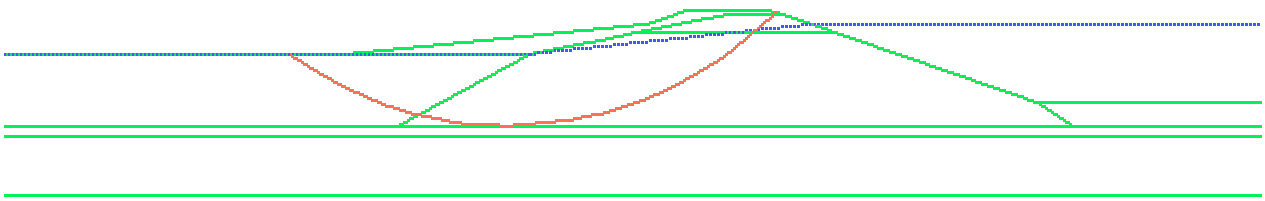
Appendix A

Stability Analyses Results

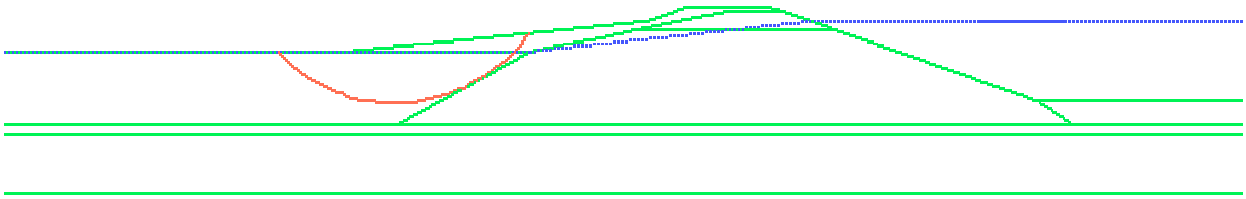
Build Full Embankment

Using Undrained Shear Strengths:

F.S. = 1.76

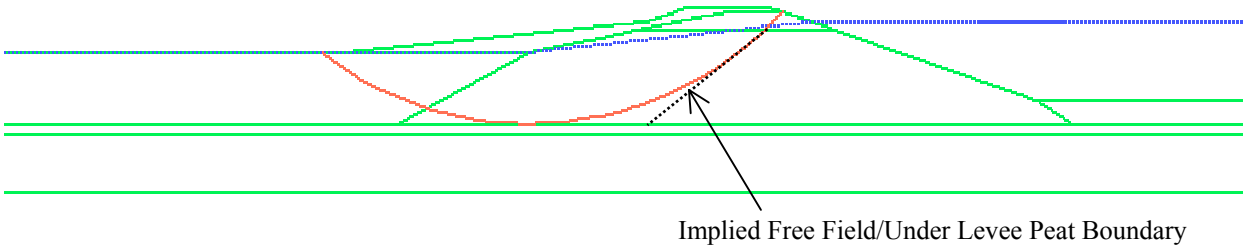


F.S. = 1.74



When 'Free Field Peat' and 'Under Levee Peat' strengths are the same:

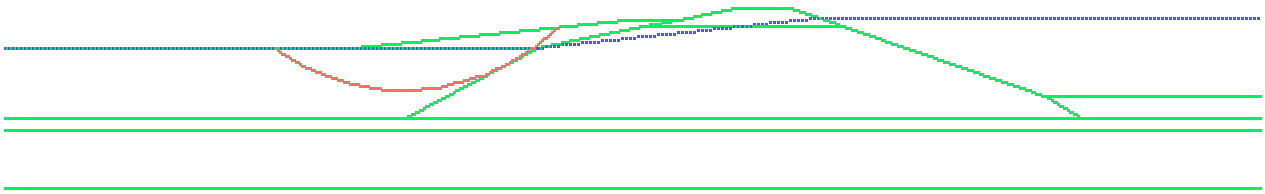
F.S. = 0.94



Build to 12ft

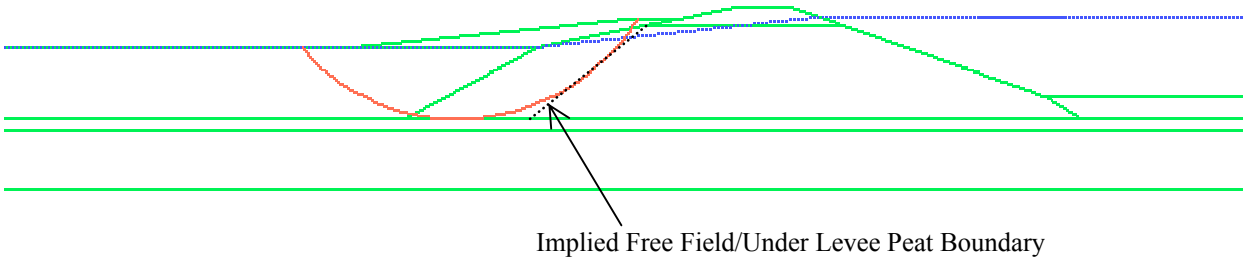
Using Undrained Shear Strengths:

F.S. = 1.8



When 'Free Field Peat' and 'Under Levee Peat' strengths are the same:

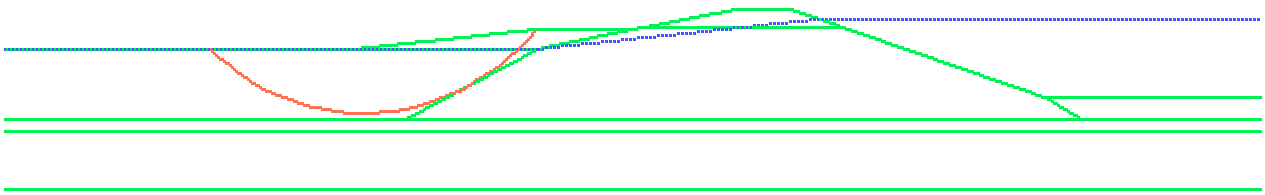
F.S. = 1.25



Build to 8ft

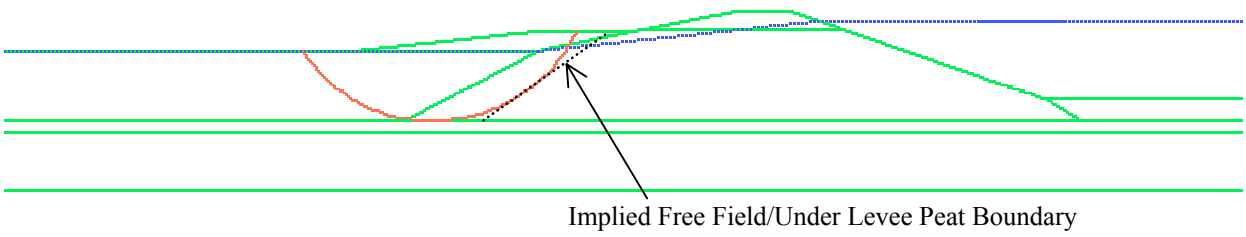
Using Undrained Shear Strengths:

F.S. = 1.98



When 'Free Field Peat' and 'Under Levee Peat' strengths are the same:

F.S. = 1.39

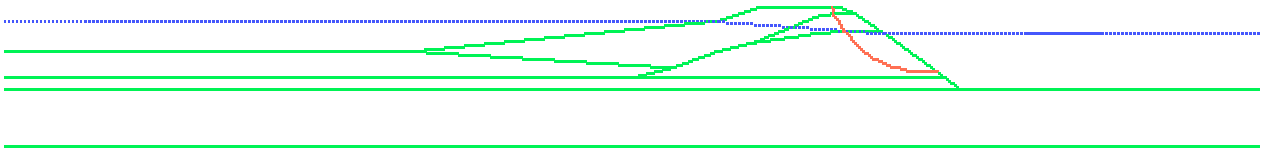


Peat at –20ft, Long Term Stability

Water levels - Slough side: -1.0ft
Reservoir side: +4.0ft

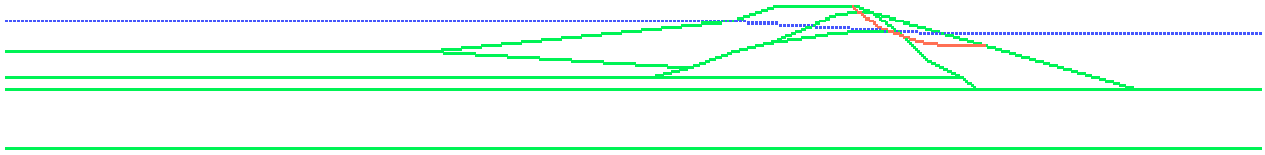
Proposed condition, without rock berm:

F.S. = 0.9

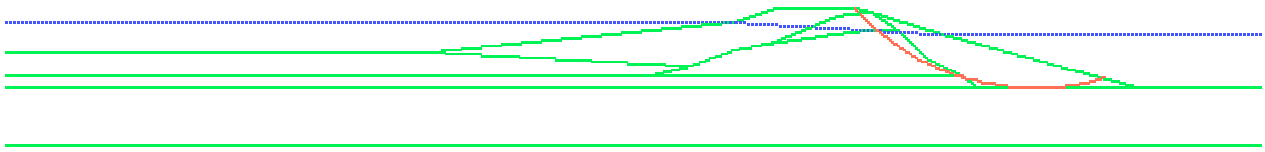


Proposed condition, with rock berm at 3:1 slope:

F.S. = 2.4



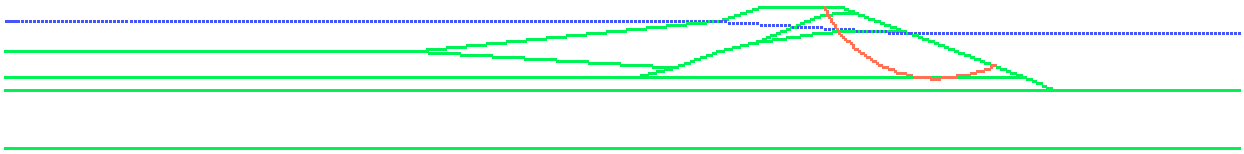
F.S. = 2.9



Peat at –20ft, Long Term Stability

Proposed condition, without rock berm:

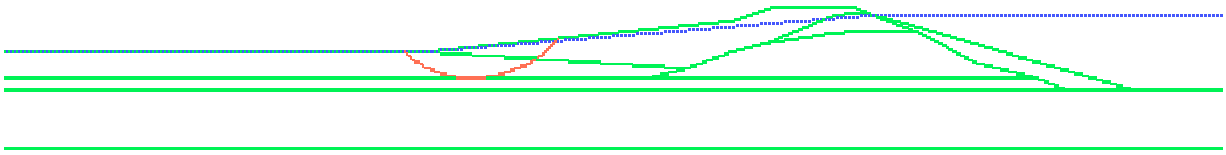
F.S. = 1.1



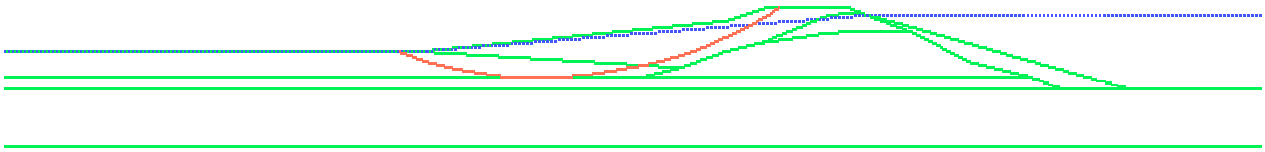
Proposed condition, with rock berm at 3:1 slope:

Water levels - Slough side: +7.0ft
Reservoir side: empty

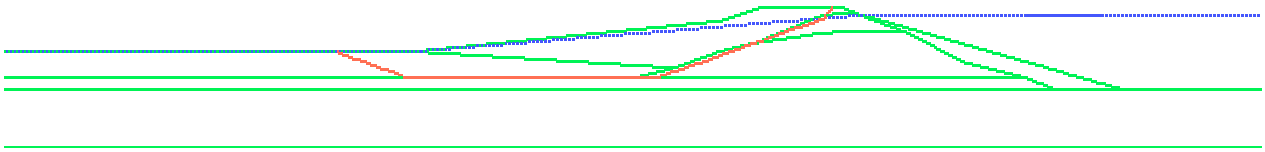
F.S. = 1.5



F.S. = 1.9

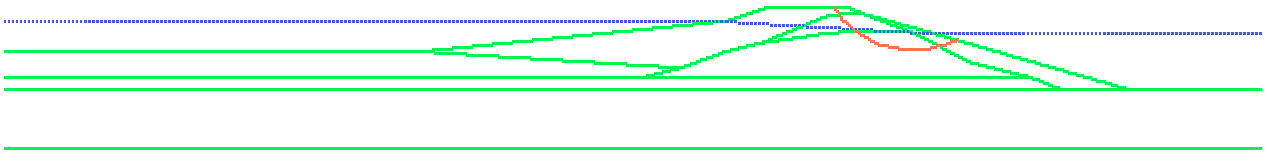


F.S. = 2.0

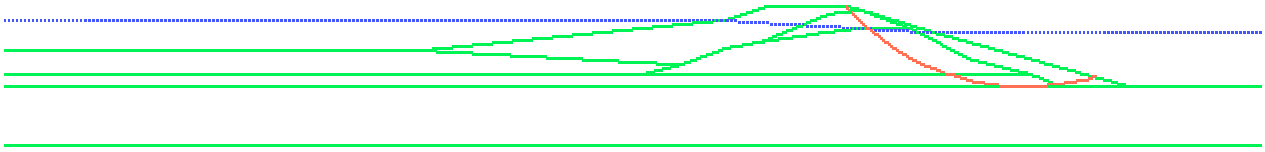


Water levels - Slough side: -1.0ft
Reservoir side: +4.0ft

F.S. = 2.0



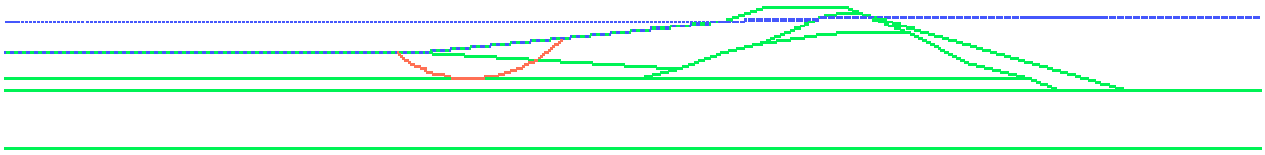
F.S. = 3.1



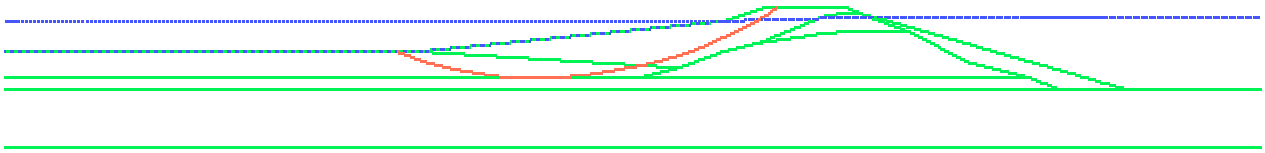
Peat at –20ft, Sudden Drawdown

Water levels - Slough side: +6.0ft
Reservoir side: +4.0ft / empty

F.S. = 1.5



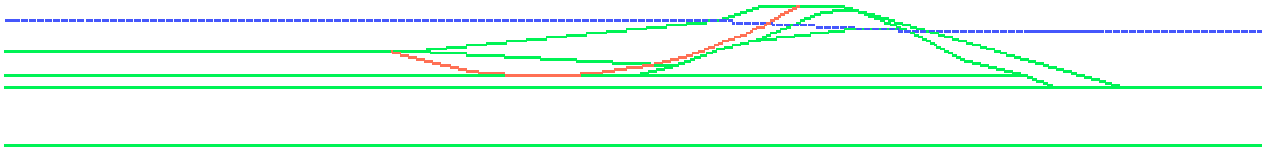
F.S. = 1.6



Peat at –20ft, without liquefiable sand layer – Low tide, high reservoir

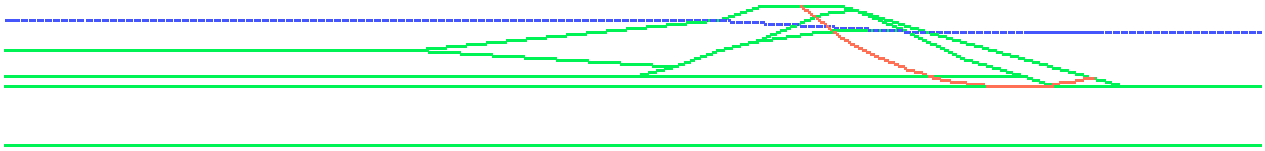
Water levels - Slough side: -1.0ft
Reservoir side: +4ft

