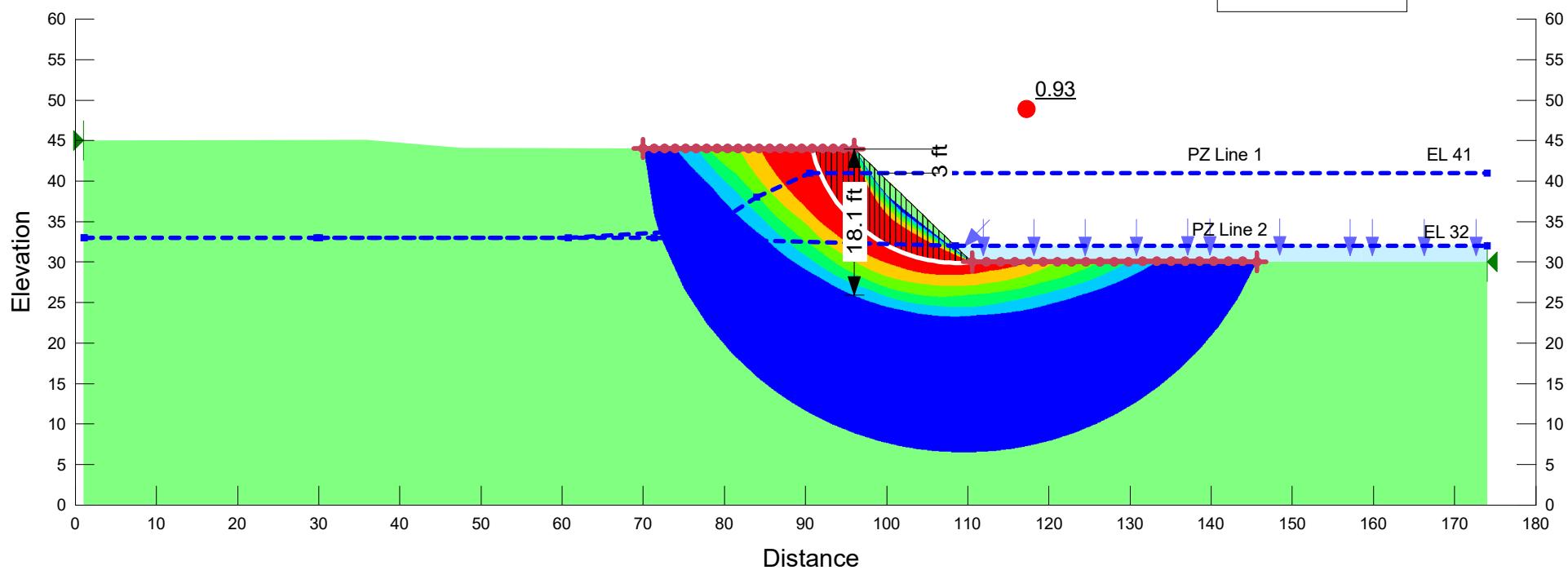


**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 14 ft; Loose Sand (SM/SC)**  
**1.0 to 1 Channel Slope**

FOS: 0.93

Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50

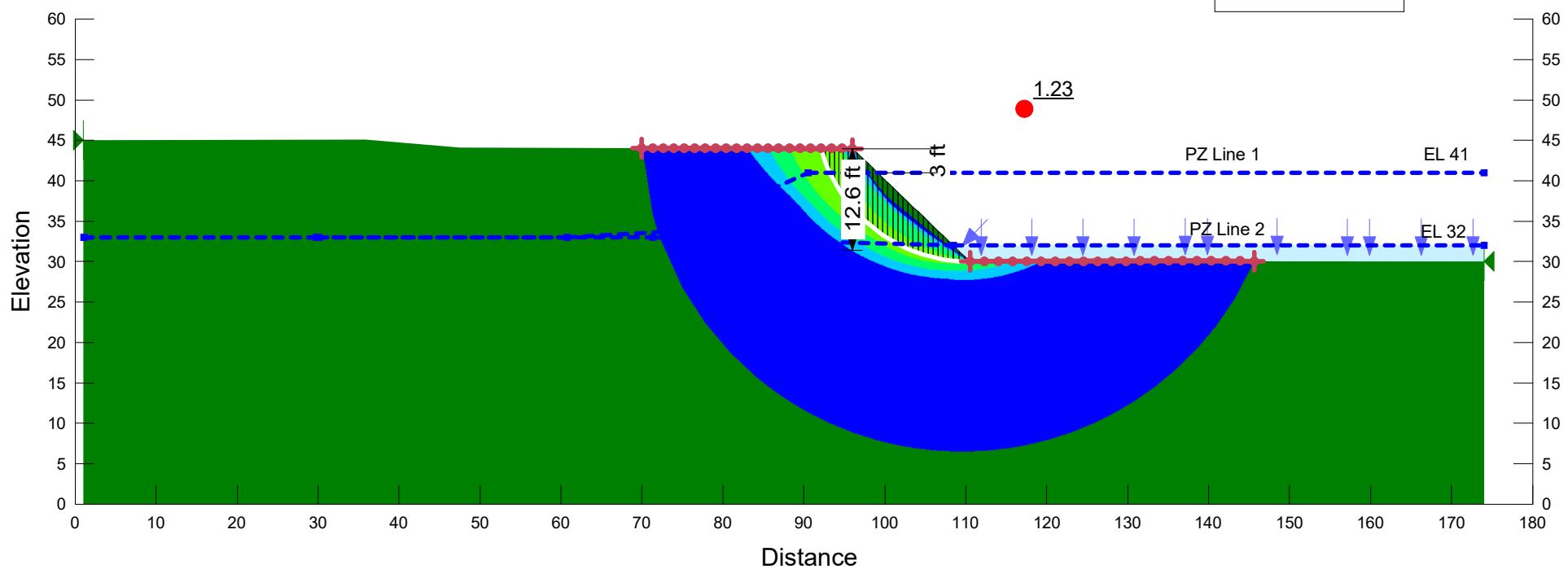


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Green	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 14 ft; Dense Sand (SM/SC)**  
**1.0 to 1 Channel Slope**

FOS: 1.23

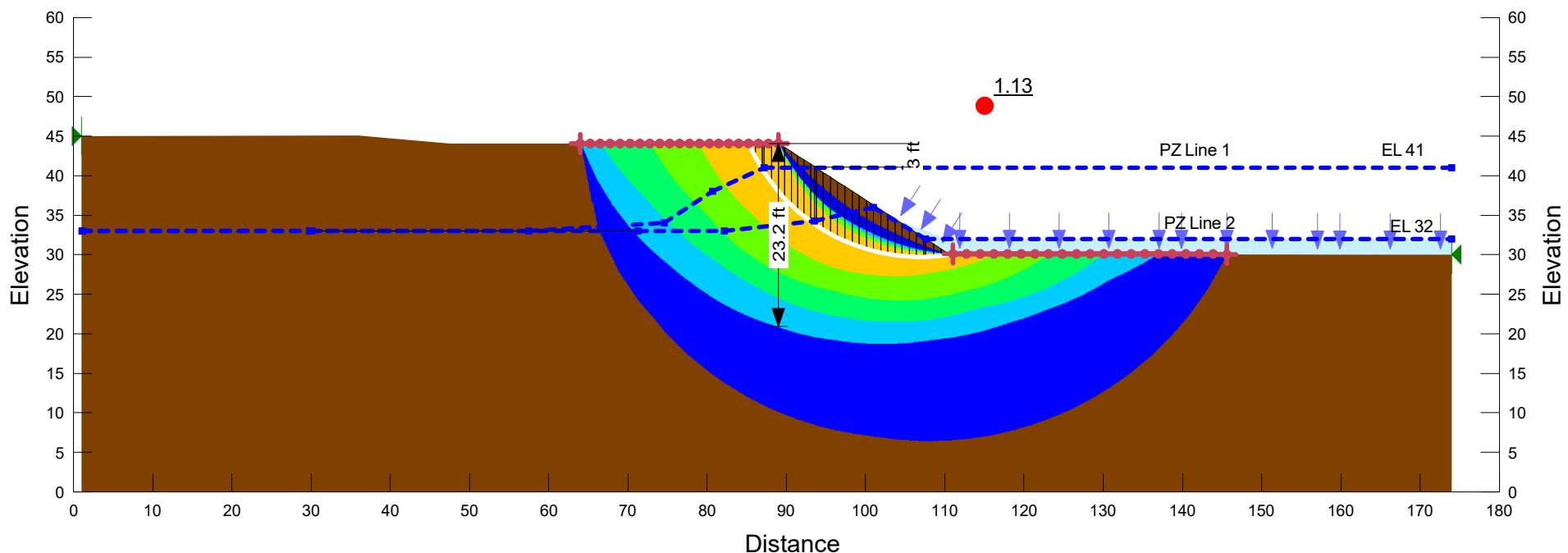
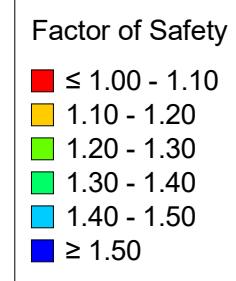
Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 14 ft; Soft Fat Clay (CH)**  
**1.5 to 1 Channel Slope**

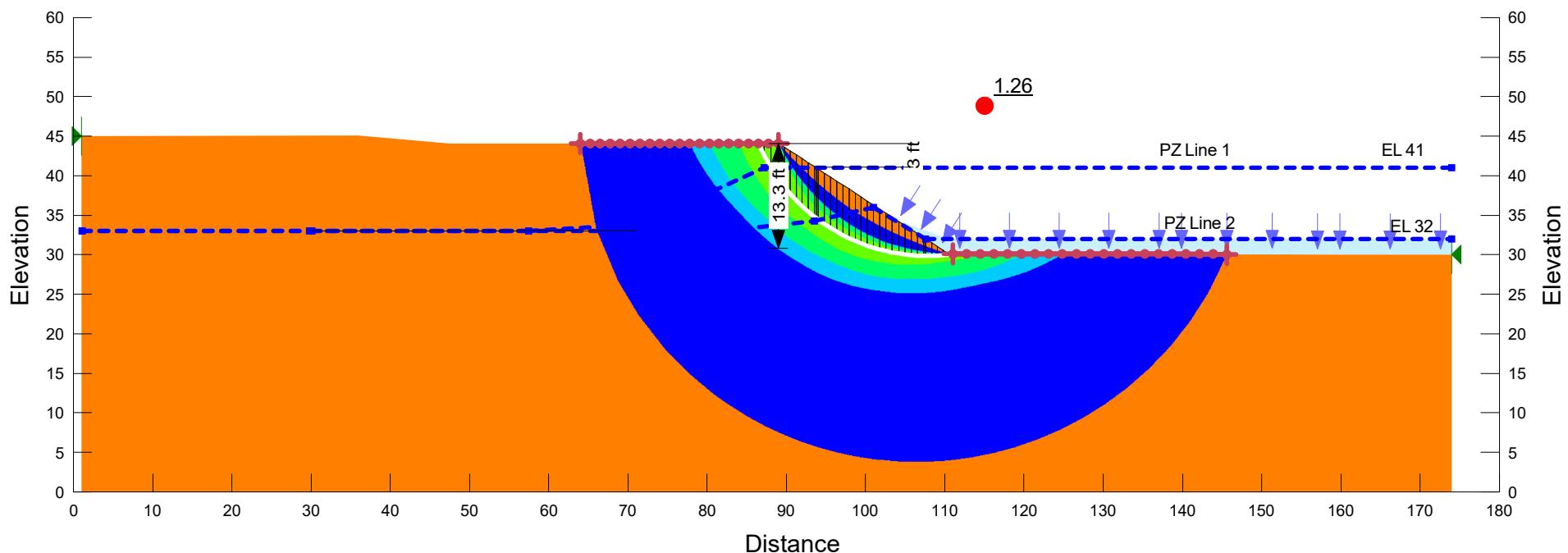
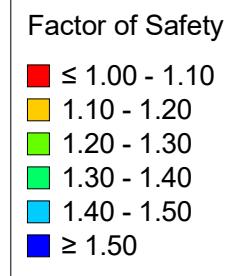
FOS: 1.13



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 14 ft; Stiff Fat Clay (CH)  
 1.5 to 1 Channel Slope

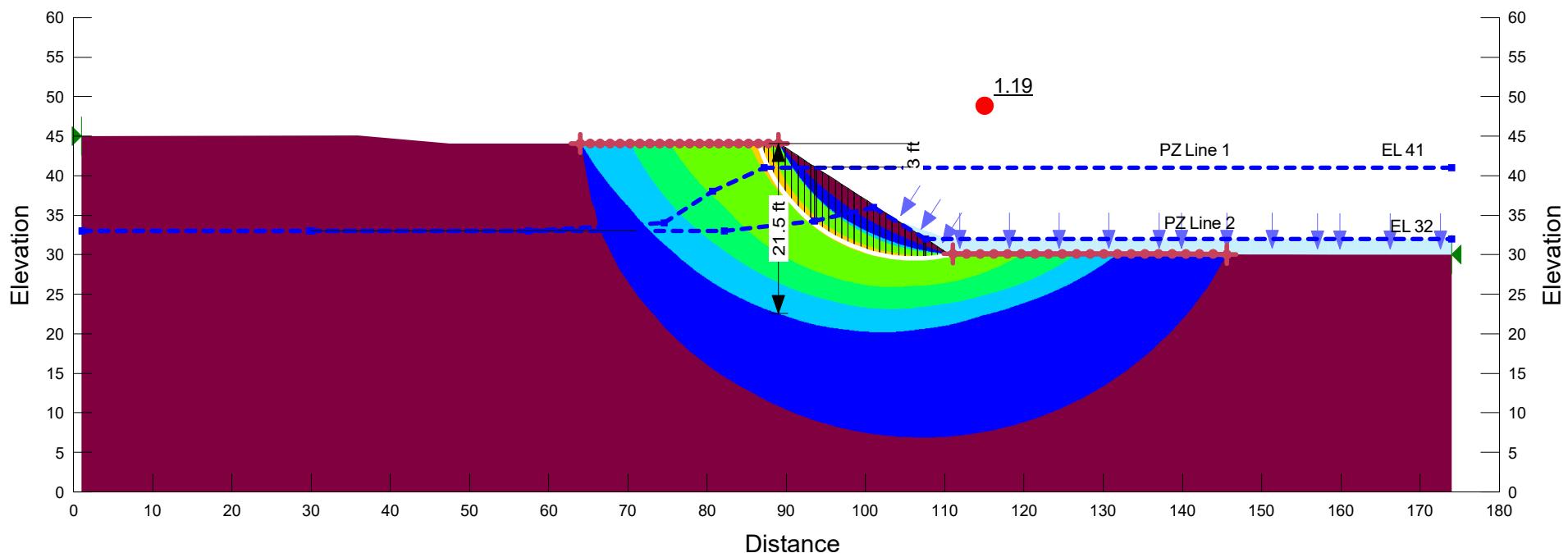
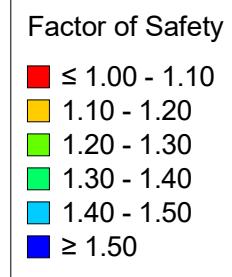
FOS: 1.26



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 14 ft; Soft Lean Clay (CL)**  
**1.5 to 1 Channel Slope**

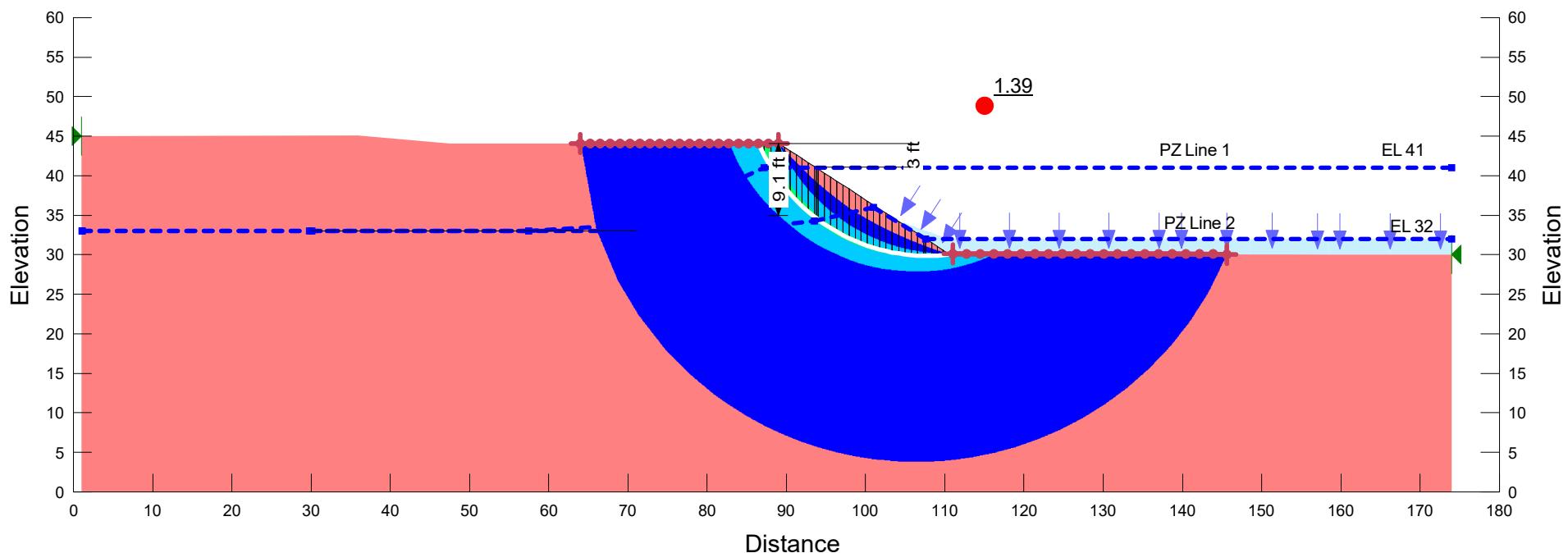
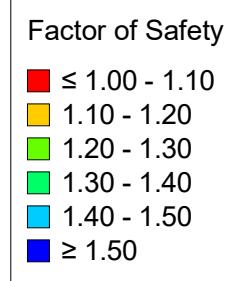
FOS: 1.19



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Soft	120	100	24	500	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 14 ft; Stiff Lean Clay (CL)  
 1.5 to 1 Channel Slope

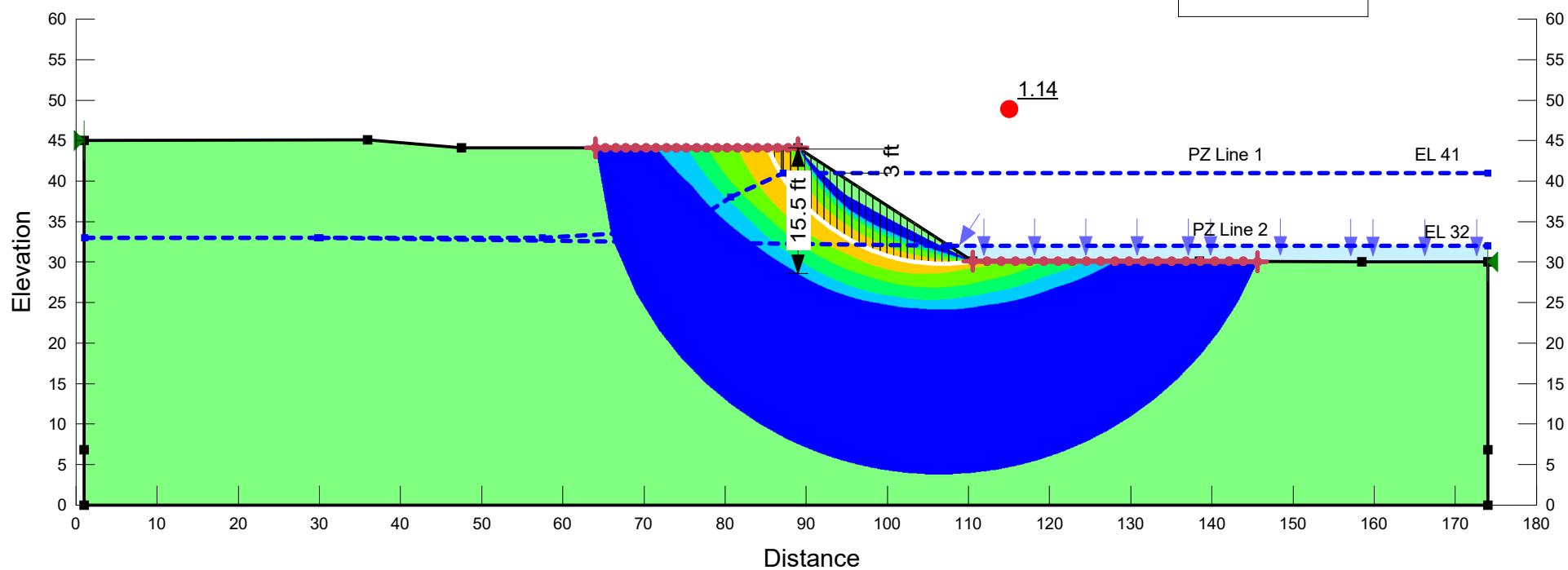
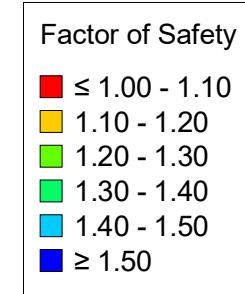
FOS: 1.39



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■ CL Stiff	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 14 ft; Loose Sand (SM/SC)**  
**1.5 to 1 Channel Slope**

FOS: 1.14

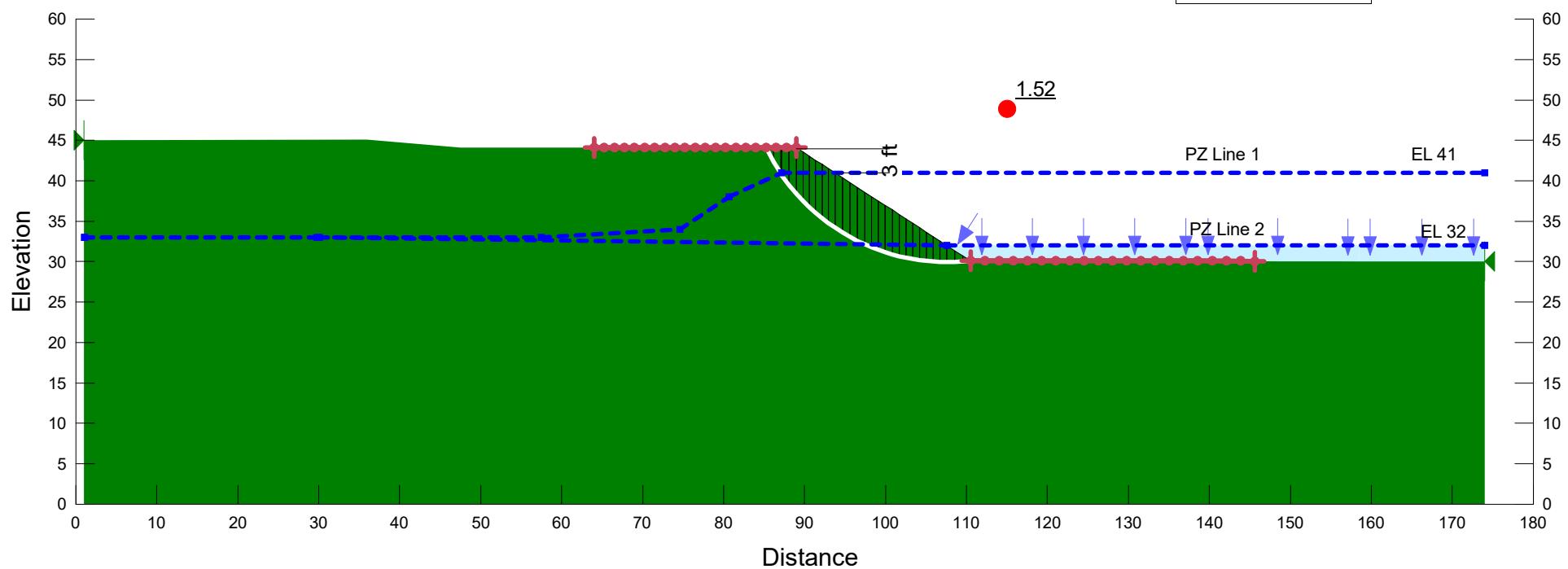


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 14 ft; Dense Sand (SM/SC)  
 1.5 to 1 Channel Slope

FOS: 1.52

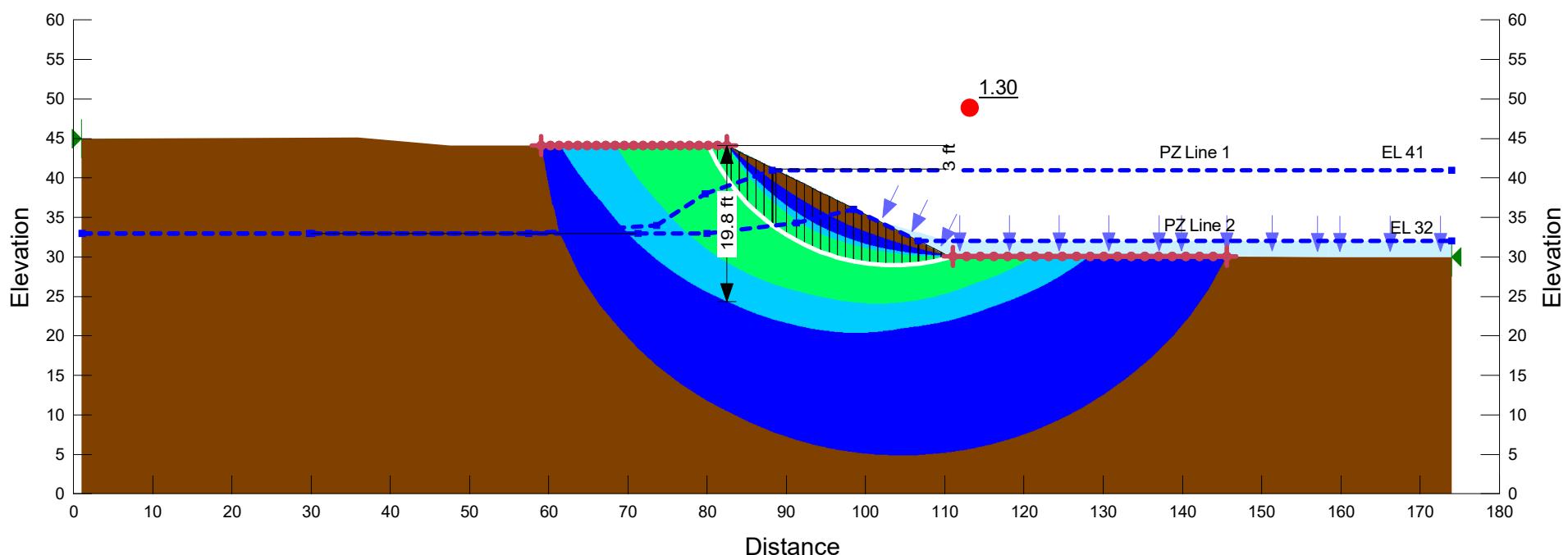
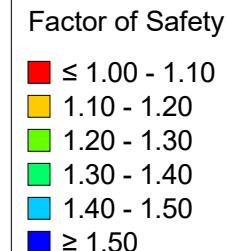
Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 14 ft; Soft Fat Clay (CH)**  
**2.0 to 1 Channel Slope**

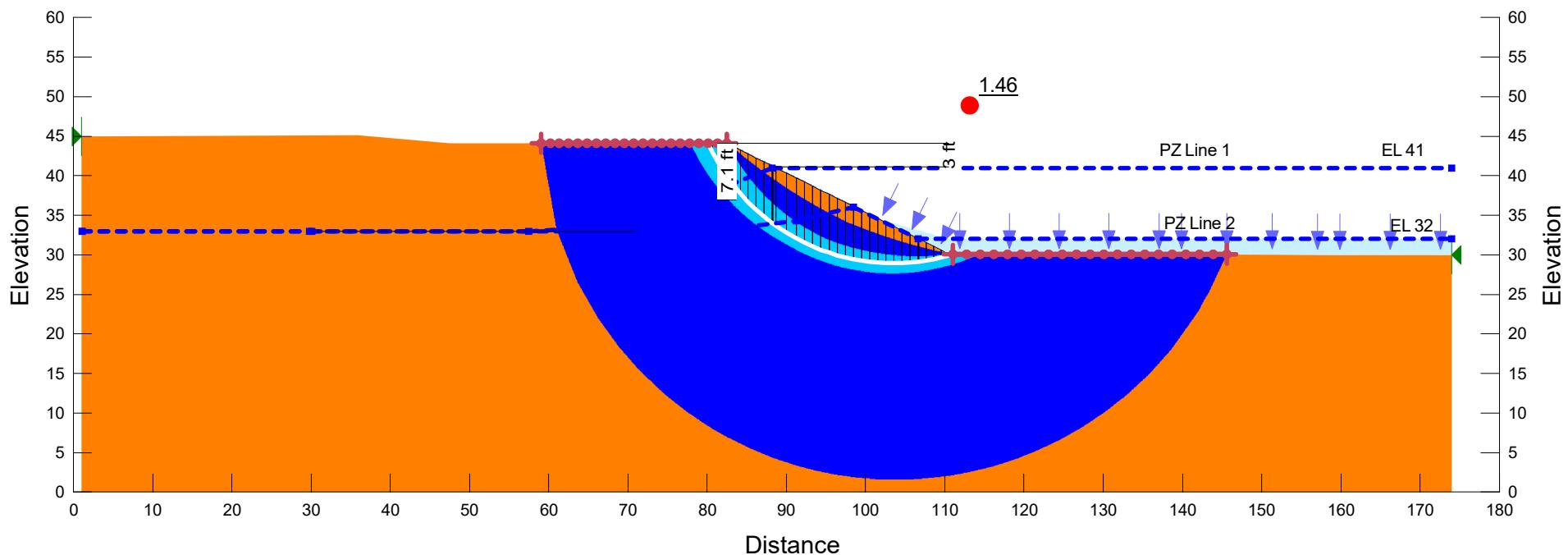
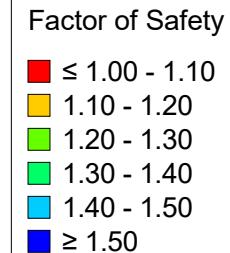
FOS: 1.30



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 14 ft; Stiff Fat Clay (CH)  
 2.0 to 1 Channel Slope

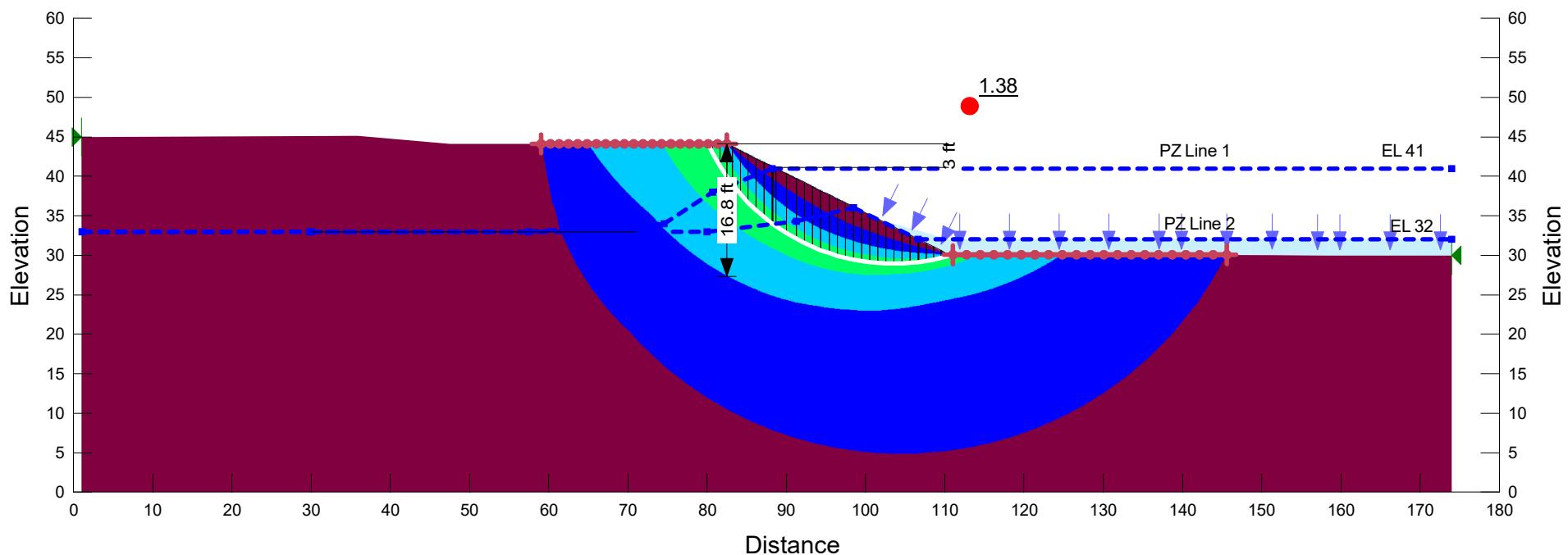
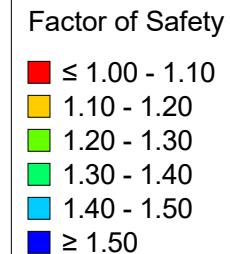
FOS: 1.46



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
<span style="color: orange;">█</span>	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 14 ft; Soft Lean Clay (CL)  
 2.0 to 1 Channel Slope

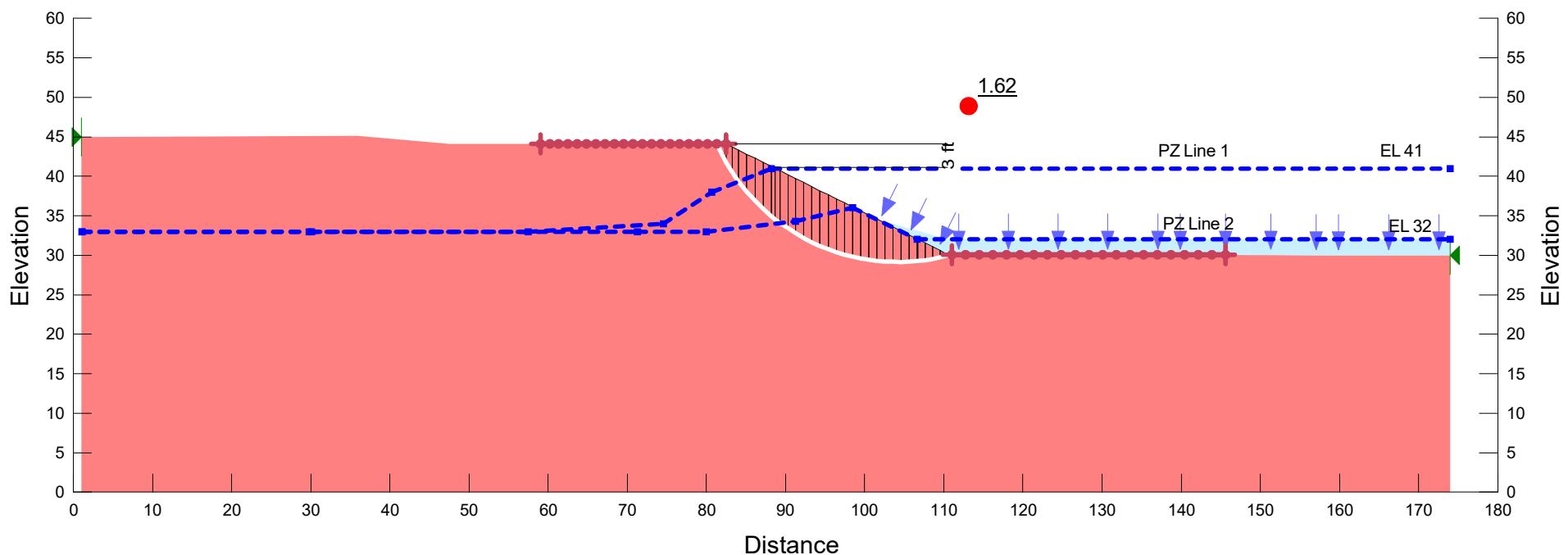
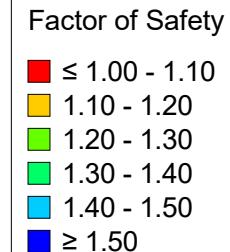
FOS: 1.38



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Soft	120	100	24	500	0	1	2

Rapid Drawdown Slope Stability Analysis  
Bank Height = 14 ft; Stiff Lean Clay (CL)  
2.0 to 1 Channel Slope

FOS: 1.62

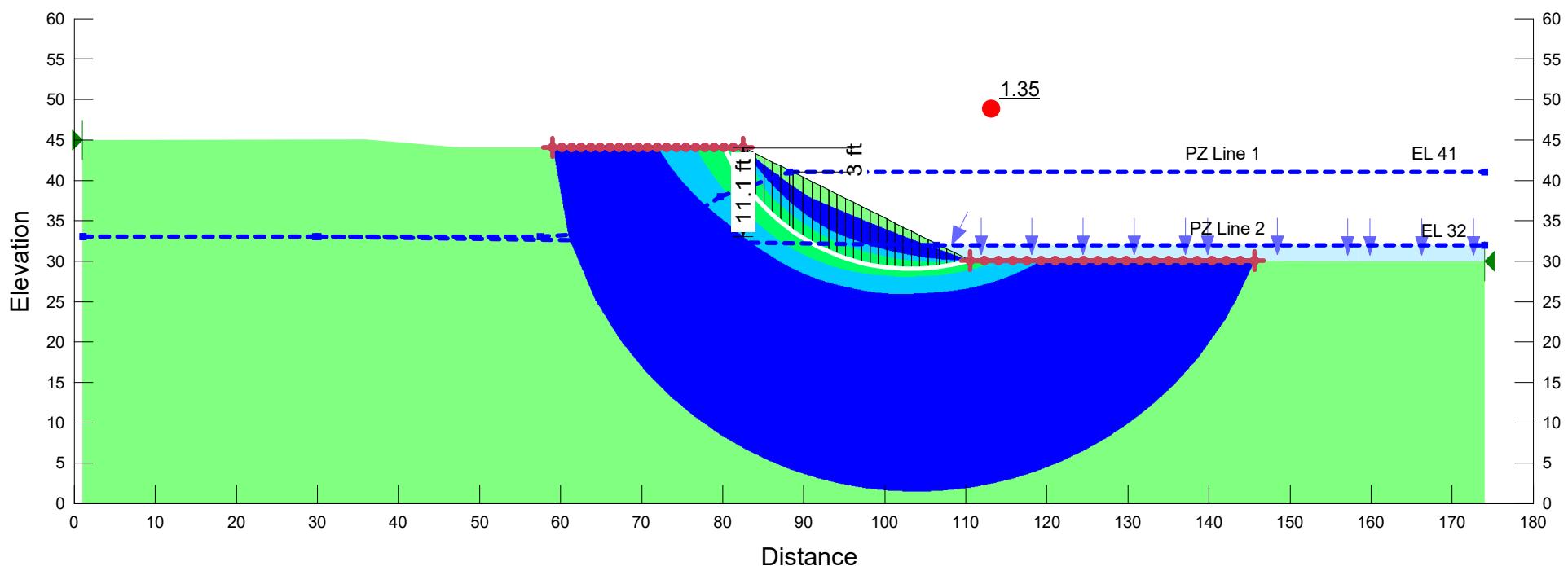


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
<span style="background-color: red;"></span>	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 14 ft; Loose Sand (SM/SC)**  
**2.0 to 1 Channel Slope**

FOS: 1.35

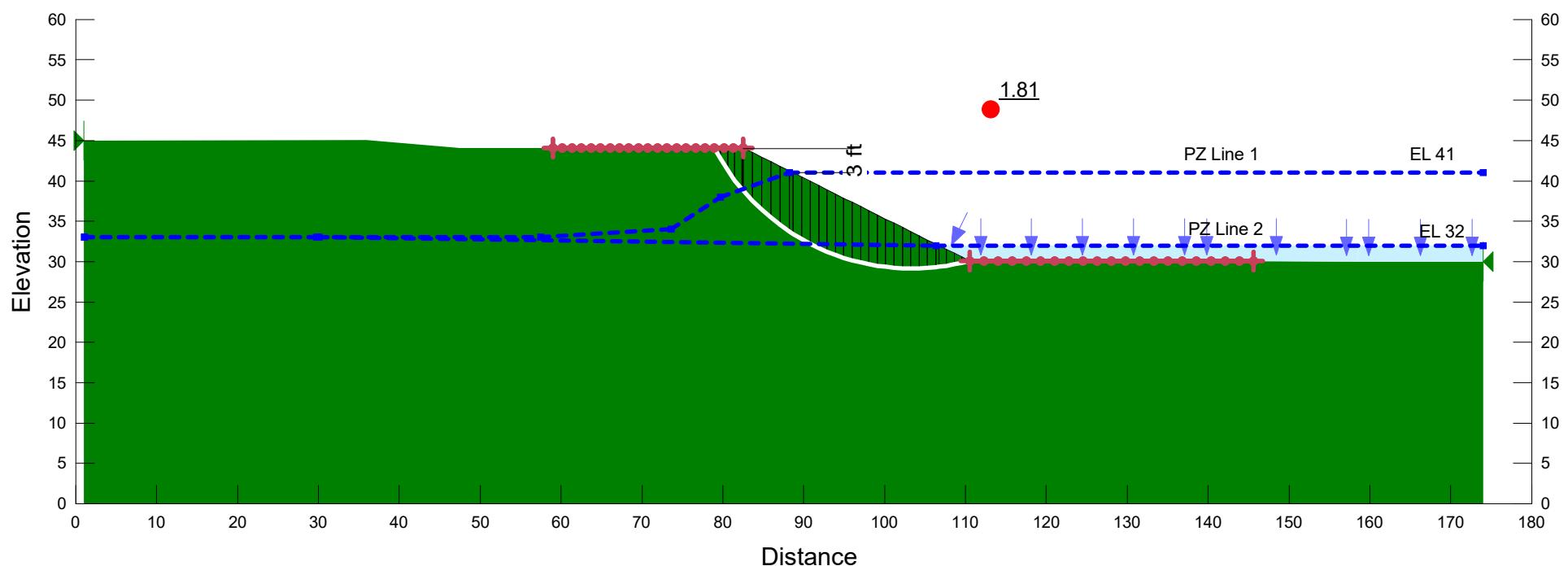
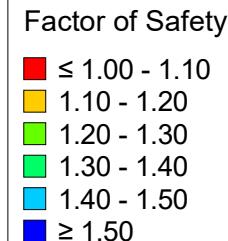
Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Green	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 14 ft; Dense Sand (SM/SC)**  
**2.0 to 1 Channel Slope**

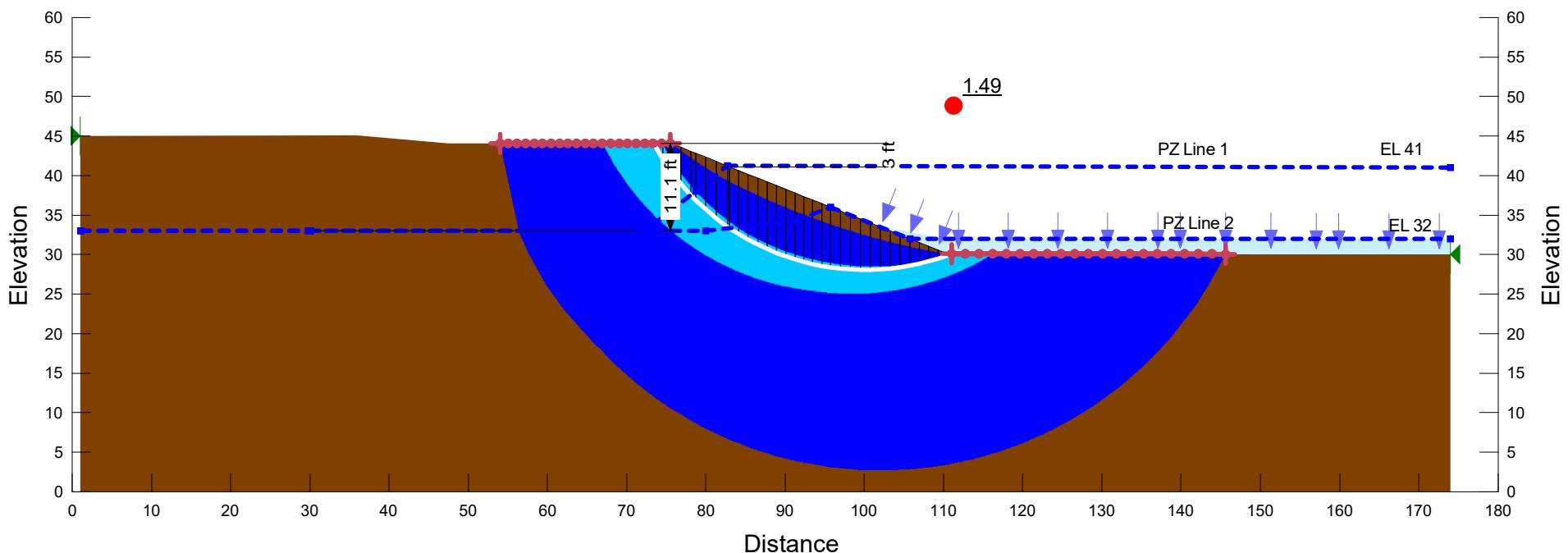
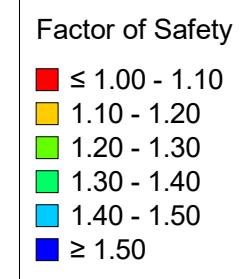
FOS: 1.81



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 14 ft; Soft Fat Clay (CH)  
 2.5 to 1 Channel Slope

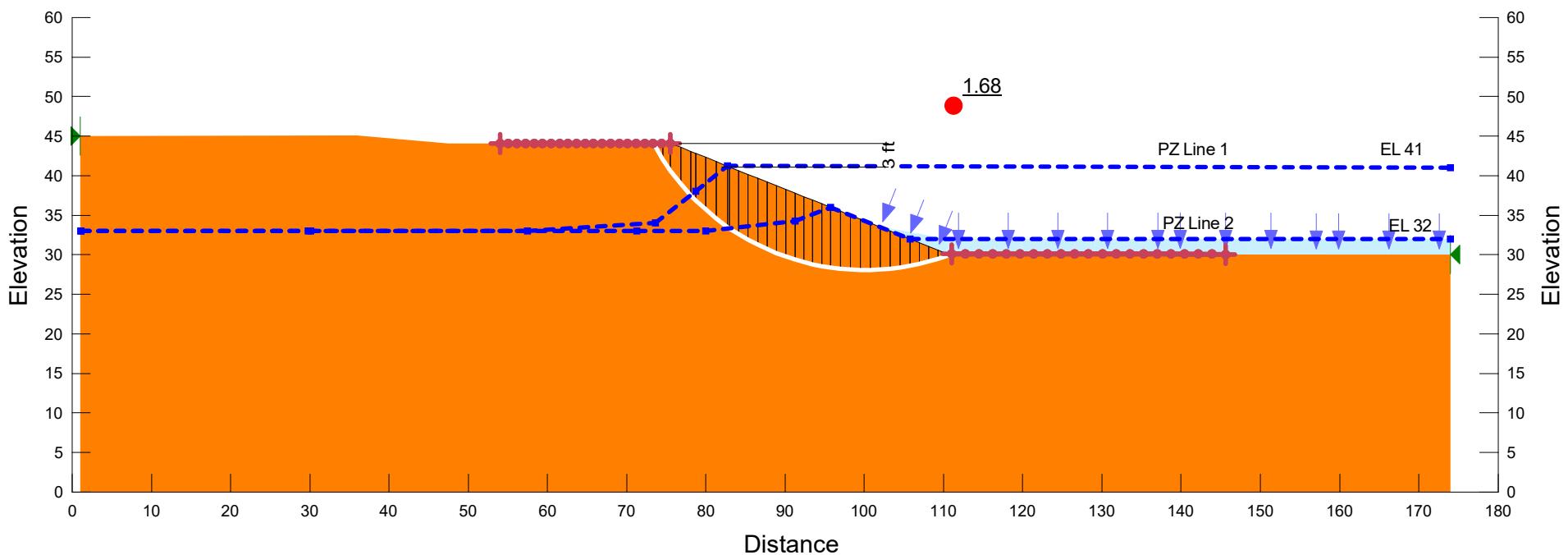
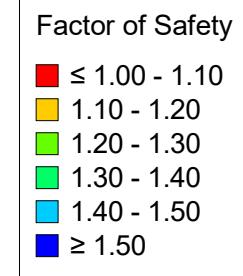
FOS: 1.49



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
<span style="color: brown;">█</span>	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 14 ft; Stiff Fat Clay (CH)**  
**2.5 to 1 Channel Slope**

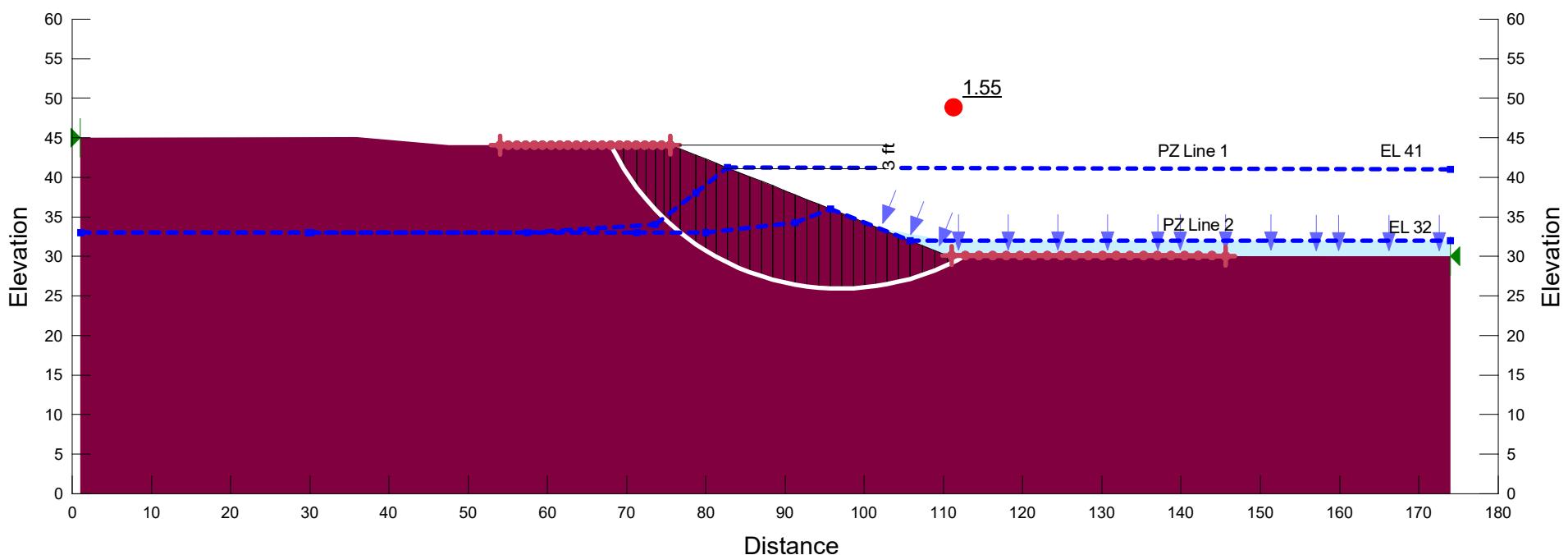
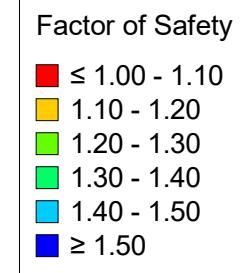
FOS: 1.68



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 14 ft; Soft Lean Clay (CL)  
 1.5 to 1 Channel Slope

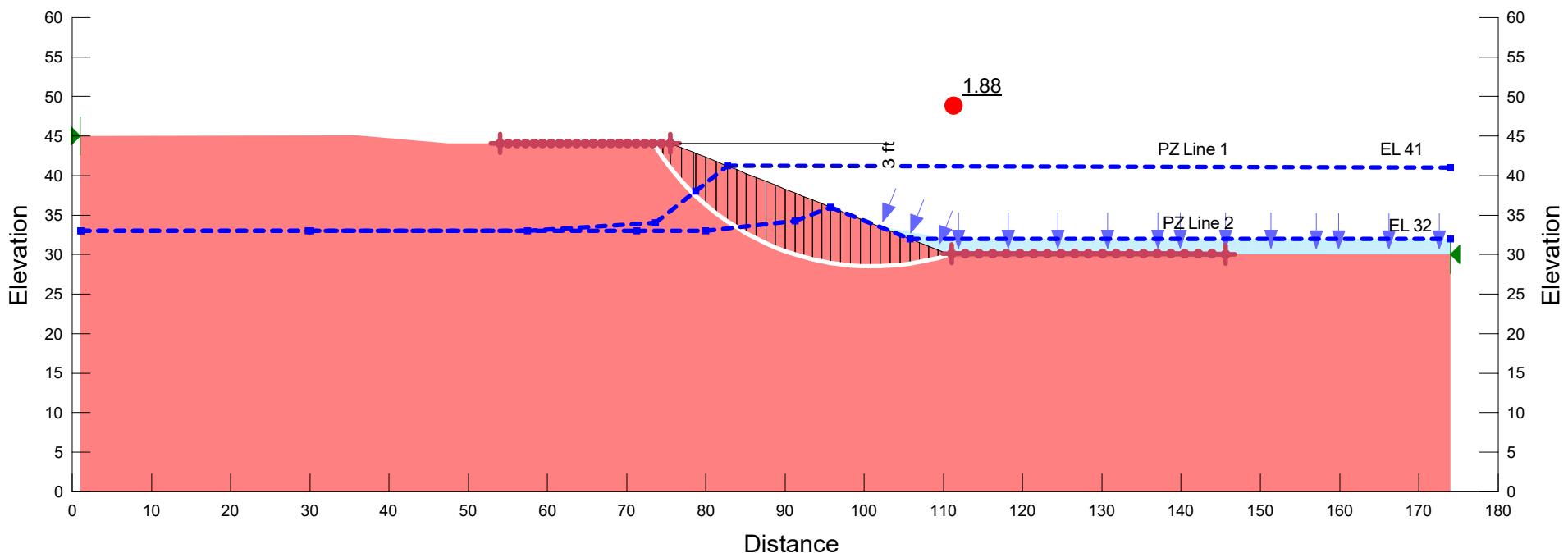
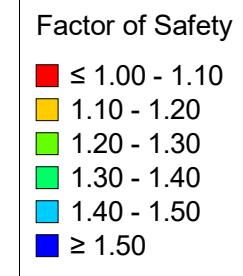
FOS: 1.55



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 14 ft; Stiff Lean Clay (CL)**  
**2.5 to 1 Channel Slope**

FOS: 1.88

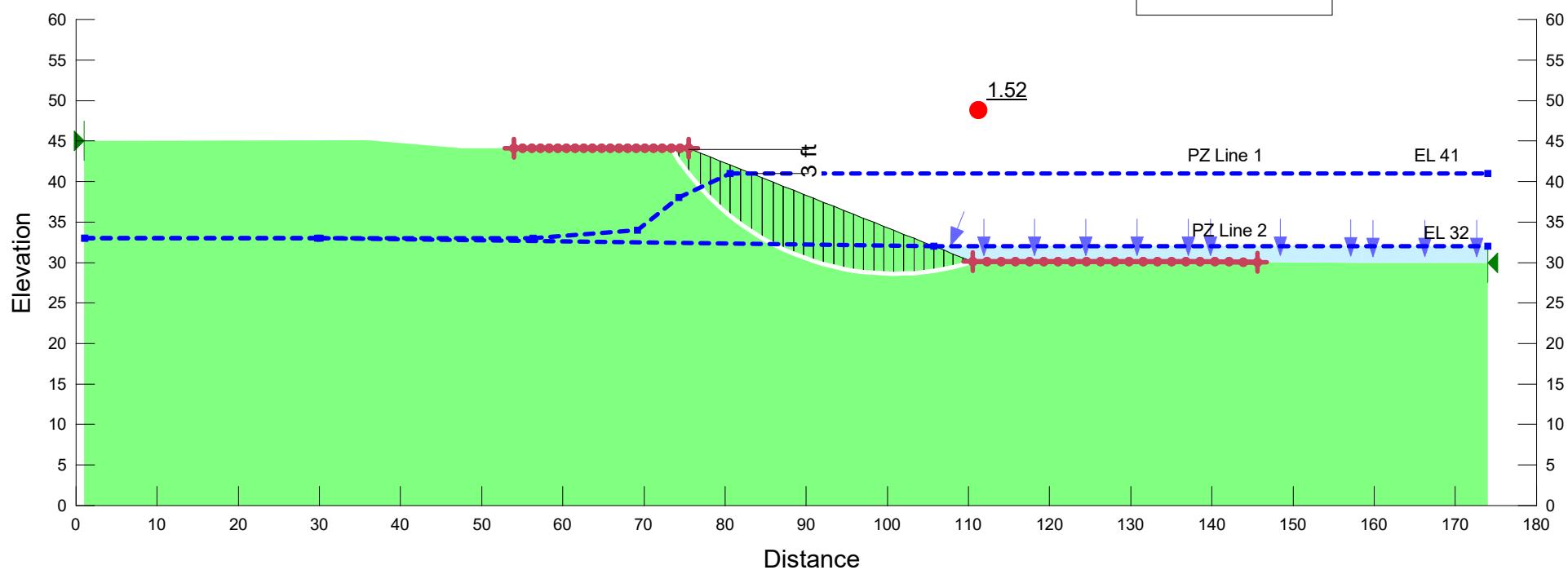


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 14 ft; Loose Sand (SM/SC)**  
**2.5 to 1 Channel Slope**

FOS: 1.52

Factor of Safety	
≤ 1.00 - 1.10	Red
1.10 - 1.20	Yellow
1.20 - 1.30	Light Green
1.30 - 1.40	Dark Green
1.40 - 1.50	Cyan
≥ 1.50	Blue

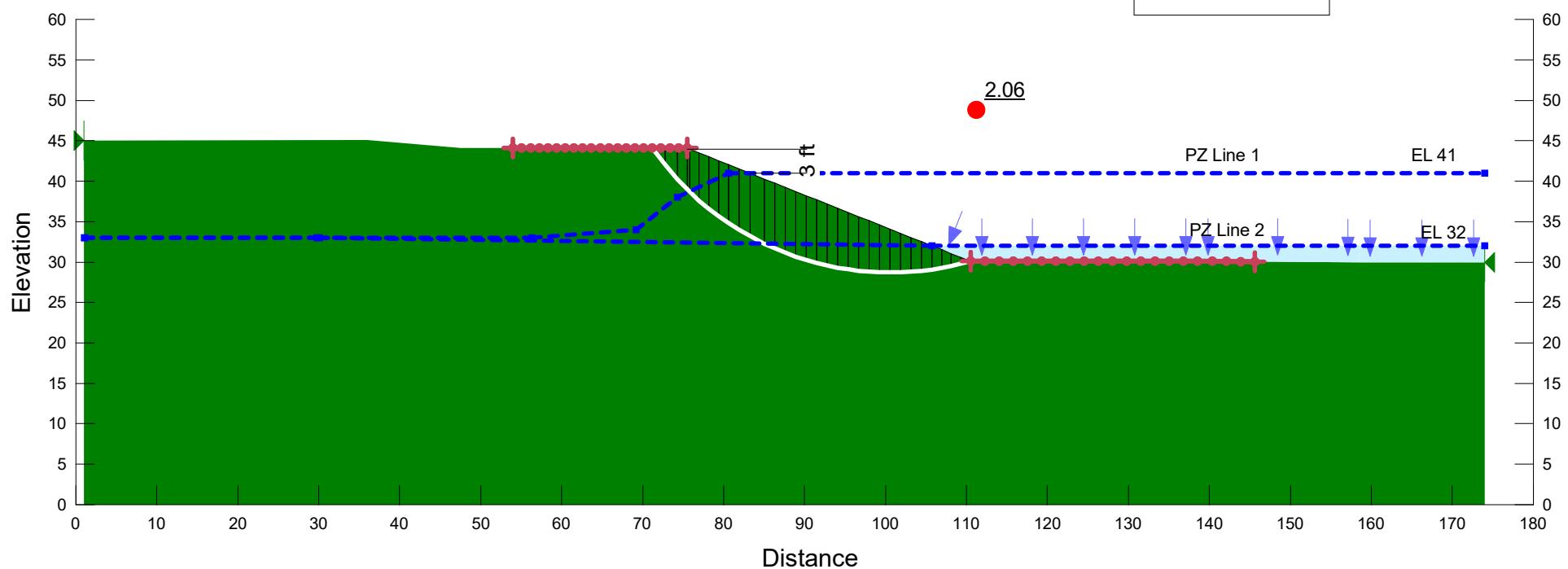


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Green	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 14 ft; Dense Sand (SM/SC)**  
**2.5 to 1 Channel Slope**

FOS: 2.06

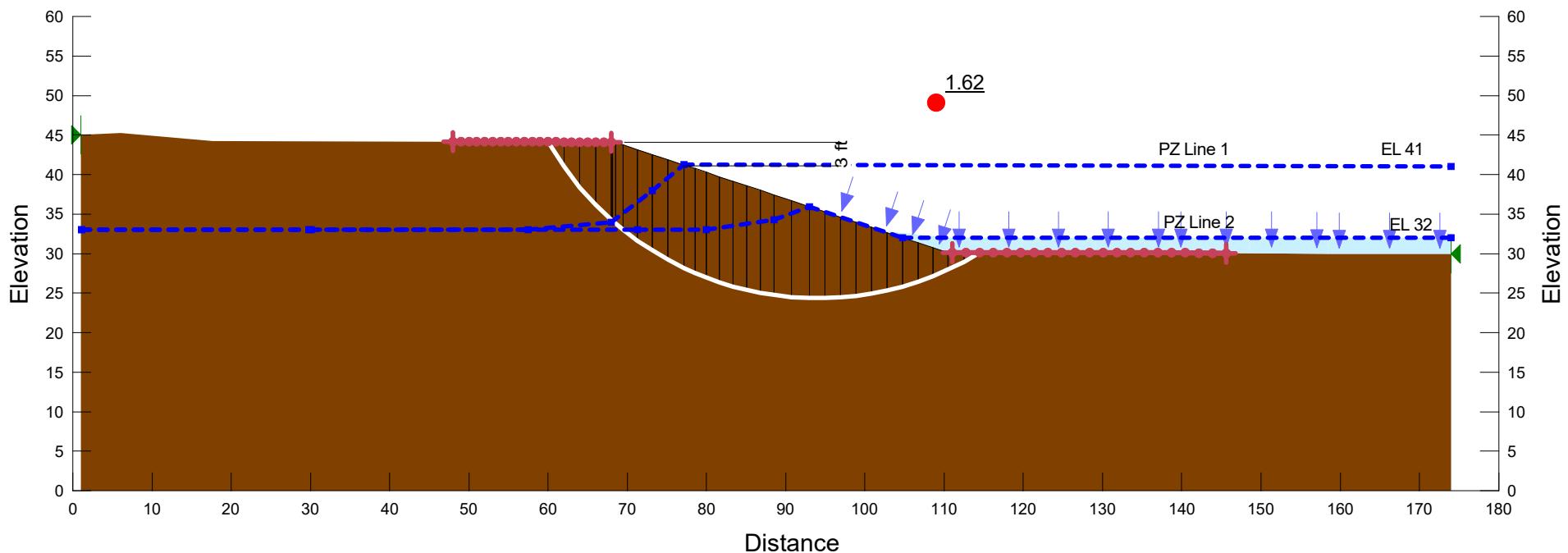
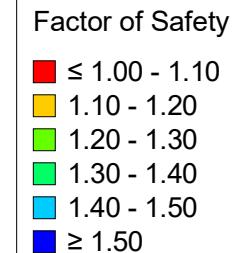
Factor of Safety	
■	≤ 1.00 - 1.10
■	1.10 - 1.20
■	1.20 - 1.30
■	1.30 - 1.40
■	1.40 - 1.50
■	≥ 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 14 ft; Soft Fat Clay (CH)  
 3.0 to 1 Channel Slope

FOS: 1.62

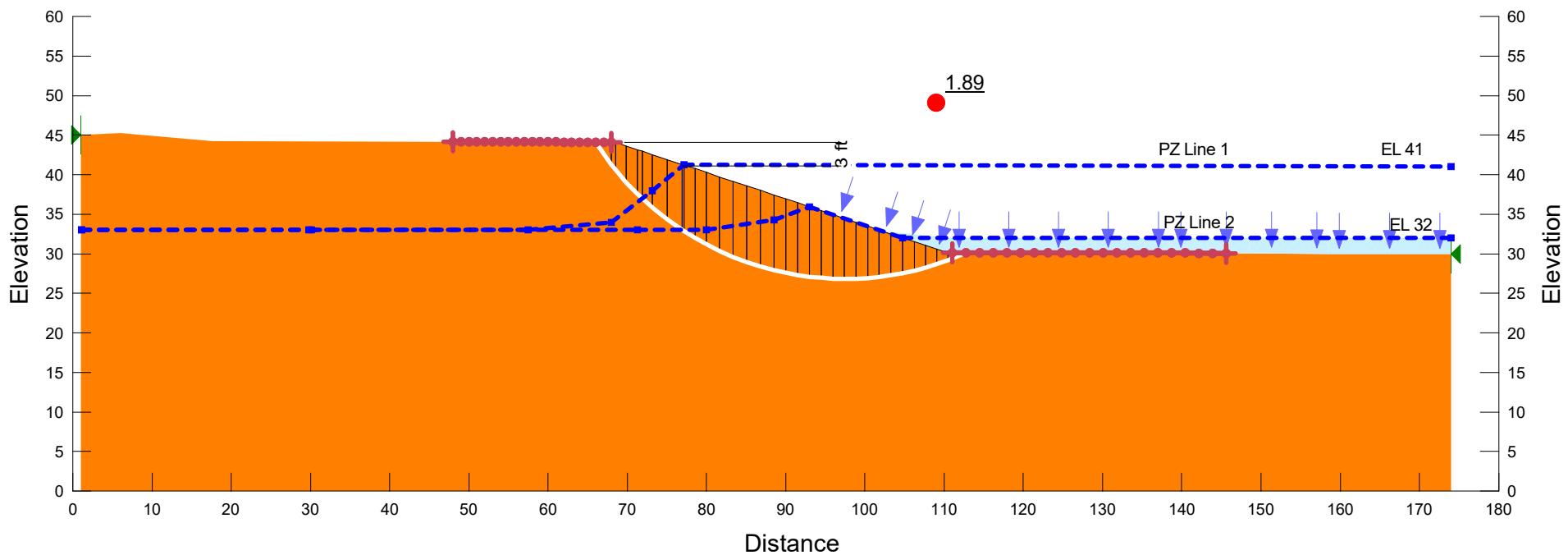


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 14 ft; Stiff Fat Clay (CH)**  
**3.0 to 1 Channel Slope**

FOS: 1.89

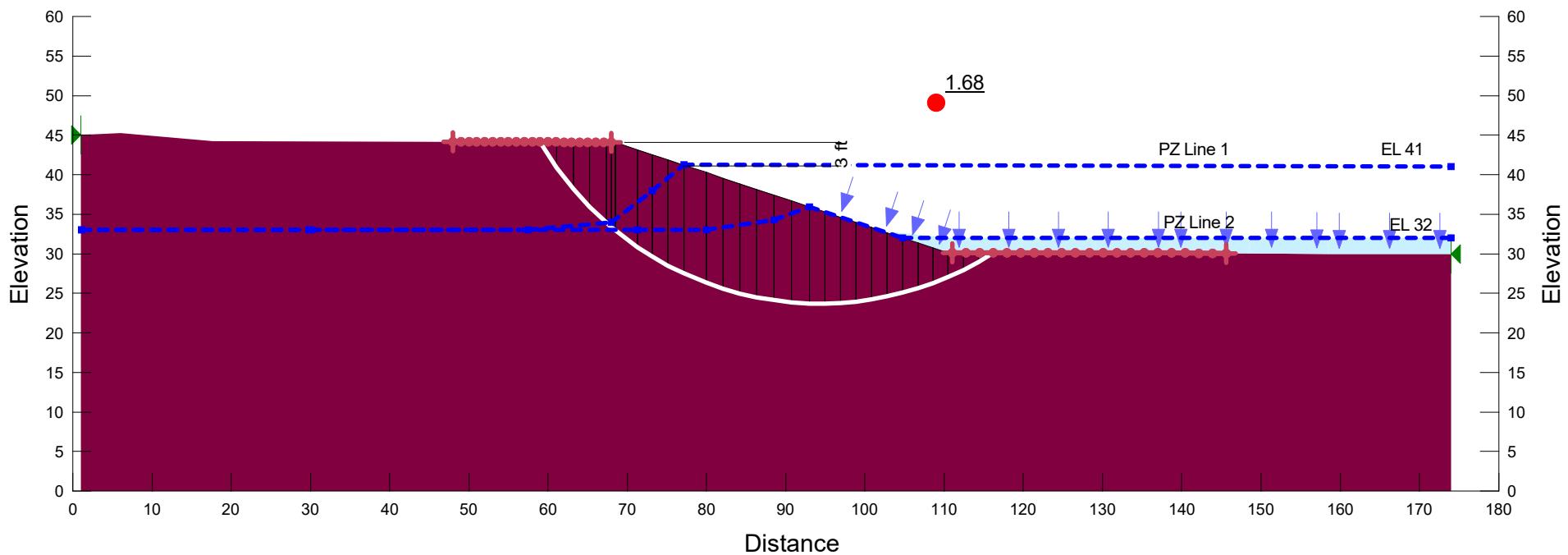
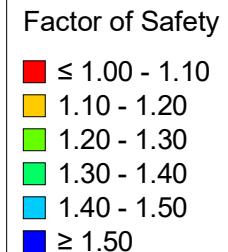
Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 14 ft; Soft Lean Clay (CL)  
 3.0 to 1 Channel Slope

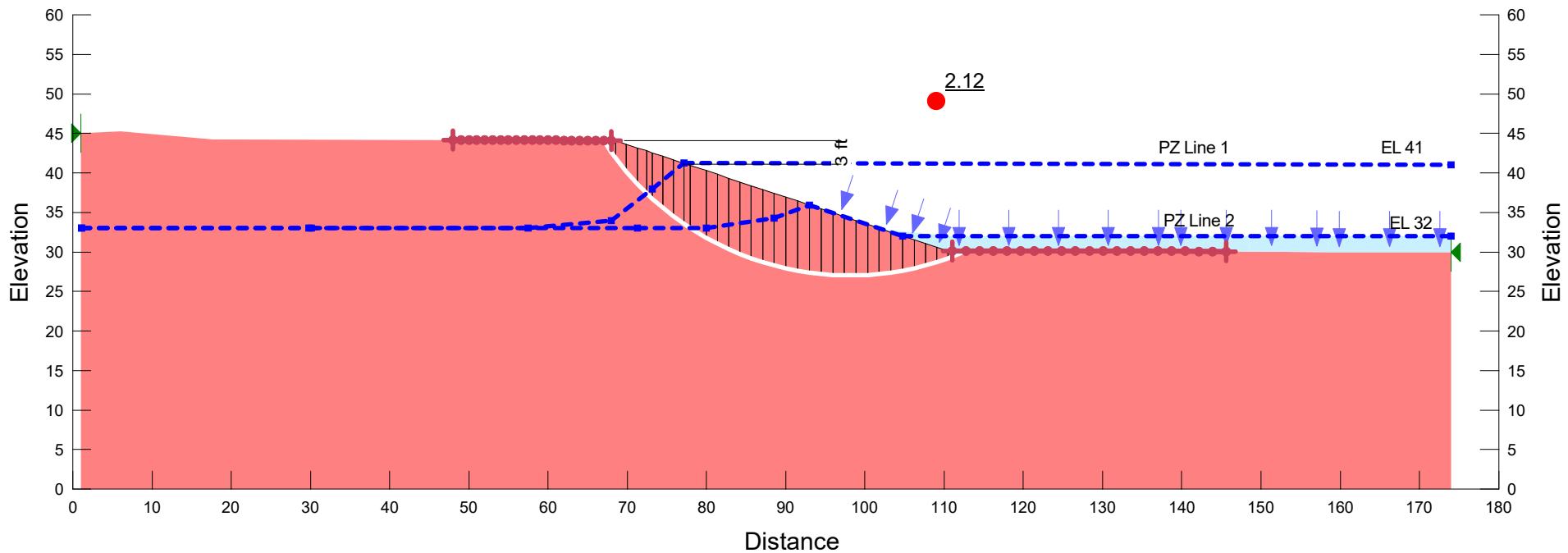
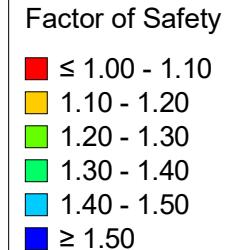
FOS: 1.68



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 14 ft; Stiff Lean Clay (CL)  
 3.0 to 1 Channel Slope

FOS: 2.12



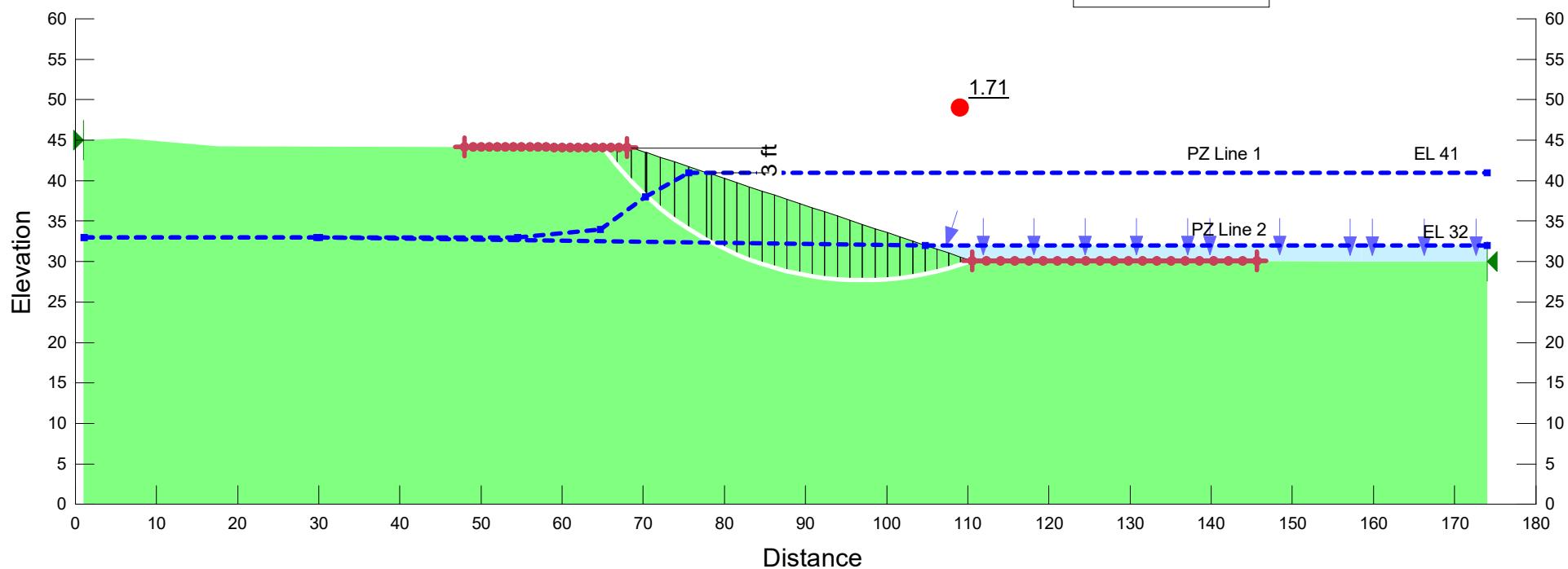
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Stiff	120	100	30	2,000	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 14 ft; Loose Sand (SM/SC)  
 3.0 to 1 Channel Slope

FOS: 1.71

### Factor of Safety

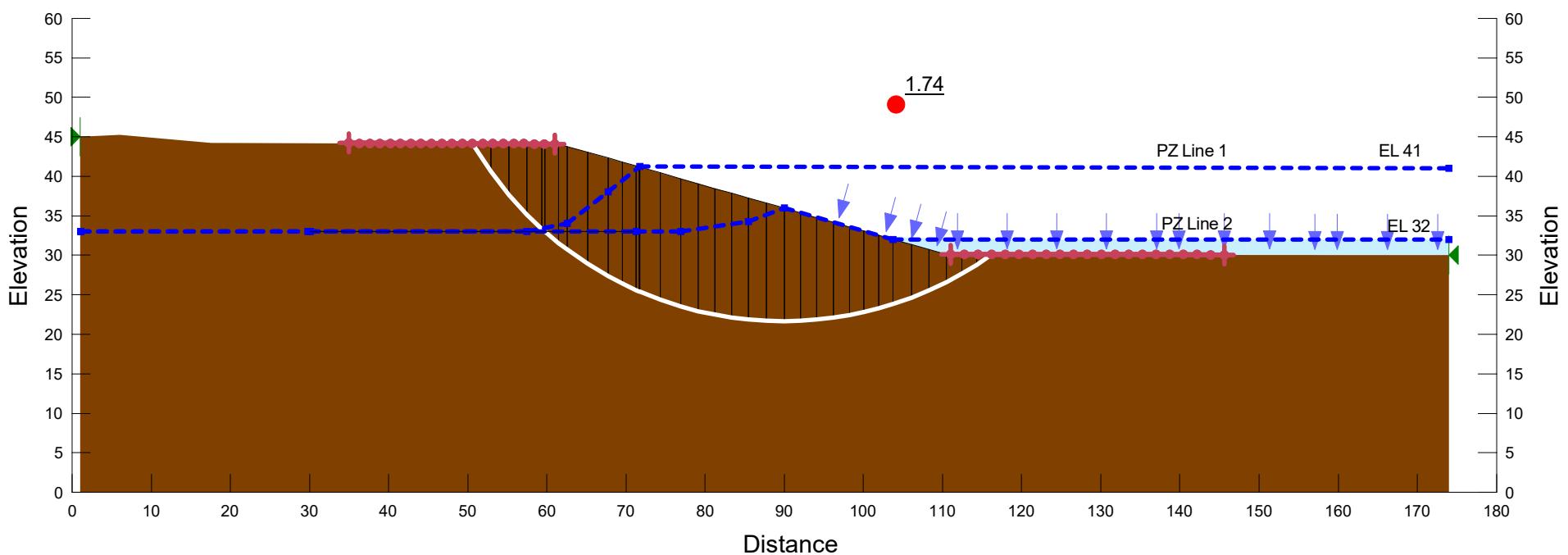
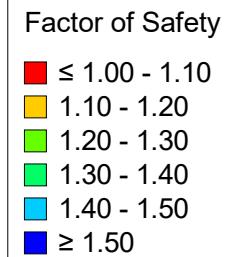
- $\leq 1.00 - 1.10$
- $1.10 - 1.20$
- $1.20 - 1.30$
- $1.30 - 1.40$
- $1.40 - 1.50$
- $\geq 1.50$



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
<span style="color: green;">■</span>	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 14 ft; Soft Fat Clay (CH)  
 3.5 to 1 Channel Slope

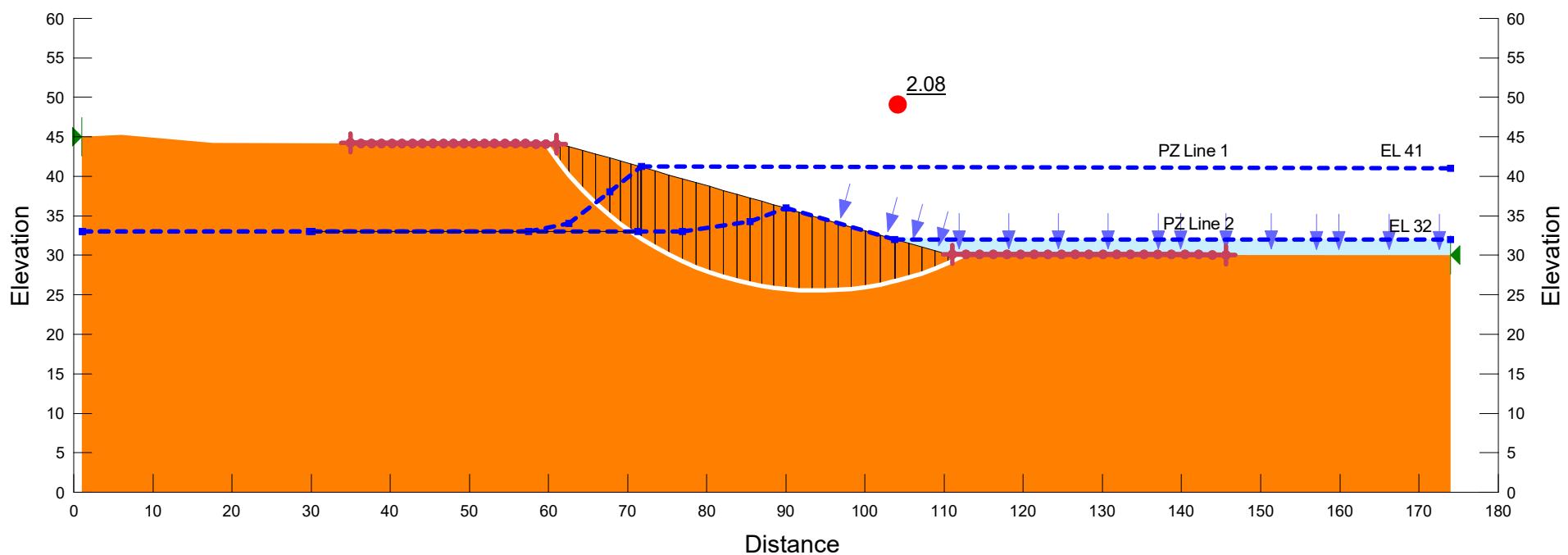
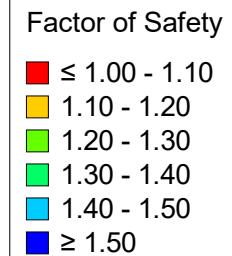
FOS: 1.74



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
█	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 14 ft; Stiff Fat Clay (CH)**  
**3.5 to 1 Channel Slope**

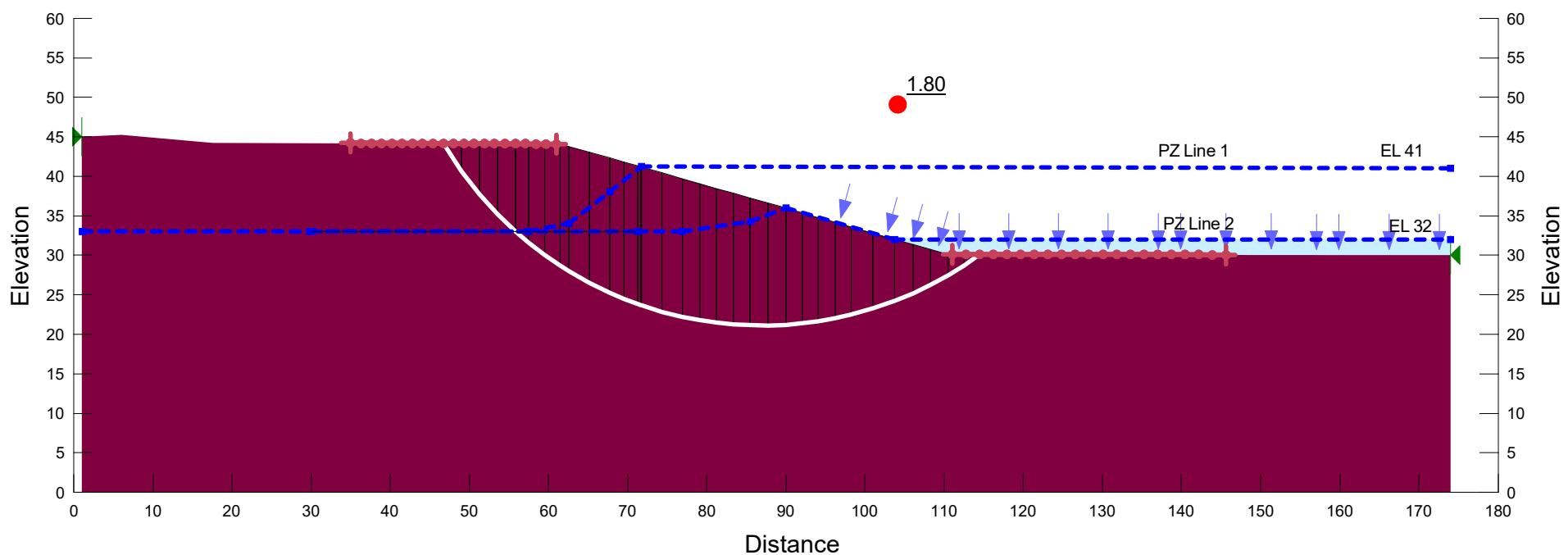
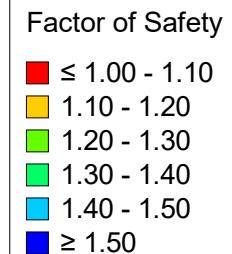
FOS: 2.08



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 14 ft; Soft Lean Clay (CL)**  
**3.5 to 1 Channel Slope**

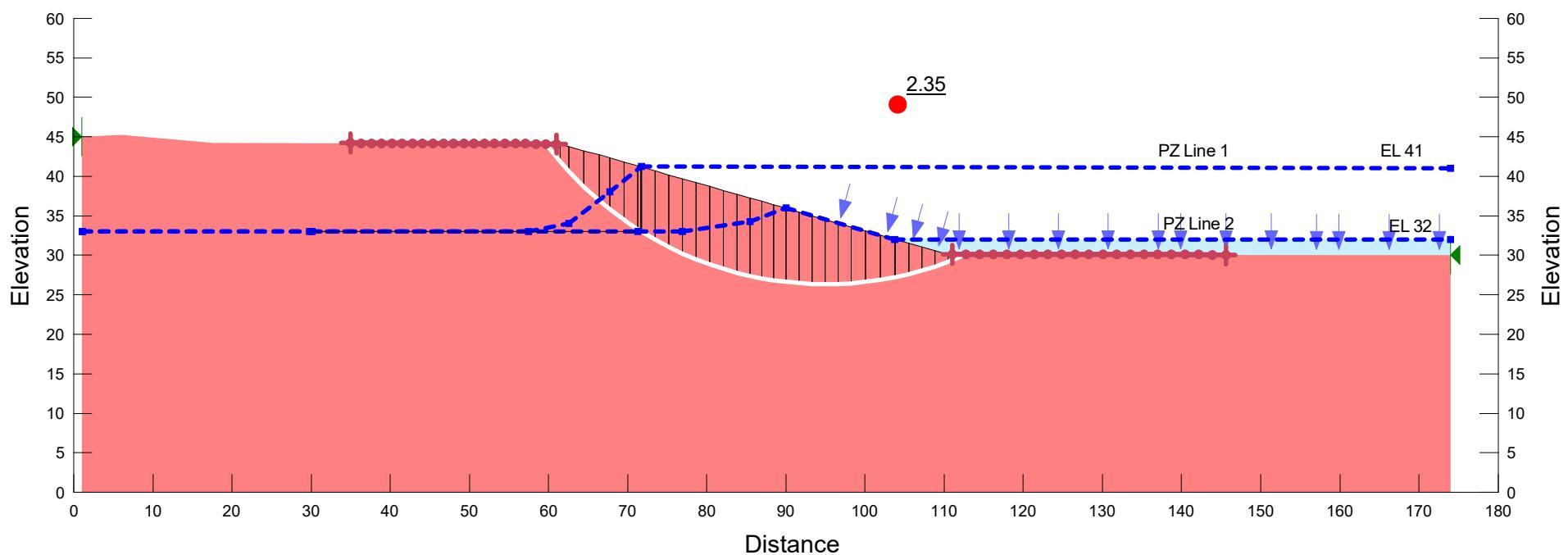
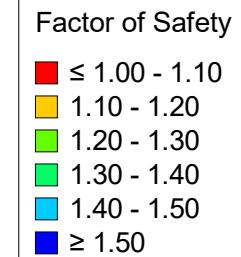
FOS: 1.80



