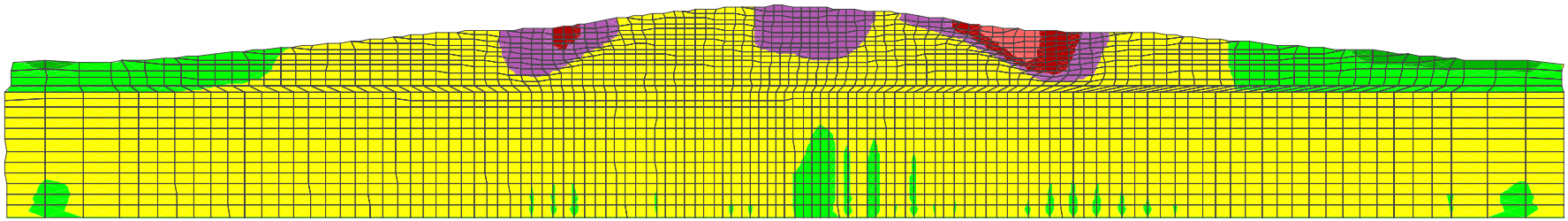


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			X Displacement Mid-Sea Dam Model 2 400 psf Shell
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.73**

Y-displacement contours

-7.50E+00
-5.00E+00
-2.50E+00
0.00E+00
2.50E+00

Contour interval= 2.50E+00

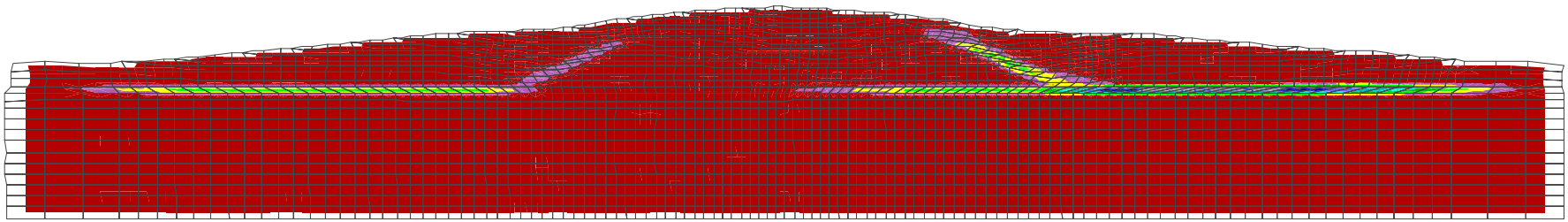


United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Y Displacement Mid-Sea Dam Model 2 400 psf Shell
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.74**

Max. shear strain increment

0.00E+00
2.50E-01
5.00E-01
7.50E-01
1.00E+00
1.25E+00
1.50E+00
1.75E+00
2.00E+00
2.25E+00

Contour interval= 2.50E-01



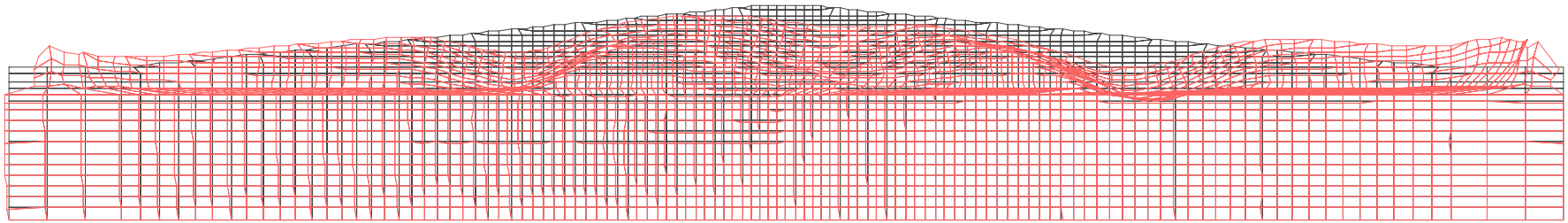
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Shear Strain Increment Mid-Sea Dam Model 2 400 psf Shell
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.75**