Seismic condition, Ky = 0.14 Post Seismic F.S. = 2.8



Circle center: (-109, 194.5)
Radius: 214.5

Seismic condition, Ky = 0.25 Post Seismic F.S. = 2.7

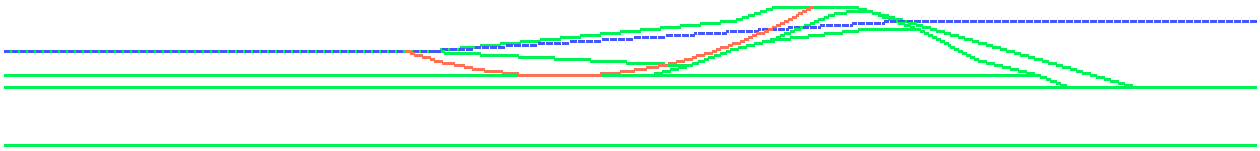


Circle center: (95, 117)
Radius: 142

Peat at –20ft, without liquefiable sand layer - High tide, empty reservoir

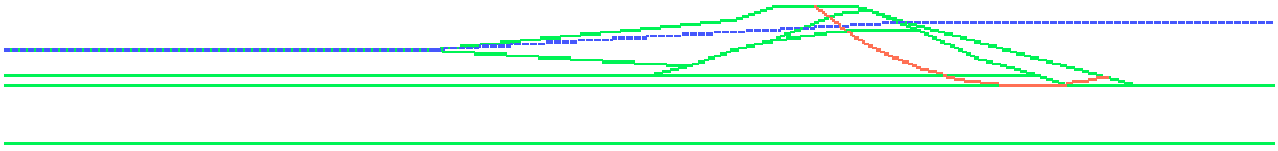
Water levels - Slough side: +3.5ft
Reservoir side: empty

Seismic condition, Ky = 0.14 Post Seismic F.S. = 2.1



Circle center: (-109, 194.5)
Radius: 214.5

Seismic condition, Ky = 0.27 Post Seismic F.S. = 3.0

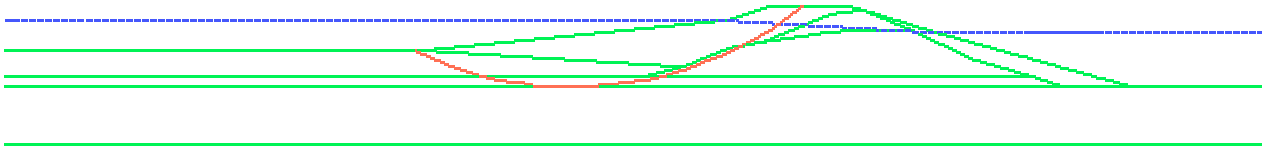


Circle center: (95, 117)
Radius: 142

Peat at –20ft, with liquefiable sand layer – Low tide, high reservoir

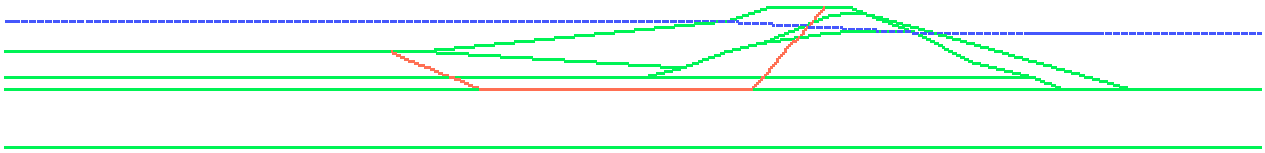
Water levels - Slough side: -1.0ft
Reservoir side: +4ft

Seismic condition, Ky = 0.092 Post Seismic F.S. = 2.1



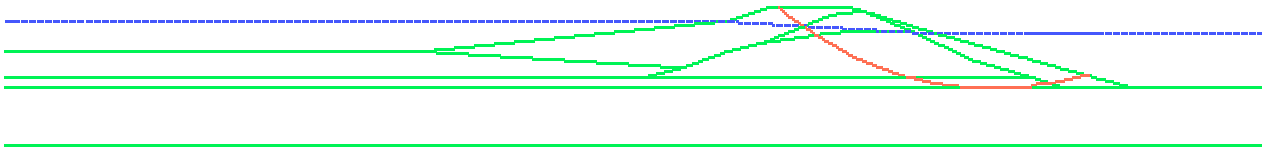
Circle center: (-100.5, 132.5)
Radius: 157.5

Seismic condition, Ky = 0.068 Post Seismic F.S. = 1.8



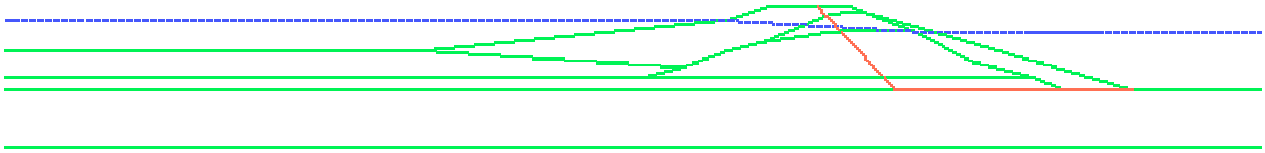
Wedge coordinates: -180.32, -9.0
-140.94, -24.9
-23.52, -24.9
-7.63, 10.0

Seismic condition, Ky = 0.105 Post Seismic F.S. = 1.7



Circle center: (82, 117)
Radius: 142

Seismic condition, Ky = 0.08 Post Seismic F.S. = 1.6

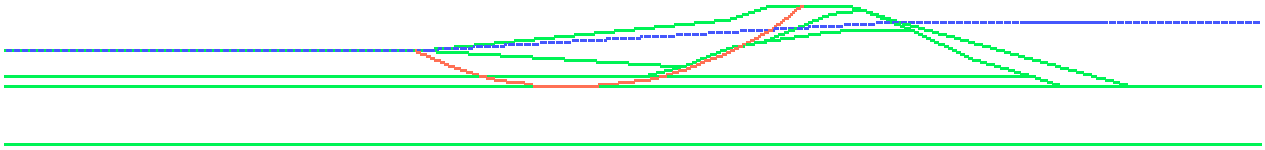


Wedge coordinates: 5.0 , 10.0
38.0, -24.9
110.0, -24.9
141.2, -25.0

Peat at –20ft, with liquefiable sand layer – High tide, empty reservoir

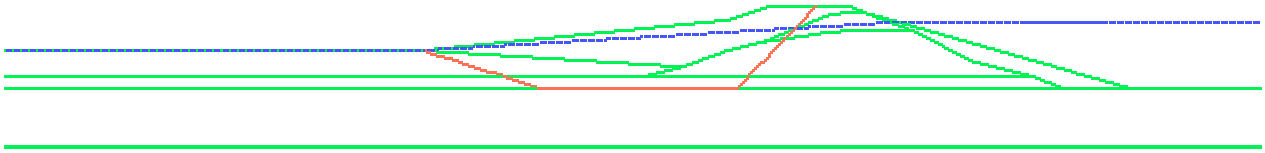
Water levels - Slough side: +3.5ft
Reservoir side: empty

Seismic condition, Ky = 0.06 Post Seismic F.S. = 1.5



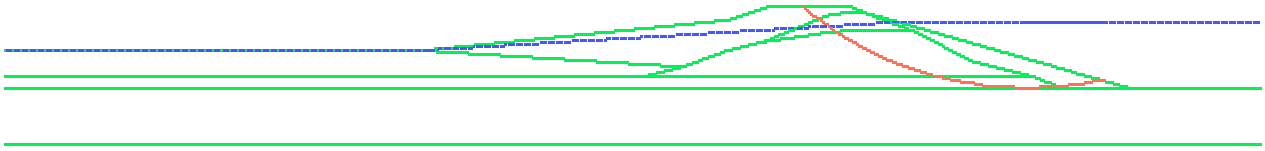
Circle center: (-100.5, 132.5)
Radius: 157.5

Seismic condition, Ky = 0.034 Post Seismic F.S. = 1.3



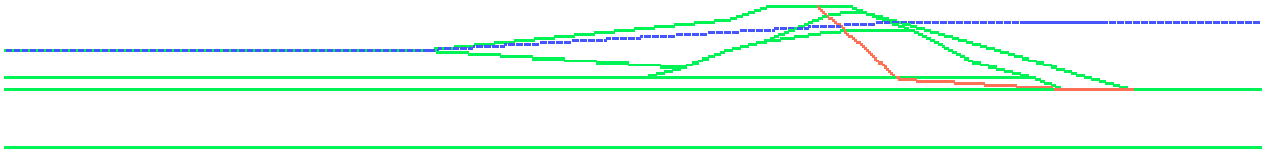
Wedge coordinates: -165, -9.0
-115.0, -24.9
-30.0, -24.9
4.0, 10.0

Seismic condition, Ky = 0.13 Post Seismic F.S. = 2.1



Circle center: (96.5, 129.5)
Radius: 154.5

Seismic condition, Ky = 0.12 Post Seismic F.S. = 2.0



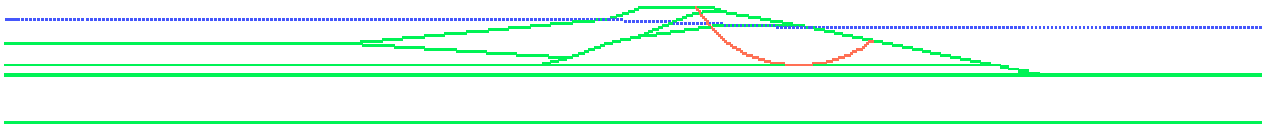
Wedge coordinates: 5.0, 10.0
40.2, -20.8
110.0, -24.94
141.2, -25.0

Peat at –20, Long Term Stability

Water levels - Slough side: -1.0ft
Reservoir side: +4ft

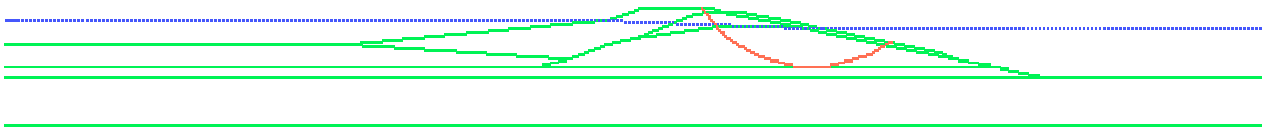
Proposed condition, without rock berm:

F.S. = 1.4



Proposed condition, with 2ft layer of rock berm:

F.S. = 1.8

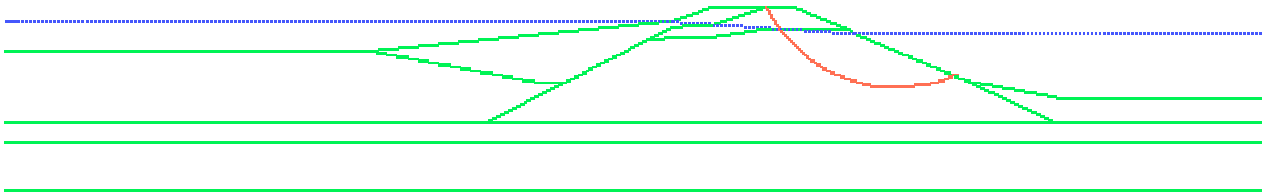


Peat at –40ft, Long term condition

Water levels - Slough side: -1.0ft
Reservoir side: +4.0ft

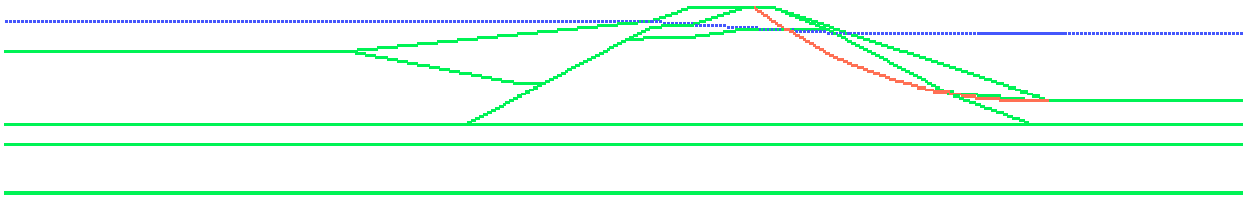
Proposed condition without rock berm:

F.S. = 1.1

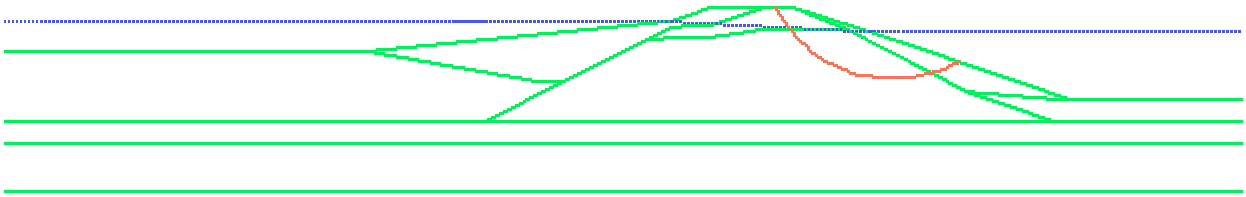


Proposed Condition with rock berm at 3:1 slope:

F.S. = 1.8



F.S. = 2.3

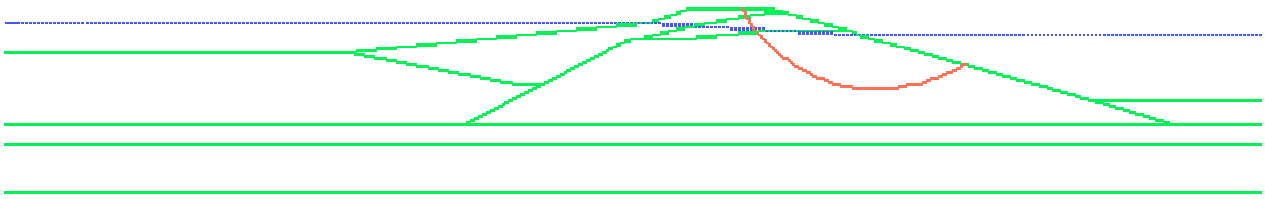


Peat at –40ft, Long term condition

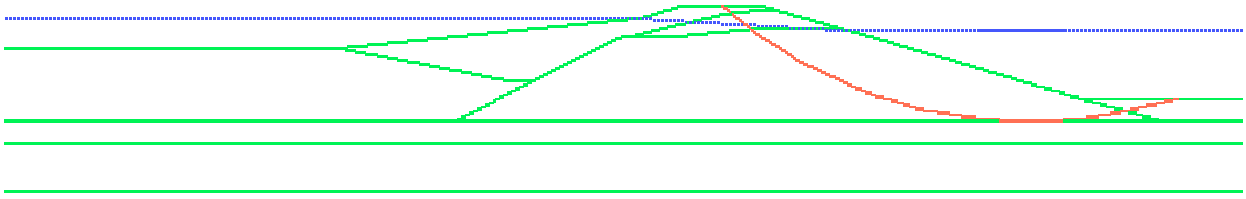
Water levels - Slough side: -1.0ft
Reservoir side: +4.0ft