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Maroon	CL Soft	120	100	24	500	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 14 ft; Stiff Lean Clay (CL)  
 3.5 to 1 Channel Slope

FOS: 2.35

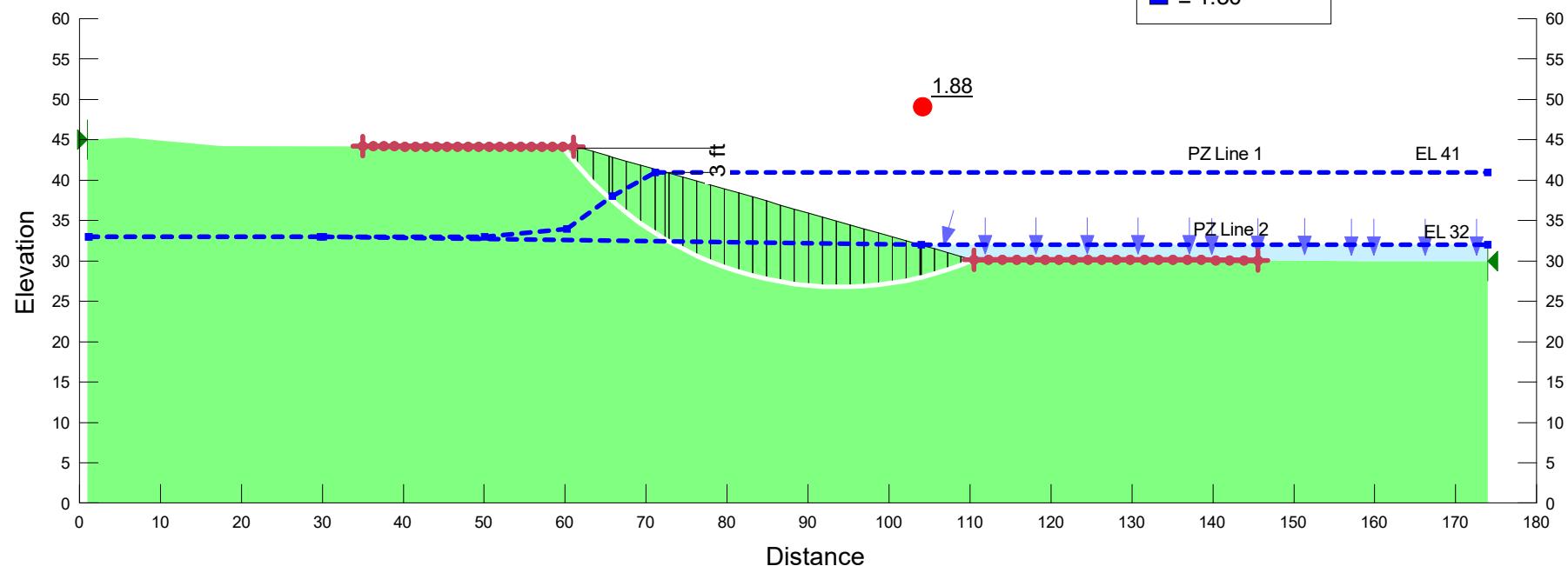


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
<span style="background-color: red;"></span>	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 14 ft; Loose Sand (SM/SC)**  
**3.5 to 1 Channel Slope**

FOS: 1.88

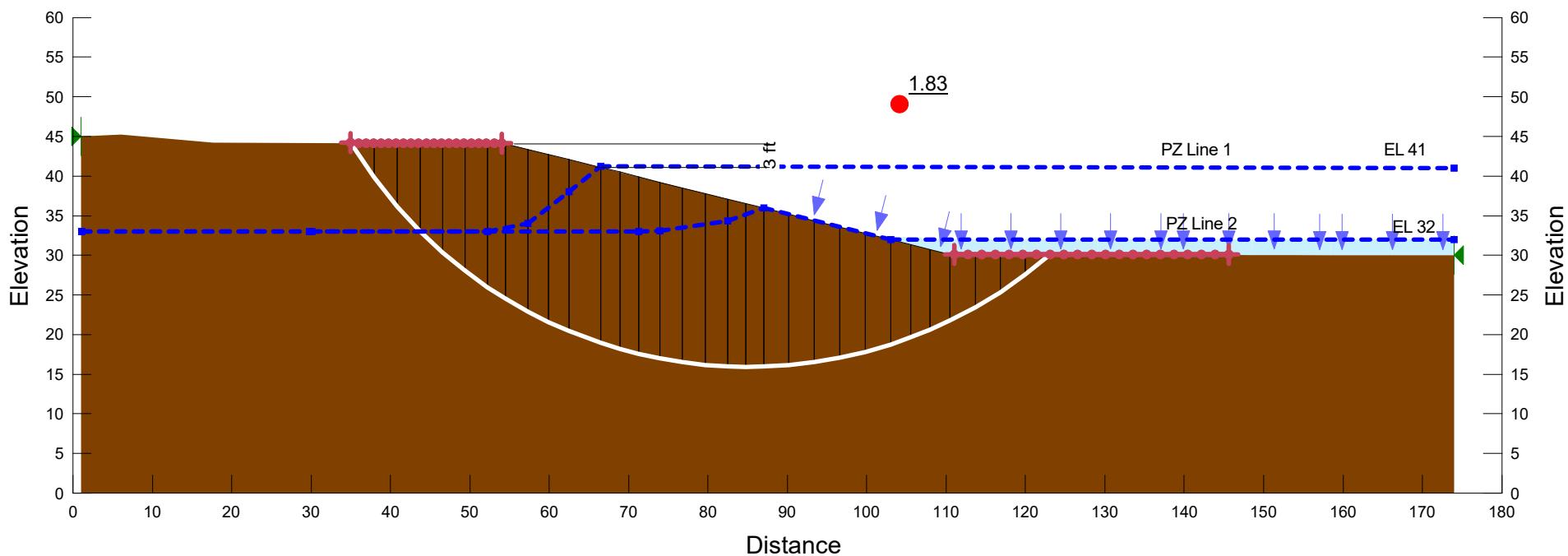
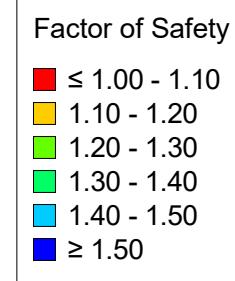
Factor of Safety	
■	≤ 1.00 - 1.10
■	1.10 - 1.20
■	1.20 - 1.30
■	1.30 - 1.40
■	1.40 - 1.50
■	≥ 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 14 ft; Soft Fat Clay (CH)**  
**4.0 to 1 Channel Slope**

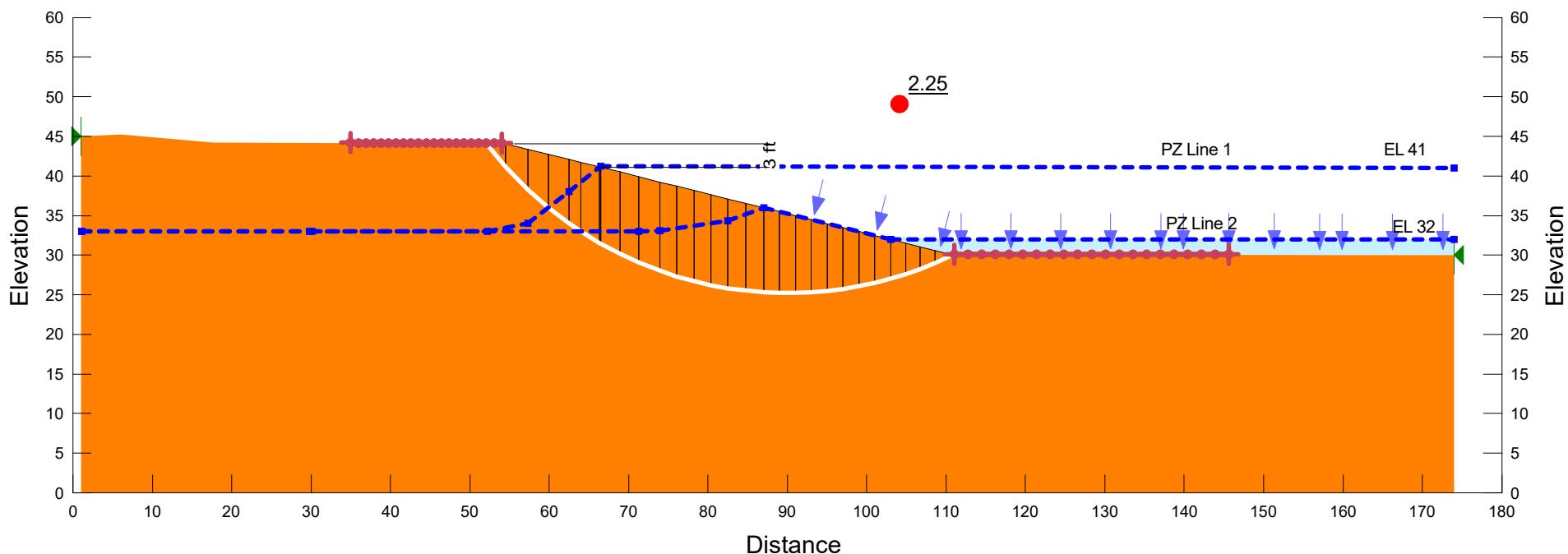
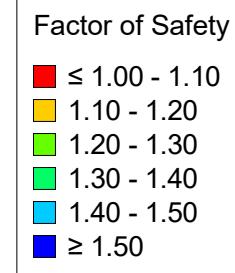
FOS: 1.83



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
<span style="color: brown;">█</span>	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 14 ft; Stiff Fat Clay (CH)  
 4.0 to 1 Channel Slope

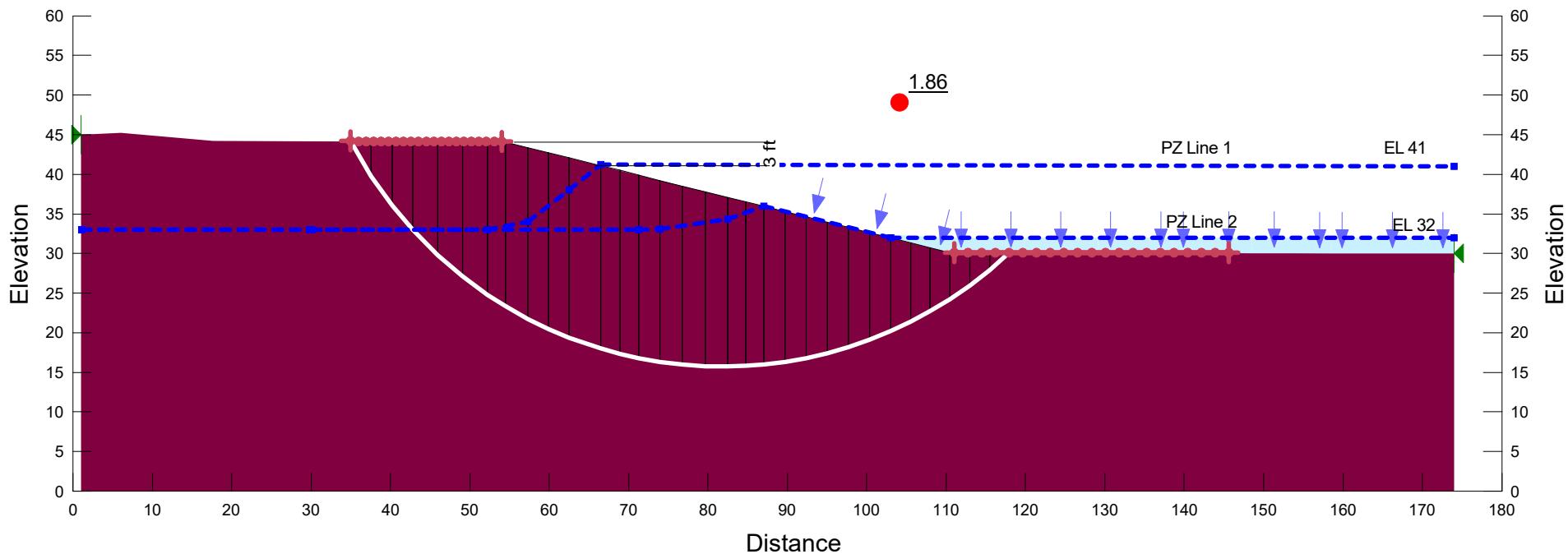
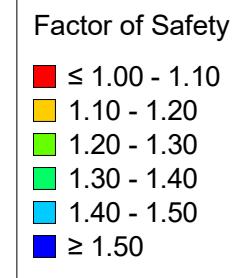
FOS: 2.25



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 14 ft; Soft Lean Clay (CL)  
 4.0 to 1 Channel Slope

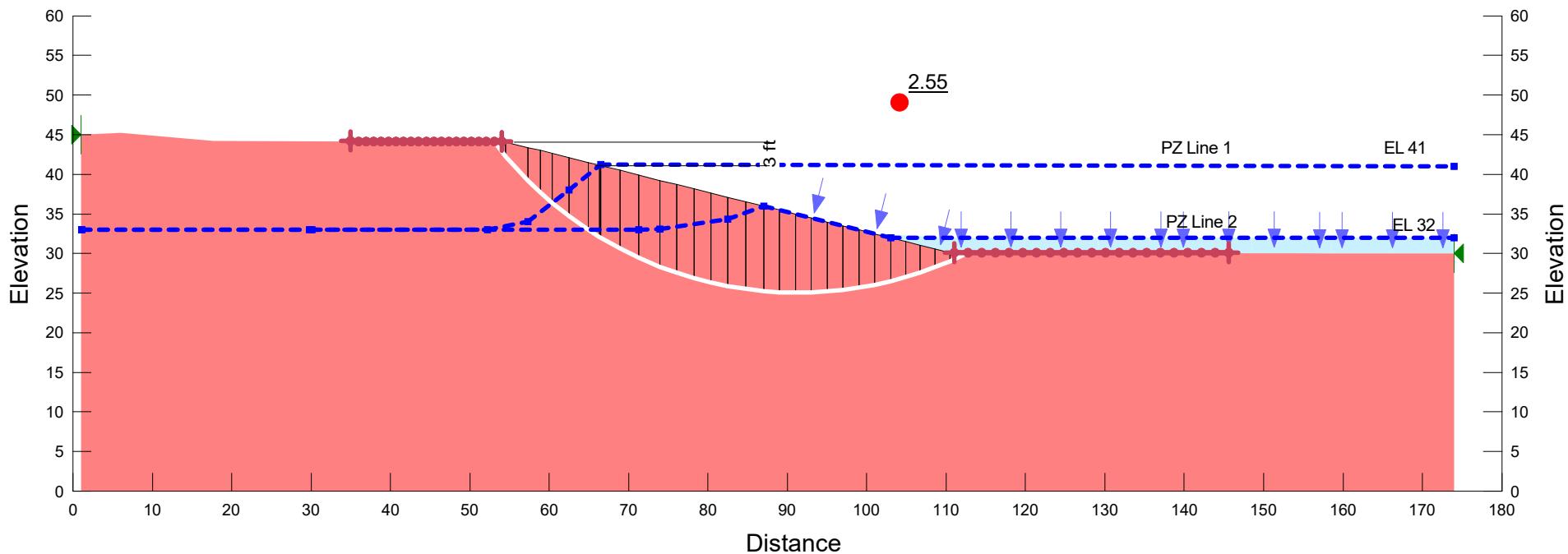
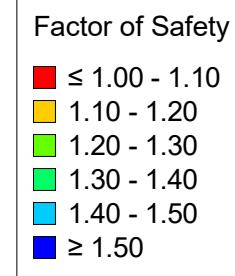
FOS: 1.86



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
<span style="background-color: maroon;">█</span>	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 14 ft; Stiff Lean Clay (CL)**  
**4.0 to 1 Channel Slope**

FOS: 2.55

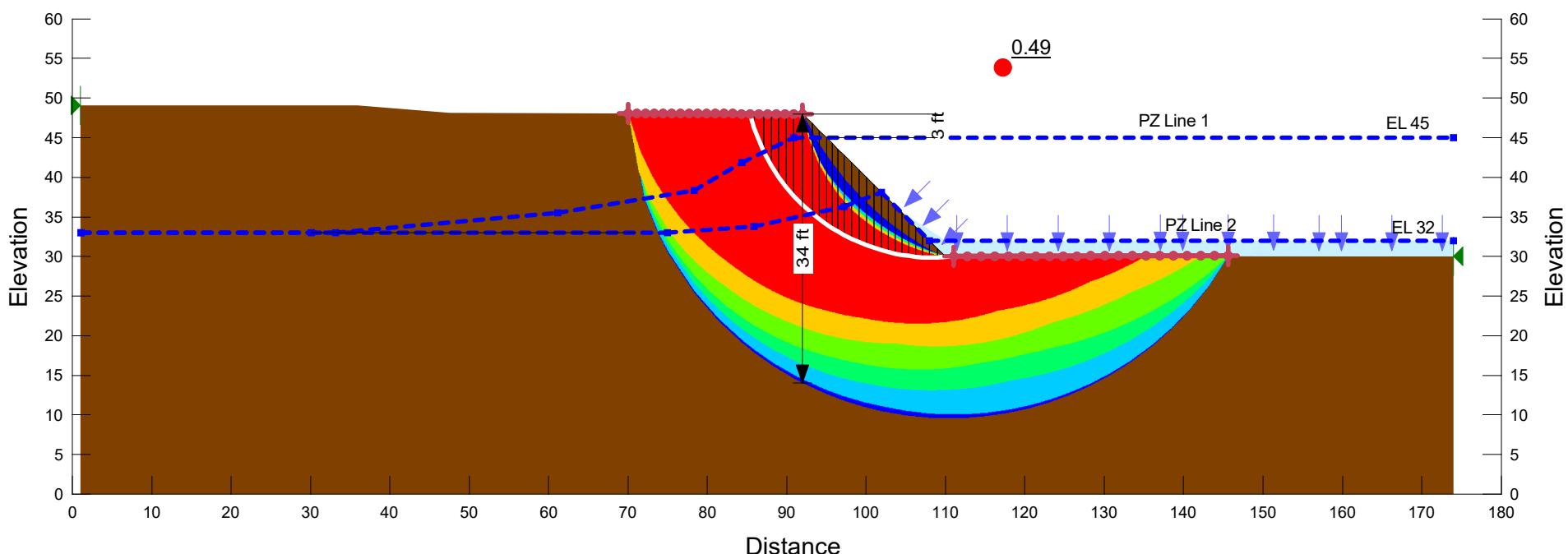


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 18 ft; Soft Fat Clay (CH)**  
**1.0 to 1 Channel Slope**

FOS: 0.49

Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50

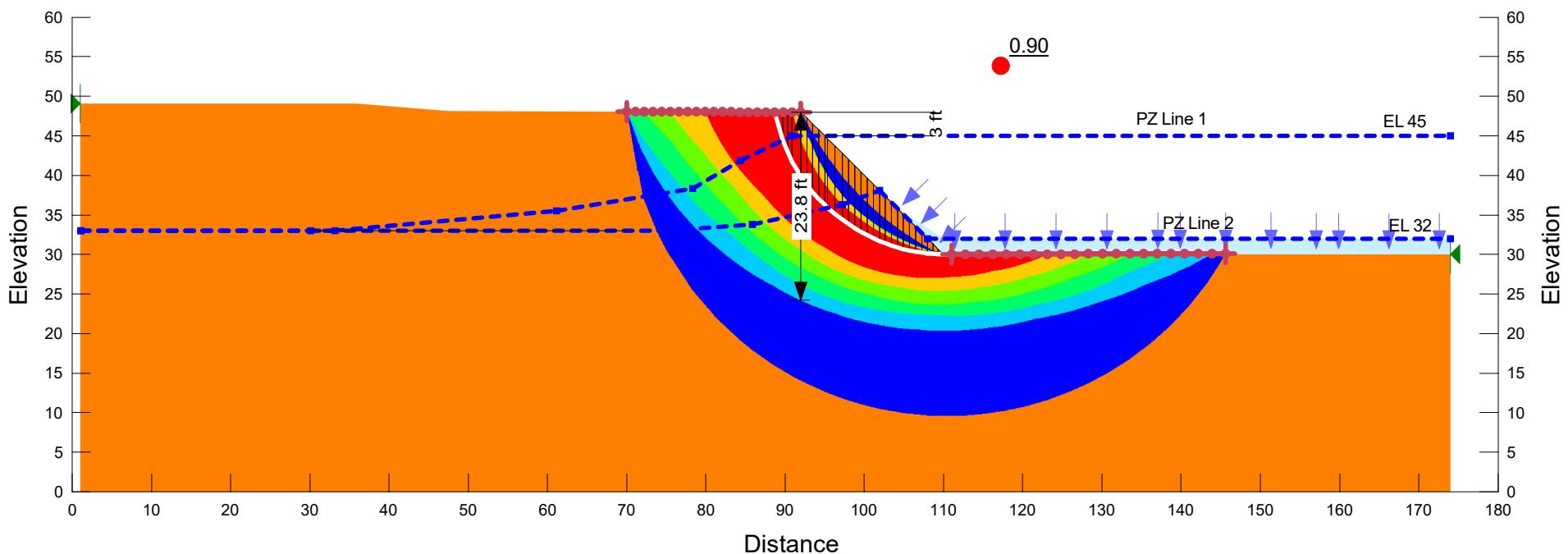


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Brown	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 18 ft; Stiff Fat Clay (CH)  
 1.0 to 1 Channel Slope

FOS: 0.90

Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50

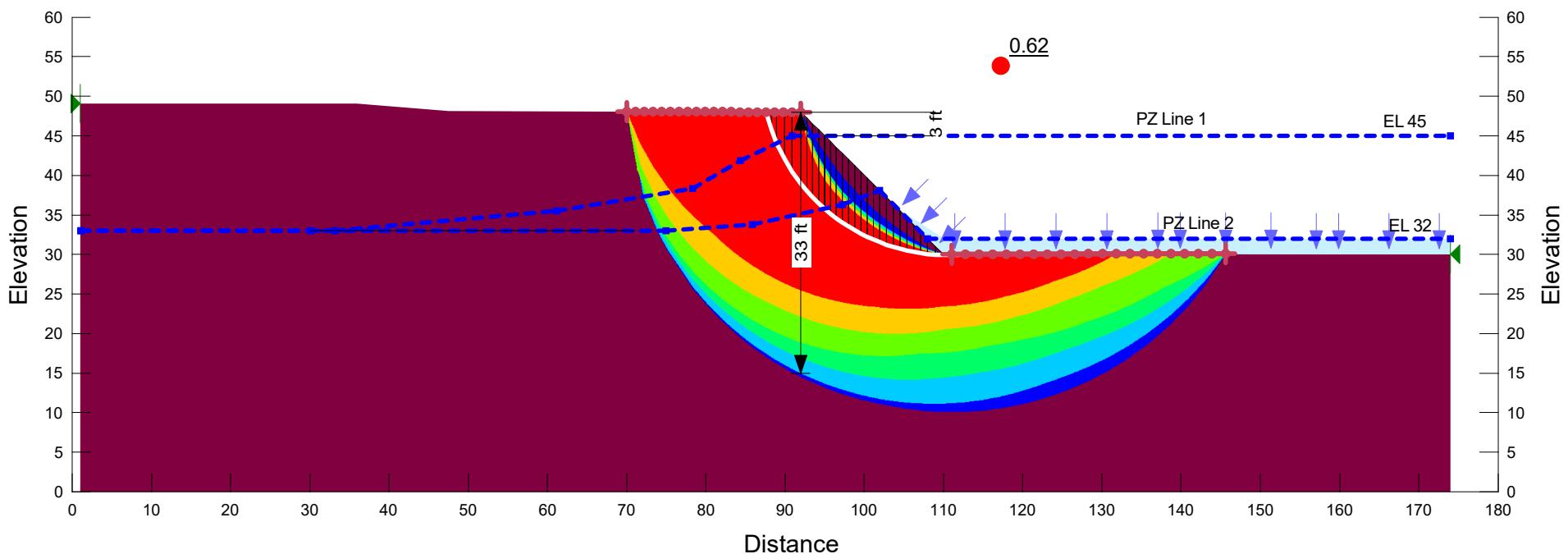


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 18 ft; Soft Lean Clay (CL)  
 1.0 to 1 Channel Slope

FOS: 0.62

Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50

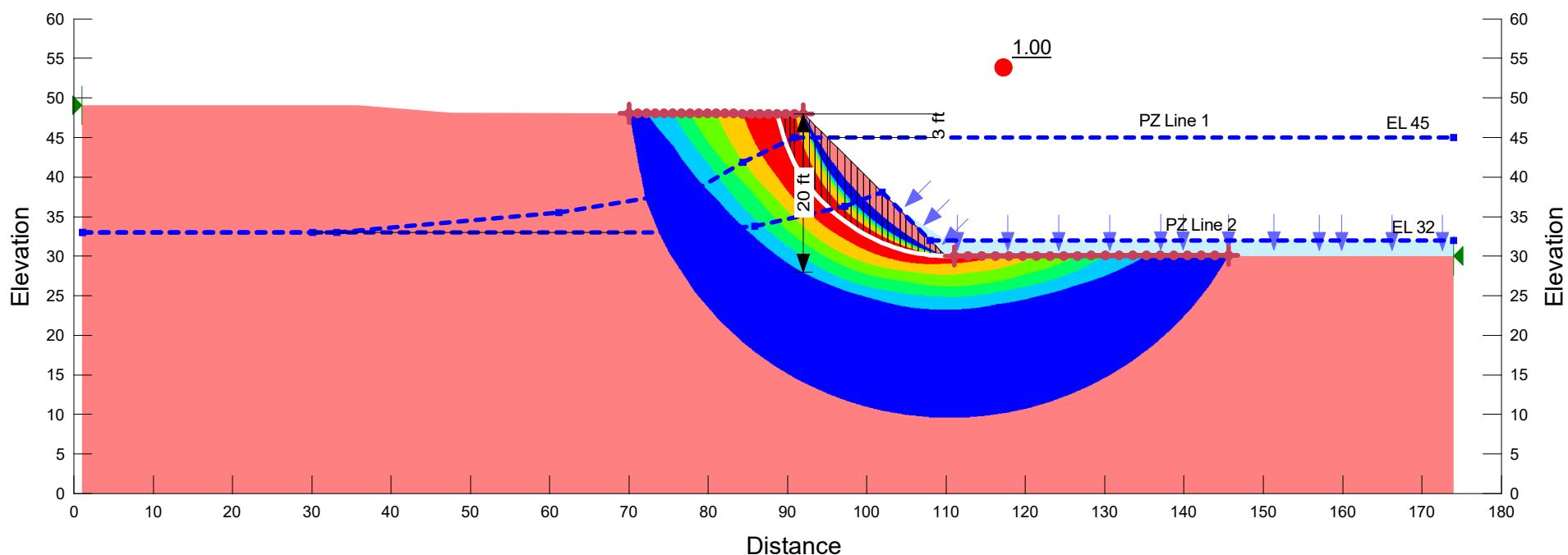


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 18 ft; Stiff Lean Clay (CL)**  
**1.0 to 1 Channel Slope**

FOS: 1.00

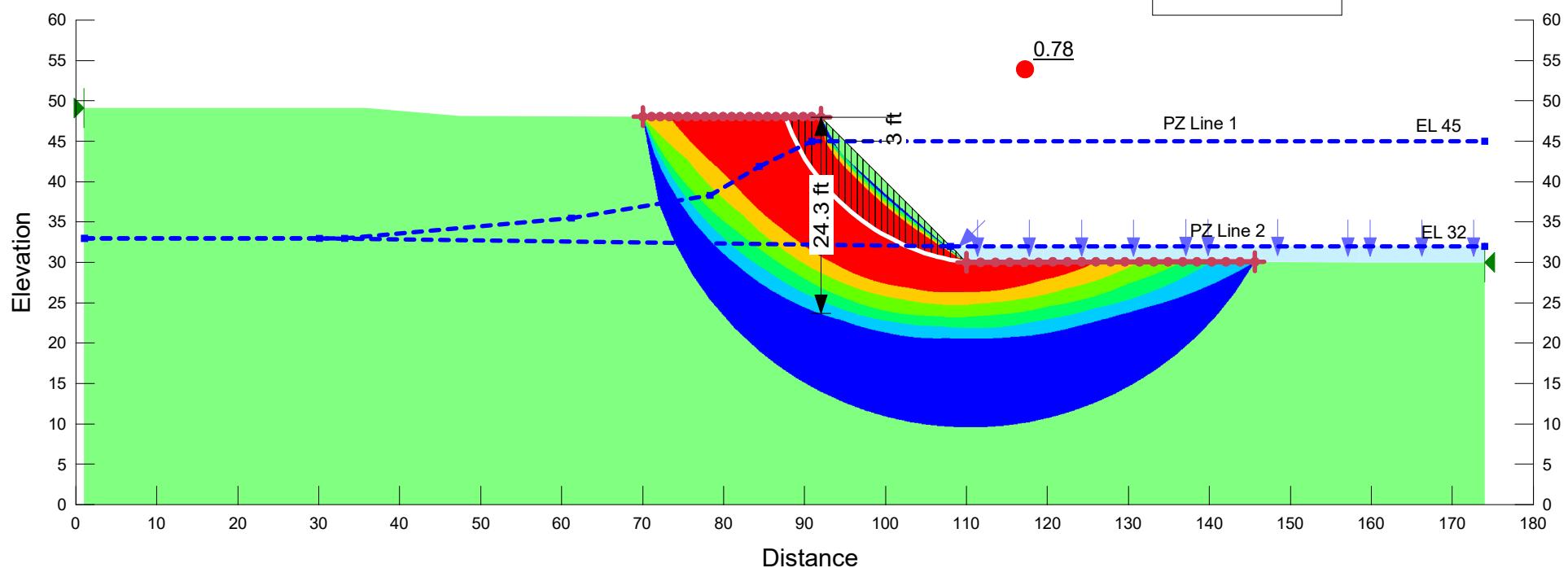
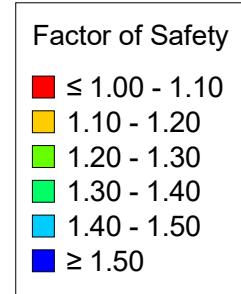
Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Red	CL Stiff	120	100	30	2,000	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 18 ft; Loose Sand (SM/SC)  
 1.0 to 1 Channel Slope

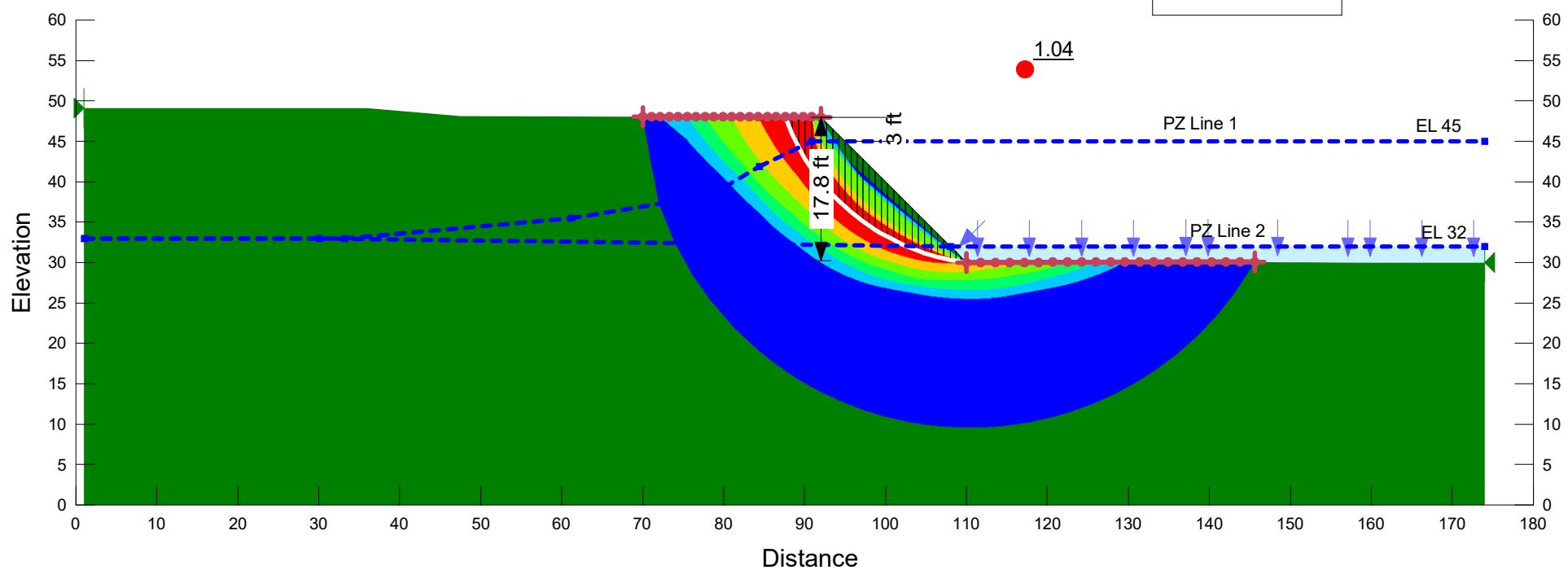
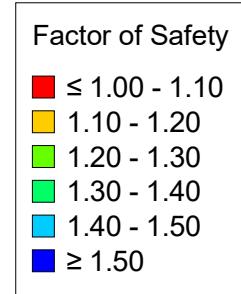
FOS: 0.78



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	$\Phi_R$ ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 18 ft; Dense Sand (SM/SC)**  
**1.0 to 1 Channel Slope**

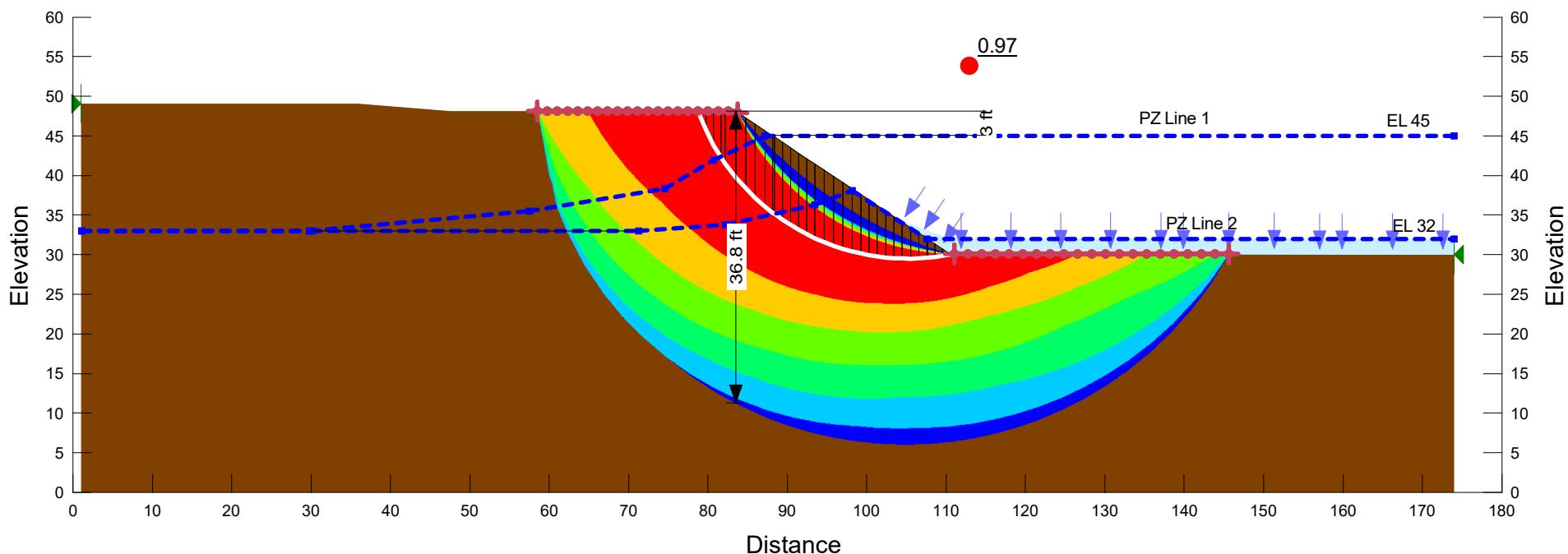
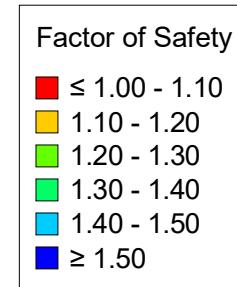
FOS: 1.04



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 18 ft; Soft Fat Clay (CH)**  
**1.5 to 1 Channel Slope**

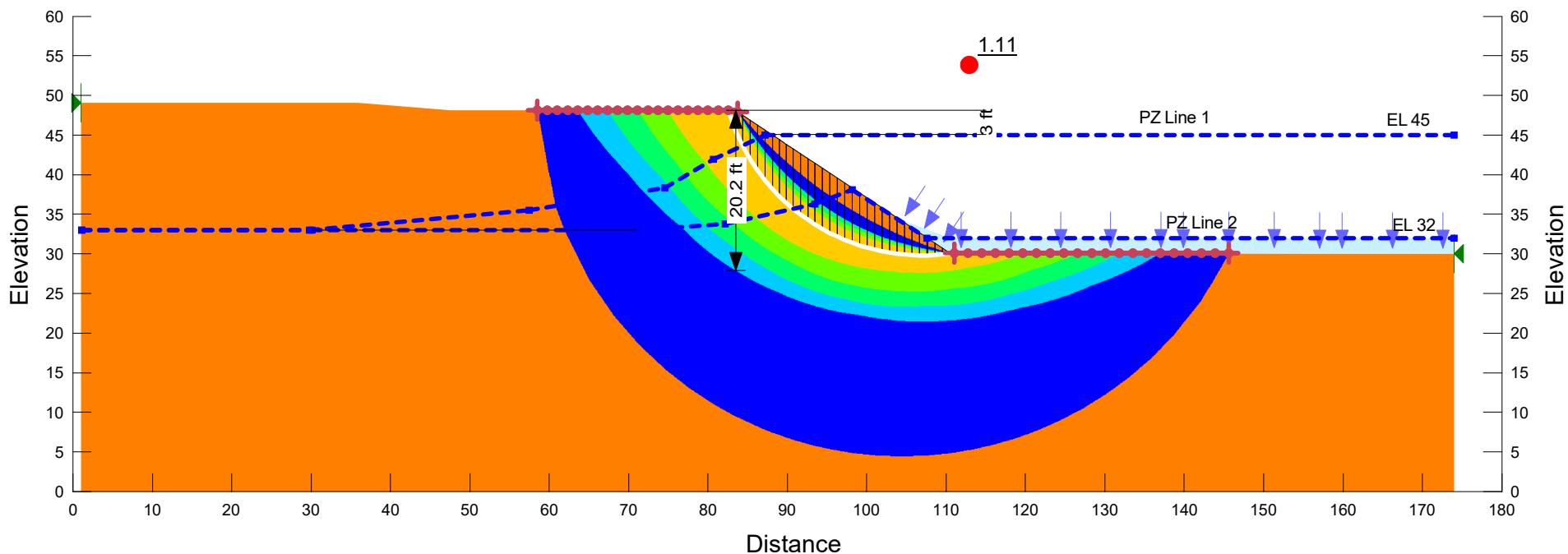
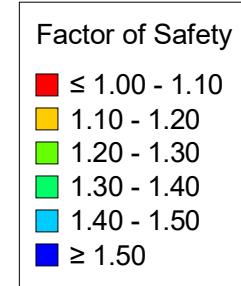
FOS: 0.97



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
█	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 18 ft; Stiff Fat Clay (CH)  
 1.5 to 1 Channel Slope

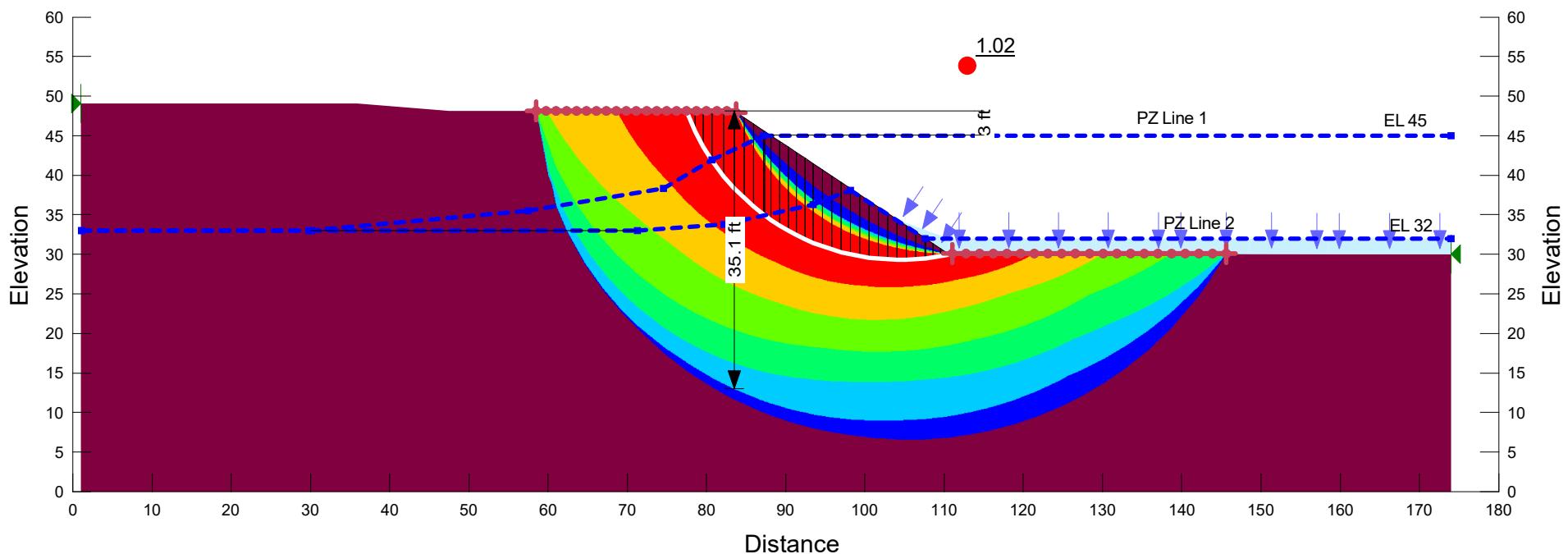
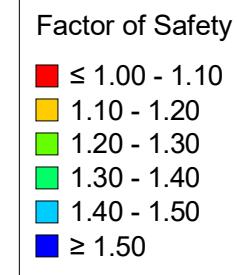
FOS: 1.11



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 18 ft; Soft Lean Clay (CL)  
 1.5 to 1 Channel Slope

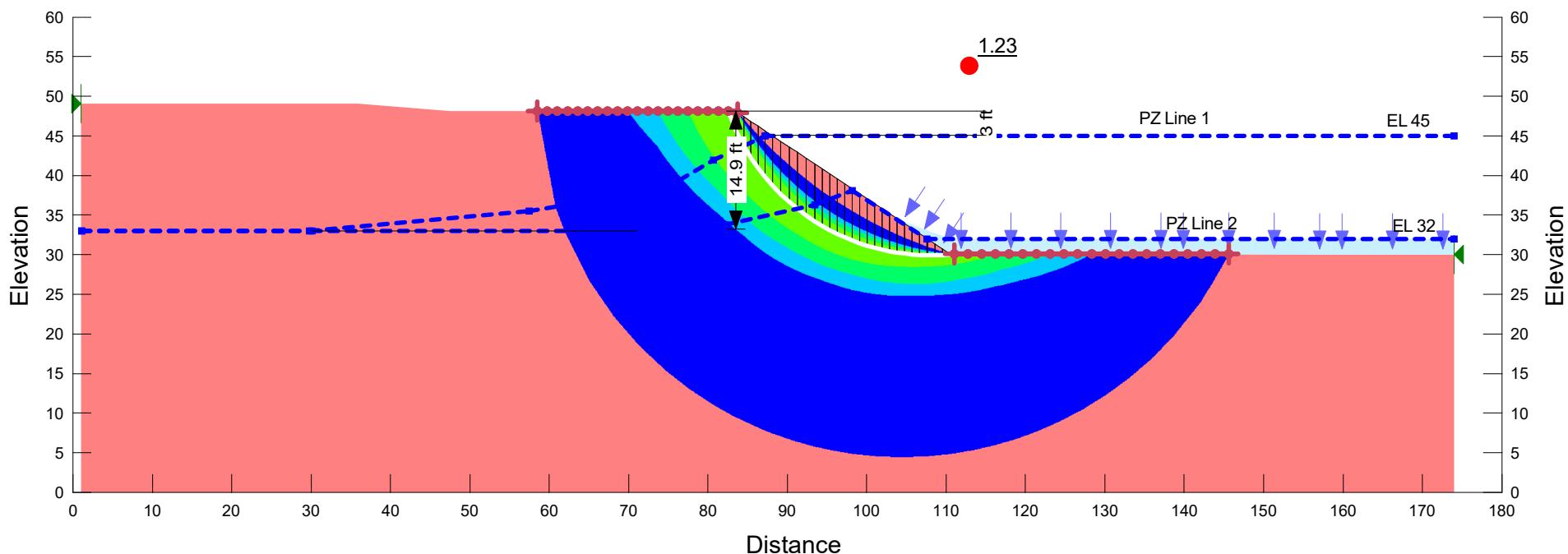
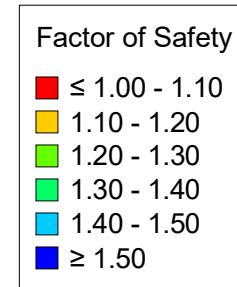
FOS: 1.02



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Soft	120	100	24	500	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 18 ft; Stiff Lean Clay (CL)  
 1.5 to 1 Channel Slope

FOS: 1.23

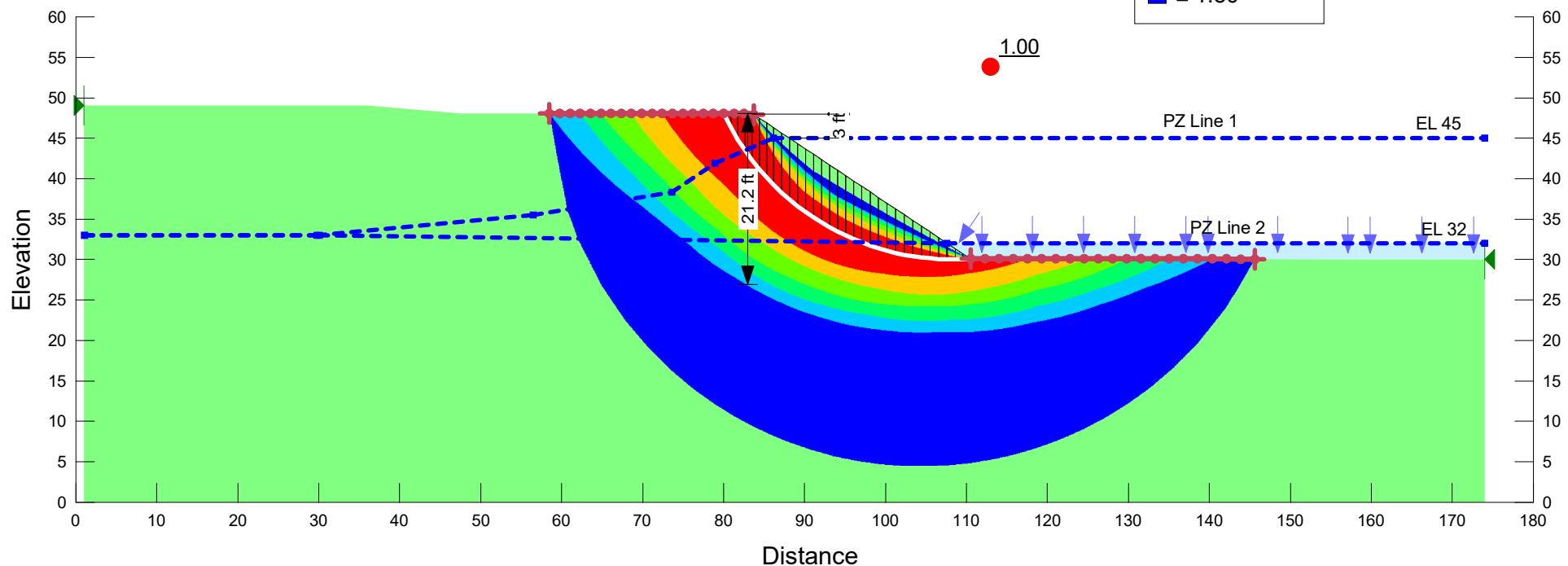


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
<span style="background-color: #ff9999;"></span>	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 18 ft; Loose Sand (SM/SC)**  
**1.5 to 1 Channel Slope**

FOS: 1.00

Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50

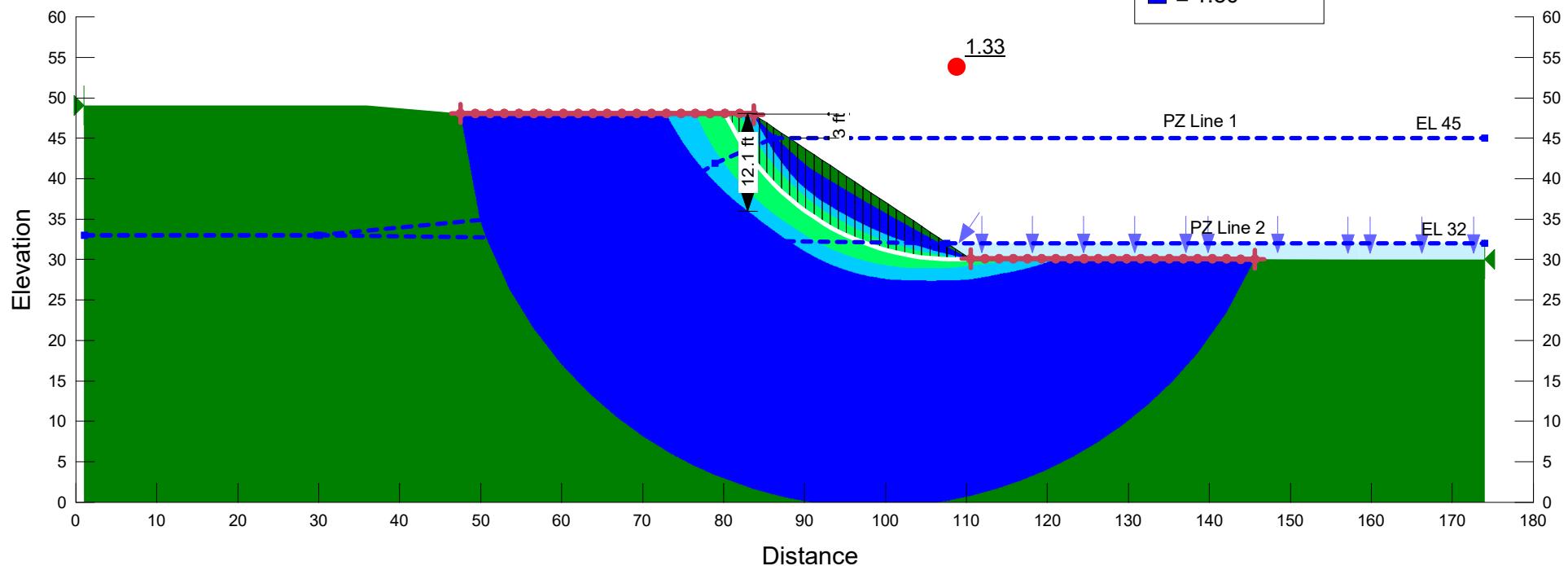


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Green	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 18 ft; Dense Sand (SM/SC)**  
**1.5 to 1 Channel Slope**

FOS: 1.33

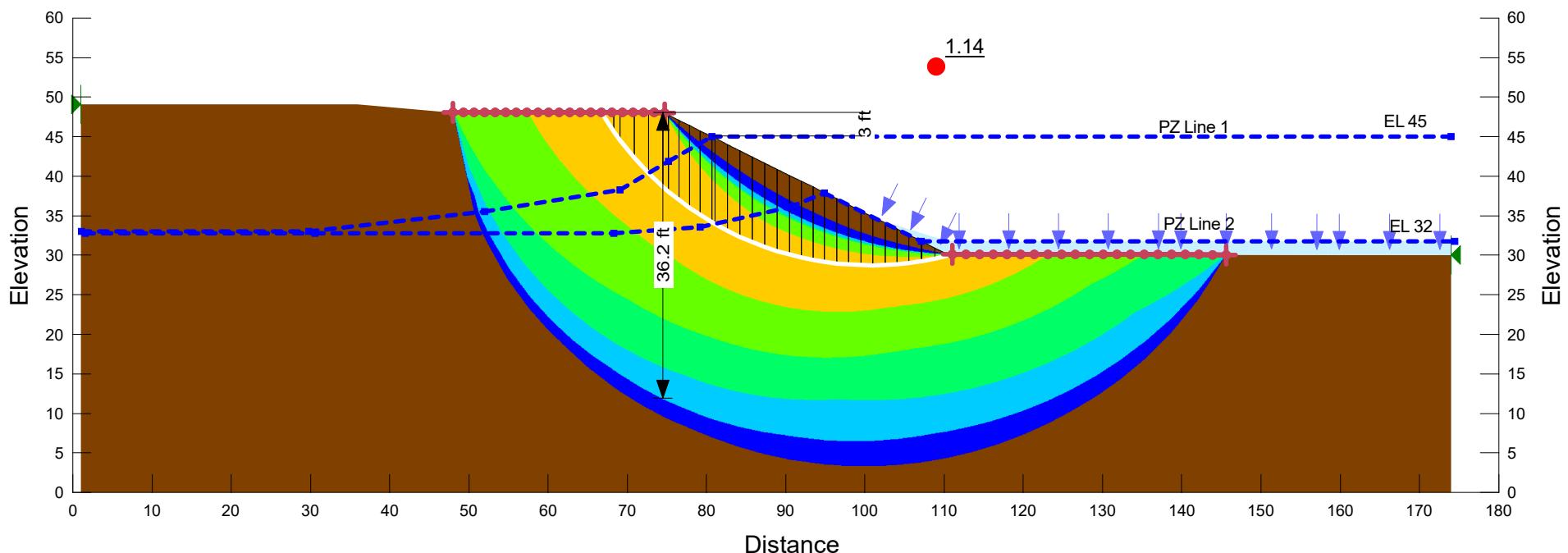
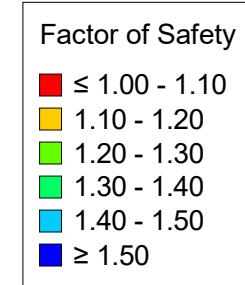
Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 18 ft; Soft Fat Clay (CH)  
 2.0 to 1 Channel Slope

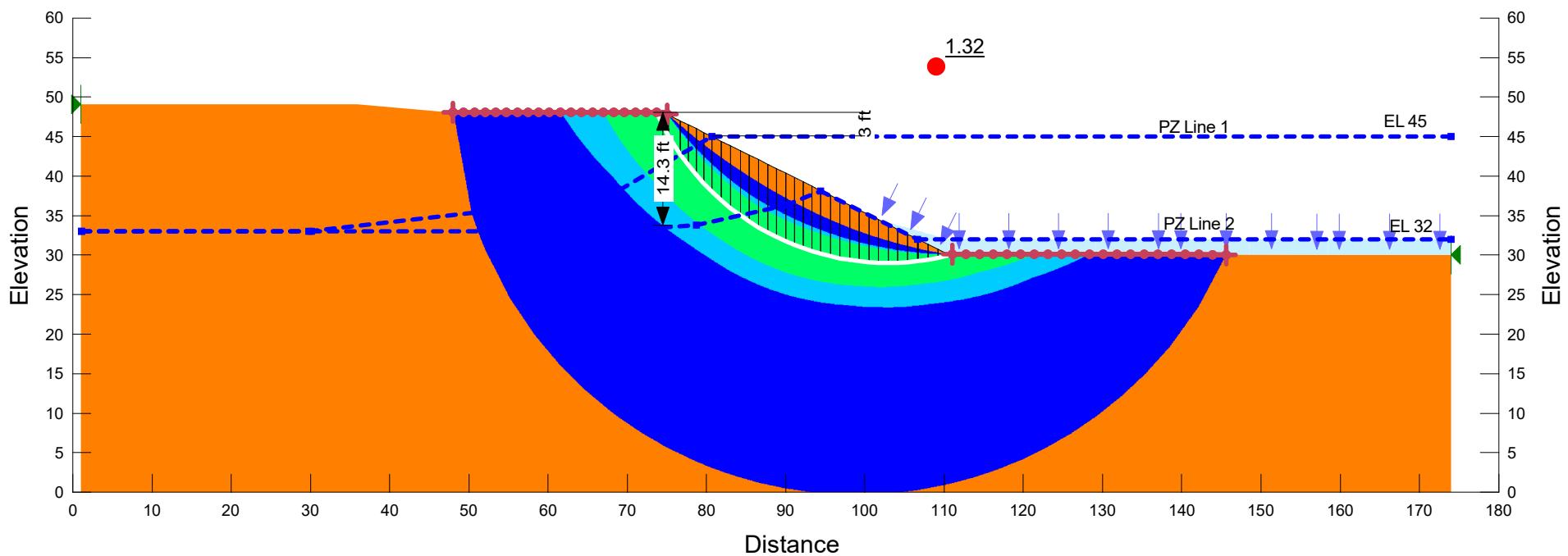
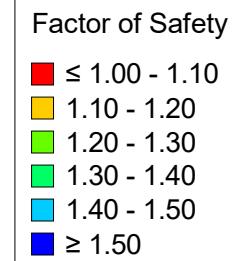
FOS: 1.14



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 18 ft; Stiff Fat Clay (CH)  
 2.0 to 1 Channel Slope

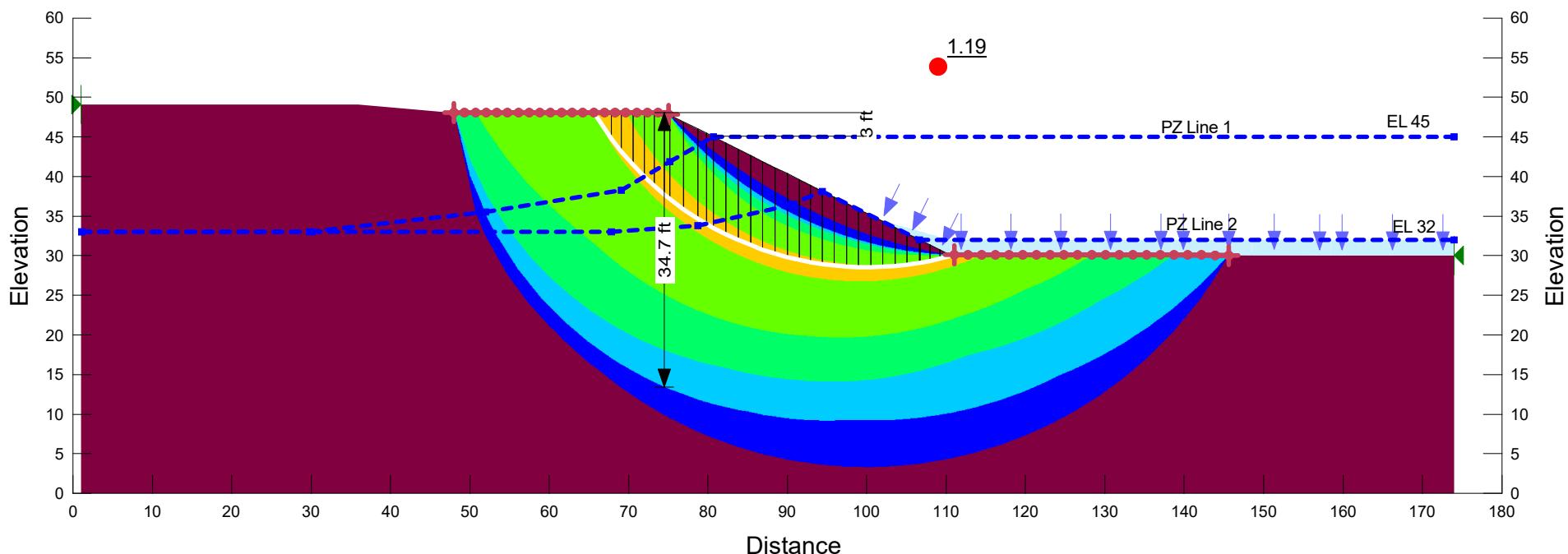
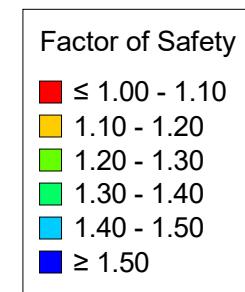
FOS: 1.32



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 18 ft; Soft Lean Clay (CL)  
 2.0 to 1 Channel Slope

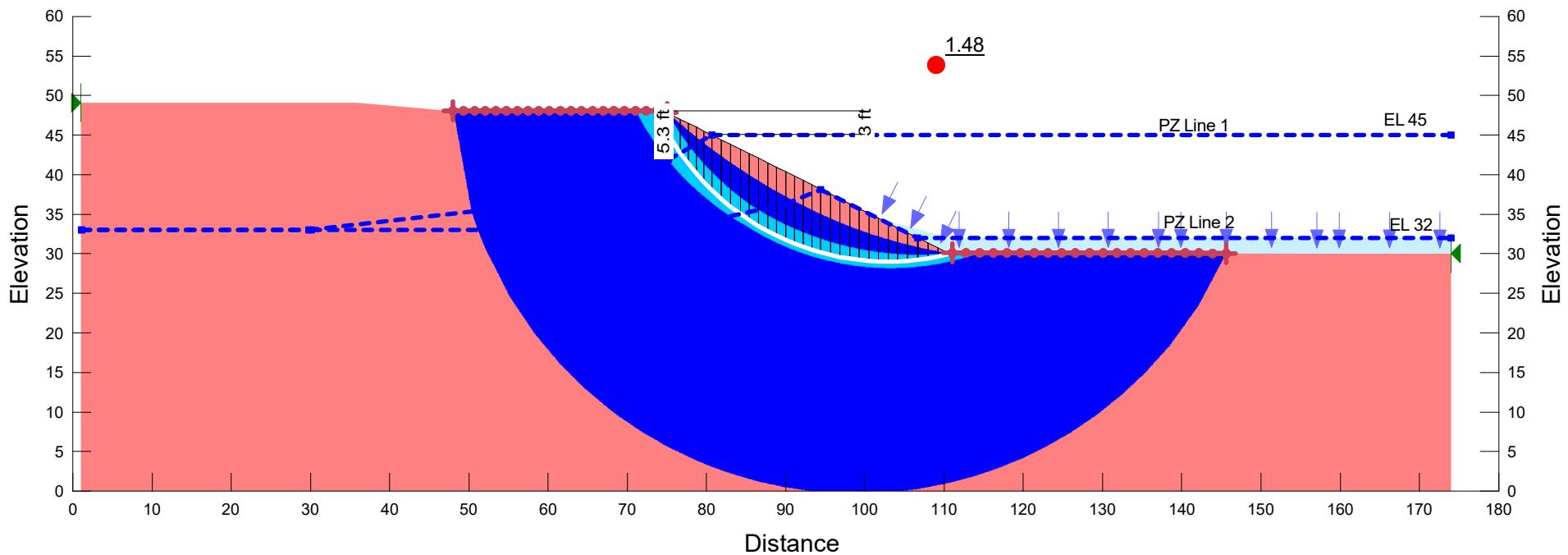
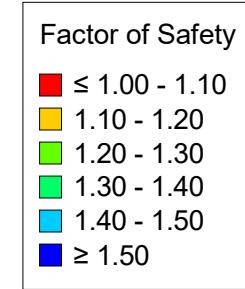
FOS: 1.19



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
<span style="color: maroon;">■</span>	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 18 ft; Stiff Lean Clay (CL)  
 2.0 to 1 Channel Slope

FOS: 1.48

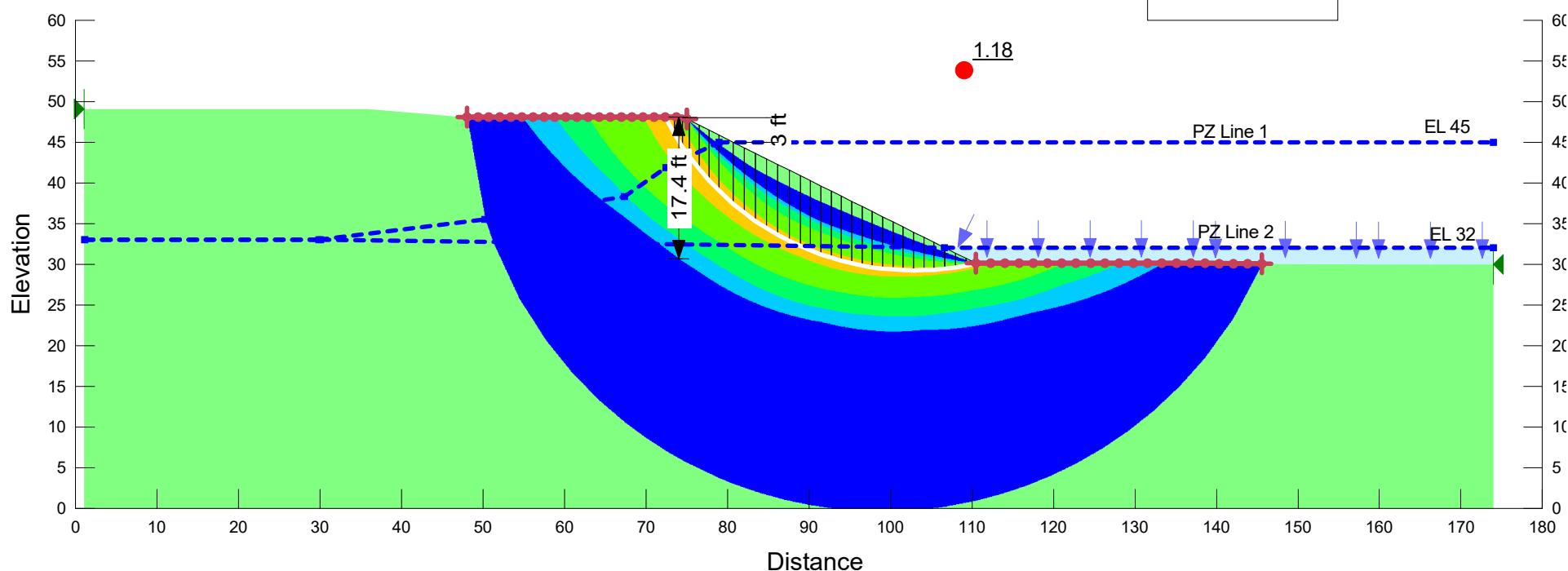


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■ CL Stiff	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 18 ft; Loose Sand (SM/SC)**  
**2.0 to 1 Channel Slope**

FOS: 1.18

Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



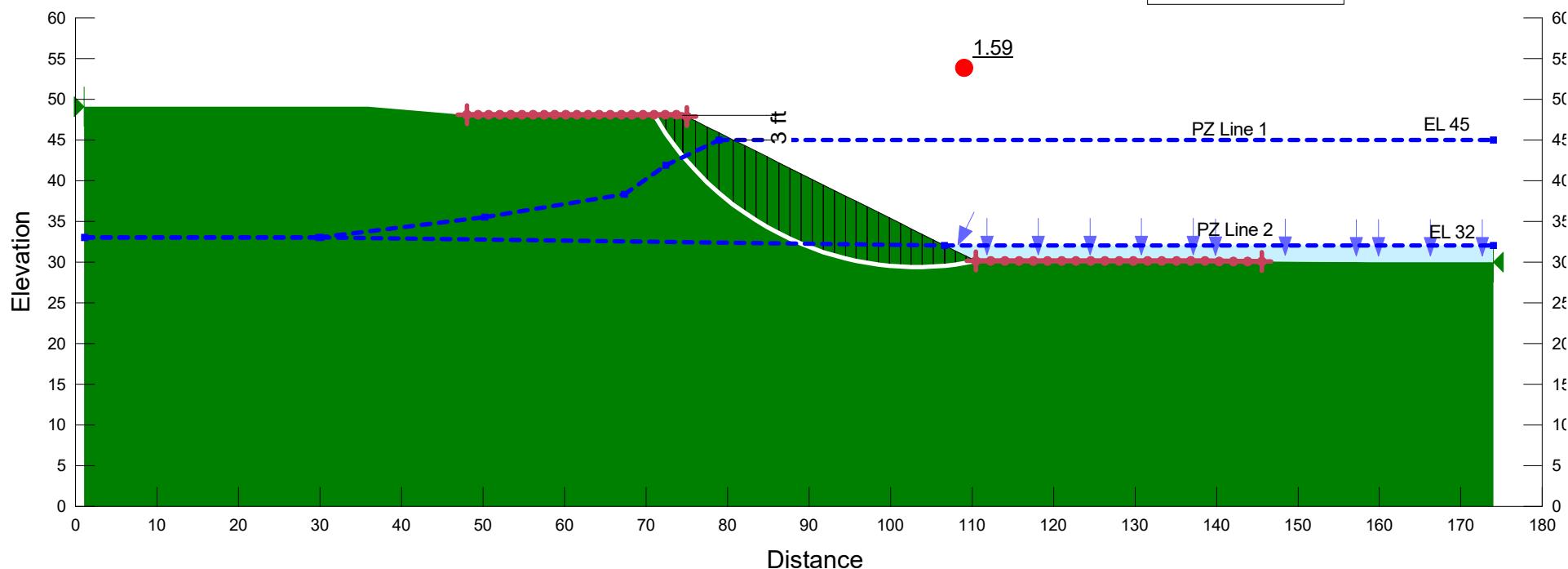
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 18 ft; Dense Sand (SM/SC)**  
**2.0 to 1 Channel Slope**

FOS: 1.59

**Factor of Safety**

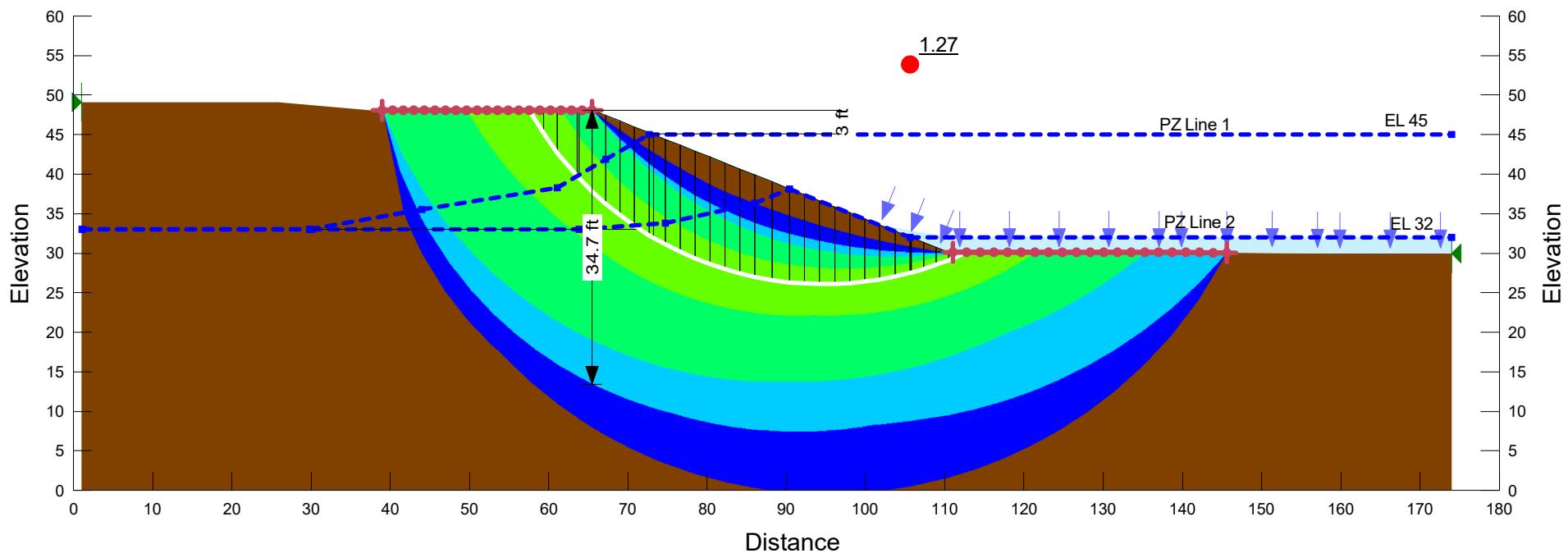
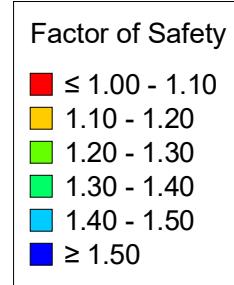
- $\leq 1.00 - 1.10$
- $1.10 - 1.20$
- $1.20 - 1.30$
- $1.30 - 1.40$
- $1.40 - 1.50$
- $\geq 1.50$



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 18 ft; Soft Fat Clay (CH)  
 2.5 to 1 Channel Slope

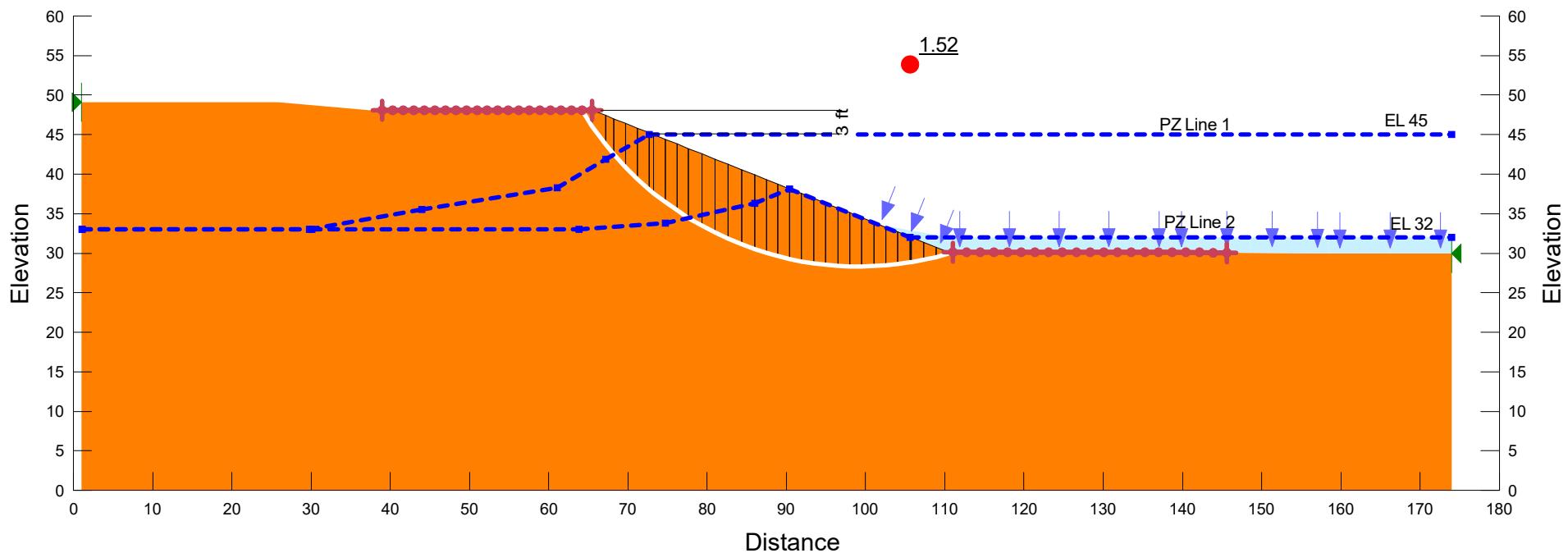
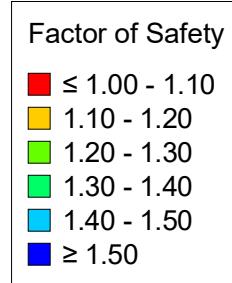
FOS: 1.27



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
<span style="color: brown;">█</span>	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 18 ft; Stiff Fat Clay (CH)**  
**2.5 to 1 Channel Slope**

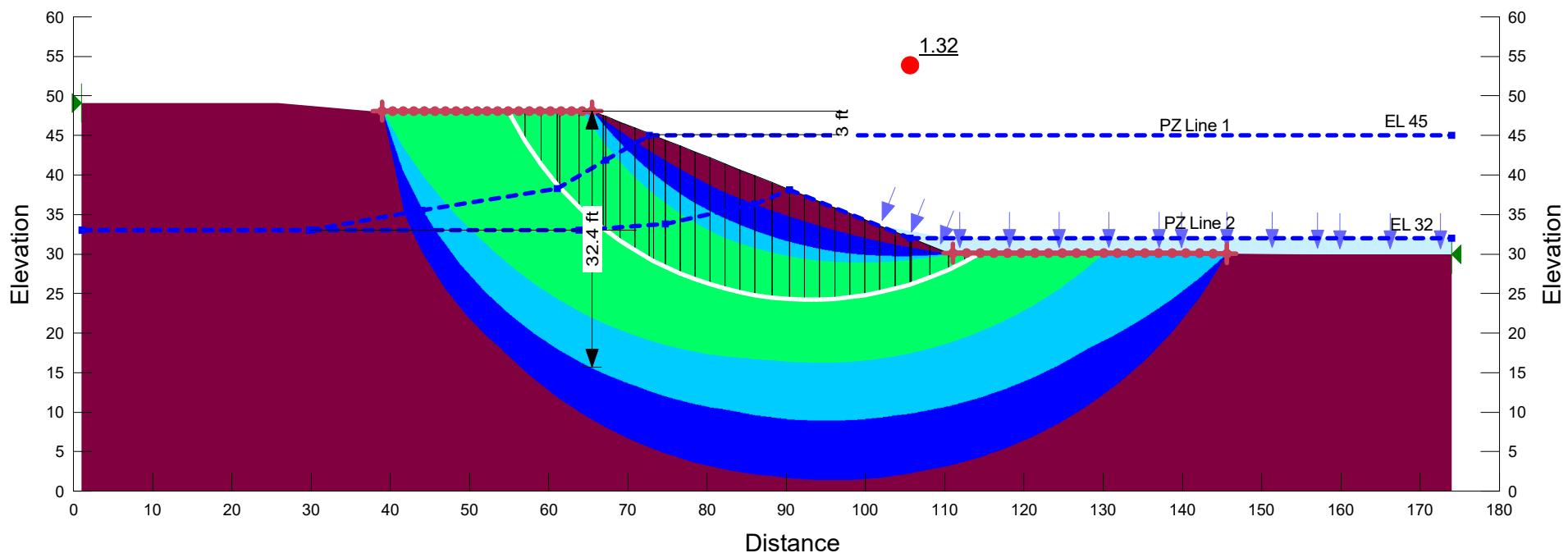
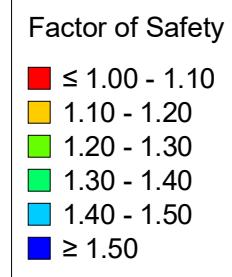
FOS: 1.52



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 18 ft; Soft Lean Clay (CL)  
 2.5 to 1 Channel Slope

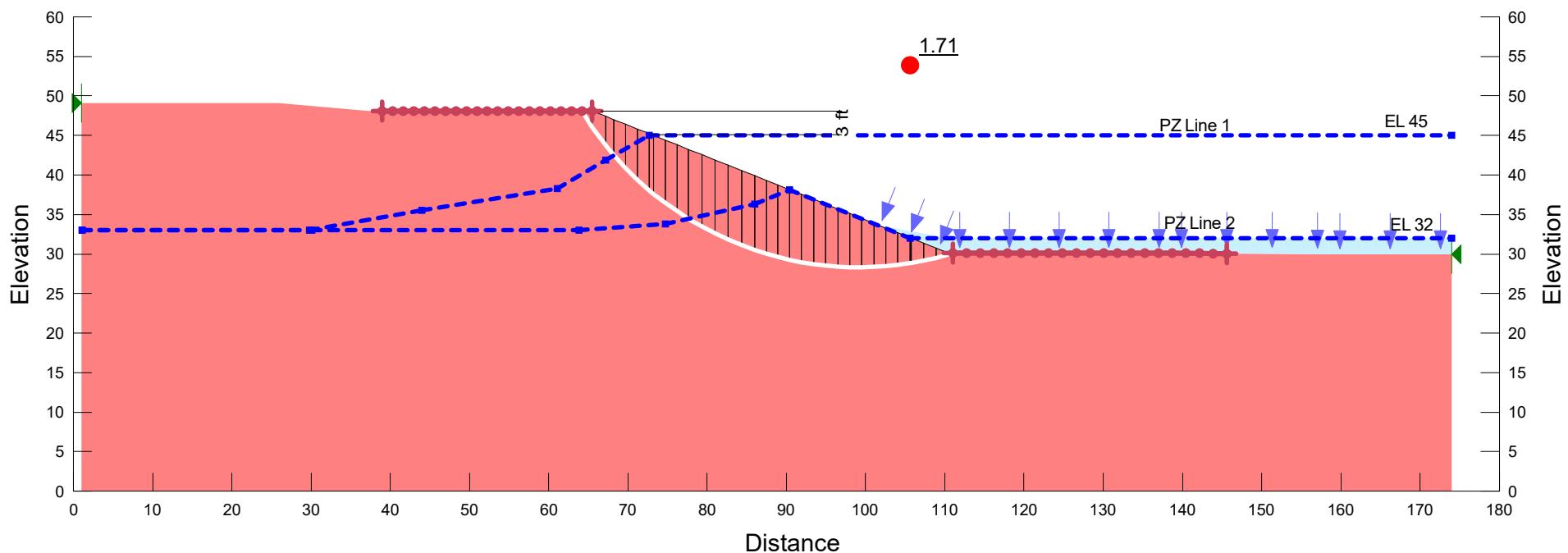
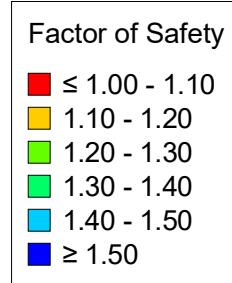
FOS: 1.32



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 18 ft; Stiff Lean Clay (CL)**  
**2.5 to 1 Channel Slope**

FOS: 1.71

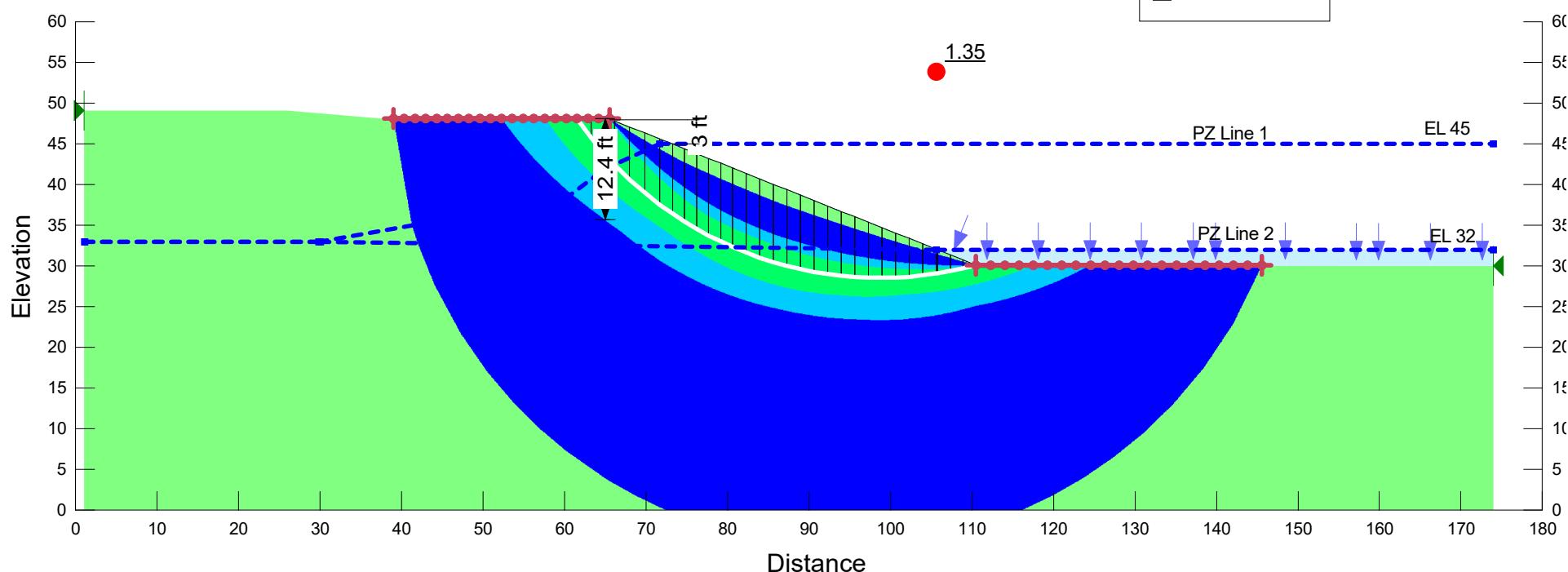


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 18 ft; Loose Sand (SM/SC)  
 2.5 to 1 Channel Slope

FOS: 1.35

Factor of Safety	
■	≤ 1.00 - 1.10
■	1.10 - 1.20
■	1.20 - 1.30
■	1.30 - 1.40
■	1.40 - 1.50
■	≥ 1.50



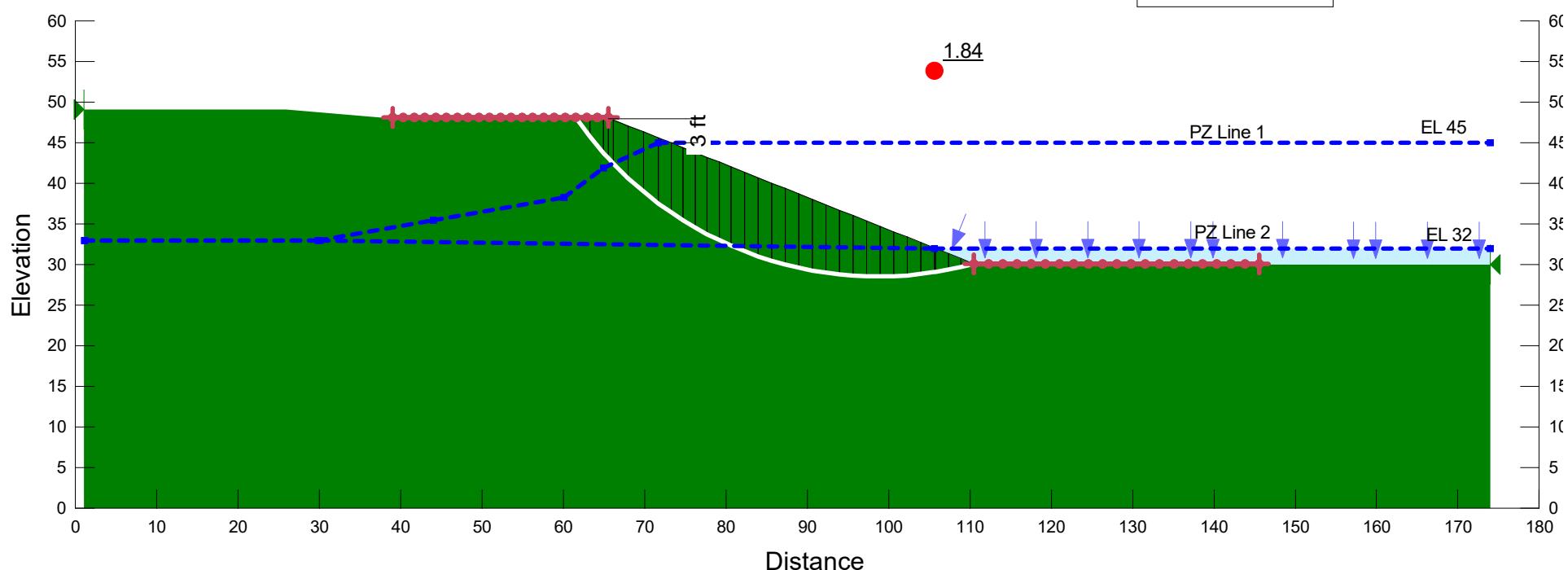
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 18 ft; Dense Sand (SM/SC)  
 2.5 to 1 Channel Slope