Exaggerated Grid Distortion

Magnification = 0.000E+00
Max Disp = 2.899E+01

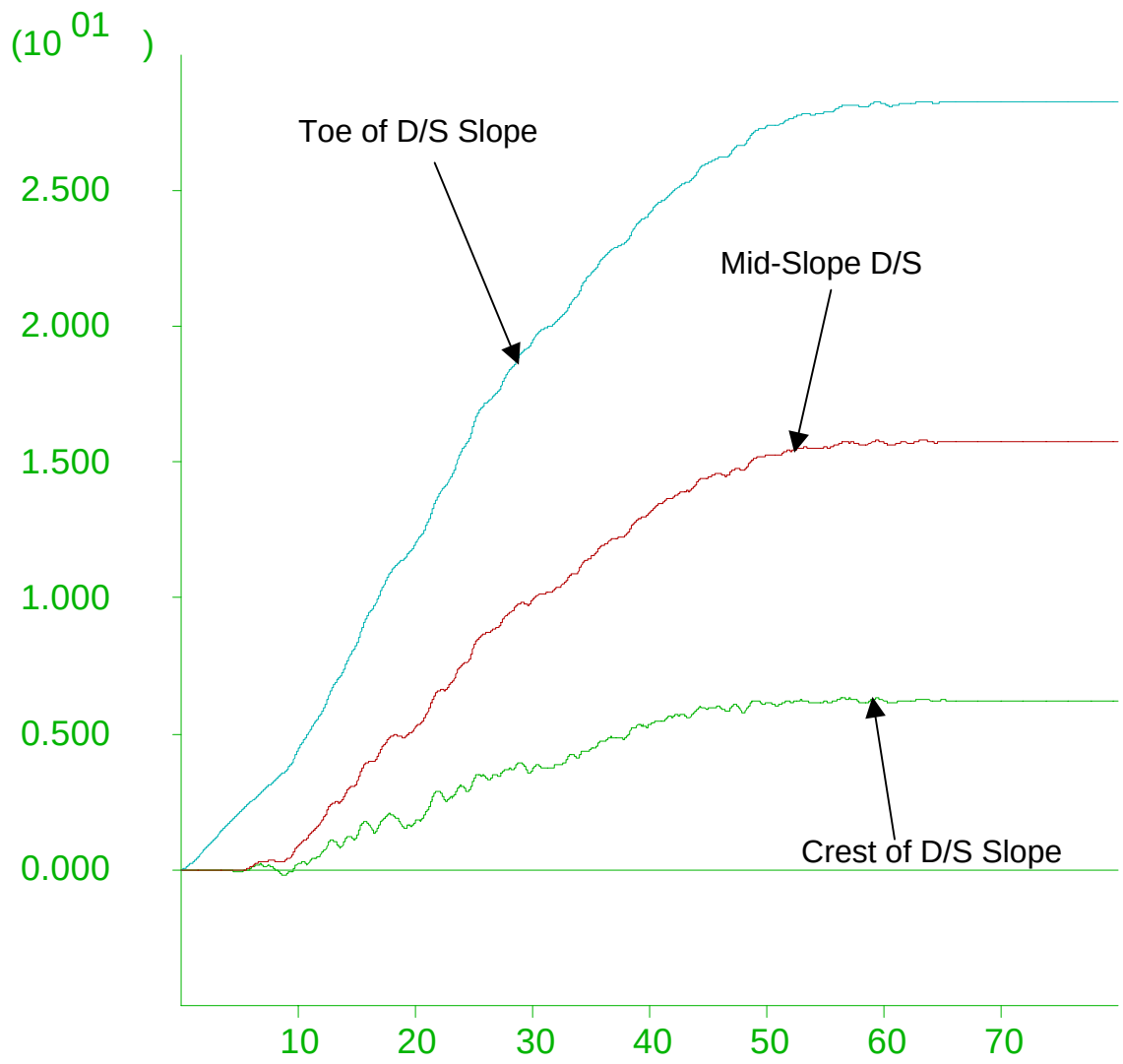
Exaggerated Grid Distortion

Magnification = 5.000E+00
Max Disp = 2.899E+01



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Deformed vs. Un-deformed Grid Mid-Sea Dam Model 2 400 psf Shell
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.76**

HISTORY PLOT
Y-axis :
17 X displacement(60, 29)
23 X displacement(95, 22)
29 X displacement(111, 17)
X-axis :
1 Dynamic time