Proposed condition without rock berm:

F.S. = 1.3

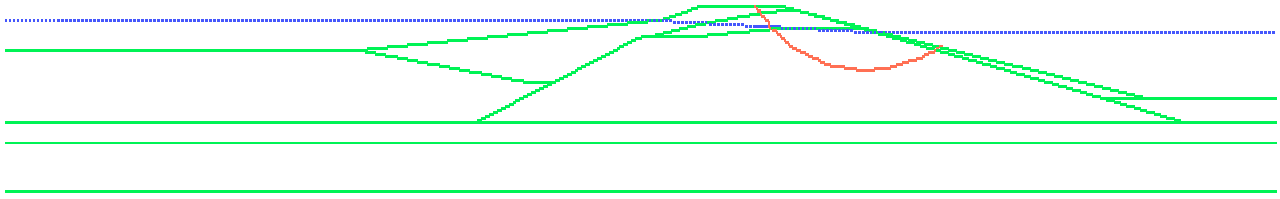


F.S. = 1.6

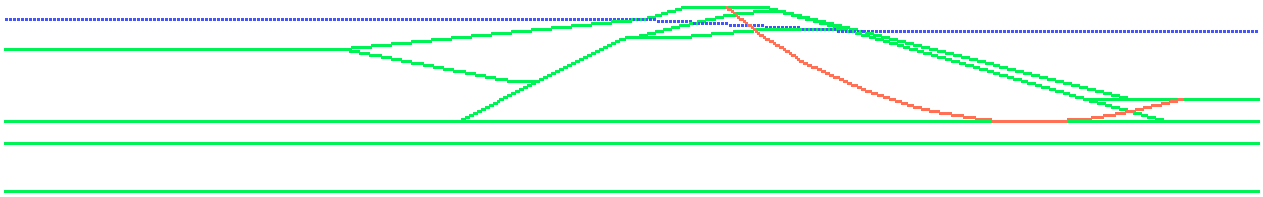


Proposed condition with rock berm at 4:1 slope:

F.S. = 1.6



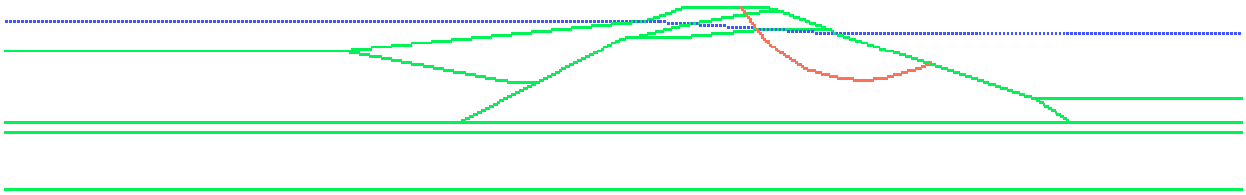
F.S. = 2.1



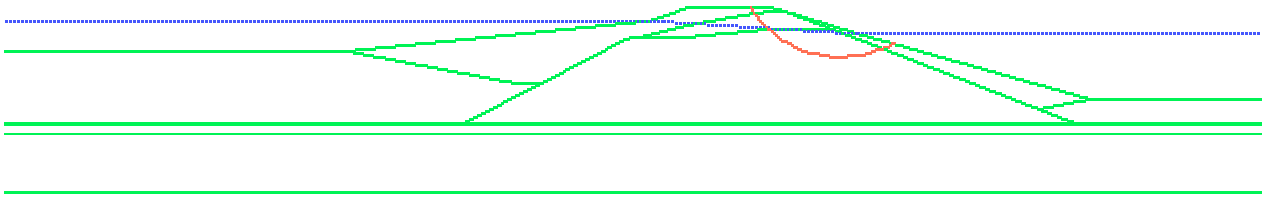
Peat at –40ft, Long term condition

Water levels - Slough side: -1.0ft
Reservoir side: +4.0ft

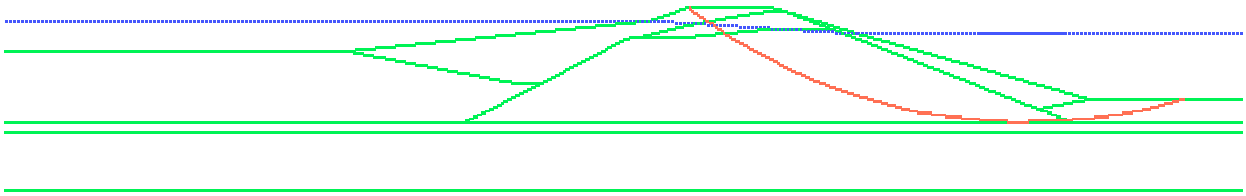
Proposed condition without rock berm:
F.S. = 1.2



Proposed condition with rock berm at 3.5:1 slope
F.S. = 1.8



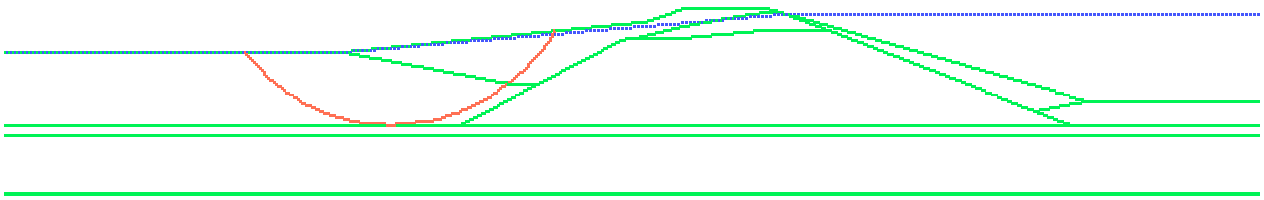
F.S. = 2.1



Peat at –40ft, Long term condition

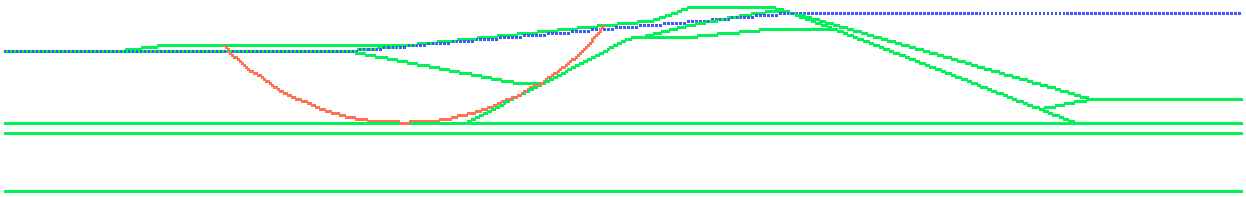
Water levels - Slough side: +7.0ft
Reservoir side: empty

F.S. = 1.2

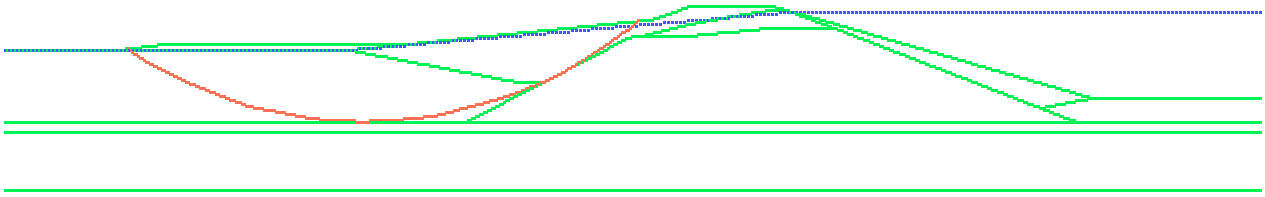


Add rock berm reinforcement at toe of the slope (100ft wide, 2ft high) to meet criteria:

F.S. = 1.7



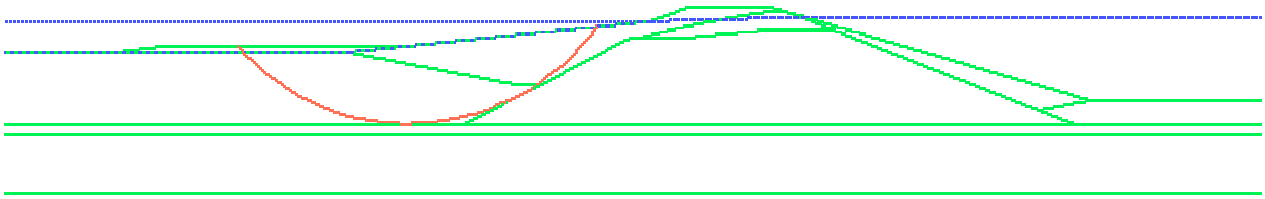
F.S. = 1.9



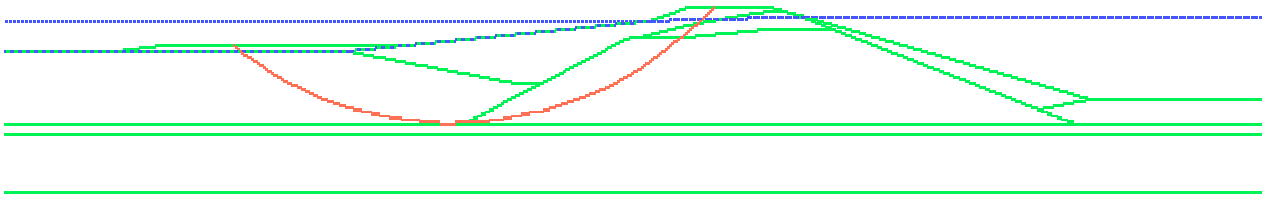
Peat at –40ft, Sudden Drawdown

Water levels - Slough side: +6.0ft
Reservoir side: +4.0ft / empty

F.S. = 1.5



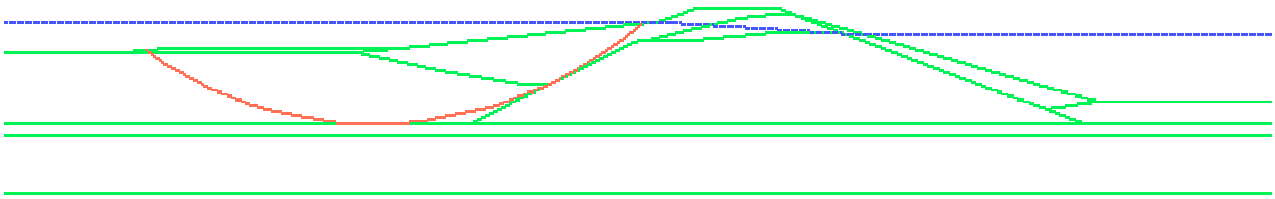
F.S. = 1.7



Peat at –40ft, without liquefiable sand layer – Low tide, high reservoir

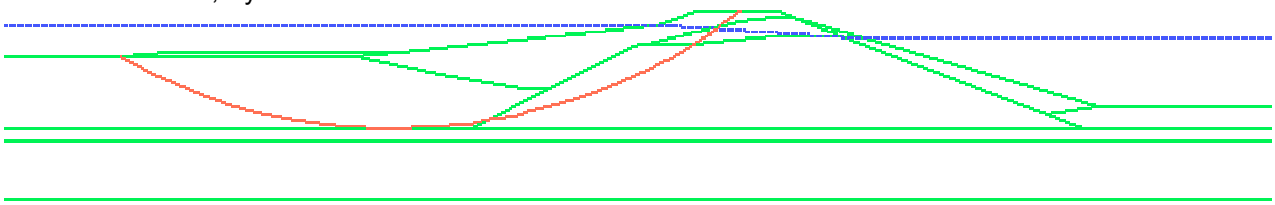
Water levels - Slough side: -1.0ft
Reservoir side: +4ft

Seismic condition, Ky = 0.092 Post Seismic F.S. = 2.6



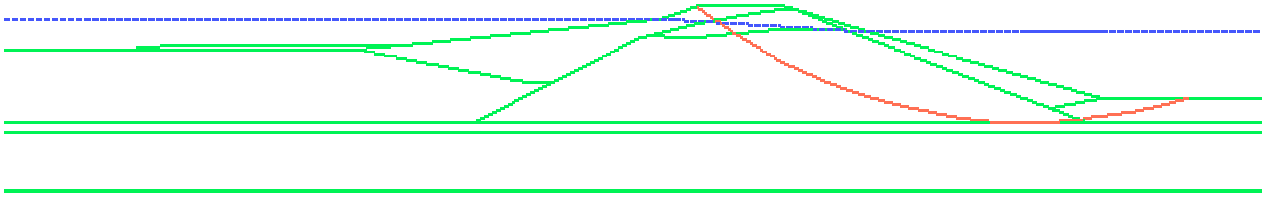
Circle center: (-190, 144)
Radius: 184

Seismic condition, Ky = 0.105 Post Seismic F.S. = 2.9



Circle center: (-179, 207)
Radius: 247

Seismic condition, Ky = 0.108 Post Seismic F.S. = 1.9

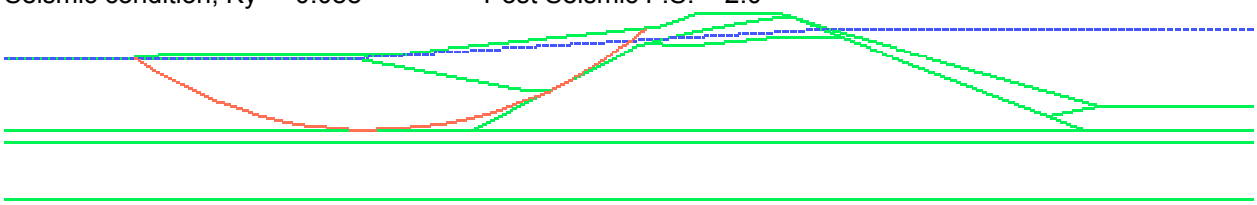


Circle center: (95, 196)
Radius: 236

Peat at –40ft, without liquefiable sand layer - High tide, empty reservoir

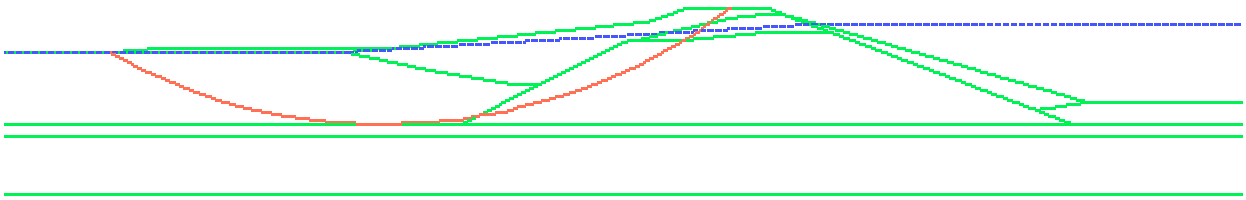
Water levels - Slough side: +3.5ft
Reservoir side: empty