FOS: 1.84

Factor of Safety

- $\leq 1.00 - 1.10$
- $1.10 - 1.20$
- $1.20 - 1.30$
- $1.30 - 1.40$
- $1.40 - 1.50$
- $\geq 1.50$



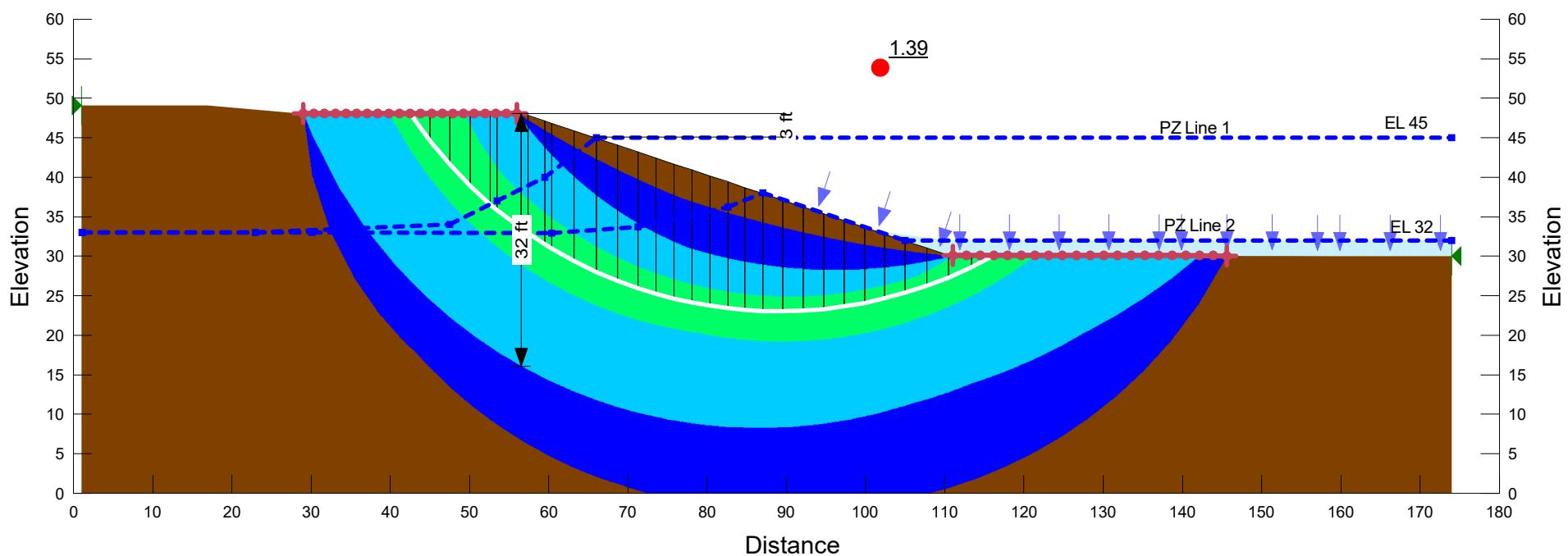
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

### Rapid Drawdown Slope Stability Analysis

Bank Height = 18 ft; Soft Fat Clay (CH)

3.0 to 1 Channel Slope

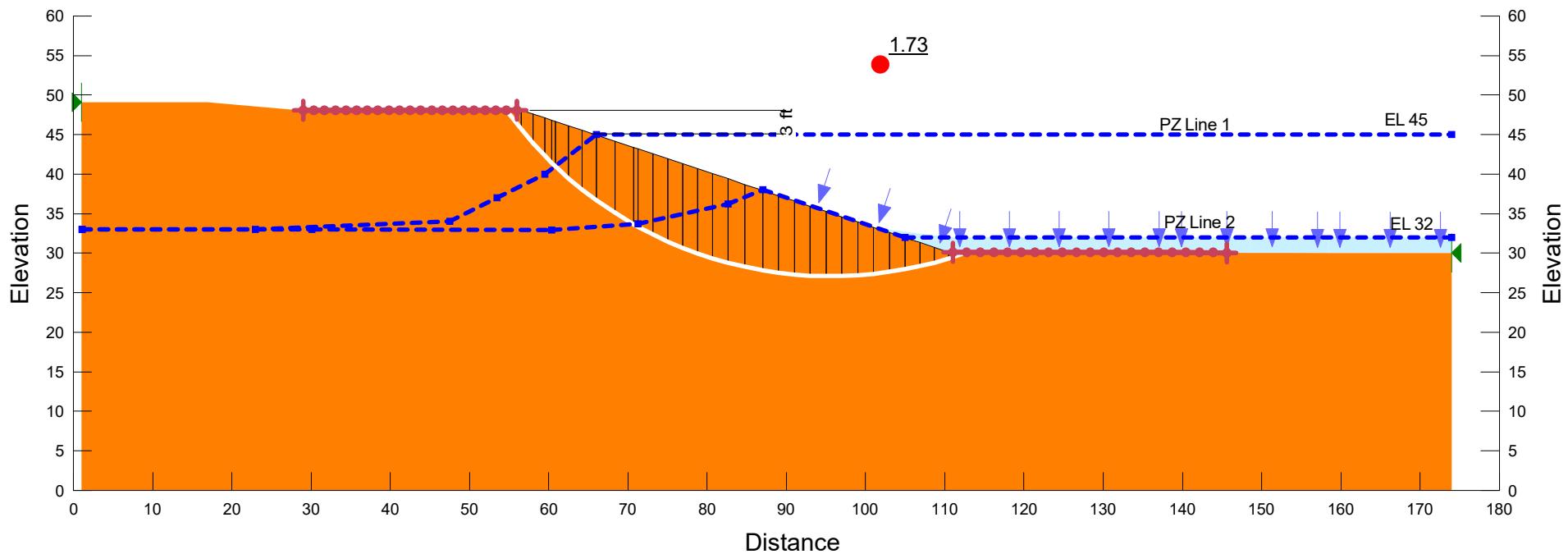
FOS: 1.39



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	$\Phi_i R$ ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
<span style="background-color: brown;"></span>	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 18 ft; Stiff Fat Clay (CH)**  
**3.0 to 1 Channel Slope**

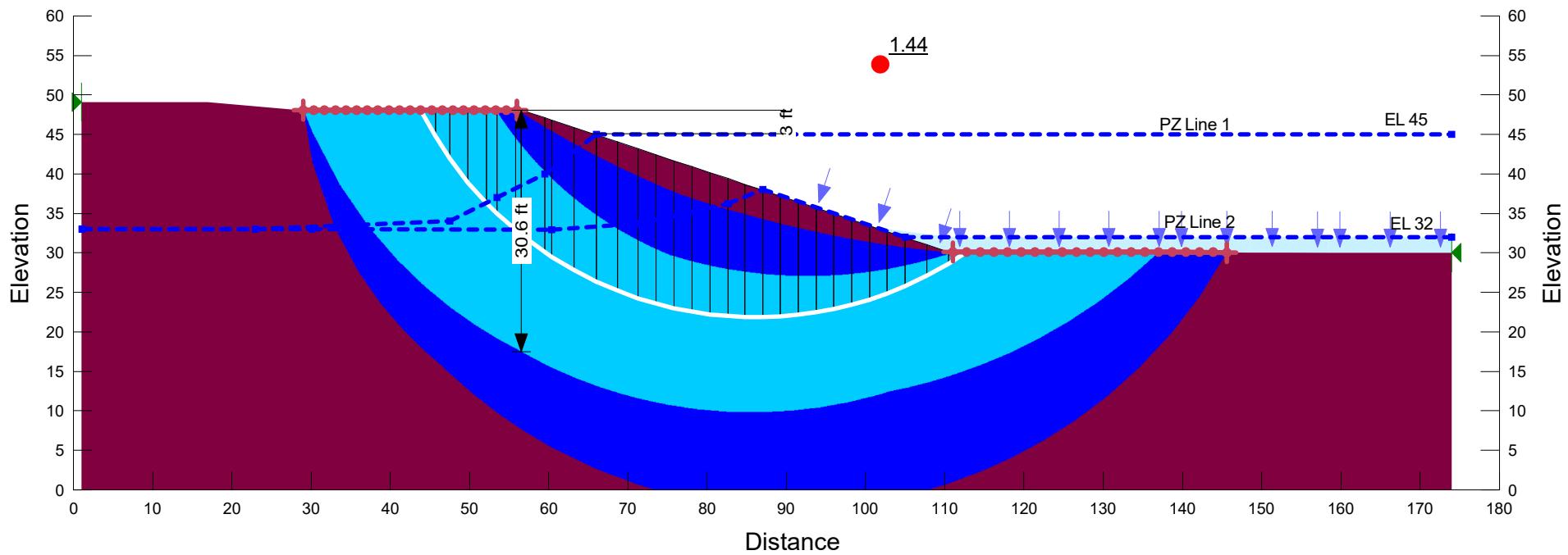
FOS: 1.73



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 18 ft; Soft Lean Clay (CL)  
 3.0 to 1 Channel Slope

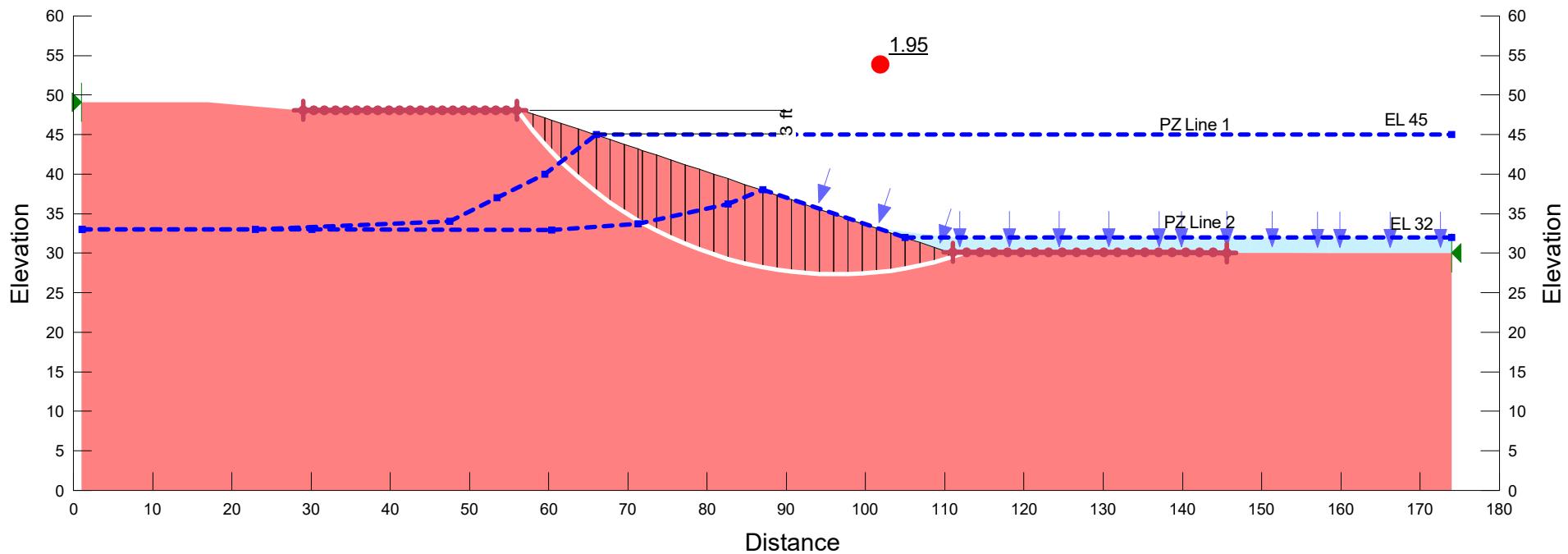
FOS: 1.44



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
Maroon	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 18 ft; Stiff Lean Clay (CL)**  
**3.0 to 1 Channel Slope**

FOS: 1.95

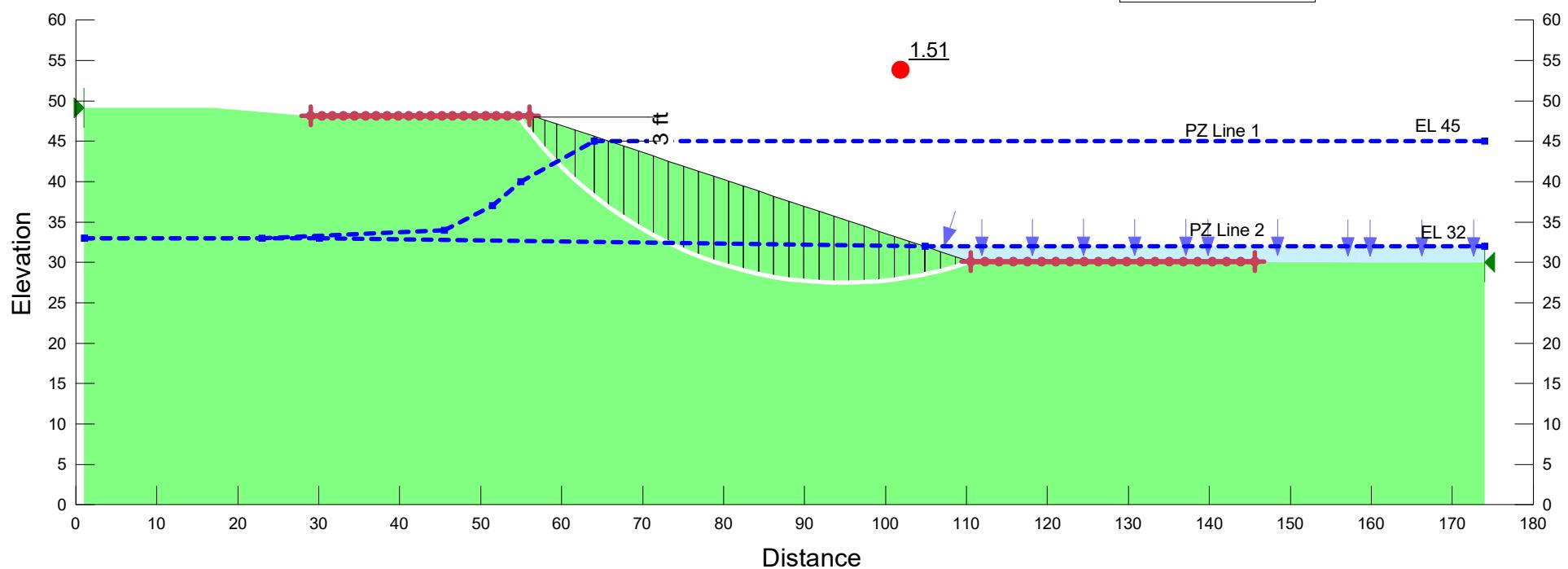


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■ CL Stiff	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 18 ft; Loose Sand (SM/SC)  
 3.0 to 1 Channel Slope

FOS: 1.51

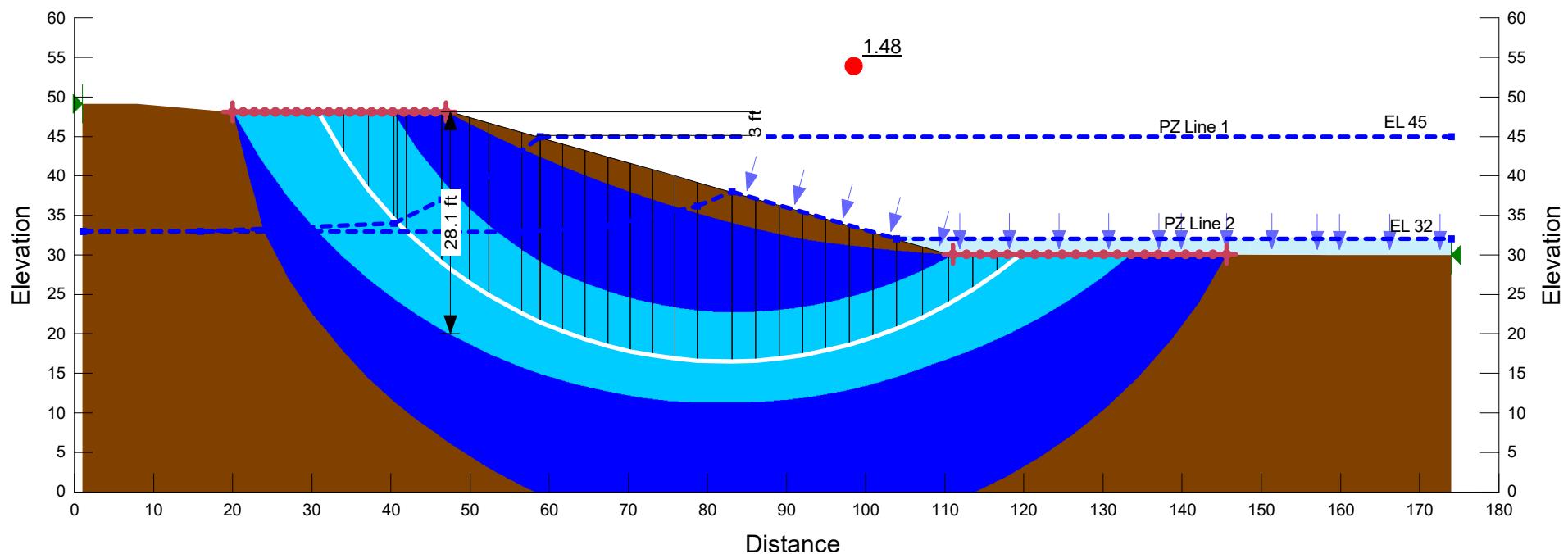
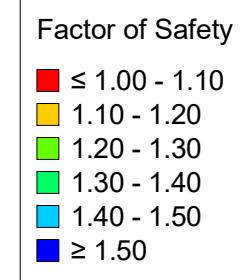
Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Green	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 18 ft; Soft Fat Clay (CH)**  
**3.5 to 1 Channel Slope**

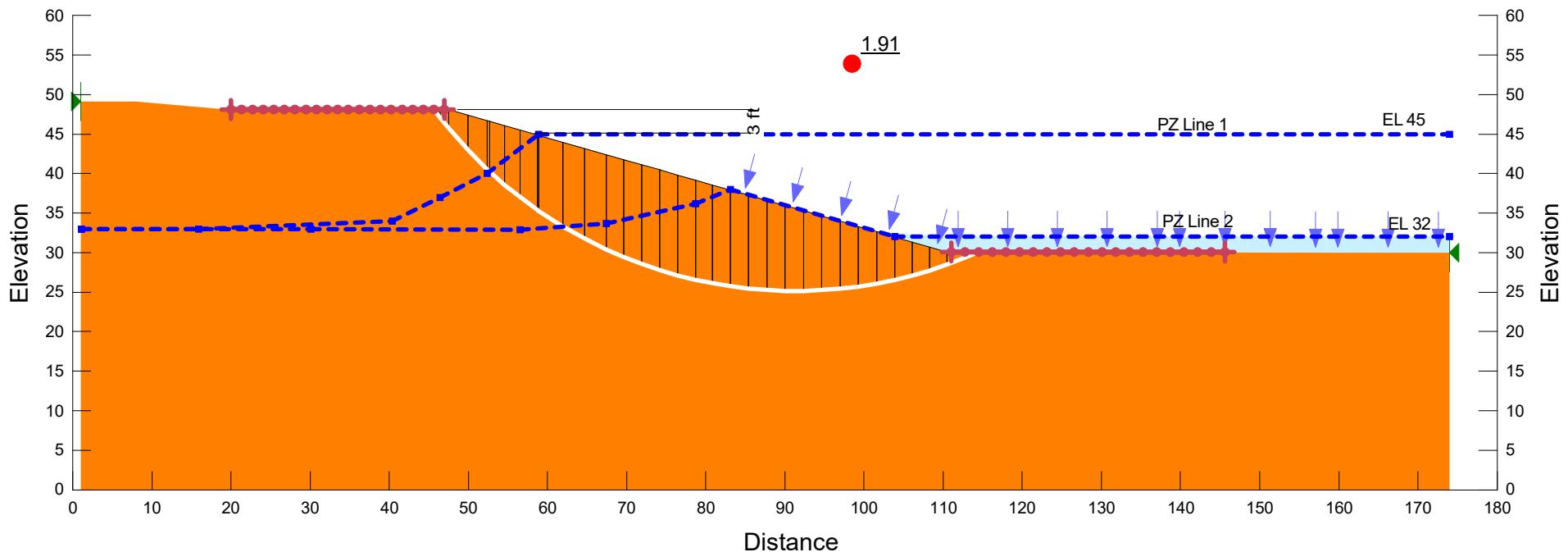
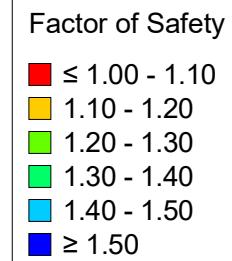
FOS: 1.48



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
Brown	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 18 ft; Stiff Fat Clay (CH)  
 3.5 to 1 Channel Slope

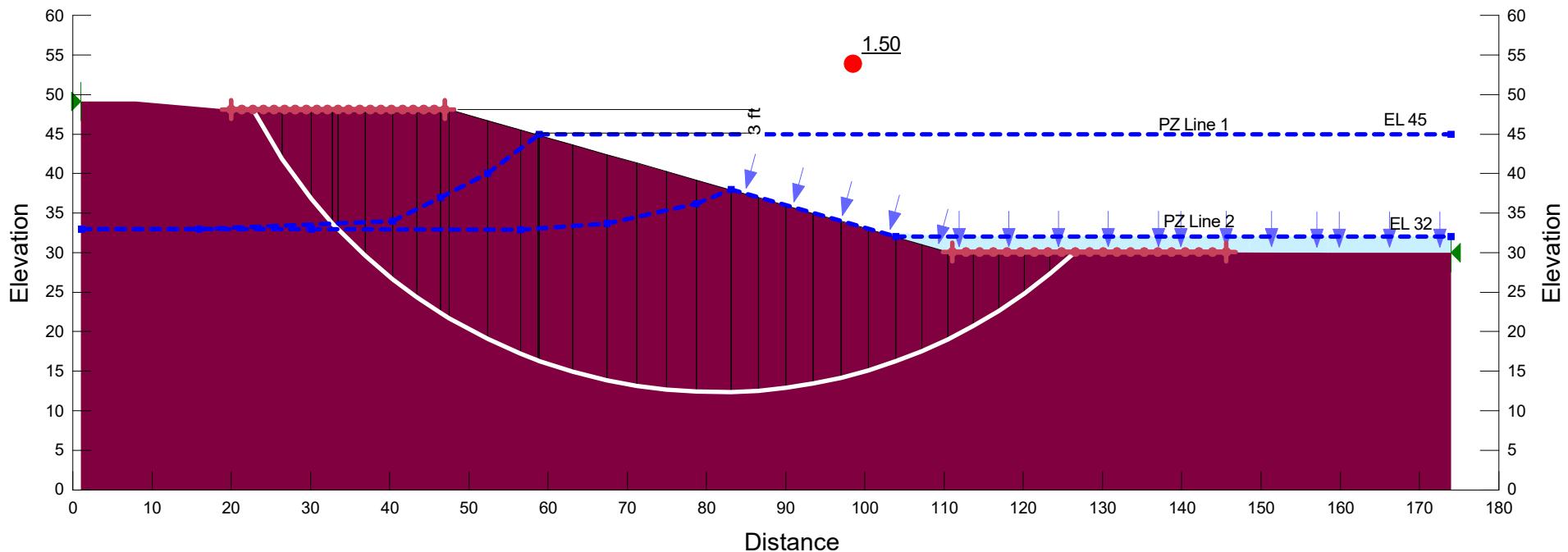
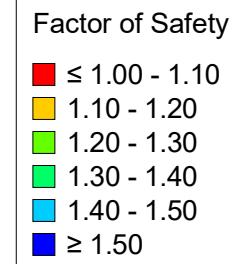
FOS: 1.91



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 18 ft; Soft Lean Clay (CL)**  
**3.5 to 1 Channel Slope**

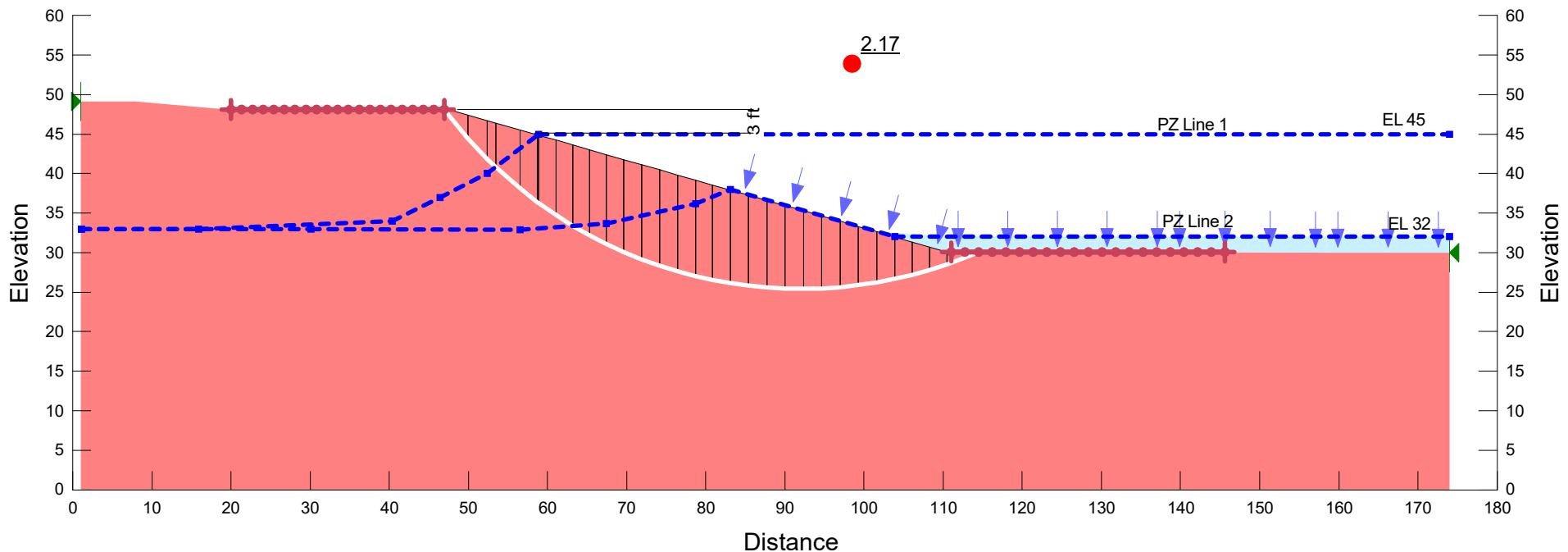
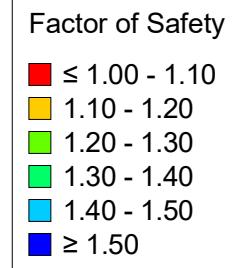
FOS: 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■ CL Soft	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 18 ft; Stiff Lean Clay (CL)**  
**3.5 to 1 Channel Slope**

FOS: 2.17

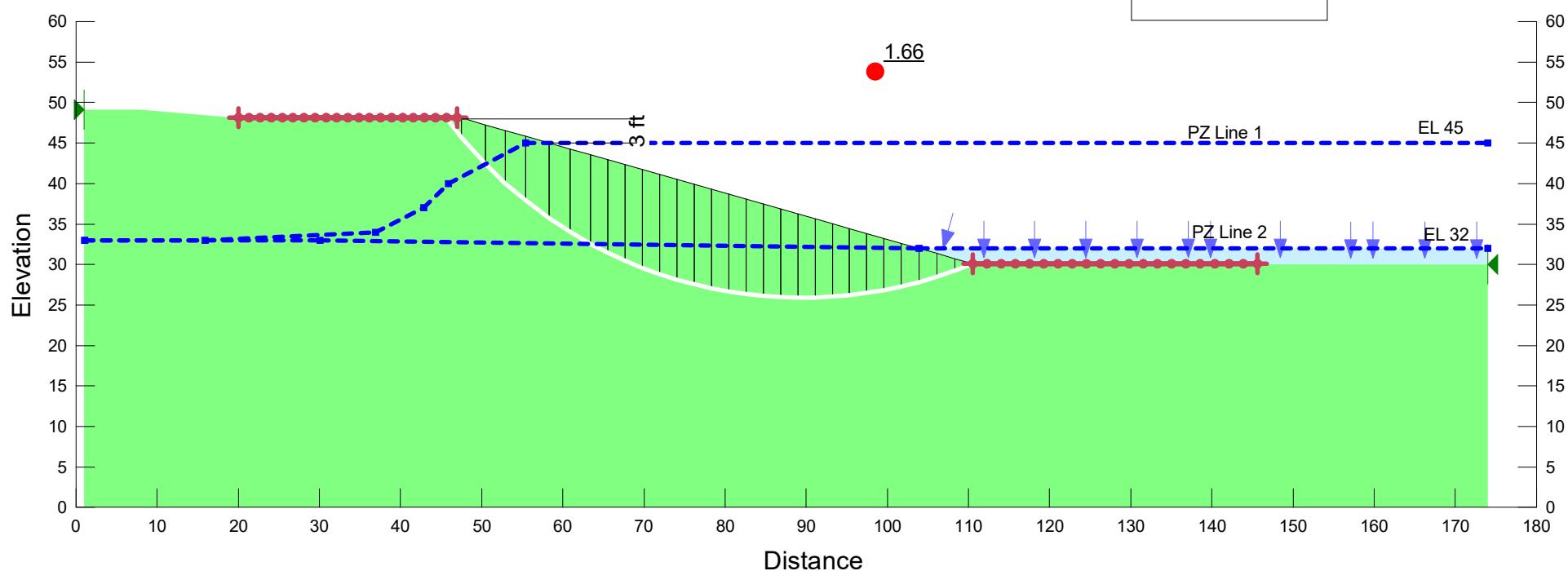


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 18 ft; Loose Sand (SM/SC)**  
**3.5 to 1 Channel Slope**

FOS: 1.66

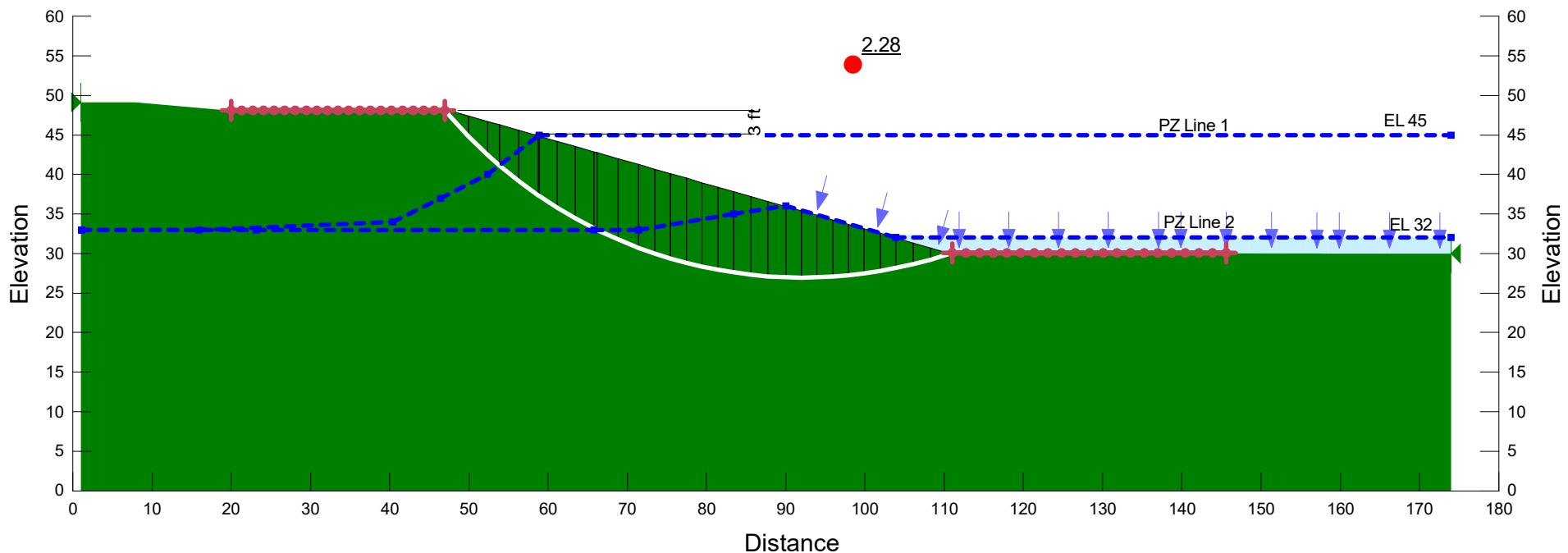
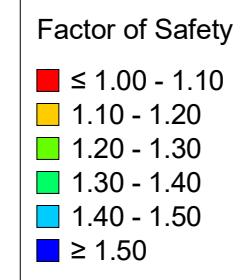
Factor of Safety	
■	$\leq 1.00 - 1.10$
■	1.10 - 1.20
■	1.20 - 1.30
■	1.30 - 1.40
■	1.40 - 1.50
■	$\geq 1.50$



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 18 ft; Dense Sand (SM/SC)**  
**3.5 to 1 Channel Slope**

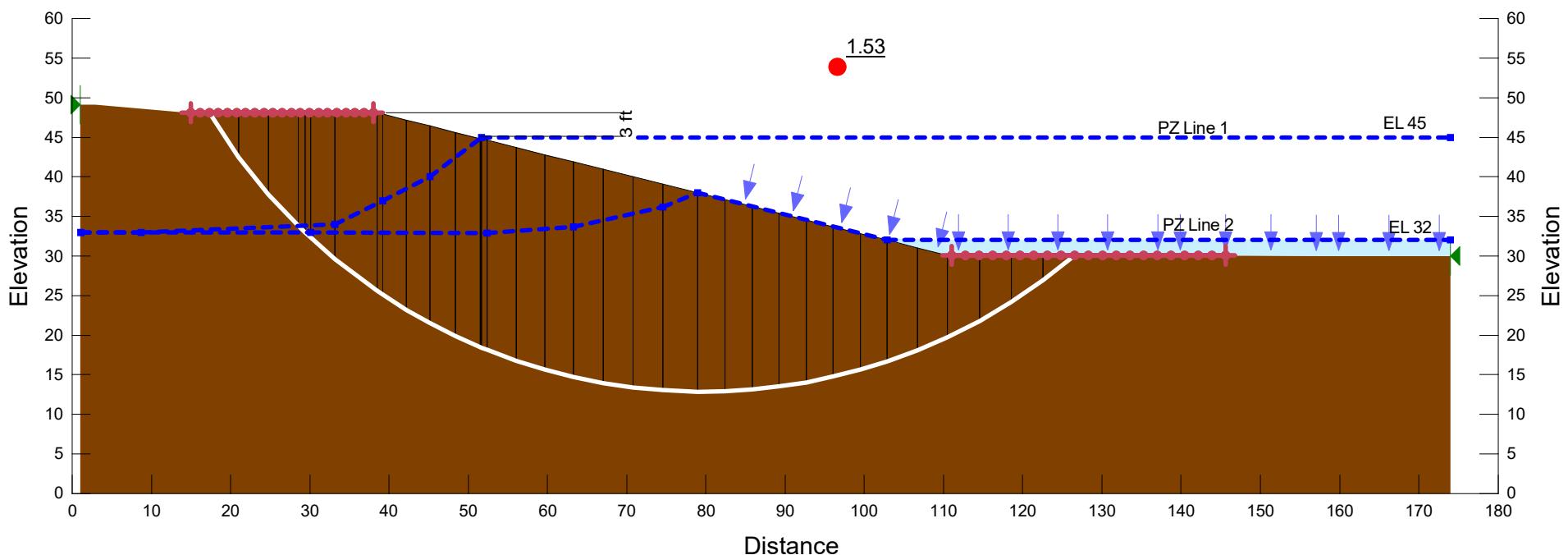
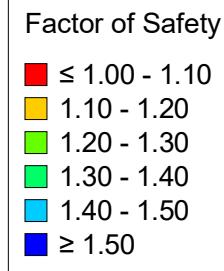
FOS: 2.28



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 18 ft; Soft Fat Clay (CH)**  
**4.0 to 1 Channel Slope**

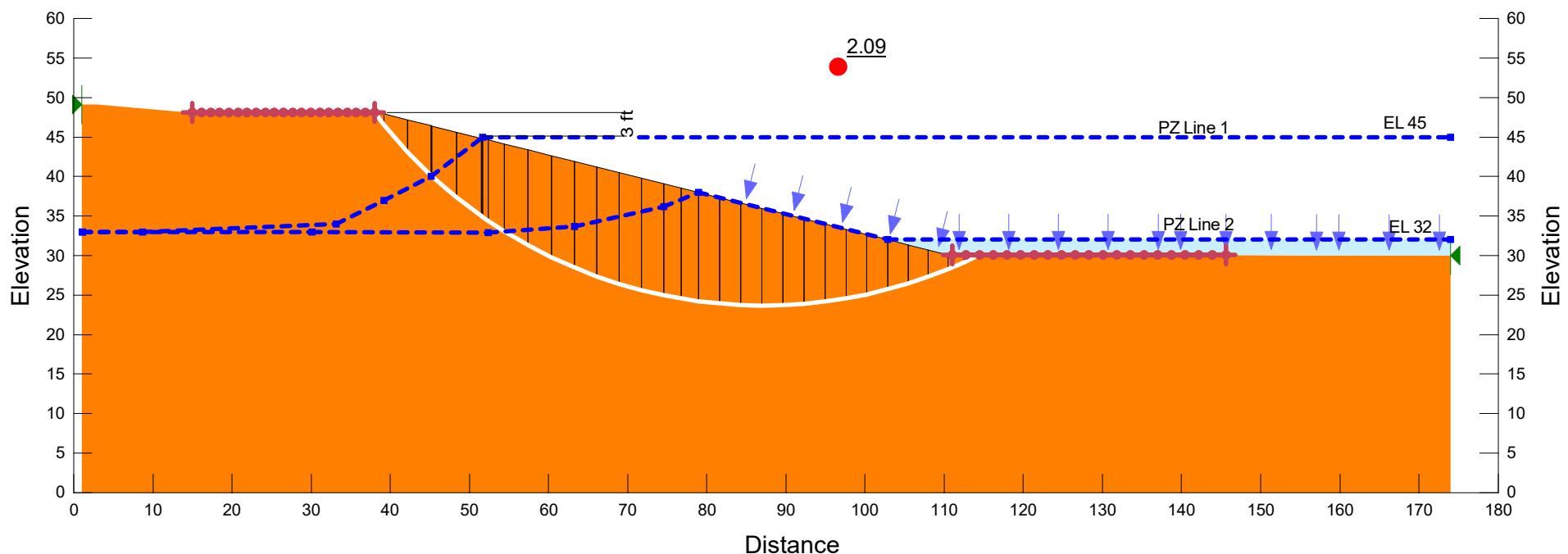
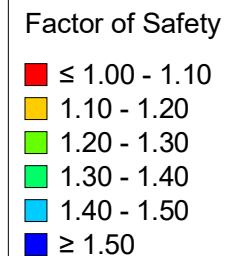
FOS: 1.53



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
Brown	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 18 ft; Stiff Fat Clay (CH)  
 4.0 to 1 Channel Slope

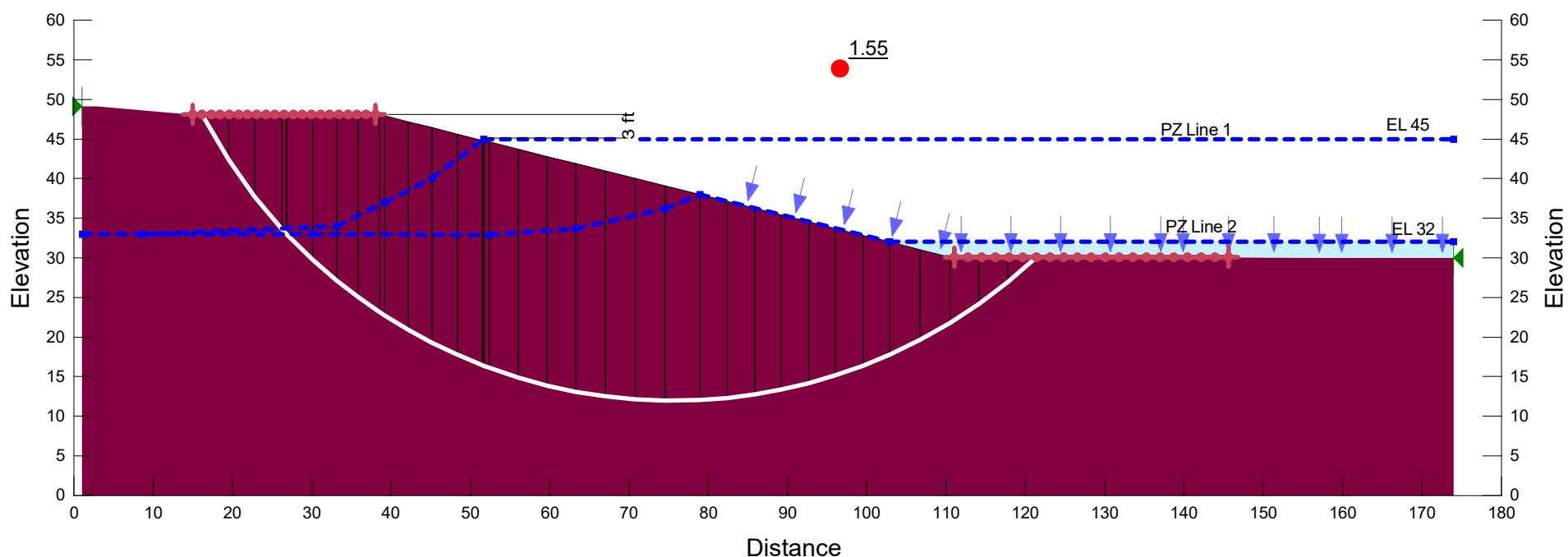
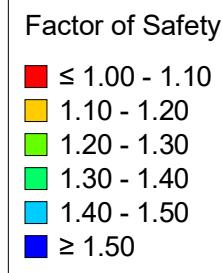
FOS: 2.09



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 18 ft; Soft Lean Clay (CL)**  
**4.0 to 1 Channel Slope**

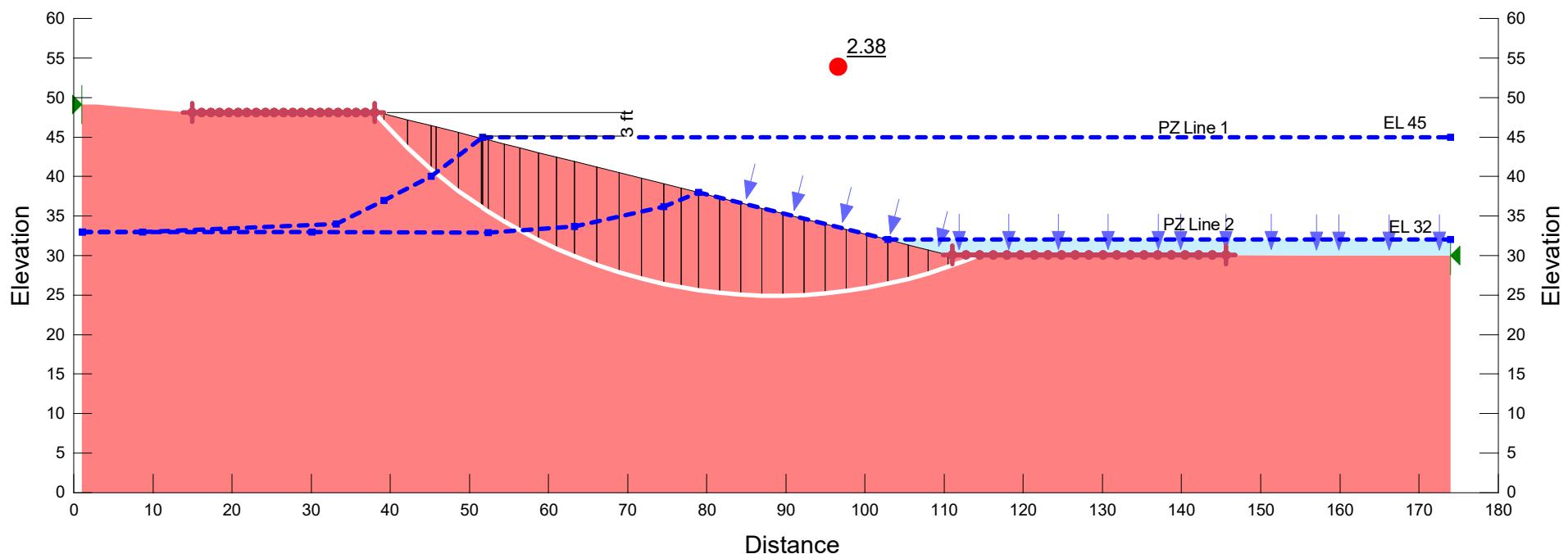
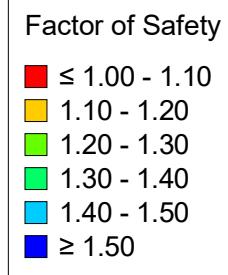
FOS: 1.55



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
Dark Red	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 18 ft; Stiff Lean Clay (CL)**  
**4.0 to 1 Channel Slope**

FOS: 2.38

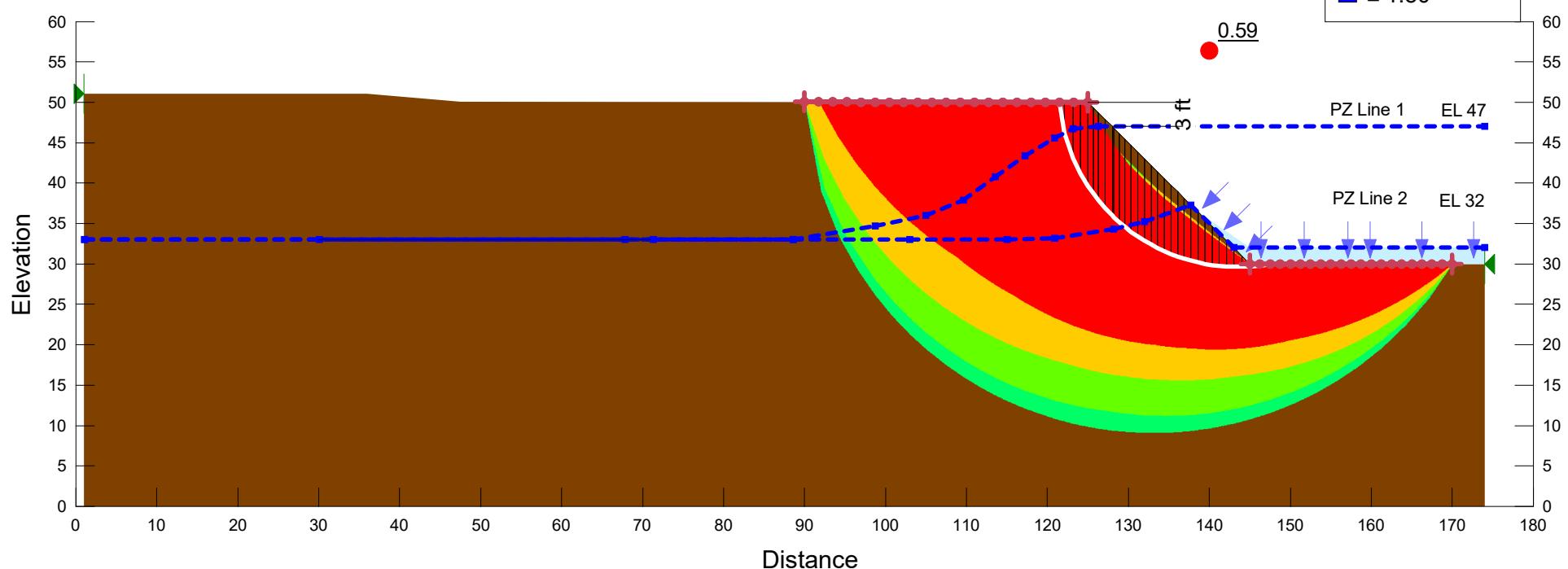


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 20 ft; Soft Fat Clay (CH)  
 1.0 to 1 Channel Slope

FOS: 0.59

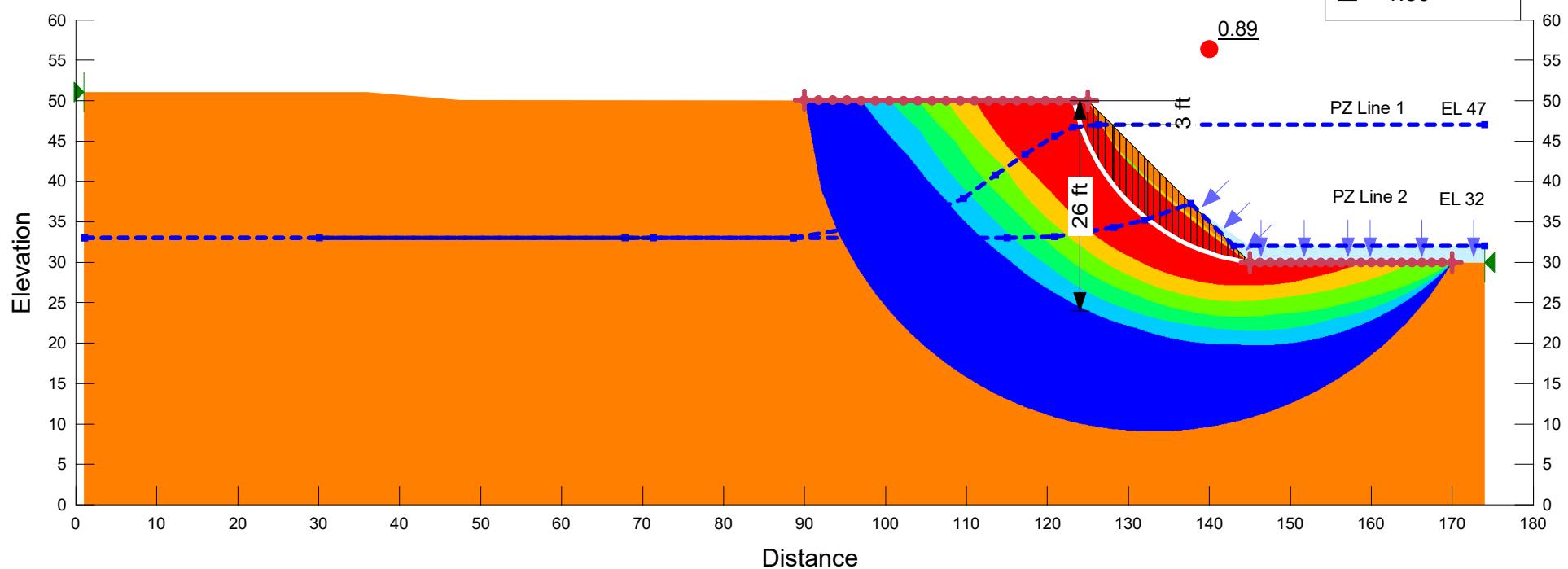
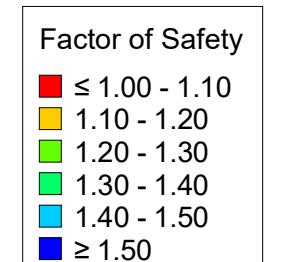
Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
█	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Stiff Fat Clay (CH)**  
**1.0 to 1 Channel Slope**

FOS: 0.89

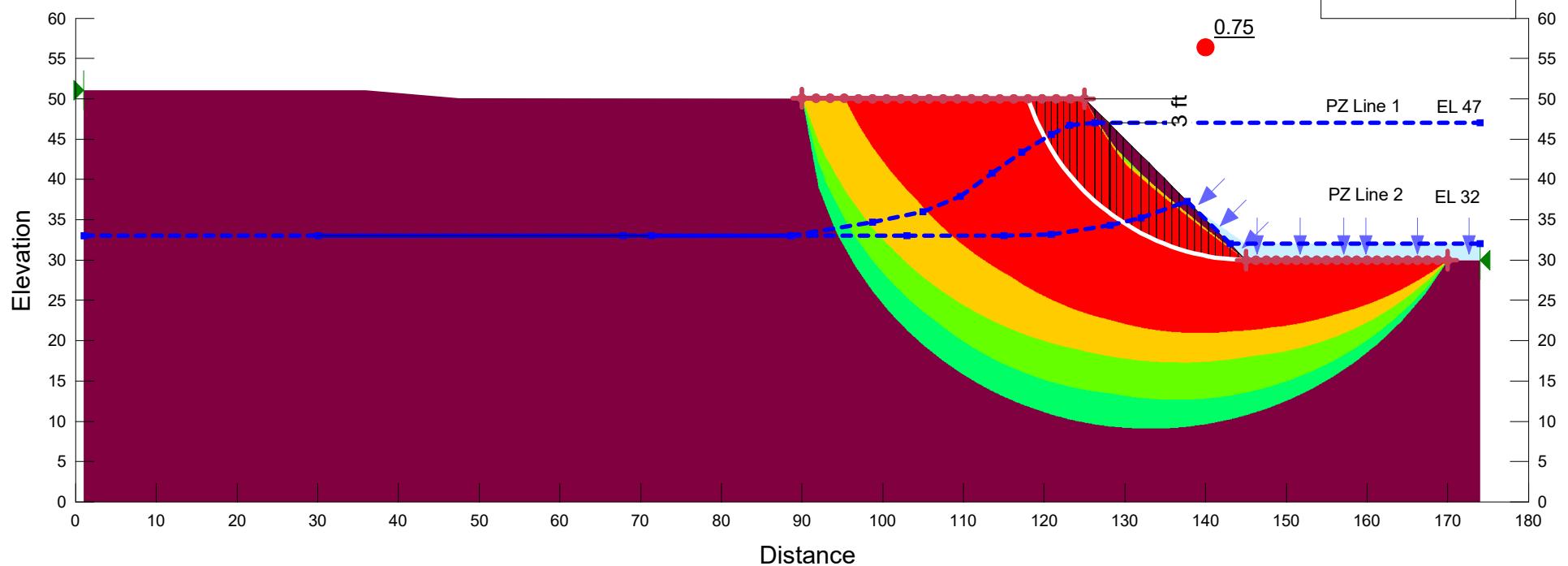


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Soft Lean Clay (CL)**  
**1.0 to 1 Channel Slope**

FOS: 0.75

Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50

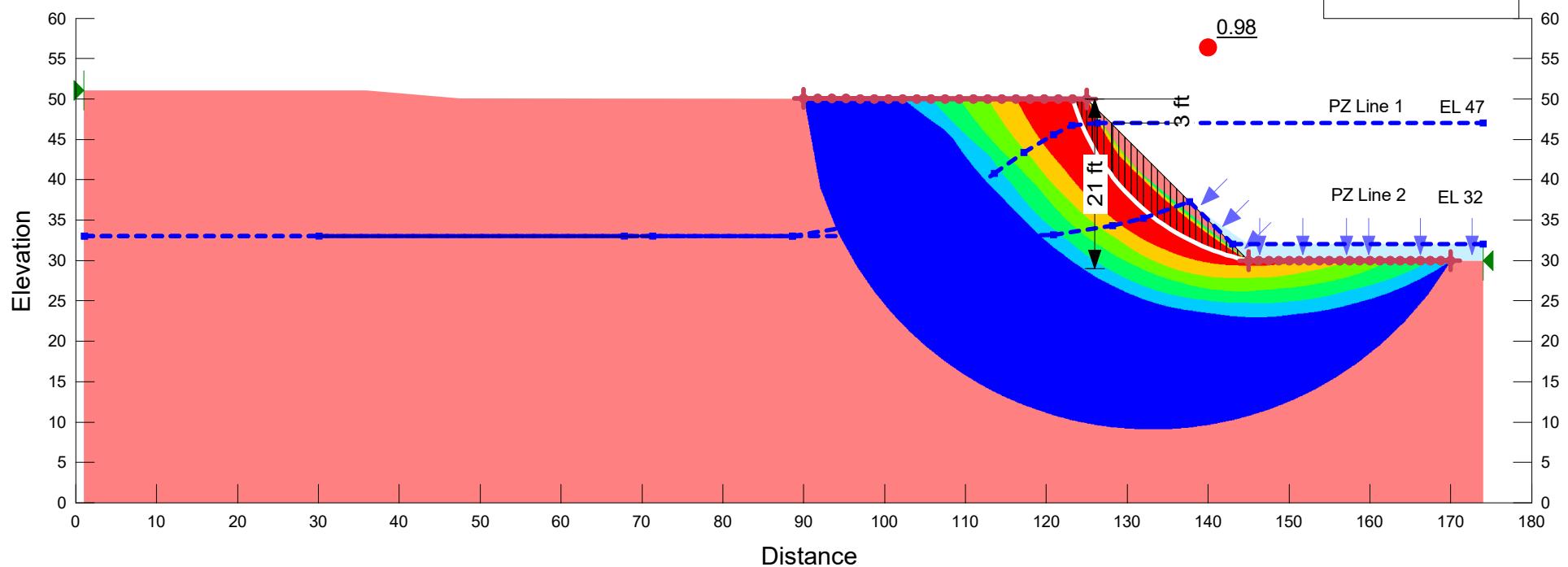


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
█	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Stiff Lean Clay (CL)**  
**1.0 to 1 Channel Slope**

FOS: 0.98

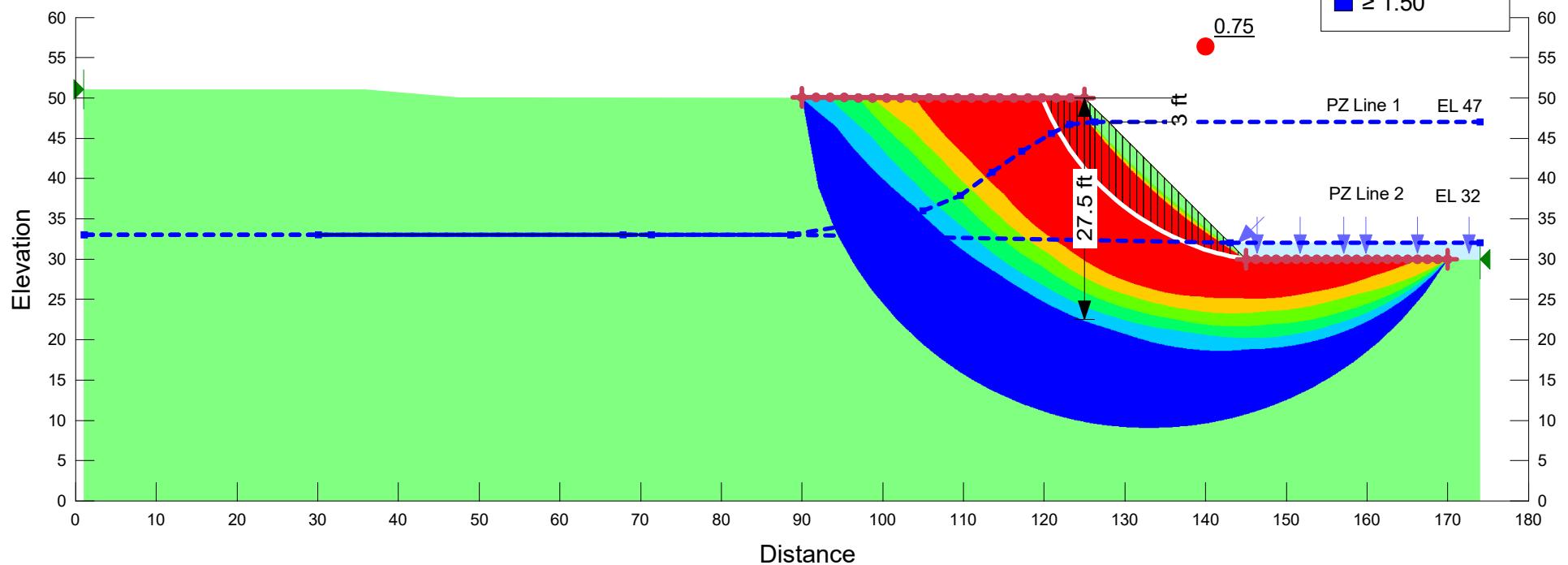
Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Red	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Loose Sand (SM/SC)**  
**1.0 to 1 Channel Slope**

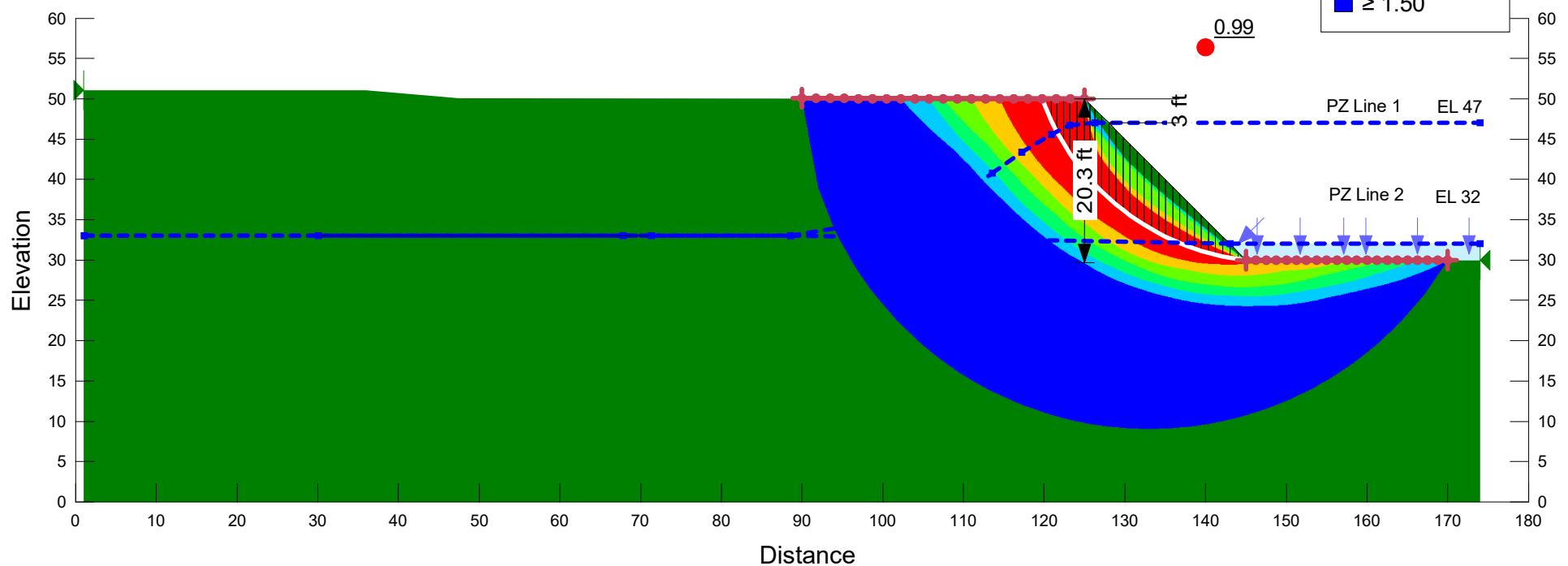
FOS: 0.75



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 20 ft; Dense Sand (SM/SC)  
 1.0 to 1 Channel Slope

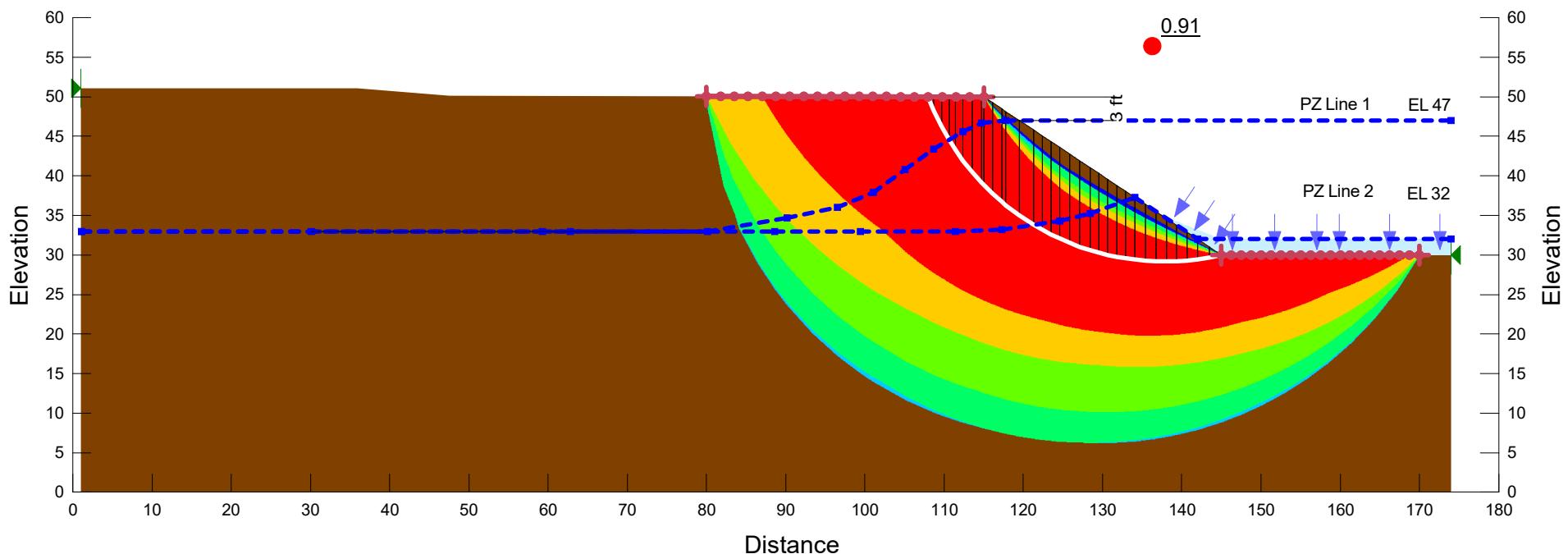
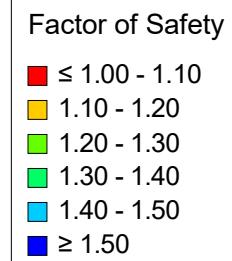
FOS: 0.99



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 20 ft; Soft Fat Clay (CH)  
 1.5 to 1 Channel Slope

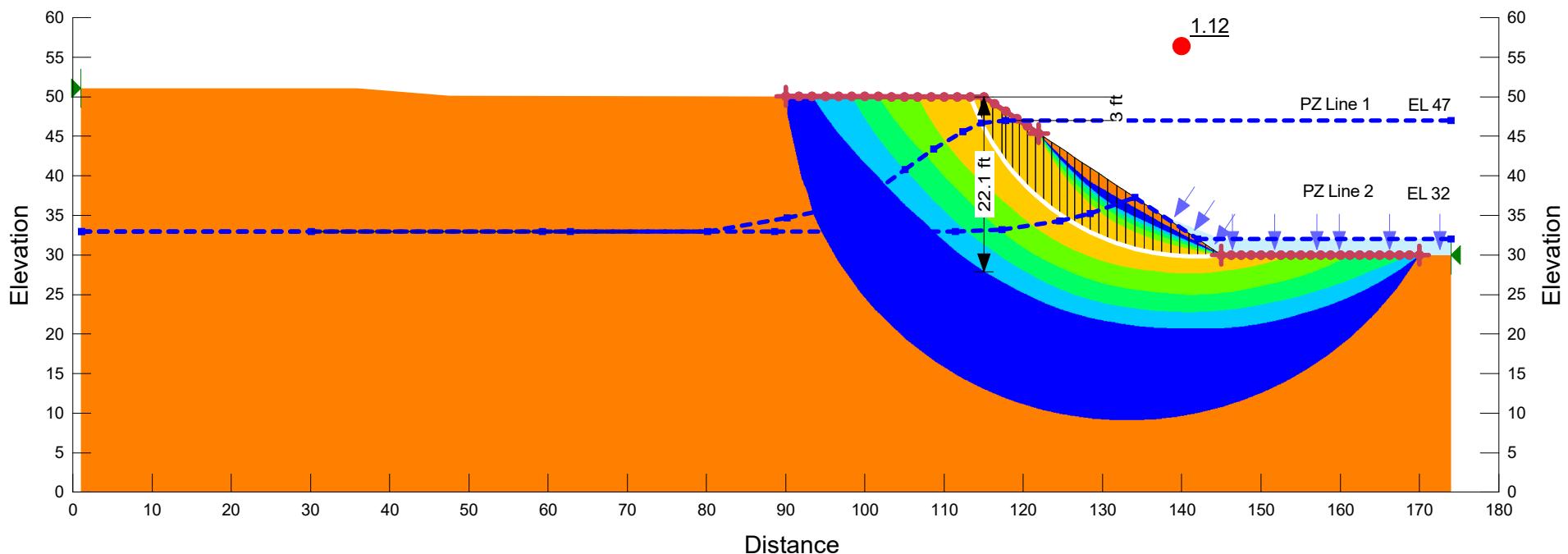
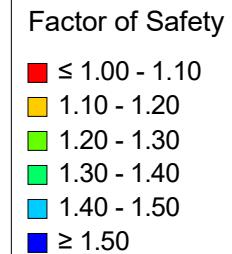
FOS: 0.91



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

Rapid Drawdown Slope Stability Analysis  
Bank Height = 20 ft; Stiff Fat Clay (CH)  
1.5 to 1 Channel Slope

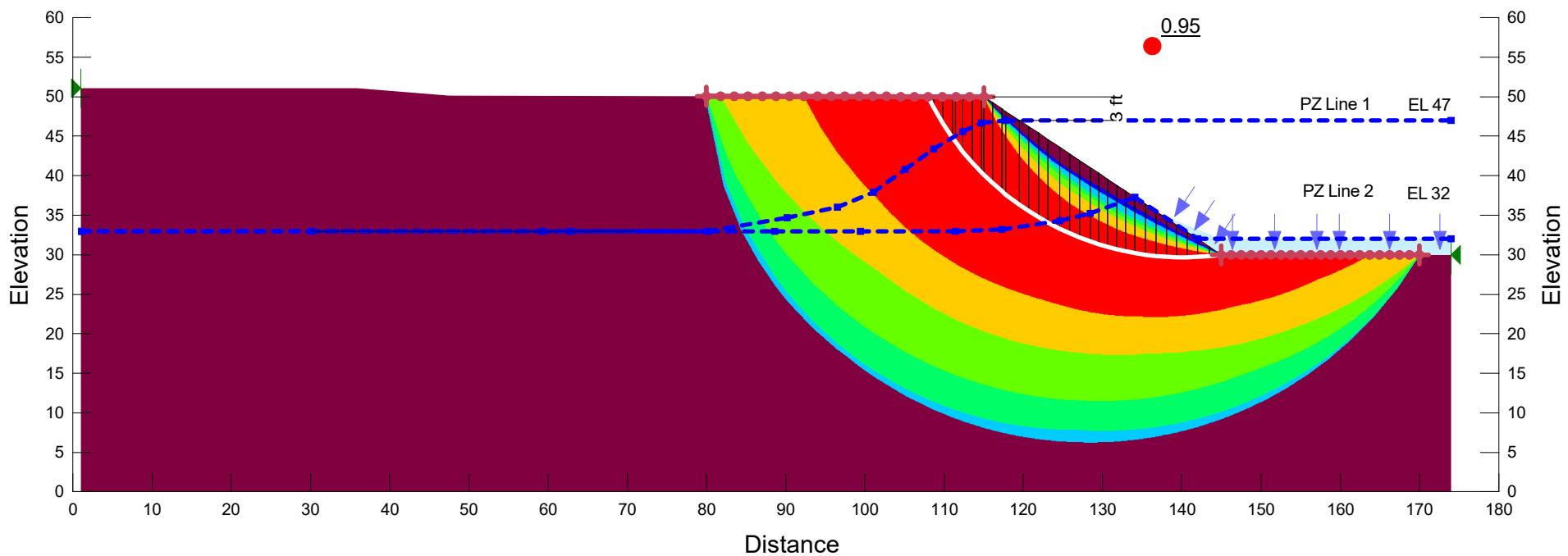
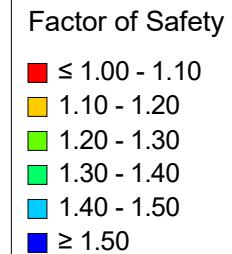
FOS: 1.12



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Soft Lean Clay (CL)**  
**1.5 to 1 Channel Slope**

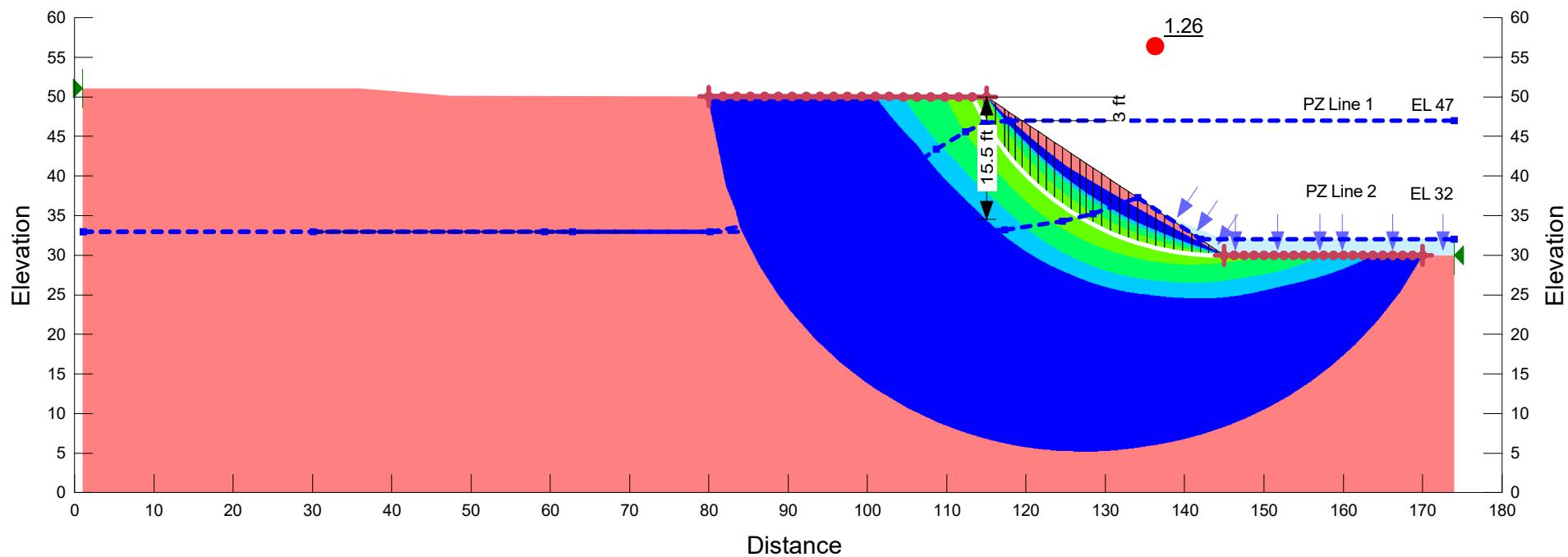
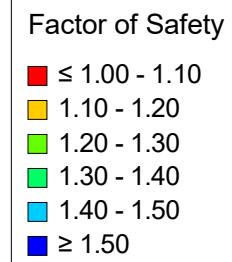
FOS: 0.95



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Stiff Lean Clay (CL)**  
**1.5 to 1 Channel Slope**

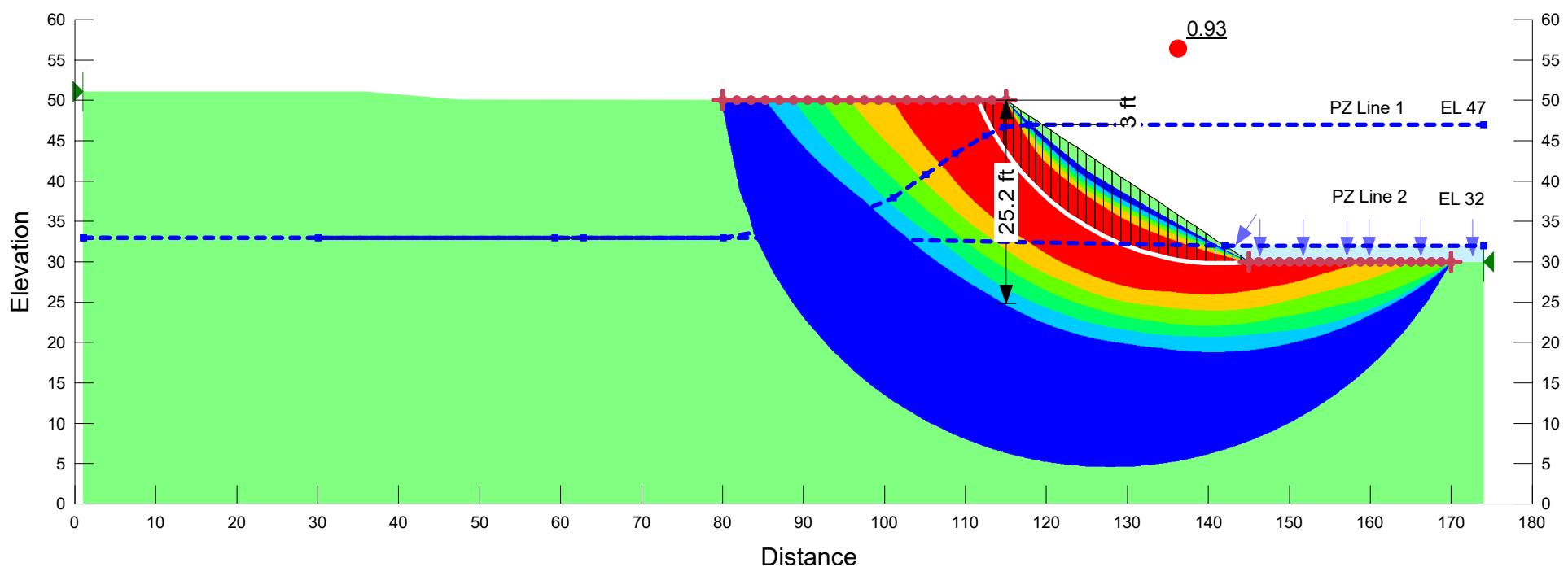
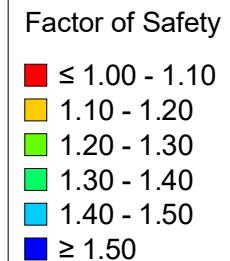
FOS: 1.26



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 20 ft; Loose Sand (SM/SC)  
 1.5 to 1 Channel Slope

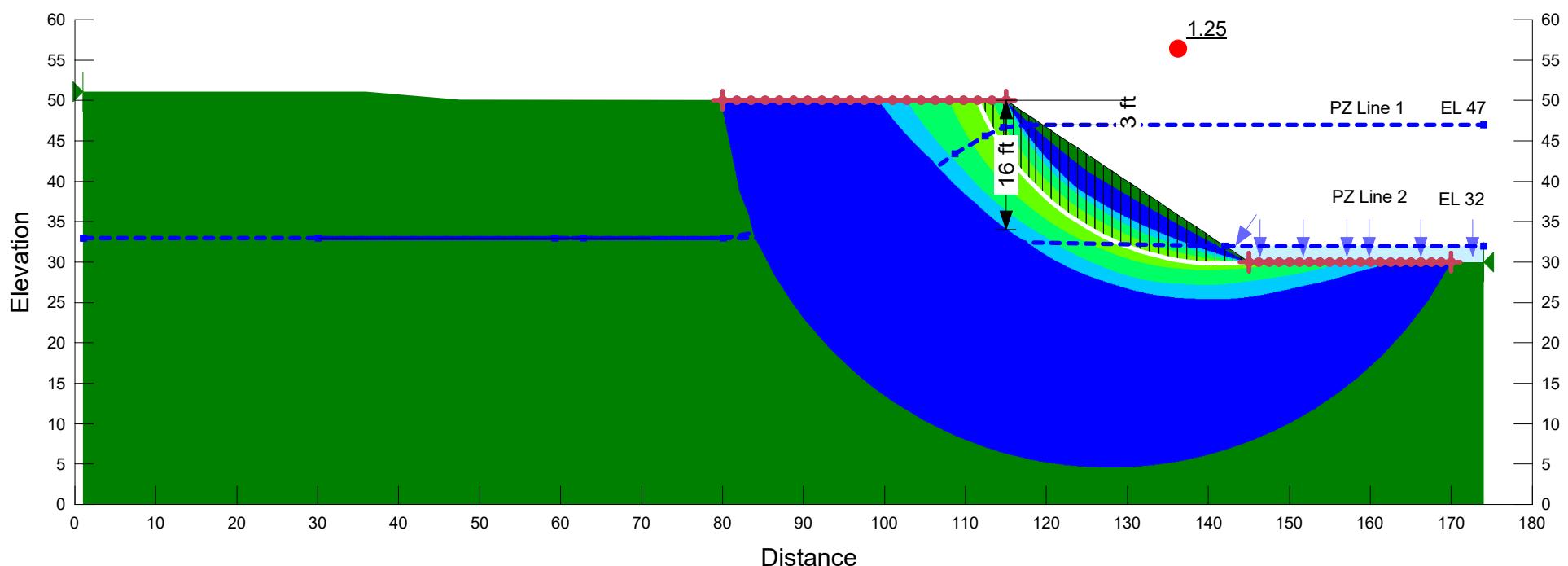
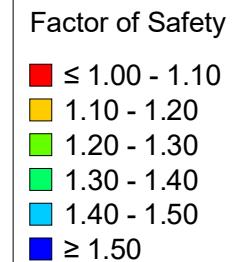
FOS: 0.93



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 20 ft; Dense Sand (SM/SC)  
 1.5 to 1 Channel Slope

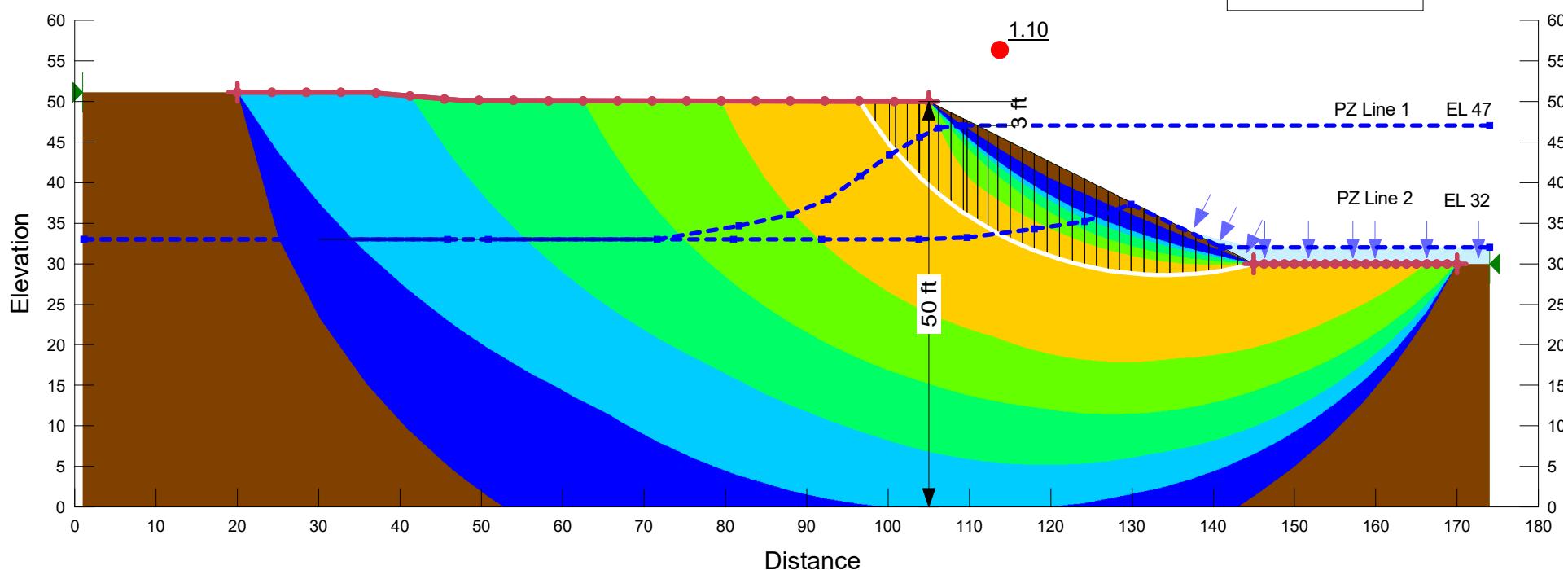
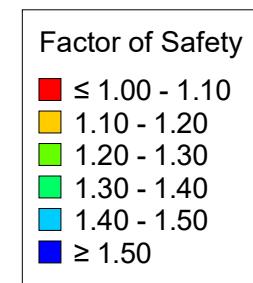
FOS: 1.25



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
<span style="background-color: black; color: black;">■</span>	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Soft Fat Clay (CH)**  
**2.0 to 1 Channel Slope**

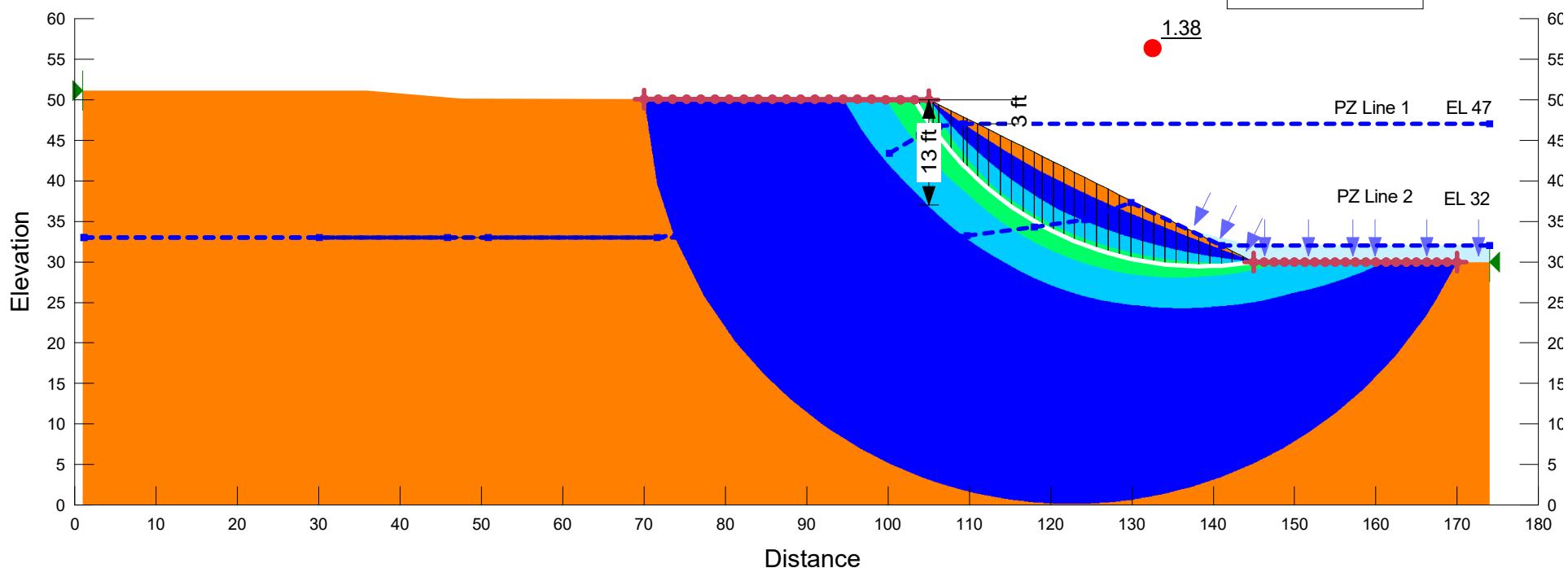
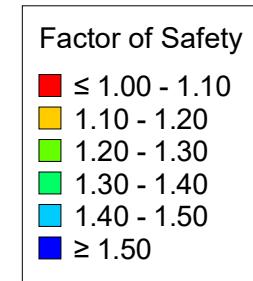
FOS: 1.10



