

January 19, 2012

Project No. 3268

Colusa Riverbend Estates, LP

Attn: Mike Olivas

P.O. Box 406

Davis, CA 95617

PROJECT: RIVERBEND ESTATES - COLUSA

Re: Seepage Analysis

Dear Mike:

At your request, we performed a seepage analysis through the levee at the location of the Riverbend Estates project in Colusa, California.

To determine the surface topography, we reviewed the topographic data and cross sections provided by Genesis Engineering. In general, the site topography is at elevation 56 and the top of the levee is at elevation 75 feet. The slopes to the levee are slightly flatter than 3:1 (H:V).

We modeled the soil conditions based on our review of the borings logs from our previous geotechnical report and from the Raney Geotechnical Report. In generally, we modeled the upper 7 feet of the site as a clay, between 7 and 11 feet as a silty sand/sandy silt, and below that as a silty sand. We used permeabilities of $3.28e-7$ ft/sec for the clay, $3.28e-6$ ft/sec for the sandy silt, and $9.8e-4$ ft/sec for the silty sands.

We analyzed the seepage through the levee using Geo-Slope/W 2007 computer software. We analyzed two scenarios, one with water elevation of 63 feet (warning level) and one at 68 feet. It is important to note that the steady state analysis provides a conservative seepage because it assumes that the soil is fully saturated and ignores the fact that it takes time to saturate the soil. Often, the river might increase sporadically and decrease in a short period of time. In these conditions, our analysis will have over-estimated the seepage based on the steady state methods.

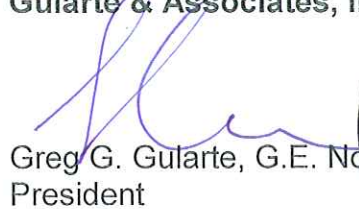
In general, we found that seepage through the levee was 1.4 cubic feet per day for a river elevation of 63, and 2.6 cubic feet per day for a river elevation of 68. These quantities are per lineal foot of levee.

It is interesting to note that only 1/3 of the total seepage volume extends 30 from the toe of the levee (for river elevation 68 feet). In other words, only 0.85 cubic feet per day per lineal foot of levee extends into the project limits.

Please call if you have questions or would like to discuss further.

Respectfully,

Gularte & Associates, Inc.