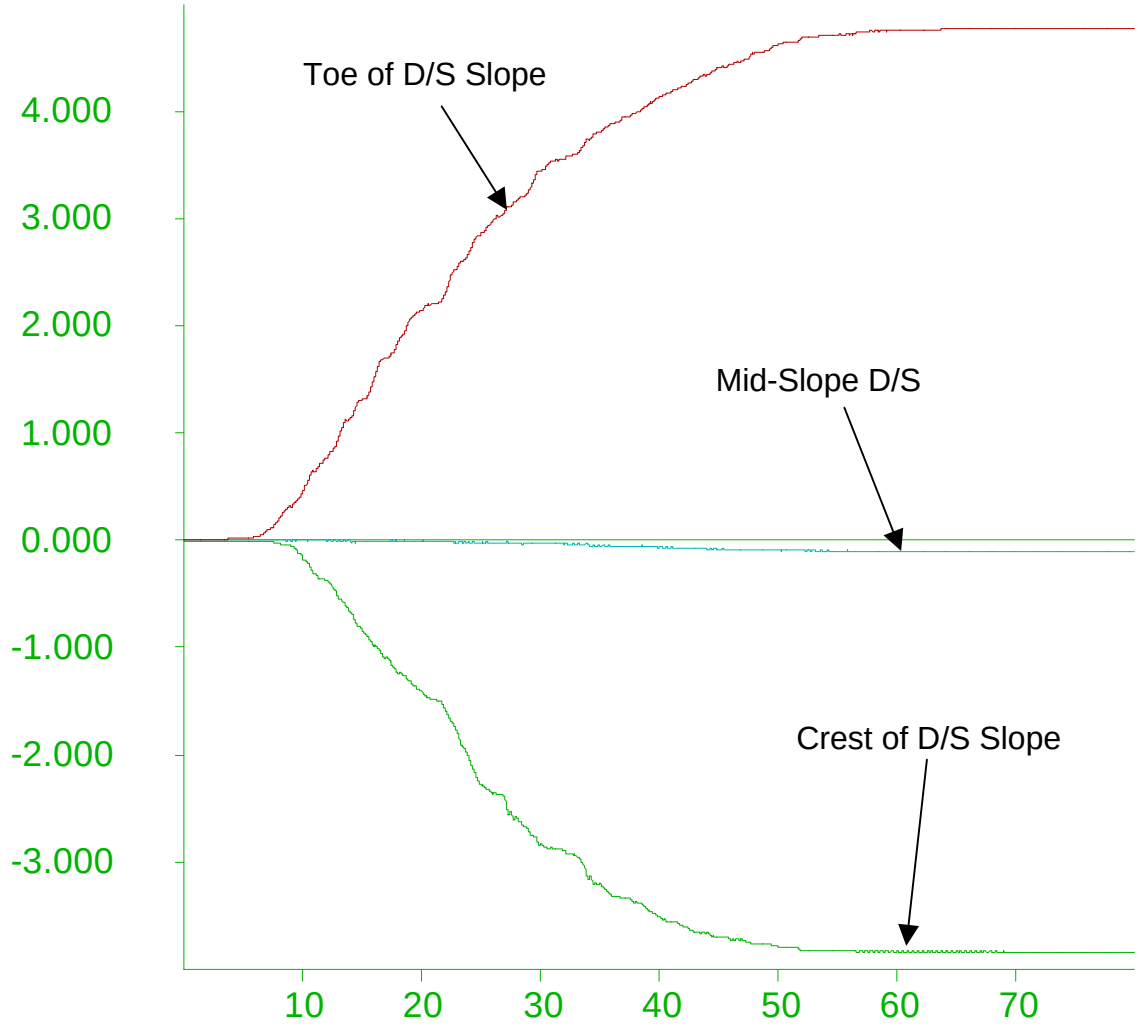


X – axis, Time (seconds)

Y – axis, Deformation (feet)

United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Graph of X Displacement Mid-Sea Dam Model 2 400 psf Shell
KLEINFELDER	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6. 77**