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Stiff Fat Clay (CH)**  
**2.0 to 1 Channel Slope**

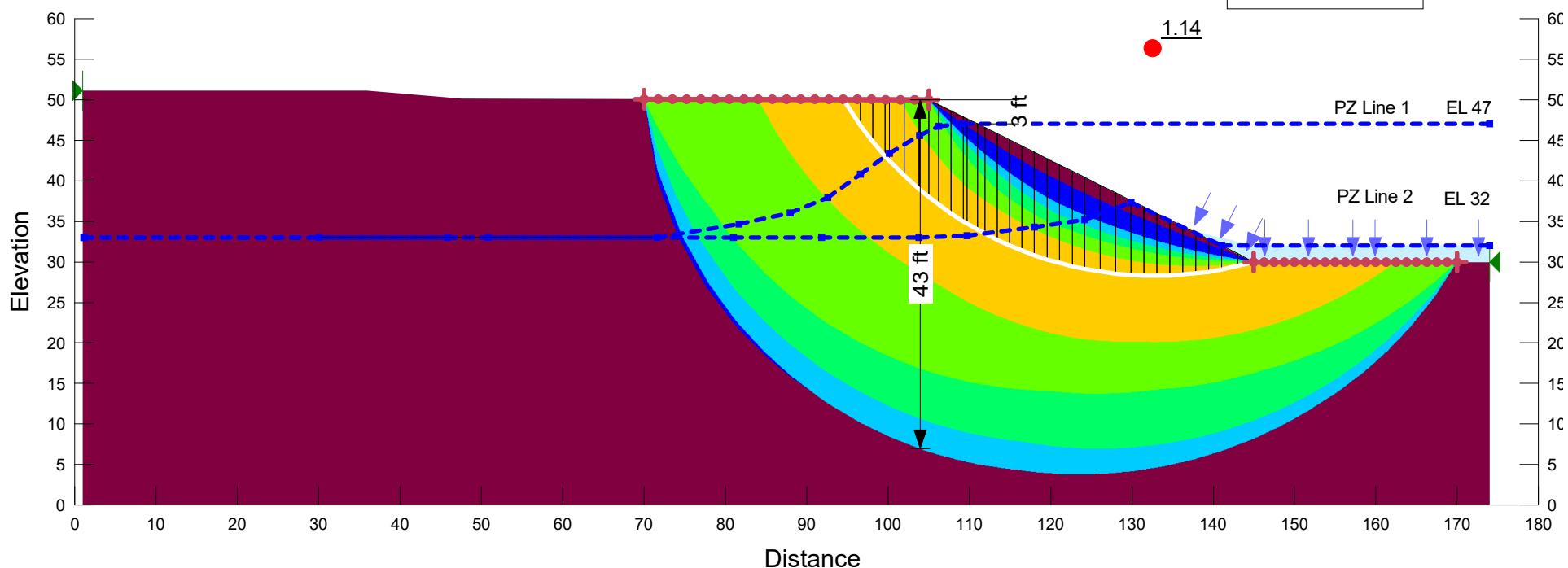
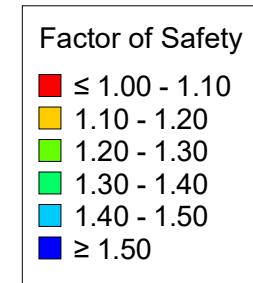
FOS: 1.38



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Soft Lean Clay (CL)**  
**2.0 to 1 Channel Slope**

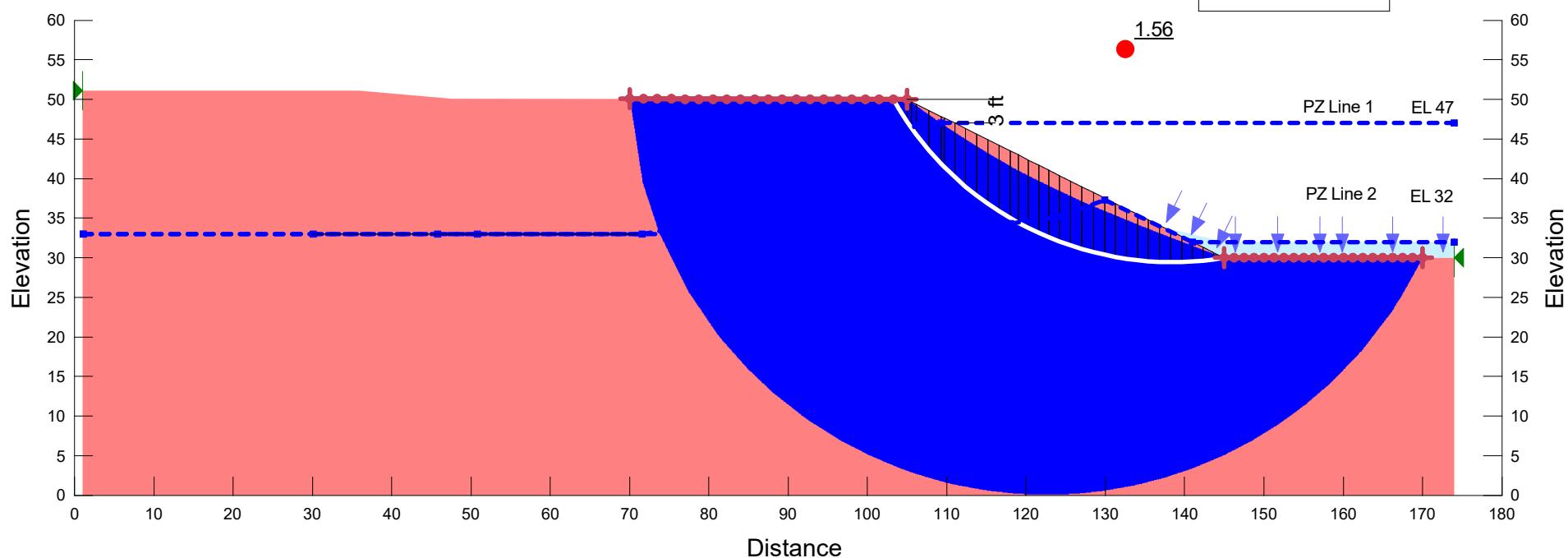
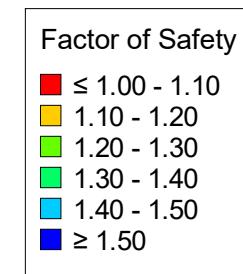
FOS: 1.14



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Soft	120	100	24	500	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 20 ft; Stiff Lean Clay (CL)  
 2.0 to 1 Channel Slope

FOS: 1.56

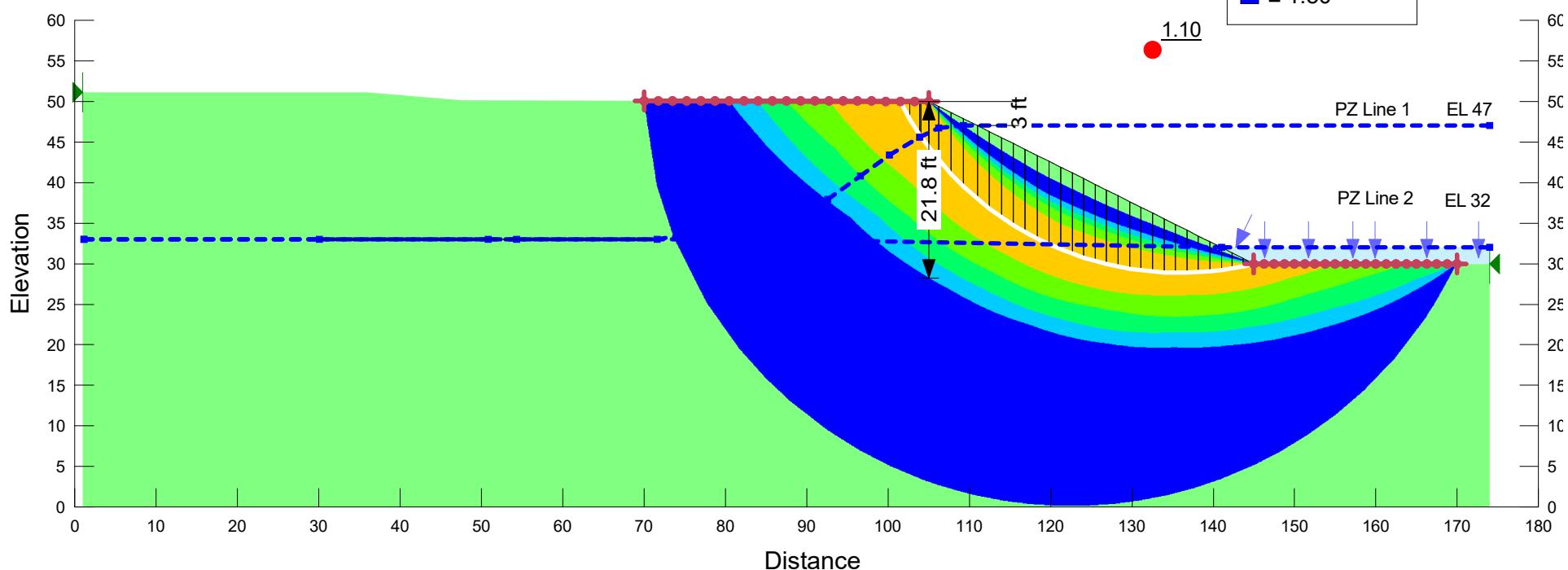


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	$\Phi$ R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Loose Sand (SM/SC)**  
**2.0 to 1 Channel Slope**

FOS: 1.10

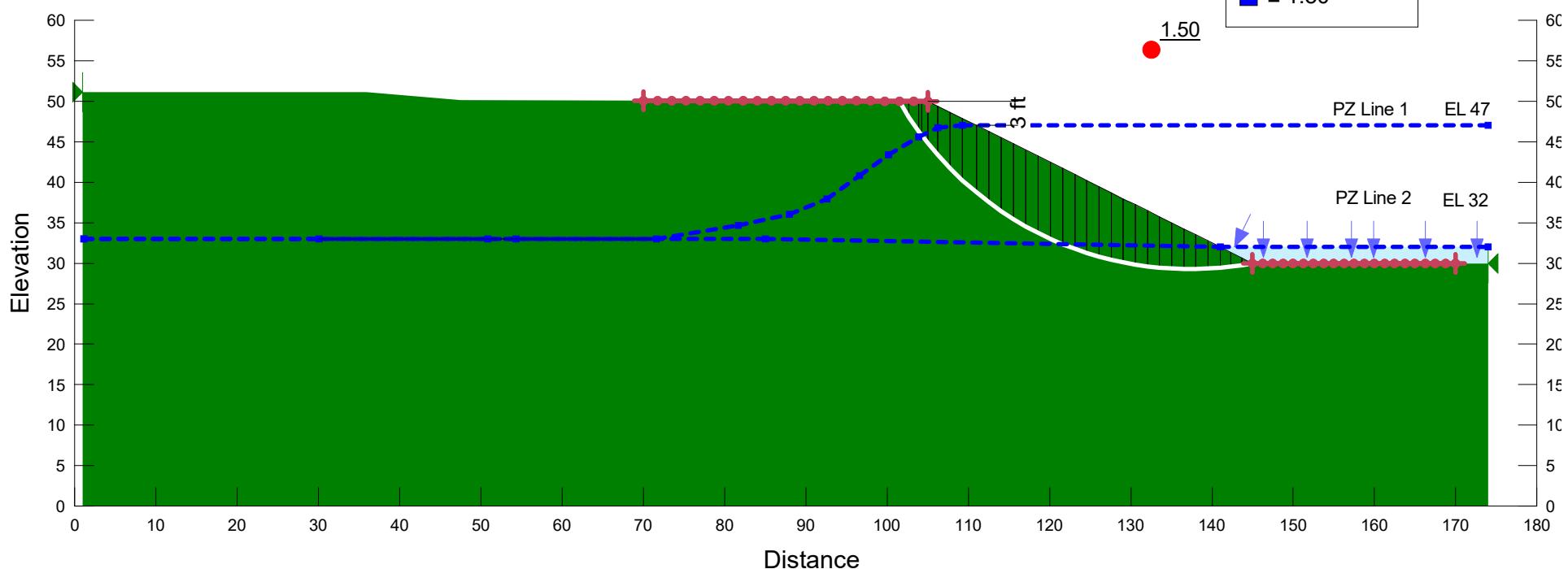
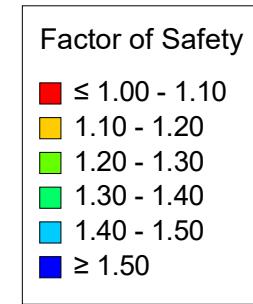
Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Green	SM/SC Loose	120	100	28	20	1	EL 47	EL 32

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Dense Sand (SM/SC)**  
**2.0 to 1 Channel Slope**

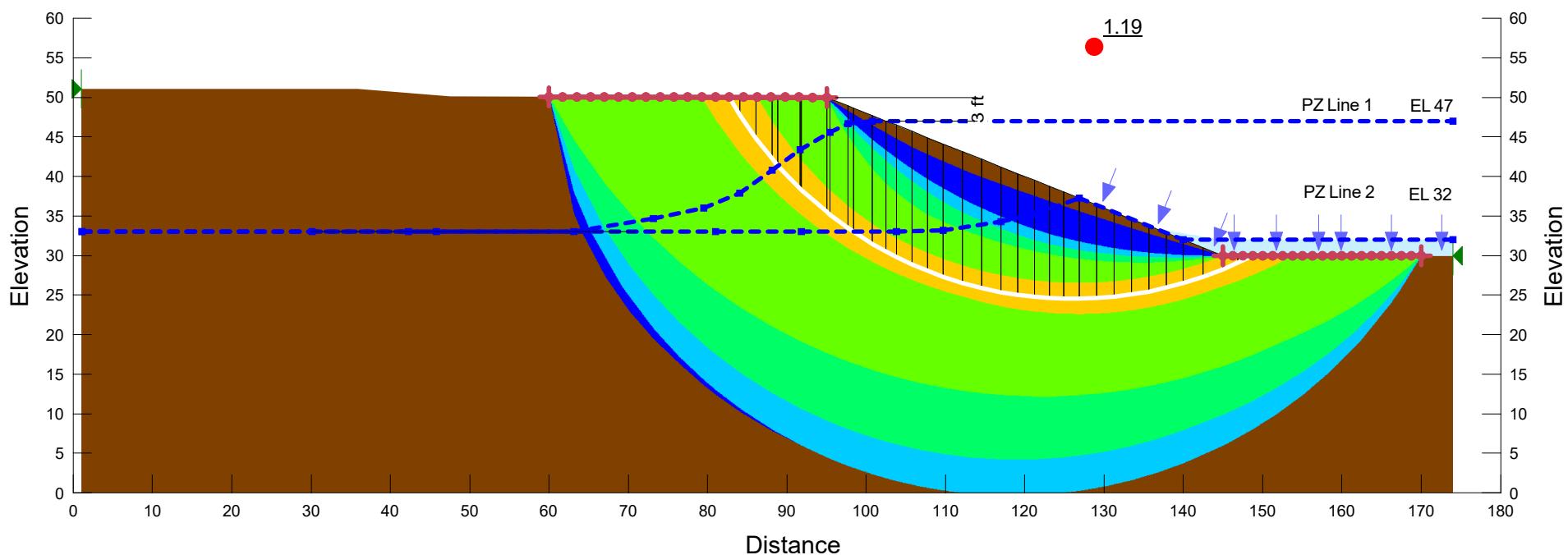
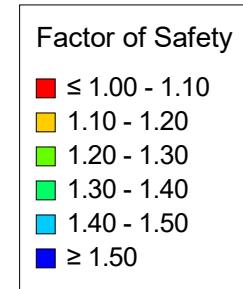
FOS: 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Soft Fat Clay (CH)**  
**2.5 to 1 Channel Slope**

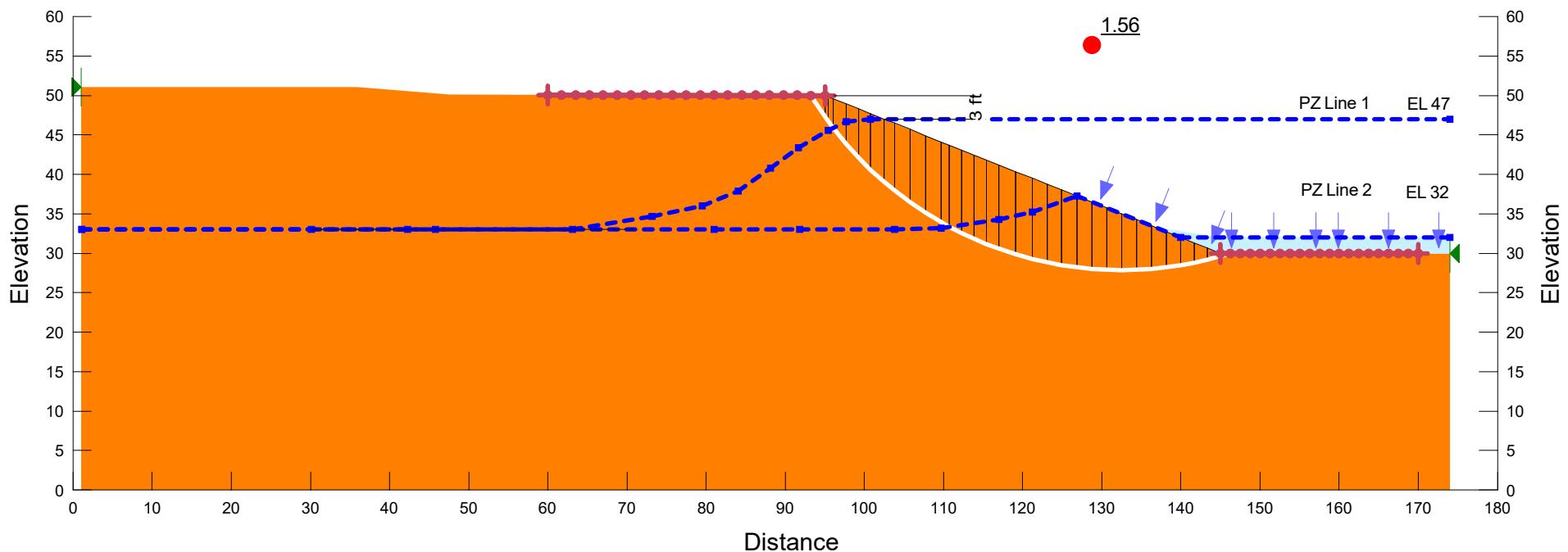
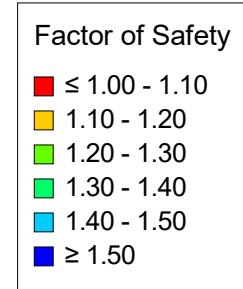
FOS: 1.19



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 20 ft; Stiff Fat Clay (CH)  
 2.5 to 1 Channel Slope

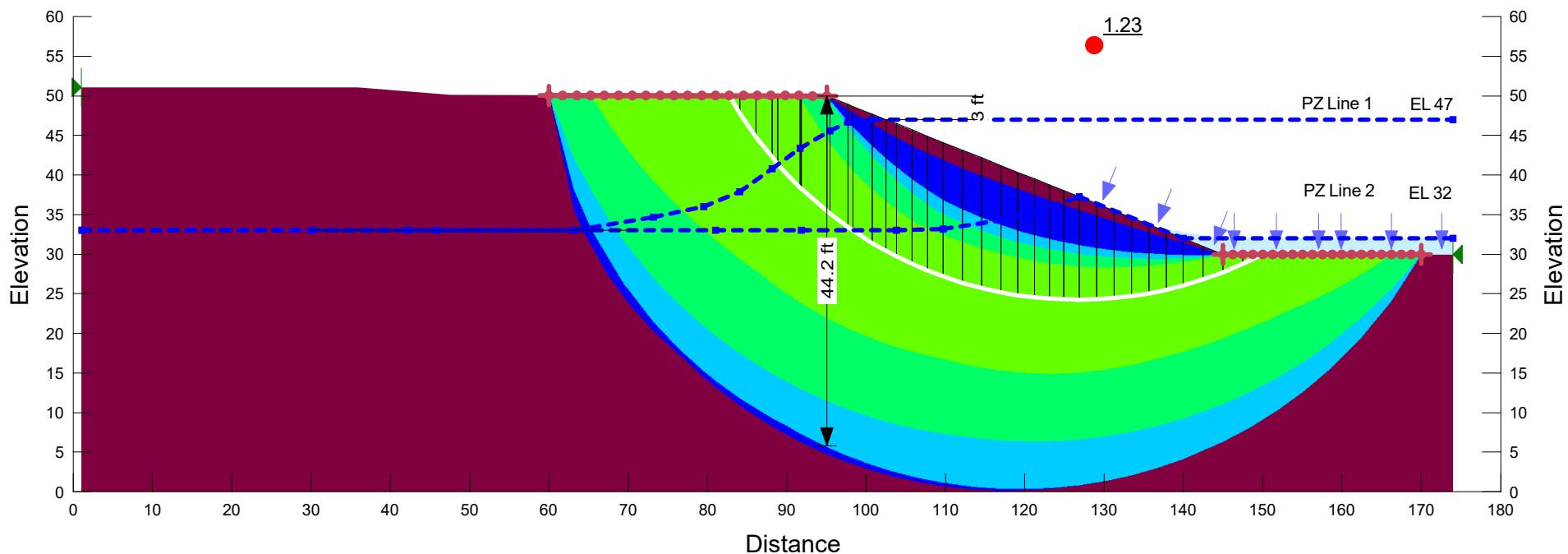
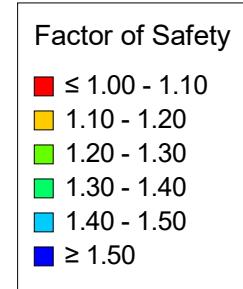
FOS: 1.56



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Stiff	120	100	26	2,000	0	1	2

Rapid Drawdown Slope Stability Analysis  
Bank Height = 20 ft; Soft Lean Clay (CL)  
2.5 to 1 Channel Slope

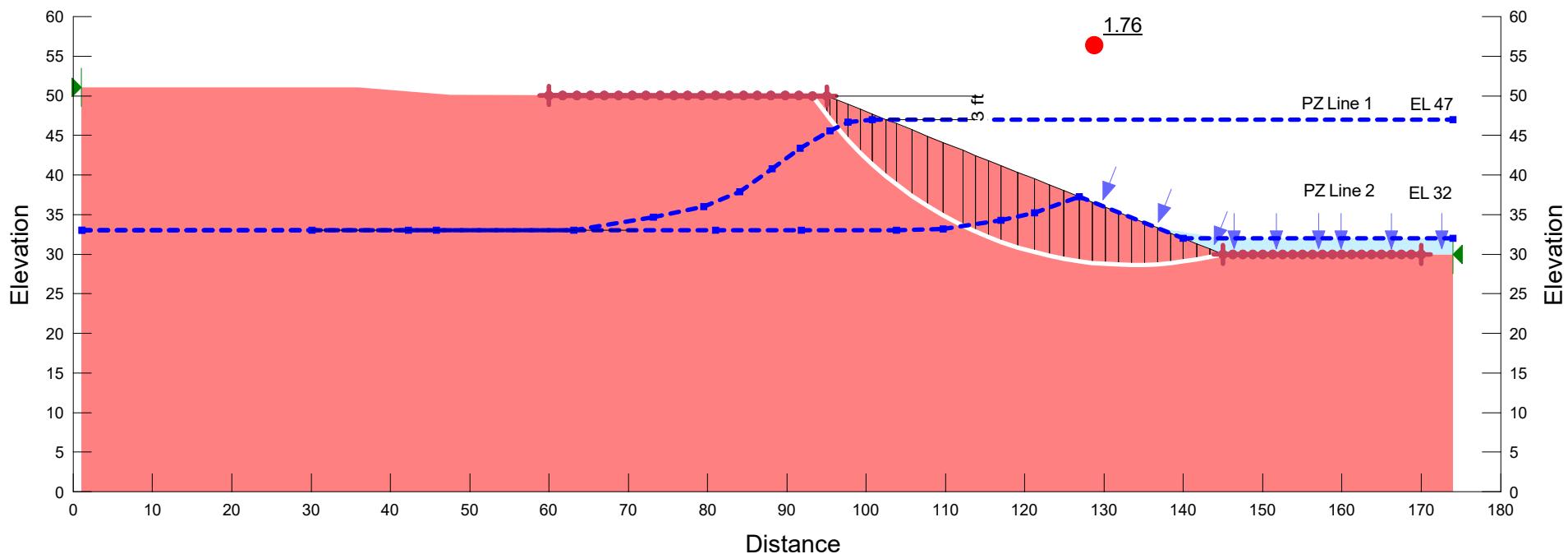
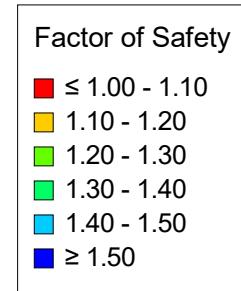
FOS: 1.23



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 20 ft; Stiff Lean Clay (CL)  
 2.5 to 1 Channel Slope

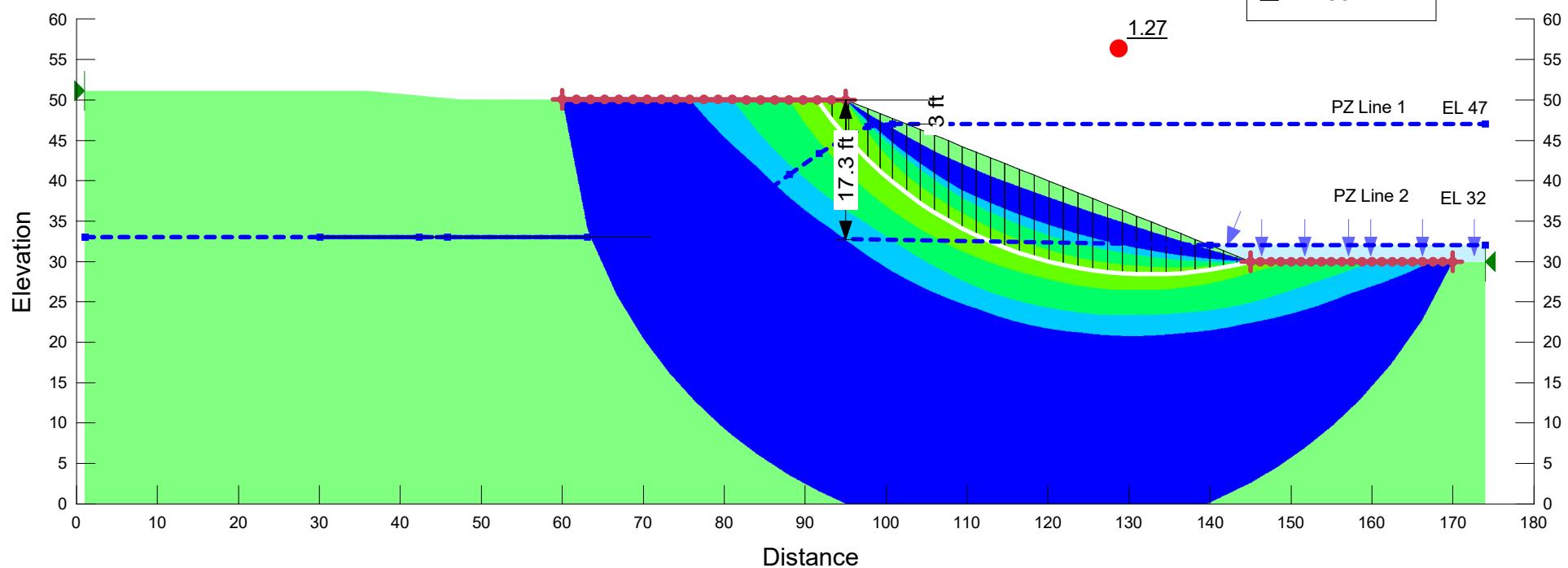
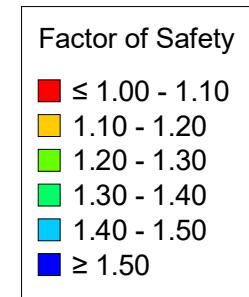
FOS: 1.76



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 20 ft; Loose Sand (SM/SC)  
 2.5 to 1 Channel Slope

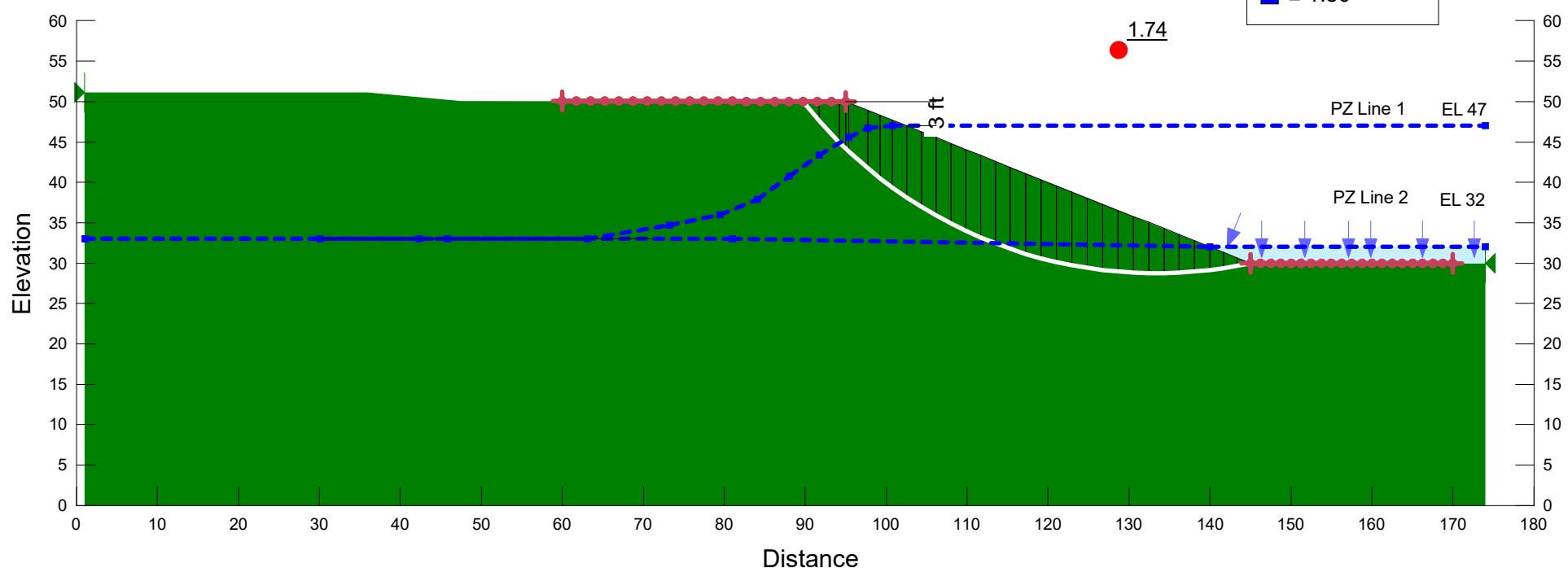
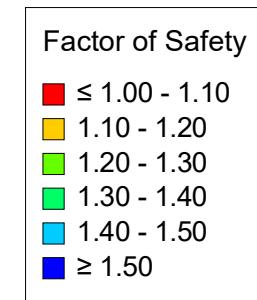
FOS: 1.27



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Dense Sand (SM/SC)**  
**2.5 to 1 Channel Slope**

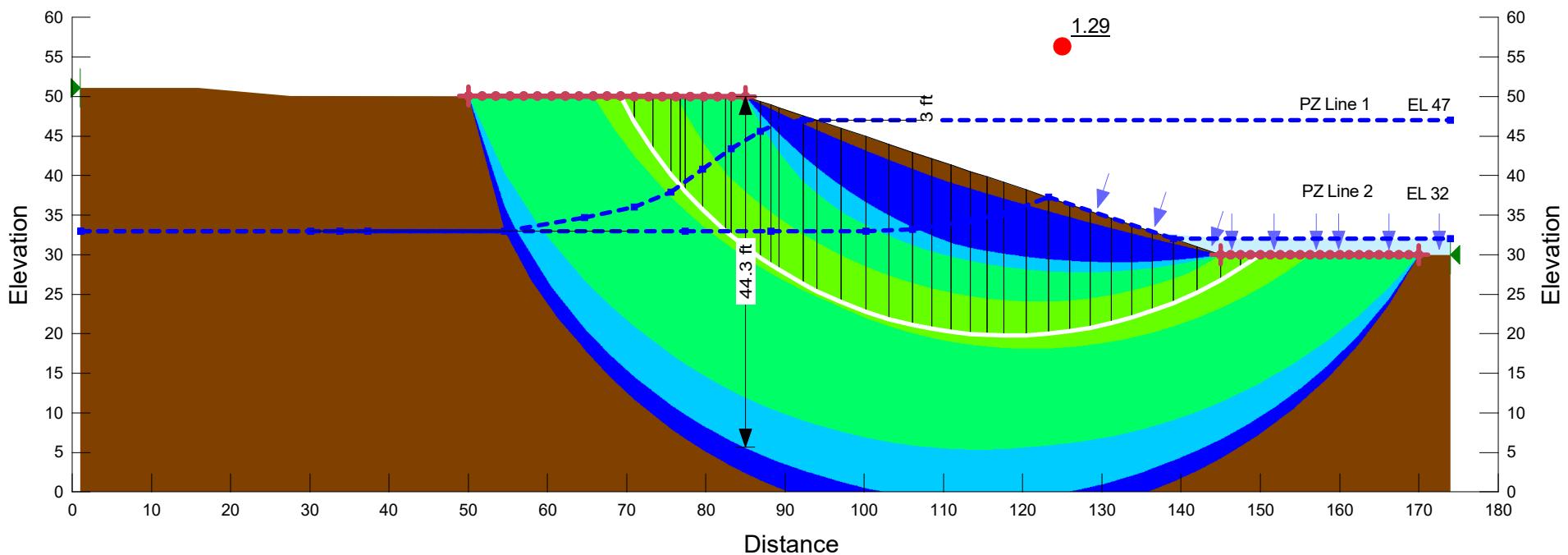
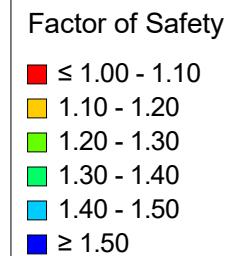
FOS: 1.74



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Soft Fat Clay (CH)**  
**3.0 to 1 Channel Slope**

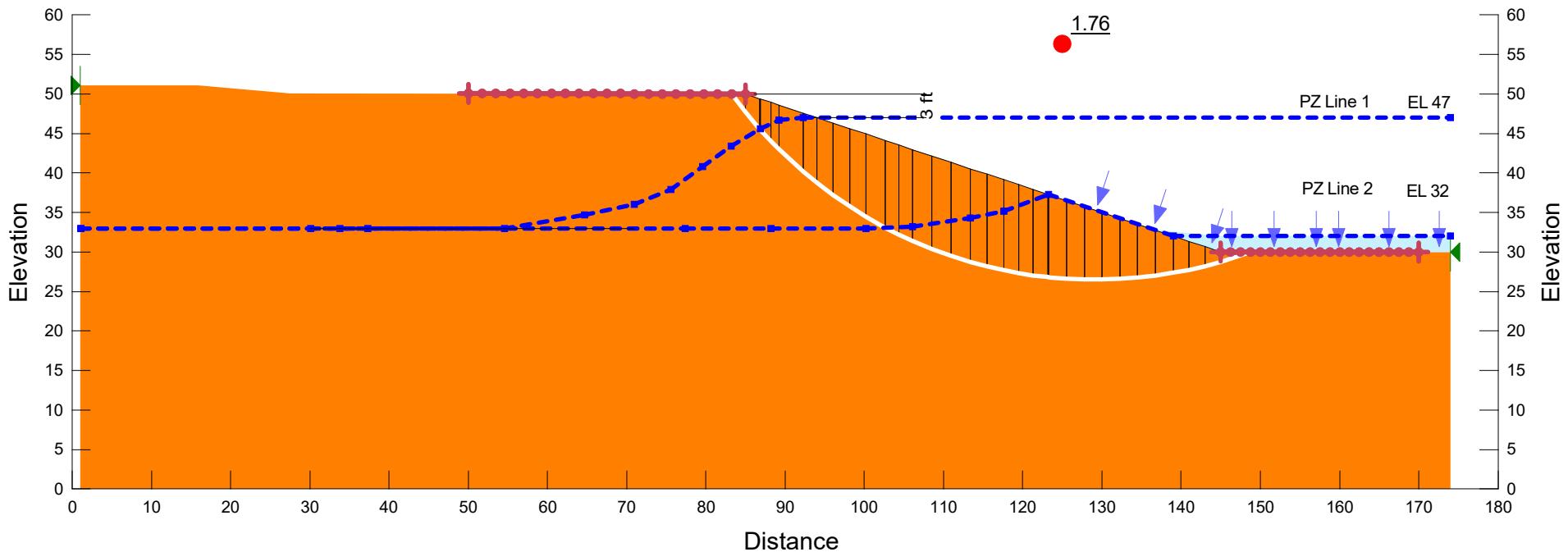
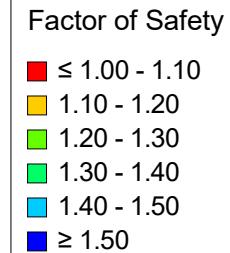
FOS: 1.29



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 20 ft; Stiff Fat Clay (CH)  
 3.0 to 1 Channel Slope

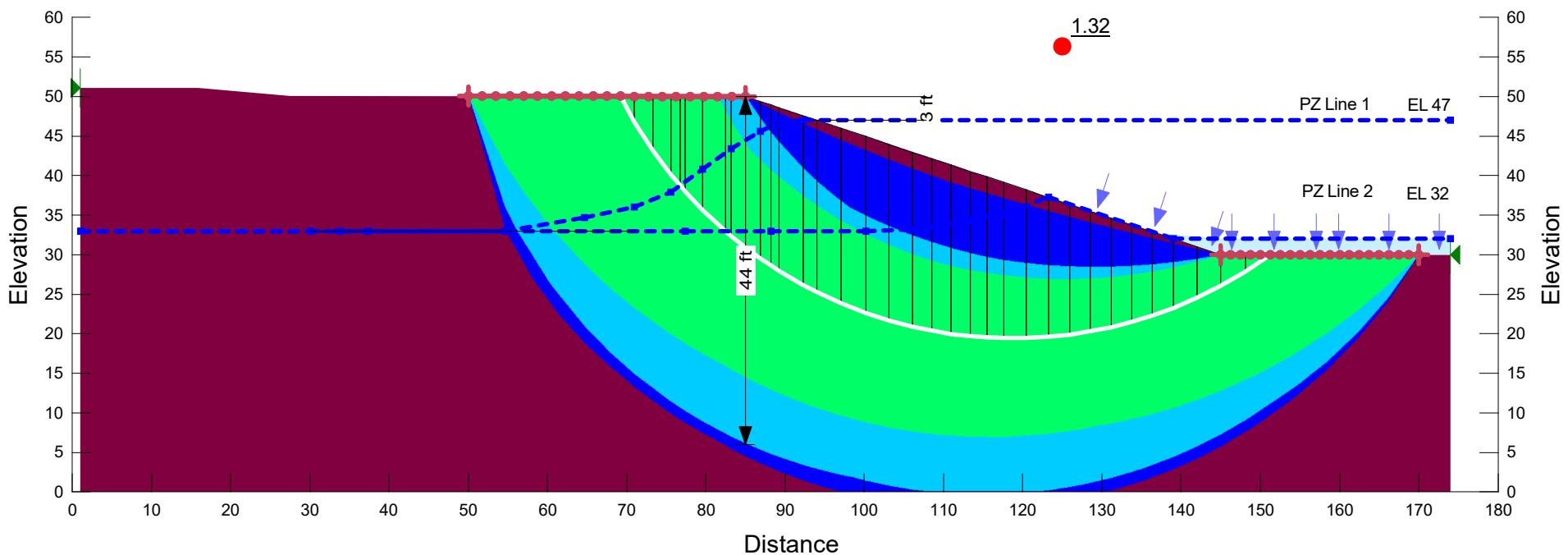
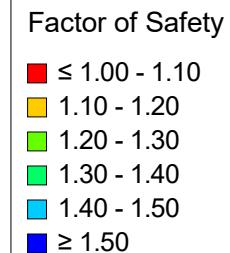
FOS: 1.76



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 20 ft; Soft Lean Clay (CL)  
 3.0 to 1 Channel Slope

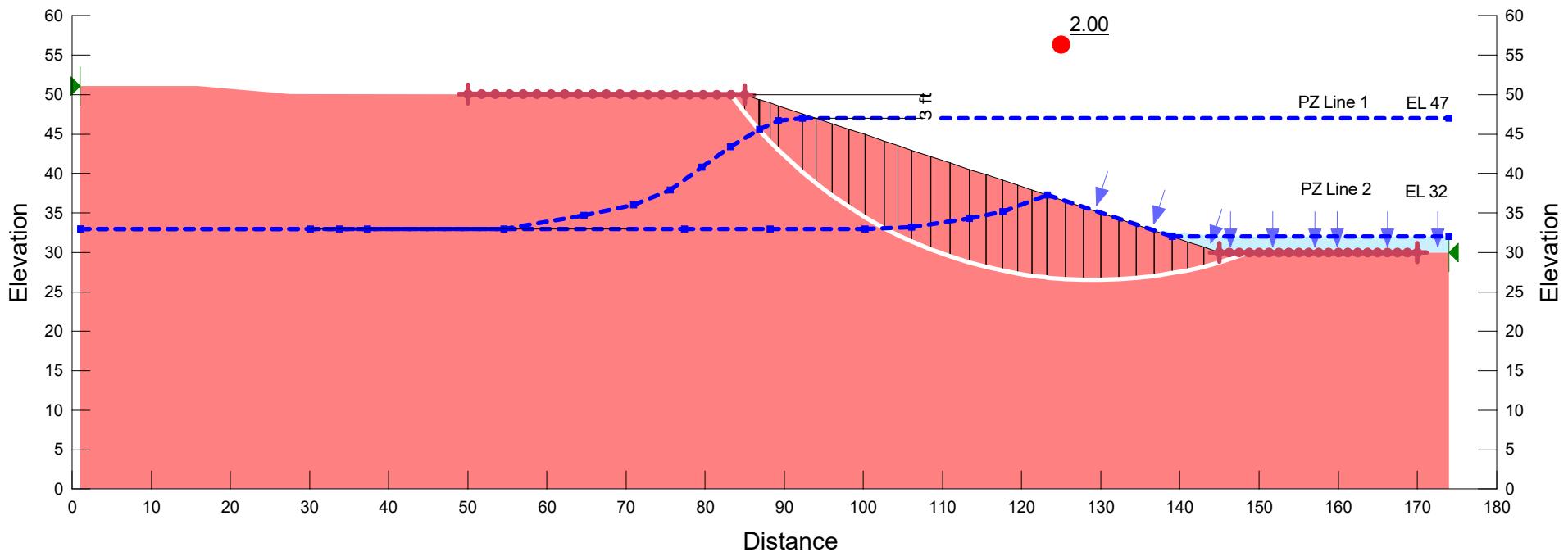
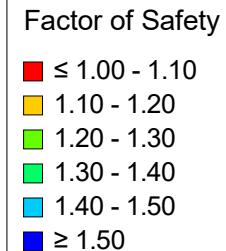
FOS: 1.32



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Stiff Lean Clay (CL)**  
**3.0 to 1 Channel Slope**

FOS: 2.00

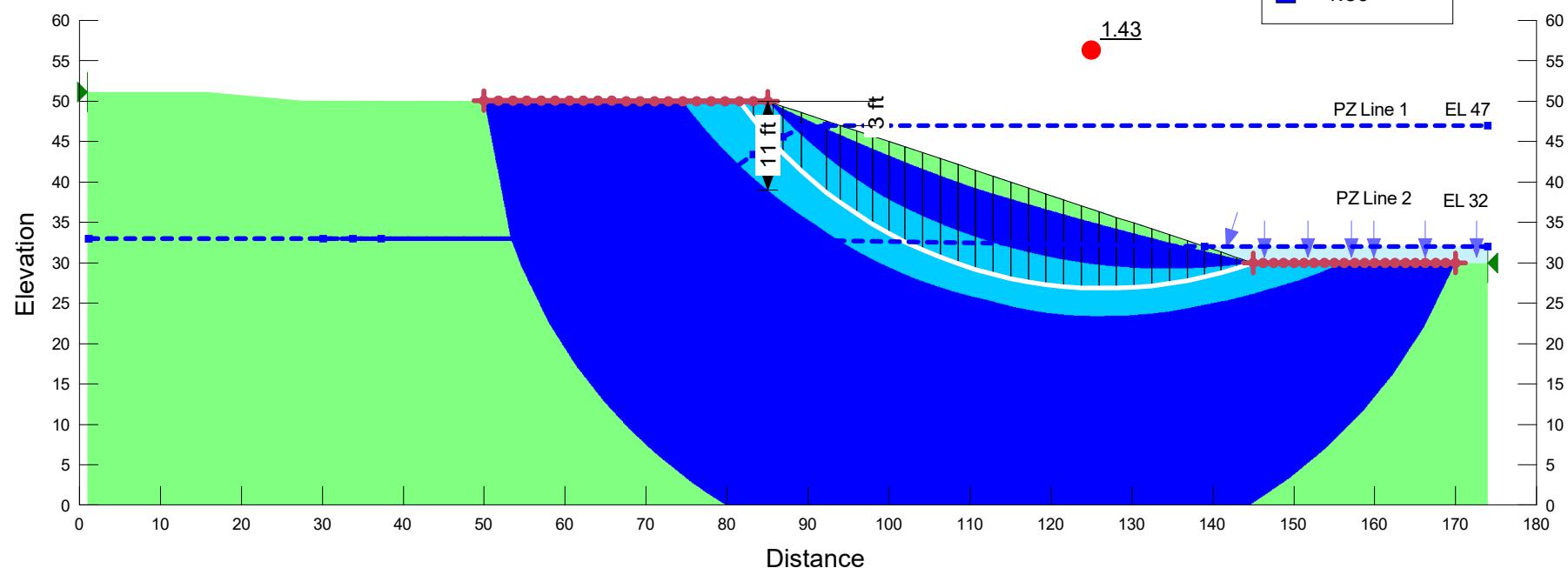


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Loose Sand (SM/SC)**  
**3.0 to 1 Channel Slope**

FOS: 1.43

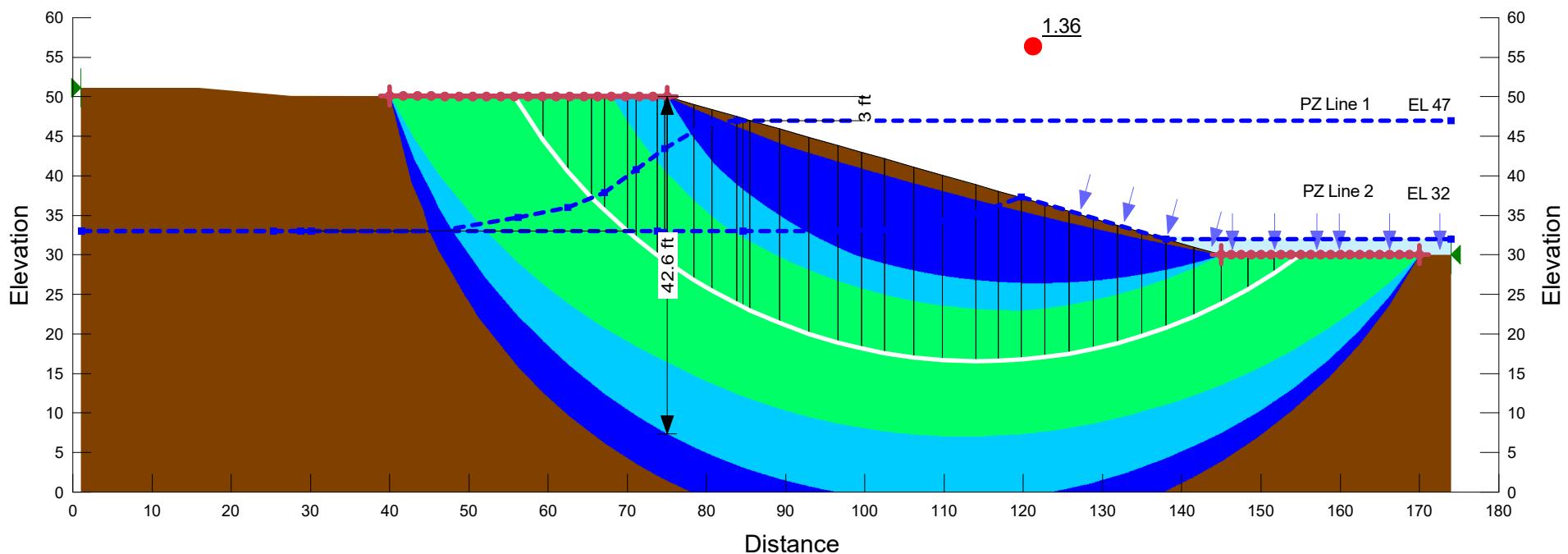
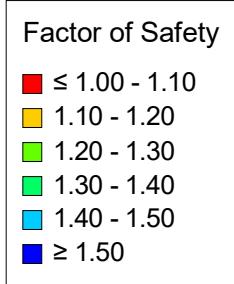
Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Soft Fat Clay (CH)**  
**3.5 to 1 Channel Slope**

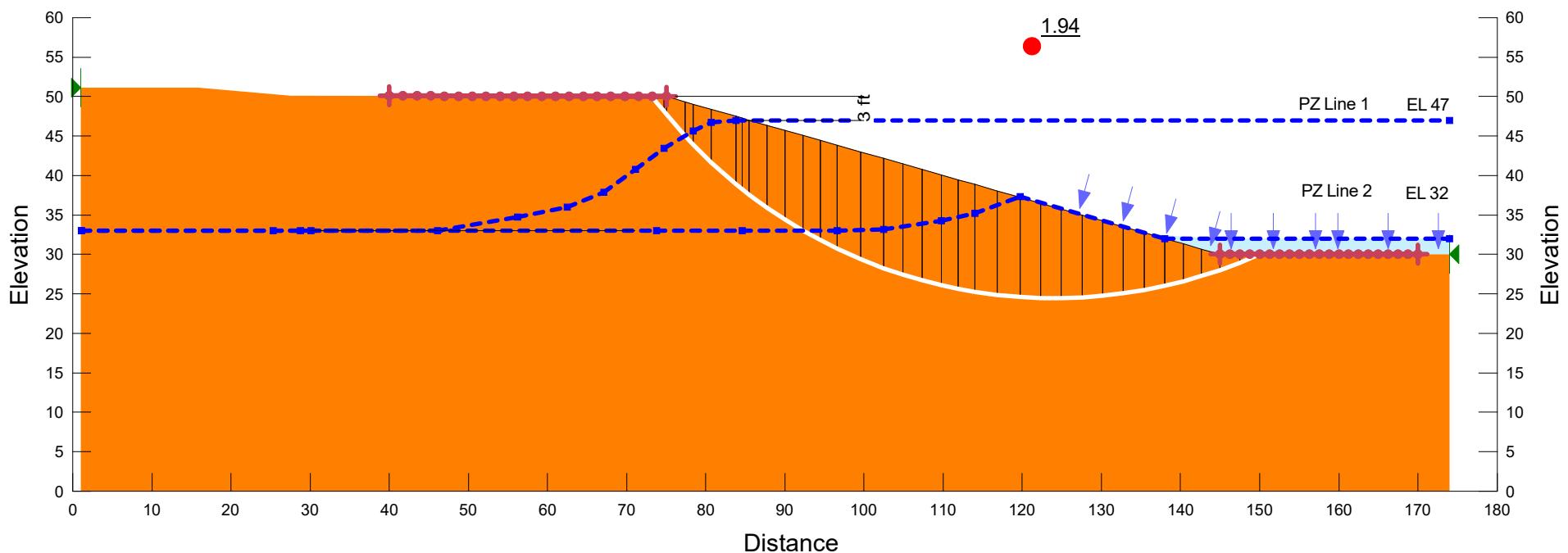
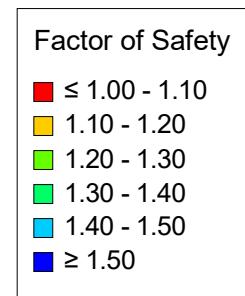
FOS: 1.36



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 20 ft; Stiff Fat Clay (CH)  
 3.5 to 1 Channel Slope

FOS: 1.94

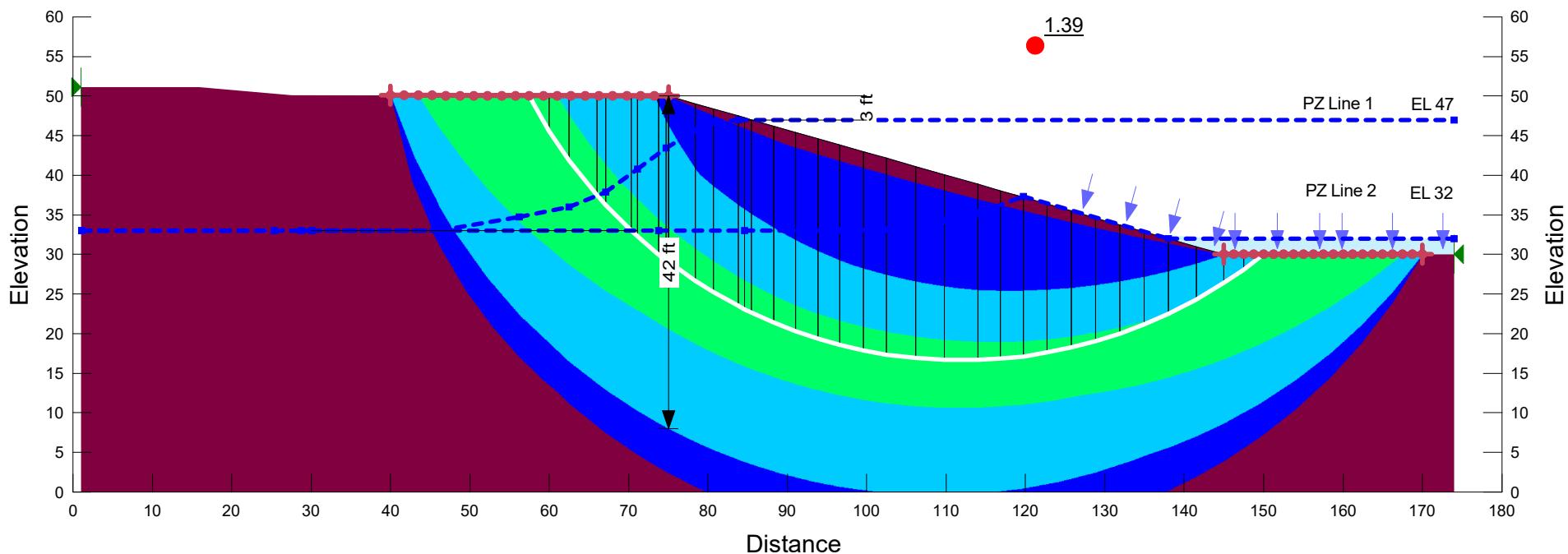


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Soft Lean Clay (CL)**  
**3.5 to 1 Channel Slope**

FOS: 1.39

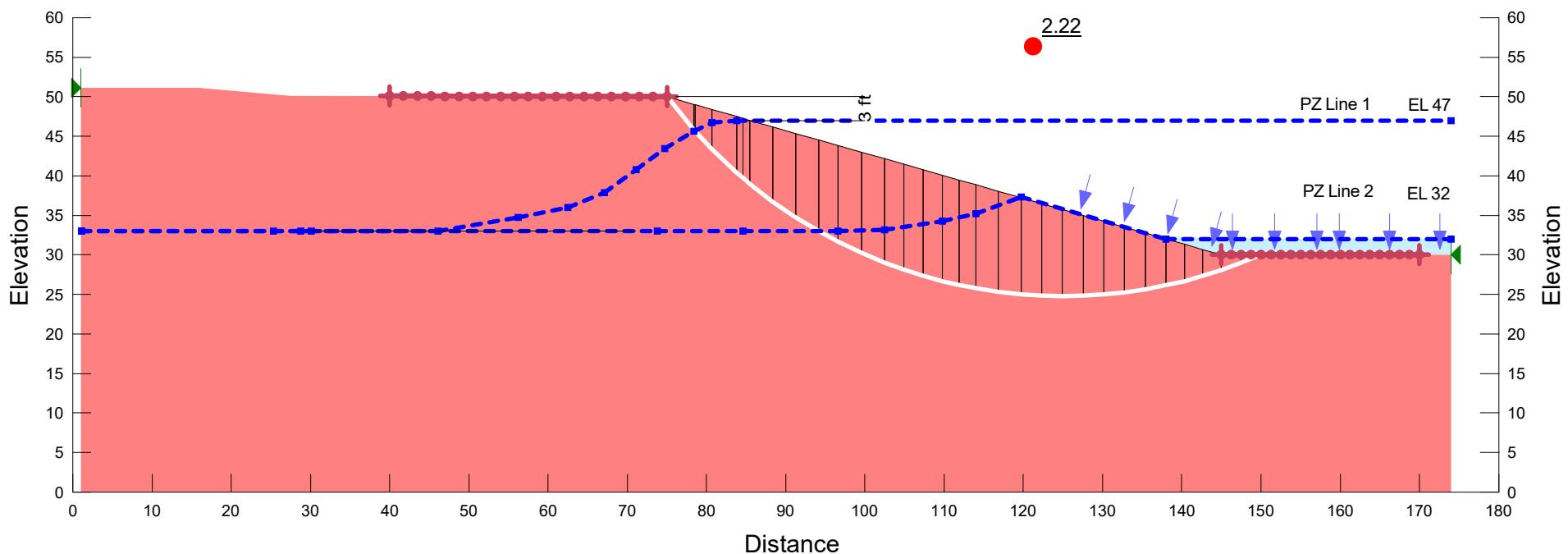
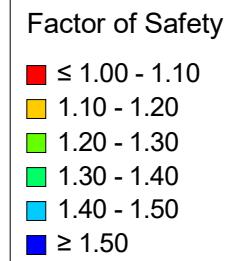
Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■ CL Soft		120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Stiff Lean Clay (CL)**  
**3.5 to 1 Channel Slope**

FOS: 2.22

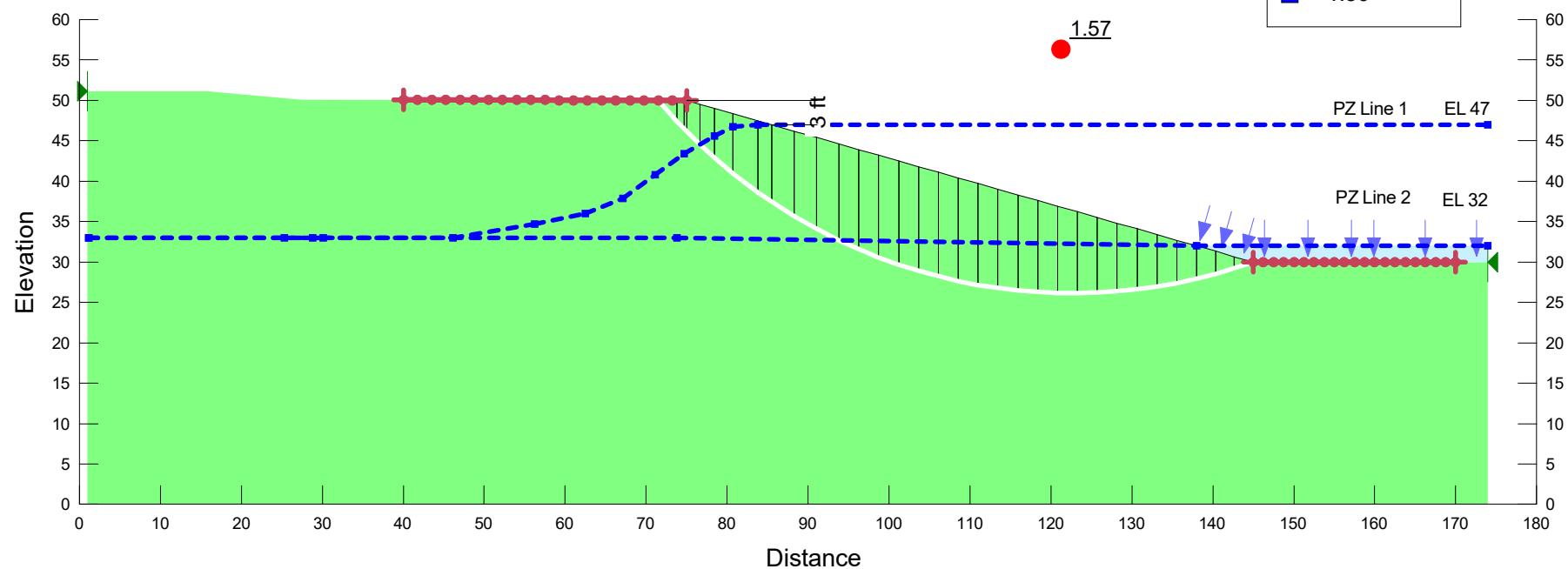


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Loose Sand (SM/SC)**  
**3.5 to 1 Channel Slope**

FOS: 1.57

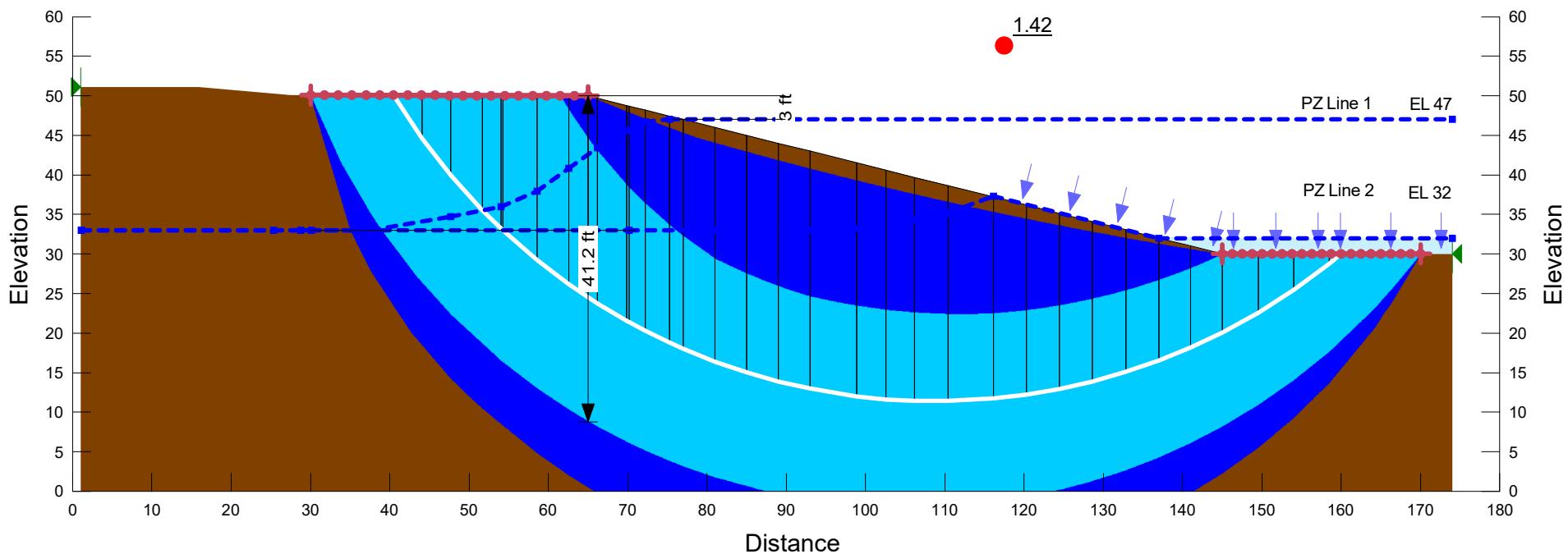
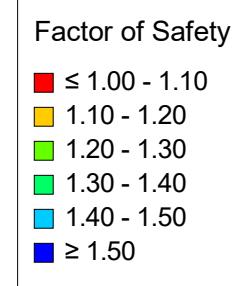
Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Green	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Soft Fat Clay (CH)**  
**4.0 to 1 Channel Slope**

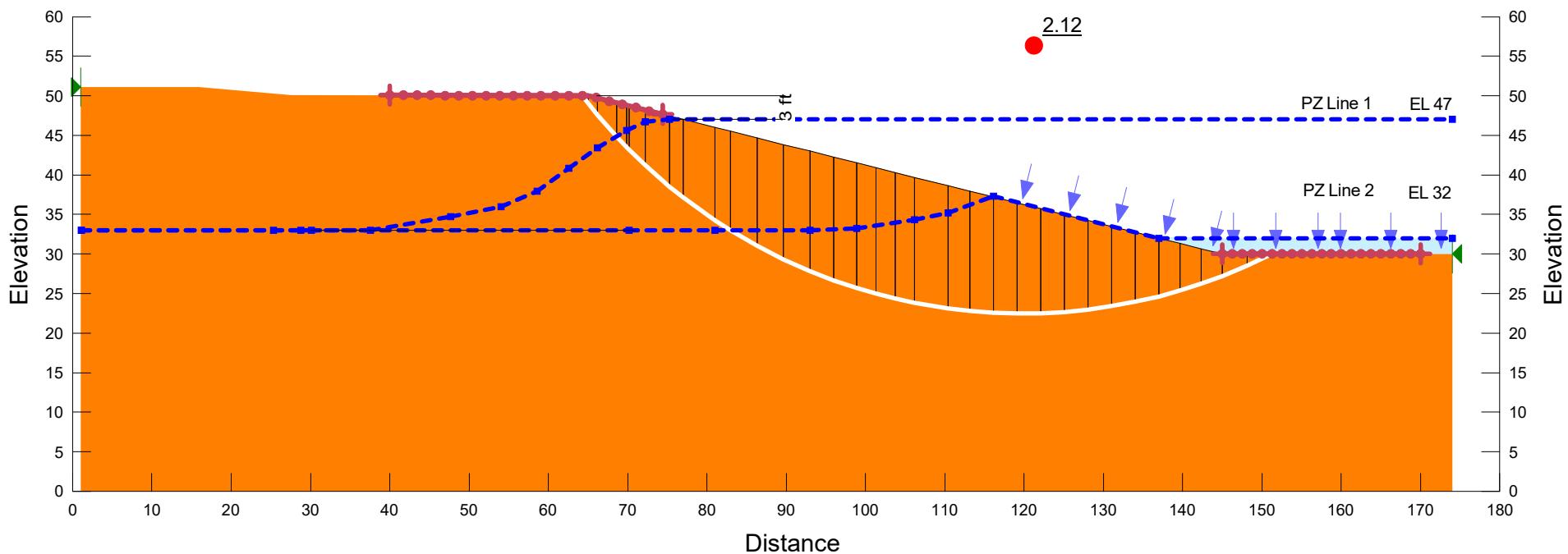
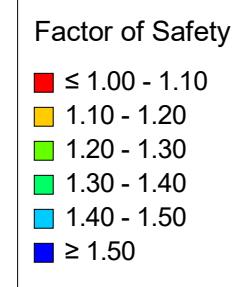
FOS: 1.42



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Stiff Fat Clay (CH)**  
**4.0 to 1 Channel Slope**

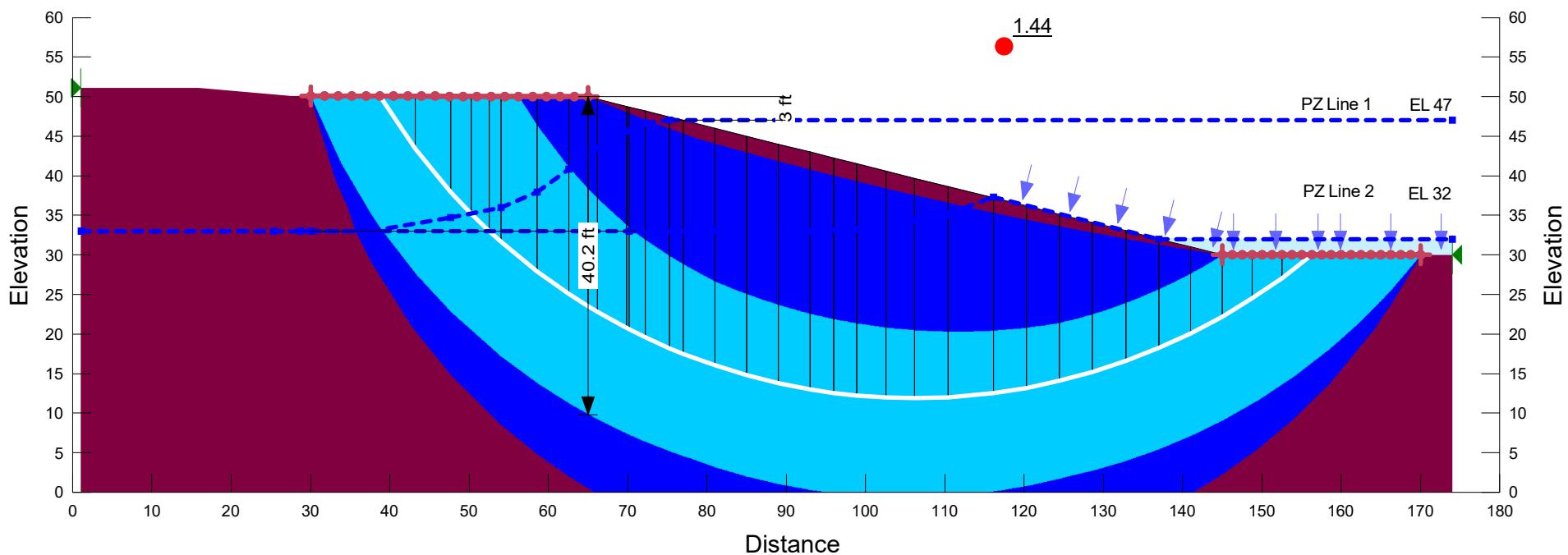
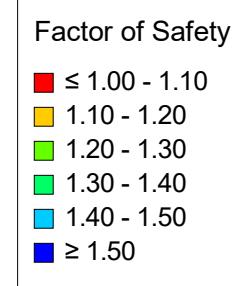
FOS: 2.12



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 20 ft; Soft Lean Clay (CL)**  
**4.0 to 1 Channel Slope**

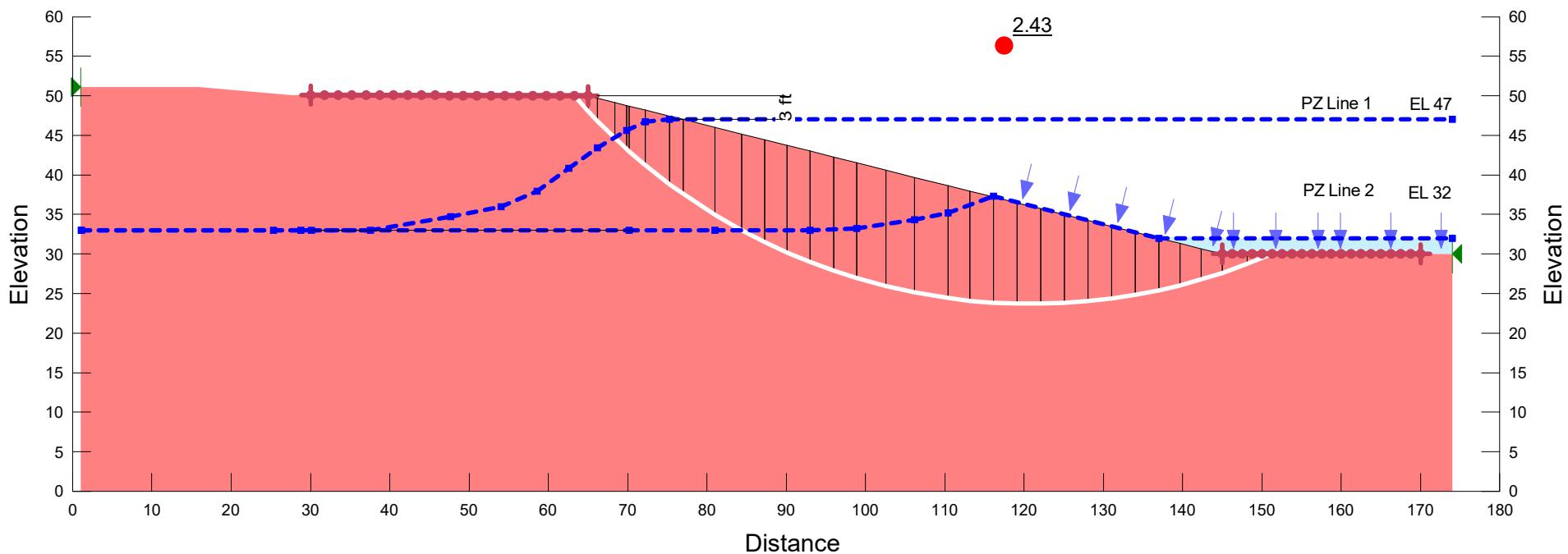
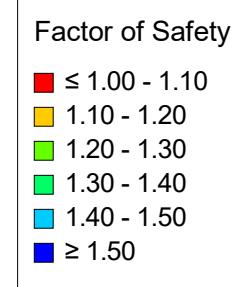
FOS: 1.44



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Soft	120	100	24	500	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 20 ft; Stiff Lean Clay (CL)  
 4.0 to 1 Channel Slope

FOS: 2.43

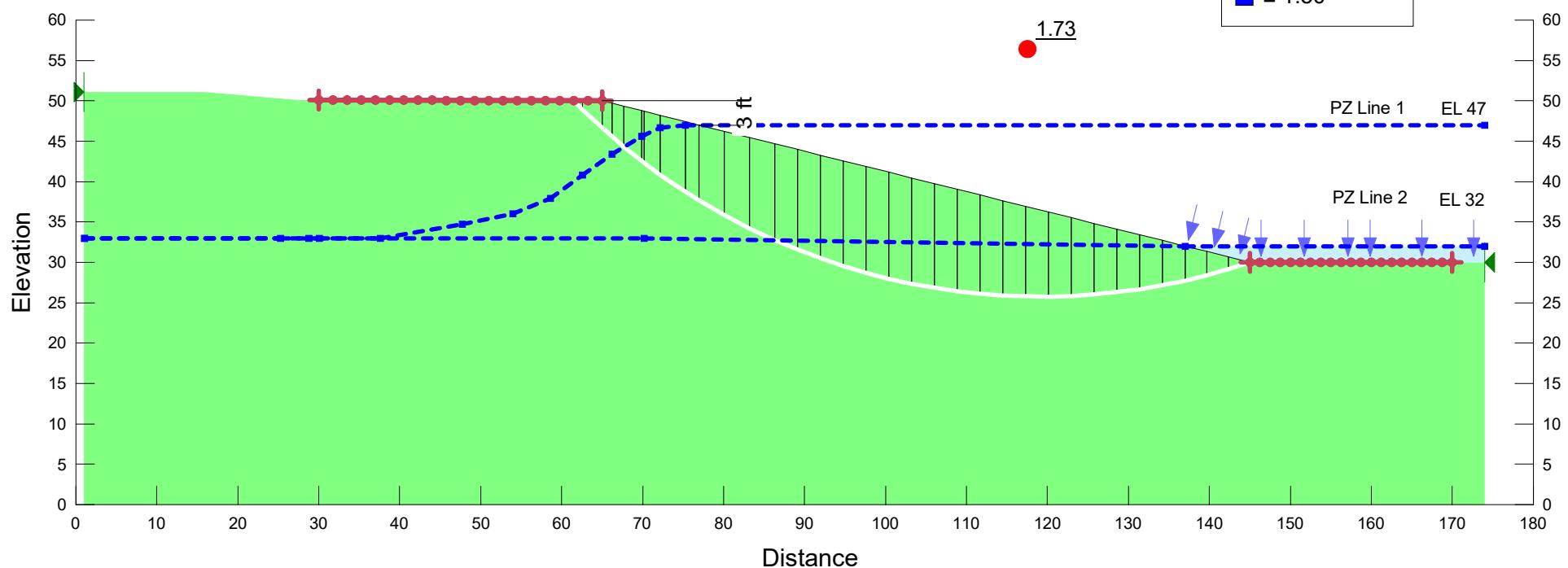


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 20 ft; Loose Sand (SM/SC)  
 4.0 to 1 Channel Slope

FOS: 1.73

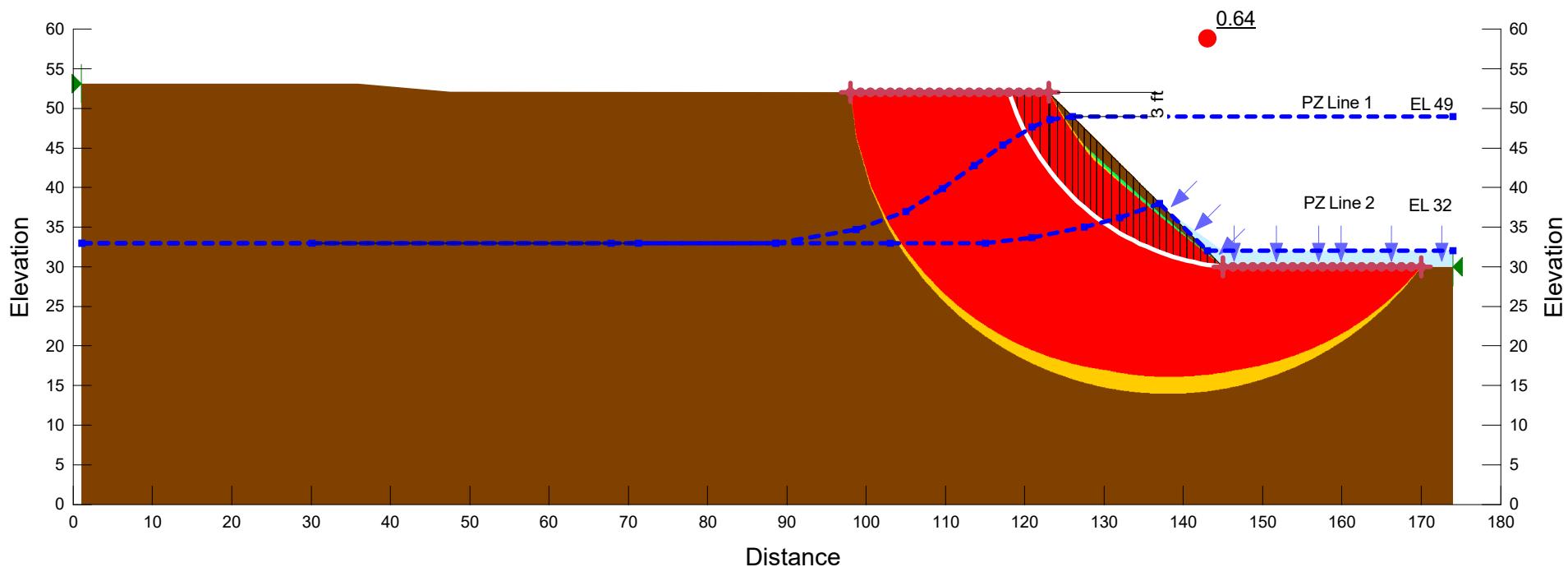
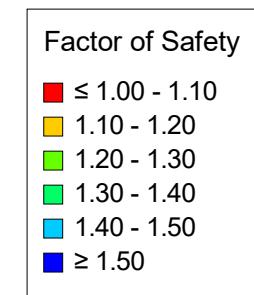
Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
[Green Box]	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Soft Fat Clay (CH)**  
**1.0 to 1 Channel Slope**

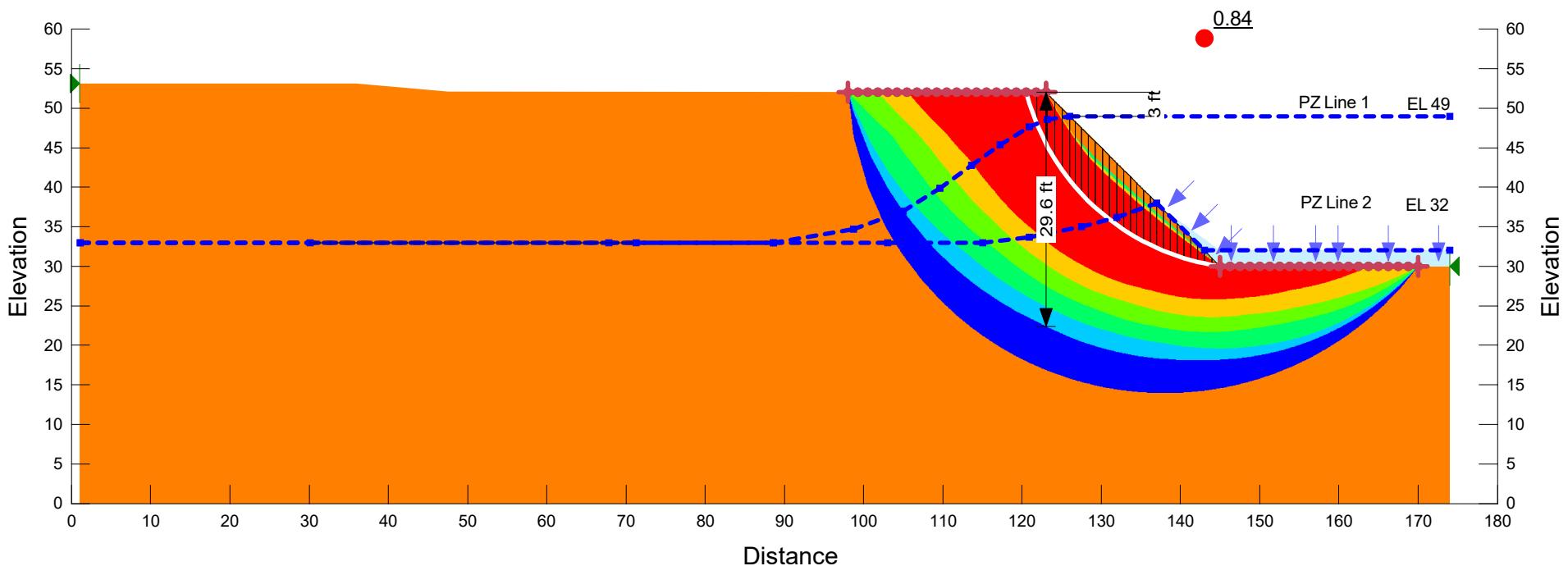
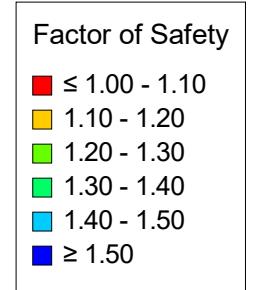
FOS: 0.64



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Stiff Fat Clay (CH)**  
**1.0 to 1 Channel Slope**

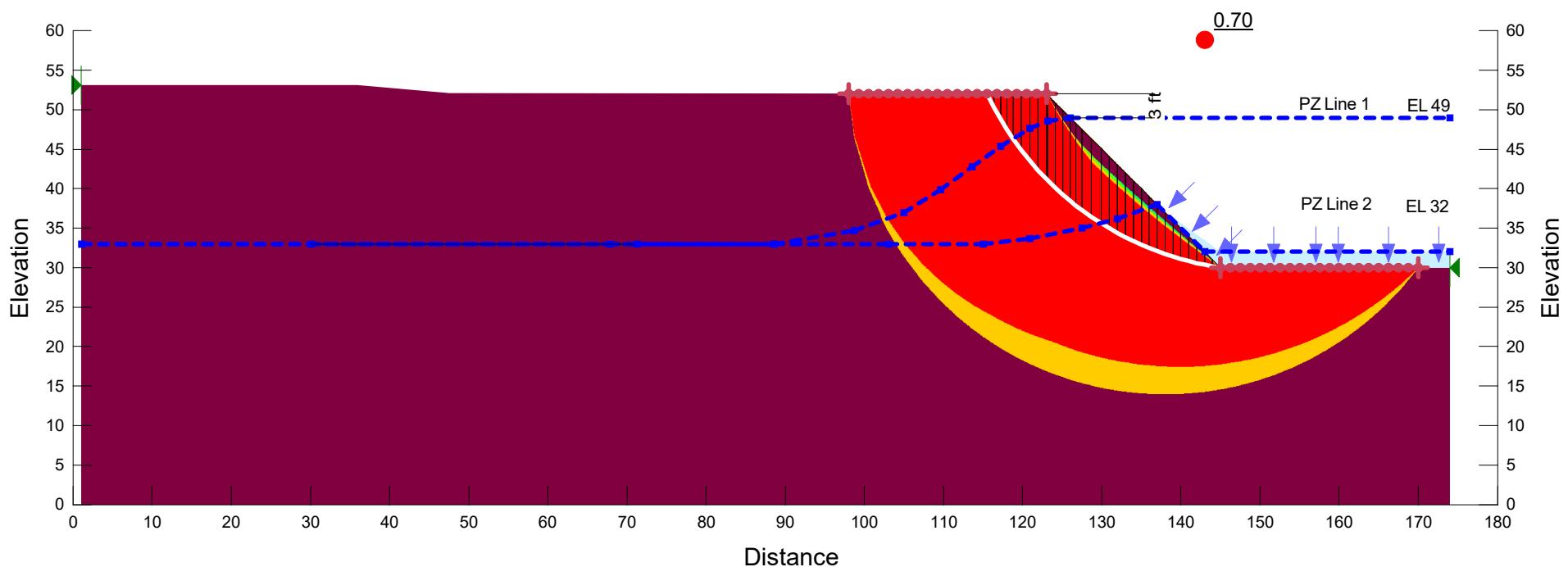
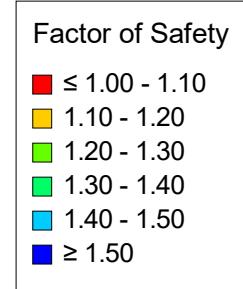
FOS: 0.84



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Soft Lean Clay (CL)**  
**1.0 to 1 Channel Slope**