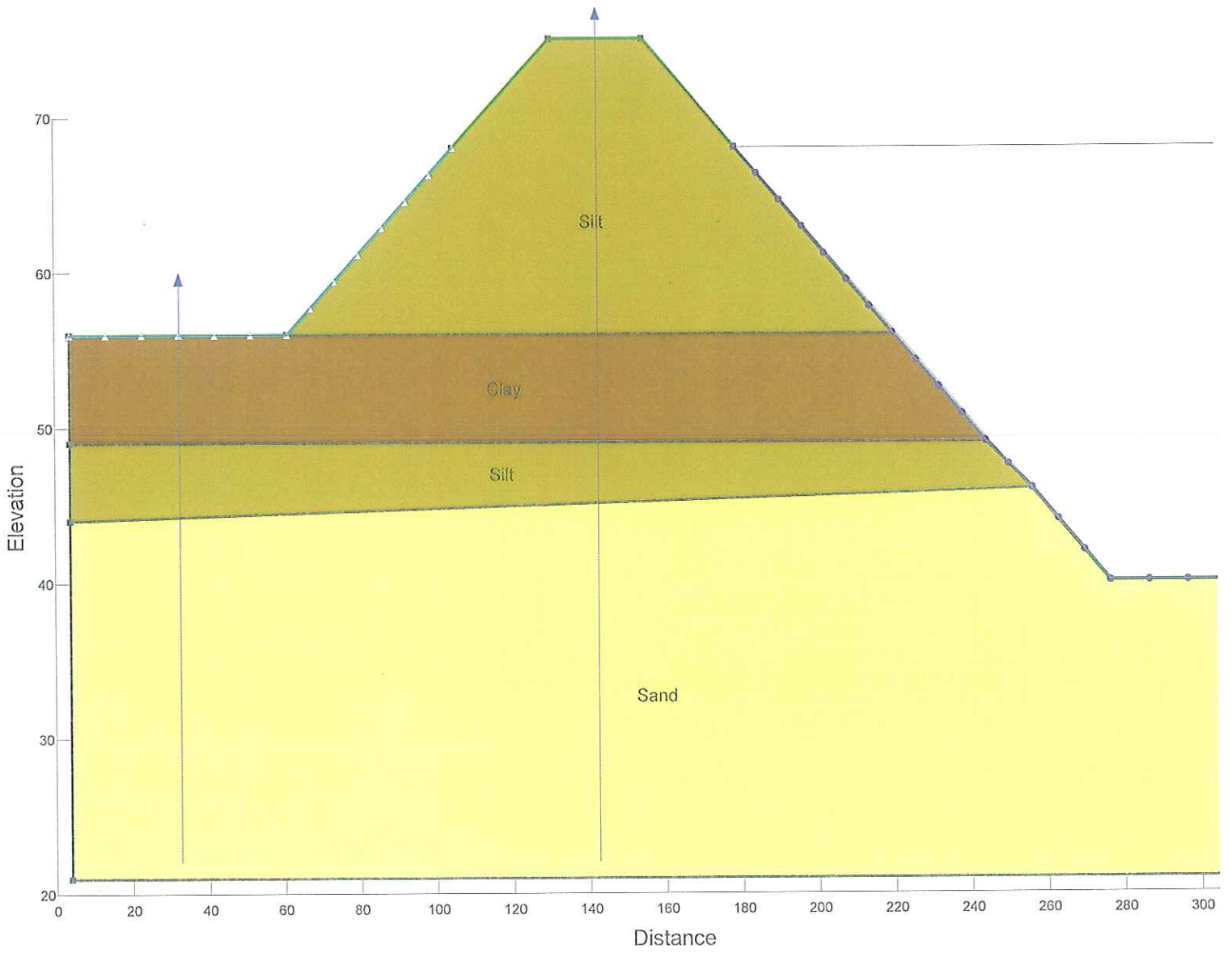


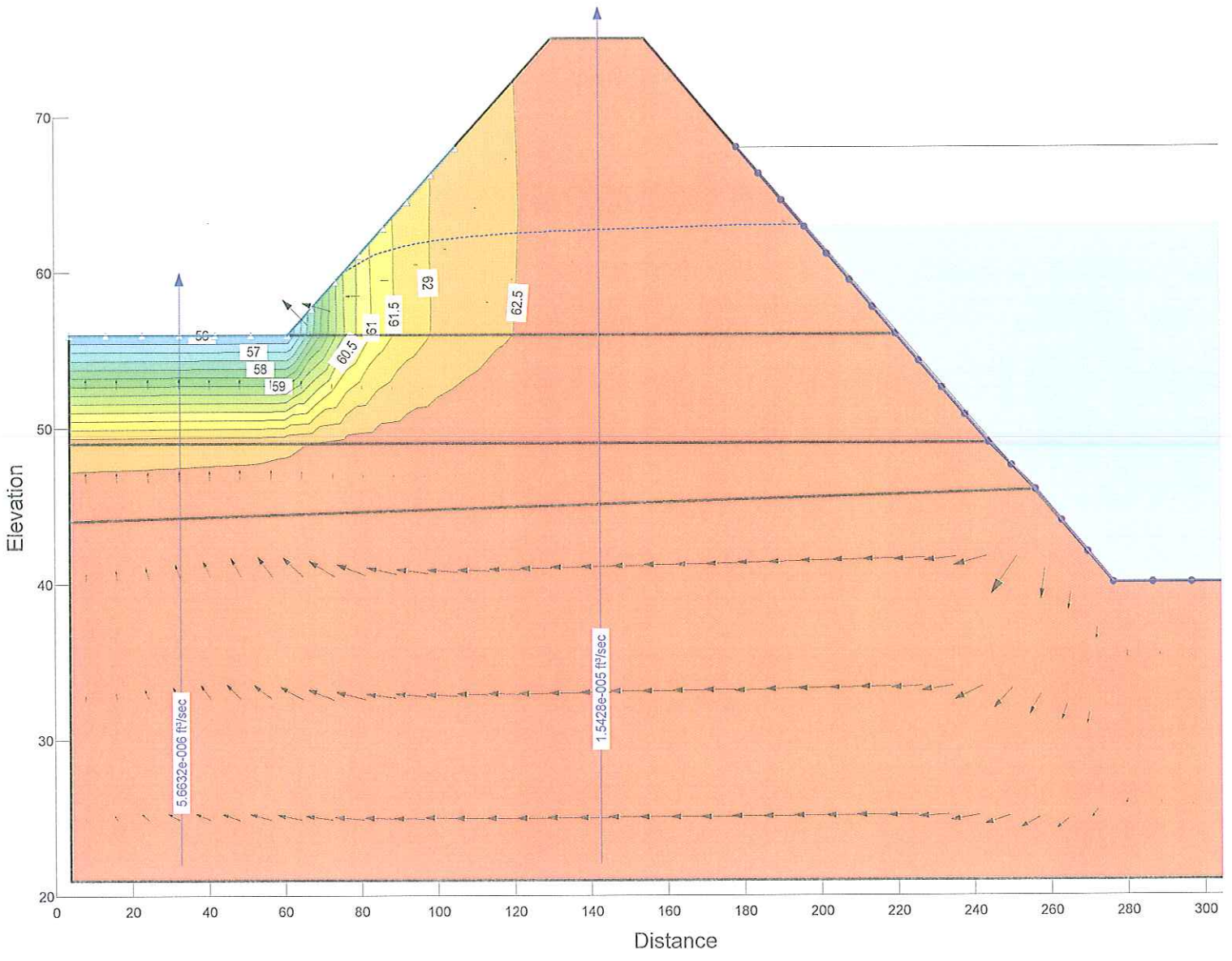
Greg G. Gularte, G.E. No. 2633
President