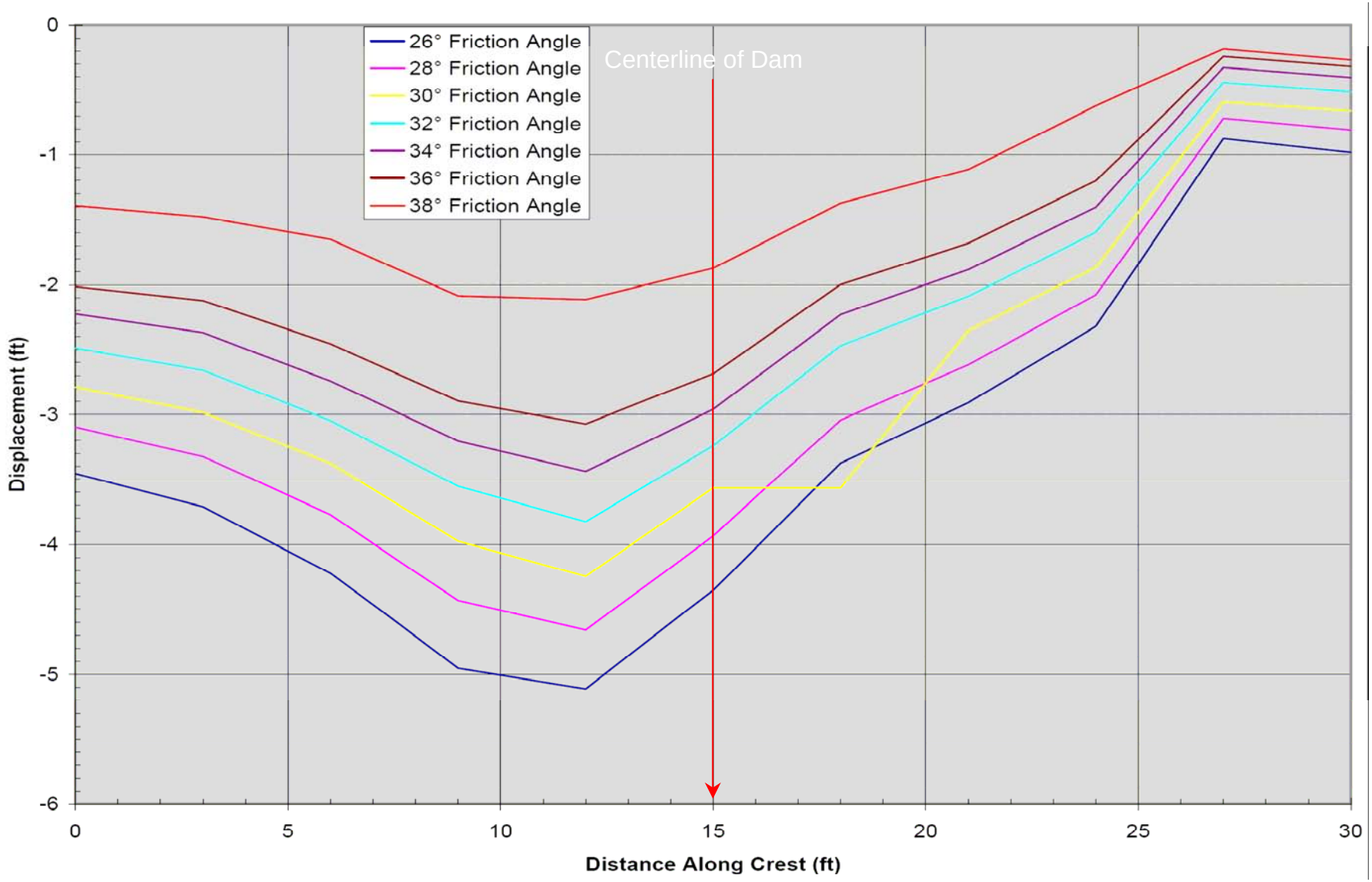
HISTORY PLOT
Y-axis :
18 Y displacement(60, 29)
24 Y displacement(95, 22)
30 Y displacement(111, 17)
X-axis :
1 Dynamic time