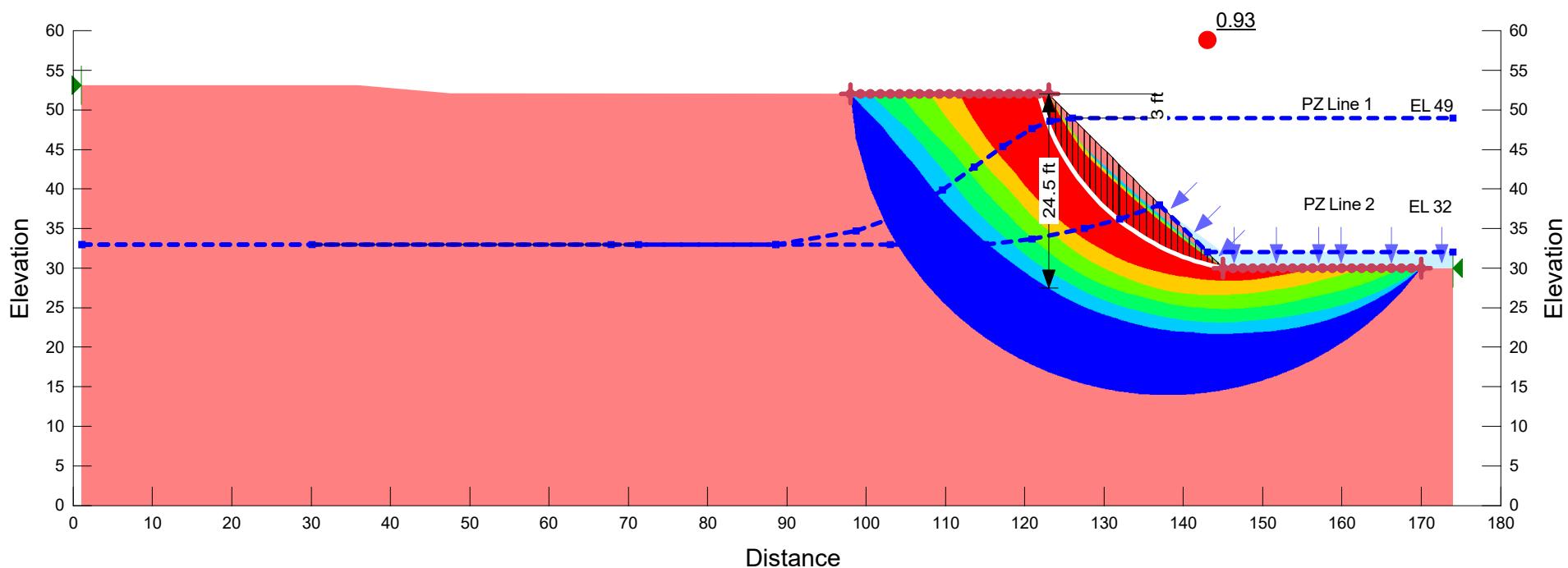
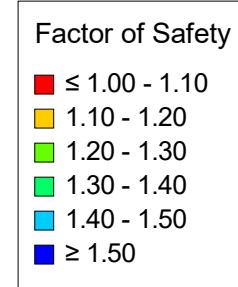
FOS: 0.70



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Soft	120	100	24	500	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 22 ft; Stiff Lean Clay (CL)  
 1.0 to 1 Channel Slope

FOS: 0.93

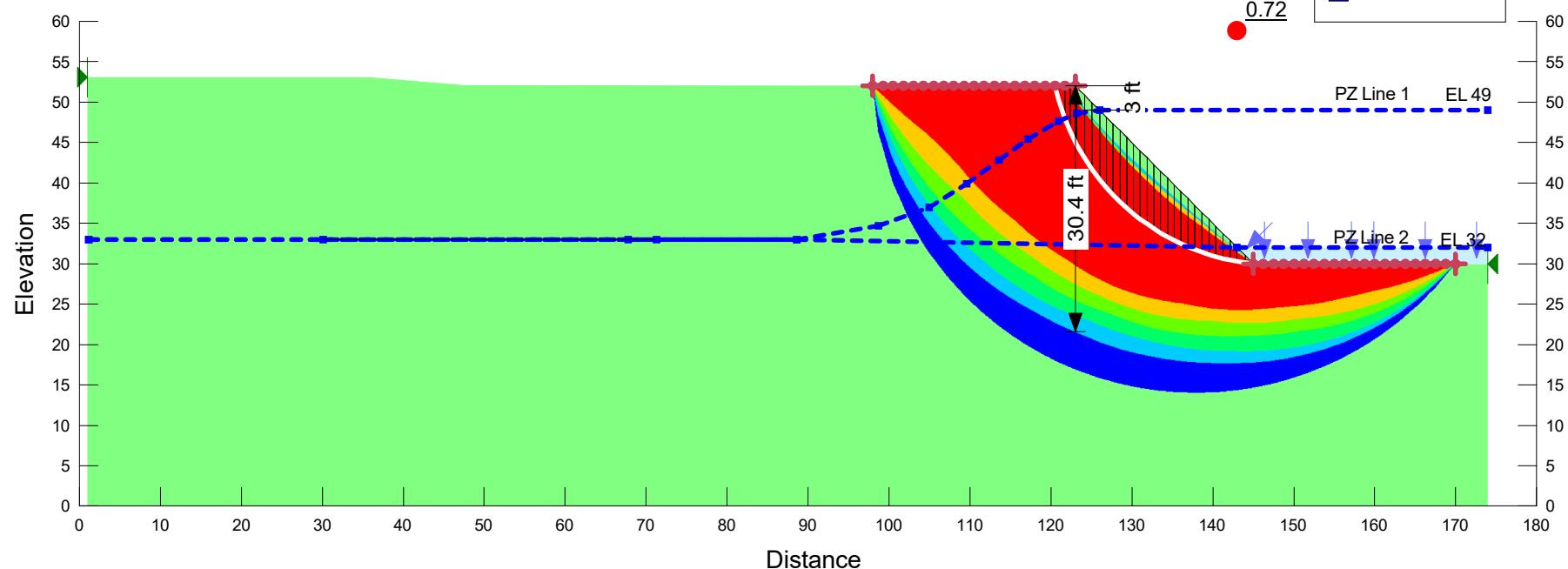


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Loose Sand (SM/SC)**  
**1.0 to 1 Channel Slope**

FOS: 0.72

Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50

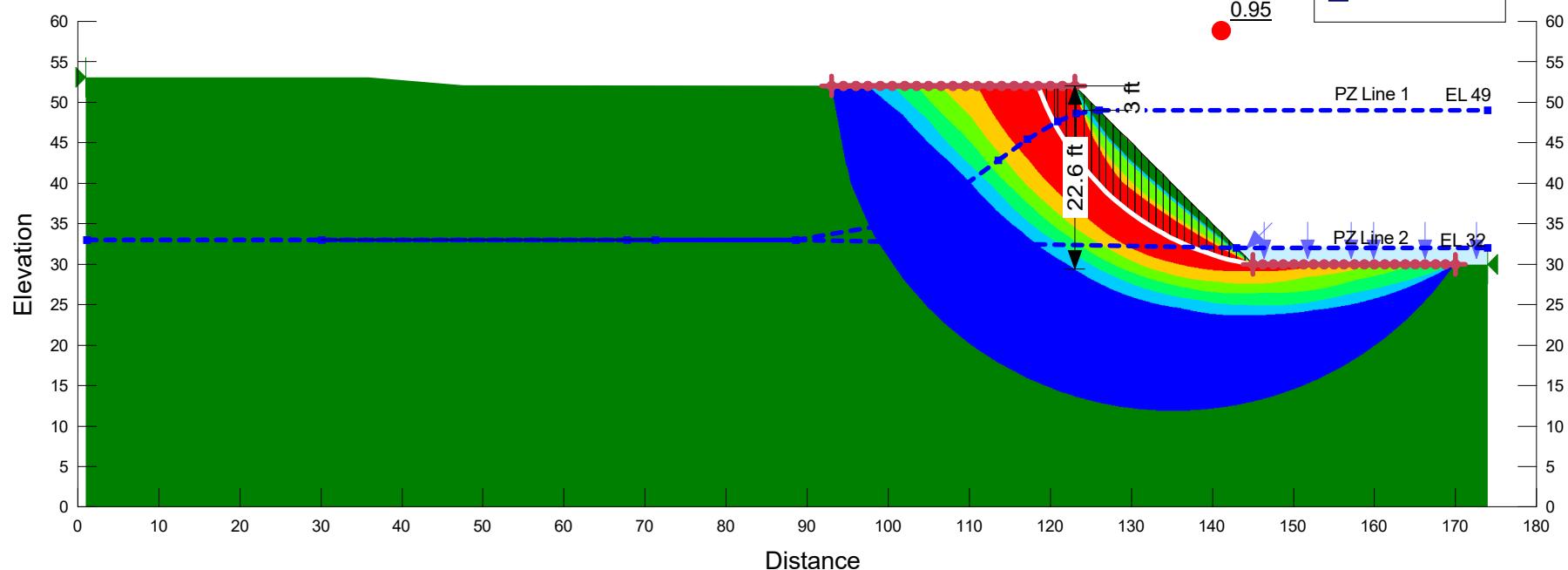


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Green	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Dense Sand (SM/SC)**  
**1.0 to 1 Channel Slope**

FOS: 0.95

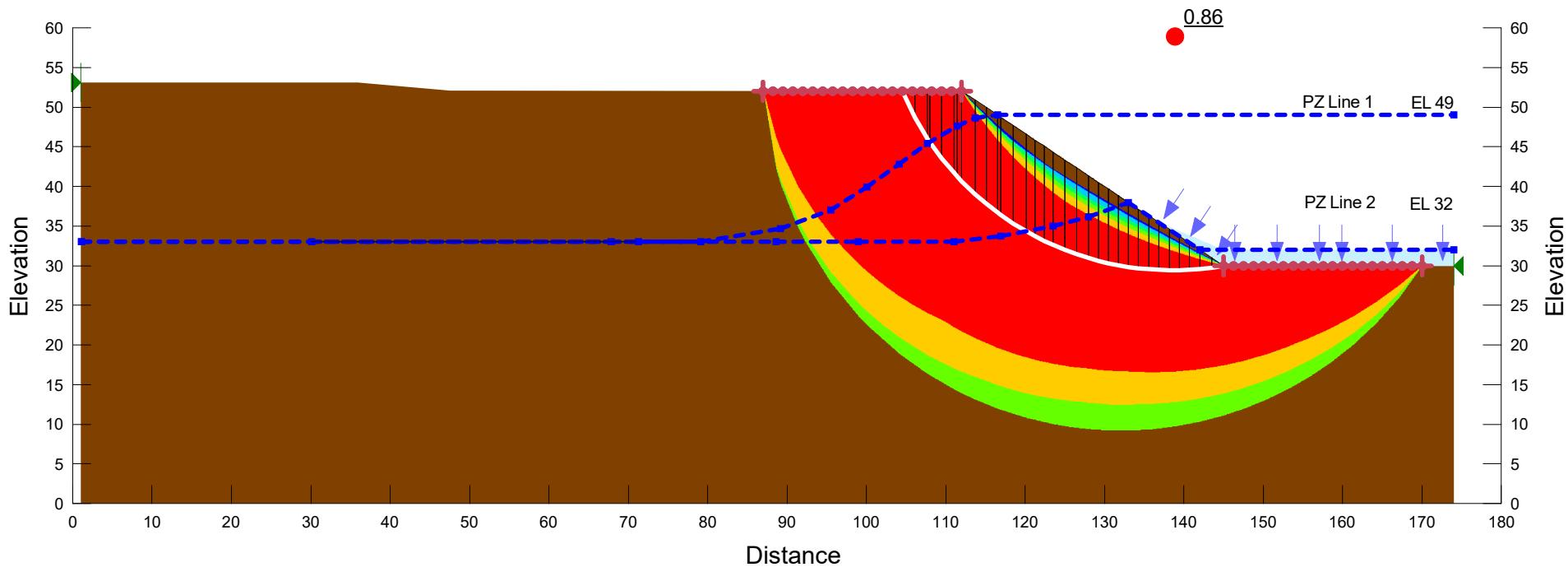
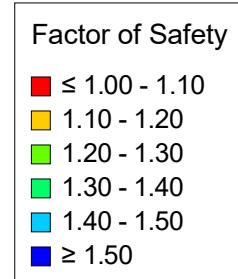
Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Soft Fat Clay (CH)**  
**1.5 to 1 Channel Slope**

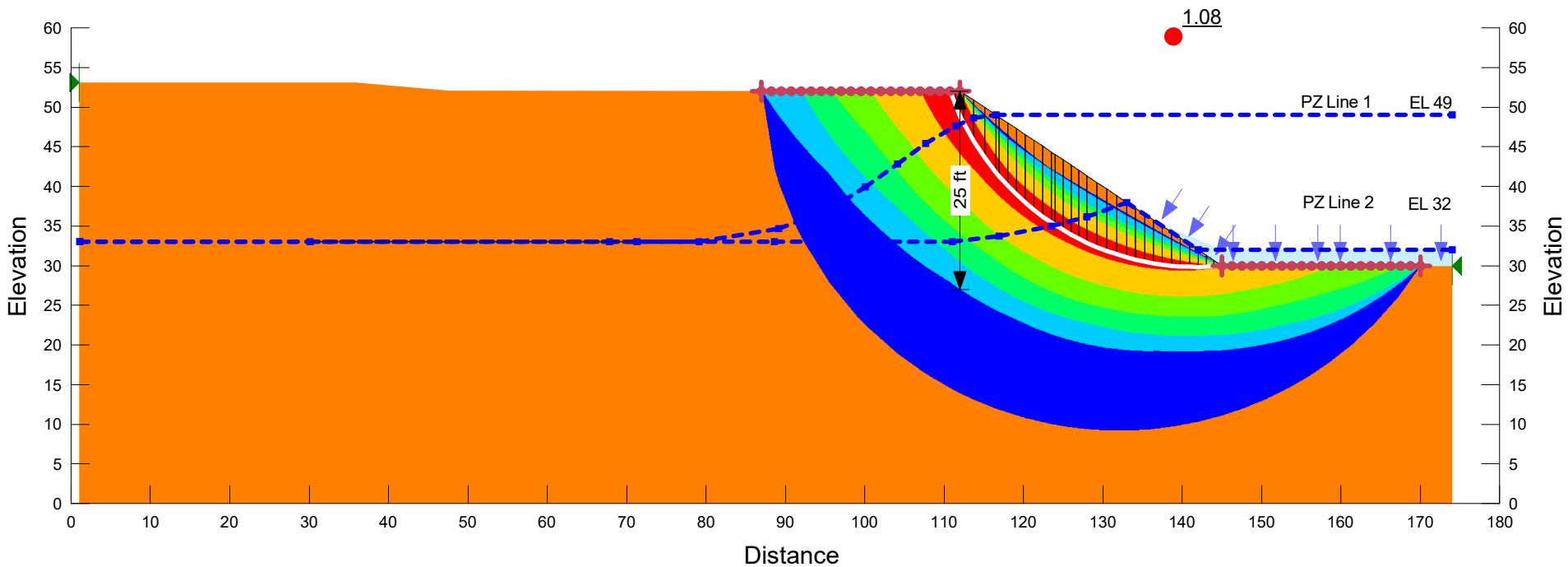
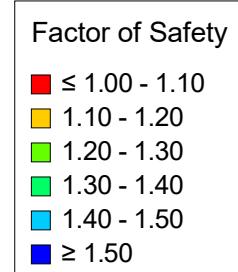
FOS: 0.86



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Stiff Fat Clay (CH)**  
**1.5 to 1 Channel Slope**

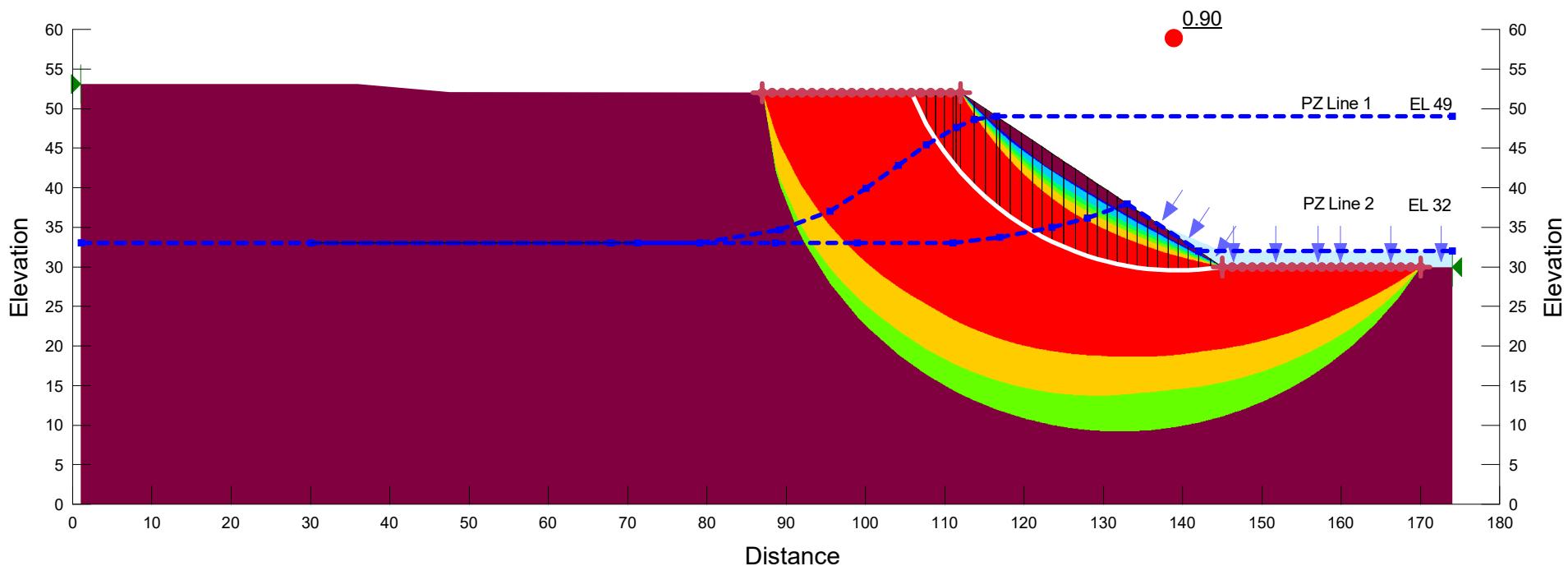
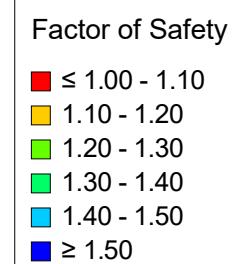
FOS: 1.08



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Soft Lean Clay (CL)**  
**1.5 to 1 Channel Slope**

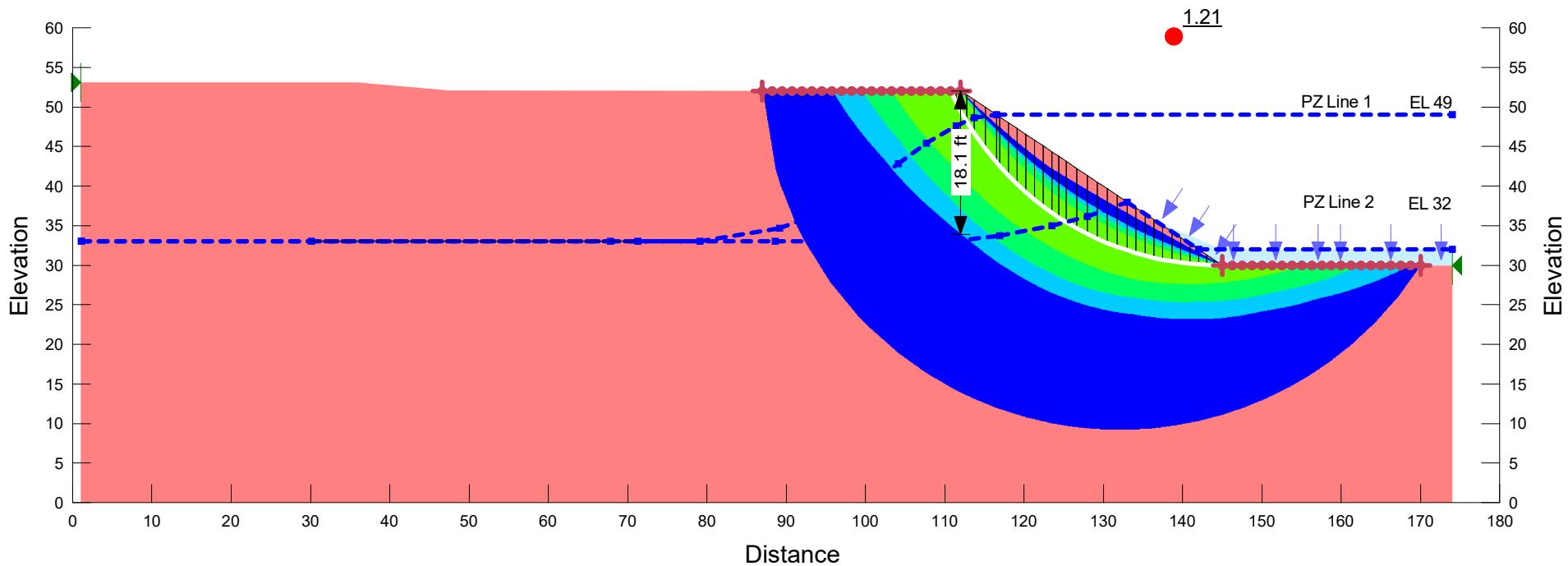
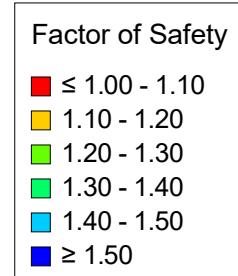
FOS: 0.90



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■ CL Soft	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 22 ft; Stiff Lean Clay (CL)  
 1.5 to 1 Channel Slope

FOS: 1.21

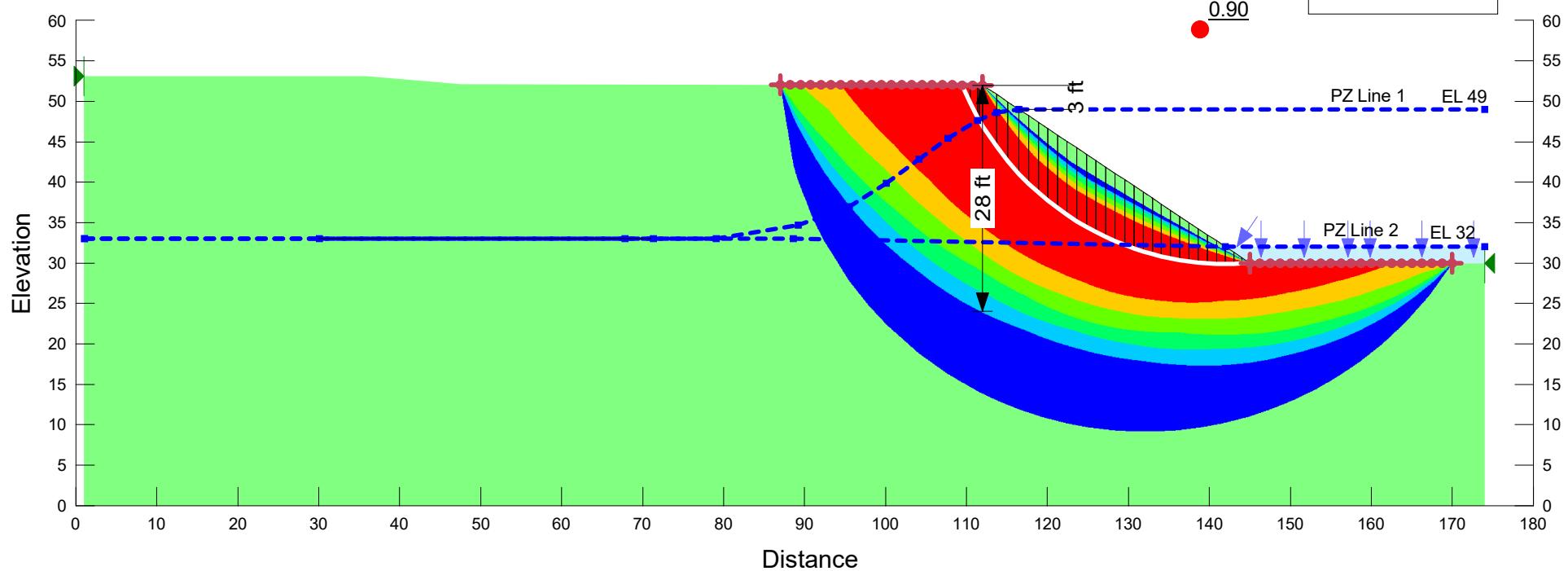


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Loose Sand (SM/SC)**  
**1.5 to 1 Channel Slope**

FOS: 0.90

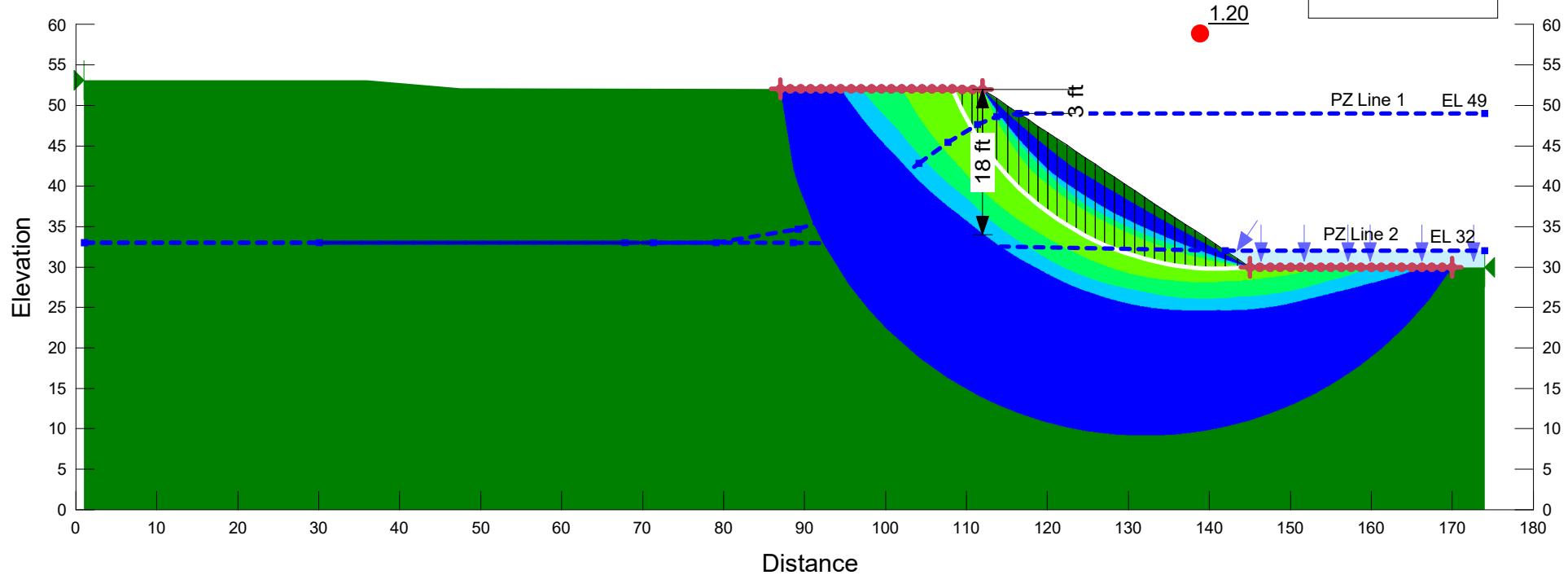
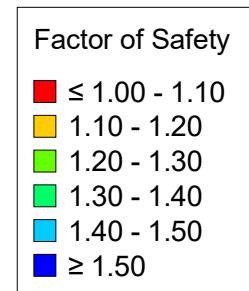
Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Green	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Dense Sand (SM/SC)**  
**1.5 to 1 Channel Slope**

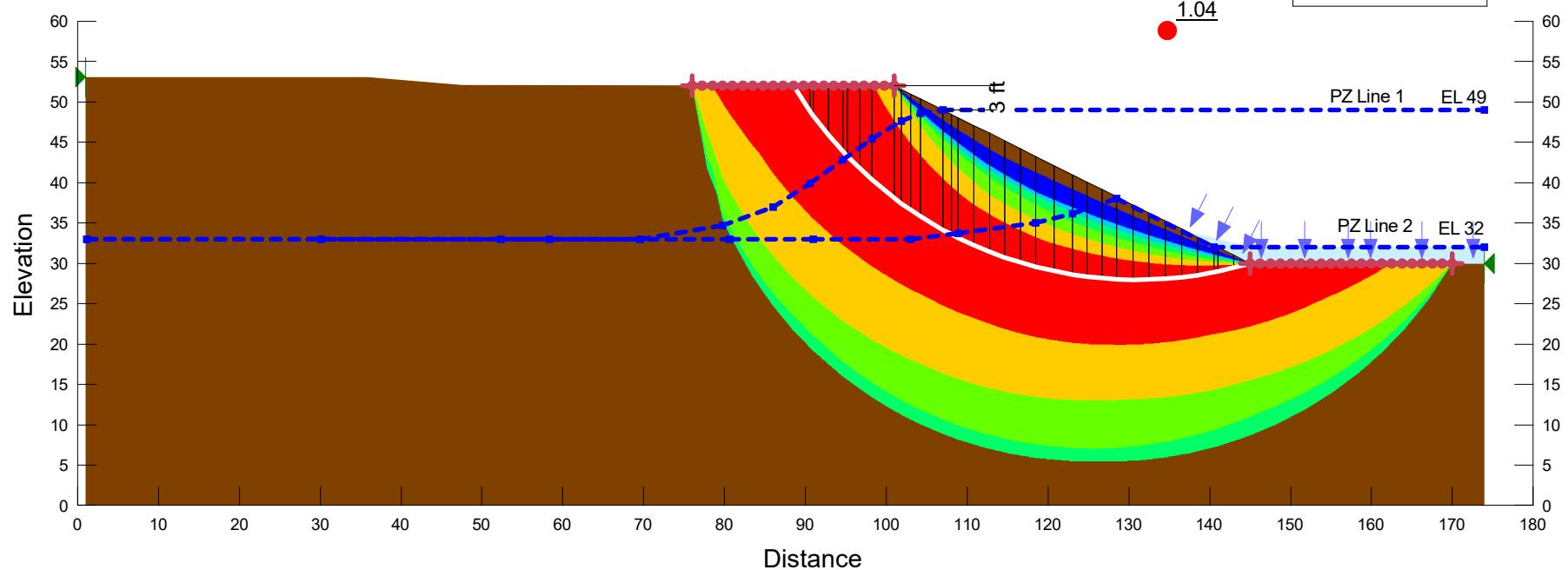
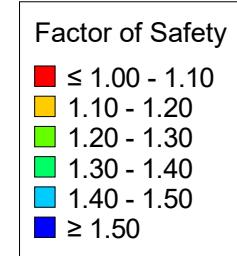
FOS: 1.20



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Soft Fat Clay (CH)**  
**2.0 to 1 Channel Slope**

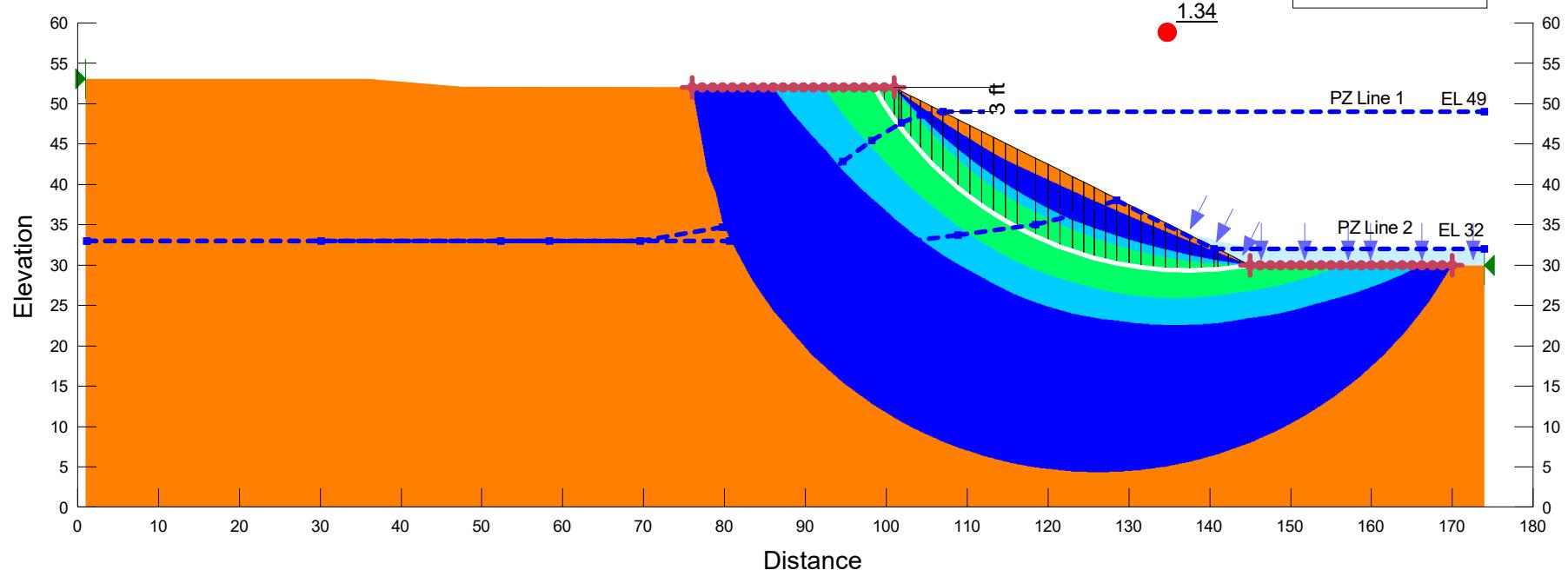
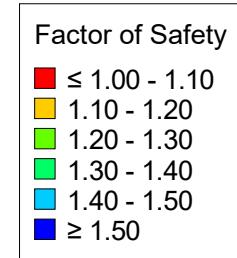
FOS: 1.04



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Stiff Fat Clay (CH)**  
**2.0 to 1 Channel Slope**

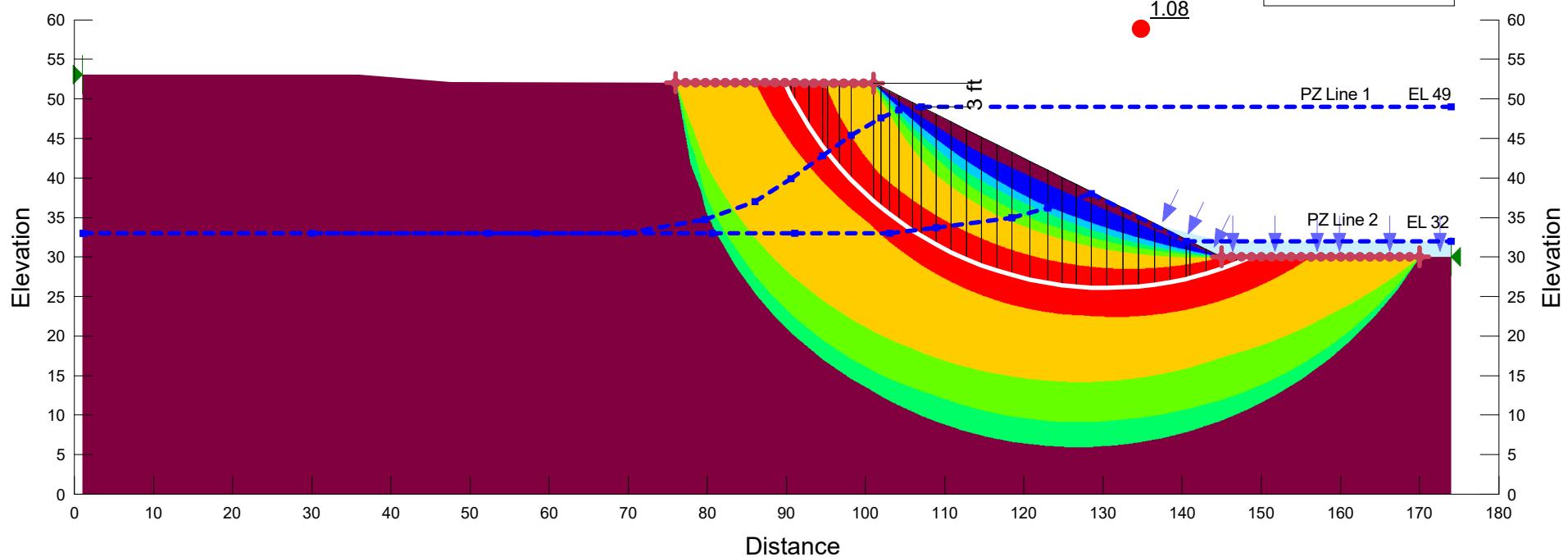
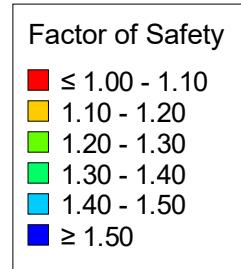
FOS: 1.34



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 22 ft; Soft Lean Clay (CL)  
 2.0 to 1 Channel Slope

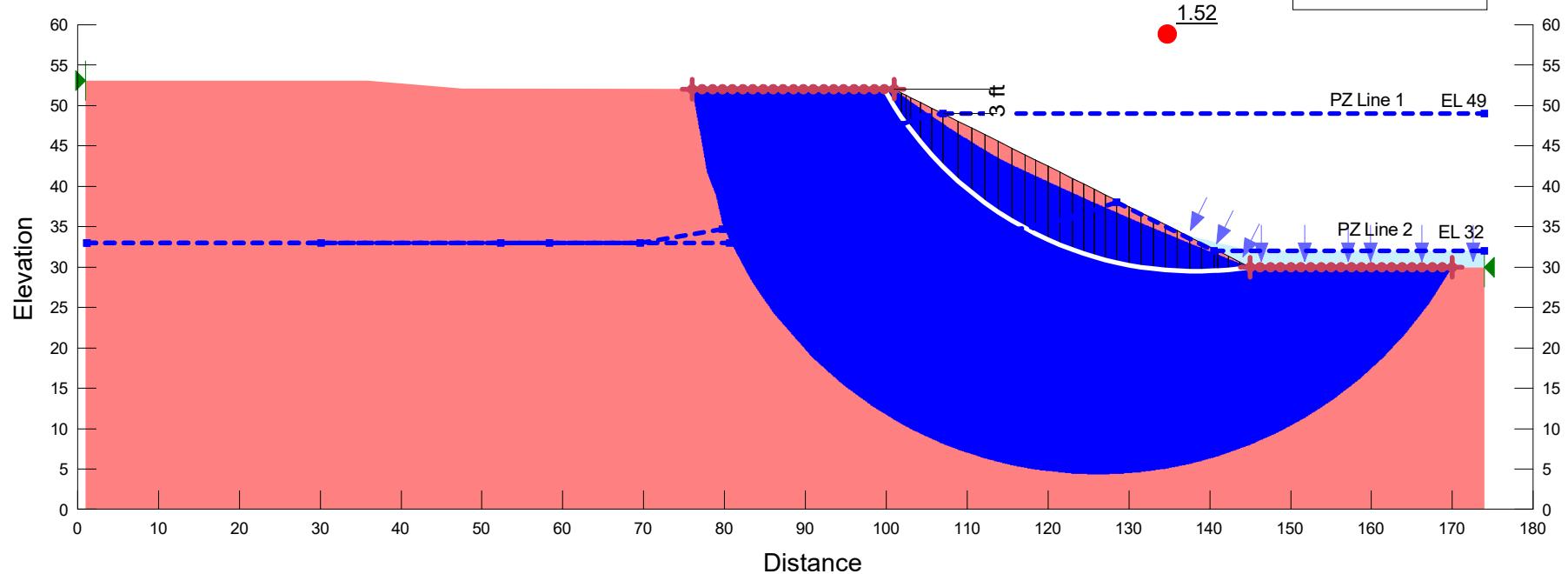
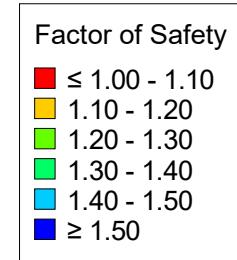
FOS: 1.08



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Stiff Lean Clay (CL)**  
**2.0 to 1 Channel Slope**

FOS: 1.52

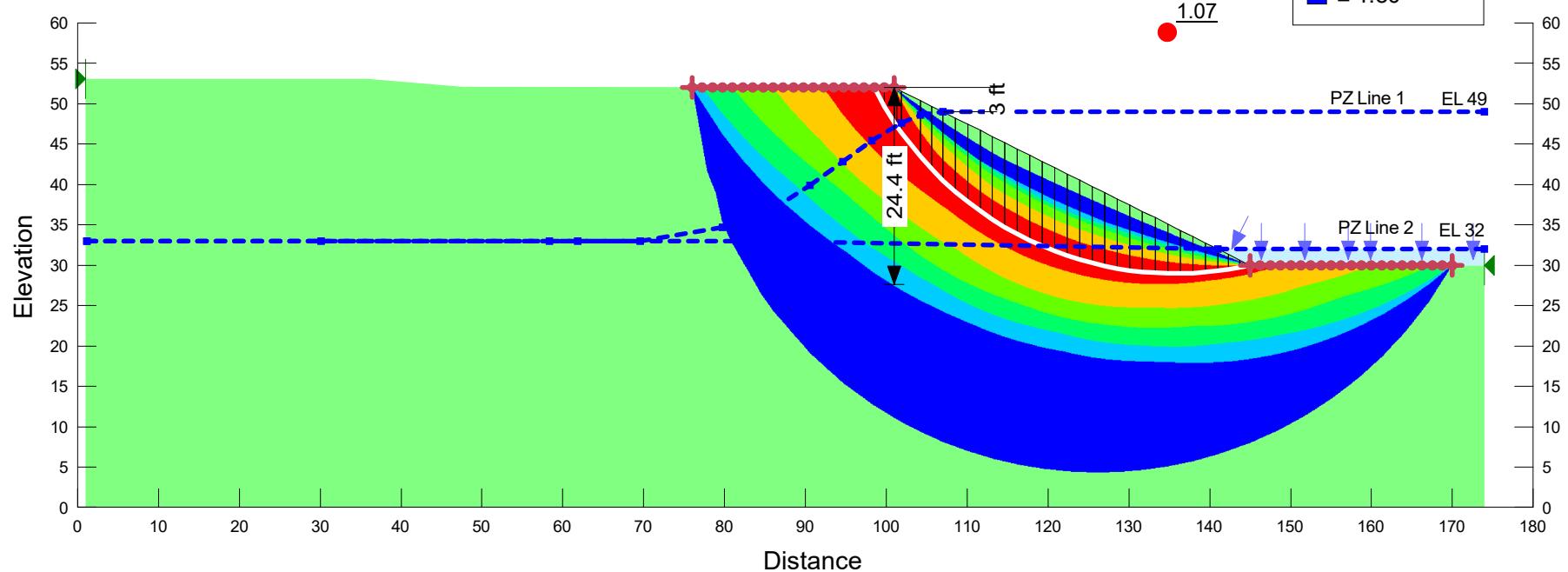


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Loose Sand (SM/SC)**  
**2.0 to 1 Channel Slope**

FOS: 1.07

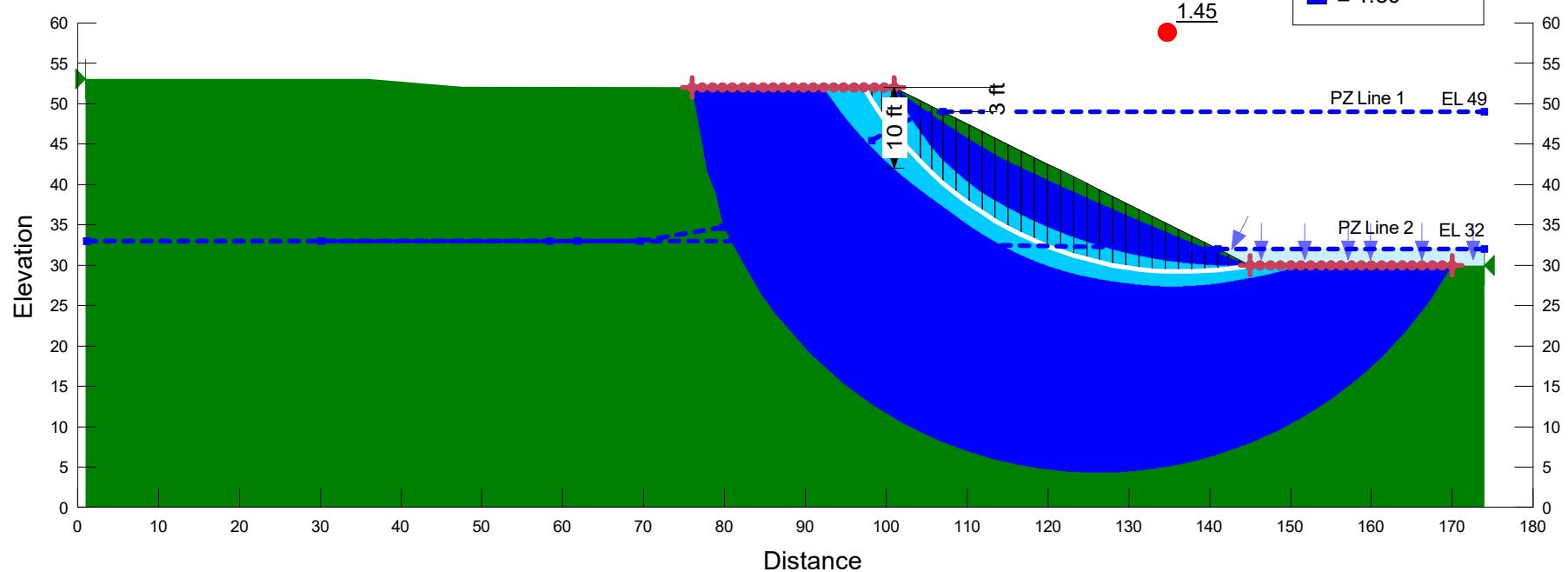
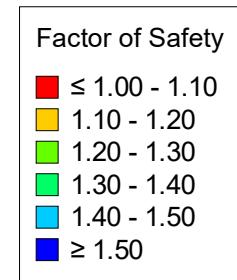
Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Green	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Dense Sand (SM/SC)**  
**2.0 to 1 Channel Slope**

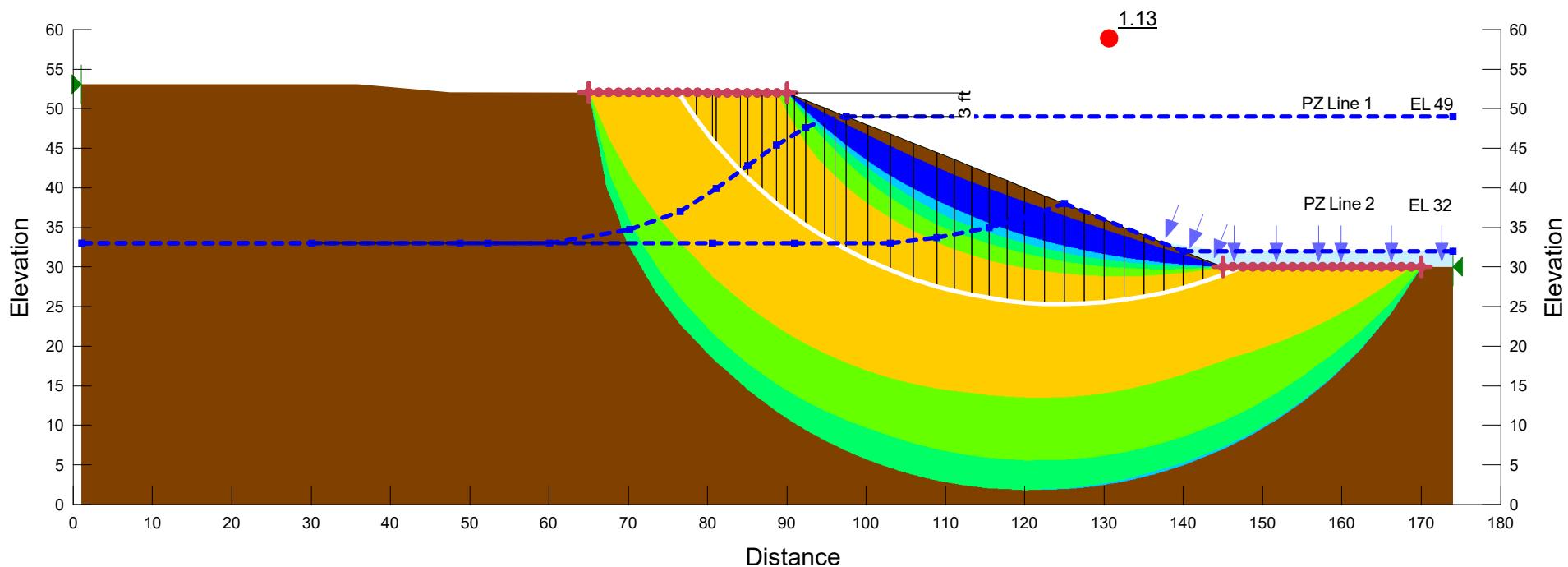
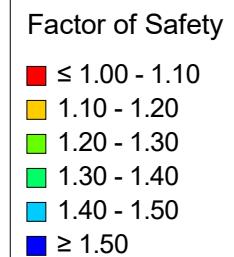
FOS: 1.45



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Soft Fat Clay (CH)**  
**2.5 to 1 Channel Slope**

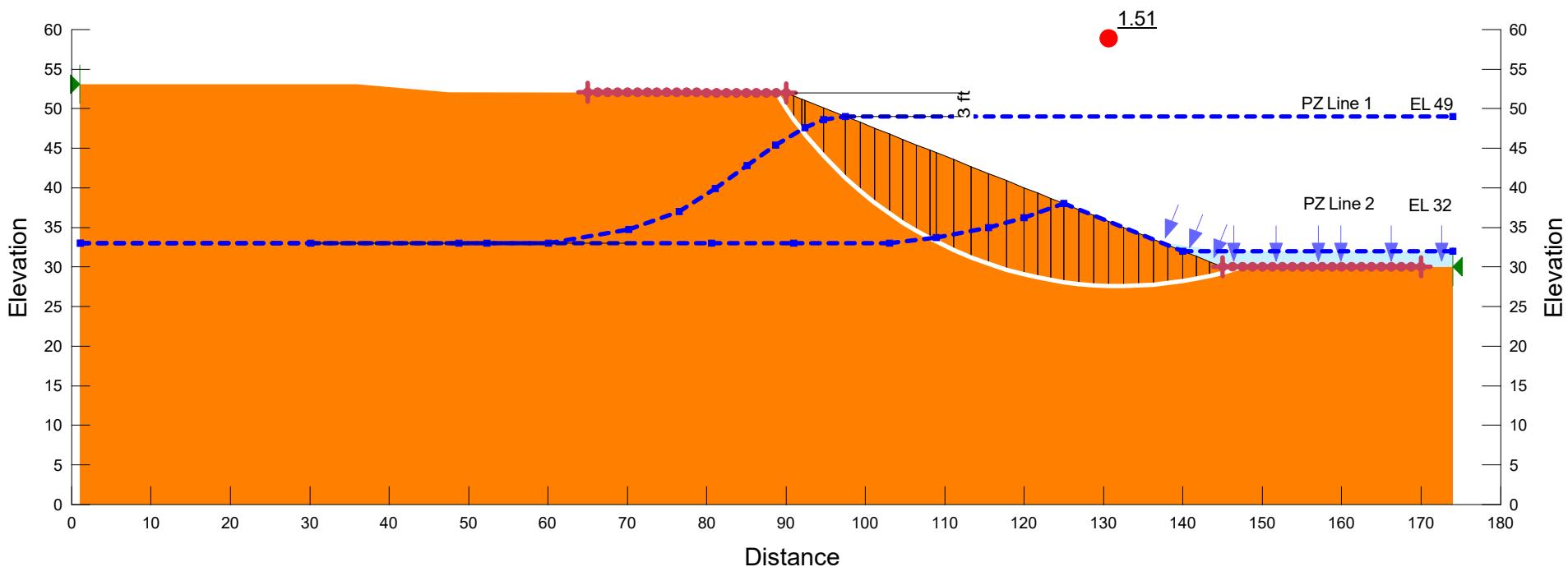
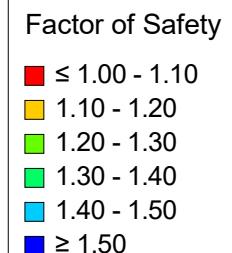
FOS: 1.13



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
<span style="color: brown;">■</span>	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 22 ft; Stiff Fat Clay (CH)  
 2.5 to 1 Channel Slope

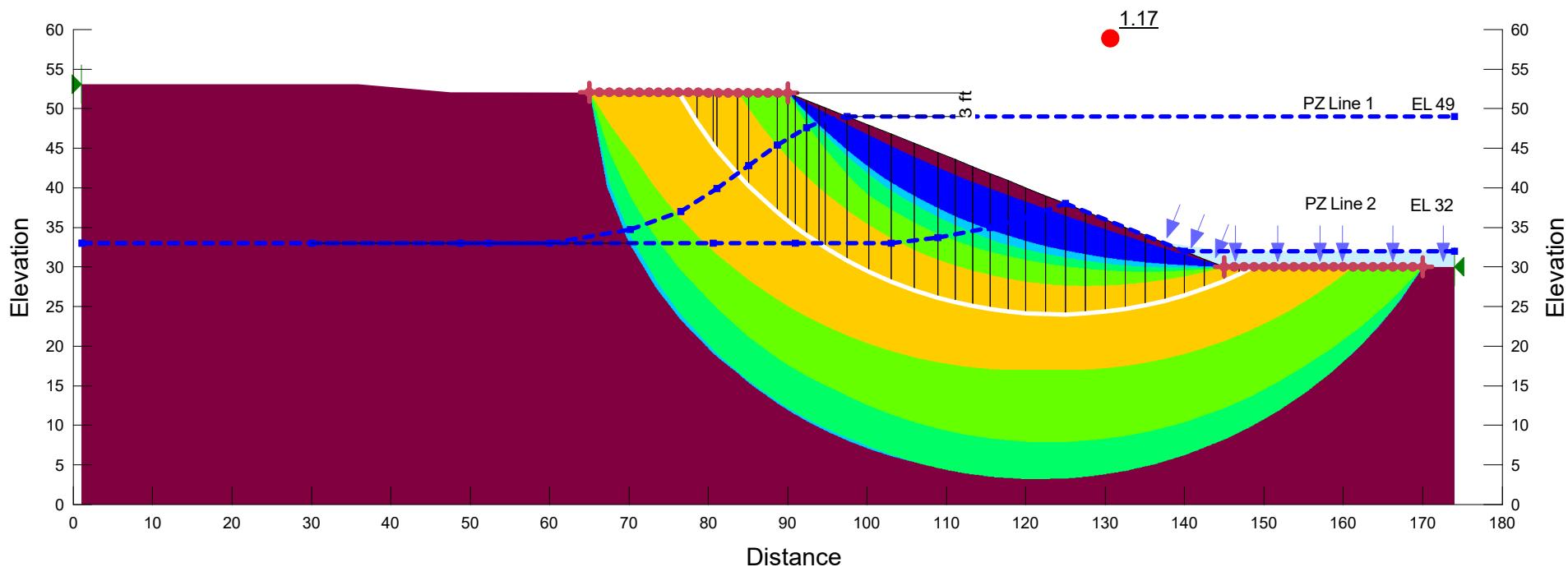
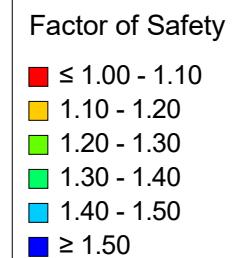
FOS: 1.51



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
<span style="color: orange;">■</span>	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 22 ft; Soft Lean Clay (CL)  
 2.5 to 1 Channel Slope

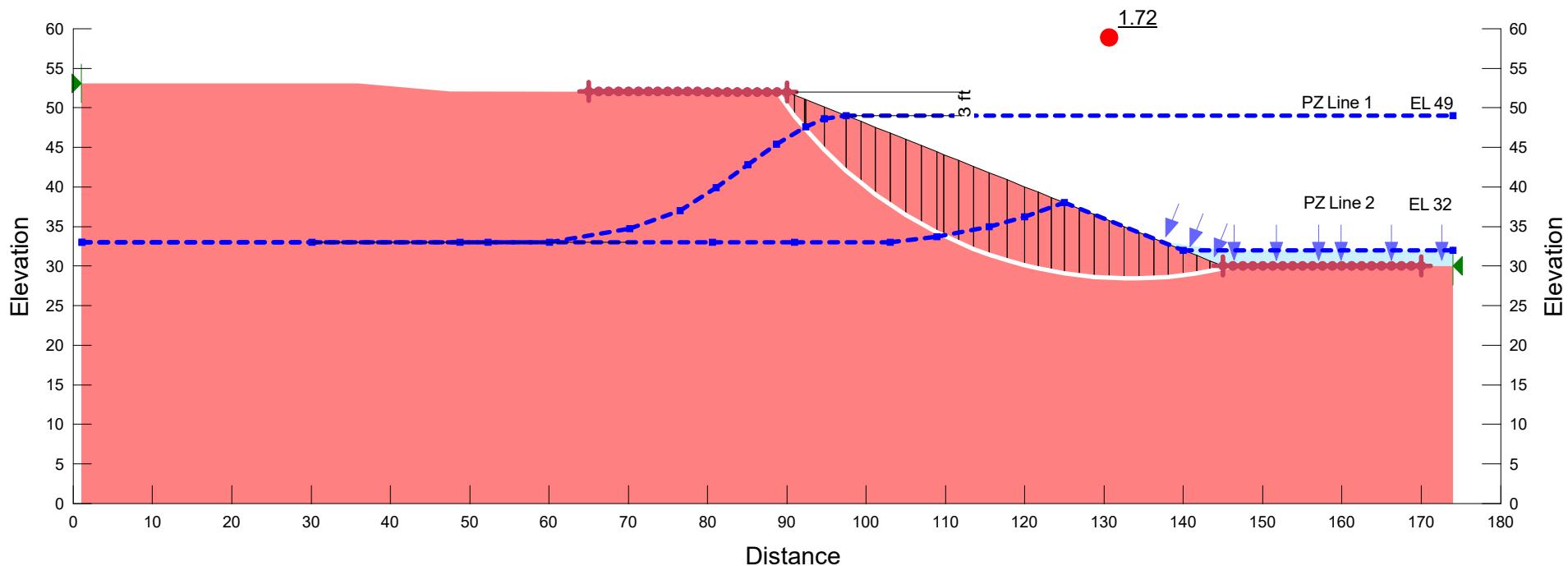
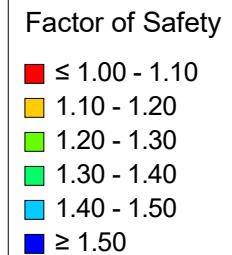
FOS: 1.17



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Soft	120	100	24	500	0	1	2

Rapid Drawdown Slope Stability Analysis  
Bank Height = 22 ft; Stiff Lean Clay (CL)  
2.5 to 1 Channel Slope

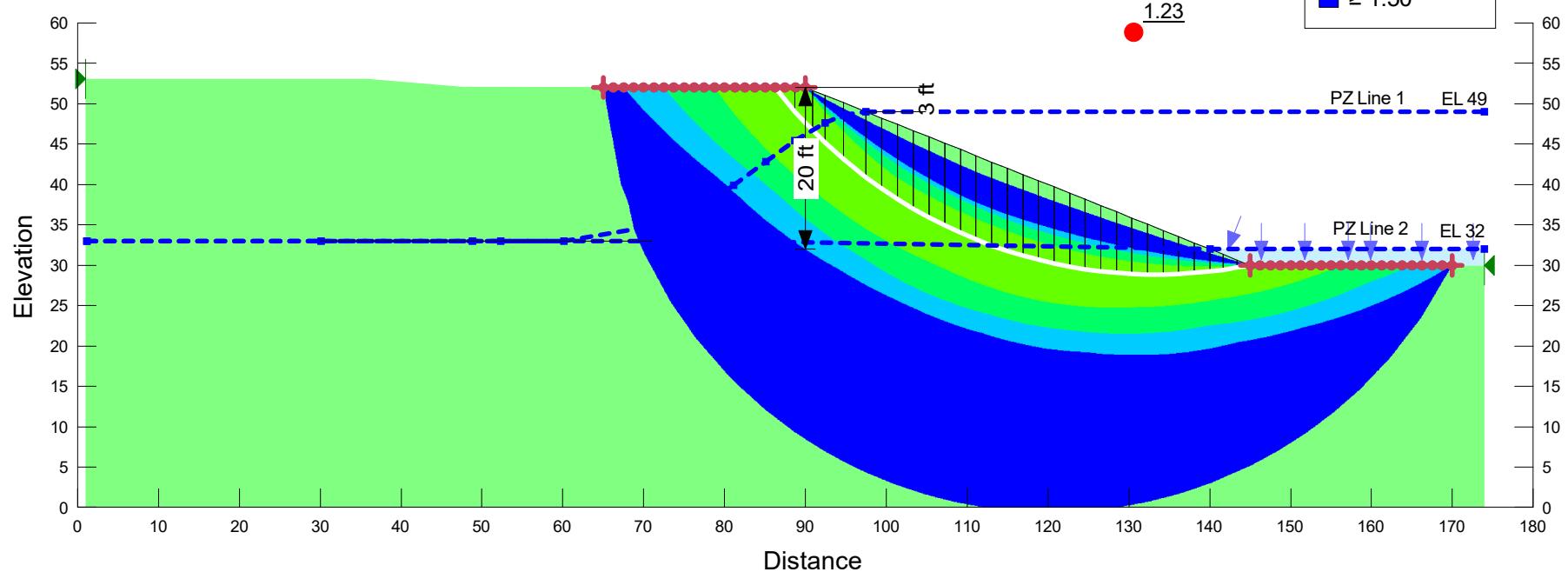
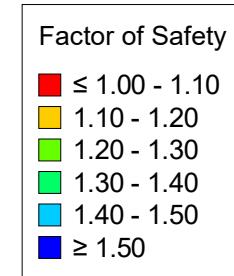
FOS: 1.72



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
<span style="color: red;">■</span>	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Loose Sand (SM/SC)**  
**2.5 to 1 Channel Slope**

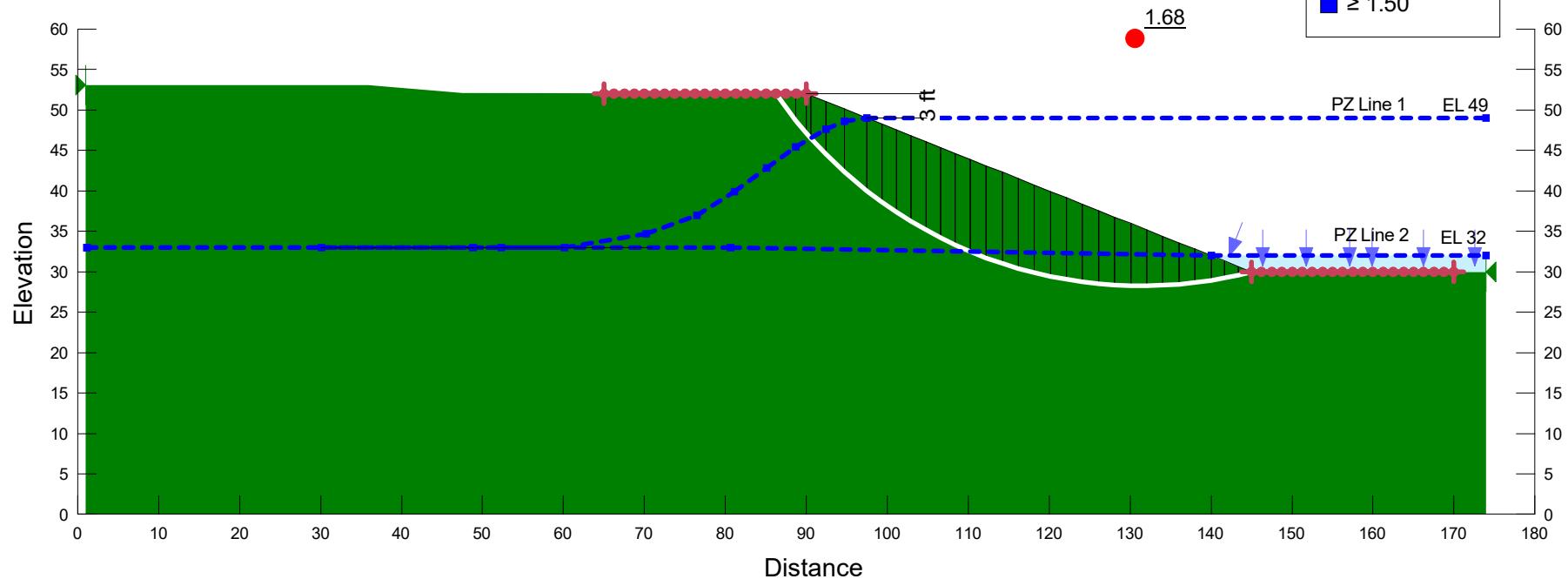
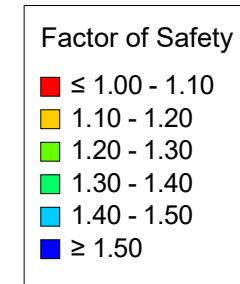
FOS: 1.23



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Dense Sand (SM/SC)**  
**2.5 to 1 Channel Slope**

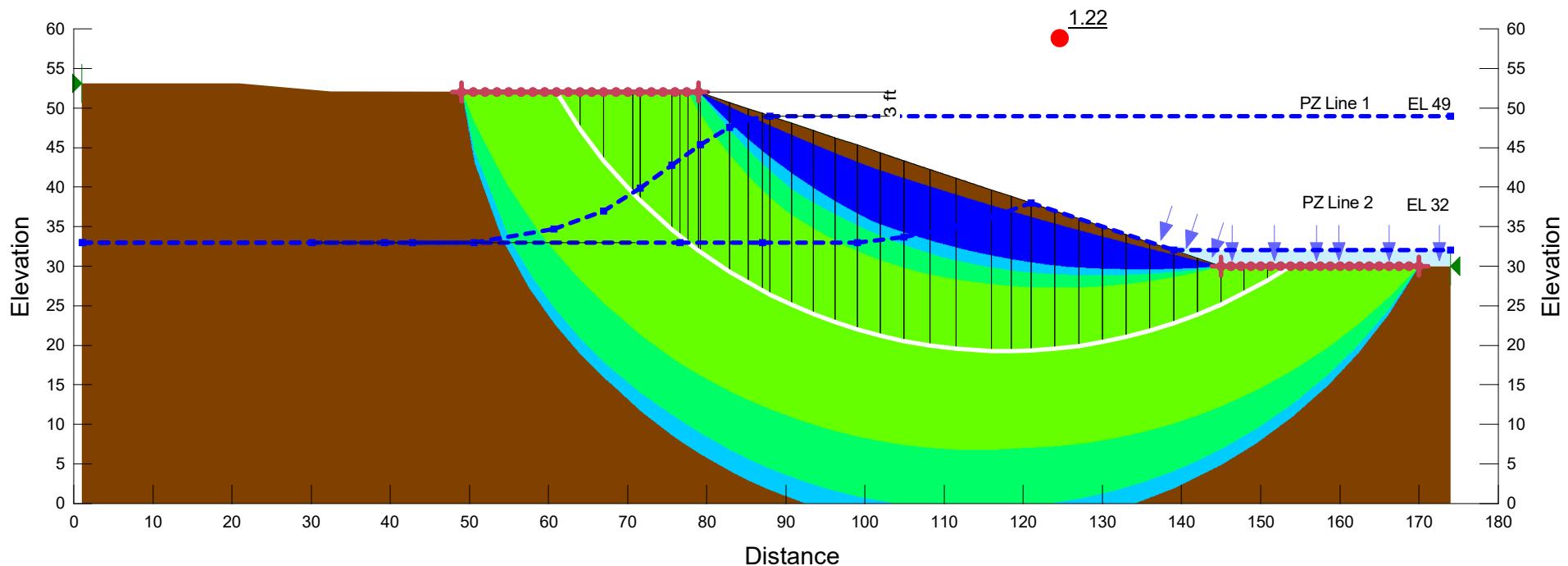
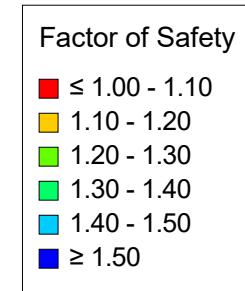
FOS: 1.68



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 22 ft; Soft Fat Clay (CH)  
 3.0 to 1 Channel Slope

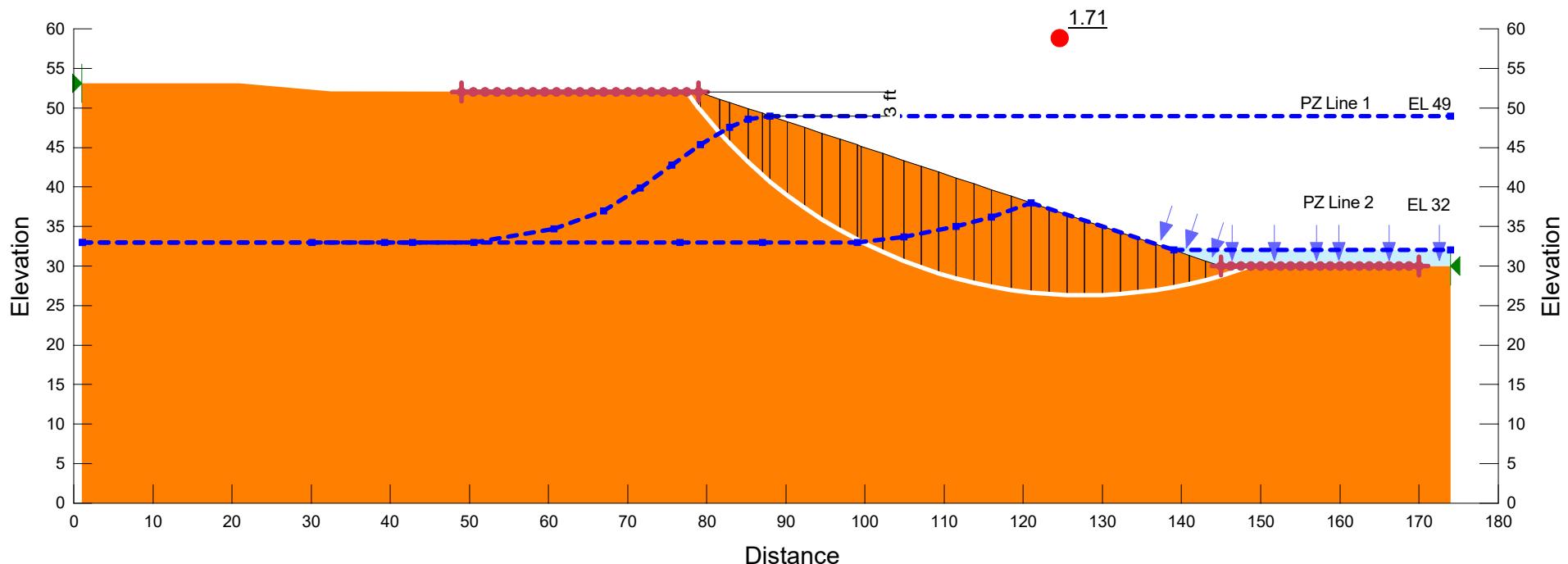
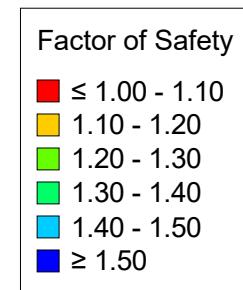
FOS: 1.22



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
<span style="background-color: brown;"></span>	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 22 ft; Stiff Fat Clay (CH)  
 3.0 to 1 Channel Slope

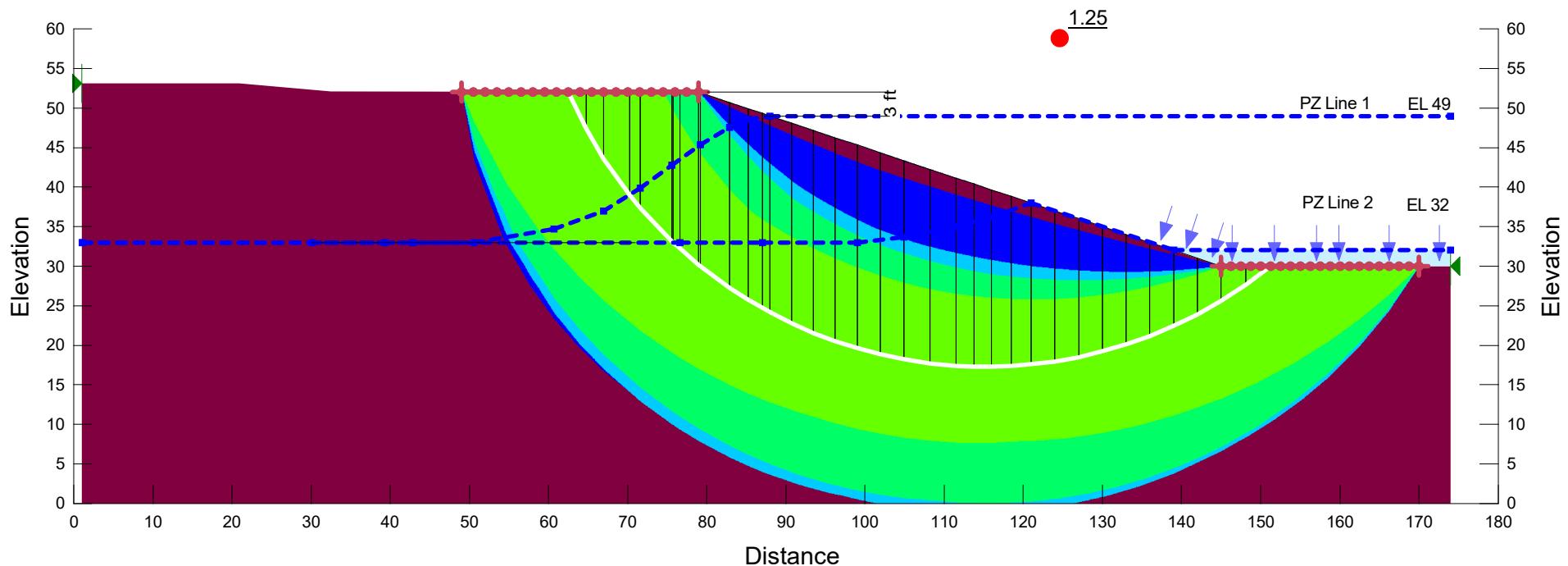
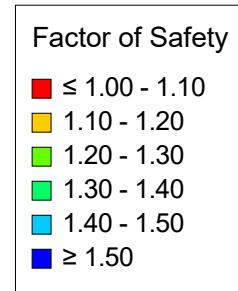
FOS: 1.71



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Soft Lean Clay (CL)**  
**3.0 to 1 Channel Slope**

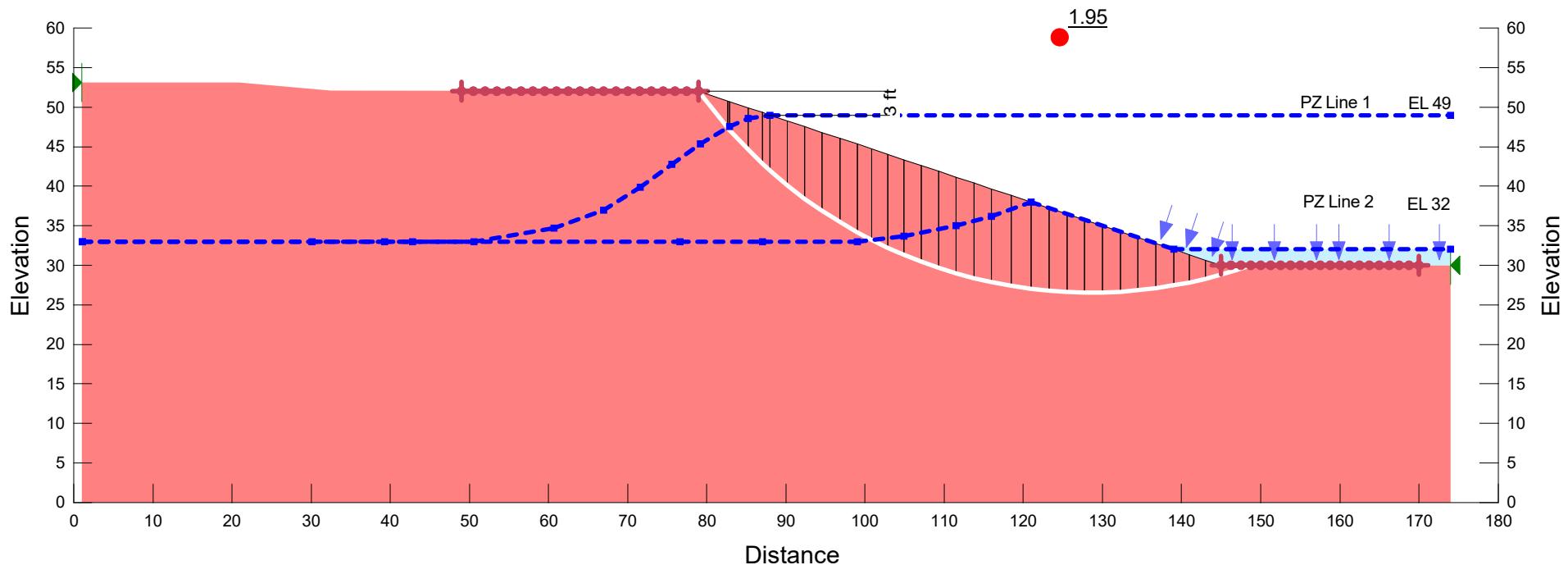
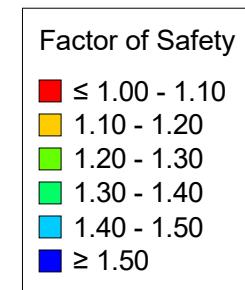
FOS: 1.25



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Maroon	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 22 ft; Stiff Lean Clay (CL)  
 3.0 to 1 Channel Slope

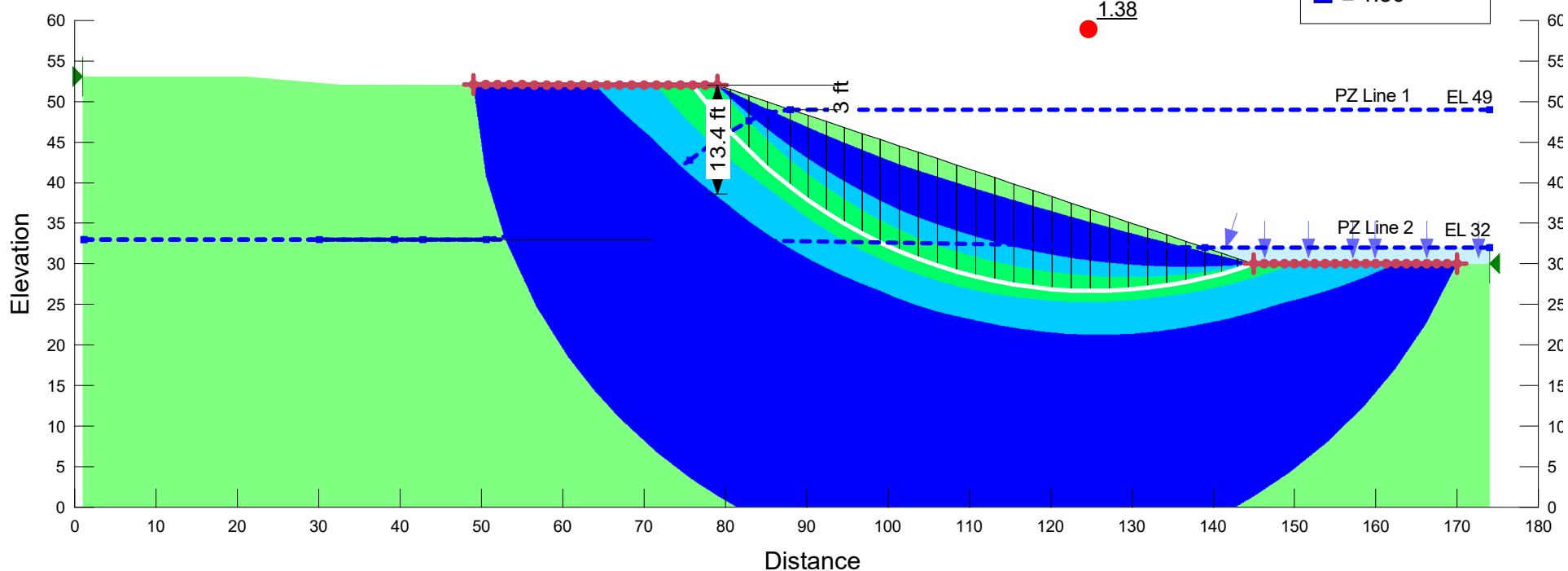
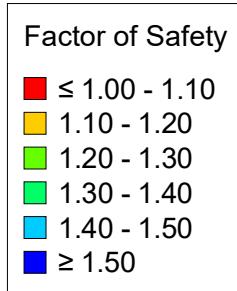
FOS: 1.95



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Red	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Loose Sand (SM/SC)**  
**3.0 to 1 Channel Slope**

FOS: 1.38

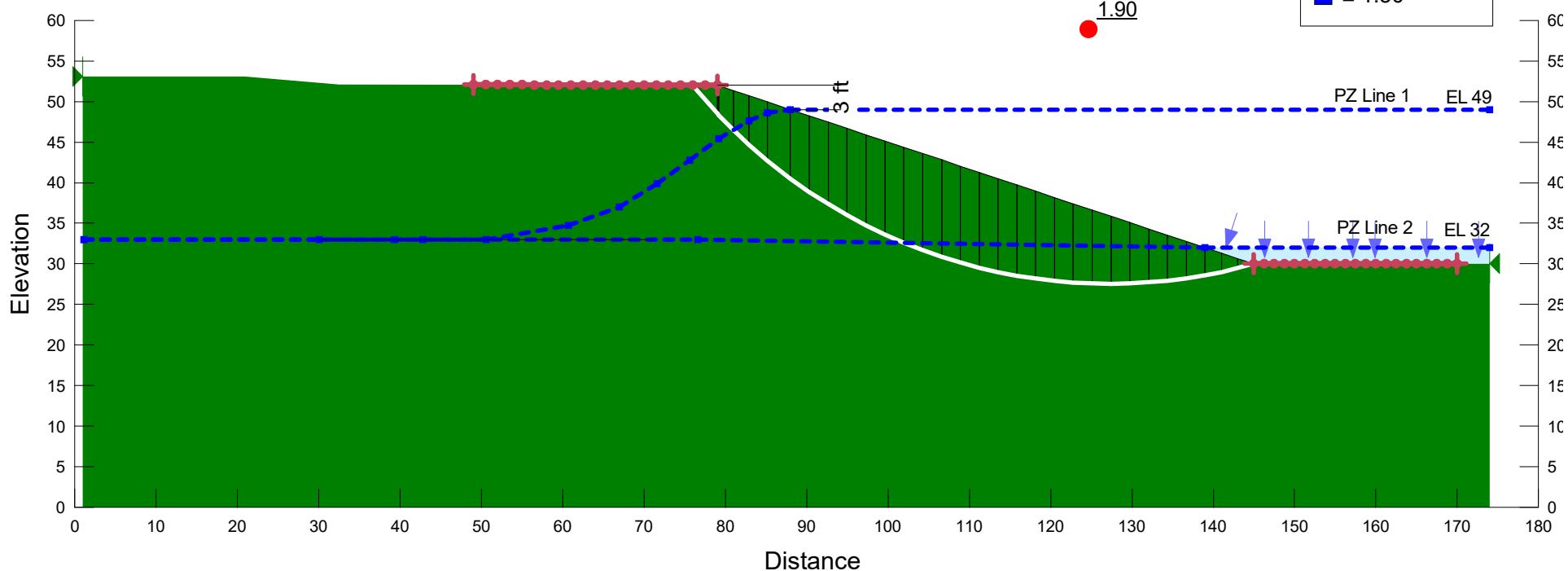


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Dense Sand (SM/SC)**  
**3.0 to 1 Channel Slope**

FOS: 1.90

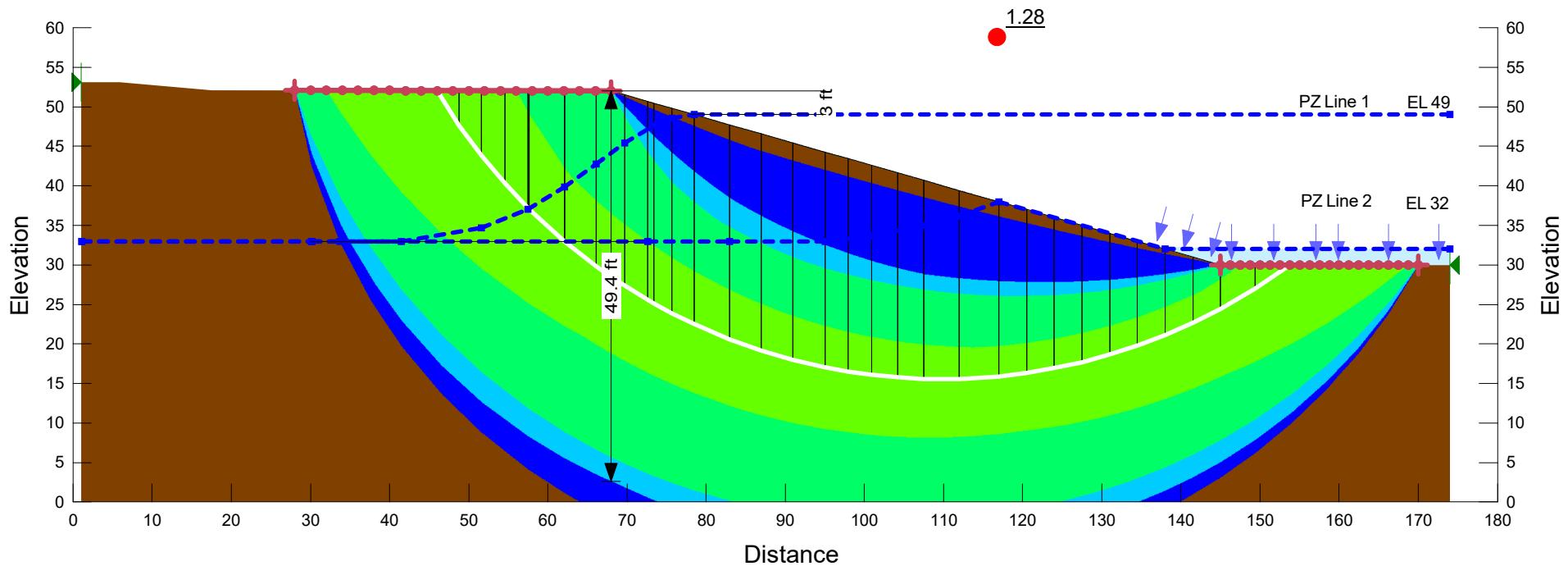
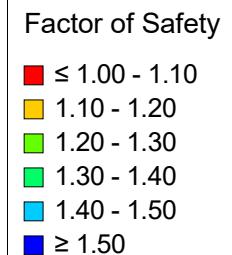
Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Soft Fat Clay (CH)**  
**3.5 to 1 Channel Slope**