Seismic condition, Ky = 0.088 Post Seismic F.S. = 2.0



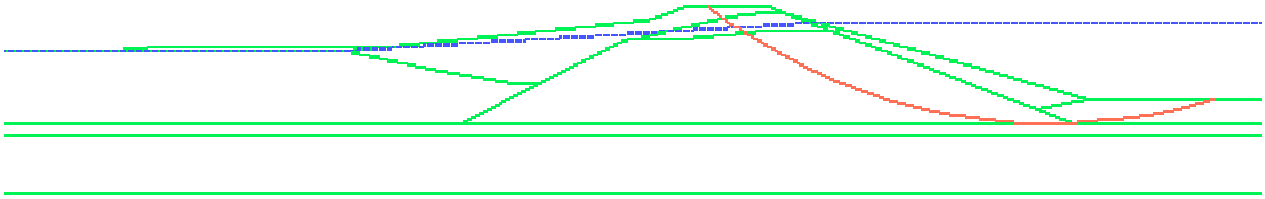
Circle center: (-190, 144)
Radius: 184

Seismic condition, Ky = 0.10 Post Seismic F.S. = 2.1



Circle center: (-179, 207)
Radius: 247

Seismic condition, Ky = 0.125 Post Seismic F.S. = 2.3

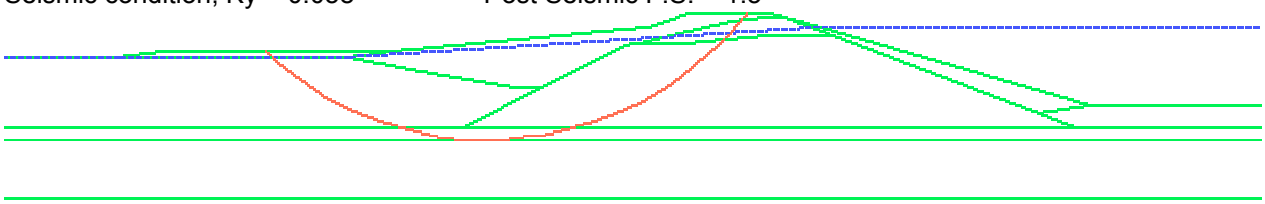


Circle center: (110.5, 208.5)
Radius: 248.5

Peat at –40ft, with liquefiable sand layer – High tide, empty reservoir

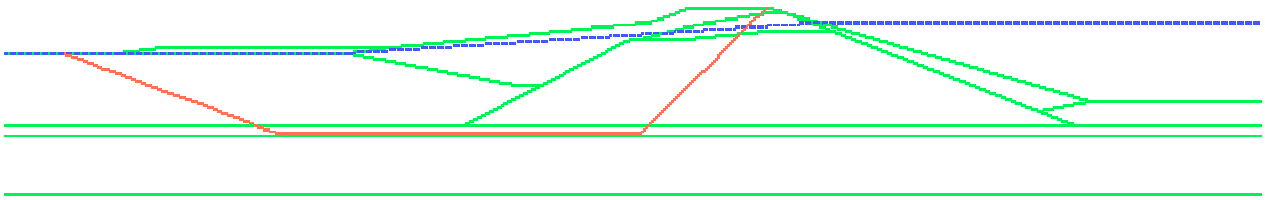
Water levels - Slough side: +3.5ft
Reservoir side: empty

Seismic condition, Ky = 0.058 Post Seismic F.S. = 1.5



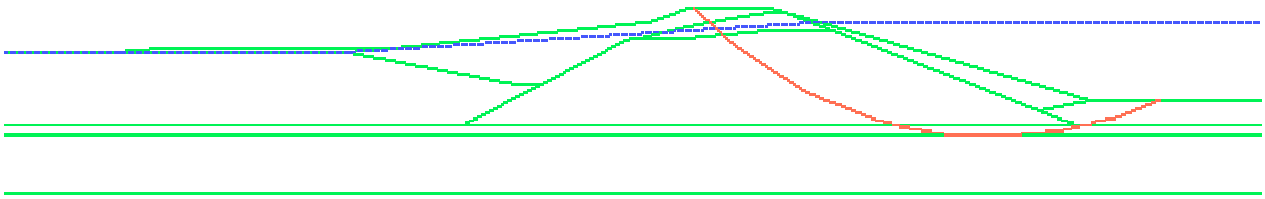
Circle center: (-135.5. 96.5)
Radius: 141.5

Seismic condition, Ky = 0.037 Post Seismic F.S. = 1.4



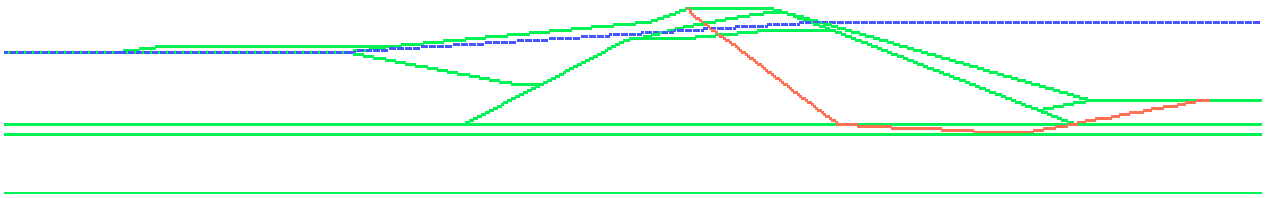
Wedge coordinates: -320, -9.0
-225.9, -43.7
-70.2, -44.1
-15.4, 10.0

Seismic condition, Ky = 0.068 Post Seismic F.S. = 1.8



Circle center: (83.5, 135)
Radius: 180

Seismic condition, Ky = 0.068 Post Seismic F.S. = 1.8

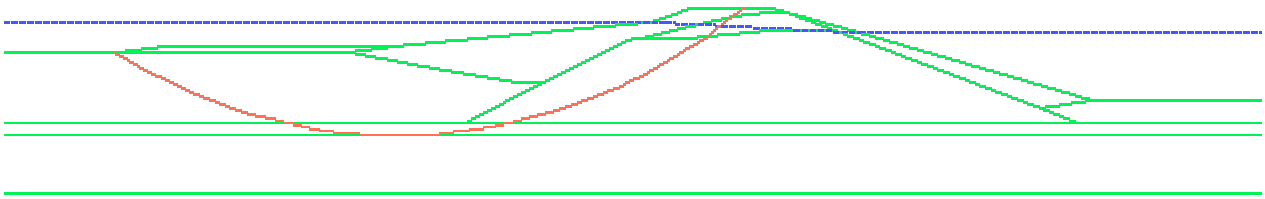


Wedge coordinates: -49.2, 9.5
16.0, -40.4
95.0, -44.3
177.0, -30.0

Peat at –40ft, with liquefiable sand layer – Low tide, high reservoir

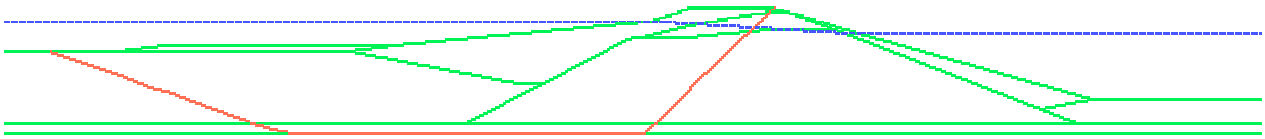
Water levels - Slough side: -1.0ft
Reservoir side: +4.0ft

Seismic condition, Ky = 0.081 Post Seismic F.S. = 2.5



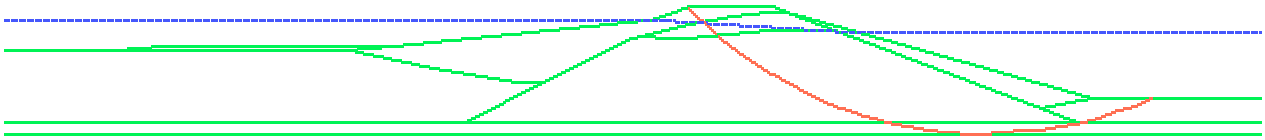
Circle center: (-175, 185)
Radius: 230

Seismic condition, Ky = 0.063 Post Seismic F.S. = 2.4



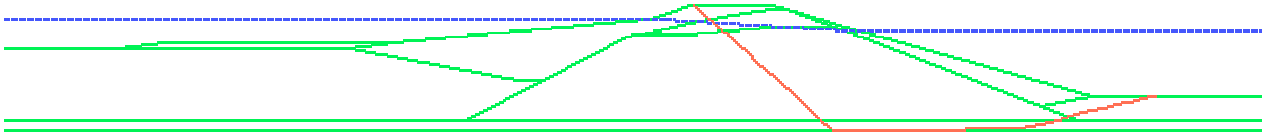
Wedge coordinates: -327.0, -9.0
-225.9, -44.3
-68.7, -44.6
-12.8, 10.0

Seismic condition, Ky = 0.047 Post Seismic F.S. = 1.4



Circle center: (79.5, 135.5)
Radius: 180.5

Seismic condition, Ky = 0.042 Post Seismic F.S. = 1.4



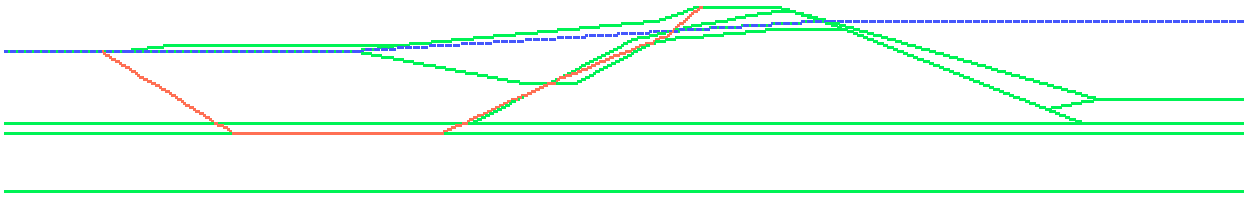
Wedge coordinates: -47.0, 10.0
12.9, -44.9
94.9, -44.1
153.0, -30.0

Peat at –40ft – with liquefiable sand and old levee material

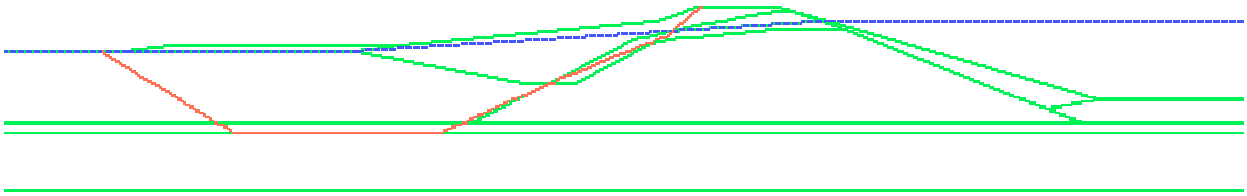
Water levels - Slough side: +3.5ft
Reservoir side: empty

Rock Berm Option

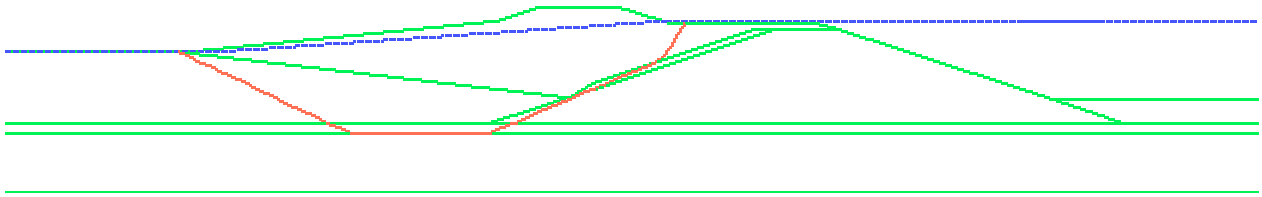
Liquefiable levee material strength = 200psf
Seismic condition, Ky = 0.033 Post Seismic F.S. = 1.4



Liquefiable levee material strength = 100psf
Seismic condition, Ky = 0.025 Post Seismic F.S. = 1.3



Engineering Bench Option
Seismic condition, Ky = 0.015 Post Seismic F.S. = 1.1

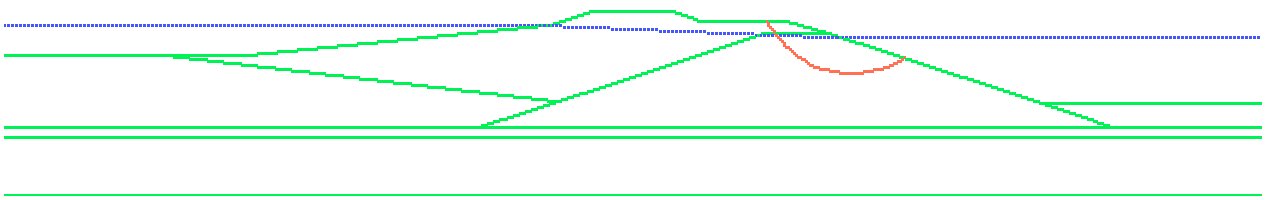


Peat at –40ft, Bench Sensitivity

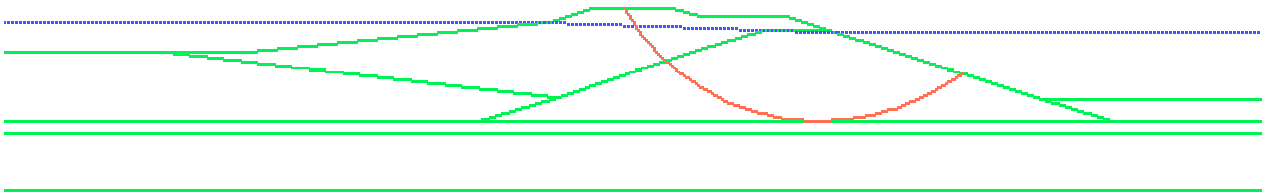
Water levels Slough side: -1.0ft
Reservoir side: +4.0ft