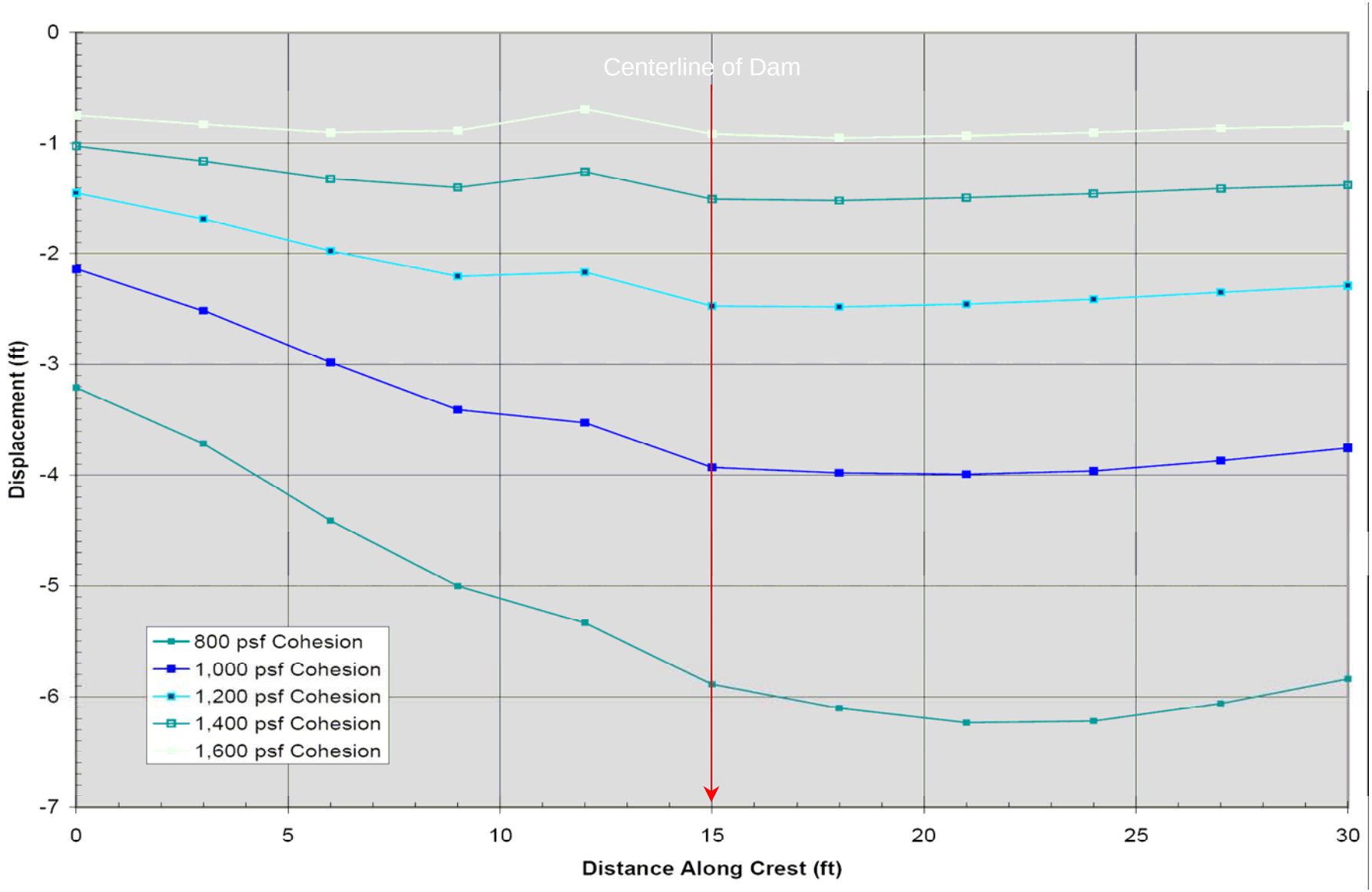
X – axis, Time (seconds)

Y – axis, Deformation (feet)