FOS: 1.28

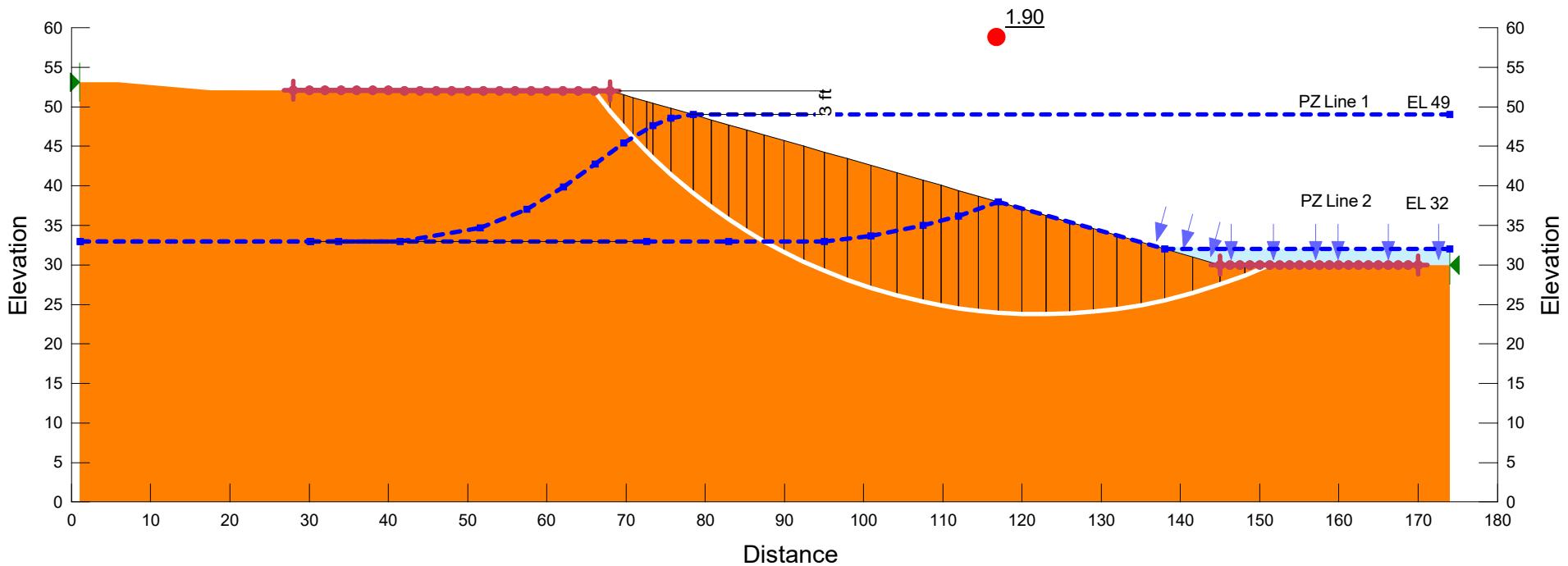


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Stiff Fat Clay (CH)**  
**3.5 to 1 Channel Slope**

FOS: 1.90

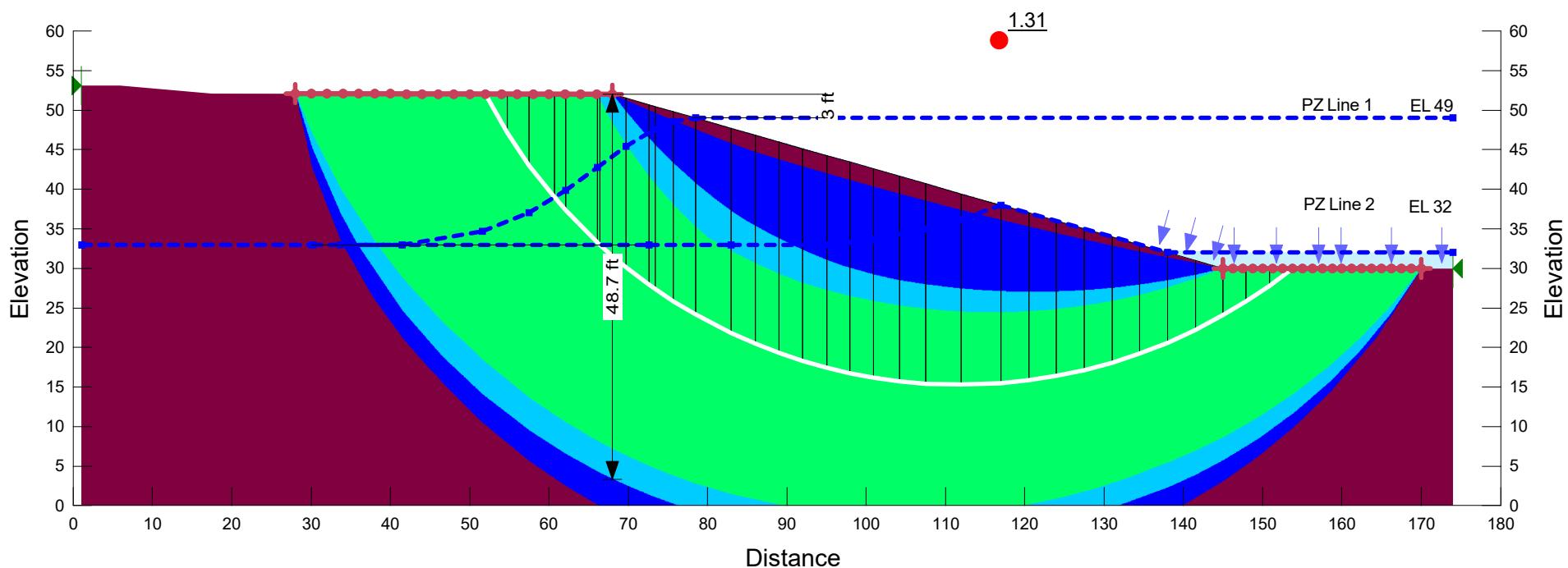
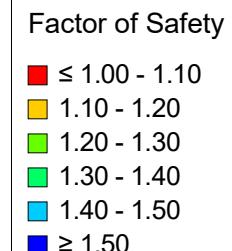
Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 22 ft; Soft Lean Clay (CL)  
 3.5 to 1 Channel Slope

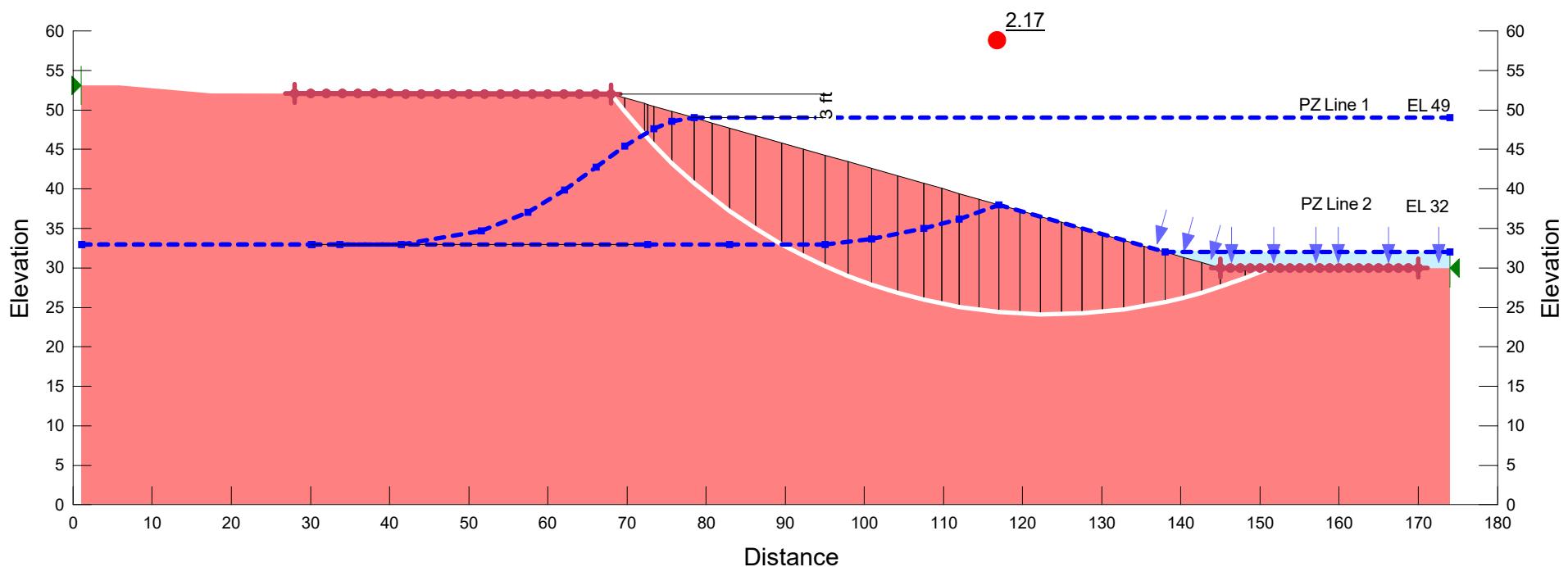
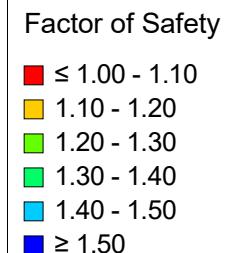
FOS: 1.31



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
<span style="background-color: maroon;"></span>	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 22 ft; Stiff Lean Clay (CL)  
 3.5 to 1 Channel Slope

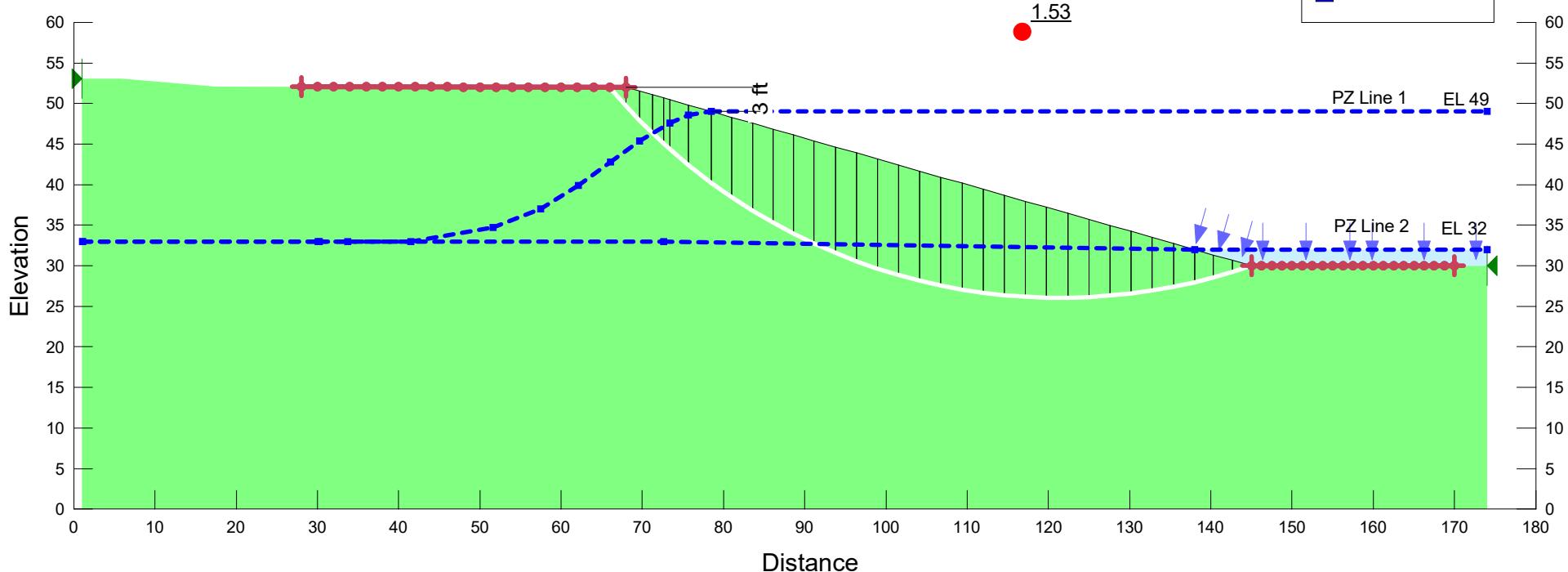
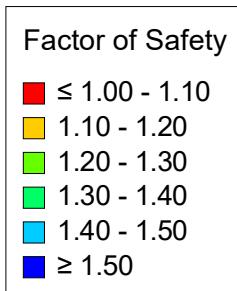
FOS: 2.17



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■ CL Stiff	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Loose Sand (SM/SC)**  
**3.5 to 1 Channel Slope**

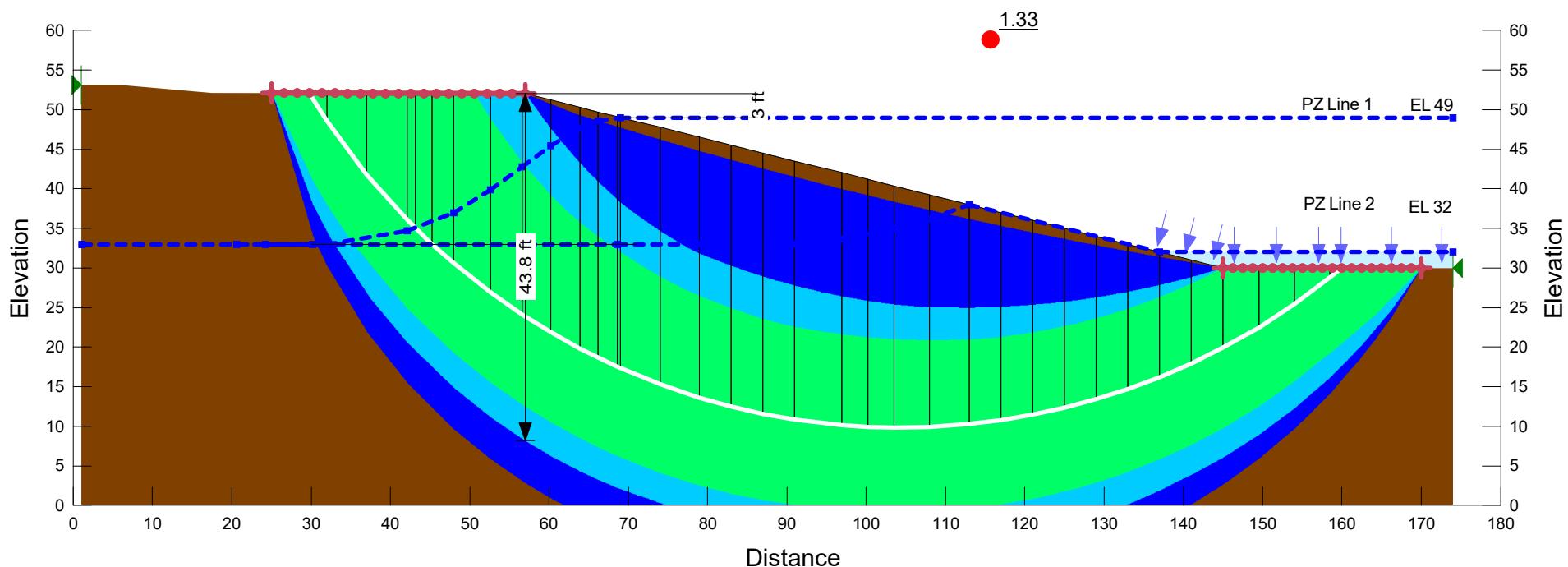
FOS: 1.53



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Soft Fat Clay (CH)**  
**4.0 to 1 Channel Slope**

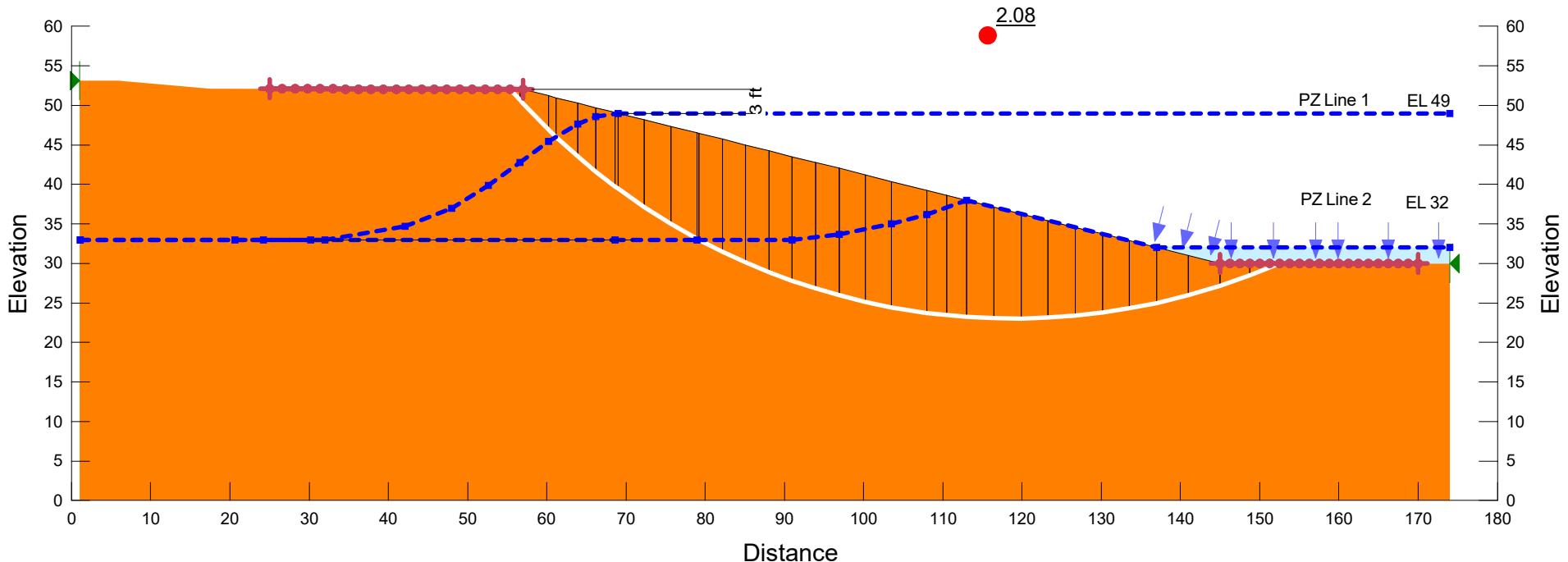
FOS: 1.33



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Stiff Fat Clay (CH)**  
**4.0 to 1 Channel Slope**

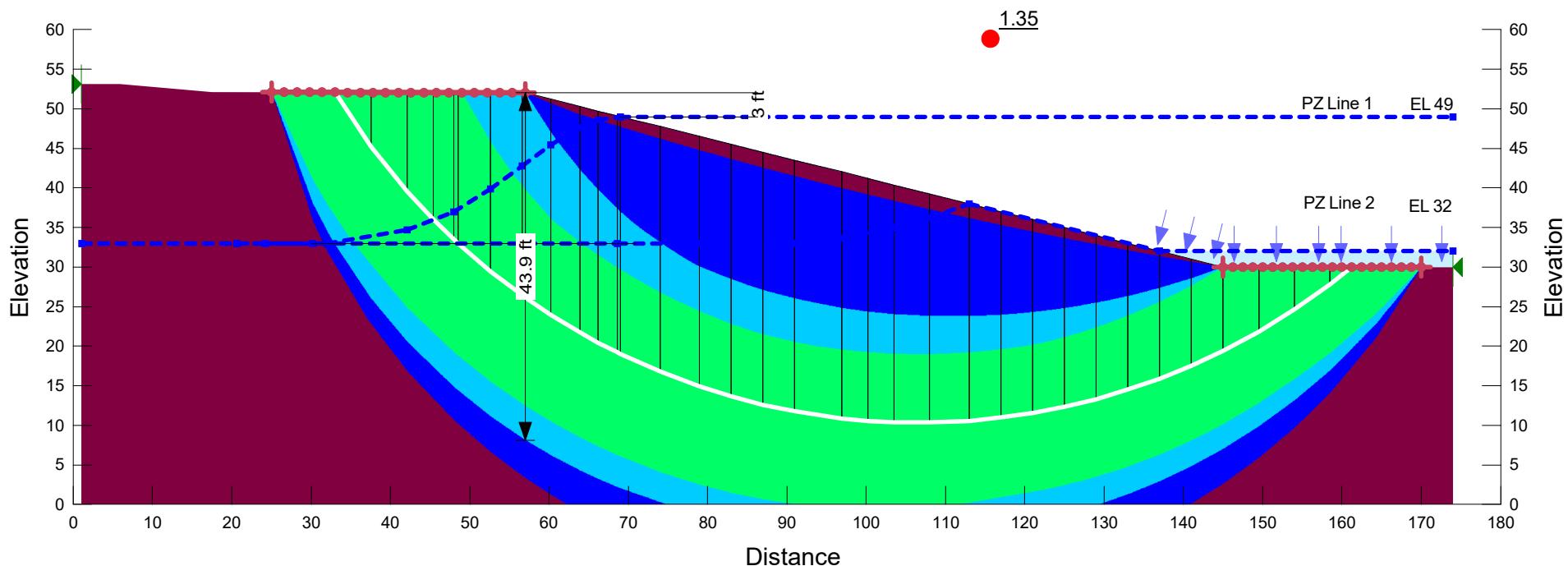
FOS: 2.08



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 22 ft; Soft Lean Clay (CL)**  
**4.0 to 1 Channel Slope**

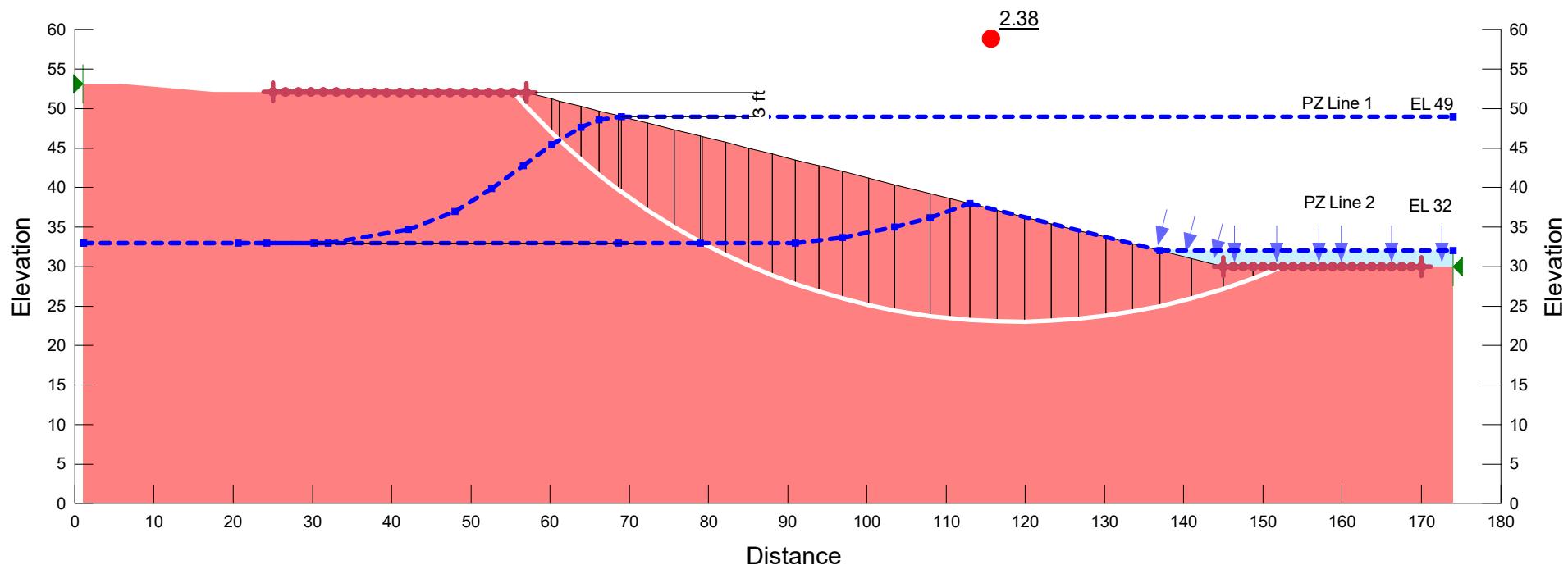
FOS: 1.35



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
CL Soft	CL Soft	120	100	24	500	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 22 ft; Stiff Lean Clay (CL)  
 4.0 to 1 Channel Slope

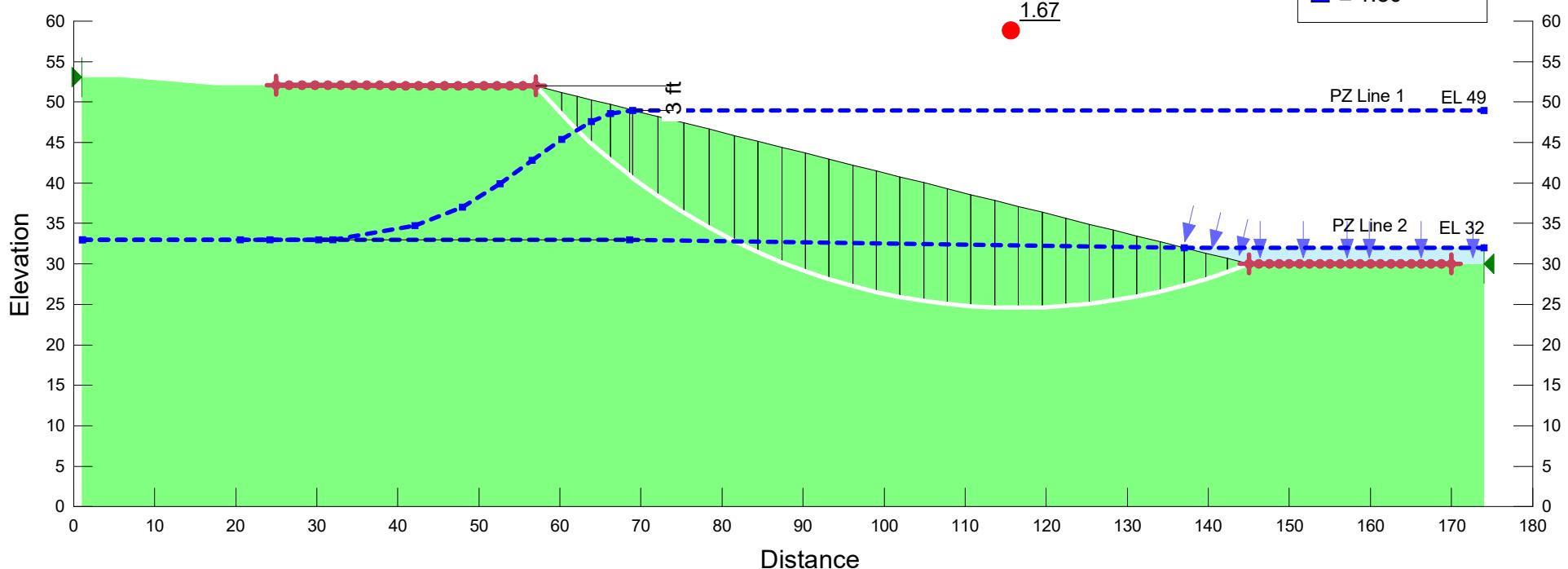
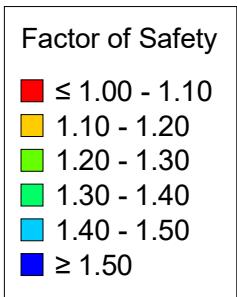
FOS: 2.38



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 22 ft; Loose Sand (SM/SC)  
 4.0 to 1 Channel Slope

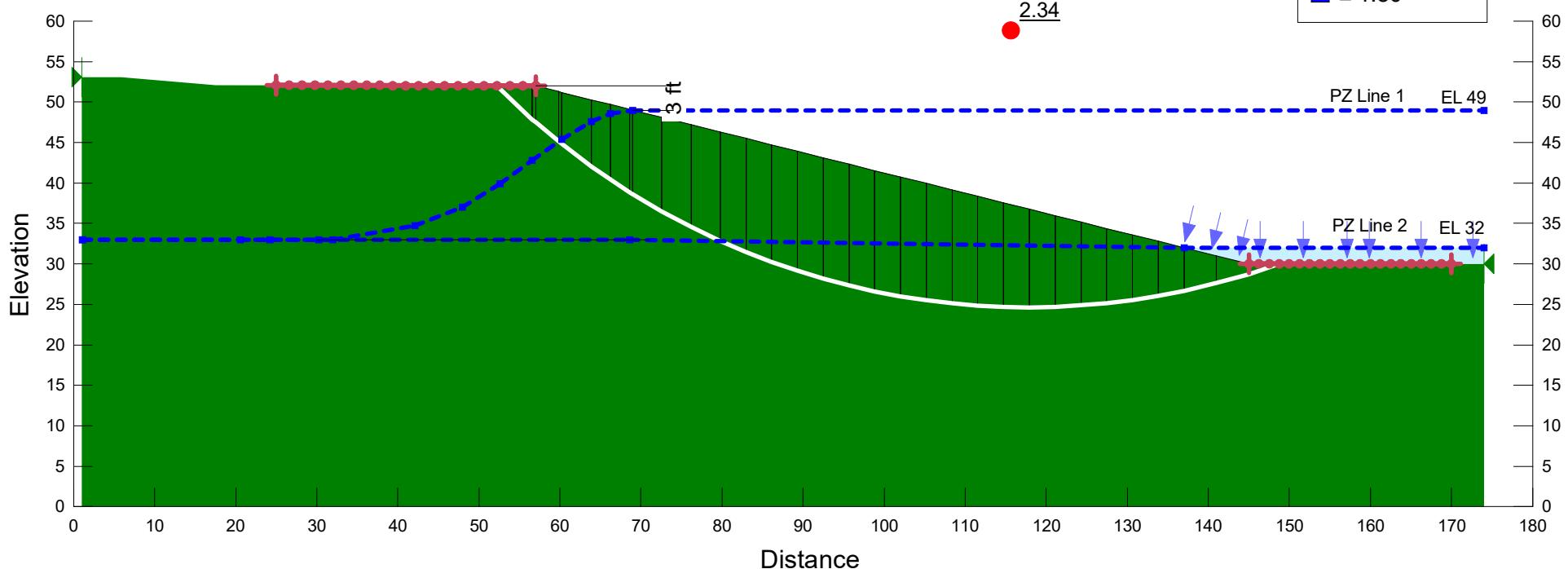
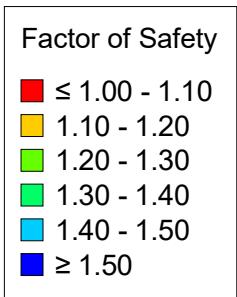
FOS: 1.67



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 22 ft; Dense Sand (SM/SC)  
 4.0 to 1 Channel Slope

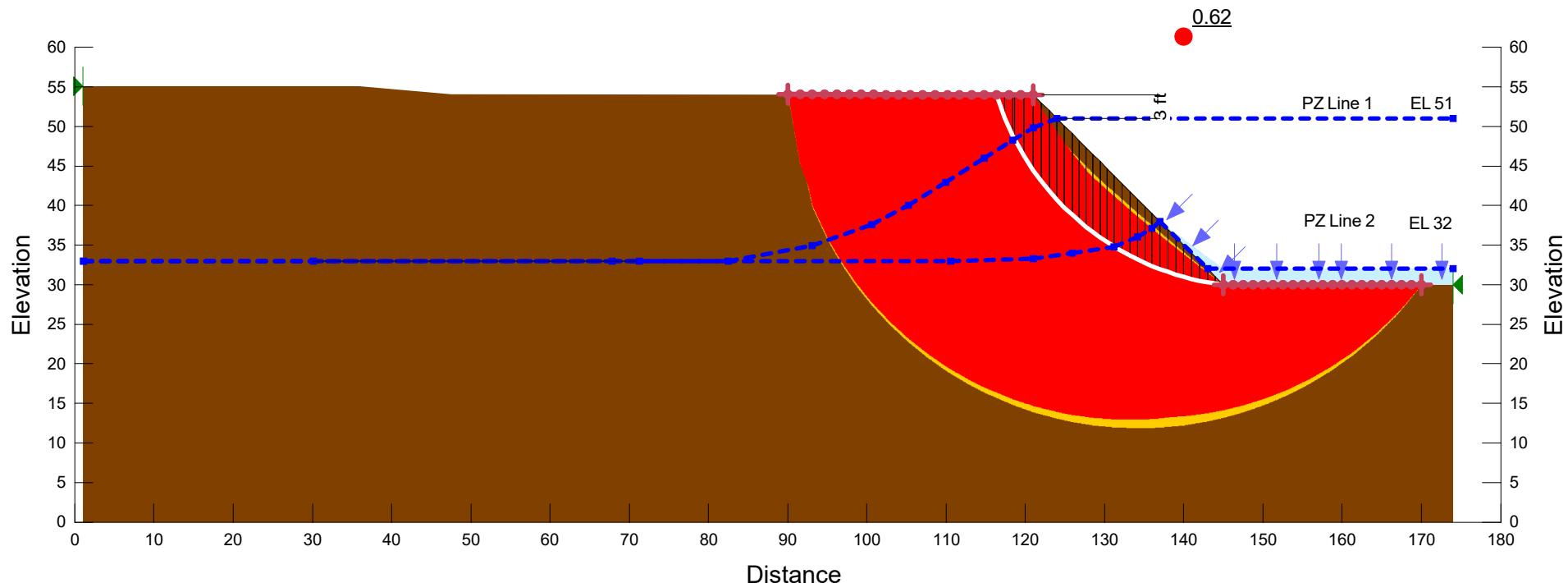
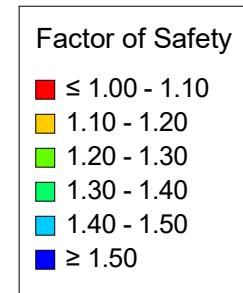
FOS: 2.34



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 24 ft; Soft Fat Clay (CH)**  
**1.0 to 1 Channel Slope**

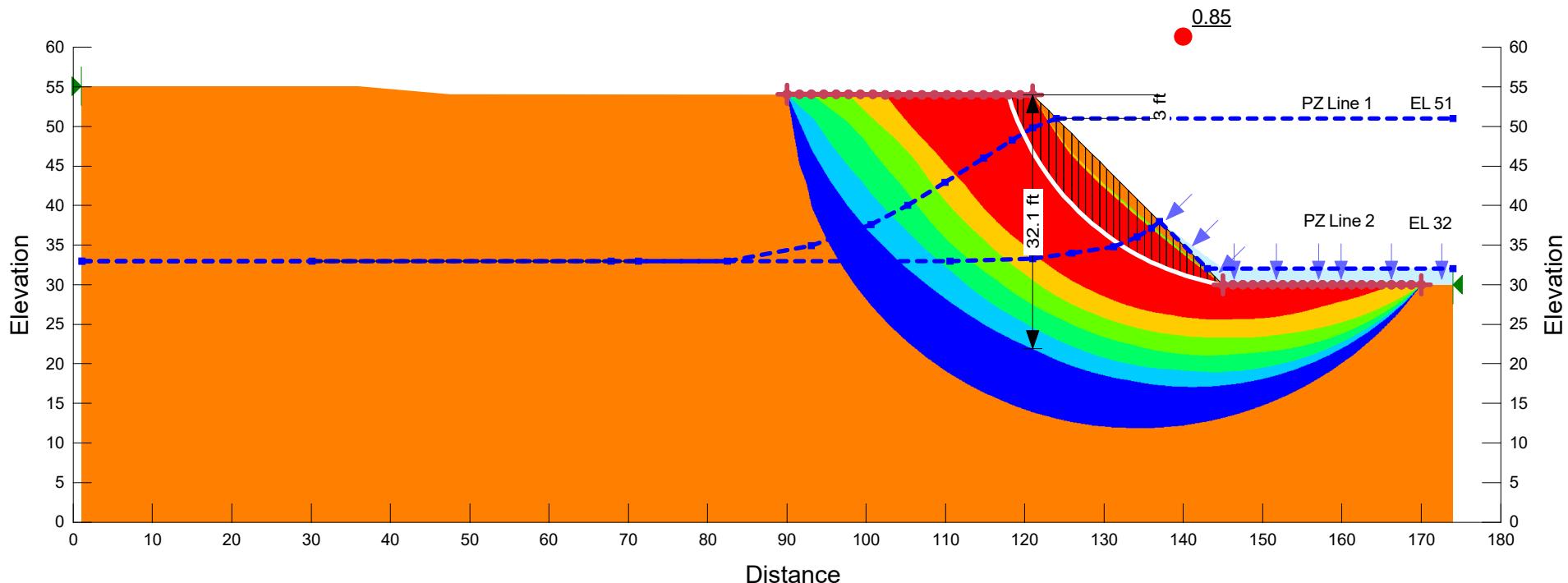
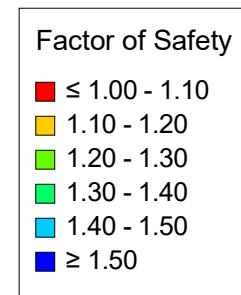
FOS: 0.62



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 24 ft; Stiff Fat Clay (CH)  
 1.0 to 1 Channel Slope

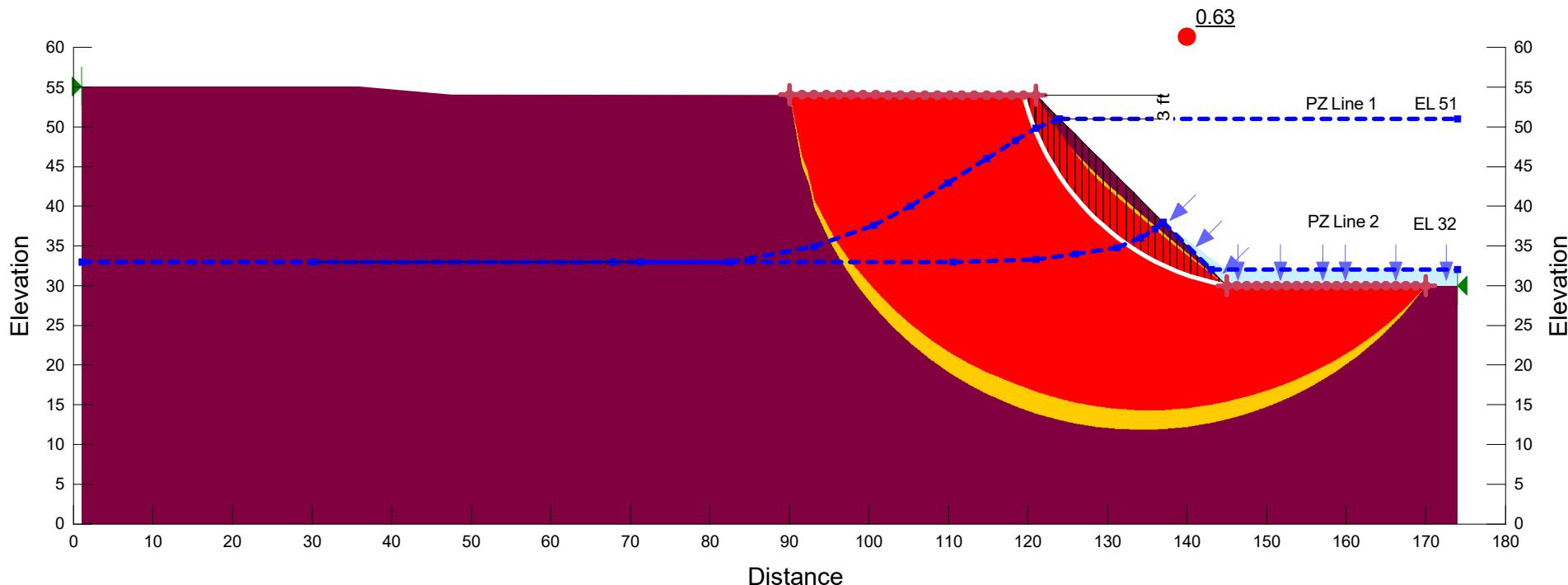
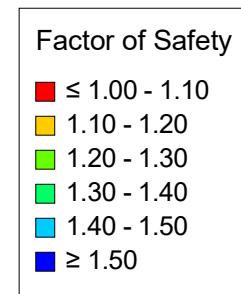
FOS: 0.85



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
<span style="color: orange;">■</span>	CH Stiff	120	100	26	2,000	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 24 ft; Soft Lean Clay (CL)  
 1.0 to 1 Channel Slope

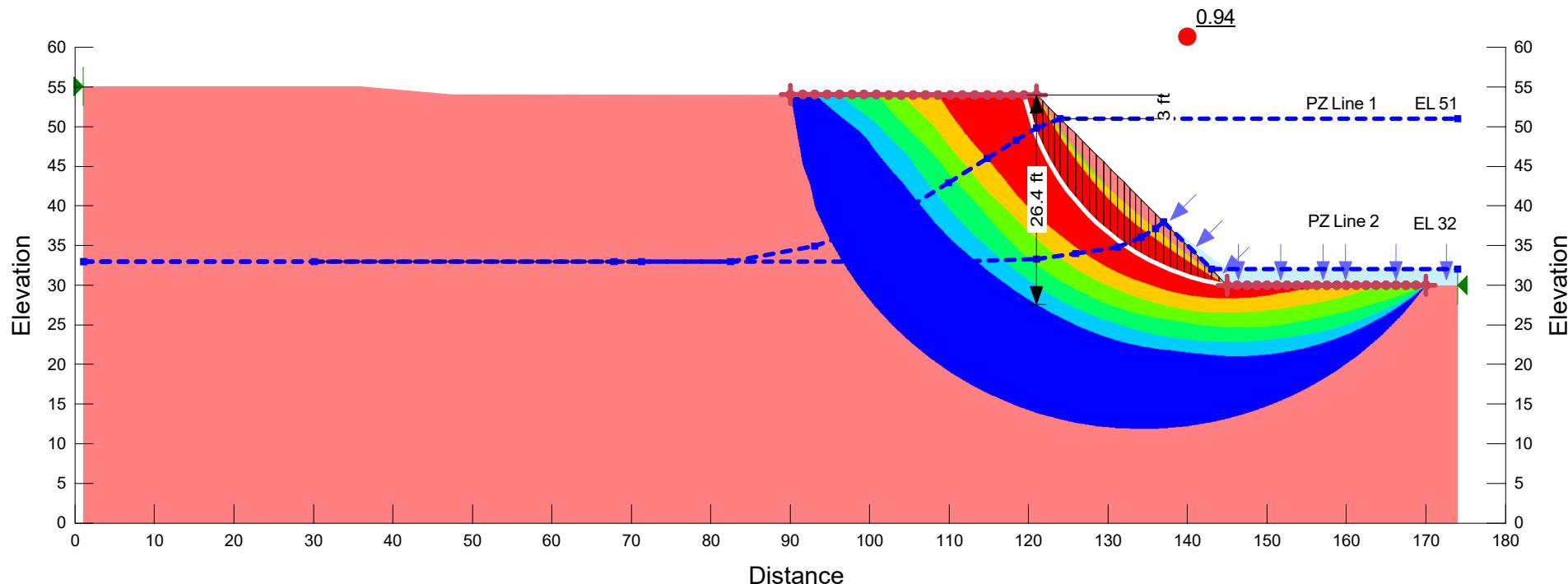
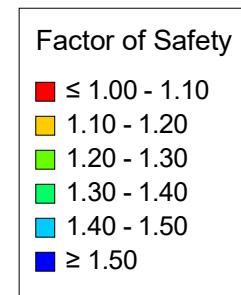
FOS: 0.63



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
<span style="background-color: #800000; color: black;">■</span>	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 24 ft; Stiff Lean Clay (CL)  
 1.0 to 1 Channel Slope

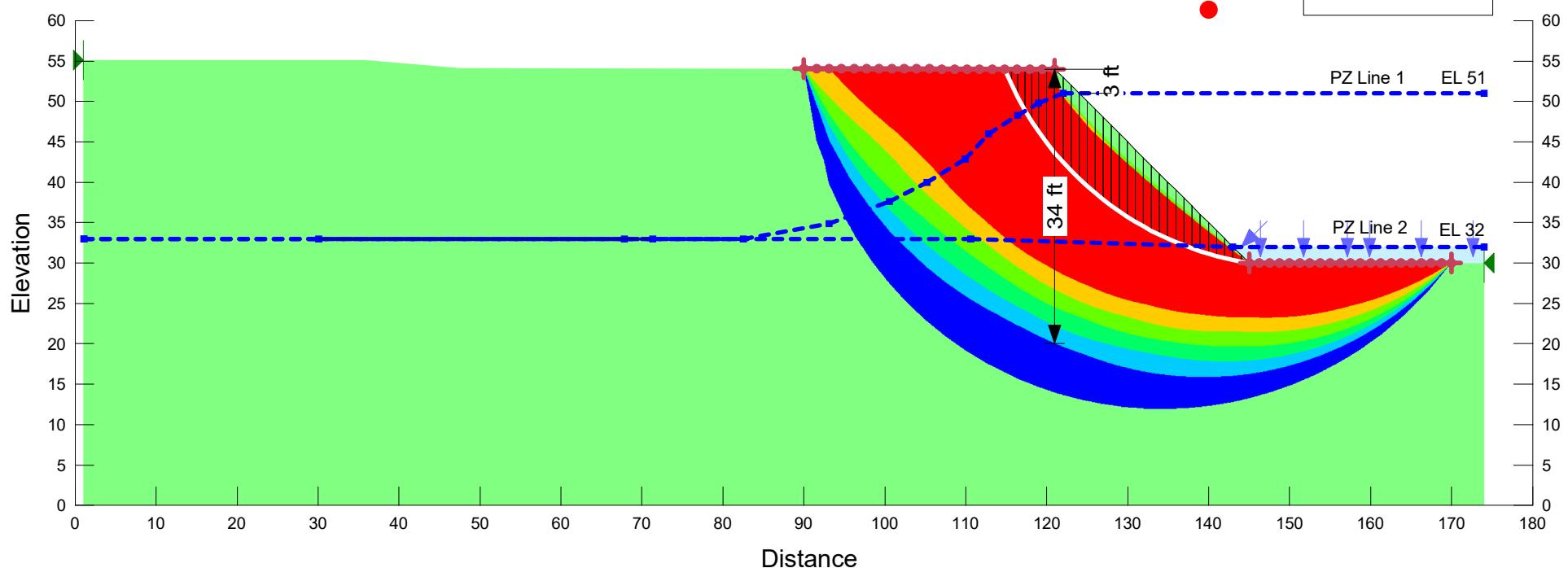
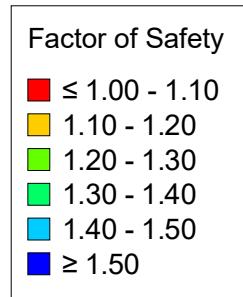
FOS: 0.94



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Stiff	120	100	30	2,000	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 24 ft; Loose Sand (SM/SC)  
 1.0 to 1 Channel Slope

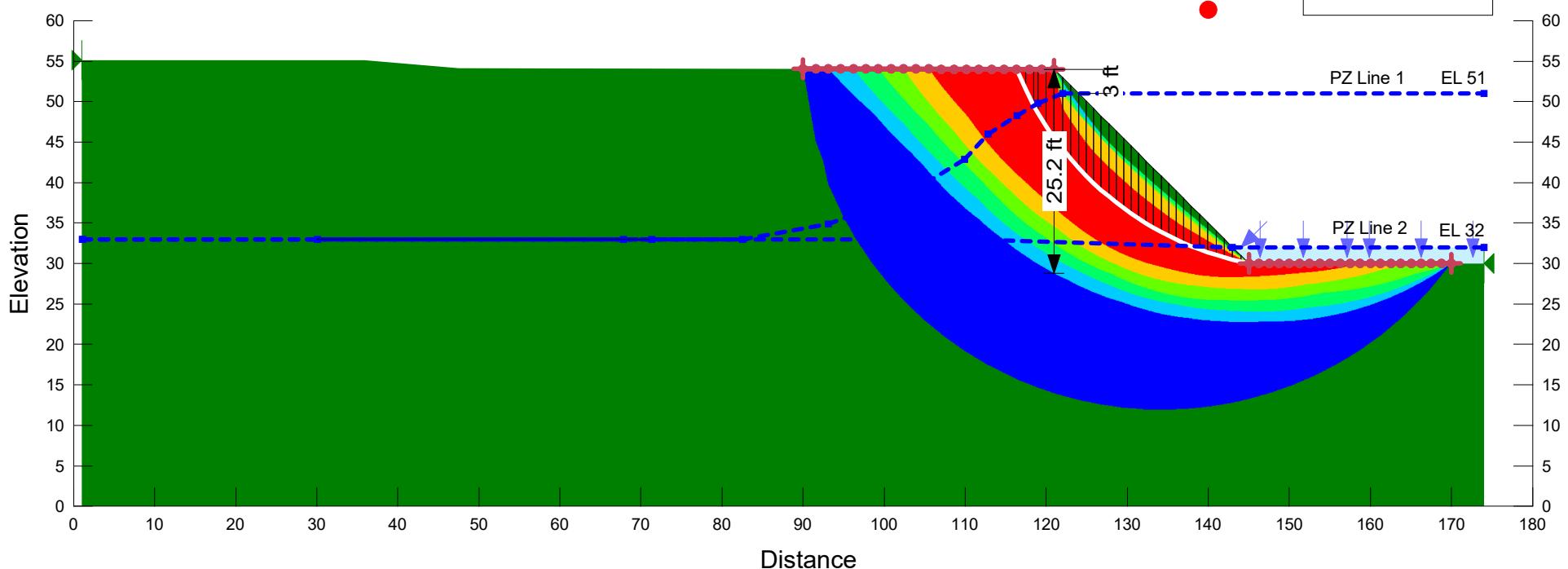
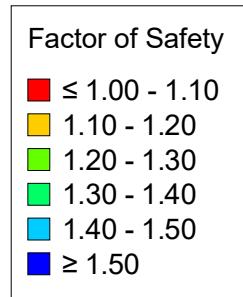
FOS: 0.69



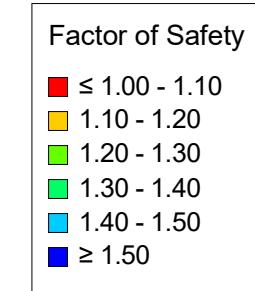
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 24 ft; Dense Sand (SM/SC)  
 1.0 to 1 Channel Slope

FOS: 0.91

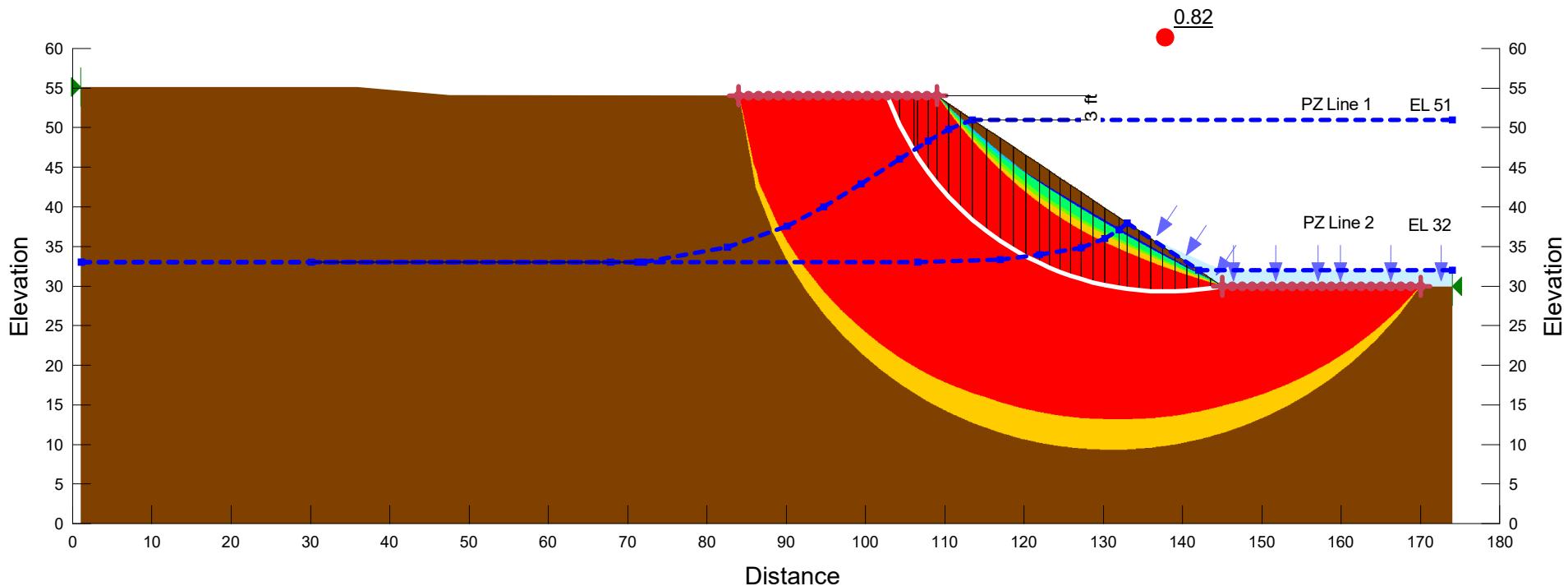


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2



Rapid Drawdown Slope Stability Analysis  
 Bank Height = 24 ft; Soft Fat Clay (CH)  
 1.5 to 1 Channel Slope

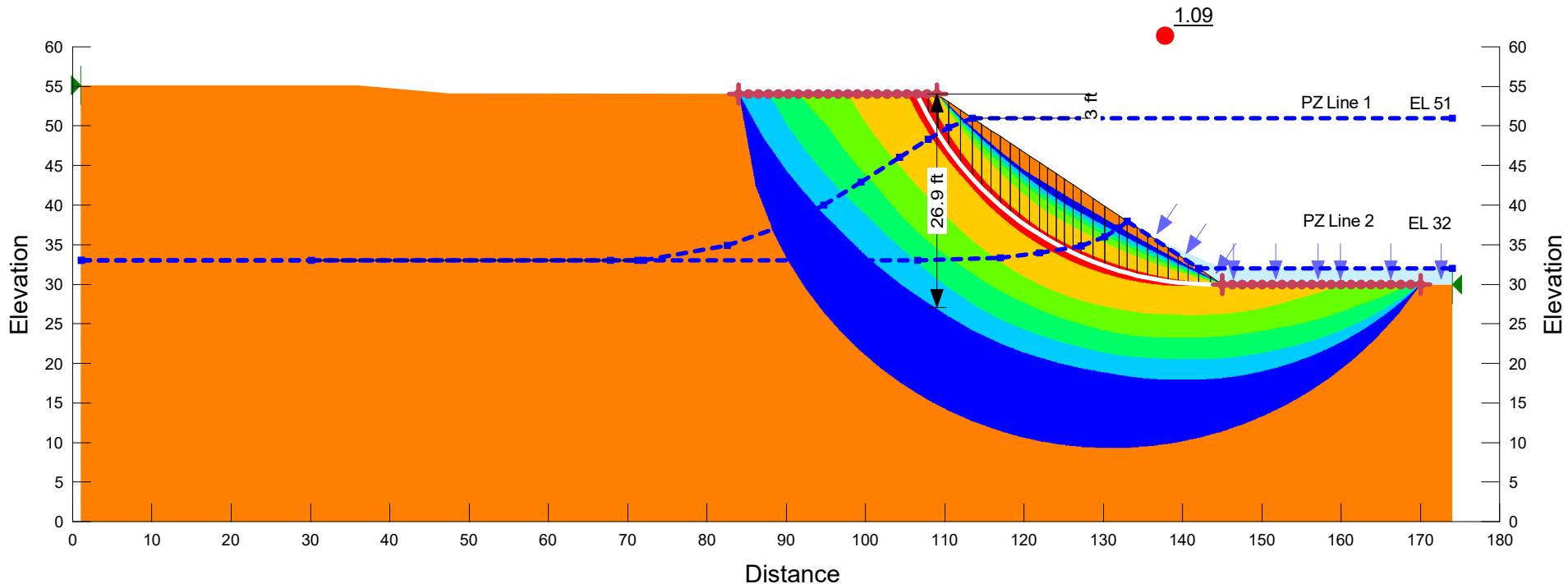
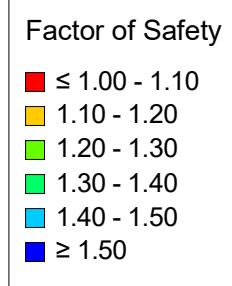
FOS: 0.82



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 24 ft; Stiff Fat Clay (CH)**  
**1.5 to 1 Channel Slope**

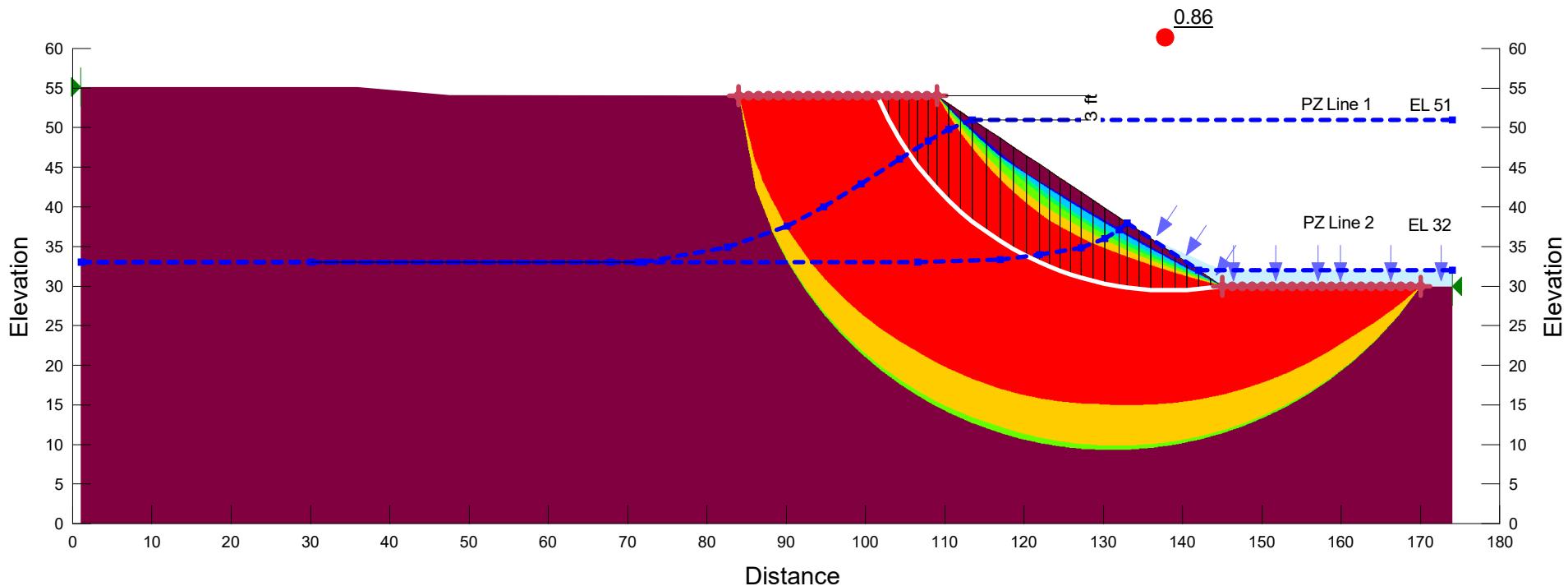
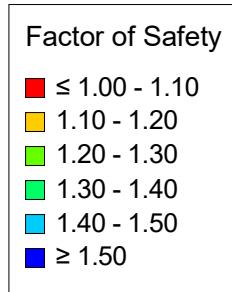
FOS: 1.09



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 24 ft; Soft Lean Clay (CL)  
 1.5 to 1 Channel Slope

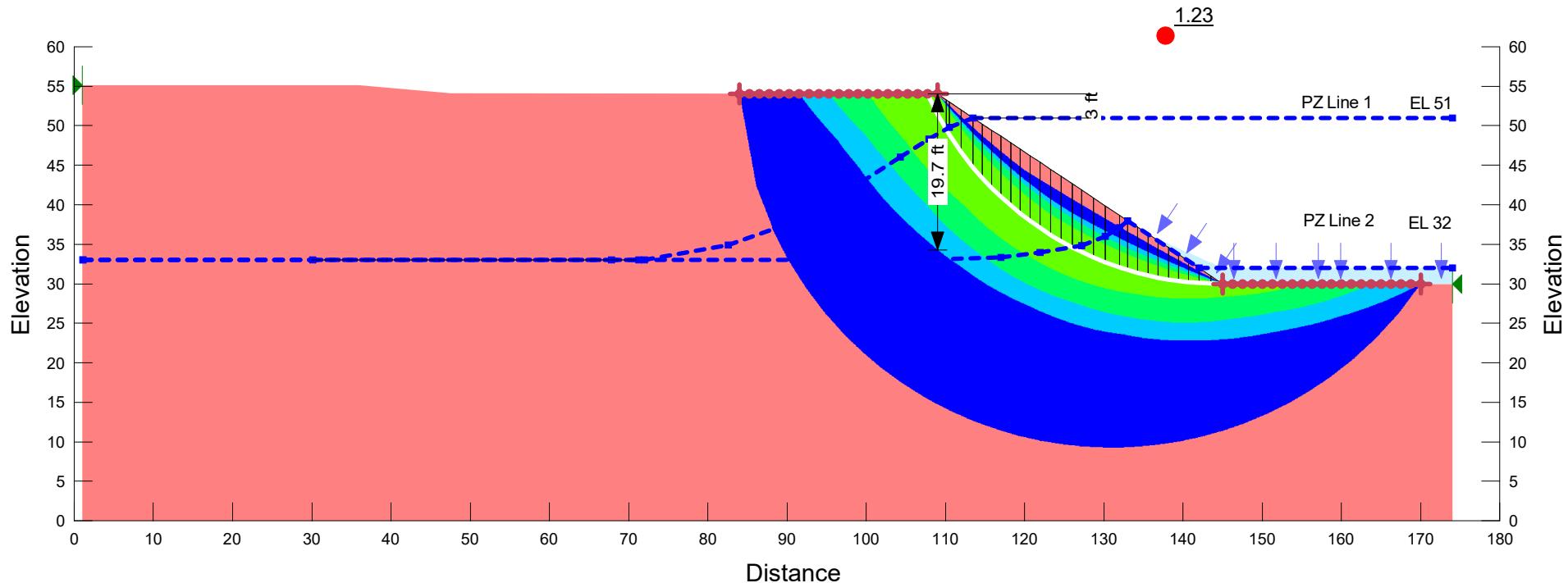
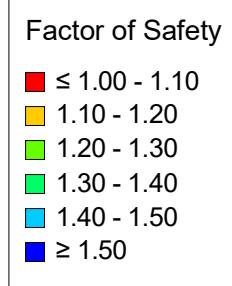
FOS: 0.86



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Soft	120	100	24	500	0	1	2

Rapid Drawdown Slope Stability Analysis  
Bank Height = 24 ft; Stiff Lean Clay (CL)  
1.5 to 1 Channel Slope

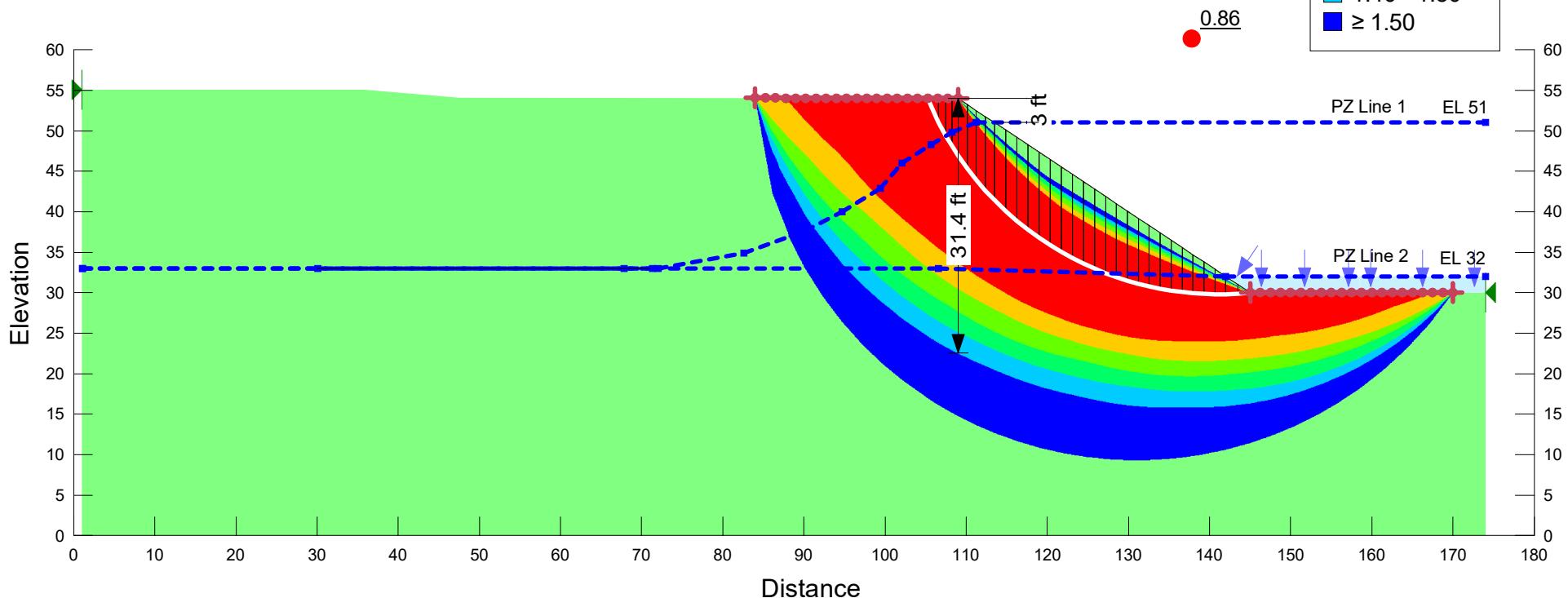
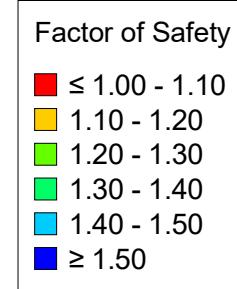
FOS: 1.23



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
<span style="background-color: red;">■</span>	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 24 ft; Loose Sand (SM/SC)**  
**1.5 to 1 Channel Slope**

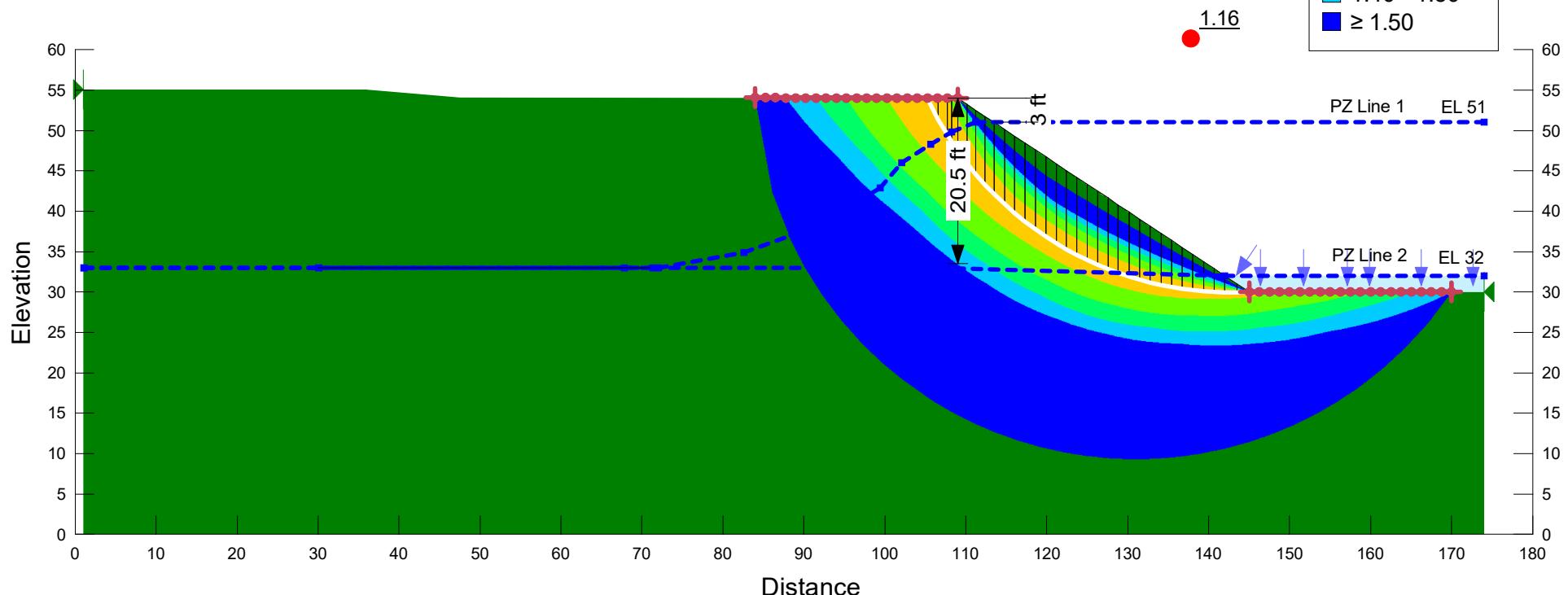
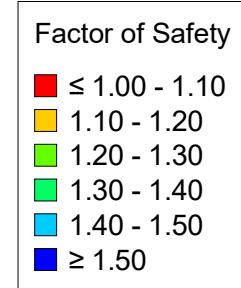
FOS: 0.86



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 24 ft; Dense Sand (SM/SC)**  
**1.5 to 1 Channel Slope**

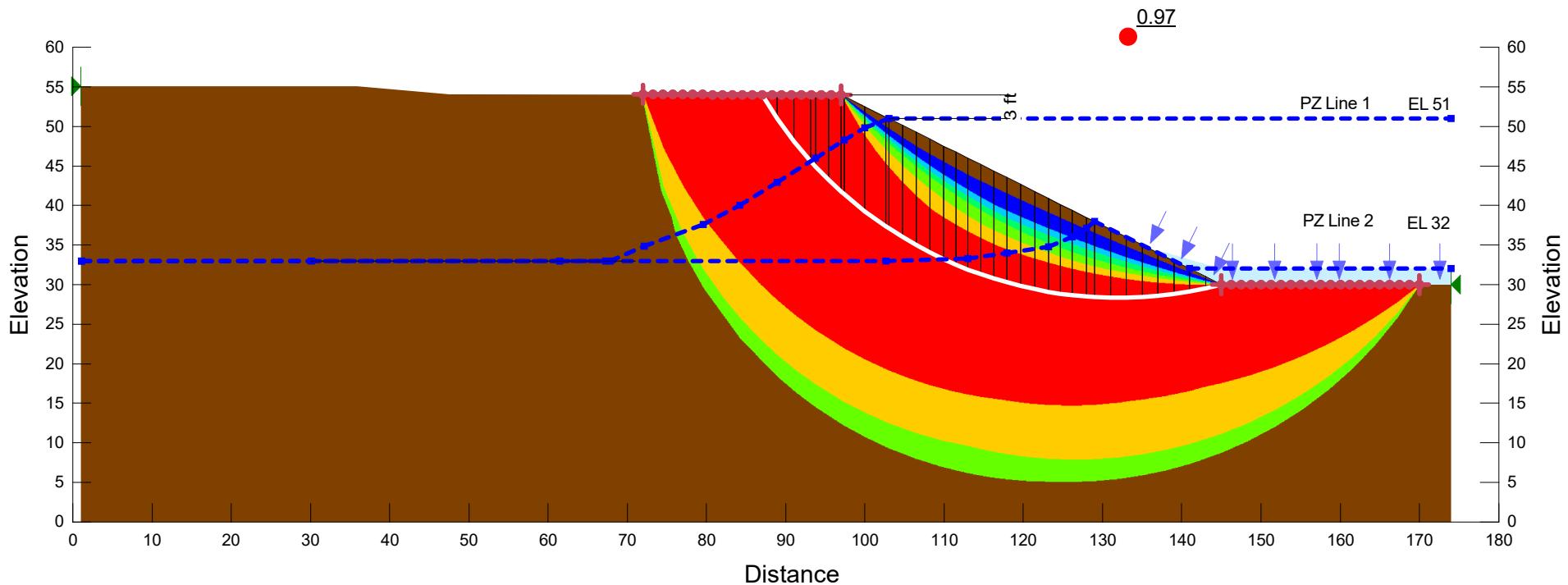
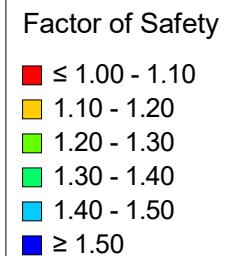
FOS: 1.16



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 24 ft; Soft Fat Clay (CH)**  
**2.0 to 1 Channel Slope**

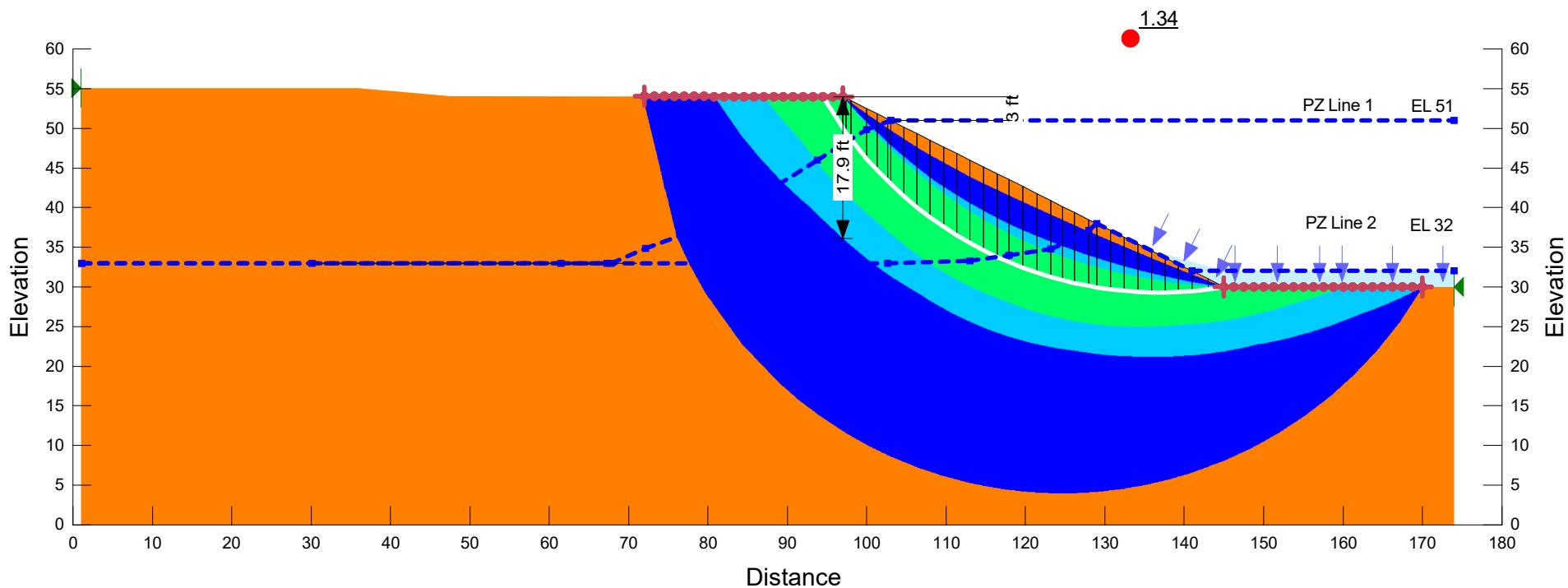
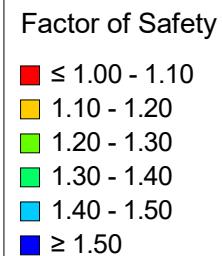
FOS: 0.97



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 24 ft; Stiff Fat Clay (CH)**  
**2.0 to 1 Channel Slope**

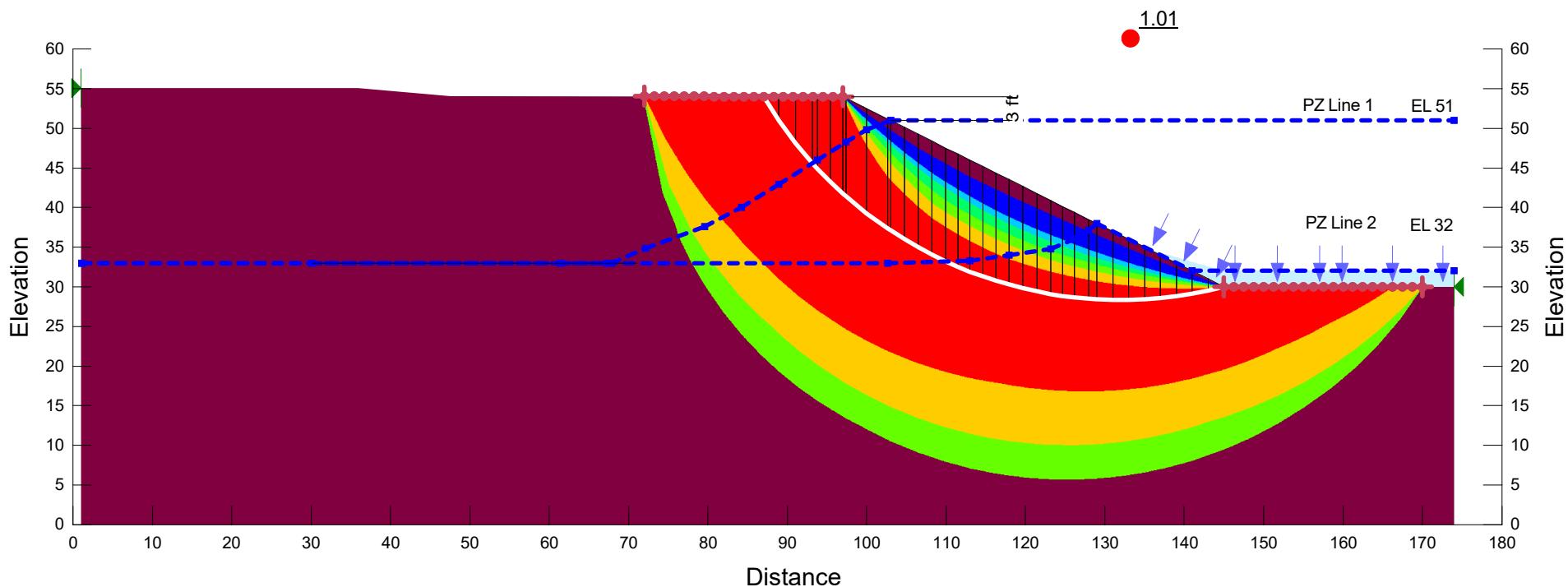
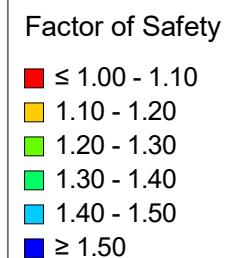
FOS: 1.34



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 24 ft; Soft Lean Clay (CL)**  
**2.0 to 1 Channel Slope**

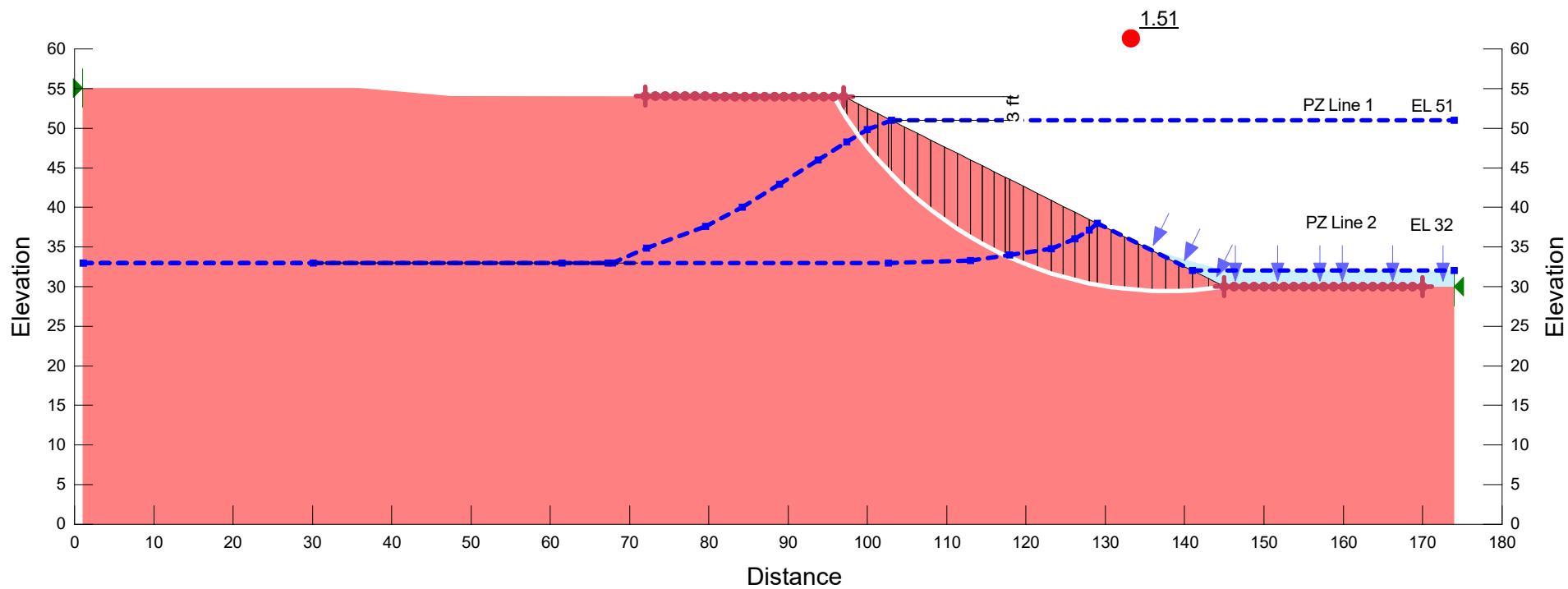
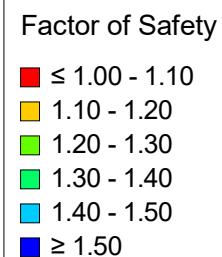
FOS: 1.01



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 24 ft; Stiff Lean Clay (CL)**  
**2.0 to 1 Channel Slope**

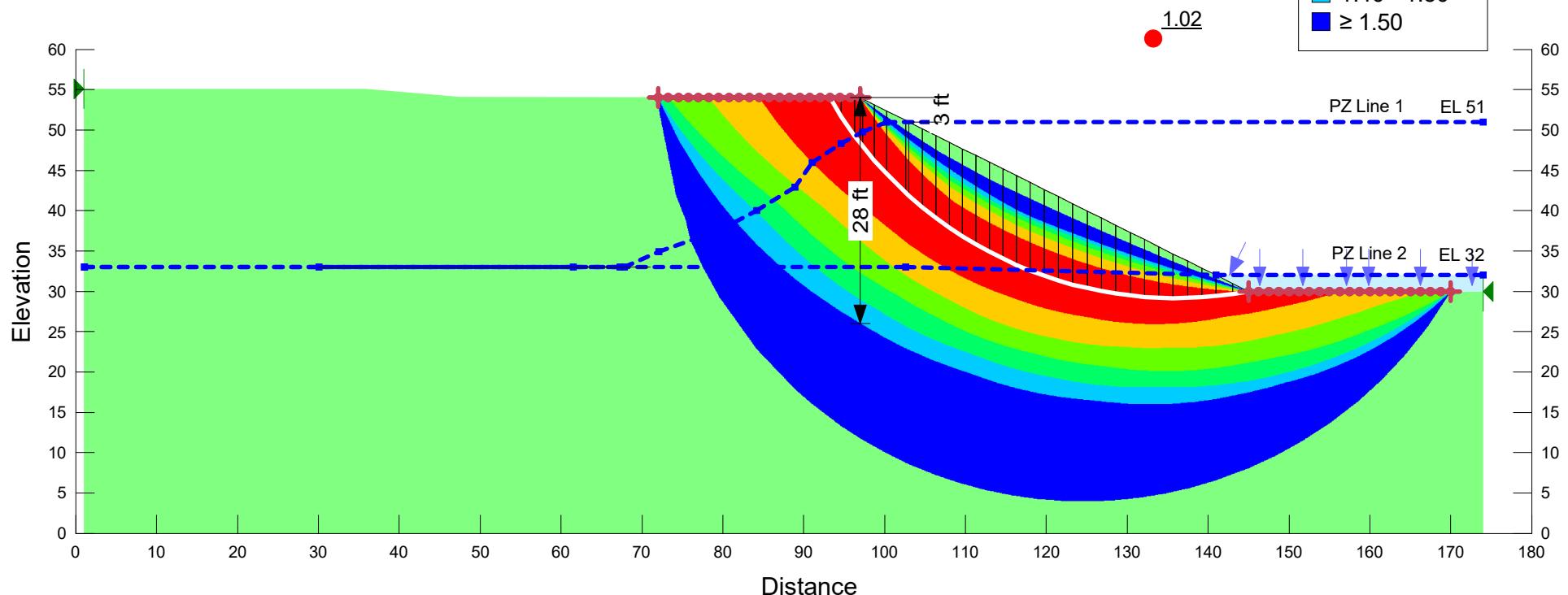
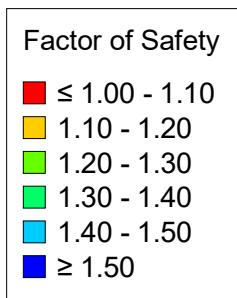
FOS: 1.51



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 24 ft; Loose Sand (SM/SC)**  
**2.0 to 1 Channel Slope**

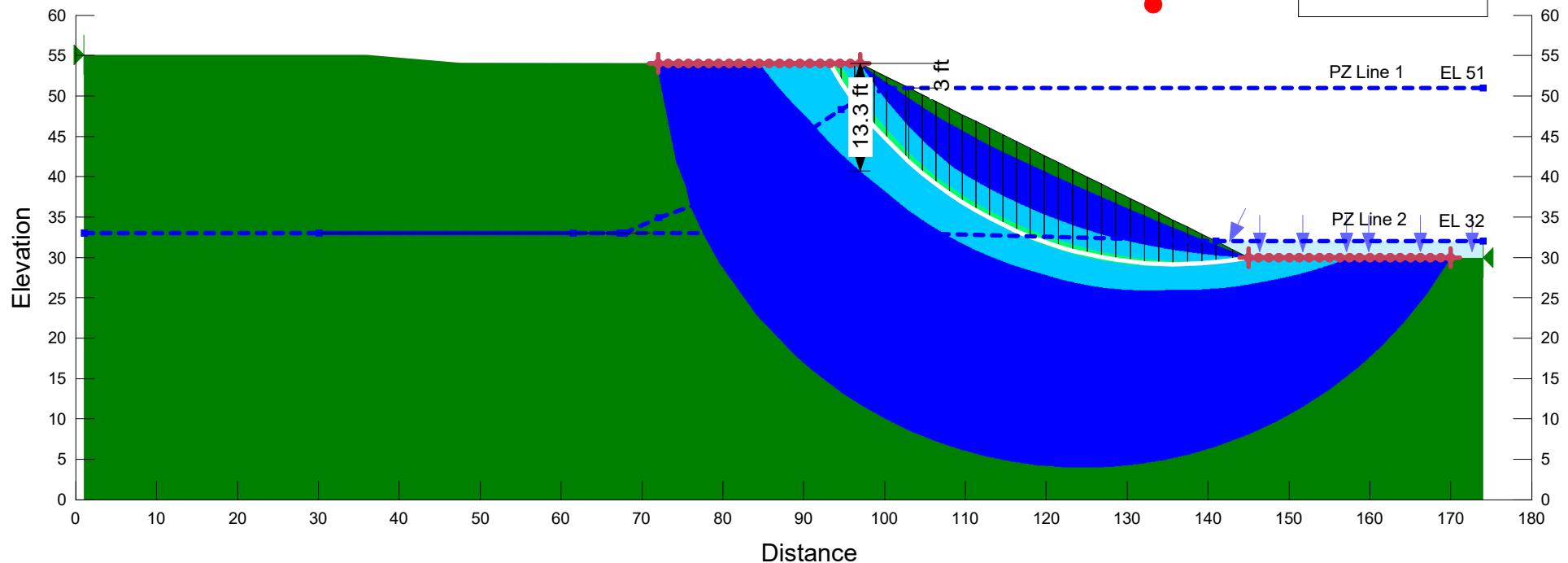
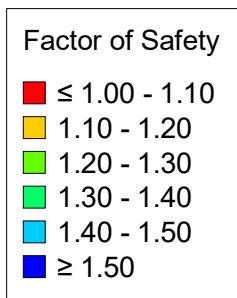
FOS: 1.02



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 24 ft; Dense Sand (SM/SC)**  
**2.0 to 1 Channel Slope**