Bench elevation: 6.0ft
Bench width: 36.0ft

F.S. = 1.36

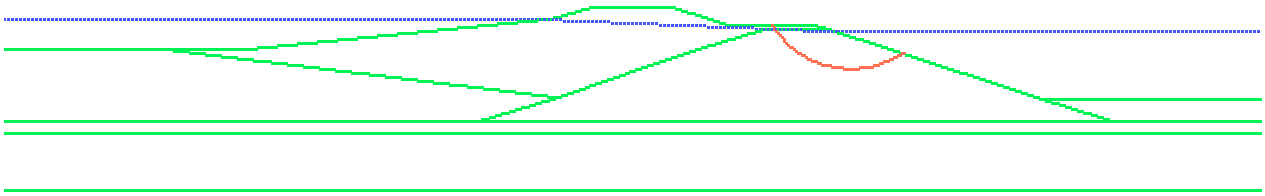


F.S. = 1.39

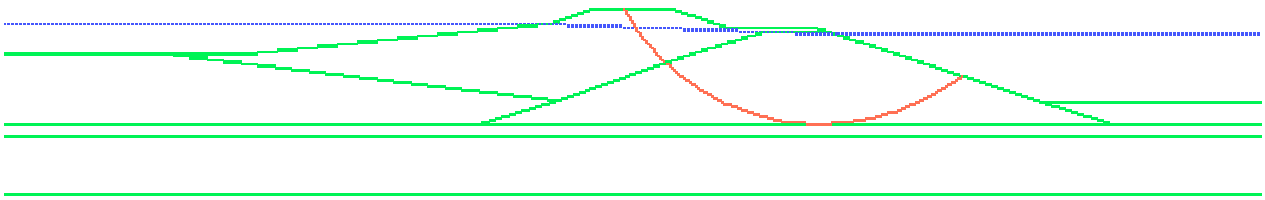


Bench elevation: 2.0ft
Bench width: 36.0ft

F.S. = 1.99

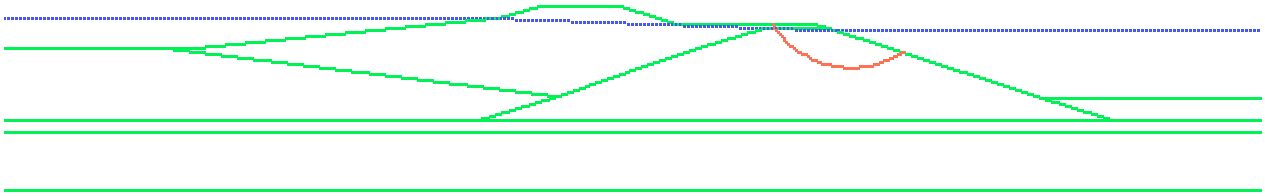


F.S. = 1.33

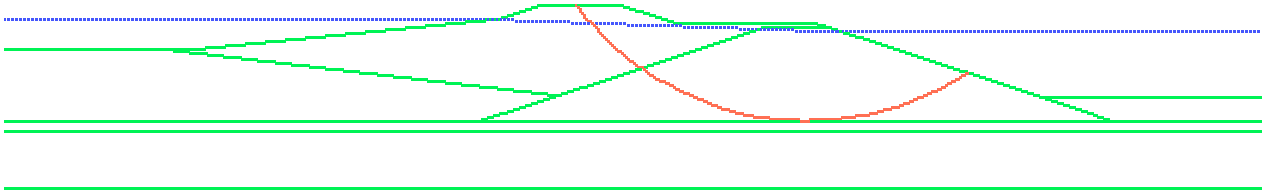


Bench elevation: 2.0ft
Bench width: 65.0ft

F.S. = 1.94

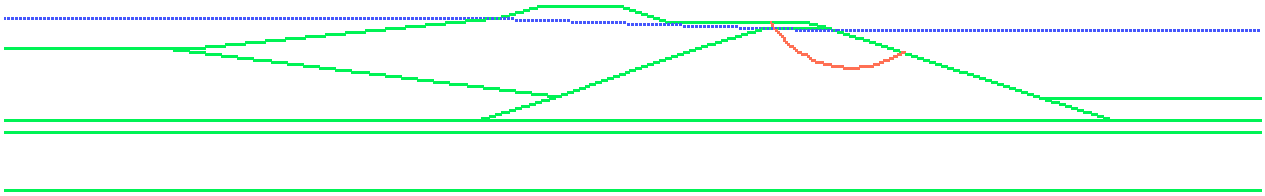


F.S. = 1.46

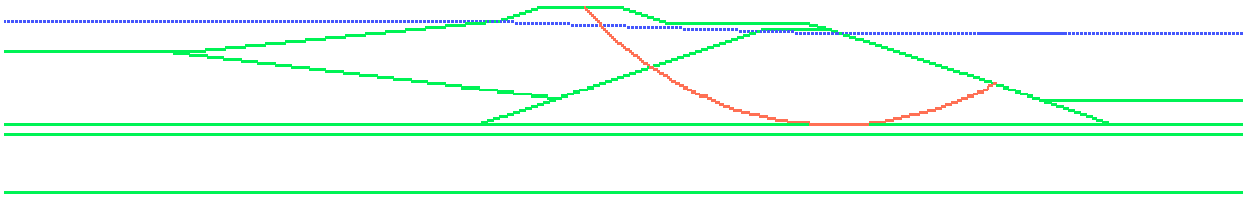


Bench elevation: 3.0ft
Bench width: 60.0ft

F.S. = 1.68

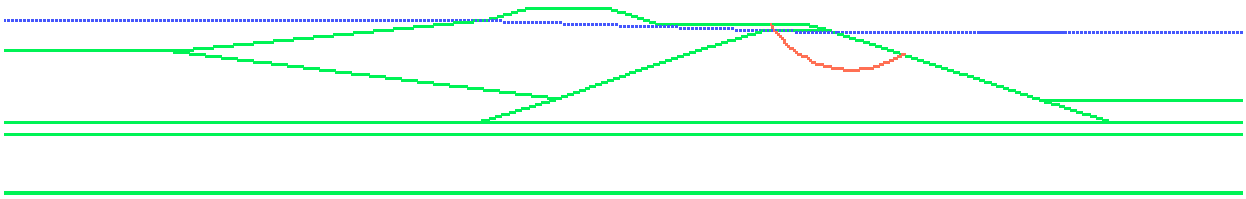


F.S. = 1.46

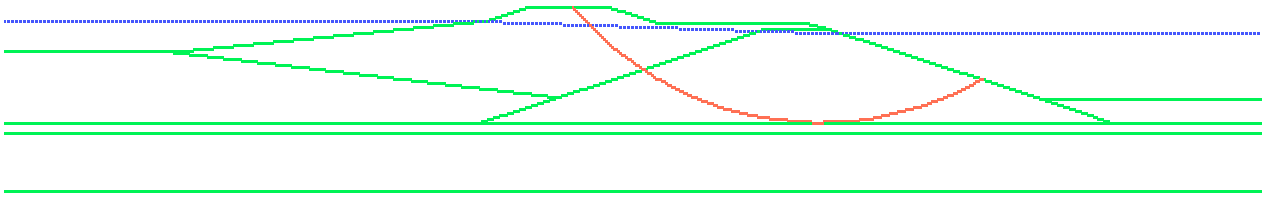


Bench elevation: 3.0ft
Bench width: 65.0ft

F.S. = 1.68



F.S. = 1.52

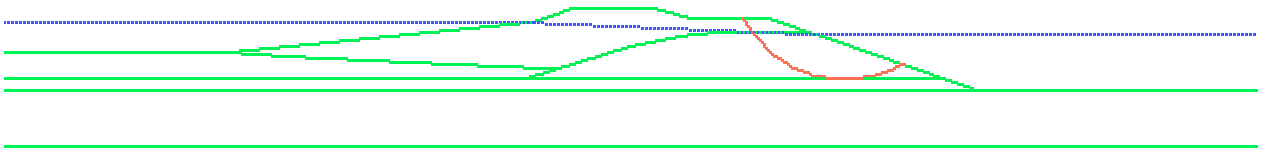


Peat at –20ft, Bench Sensitivity

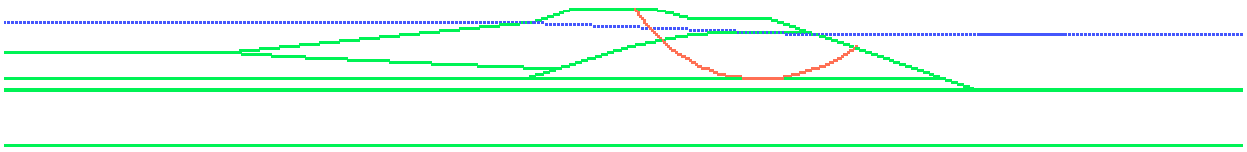
Water levels Slough side: -1.0ft
Reservoir side: +4.0ft

Bench elevation: 6.0ft
Bench width: 34.0ft

F.S. = 1.33

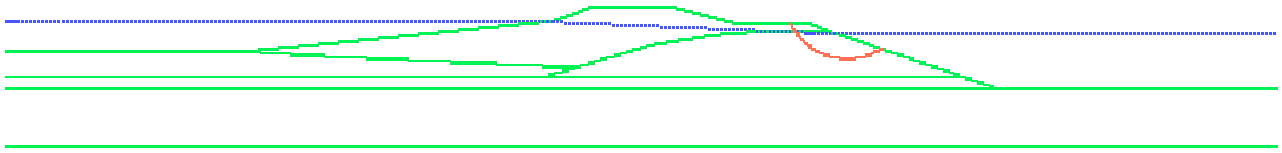


F.S. = 2.00

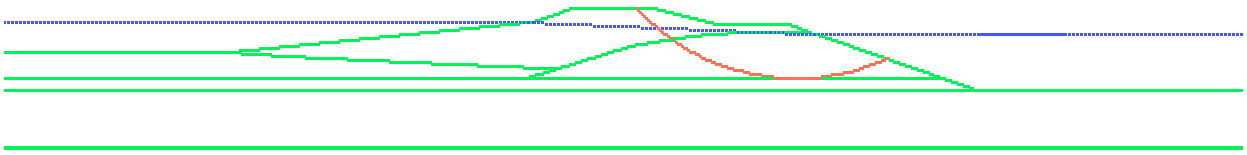


Bench elevation: 3.0ft
Bench width: 31.0ft

F.S. = 1.64

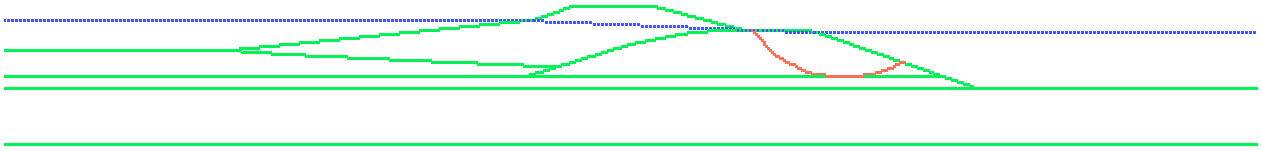


F.S. = 1.63

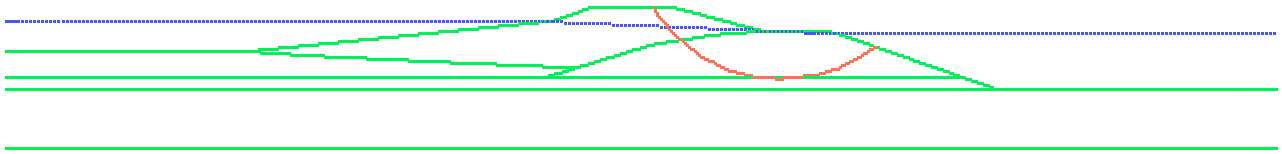


Bench elevation: 0.0ft
Bench width: 27.0ft

F.S. = 2.60



F.S. = 1.36

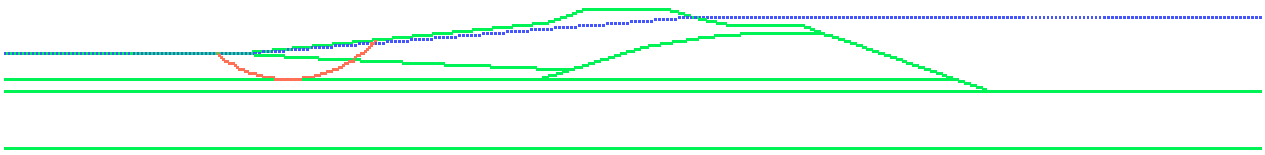


Peat at –20ft

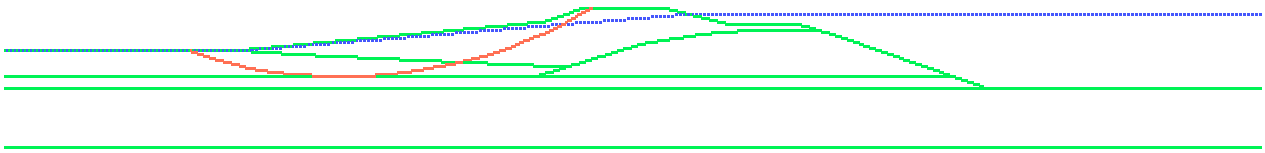
Long Term Condition

Water levels – Slough side: +7ft
Reservoir side: empty

FS = 1.6

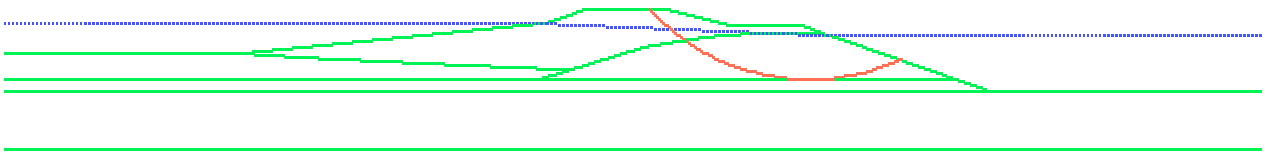


FS = 1.8

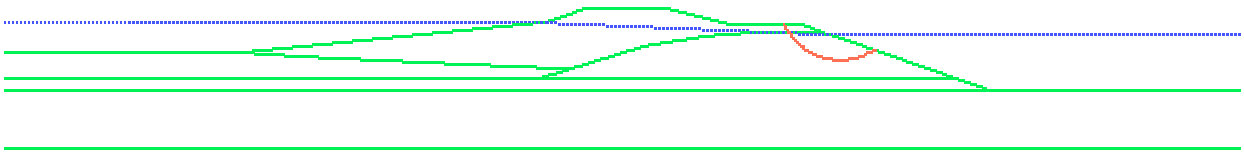


Water levels – Slough side: -1.0ft
Reservoir side: +4.0ft

FS = 1.6



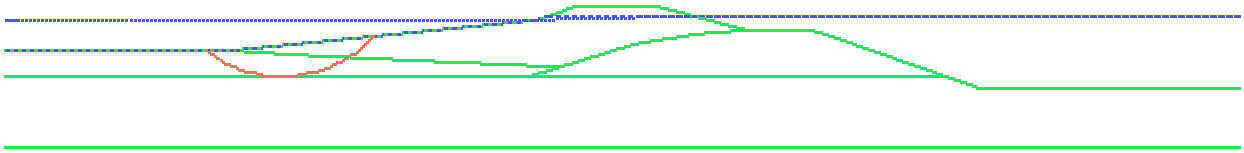
FS = 1.6



Sudden Drawdown

Water levels – Slough side: +6ft
Reservoir side: +4ft at first stage, -9ft at second stage

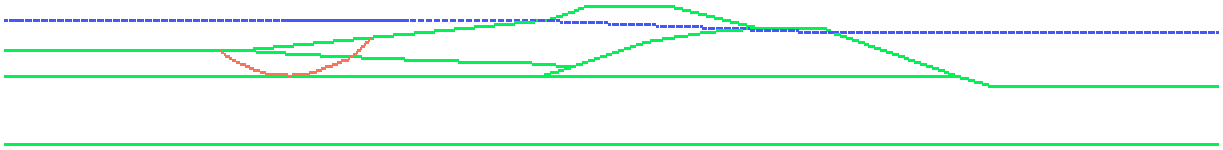
FS = 1.4



Peat at –20ft, without liquefiable layer – Low tide, high reservoir

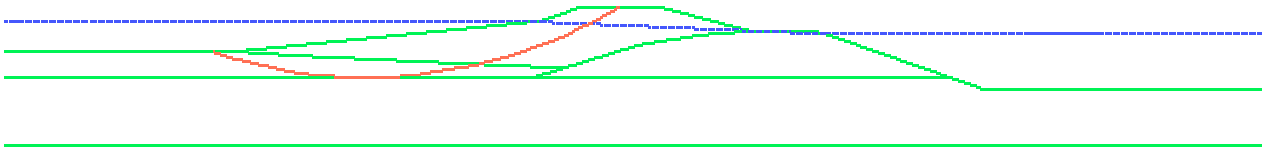
Water levels – Slough side: -1ft
Reservoir side: +4ft