Seepage Analysis

River Elevation 63 Feet





colusa levee

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File Information

Created By: Greg Gularte
Revision Number: 22
Last Edited By: Greg Gularte
Date: 1/19/2012
Time: 2:56:15 PM
File Name: colusa seepage.gsz
Directory: G:\Projects- Gularte\Archives\3268 Riverbend Colusa 273 lots\
Last Solved Date: 1/19/2012
Last Solved Time: 2:58:46 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Mass(M) Units: lbs
Mass Flux Units: lbs/sec
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

colusa levee

Kind: SEEP/W
Method: Steady-State
Settings
 Include Air Flow: No
Control
 Apply Runoff: Yes
Convergence
 Convergence Type: Gauss Point K
 Convergence Settings
 Maximum Number of Iterations: 500
 Tolerance: 0.01
 Maximum Change in K: 0.1
 Rate of Change in K: 1.02
 Minimum Change in K: 0.0001
Equation Solver: Direct

Potential Seepage Max # of Reviews: 10

Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

Clay

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Silt

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-006 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sand

Model: Saturated Only

Hydraulic

K-Sat: 0.00098 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Boundary Conditions

Potential Seepage Face

Review: true

Type: Total Flux (Q) 0

River Level

Type: Head (H) 63

Flux Sections

Flux Section 1

Coordinates

Coordinate: (142.22222, 22) ft

Coordinate: (142.22222, 77) ft

Flux Section 2

Coordinates

Coordinate: (32.507937, 22) ft

Coordinate: (32.507937, 60) ft

Regions

	Material	Points	Area (ft ²)
Region 1	Clay	1,5,2,3,4	1592.8889
Region 2	Silt	5,14,6,7,15,2	1737.1428
Region 3	Silt	4,3,8,9	989.46032
Region 4	Sand	9,10,11,12,13,8	7265.5238

Lines

	Start Point	End Point	Hydraulic Boundary
Line 1	2	3	River Level
Line 2	3	4	
Line 3	4	1	
Line 4	1	5	Potential Seepage Face
Line 5	5	2	
Line 6	6	7	
Line 7	3	8	River Level
Line 8	8	9	
Line 9	9	4	
Line 10	9	10	
Line 11	10	11	
Line 12	11	12	
Line 13	12	13	River Level
Line 14	13	8	River Level
Line 15	5	14	Potential Seepage Face
Line 16	14	6	