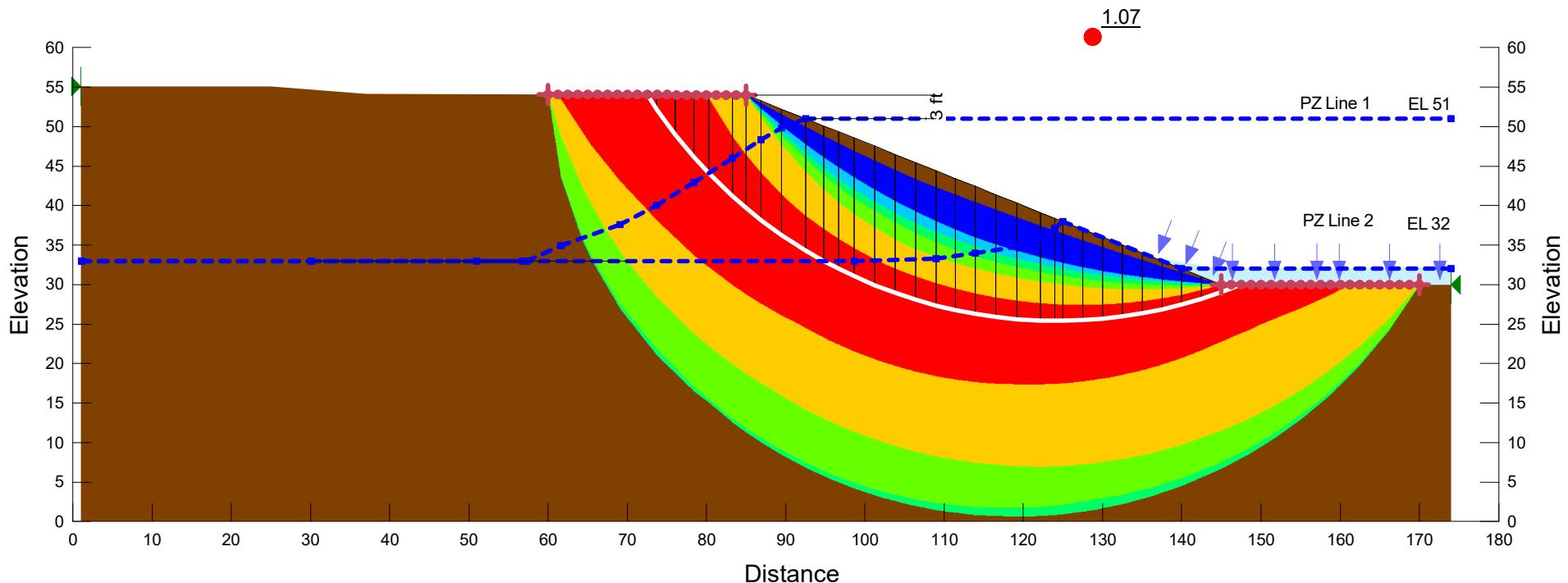
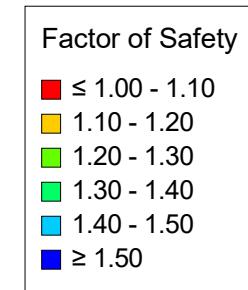
FOS: 1.40



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 24 ft; Soft Fat Clay (CH)  
 2.5 to 1 Channel Slope

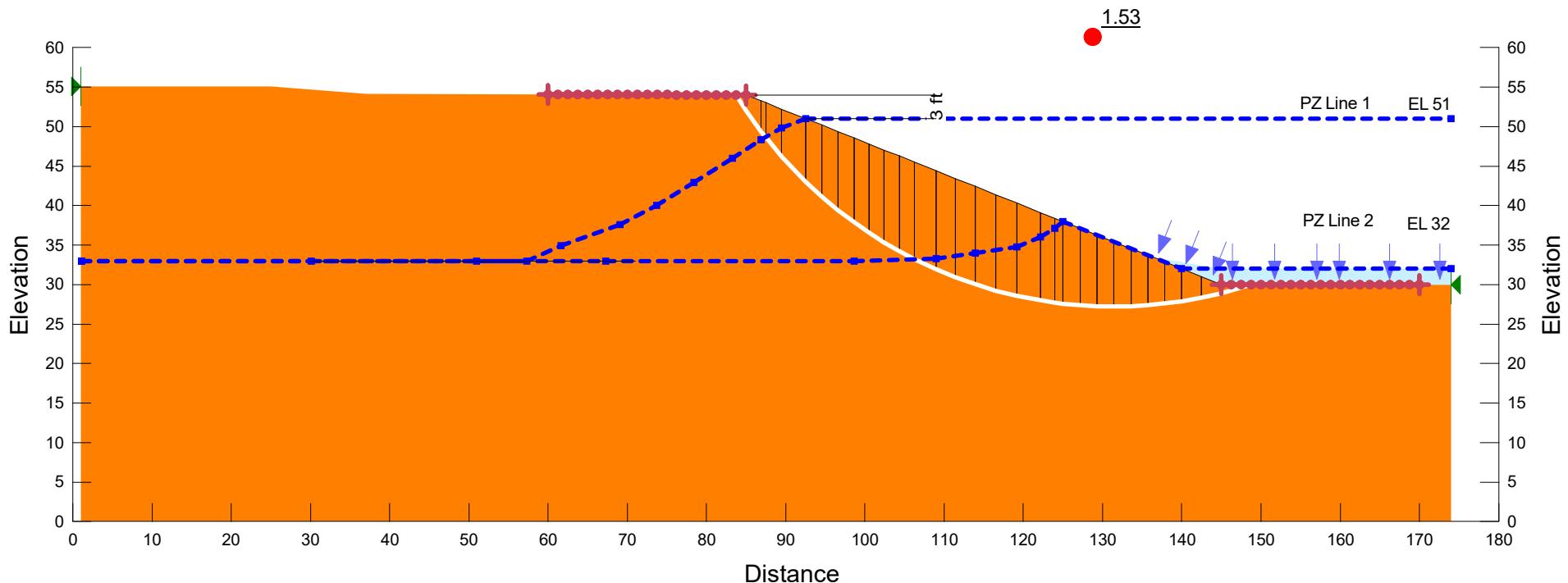
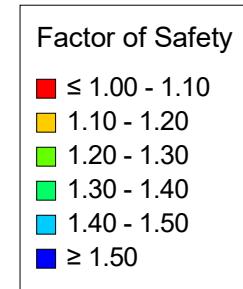
FOS: 1.07



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 24 ft; Stiff Fat Clay (CH)**  
**2.5 to 1 Channel Slope**

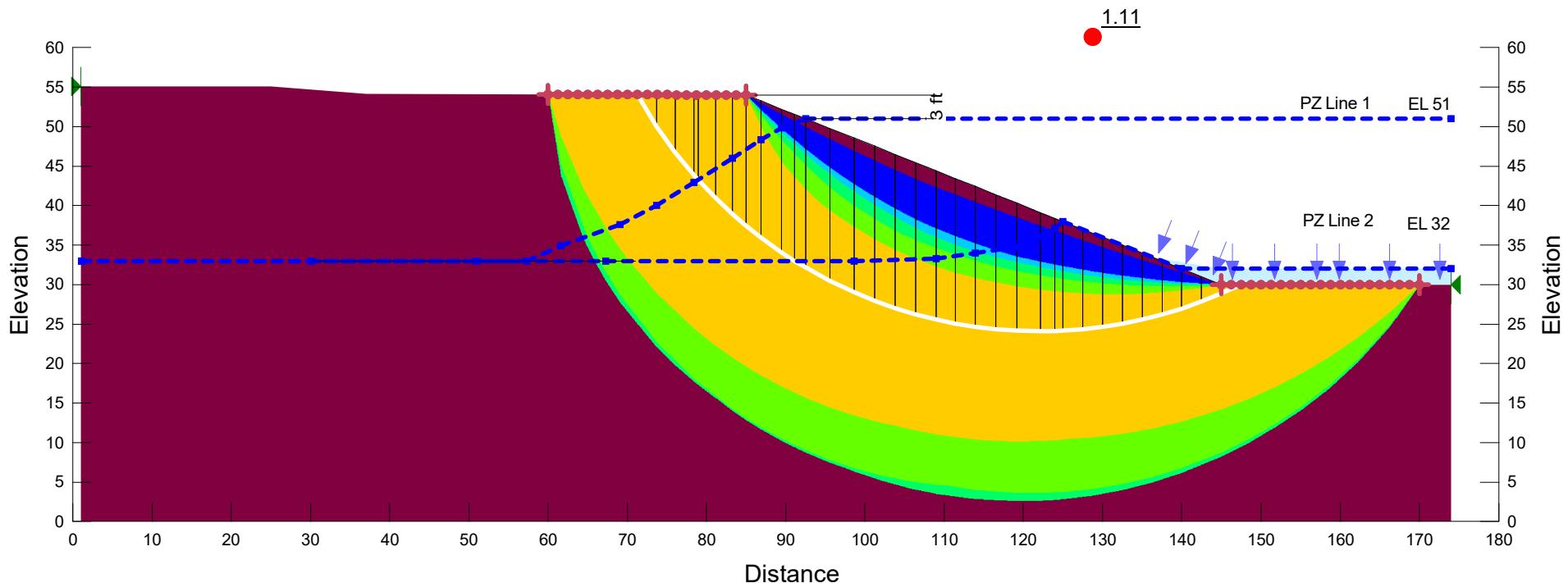
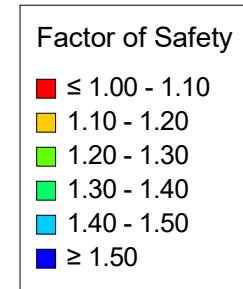
FOS: 1.53



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 24 ft; Soft Lean Clay (CL)**  
**2.5 to 1 Channel Slope**

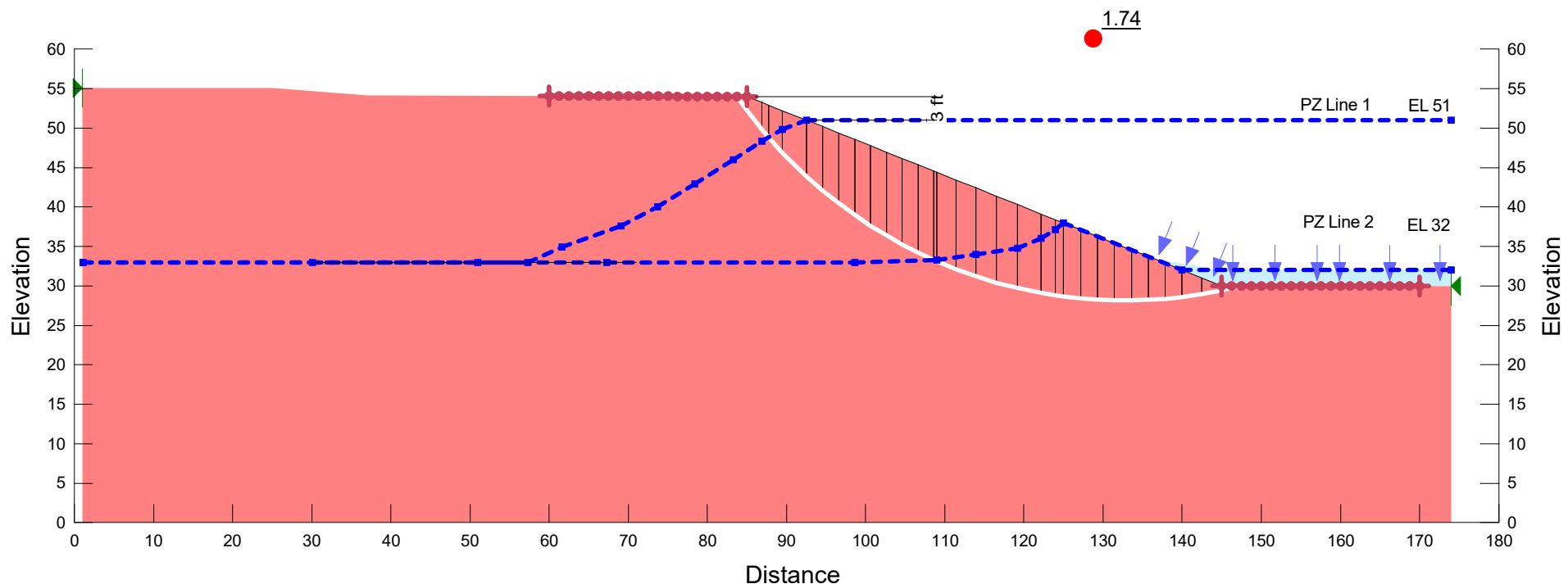
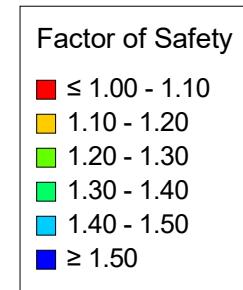
FOS: 1.11



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Maroon	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 24 ft; Stiff Lean Clay (CL)**  
**2.5 to 1 Channel Slope**

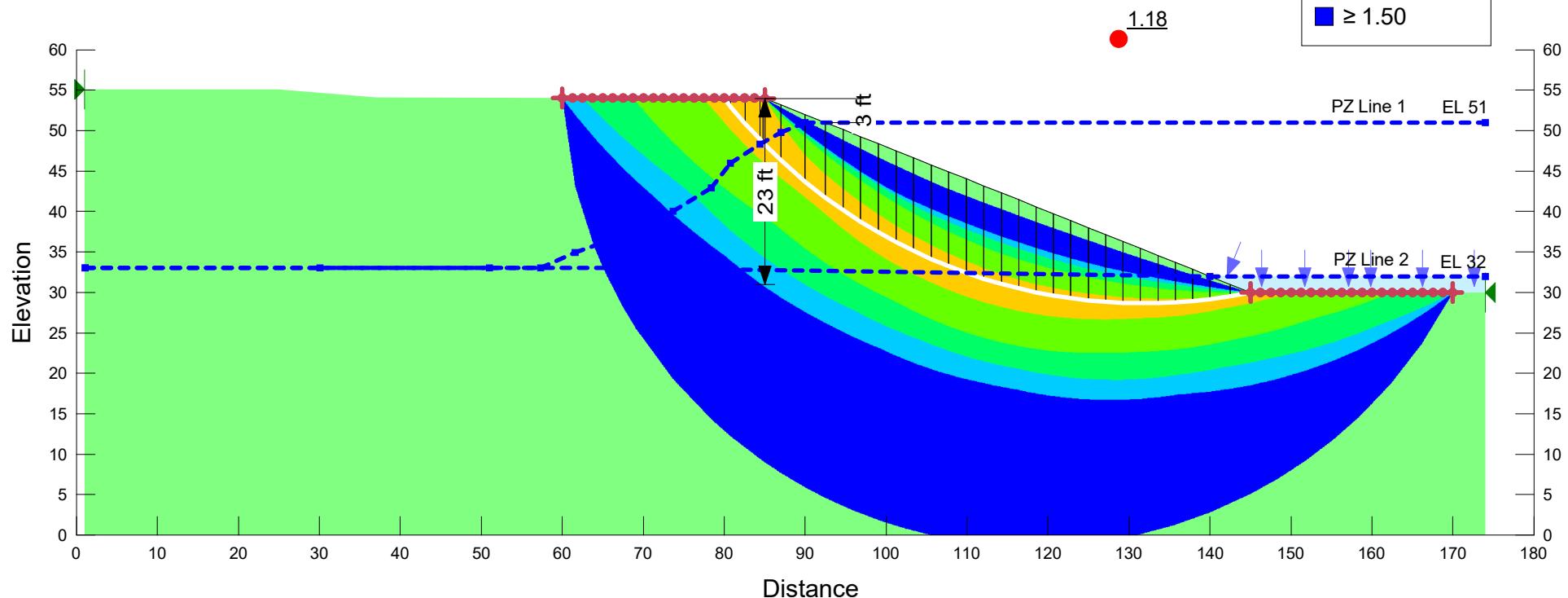
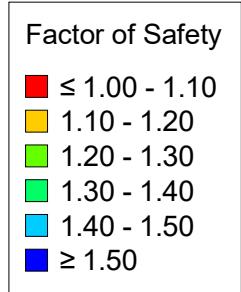
FOS: 1.74



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■ CL Stiff	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 24 ft; Loose Sand (SM/SC)  
 2.5 to 1 Channel Slope

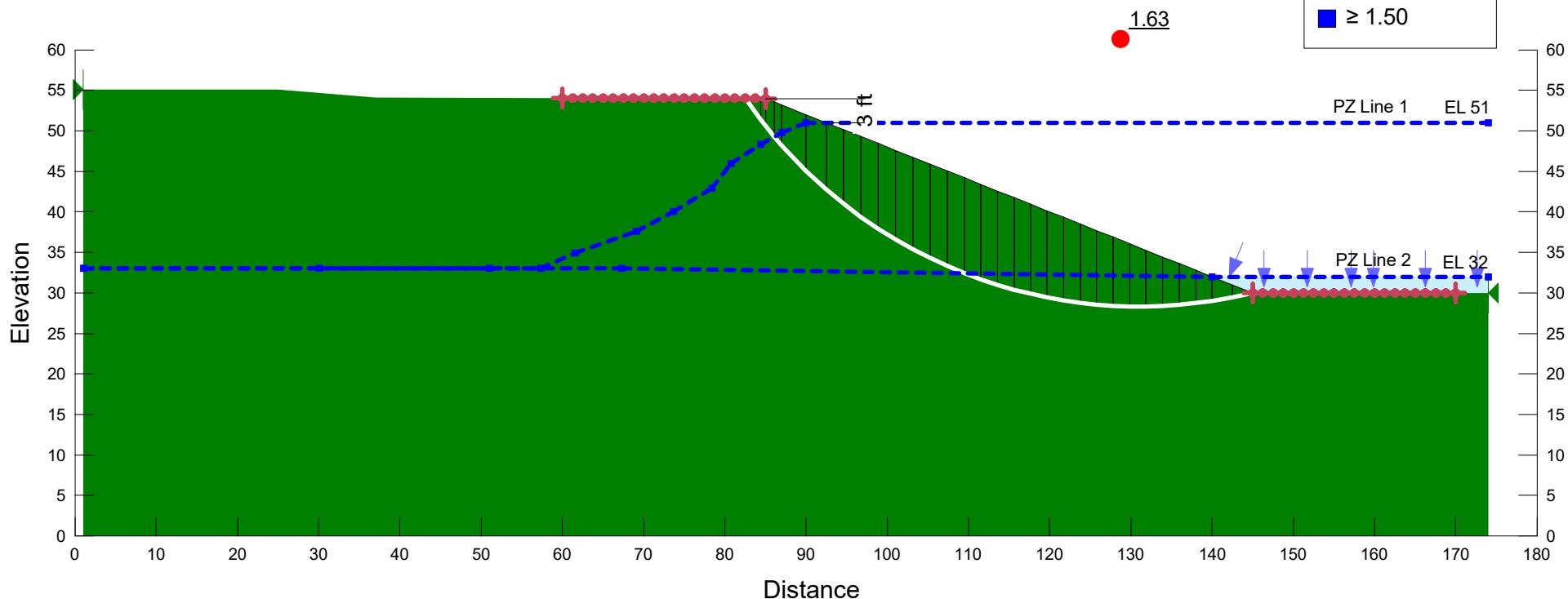
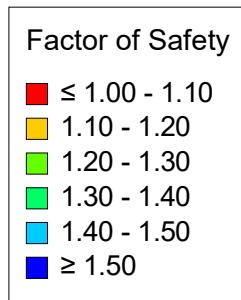
FOS: 1.18



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 24 ft; Dense Sand (SM/SC)**  
**2.5 to 1 Channel Slope**

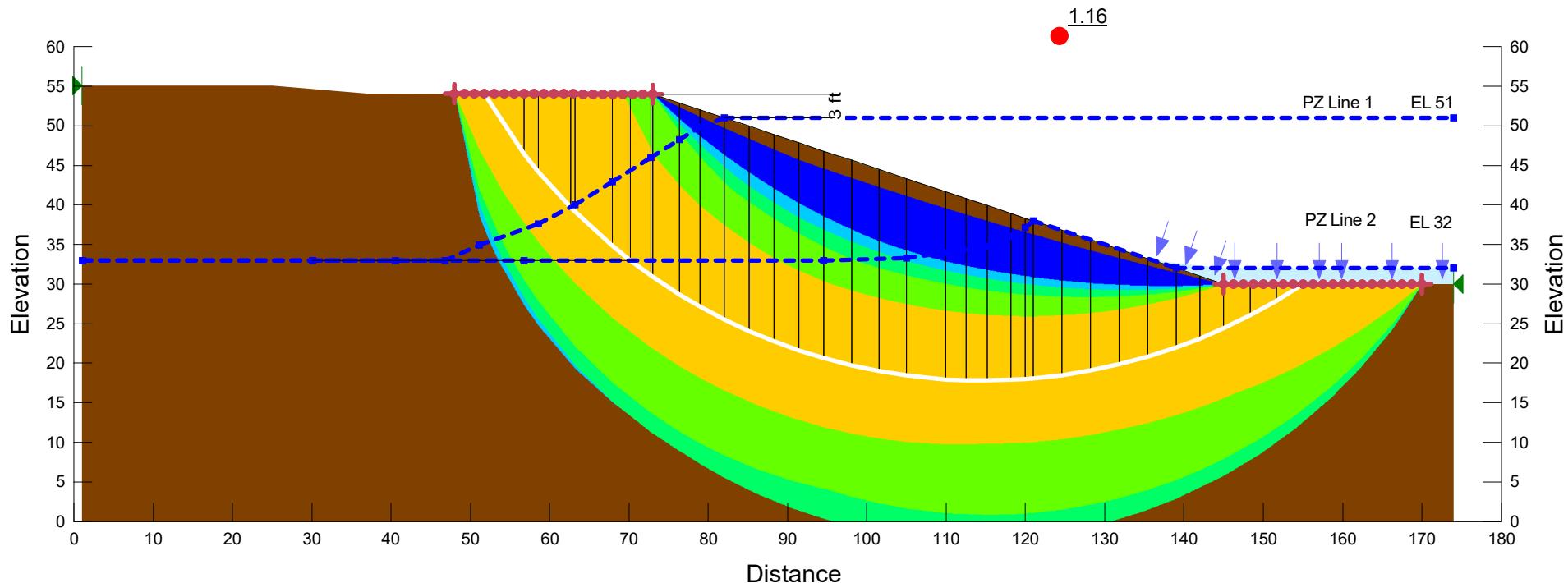
FOS: 1.63



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 24 ft; Soft Fat Clay (CH)  
 3.0 to 1 Channel Slope

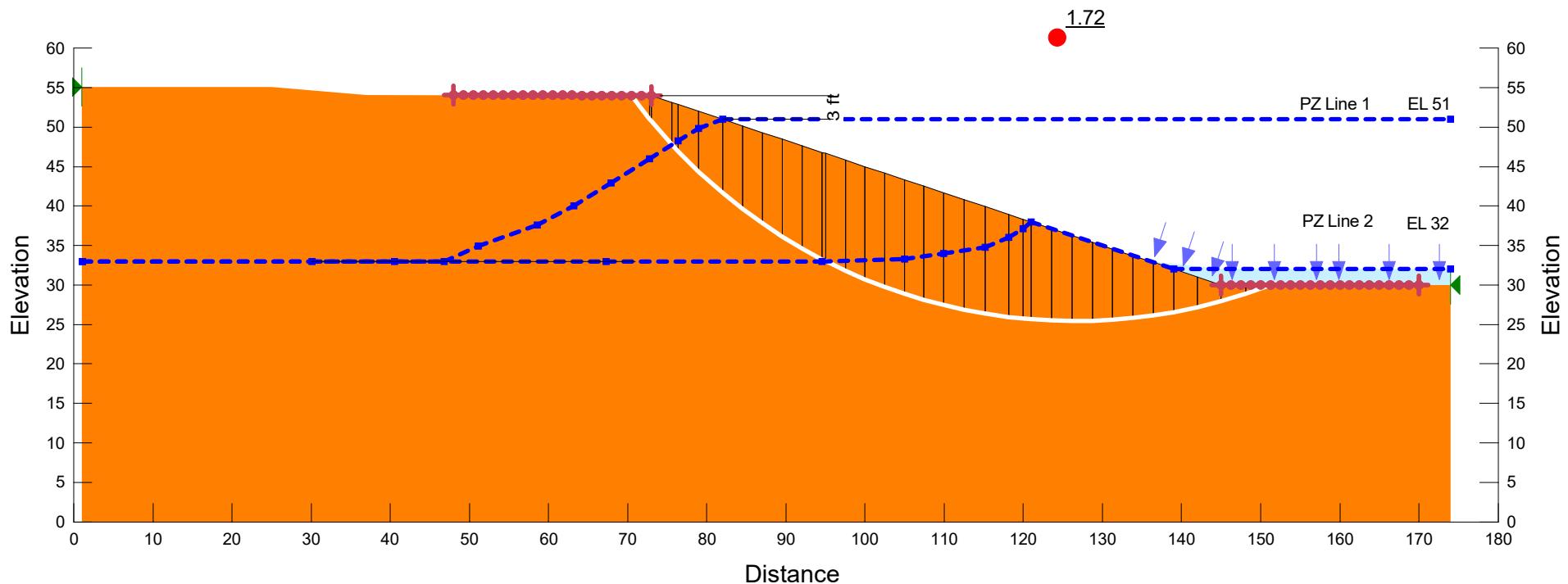
FOS: 1.16



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
█	CH Soft	120	100	22	500	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 24 ft; Stiff Fat Clay (CH)  
 3.0 to 1 Channel Slope

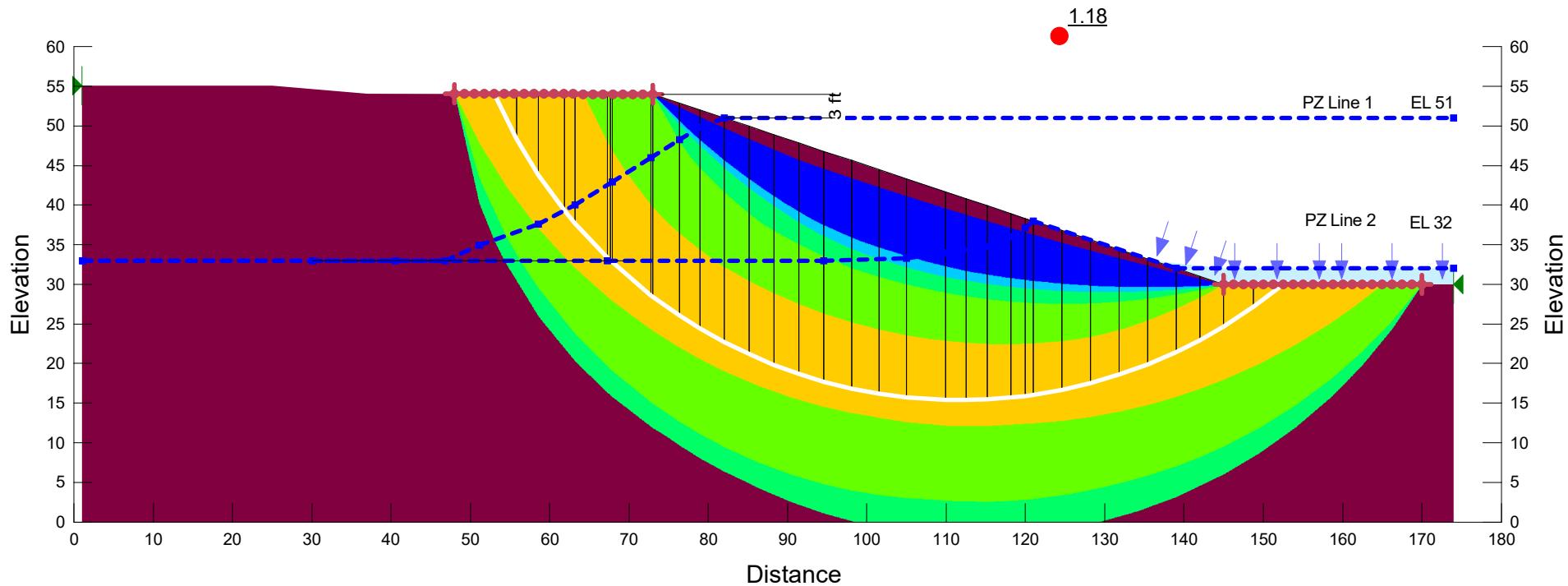
FOS: 1.72



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 24 ft; Soft Lean Clay (CL)**  
**3.0 to 1 Channel Slope**

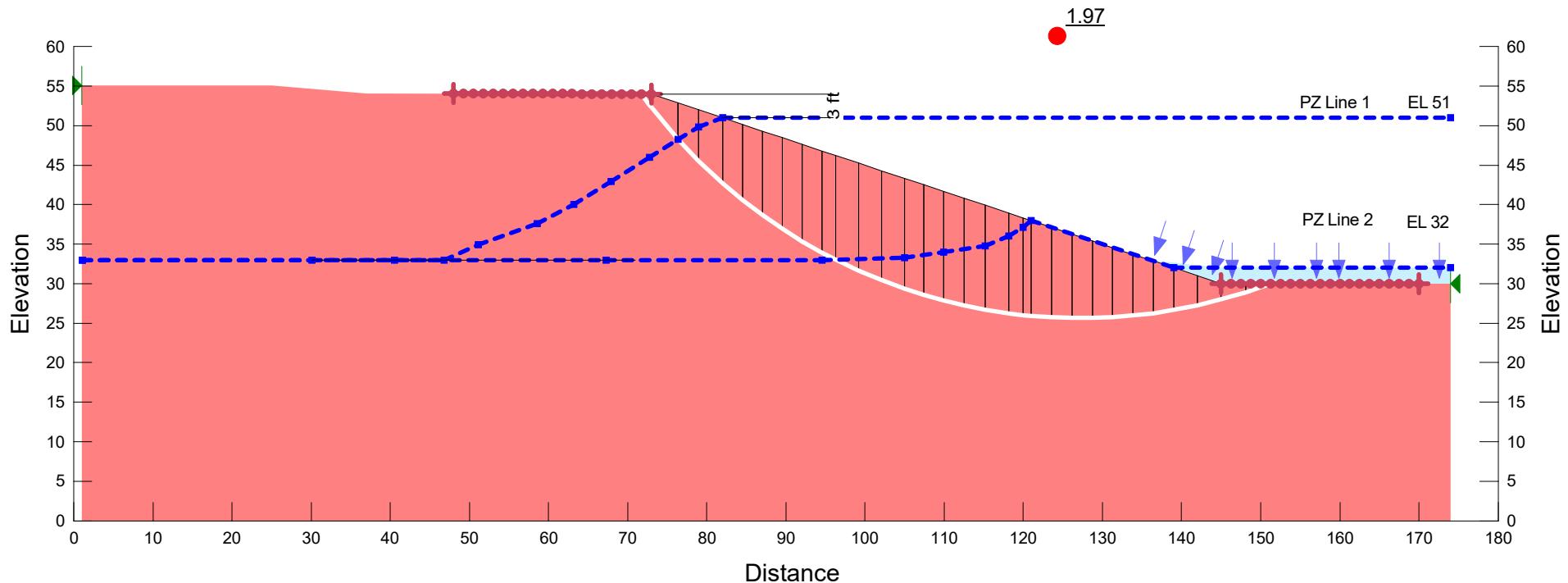
FOS: 1.18



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
Maroon	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 24 ft; Stiff Lean Clay (CL)  
 3.0 to 1 Channel Slope

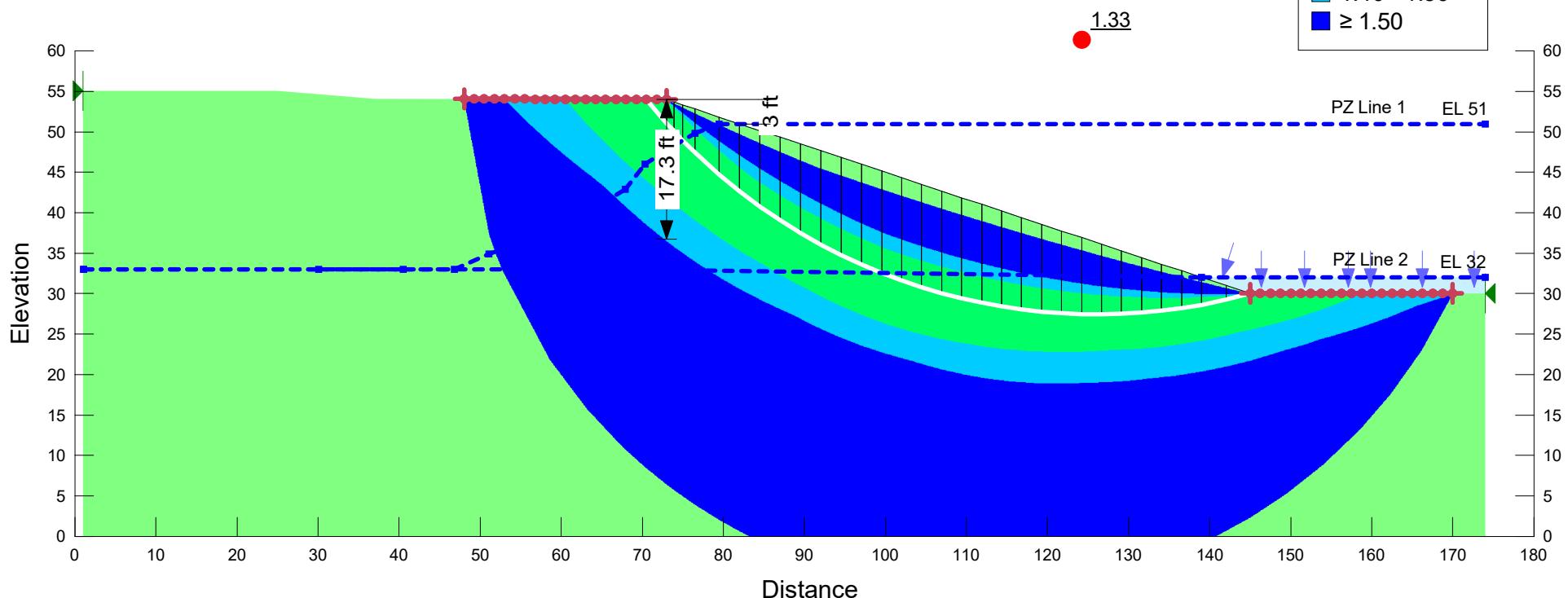
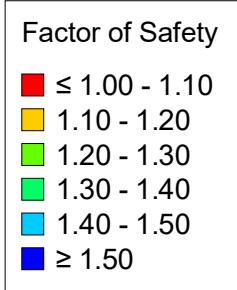
FOS: 1.97



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 24 ft; Loose Sand (SM/SC)  
 3.0 to 1 Channel Slope

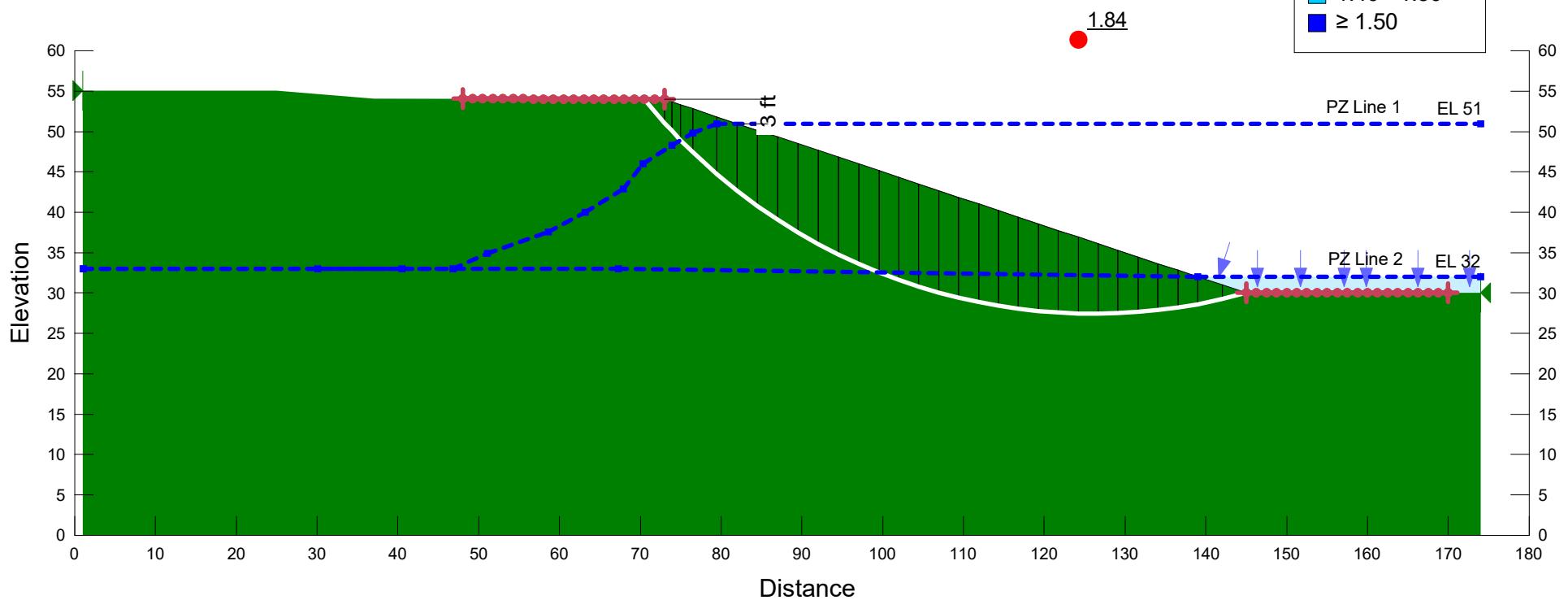
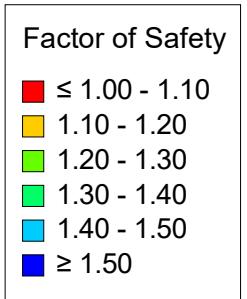
FOS: 1.33



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 24 ft; Dense Sand (SM/SC)**  
**3.0 to 1 Channel Slope**

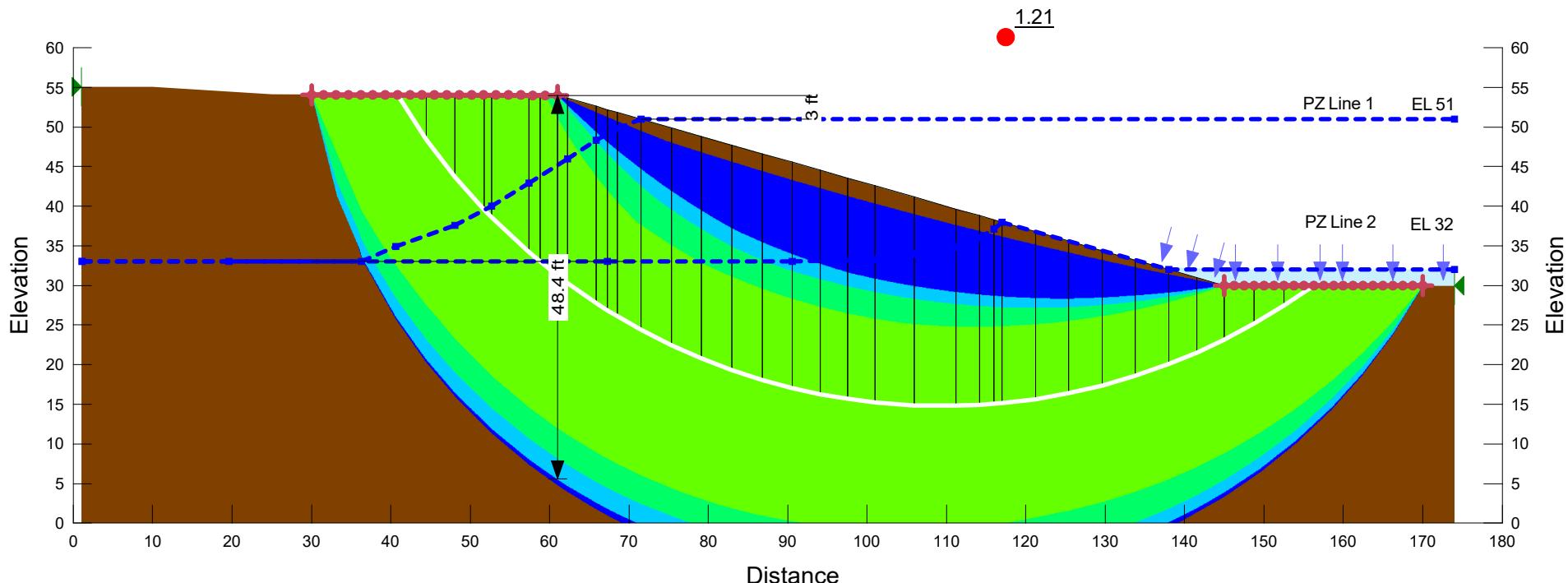
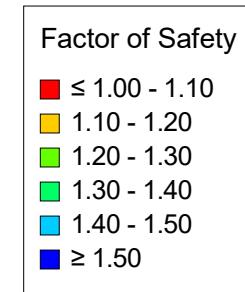
FOS: 1.84



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 24 ft; Soft Fat Clay (CH)  
 3.5 to 1 Channel Slope

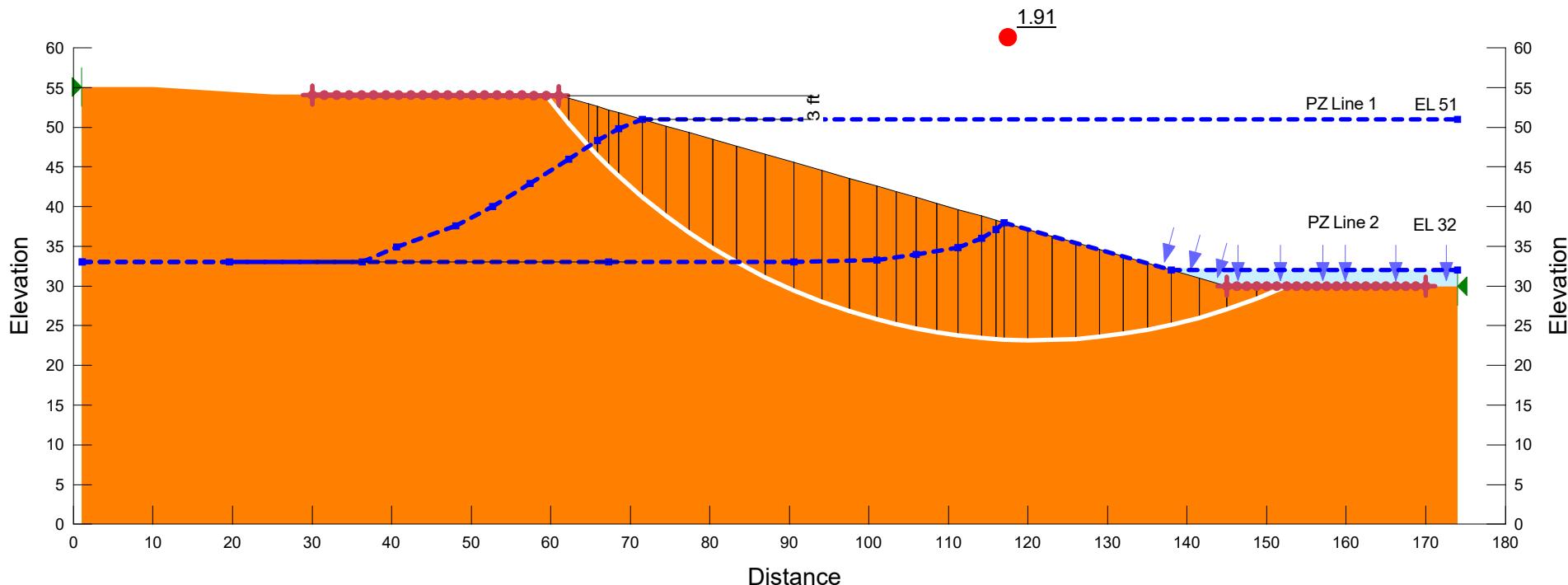
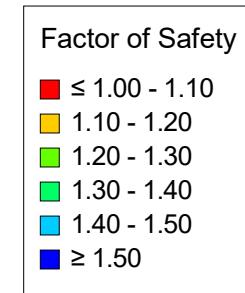
FOS: 1.21



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■ CH Soft	CH Soft	120	100	22	500	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 24 ft; Stiff Fat Clay (CH)  
 3.5 to 1 Channel Slope

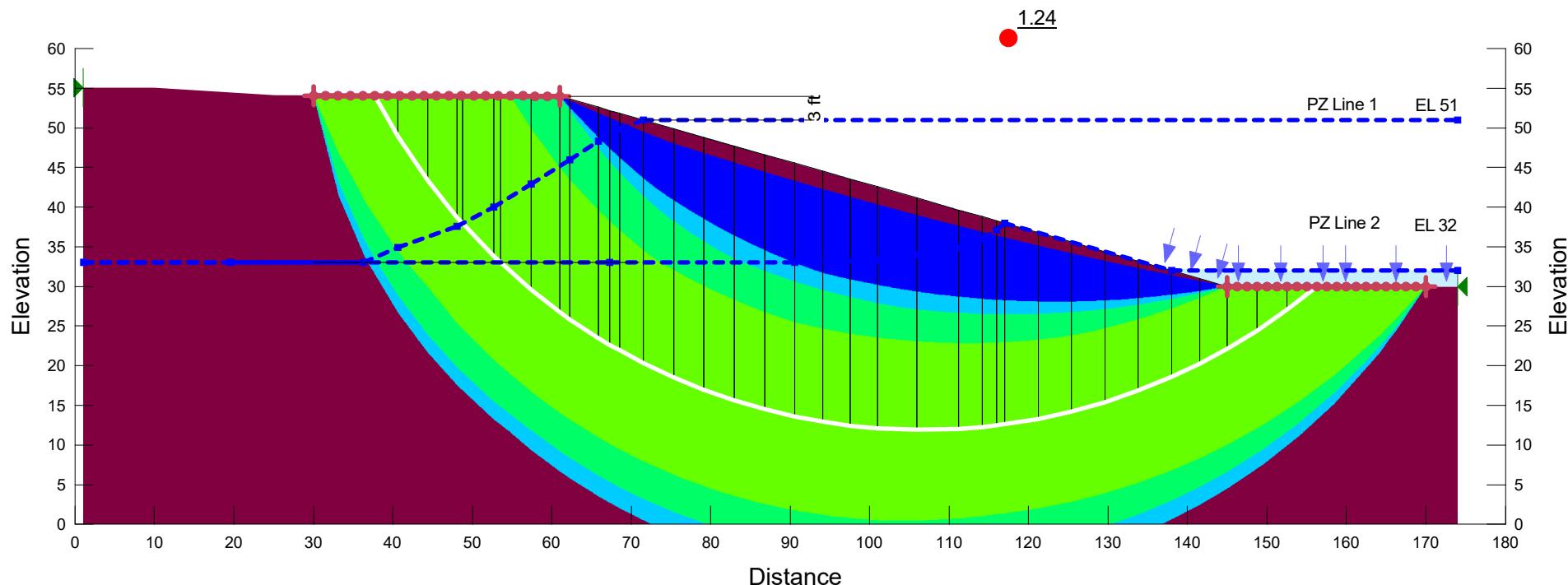
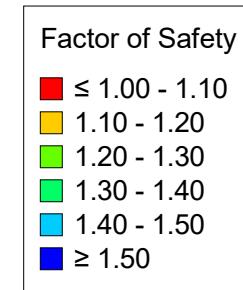
FOS: 1.91



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 24 ft; Soft Lean Clay (CL)**  
**3.5 to 1 Channel Slope**

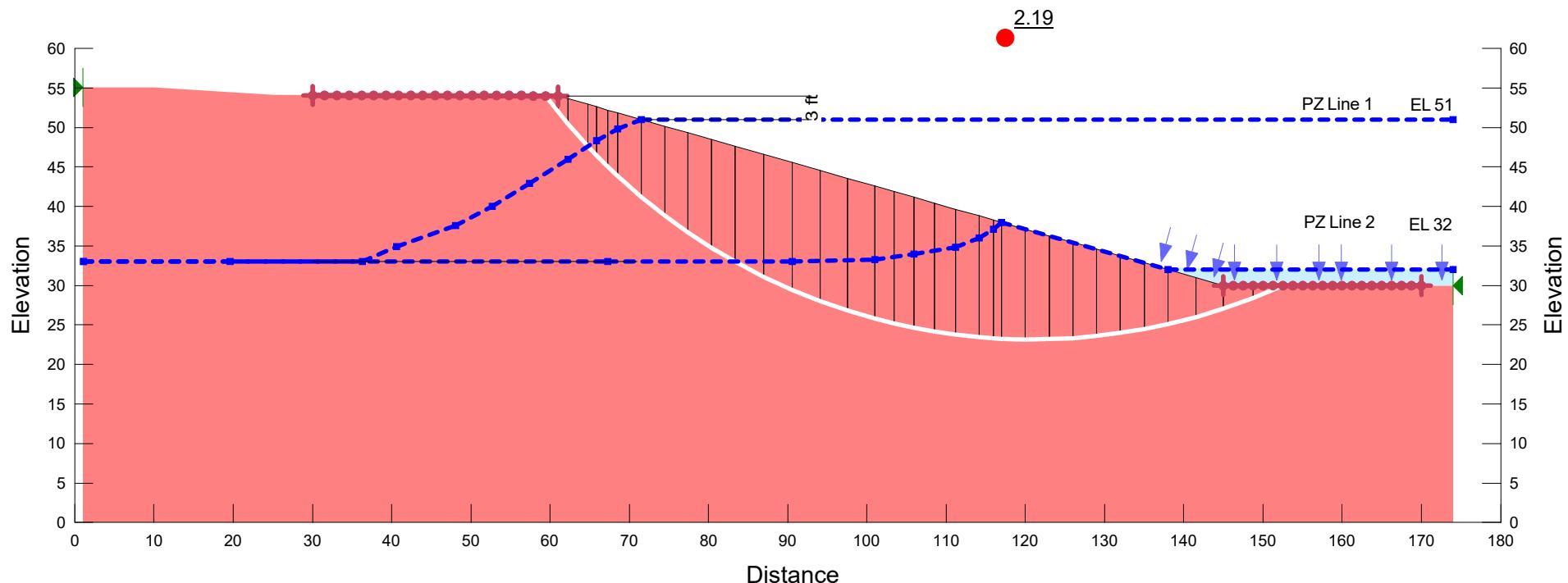
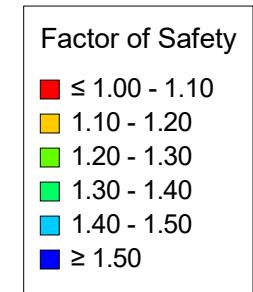
FOS: 1.24



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Maroon	CL Soft	120	100	24	500	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 24 ft; Stiff Lean Clay (CL)  
 3.5 to 1 Channel Slope

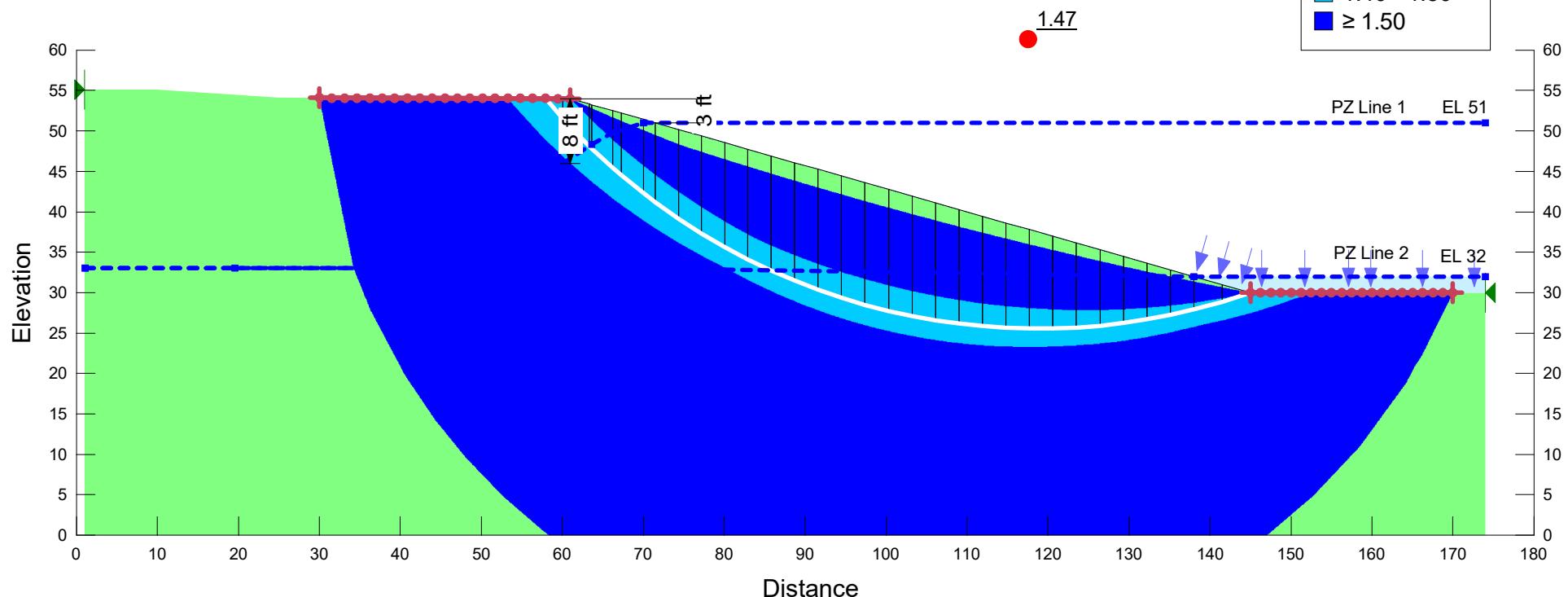
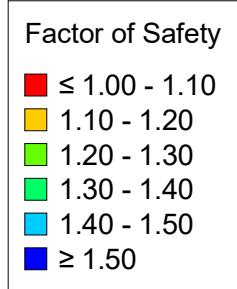
FOS: 2.19



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Red	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 24 ft; Loose Sand (SM/SC)  
 3.5 to 1 Channel Slope

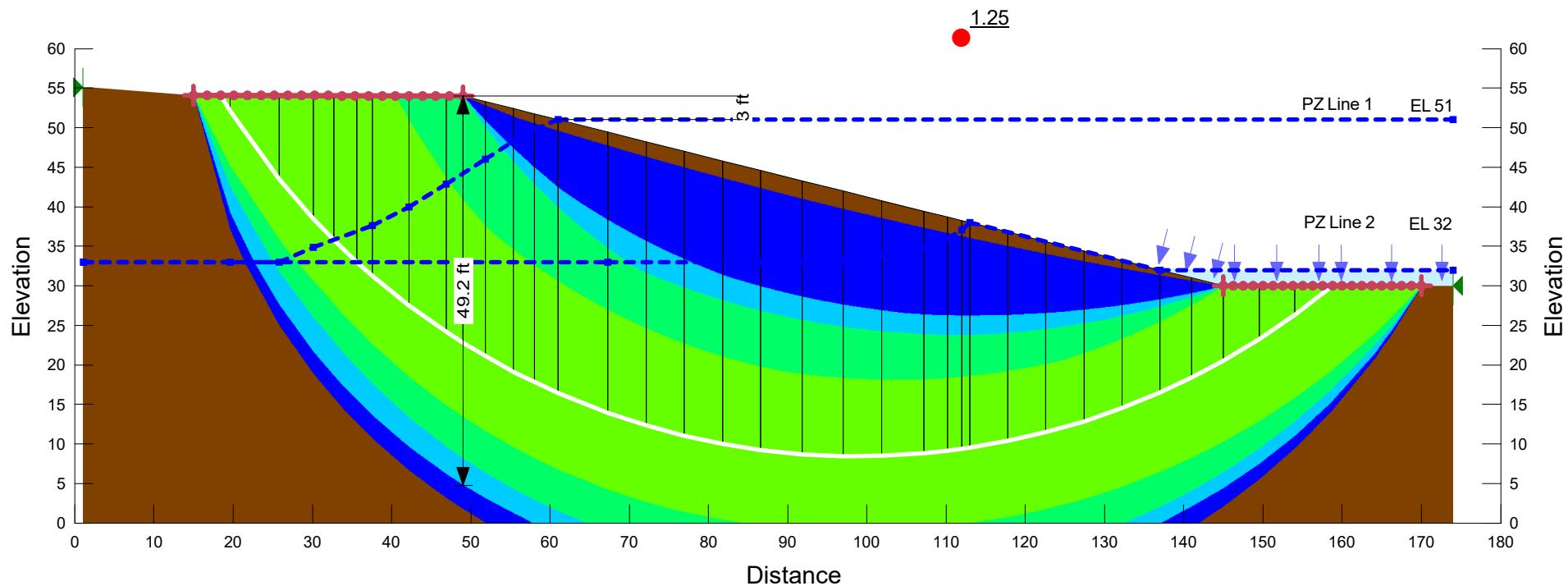
FOS: 1.47



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 24 ft; Soft Fat Clay (CH)**  
**4.0 to 1 Channel Slope**

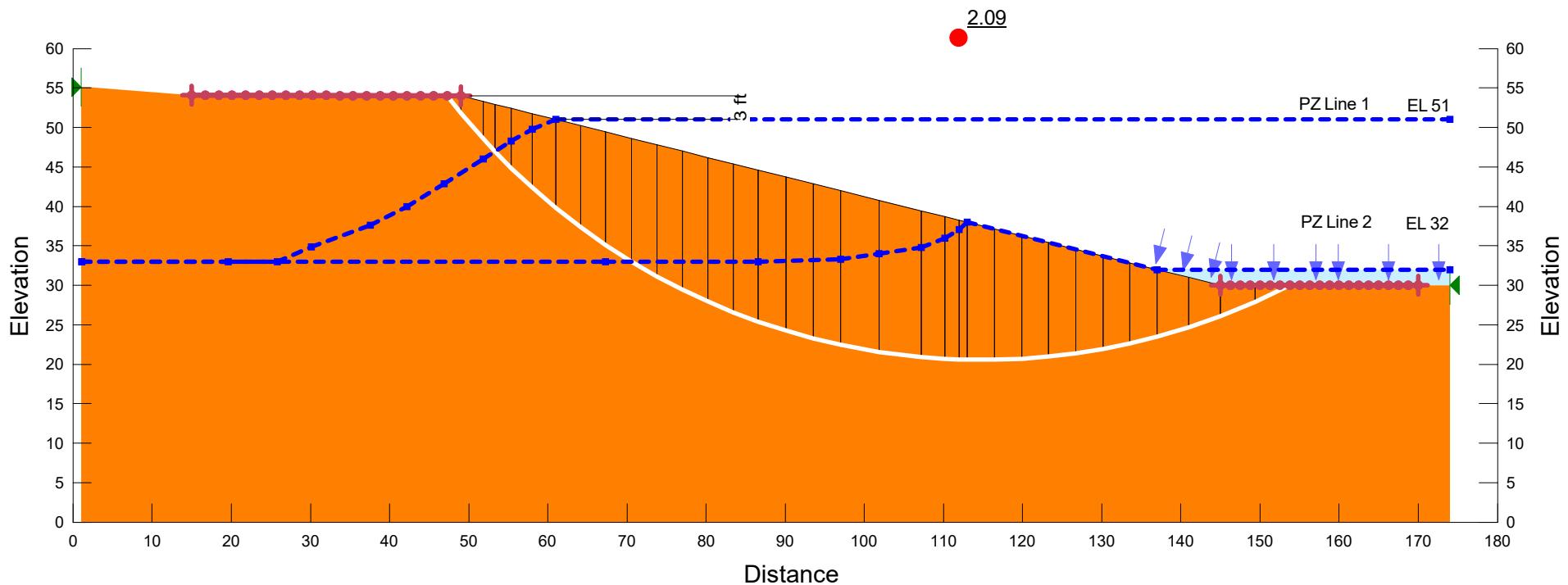
FOS: 1.25



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
brown	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 24 ft; Stiff Fat Clay (CH)**  
**4.0 to 1 Channel Slope**

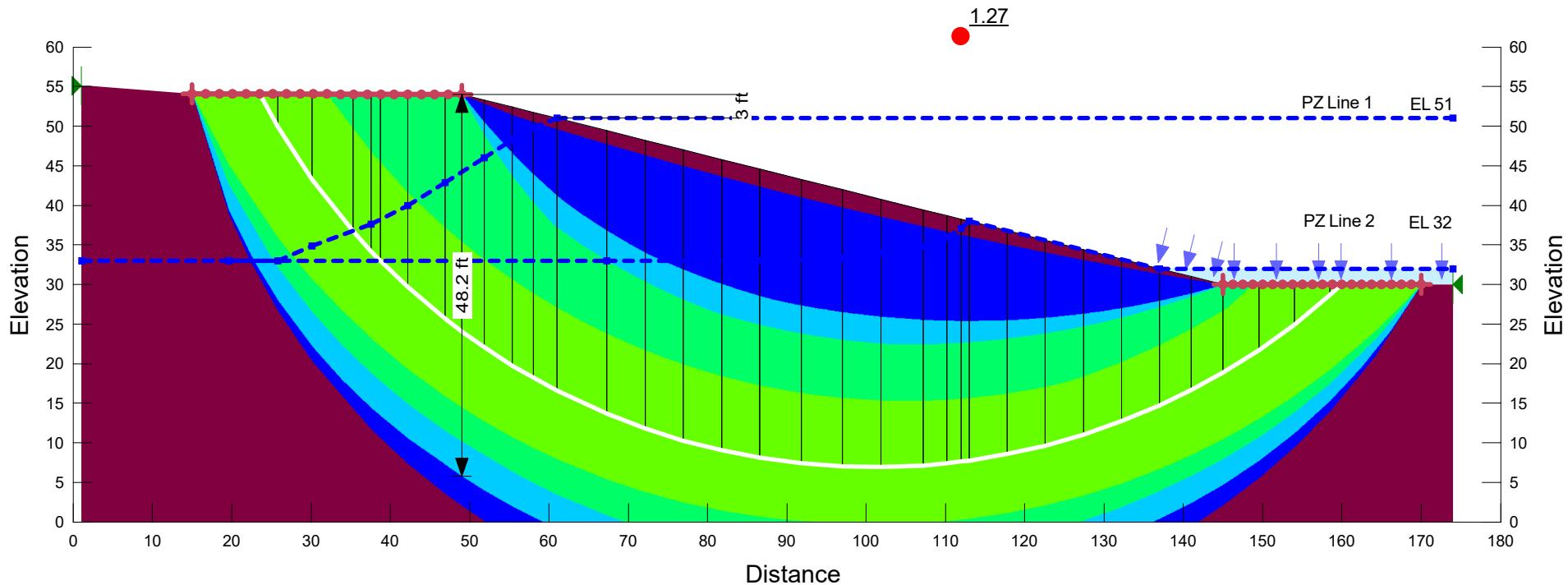
FOS: 2.09



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 24 ft; Soft Lean Clay (CL)  
 4.0 to 1 Channel Slope

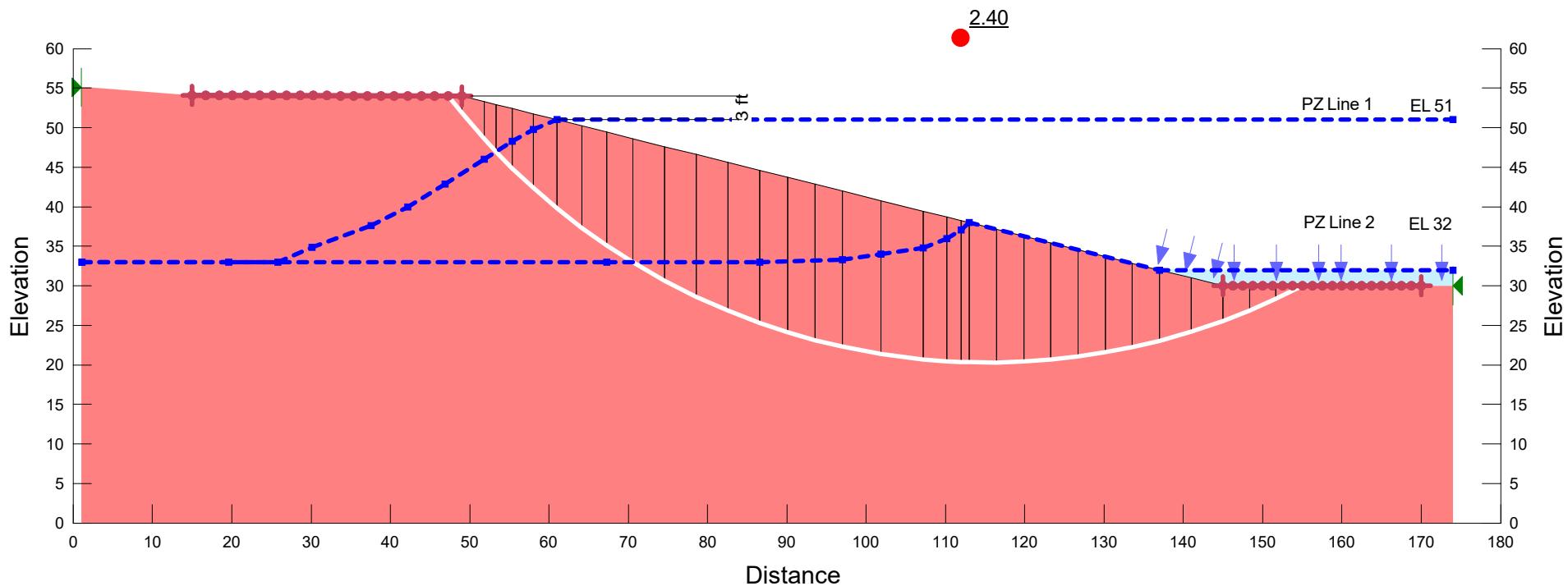
FOS: 1.27



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
CL Soft		120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 24 ft; Stiff Lean Clay (CL)**  
**4.0 to 1 Channel Slope**

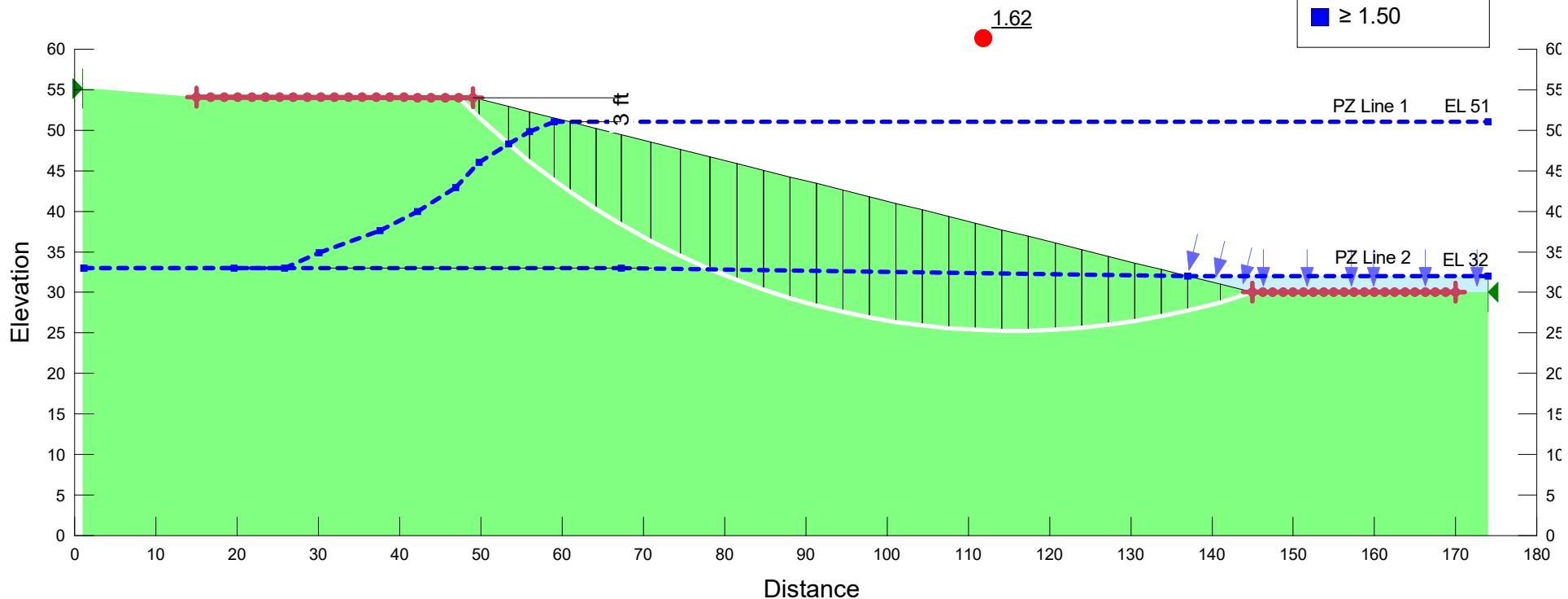
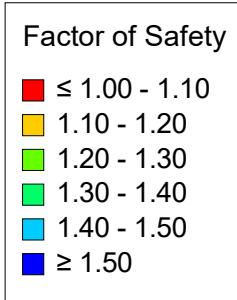
FOS: 2.40



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 24 ft; Loose Sand (SM/SC)  
 4.0 to 1 Channel Slope

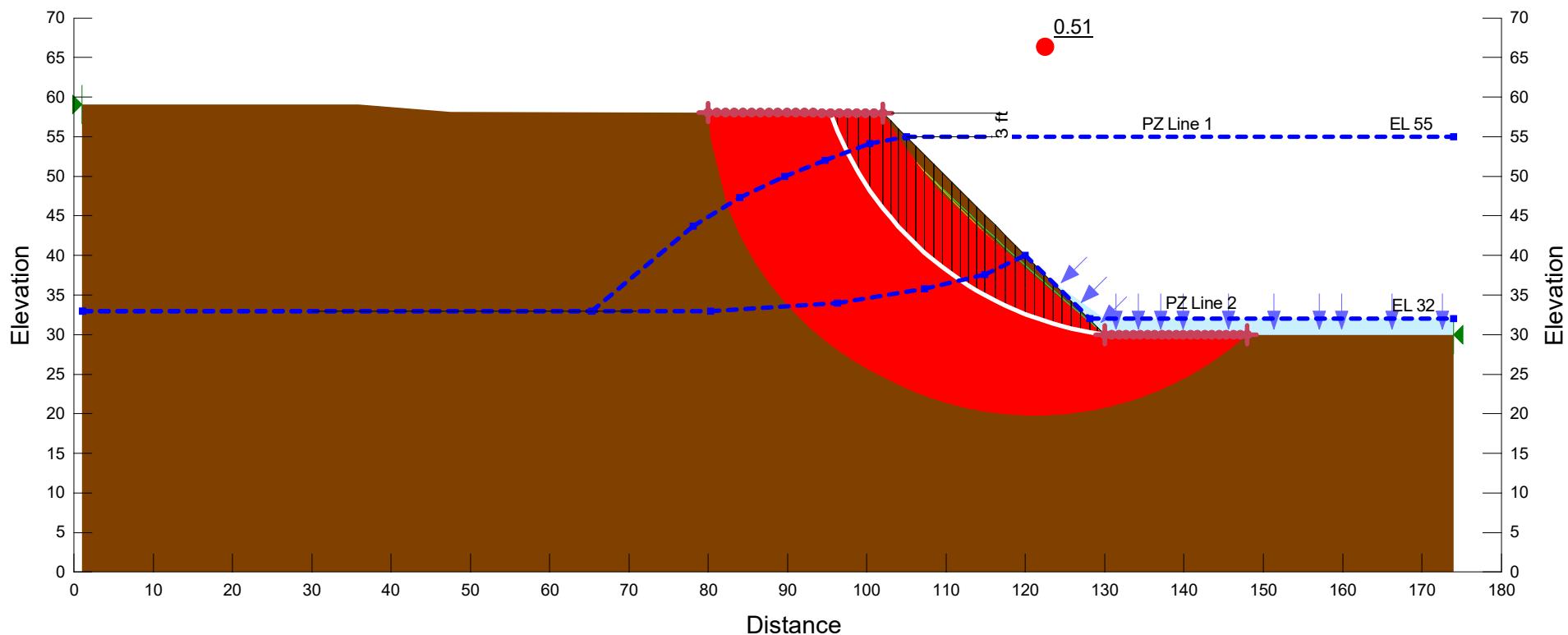
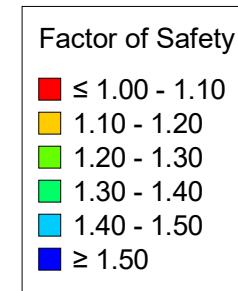
FOS: 1.62



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Soft Fat Clay (CH)**  
**1.0 to 1 Channel Slope**

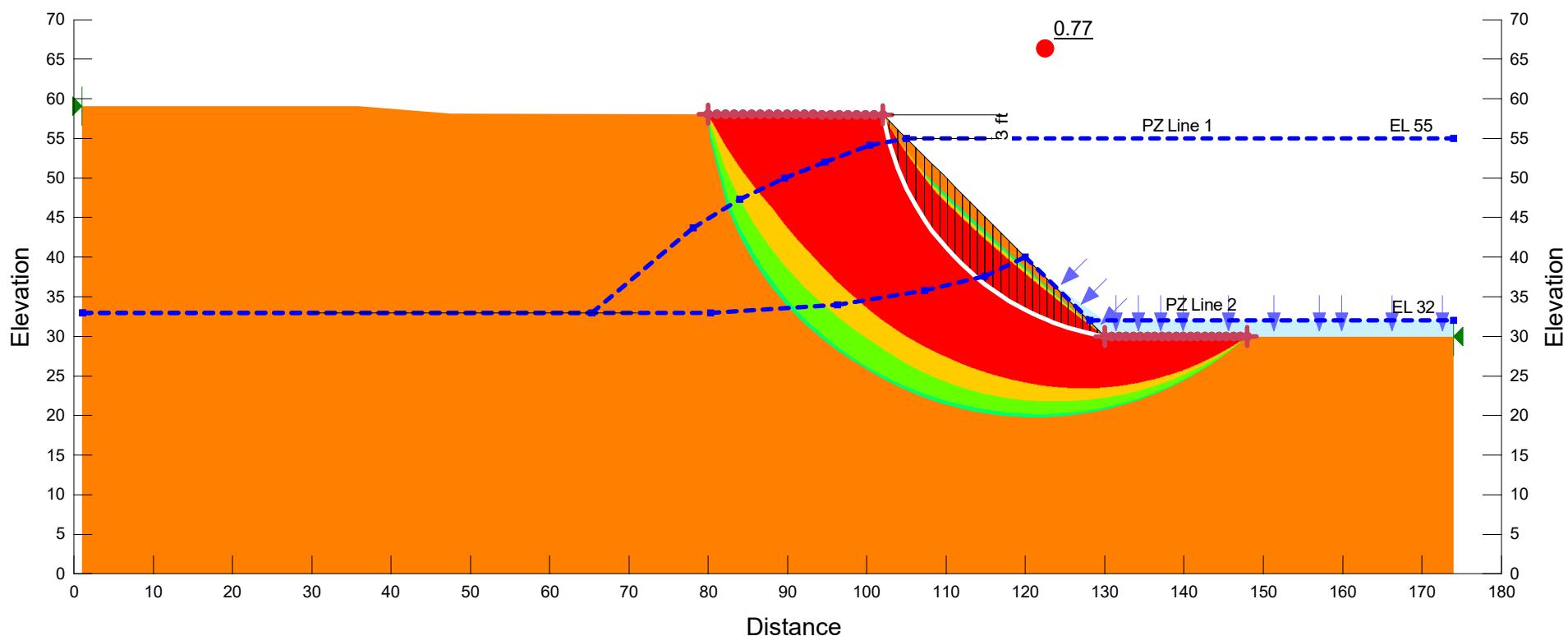
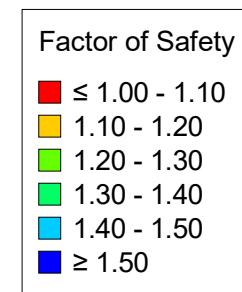
FOS: 0.51



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Stiff Fat Clay (CH)**  
**1.0 to 1 Channel Slope**

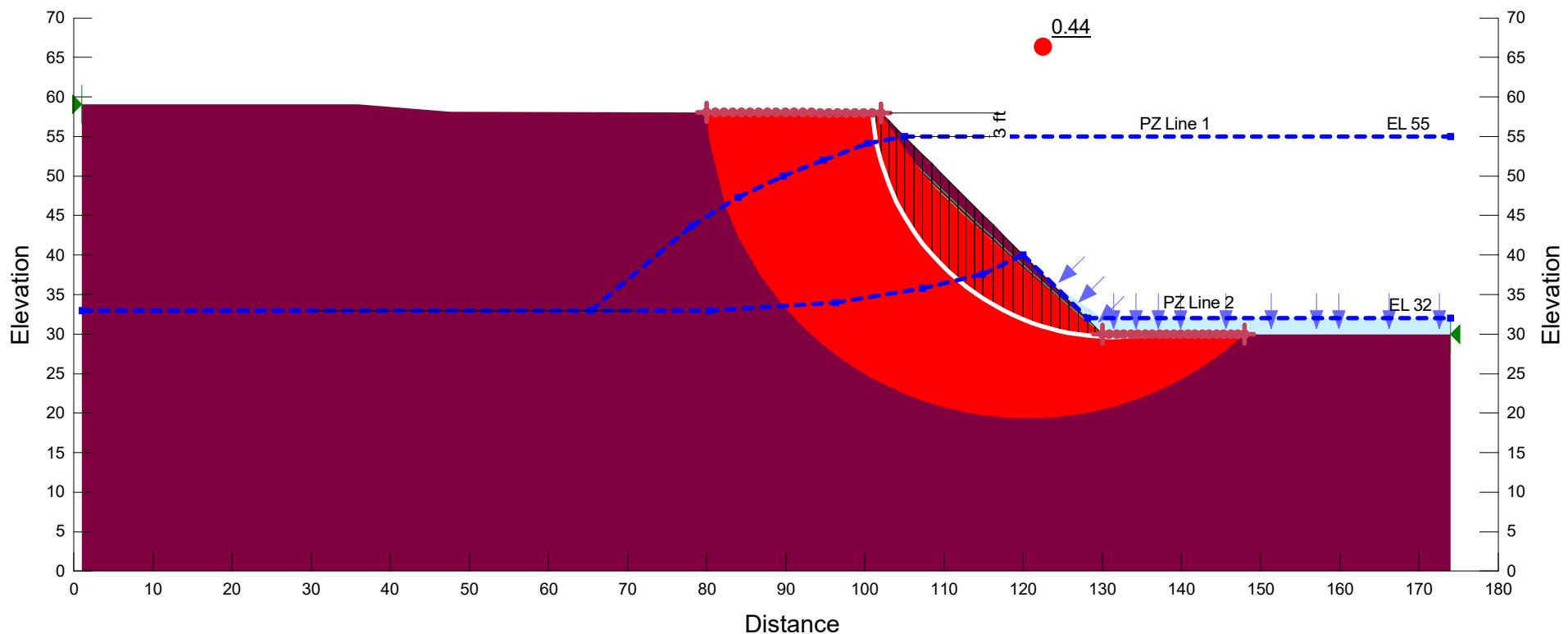
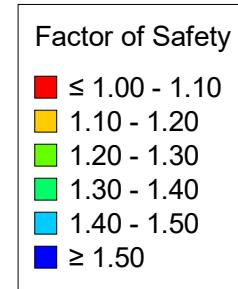
FOS: 0.77



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 28 ft; Soft Lean Clay (CL)  
 1.0 to 1 Channel Slope

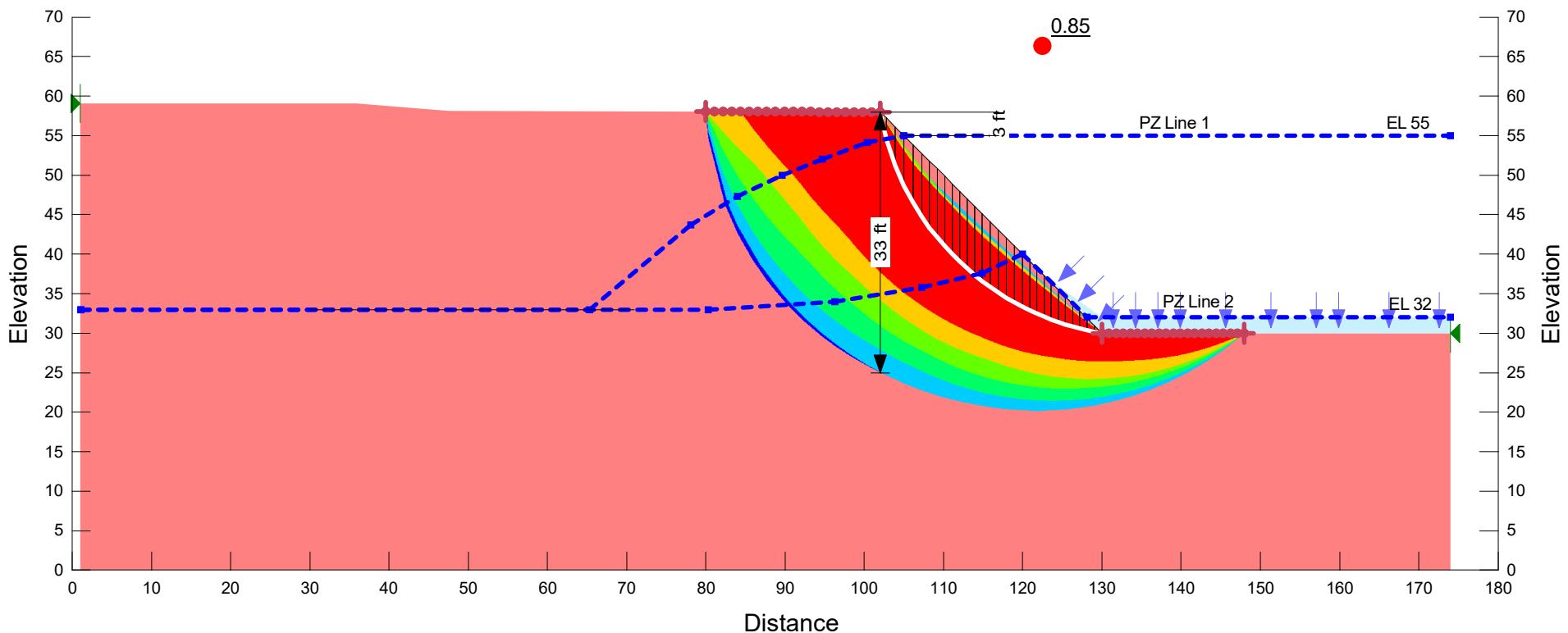
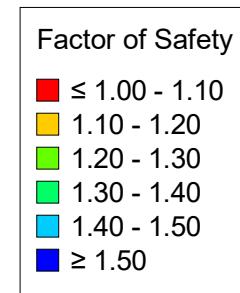
FOS: 0.44



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
Maroon	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Stiff Lean Clay (CL)**  
**1.0 to 1 Channel Slope**

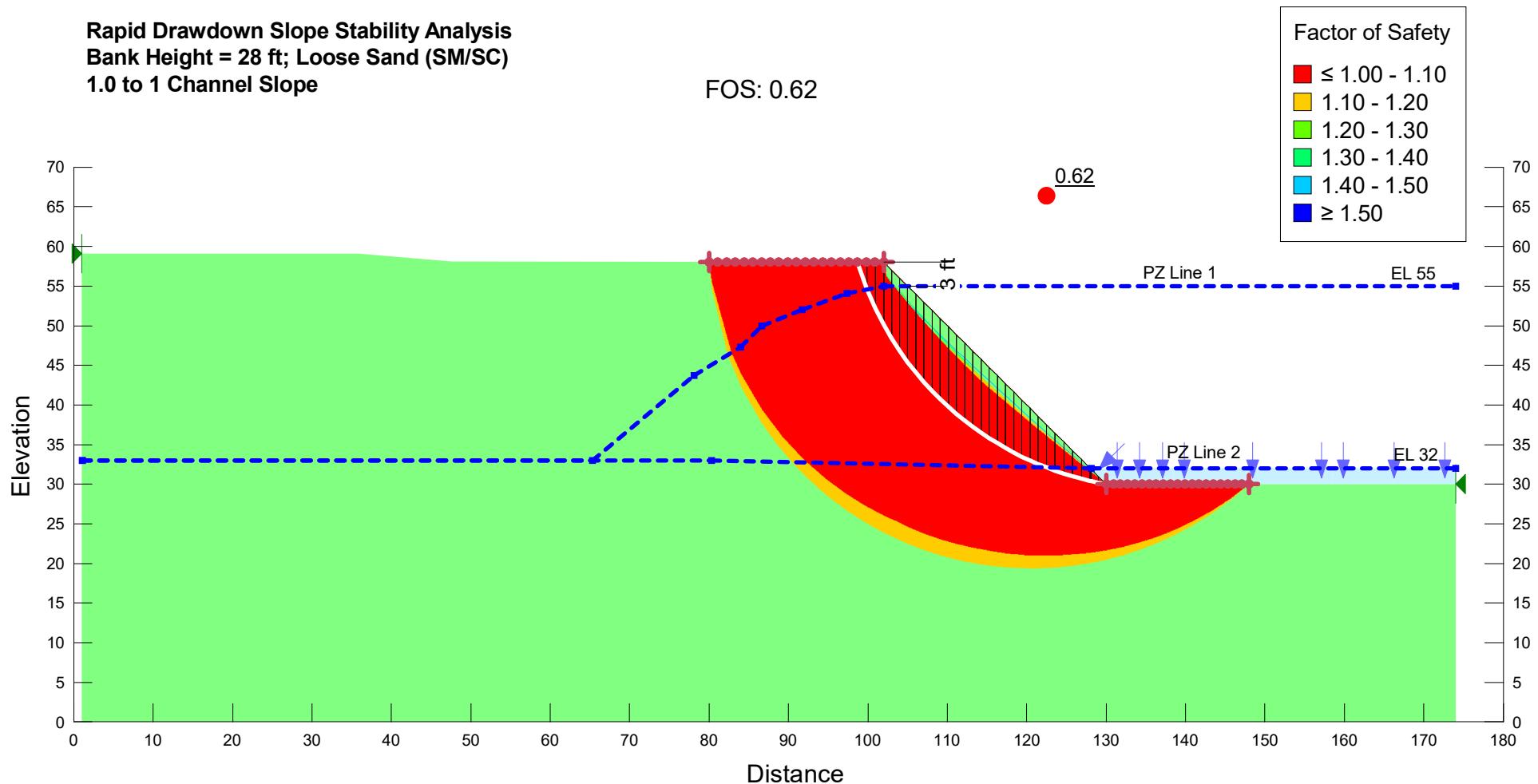
FOS: 0.85



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
Red	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Loose Sand (SM/SC)**  
**1.0 to 1 Channel Slope**