Seismic Condition, Ky = 0.125 Post Seismic F.S. = 2.6



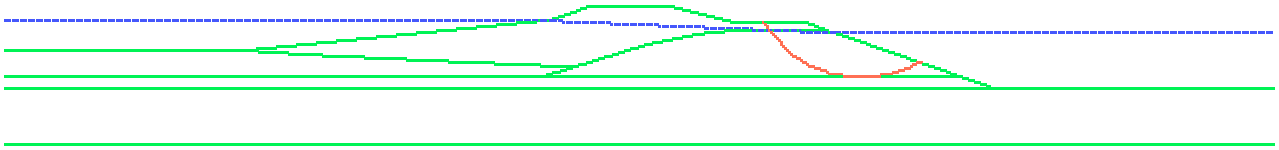
Circle center: (-225.5,26.5)
Radius: 46.5

Seismic Condition, Ky = 0.138 Post Seismic F.S. = 2.8



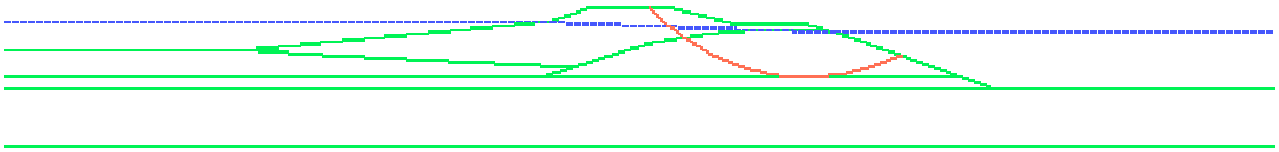
Circle center: (-188, 192)
Radius: 212

Seismic Condition, Ky = 0.094 Post Seismic F.S. = 1.7



Circle center: (22, 30.5)
Radius: 51

Seismic Condition, Ky = 0.095 Post Seismic F.S. = 1.6

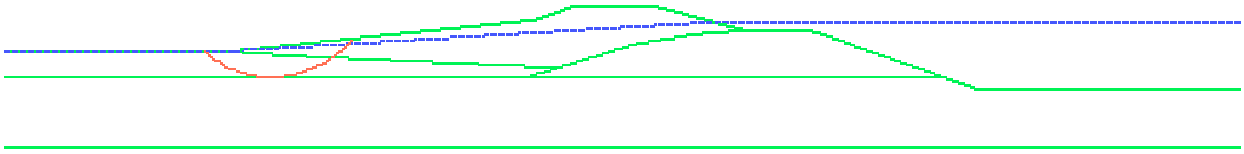


Circle center: (-1.5, 74.5)
Radius: 94.5

Peat at –20ft, without liquefiable layer – High tide, empty reservoir

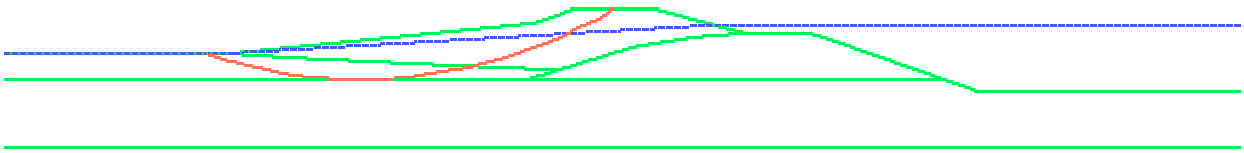
Water levels – Slough side: +3.5ft
Reservoir side: empty

Seismic Condition, Ky = 0.092 Post Seismic F.S. = 1.7



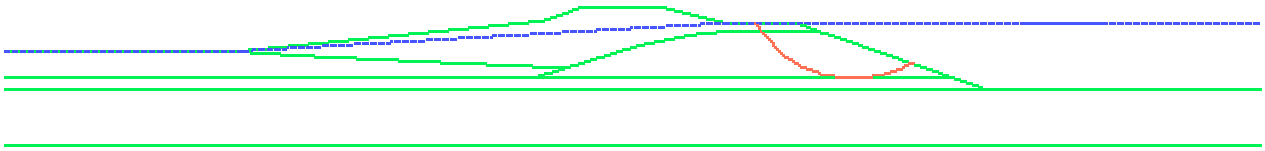
Circle center: (-227, 24)
Radius: 44

Seismic Condition, Ky = 0.135 Post Seismic F.S. = 2.1



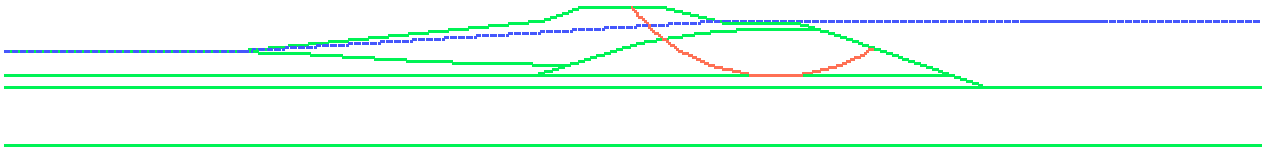
Circle center: (-188, 192)
Radius: 212

Seismic Condition, Ky = 0.115 Post Seismic F.S. = 2.6



Circle center: (22, 30.5)
Radius: 51

Seismic Condition, Ky = 0.108 Post Seismic F.S. = 1.8

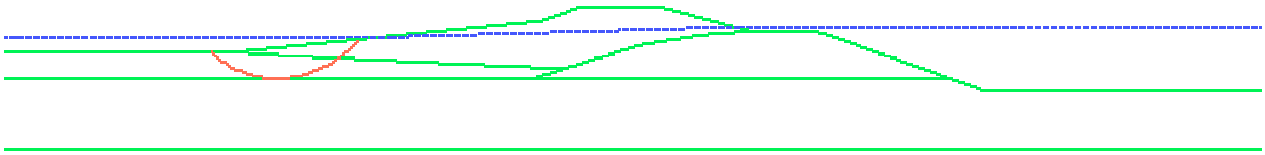


Circle center: (-12, 61)
Radius: 81

Peat at –20ft, without liquefiable layer – Average tide, average reservoir

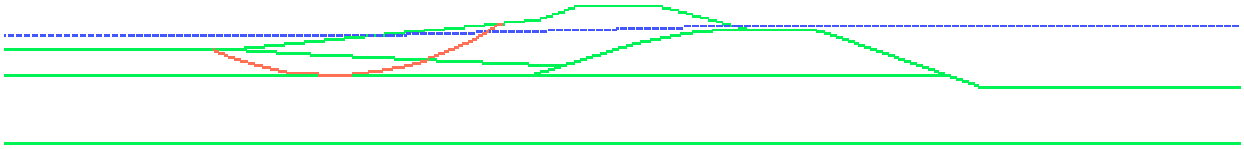
Water levels – Slough side: +1.5ft
Reservoir side: -2.5ft

Seismic Condition, Ky = 0.125 Post Seismic F.S. = 2.6



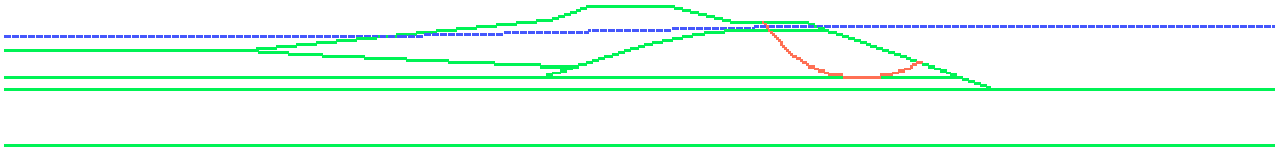
Circle center: (-227, 24)
Radius: 44

Seismic Condition, Ky = 0.128 Post Seismic F.S. = 2.5



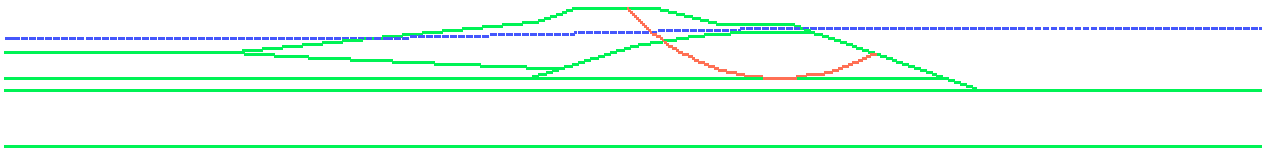
Circle center: (-202.5, 108.5)
Radius: 128.5

Seismic Condition, Ky = 0.115 Post Seismic F.S. = 2.2



Circle center: (22.0, 30.5)
Radius: 51.0

Seismic Condition, Ky = 0.12 Post Seismic F.S. = 1.8

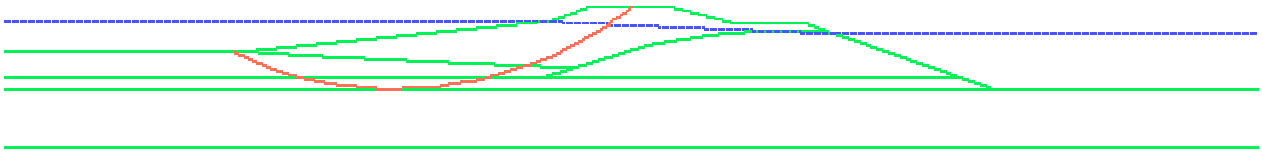


Circle center: (-8.0, 67)
Radius: 87.0

Peat at –20ft, with liquefiable sand layer – Low tide, high reservoir

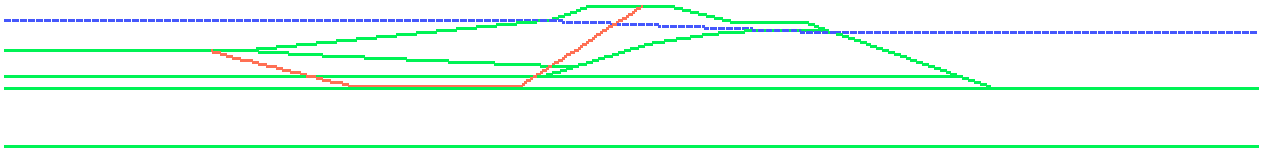
Water levels - Slough side: -1.0ft
Reservoir side: +4ft

Seismic condition, Ky = 0.083 Post Seismic F.S. = 2.1



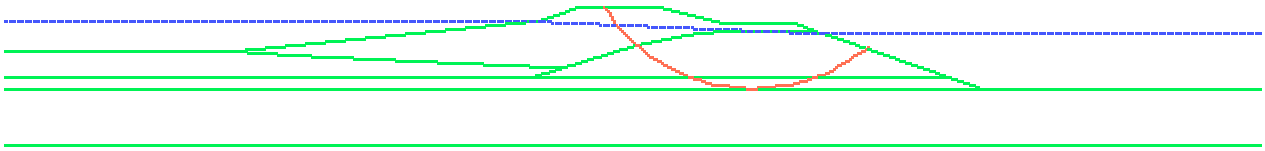
Circle center: (-180, 140)
Radius: 165

Seismic condition, Ky = 0.07 Post Seismic F.S. = 1.9



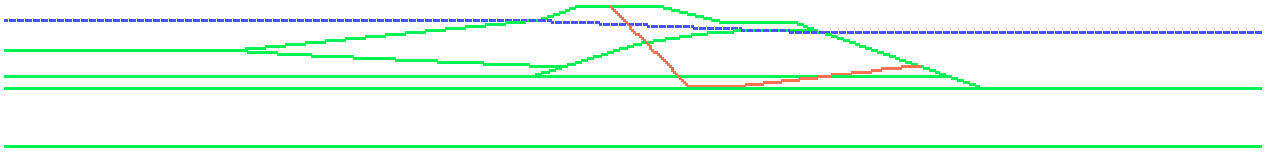
Wedge coordinates: -260.59, -9.0
-199.02, -24.10
-126.36, -24.34
-74.0, 10.0

Seismic condition, Ky = 0.042 Post Seismic F.S. = 1.3



Circle center: (-20.5, 53.0)
Radius: 78.0

Seismic condition, Ky = 0.027 Post Seismic F.S. = 1.2

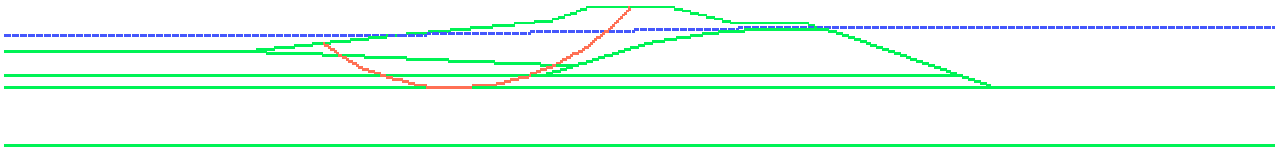


Wedge coordinates: -81.62, 10.0
-48.70, -24.36
-25.01, -24.26
51.37, -15.34

Peat at –20ft, with liquefiable sand layer – Average tide, average reservoir

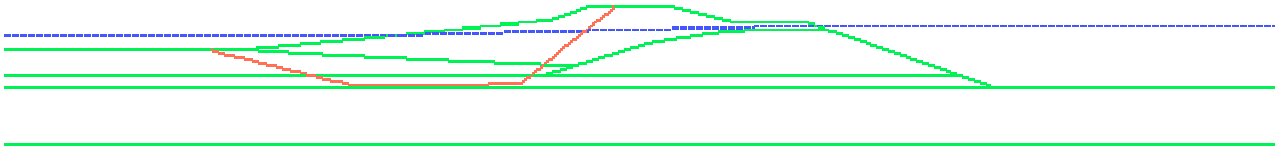
Water levels - Slough side: +1.5ft
Reservoir side: -2.5ft

Seismic condition, Ky = 0.078 Post Seismic F.S. = 1.6



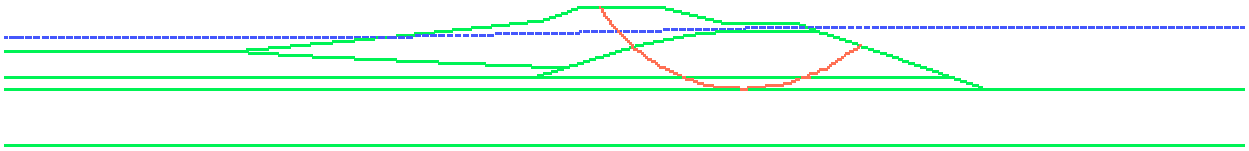
Circle center: (-154, 73)
Radius: 98.0

Seismic condition, Ky = 0.05 Post Seismic F.S. = 1.5



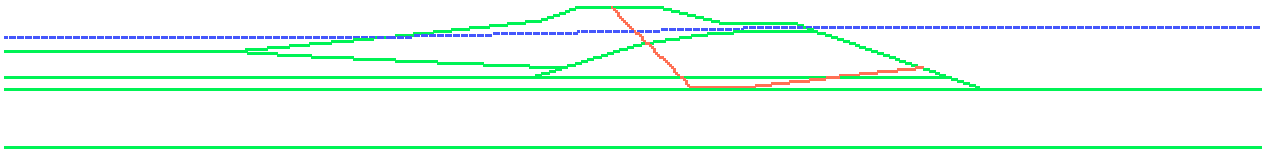
Wedge coordinates: -260.57, -9.0
-199.01, -24.16
-126.3, -23.85
-86.0, 10.0