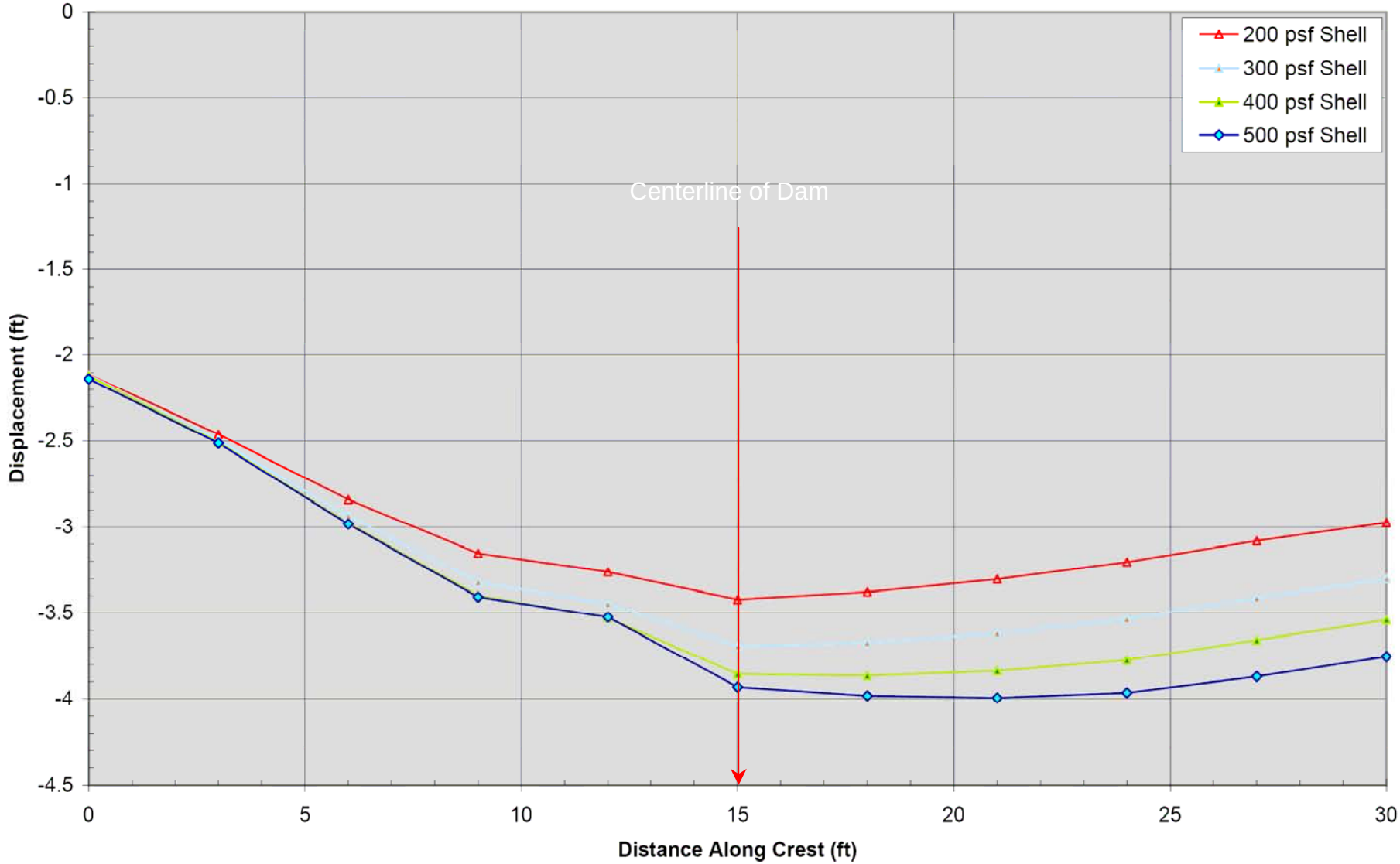
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Graph of Y Displacement Mid-Sea Dam Model 2 400 psf Shell
KLEINFELDER	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.78**