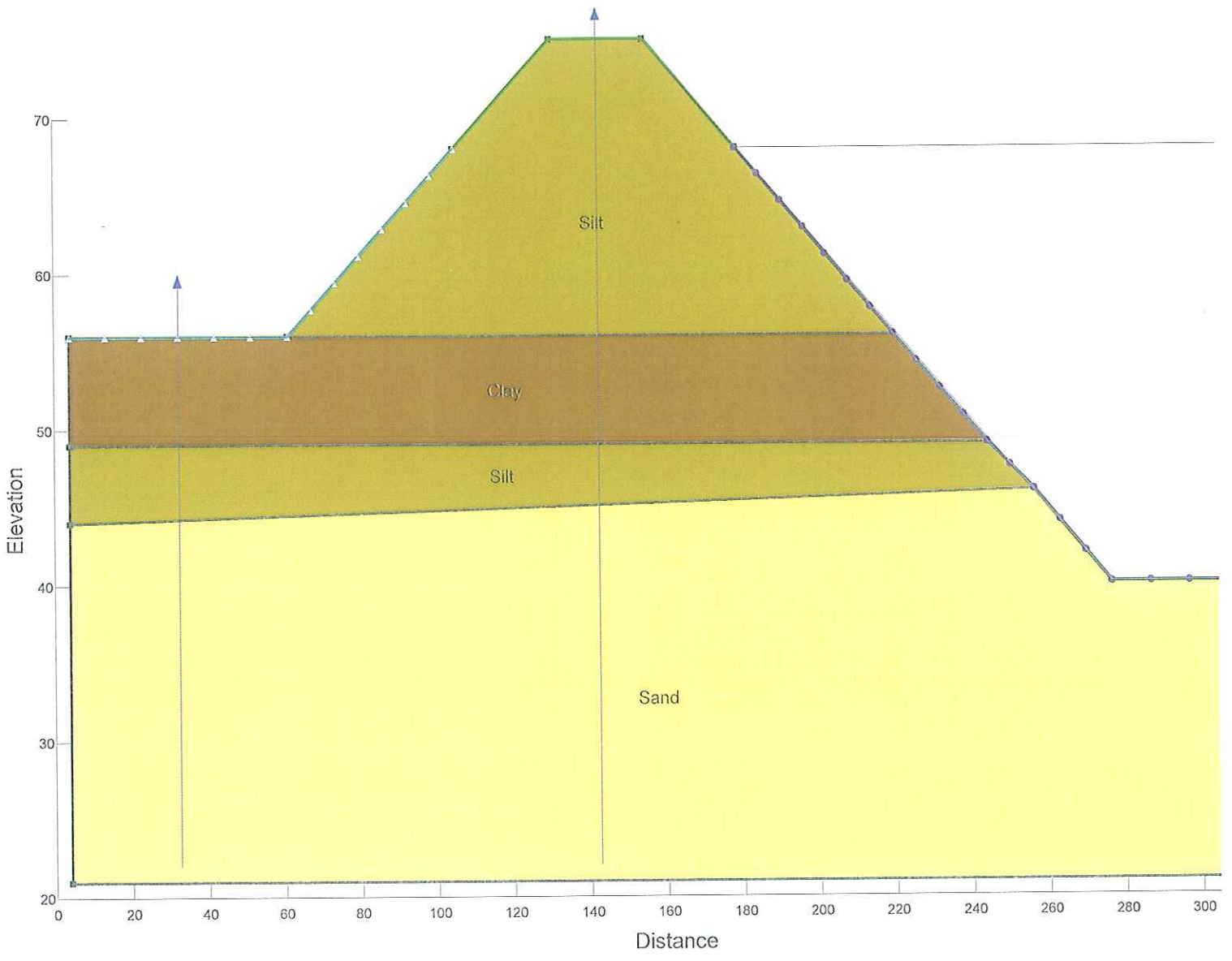
Line 17	7	15	
Line 18	15	2	River Level

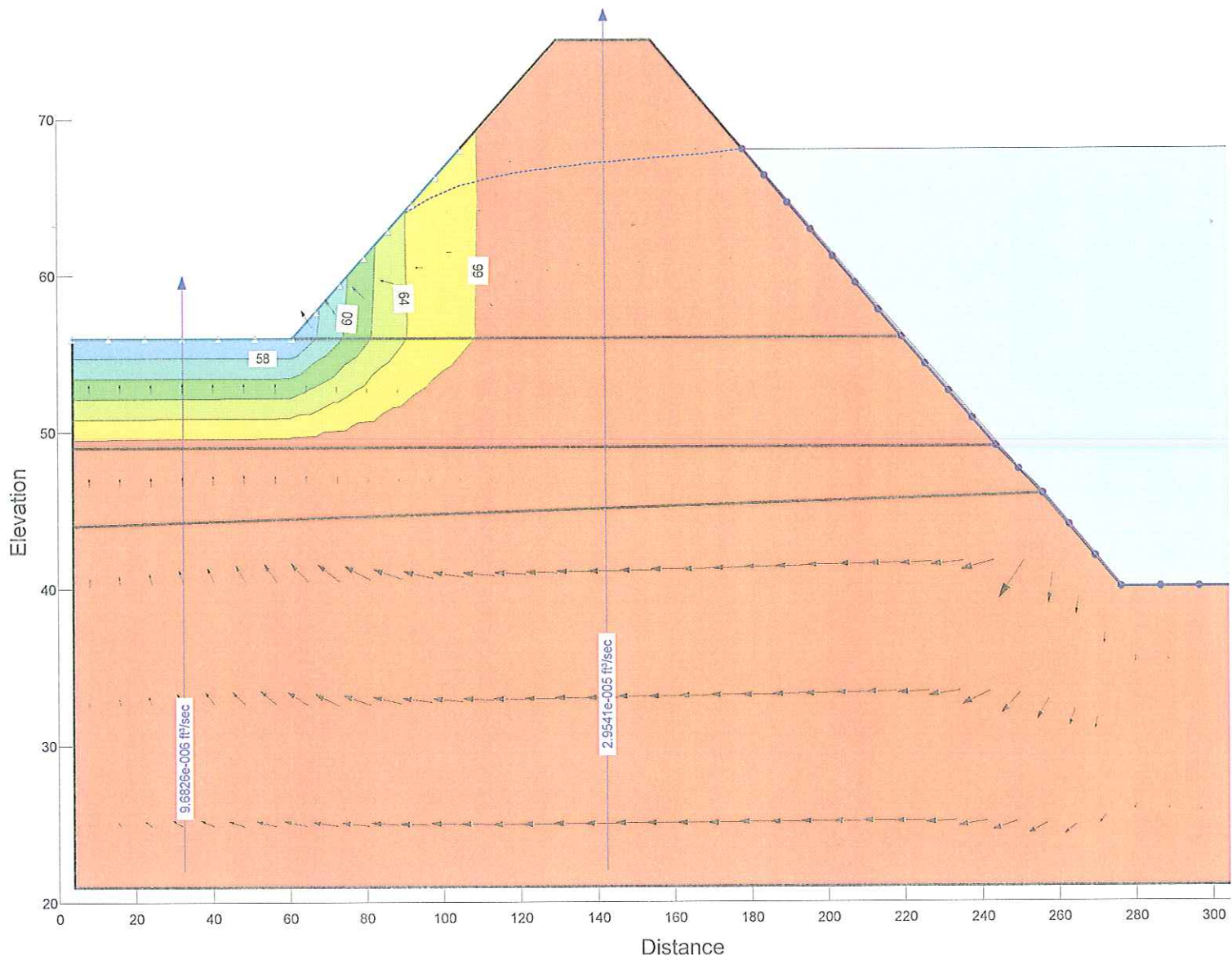
Points

	X (ft)	Y (ft)
Point 1	4.06349	56
Point 2	219.42857	56
Point 3	243.80952	49
Point 4	4.06349	49
Point 5	60.95238	56
Point 6	130.03175	75
Point 7	154.4127	75
Point 8	256	46
Point 9	4.06349	44
Point 10	4.06349	21
Point 11	316.95238	21
Point 12	316.95238	40
Point 13	276.31746	40
Point 14	104.58146	68
Point 15	178.36592	68

Seepage Analysis

River Elevation 68 Feet





colusa levee

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File Information

Created By: Greg Gularte
Revision Number: 25
Last Edited By: Greg Gularte
Date: 1/19/2012
Time: 3:04:51 PM
File Name: colusa seepage68.gsz
Directory: G:\Projects- Gularte\Archives\3268 Riverbend Colusa 273 lots\
Last Solved Date: 1/19/2012
Last Solved Time: 3:05:01 PM

Project Settings

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Potential Seepage Max # of Reviews: 10

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Hydraulic

K-Sat: 3.28e-007 ft/sec

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K-Direction: 0 °

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Model: Saturated Only

Hydraulic

K-Sat: 3.28e-006 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sand

Model: Saturated Only

Hydraulic

K-Sat: 0.00098 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Boundary Conditions

Potential Seepage Face

Review: true

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