Seismic condition, Ky = 0.073 Post Seismic F.S. = 1.5



Circle center: (-25, 49.5)
Radius: 74.5

Seismic condition, Ky = 0.053 Post Seismic F.S. = 1.4

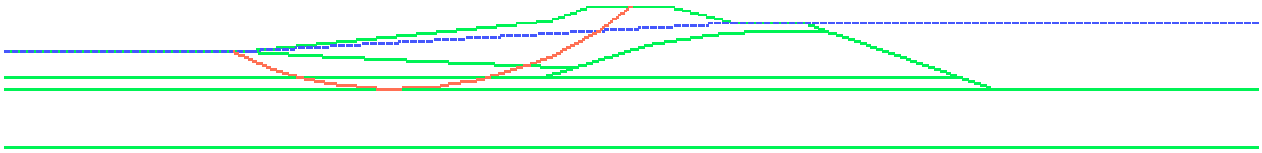


Wedge coordinates: -81.91, 10.0
-47.43, -24.50
-14.90, -24.67
52.61, -15.77

Peat at –20ft, with liquefiable sand layer – High tide, empty reservoir

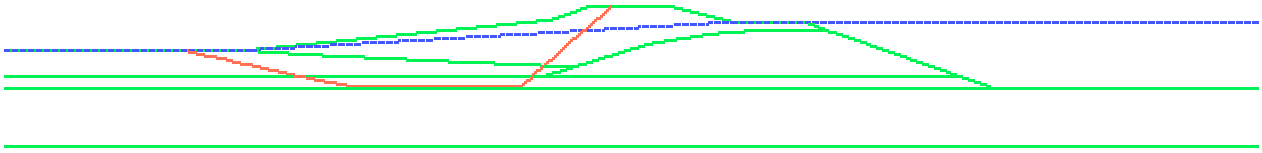
Water levels - Slough side: +3.5ft
Reservoir side: empty

Seismic condition, Ky = 0.055 Post Seismic F.S. = 1.4



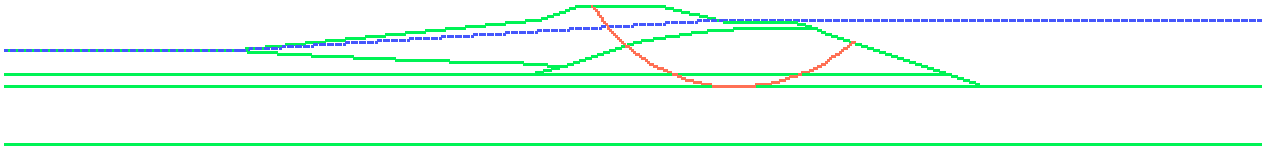
Circle center: (-180, 140)
Radius: 165

Seismic condition, Ky = 0.027 Post Seismic F.S. = 1.2



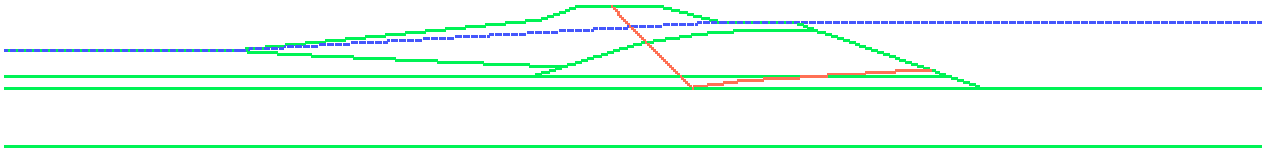
Wedge coordinates: -270.7, -9.0
-199.01, -24.48
-126.12, -24.13
-87.47, 10.0

Seismic condition, Ky = 0.08 Post Seismic F.S. = 1.6



Circle center: (-27.5, 49)
Radius: 74

Seismic condition, Ky = 0.063 Post Seismic F.S. = 1.5

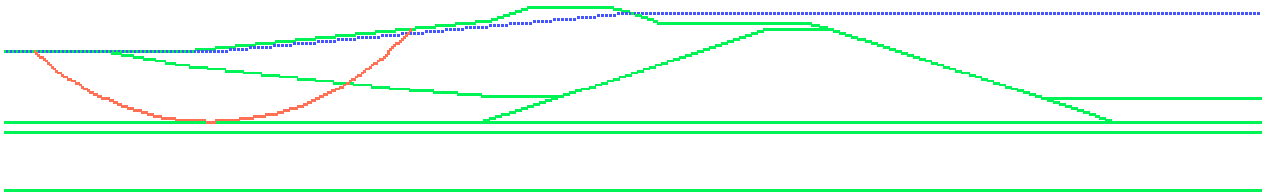


Wedge coordinates: -82.37, 10.0
-47.56, -24.95
-25.08, -21.84
56.39, -17.07

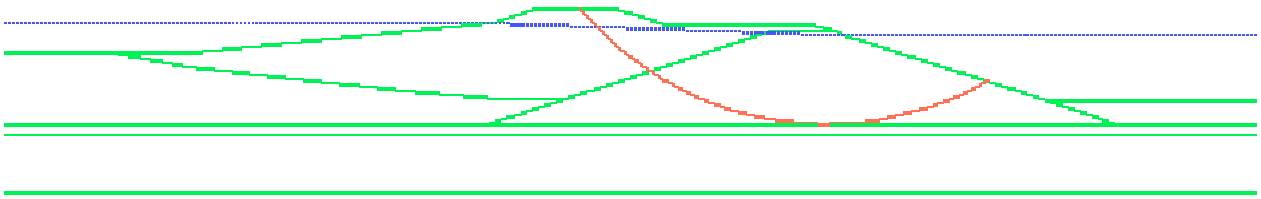
Peat at –40ft

Long Term Condition
Water levels – Slough side: +7ft
Reservoir side: empty

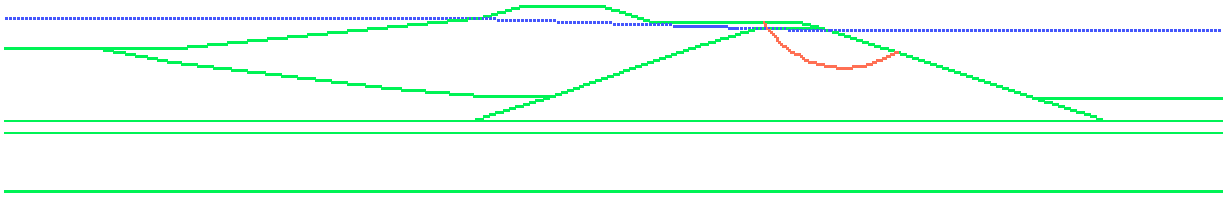
F.S. = 1.5



F.S. = 1.5



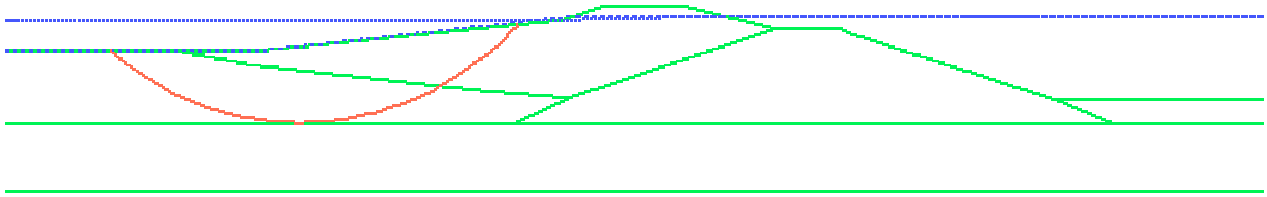
F.S. = 1.7



Sudden Drawdown

Water levels – Slough side: +6ft
Reservoir side: +4ft at first stage, empty at second stage

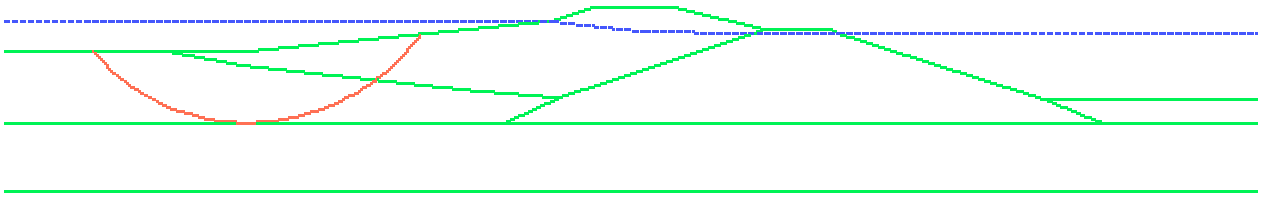
FS = 1.3



Peat at –40ft, without liquefiable layer – Low tide, high reservoir

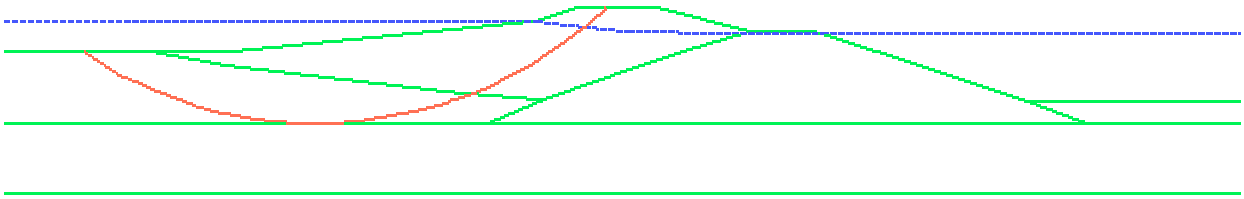
Water levels – Slough side: -1ft
Reservoir side: +4ft

Seismic Condition, Ky = 0.082 Post Seismic F.S. = 2.0



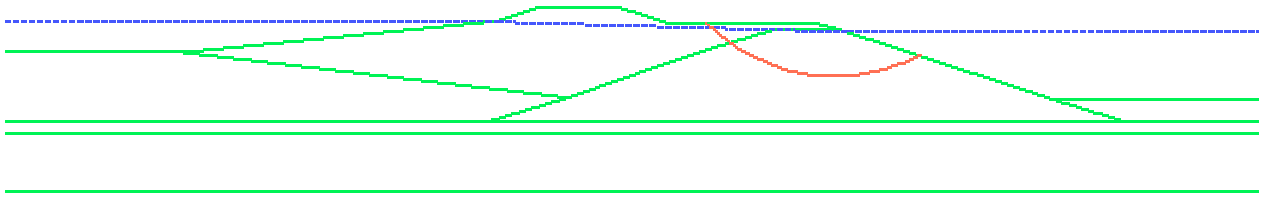
Circle center: (-268.0, 50)
Radius: 90

Seismic Condition, Ky = 0.094 Post Seismic F.S. = 2.1



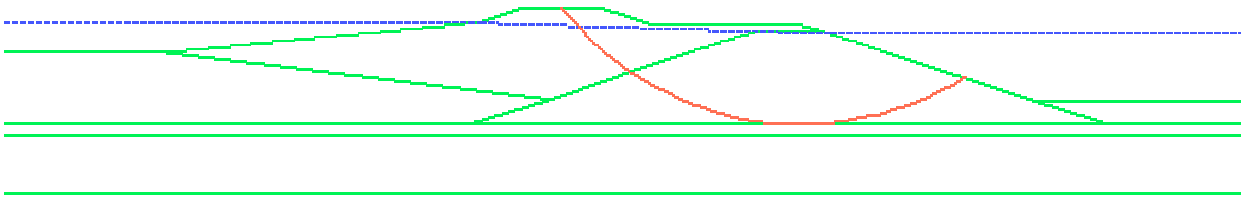
Circle center: (-231.6, 141)
Radius: 181

Seismic Condition, Ky = 0.082 Post Seismic F.S. = 2.0



Circle center: (10, 60)
Radius: 80

Seismic Condition, Ky = 0.062 Post Seismic F.S. = 1.5

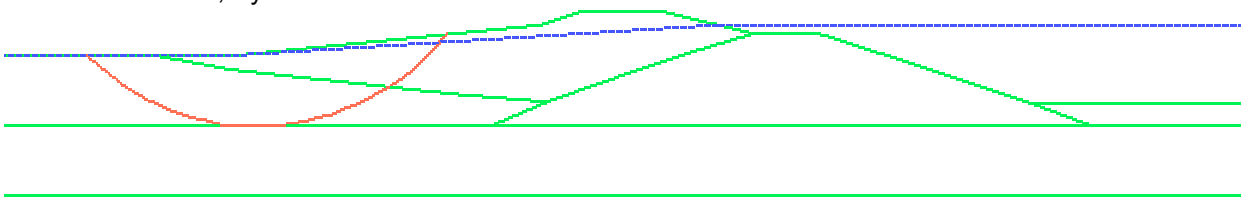


Circle center: (3, 94.5)
Radius: 134.5

Peat at –40ft, without liquefiable layer – High tide, empty reservoir

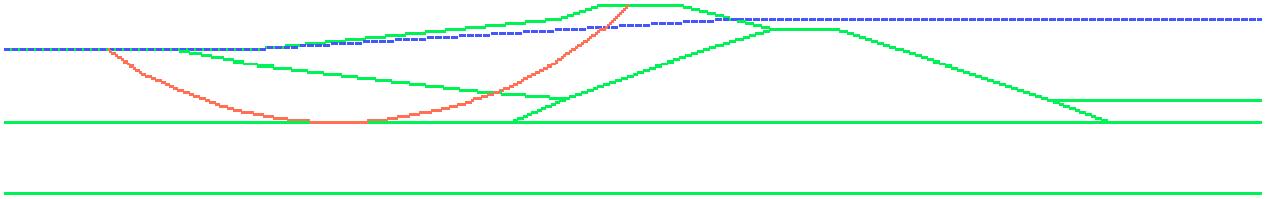
Water levels – Slough side: +3.5ft
Reservoir side: empty

Seismic Condition, Ky = 0.058 Post Seismic F.S. = 1.5



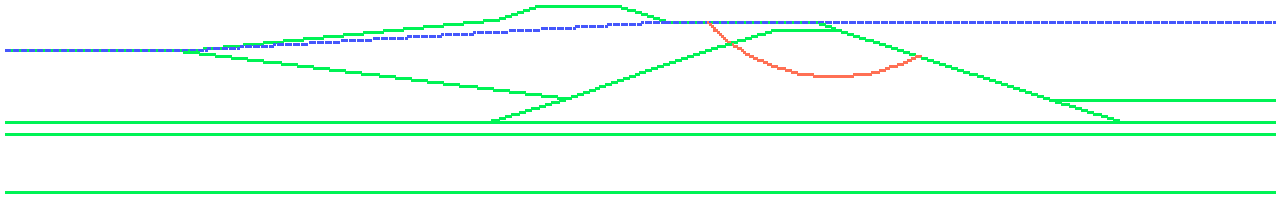
Circle center: (-59.62, 62.5)
Radius: 102.5

Seismic Condition, Ky = 0.07 Post Seismic F.S. = 1.5



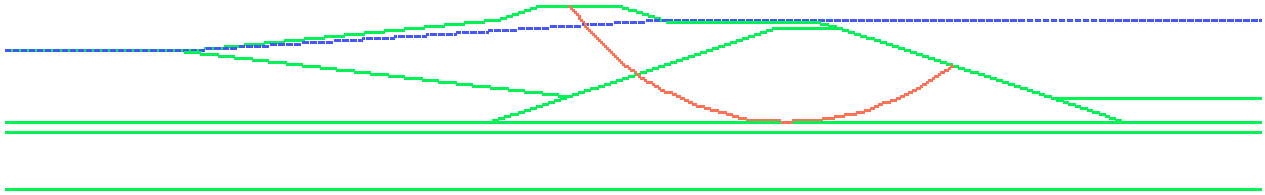
Circle center: (-231.6, 141)
Radius: 181

Seismic Condition, Ky = 0.11 Post Seismic F.S. = 2.7



Circle center: (10, 59.5)
Radius: 79.5

Seismic Condition, Ky = 0.078 Post Seismic F.S. = 1.7

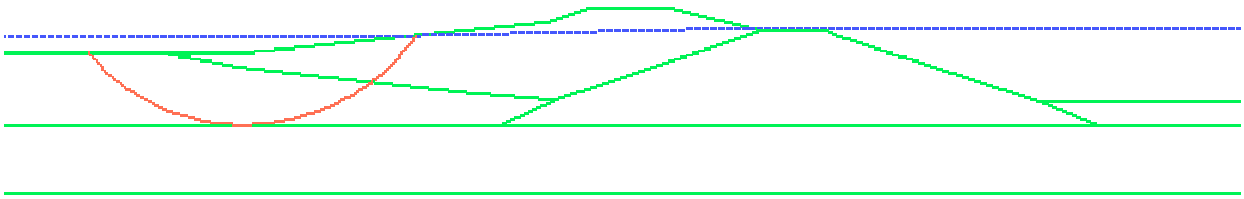


Circle center: (-10.5, 76)
Radius: 116

Peat at –40ft, without liquefiable layer – Average tide, average reservoir

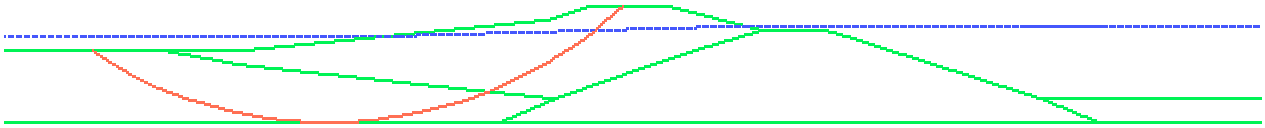
Water levels – Slough side: +1.5ft
Reservoir side: -2.5ft.