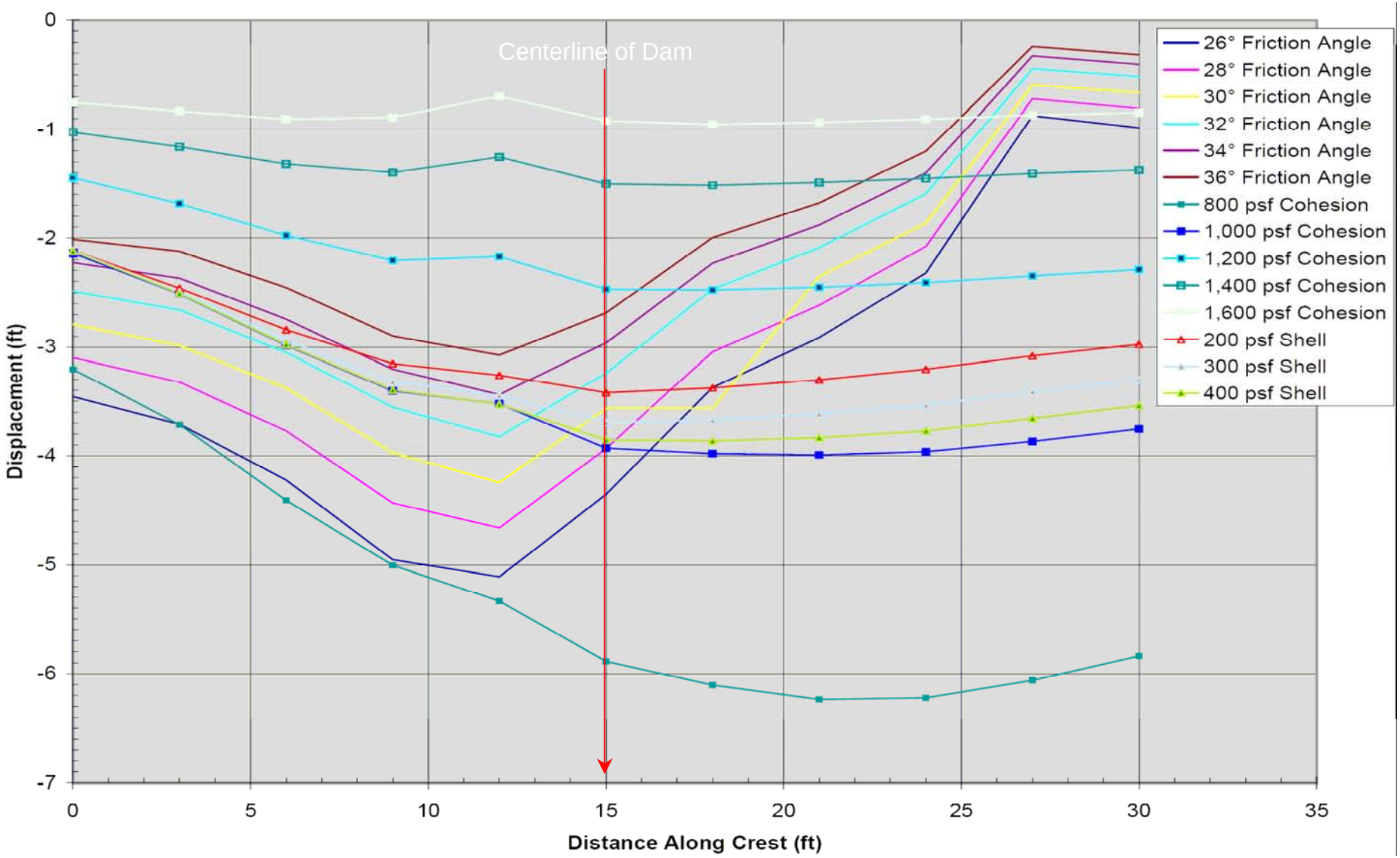
United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Effect of Core Shear Strength on Crest Displacements (Frictional)
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.79**



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Effect of Core Shear Strength on Crest Displacements (Cohesive)
K L E I N F E L D E R	Project 71100 / By S. Anderson / August 2006	**FIGURE C.6.80**



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses			Effect of Shell Shear Strength on Crest Displacements
K L E I N F E L D E R	Project 71100	By S. Anderson	August 2006	**FIGURE C.6.81**



United States Department of the Interior Bureau of Reclamation	**SALTON SEA RESTORATION PROJECT** EMBANKMENT DESIGNS AND OPTIMIZATION STUDY Appendix 2C – Deformation Analyses	Combined Chart with Effect of Core/Shell Shear Strengths on Crest Displacements
K L E I N F E L D E R	Project 71100 | By S. Anderson | August 2006	**FIGURE C.6.82**