Seismic Condition, Ky = 0.082 Post Seismic F.S. = 2.0



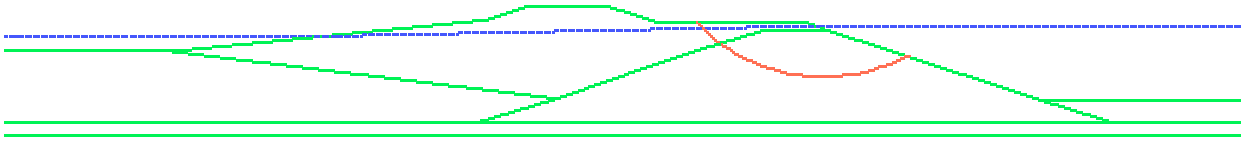
Circle center: (-268.1, 50)
Radius: 90

Seismic Condition, Ky = 0.086 Post Seismic F.S. = 1.9



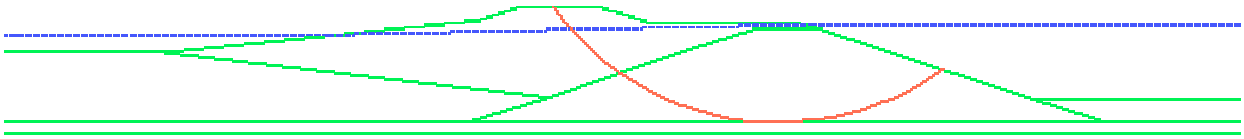
Circle center: (-232.5, 146)
Radius: 186

Seismic Condition, Ky = 0.125 Post Seismic F.S. = 2.5



Circle center: (10.5, 59.5)
Radius: 79.5

Seismic Condition, Ky = 0.085 Post Seismic F.S. = 1.7

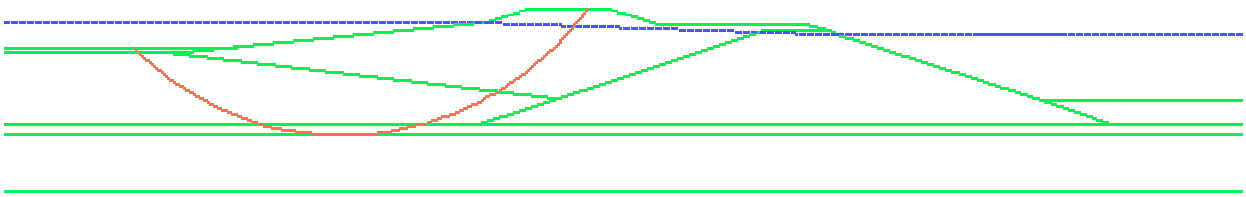


Circle center: (-6.0, 82.5)
Radius: 122.5

Peat at –40ft, with liquefiable sand layer – Low tide, high reservoir
**with 2ft of rip rap at the toe of reservoir slope

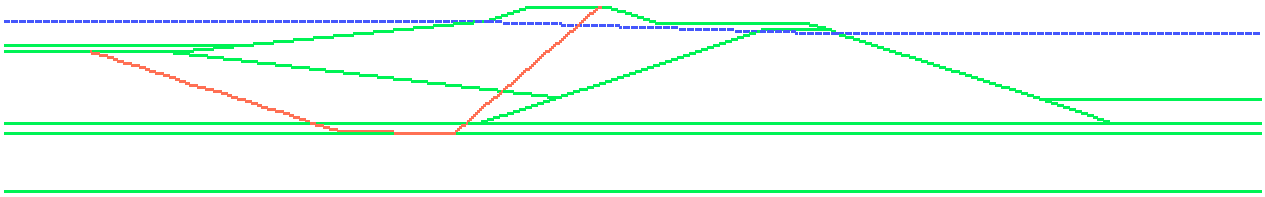
Water levels - Slough side: -1.0ft
Reservoir side: +4ft

Seismic condition, Ky = 0.06 Post Seismic F.S. = 1.6



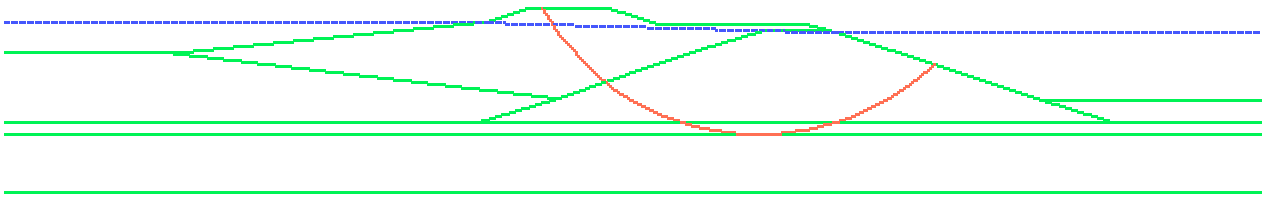
Circle center: (-199, 83)
Radius: 128.0

Seismic condition, Ky = 0.058 Post Seismic F.S. = 1.6



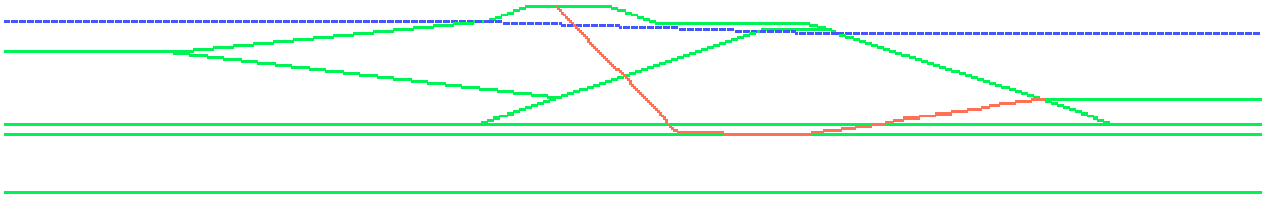
Wedge coordinates: -309, -9.0
-199.3, -44.1
-151.4, -44.5
-88.3, 10.0

Seismic condition, Ky = 0.027 Post Seismic F.S. = 1.2



Circle center: (-19.0, 63.5)
Radius: 108.5

Seismic condition, Ky = 0.009 Post Seismic F.S. = 1.1

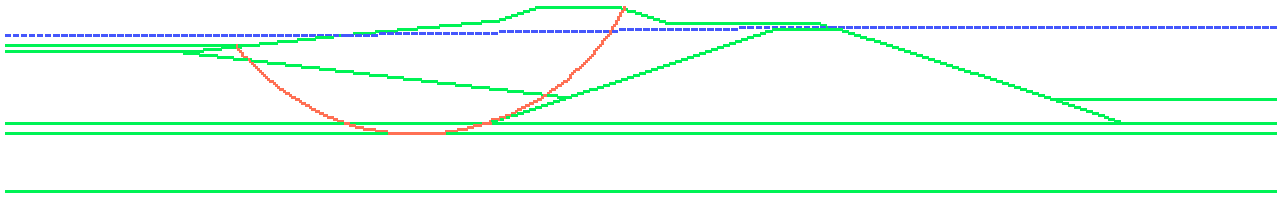


Wedge coordinates: -106.94, 10.0
-54.41, -43.82
0.33, -45.02
104.17, -29.96

Peat at –40ft, with liquefiable sand layer – Average tide, average reservoir
**with 2ft of rip rap at the toe of reservoir slope

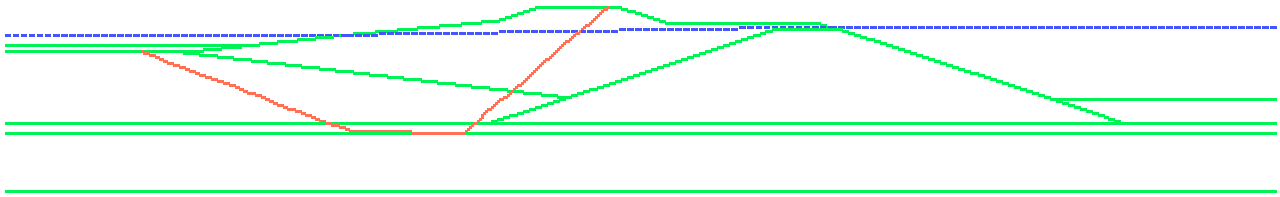
Water levels - Slough side: +1.5ft
Reservoir side: -2.5ft

Seismic condition, Ky = 0.09 Post Seismic F.S. = 1.7



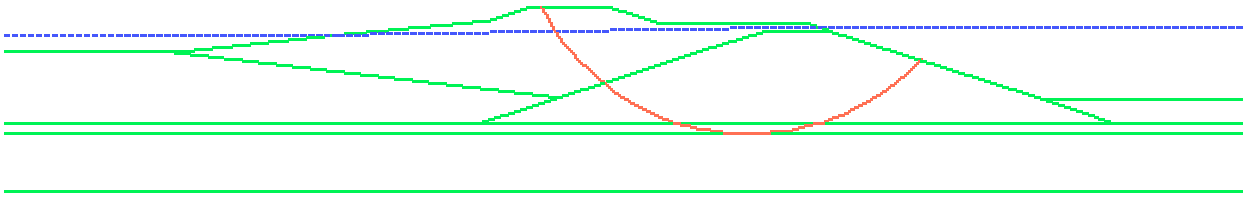
Circle center: (-171.5, 55.5)
Radius: 100.5

Seismic condition, Ky = 0.075 Post Seismic F.S. = 1.7



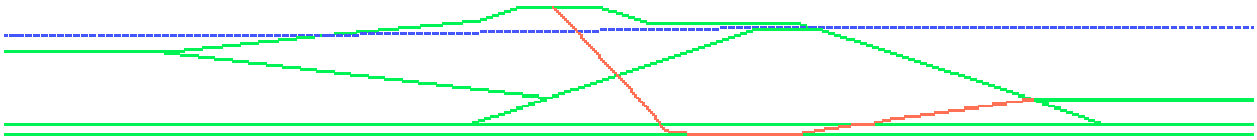
Wedge coordinates: -295, -9.0
-199.35, -44.1
-151.44, -44.5
-88.97, 10.0

Seismic condition, Ky = 0.05 Post Seismic F.S. = 1.4



Circle center: (-23.5, 57)
Radius: 102.0

Seismic condition, Ky = 0.029 Post Seismic F.S. = 1.2

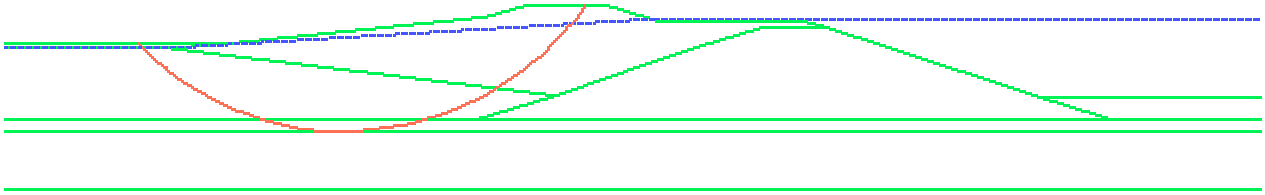


Wedge coordinates: -104.11, 10.0
-54.32, -44.23
0.29, -44.94
103.71, -29.81

Peat at –40ft, with liquefiable sand layer – High tide, empty reservoir
**with 2ft of rip rap at the toe of reservoir slope

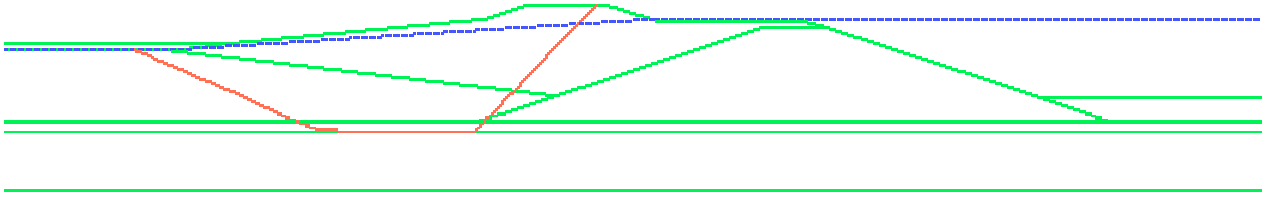
Water levels - Slough side: +3.5ft
Reservoir side: empty

Seismic condition, Ky = 0.04 Post Seismic F.S. = 1.2



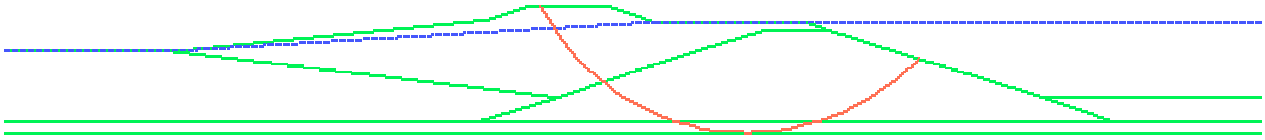
Circle center: (-197.5, 80.5)
Radius: 125.5

Seismic condition, Ky = 0.015 Post Seismic F.S. = 1.1



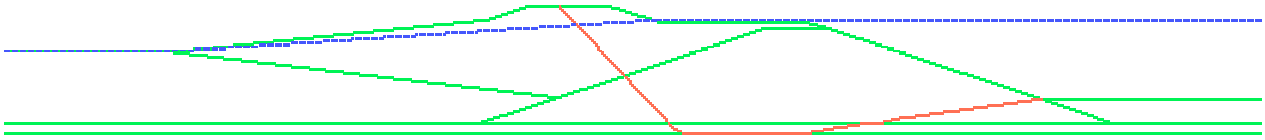
Wedge coordinates: -289, -9.0
-208.84, -44.26
-141.69, -44.66
-88.97, 10.0

Seismic condition, Ky = 0.052 Post Seismic F.S. = 1.4



Circle center: (-24, 55.5)
Radius: 100.5

Seismic condition, Ky = 0.03 Post Seismic F.S. = 1.3



Wedge coordinates: -105.6, 10.0
-54.32, -44.24
0.48, -44.92
104.08, -29.93