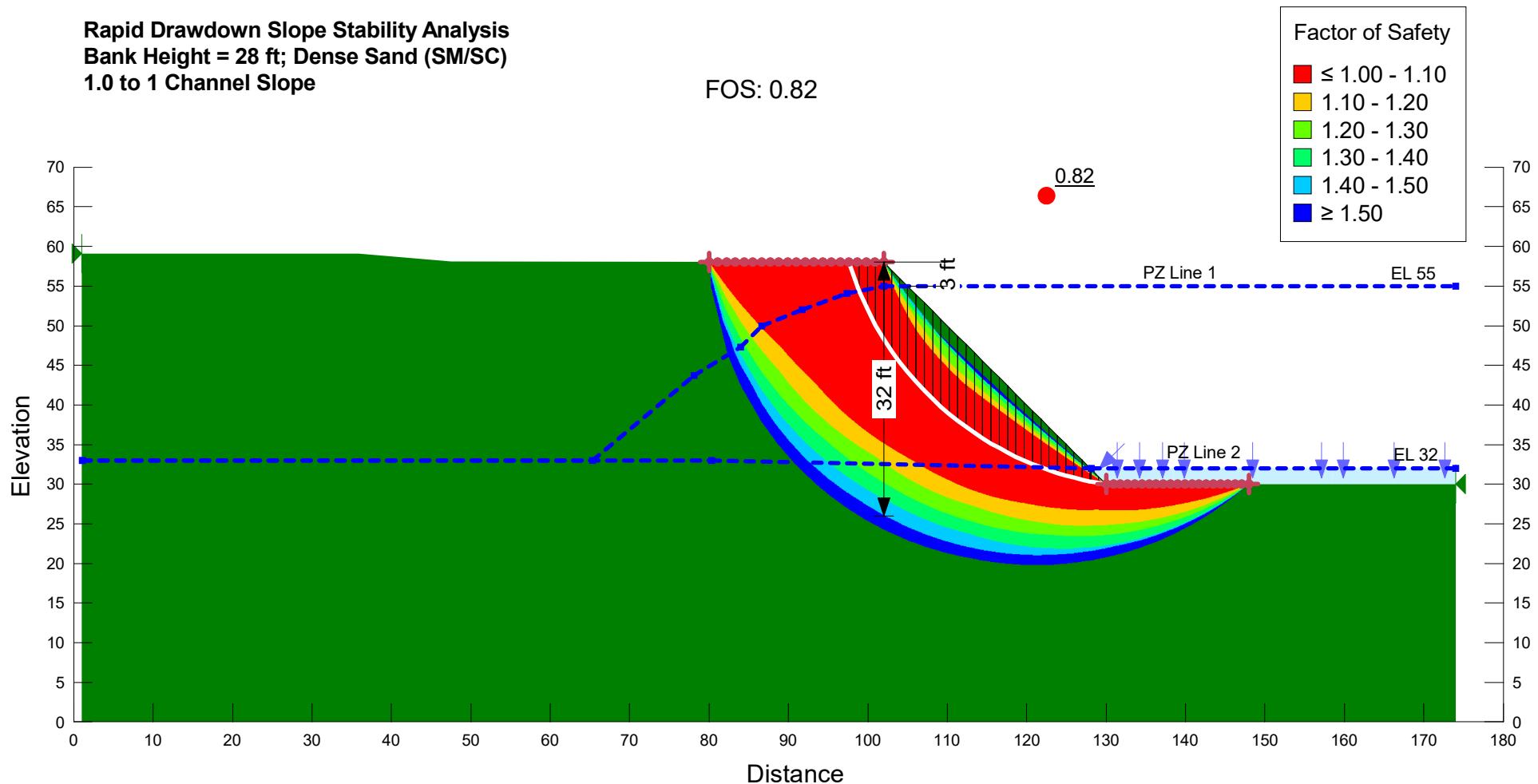
FOS: 0.62



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Dense Sand (SM/SC)**  
**1.0 to 1 Channel Slope**

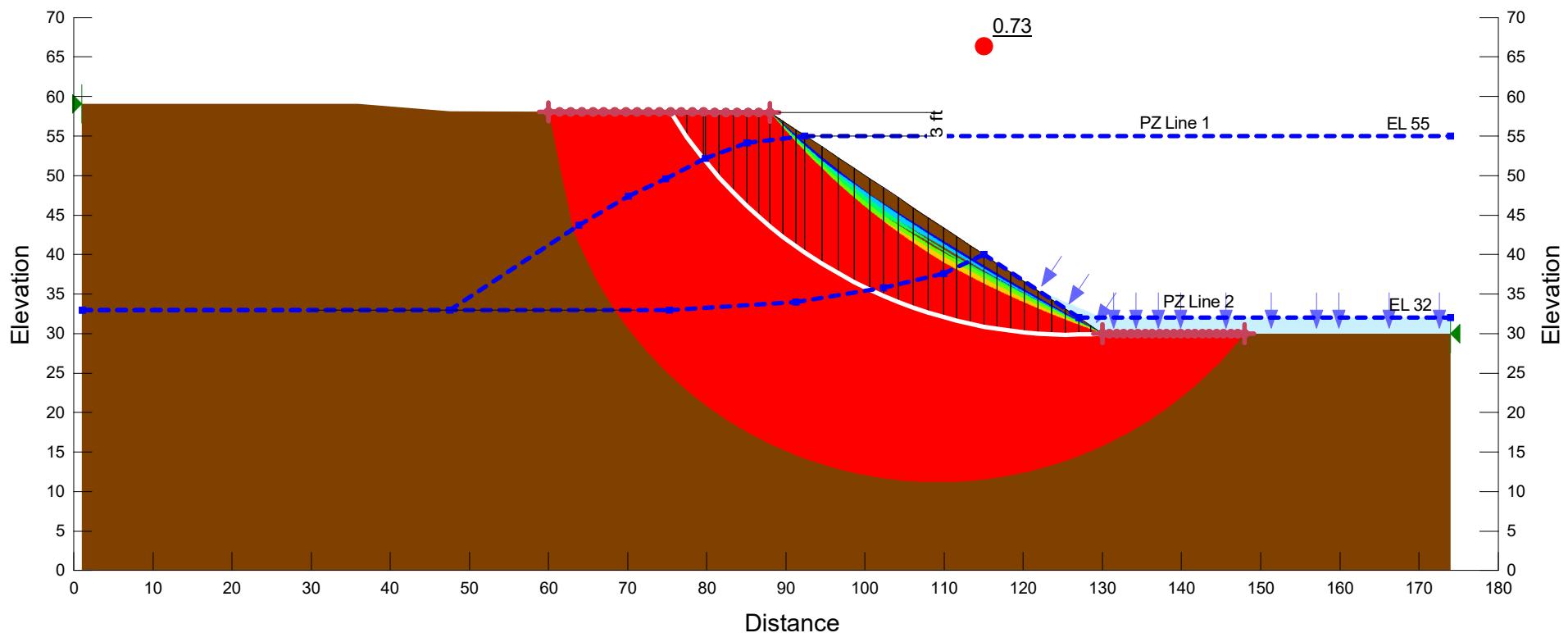
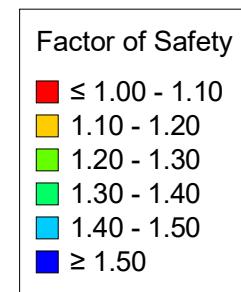
FOS: 0.82



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
█	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 28 ft; Soft Fat Clay (CH)  
 1.5 to 1 Channel Slope

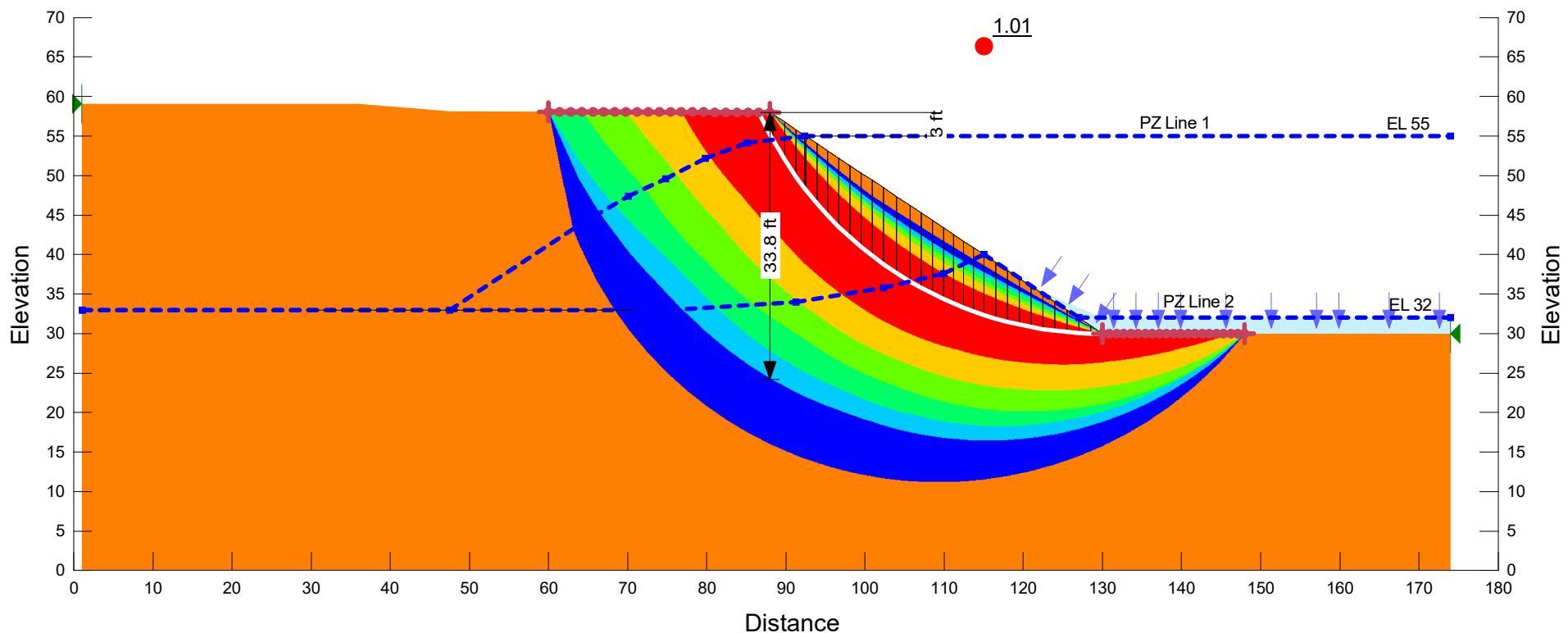
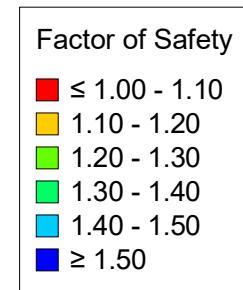
FOS: 0.73



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface (ft)	Piezometric Surface After Drawdown (ft)
<span style="background-color: #8B4513; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span>	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 28 ft; Stiff Fat Clay (CH)  
 1.5 to 1 Channel Slope

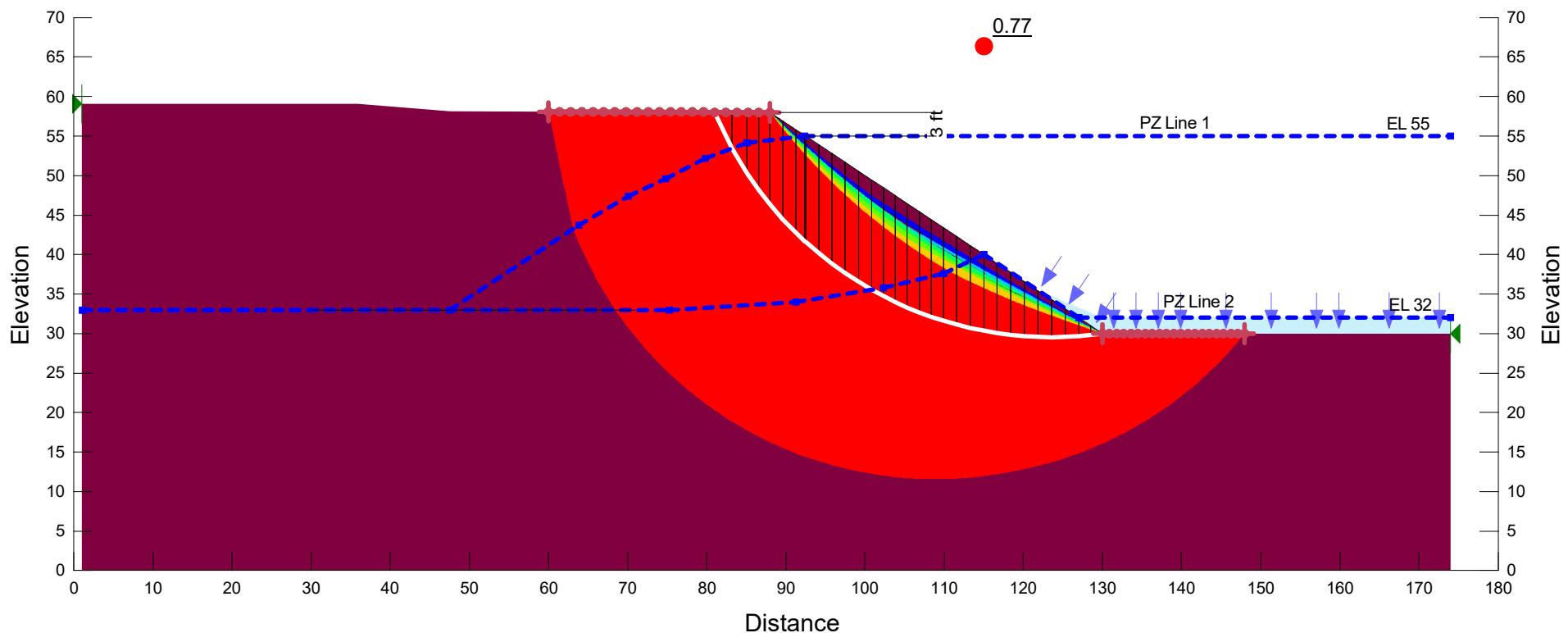
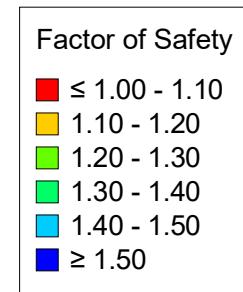
FOS: 1.01



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 28 ft; Soft Lean Clay (CL)  
 1.5 to 1 Channel Slope

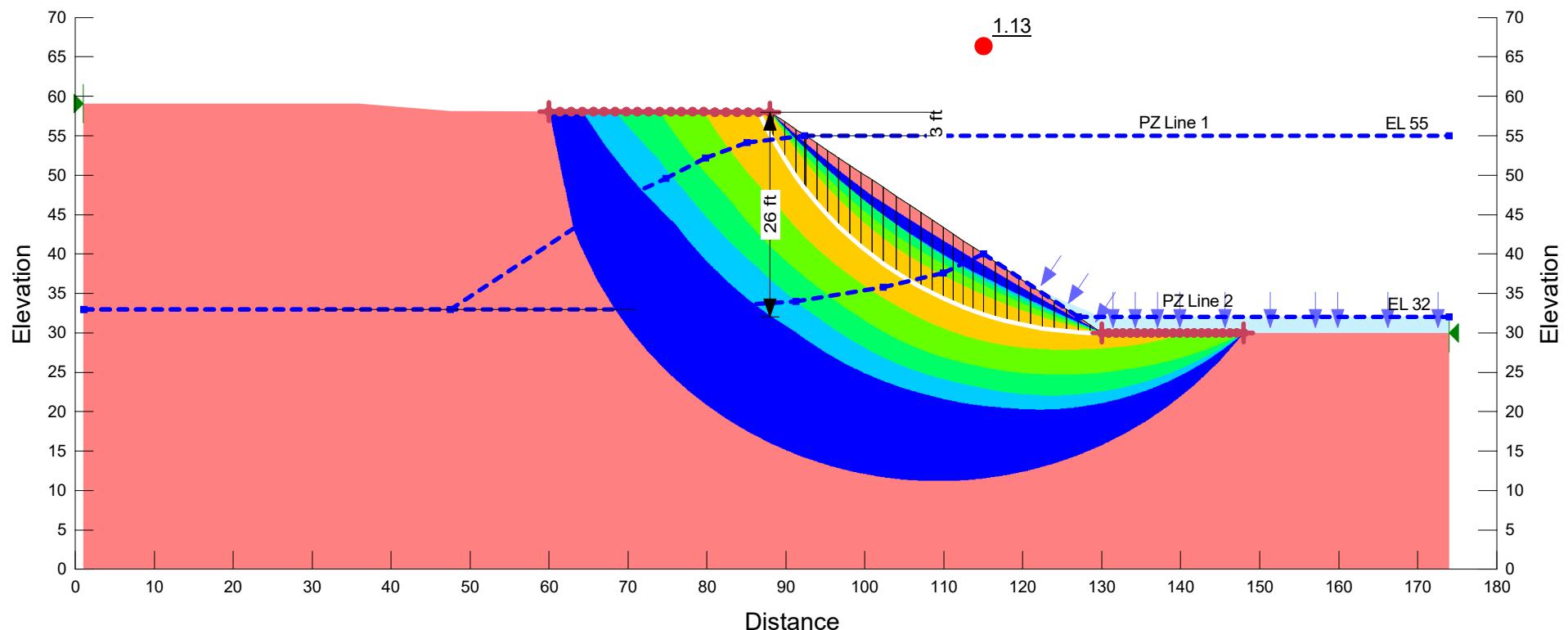
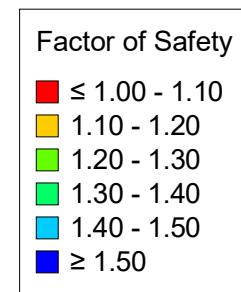
FOS: 0.77



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■ CL Soft		120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Stiff Lean Clay (CL)**  
**1.5 to 1 Channel Slope**

FOS: 1.13

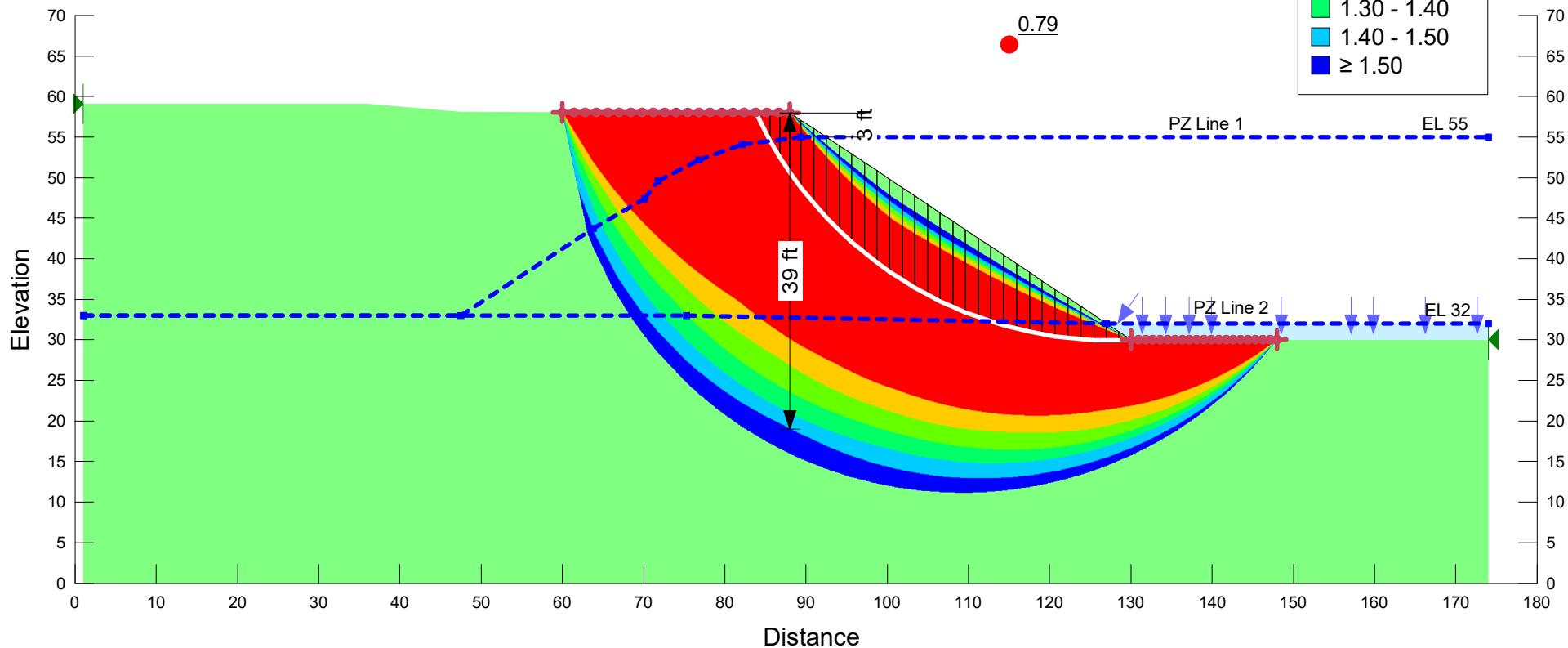


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Red	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 28 ft; Loose Sand (SM/SC)  
 1.5 to 1 Channel Slope

FOS: 0.79

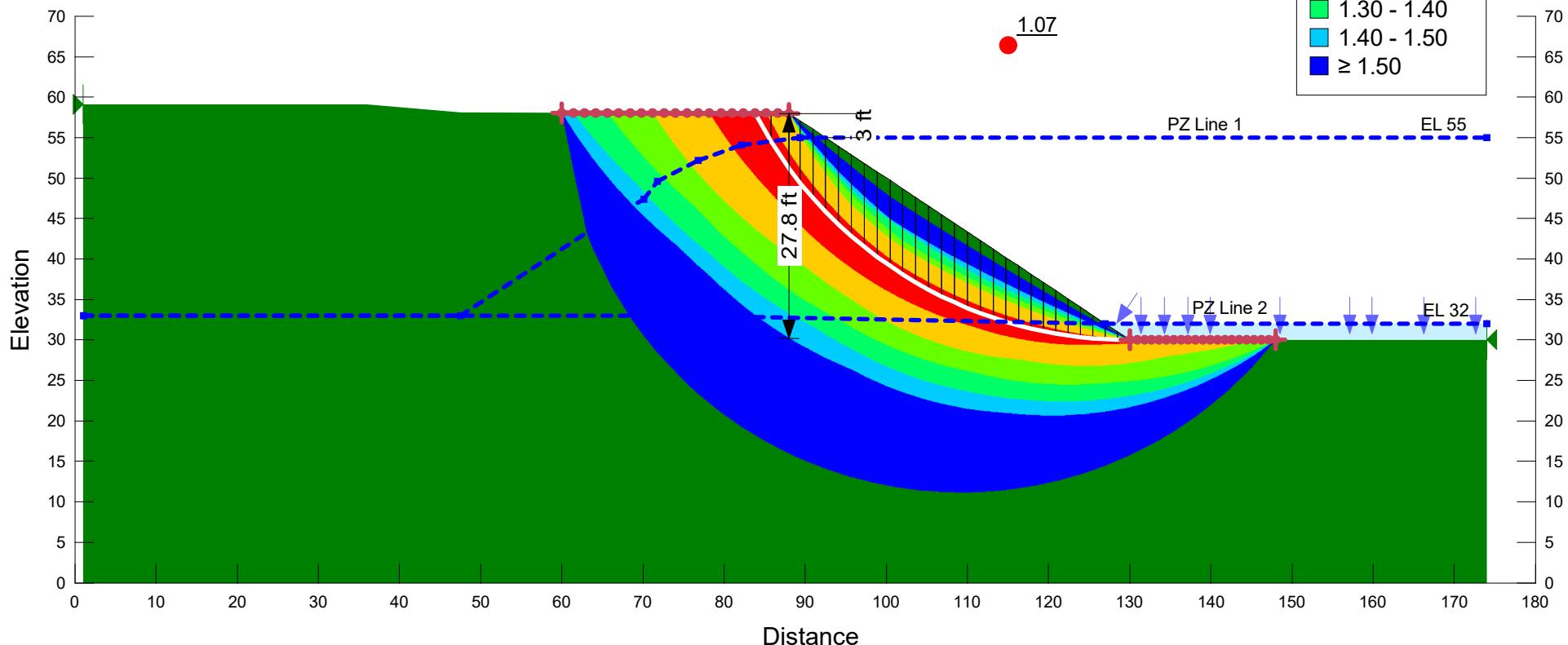
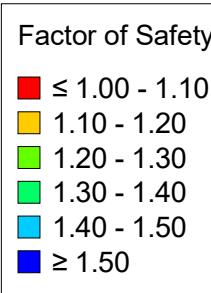
Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



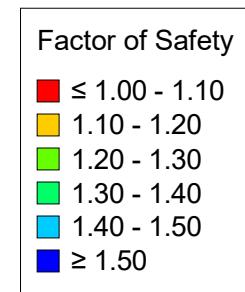
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 28 ft; Dense Sand (SM/SC)  
 1.5 to 1 Channel Slope

FOS: 1.07

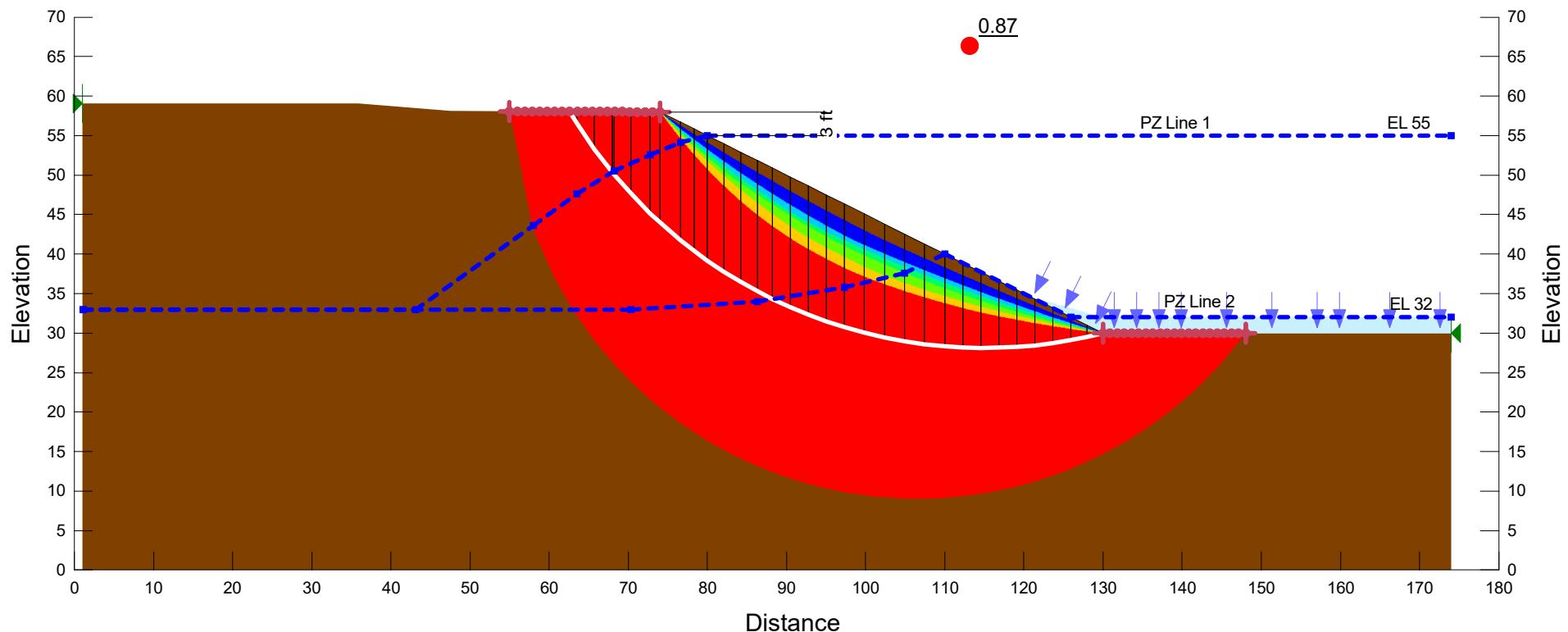


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2



**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Soft Fat Clay (CH)**  
**2.0 to 1 Channel Slope**

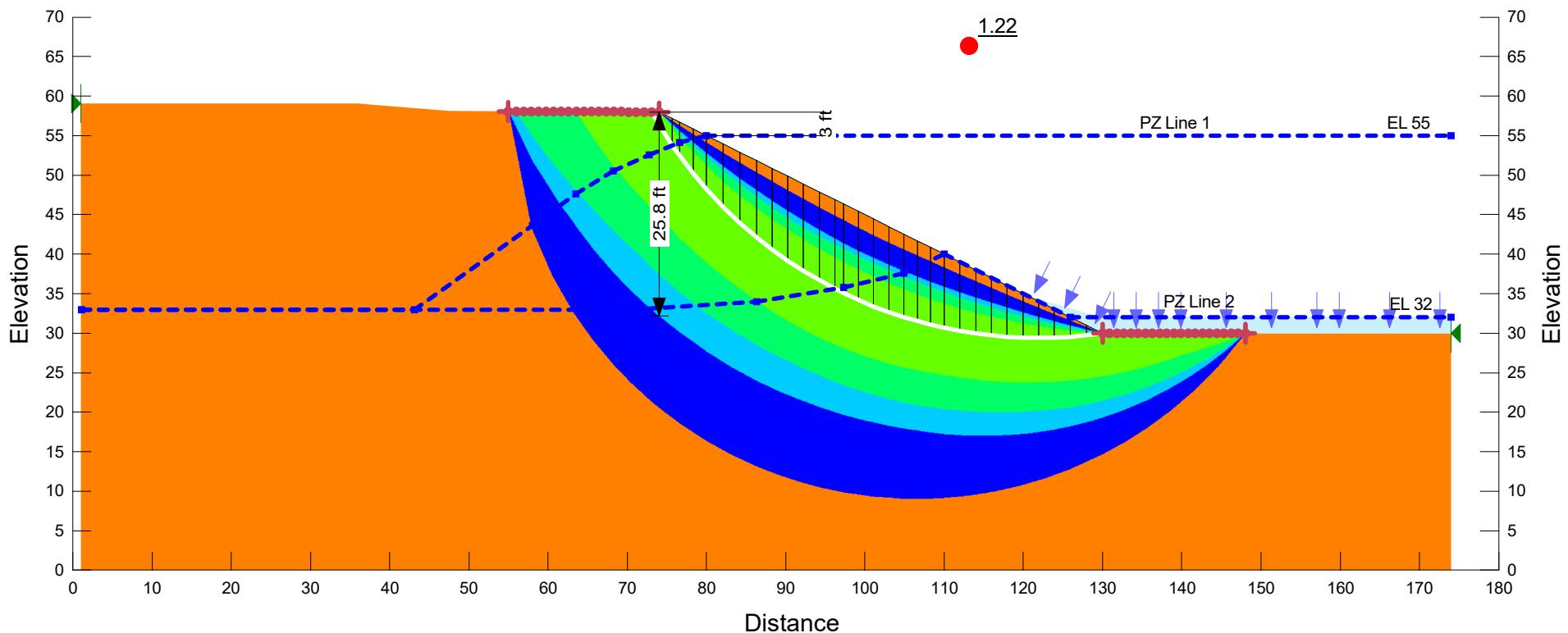
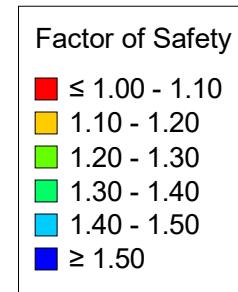
FOS: 0.87



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Stiff Fat Clay (CH)**  
**2.0 to 1 Channel Slope**

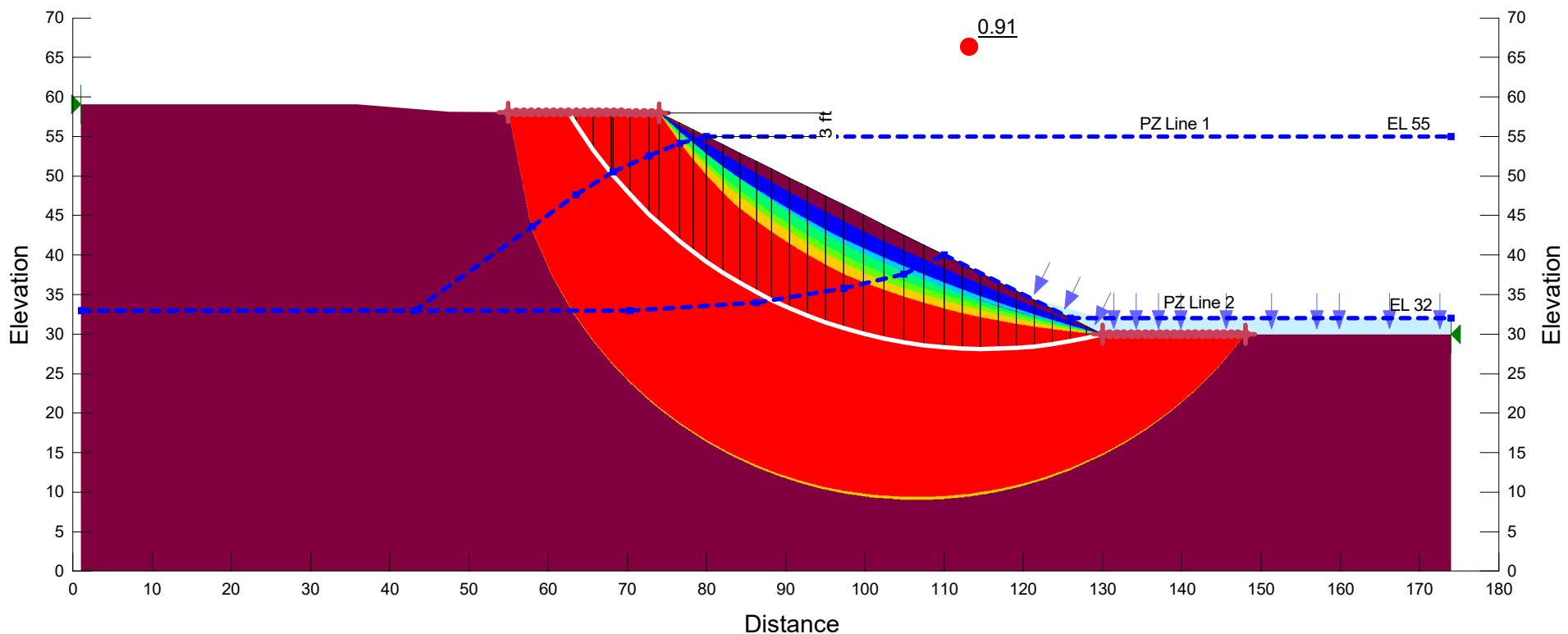
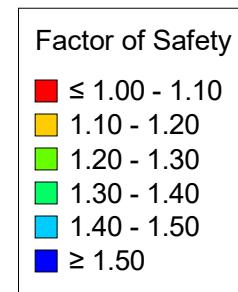
FOS: 1.22



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 28 ft; Soft Lean Clay (CL)  
 2.0 to 1 Channel Slope

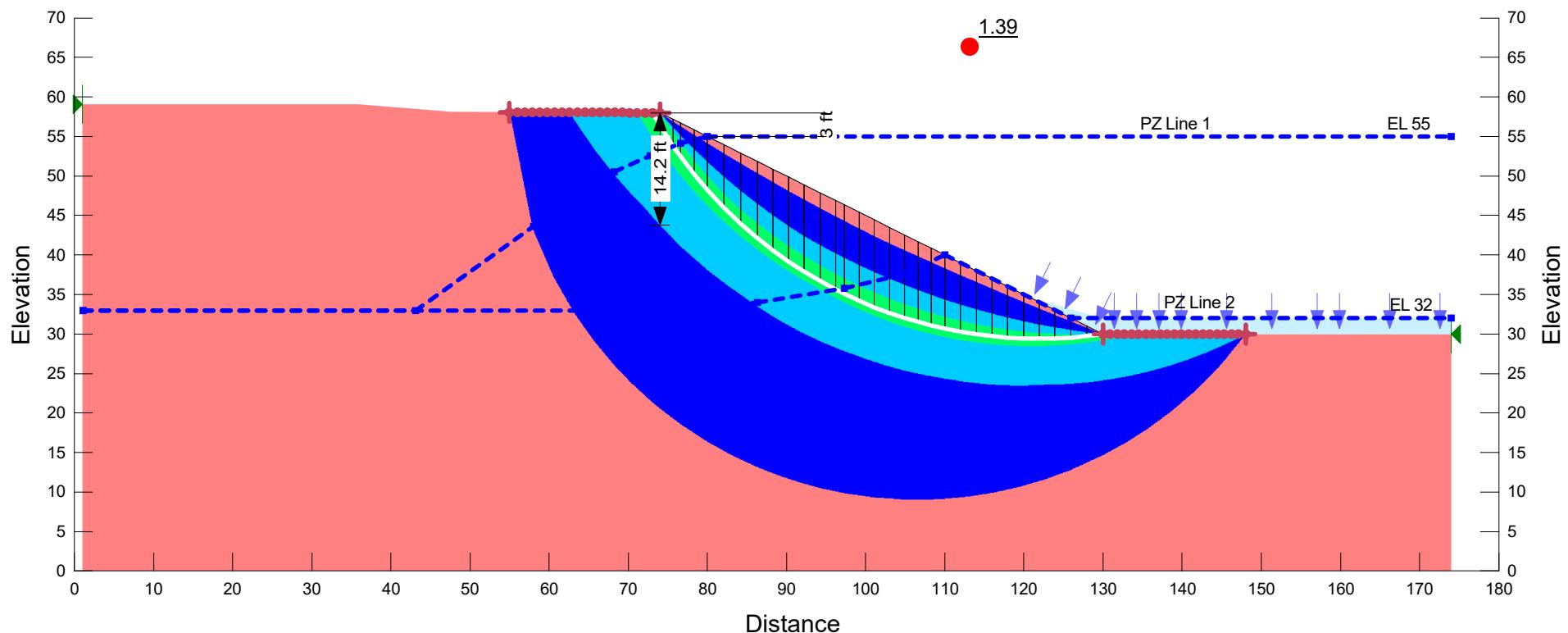
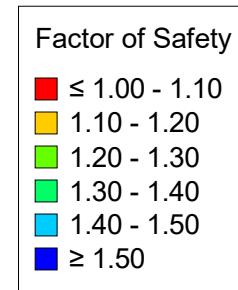
FOS: 0.91



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Maroon	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Stiff Lean Clay (CL)**  
**2.0 to 1 Channel Slope**

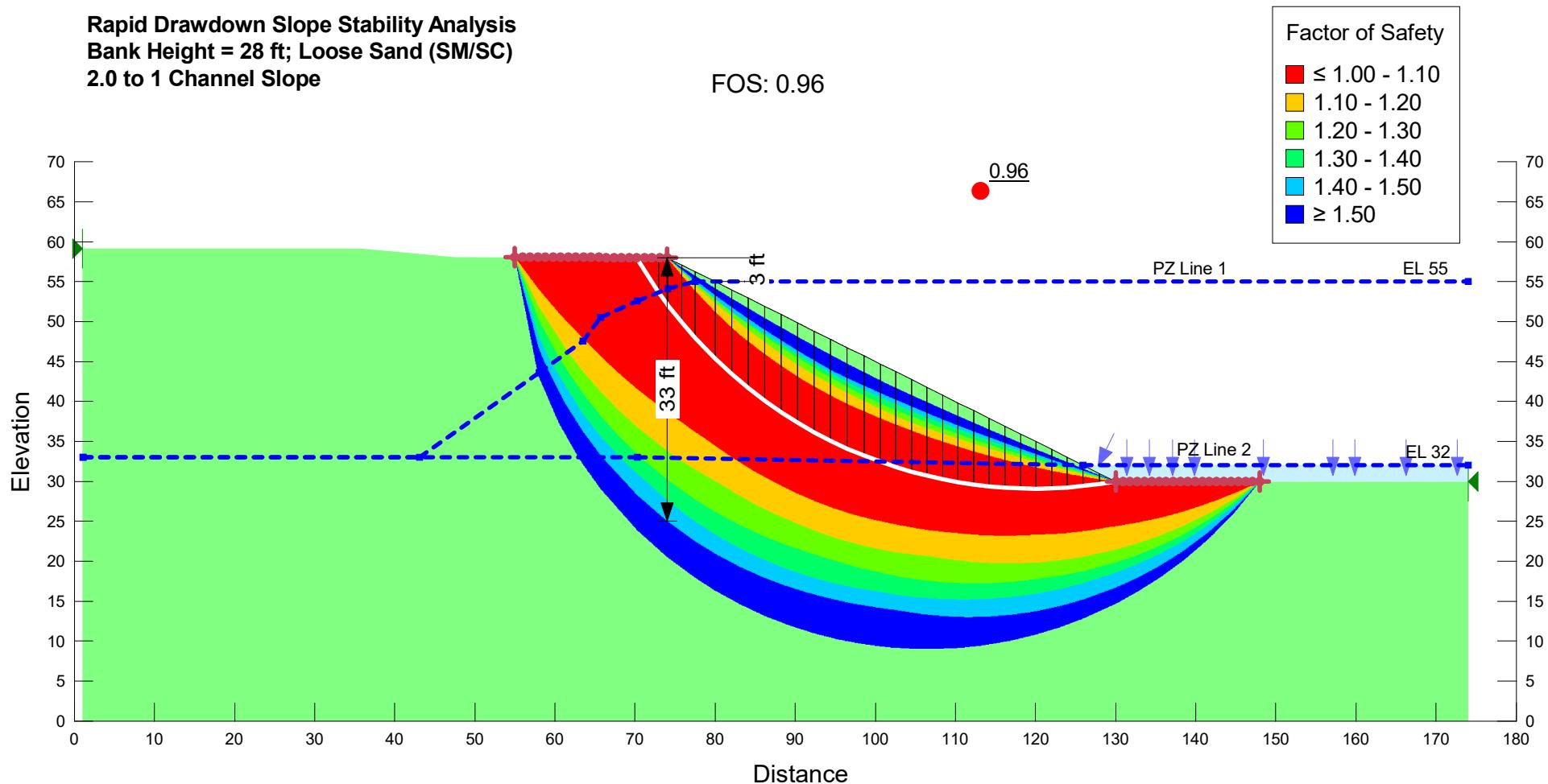
FOS: 1.39



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
CL Stiff		120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Loose Sand (SM/SC)**  
**2.0 to 1 Channel Slope**

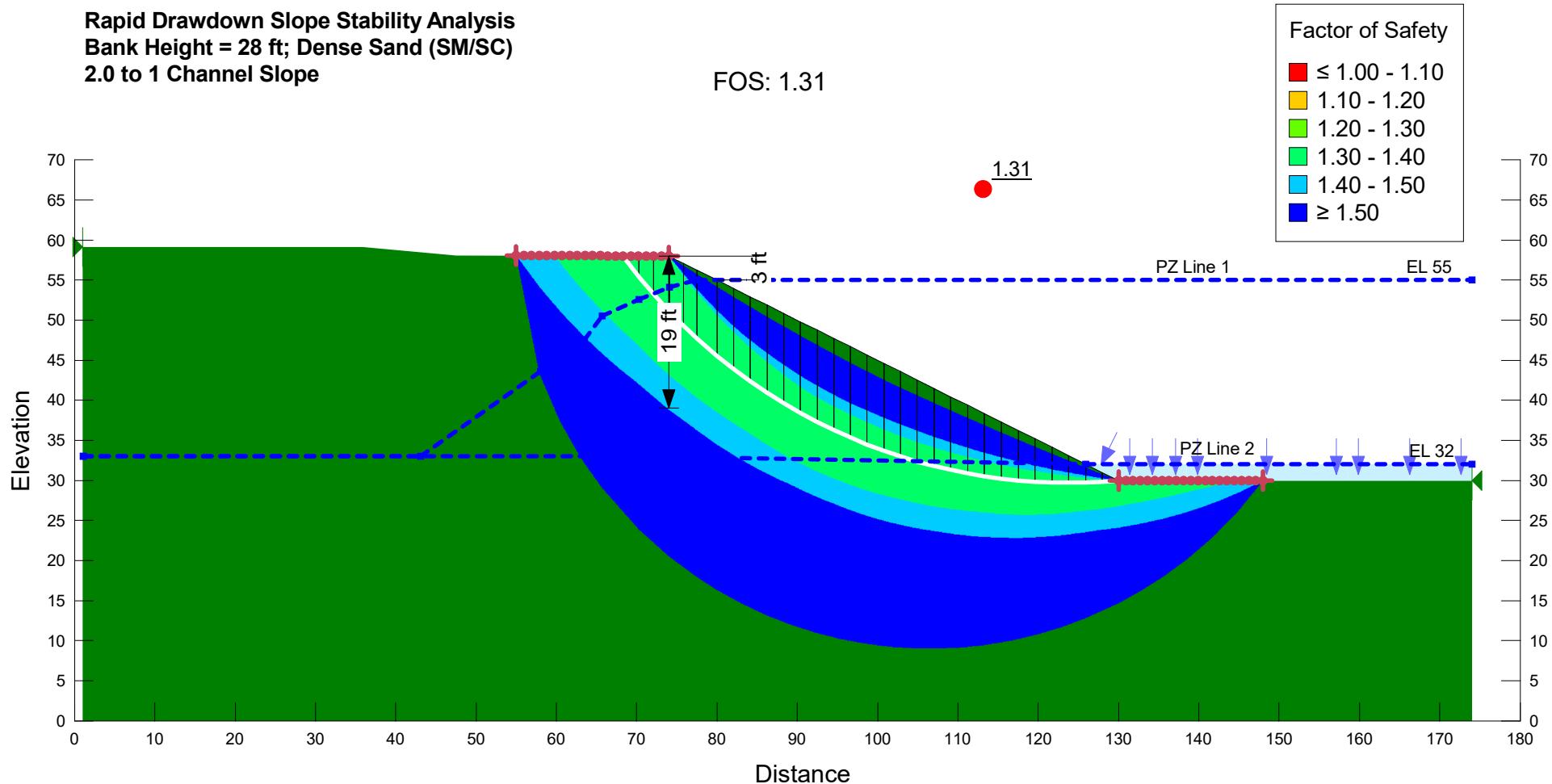
FOS: 0.96



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Dense Sand (SM/SC)**  
**2.0 to 1 Channel Slope**

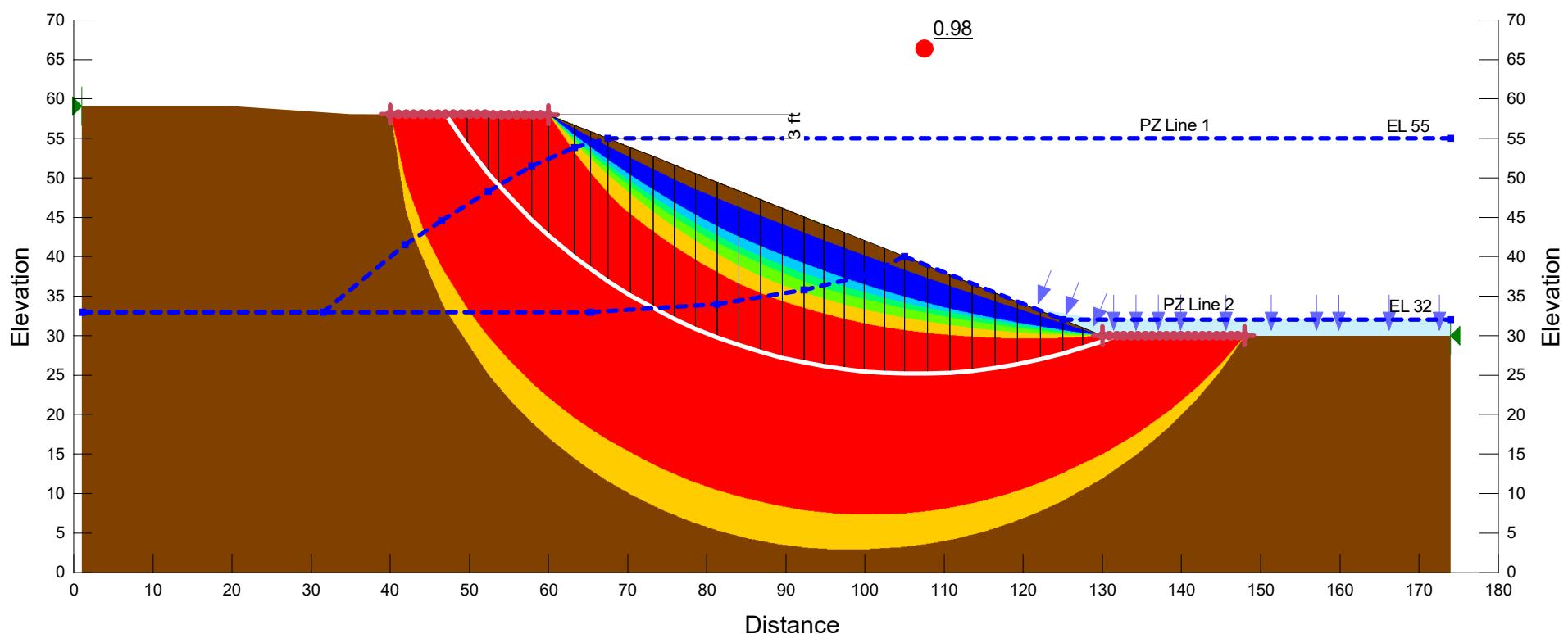
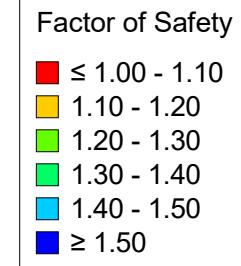
FOS: 1.31



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Soft Fat Clay (CH)**  
**2.5 to 1 Channel Slope**

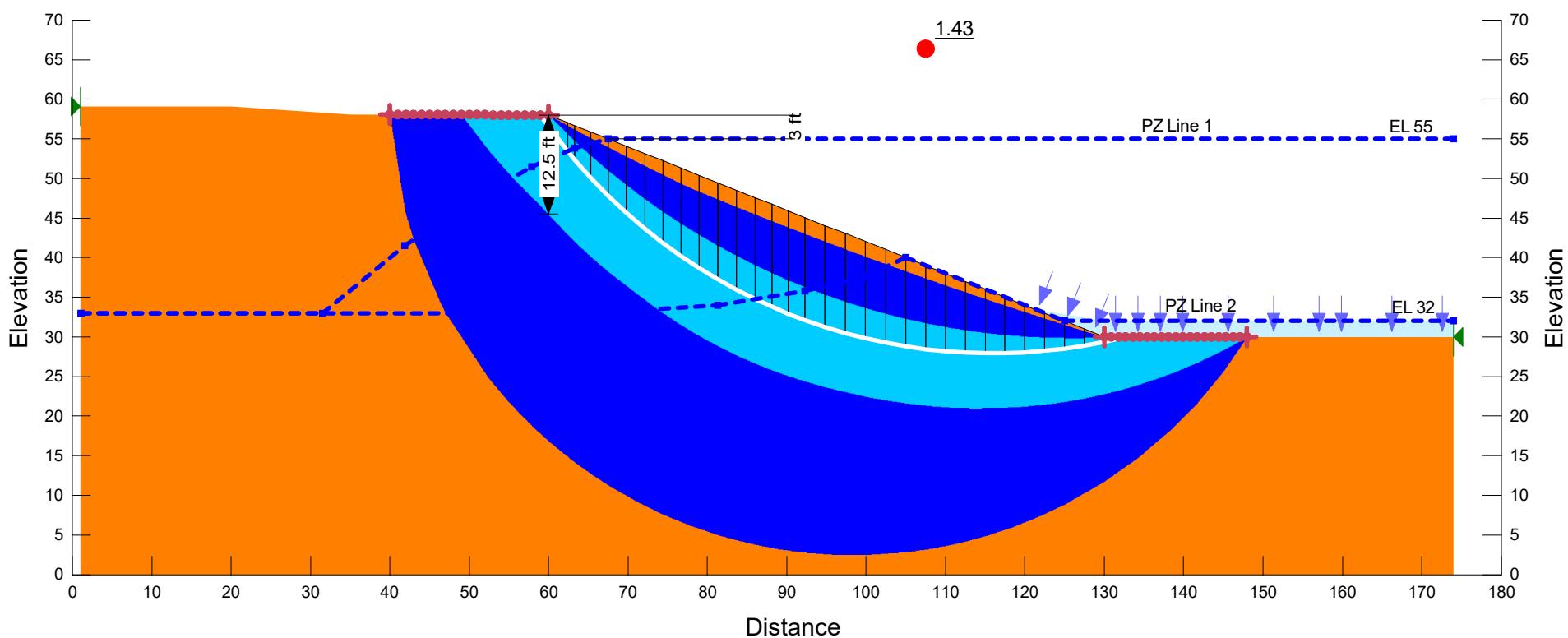
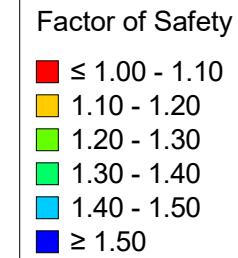
FOS: 0.98



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Stiff Fat Clay (CH)**  
**2.5 to 1 Channel Slope**

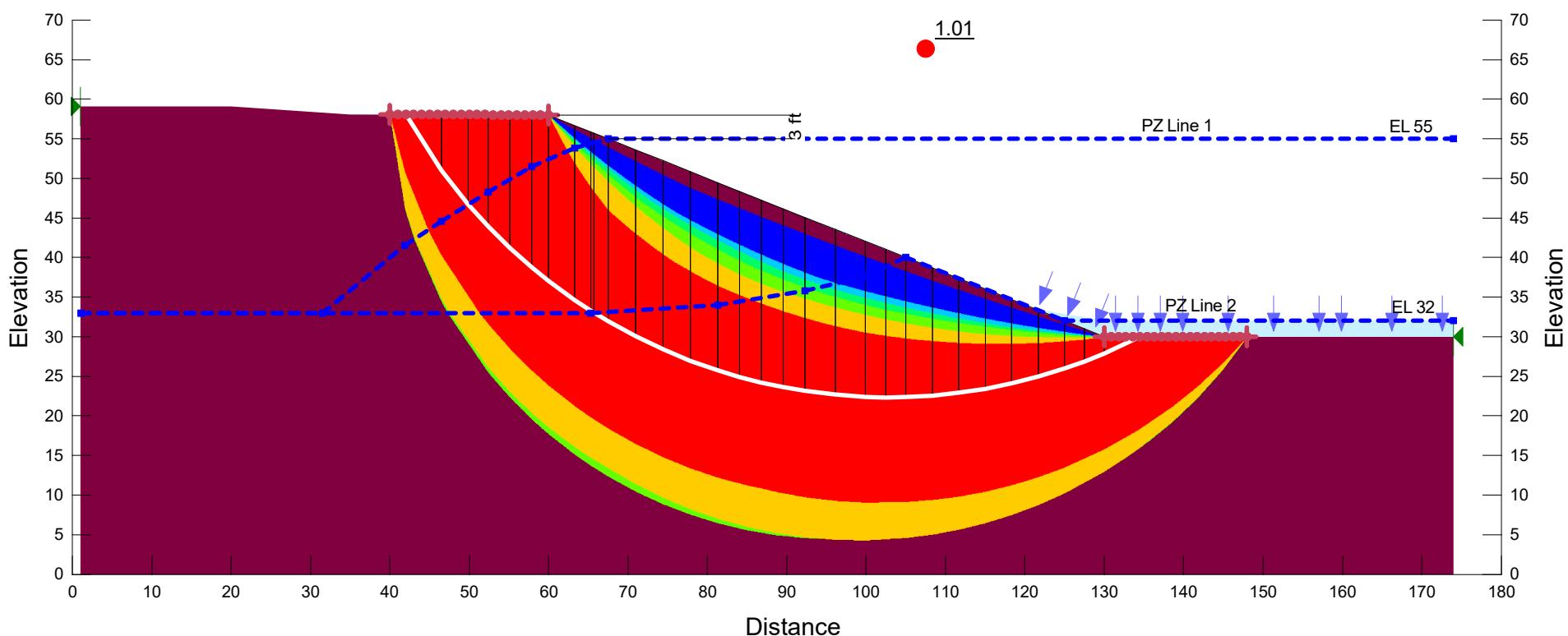
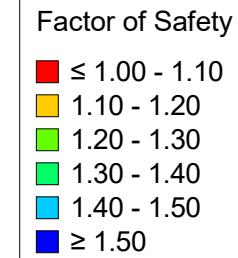
FOS: 1.43



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 28 ft; Soft Lean Clay (CL)  
 2.5 to 1 Channel Slope

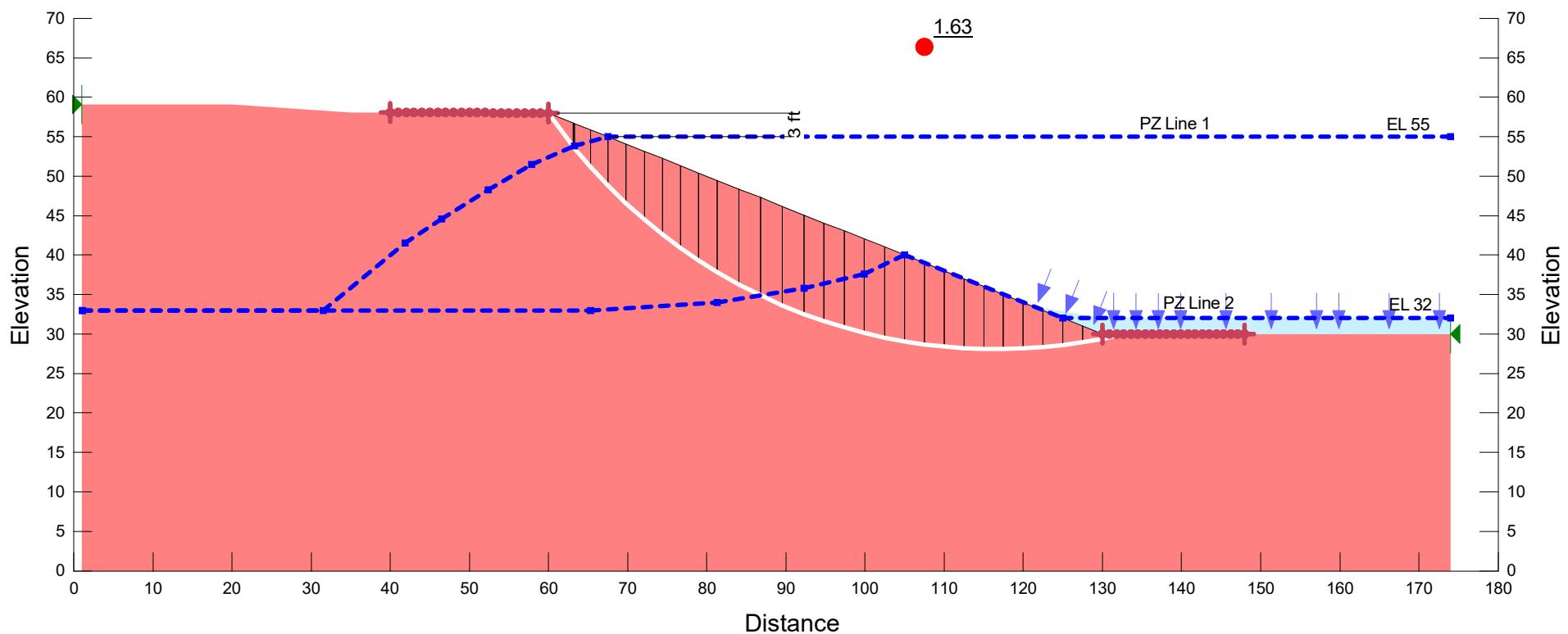
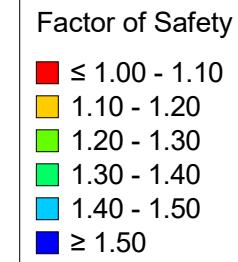
FOS: 1.01



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 28 ft; Stiff Lean Clay (CL)  
 2.5 to 1 Channel Slope

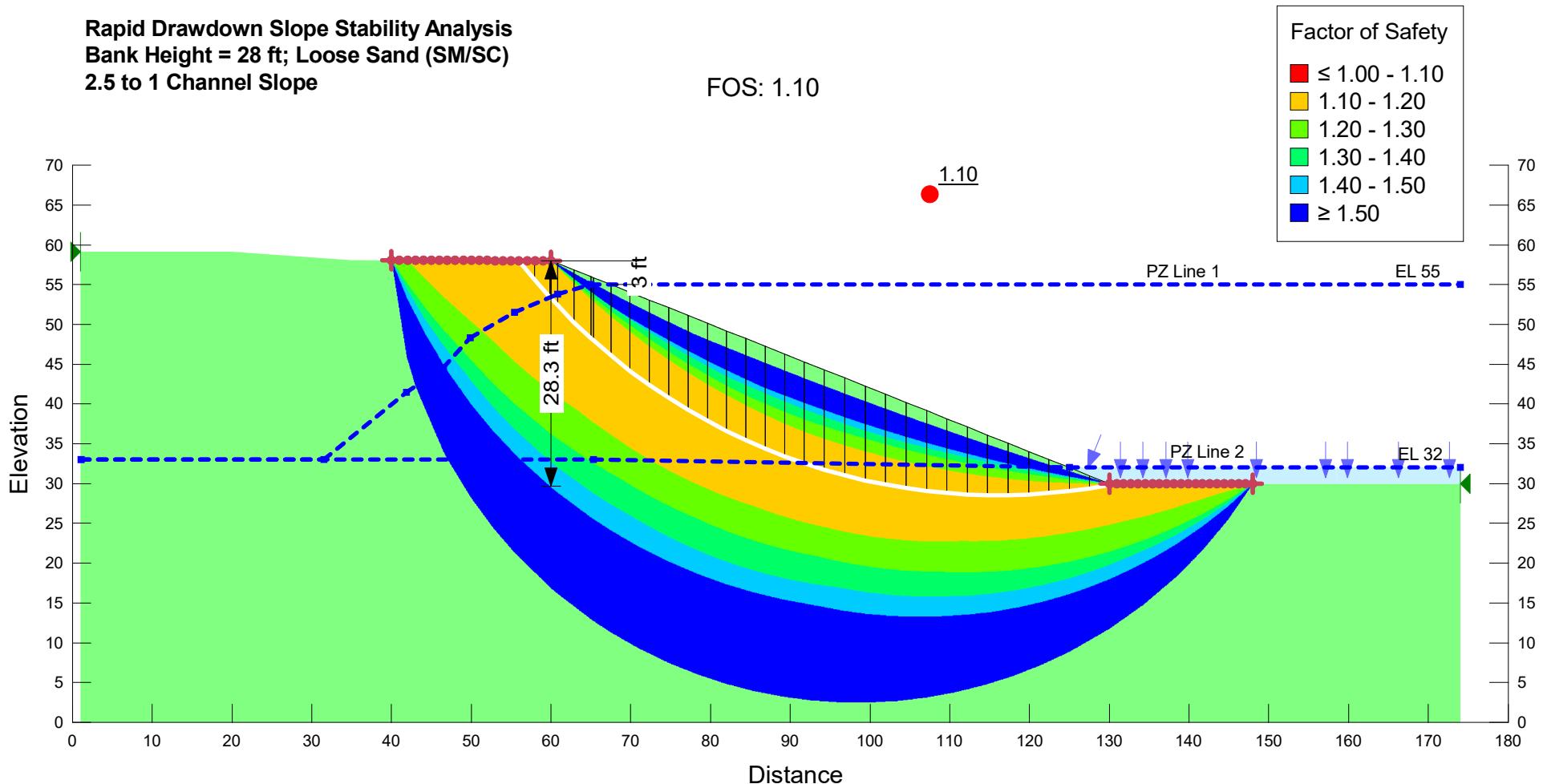
FOS: 1.63



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Loose Sand (SM/SC)**  
**2.5 to 1 Channel Slope**

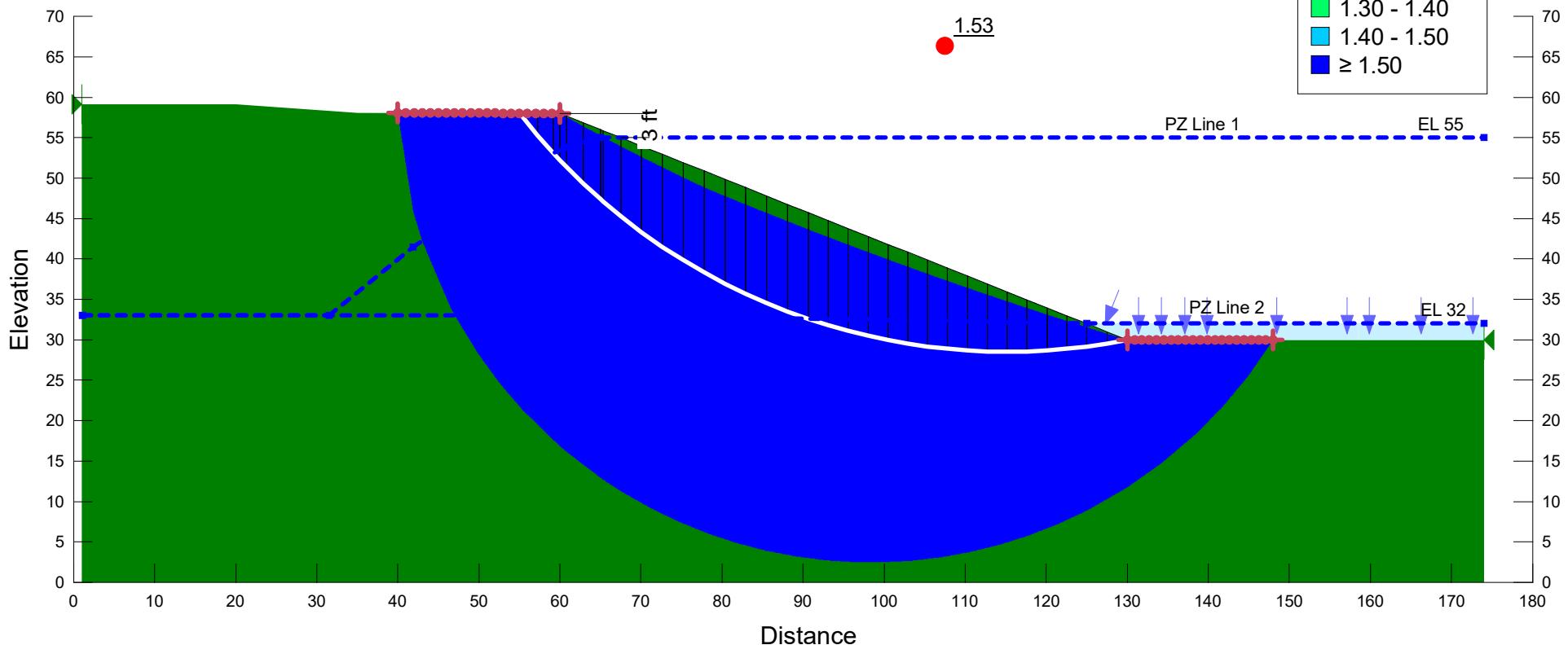
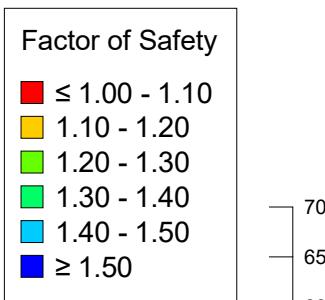
FOS: 1.10



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
[Green Box]	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Dense Sand (SM/SC)**  
**2.5 to 1 Channel Slope**

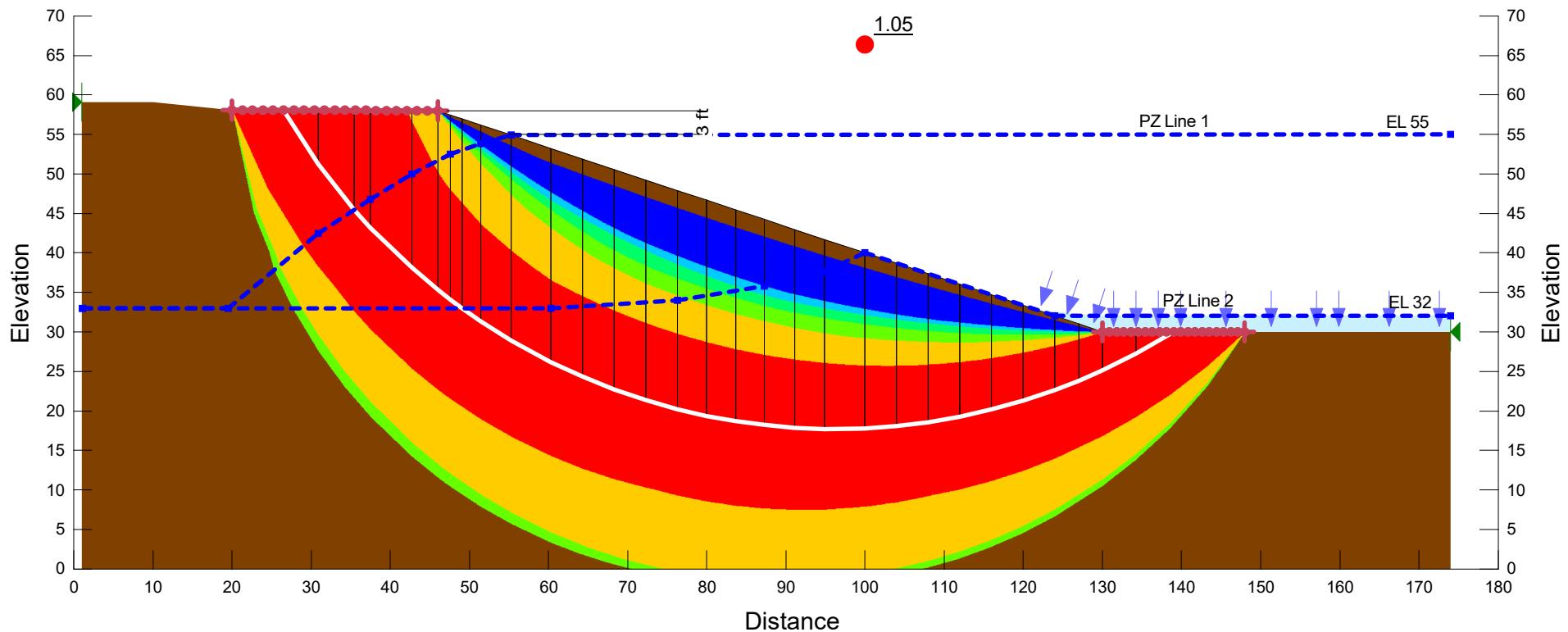
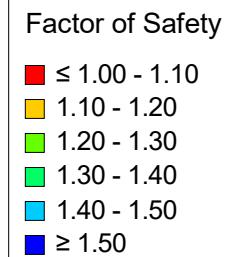
FOS: 1.53



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Green	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Soft Fat Clay (CH)**  
**3.0 to 1 Channel Slope**

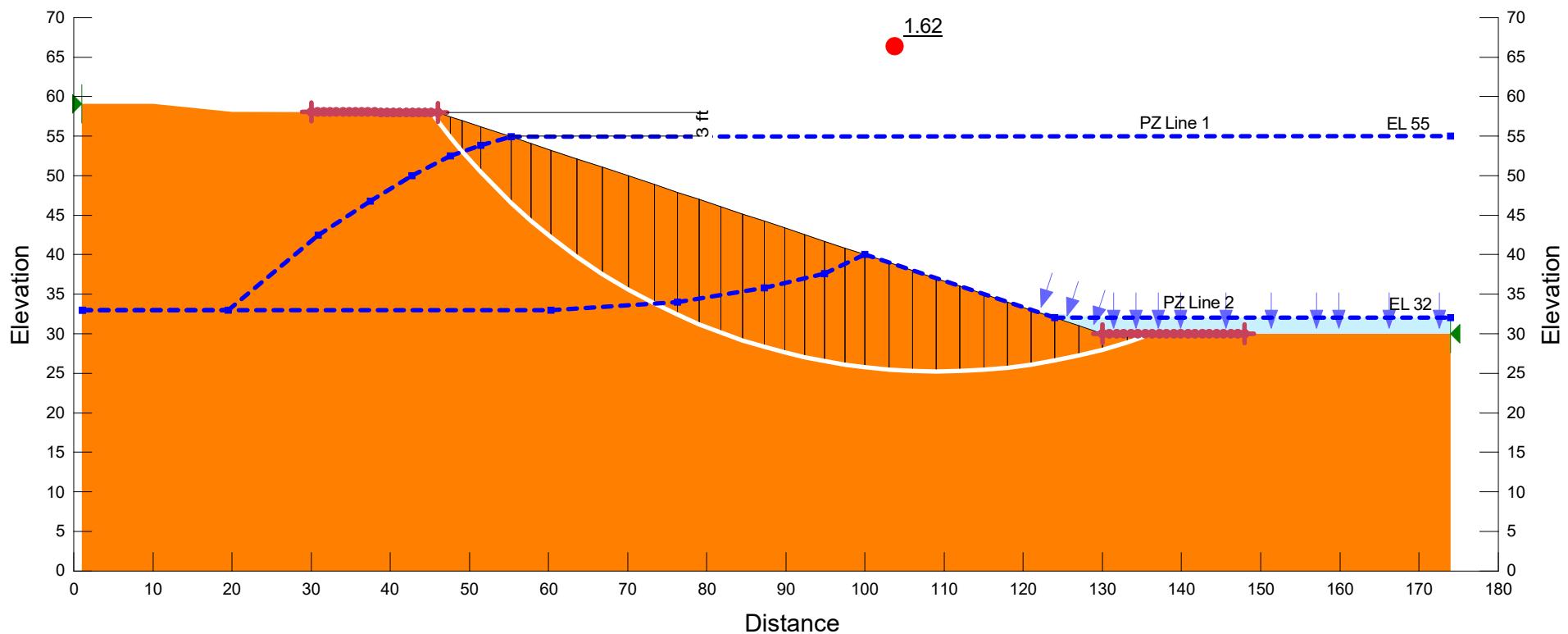
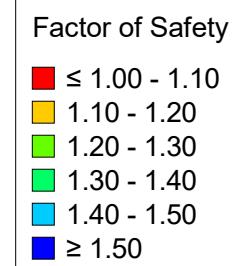
FOS: 1.05



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
■	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 28 ft; Stiff Fat Clay (CH)  
 3.0 to 1 Channel Slope

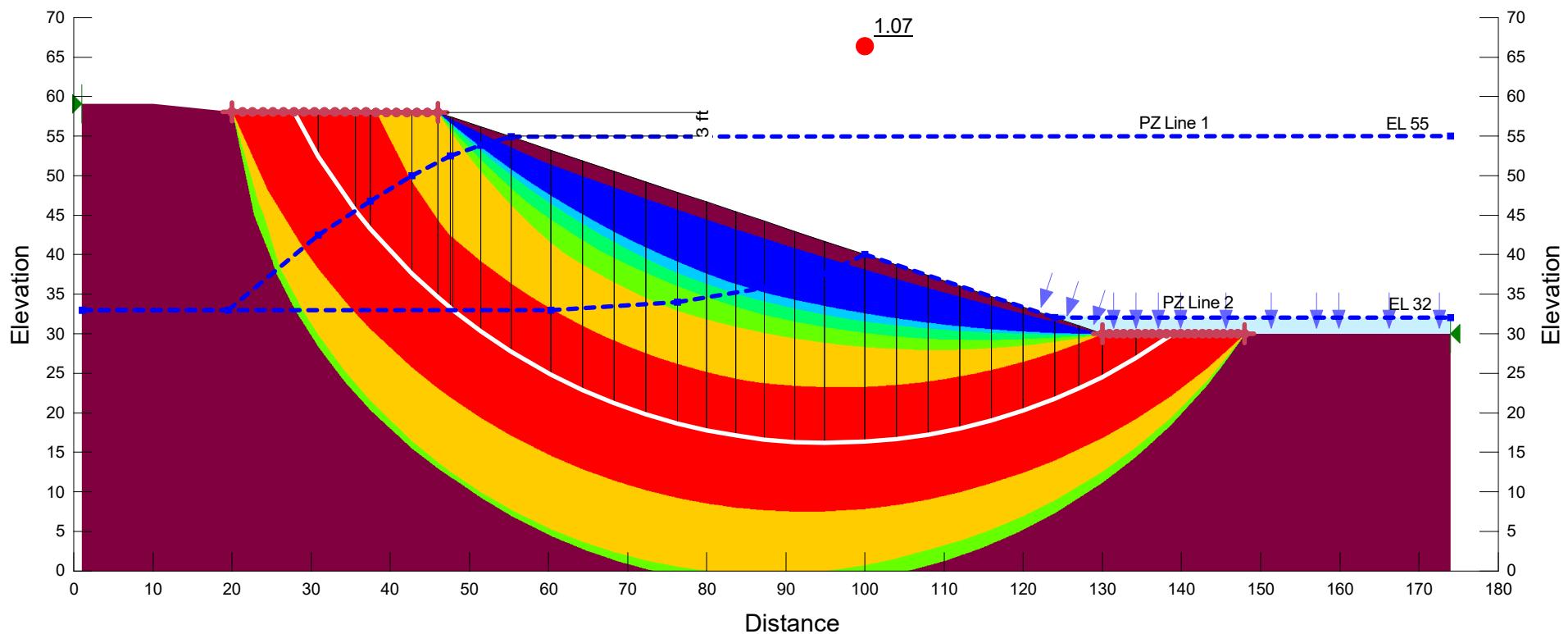
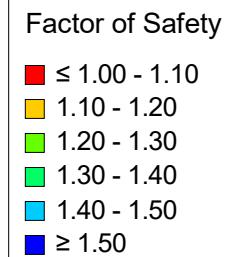
FOS: 1.62



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Soft Lean Clay (CL)**  
**3.0 to 1 Channel Slope**

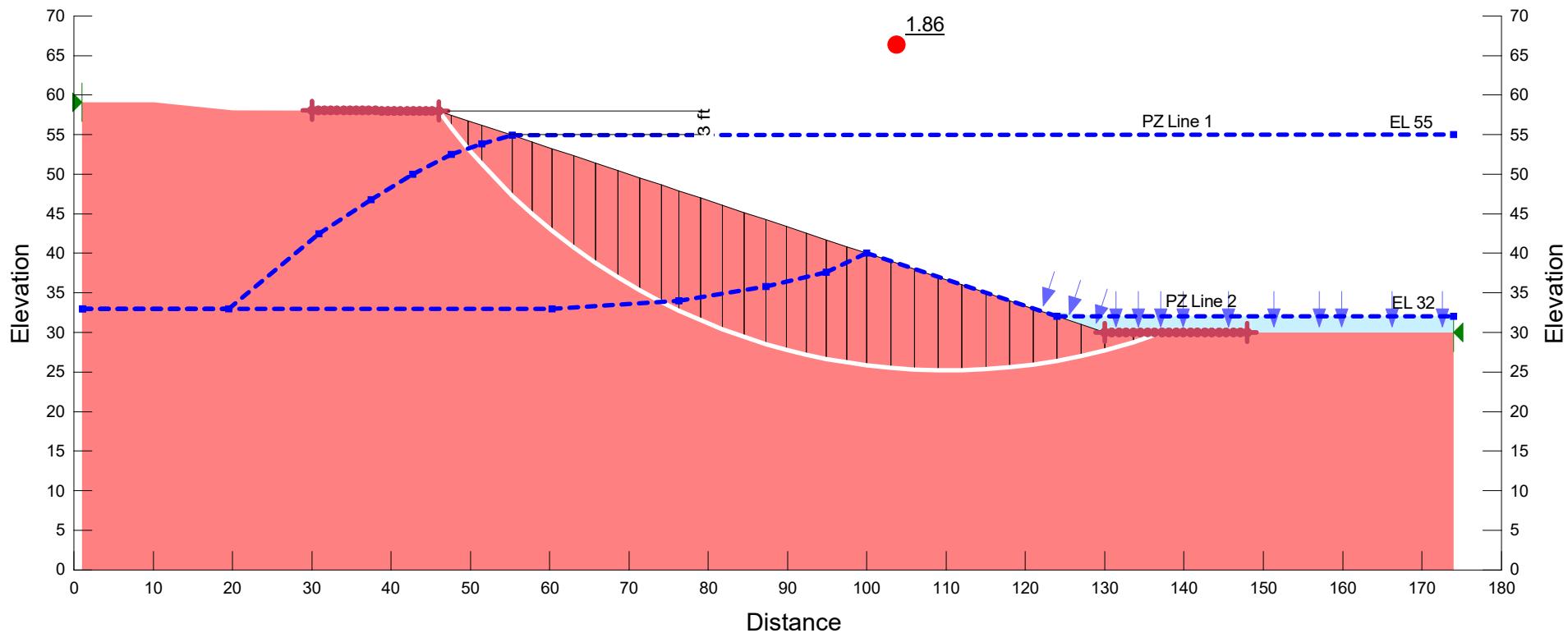
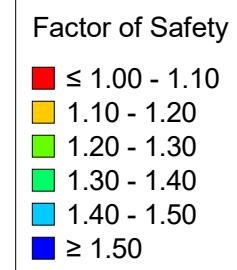
FOS: 1.07



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■ CL Soft	CL Soft	120	100	24	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Stiff Lean Clay (CL)**  
**3.0 to 1 Channel Slope**

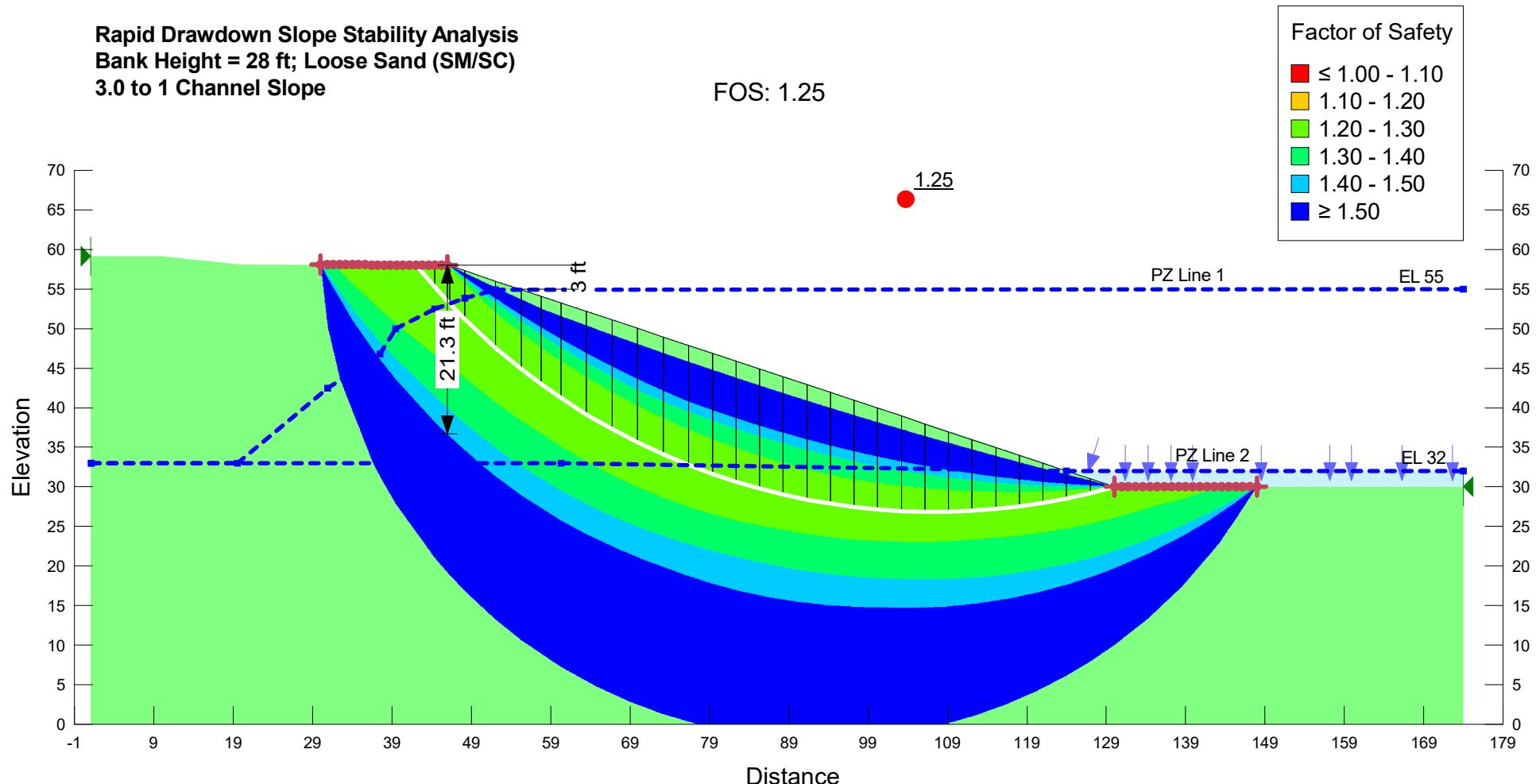
FOS: 1.86



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Red	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Loose Sand (SM/SC)**  
**3.0 to 1 Channel Slope**

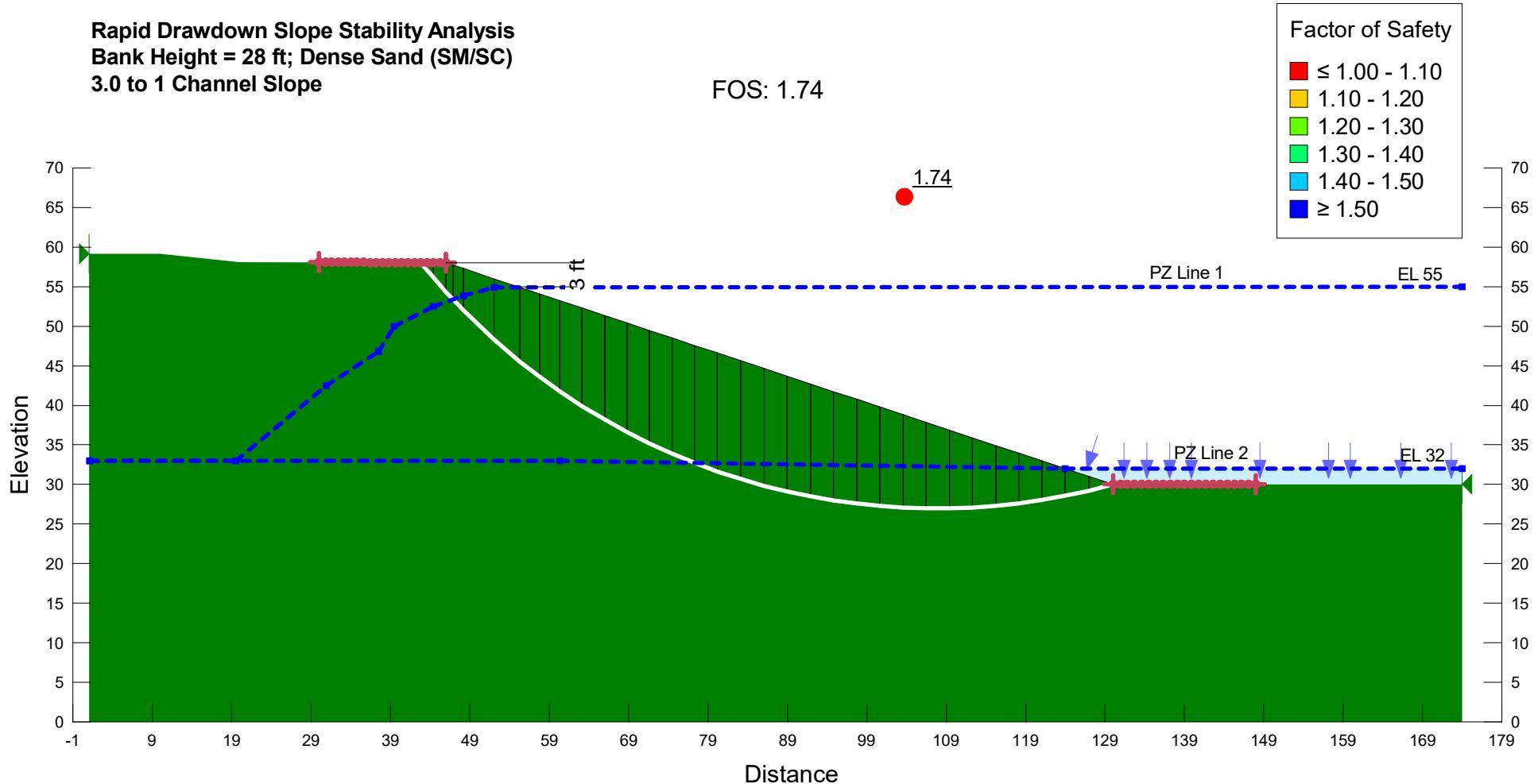
FOS: 1.25



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Green	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Dense Sand (SM/SC)**  
**3.0 to 1 Channel Slope**

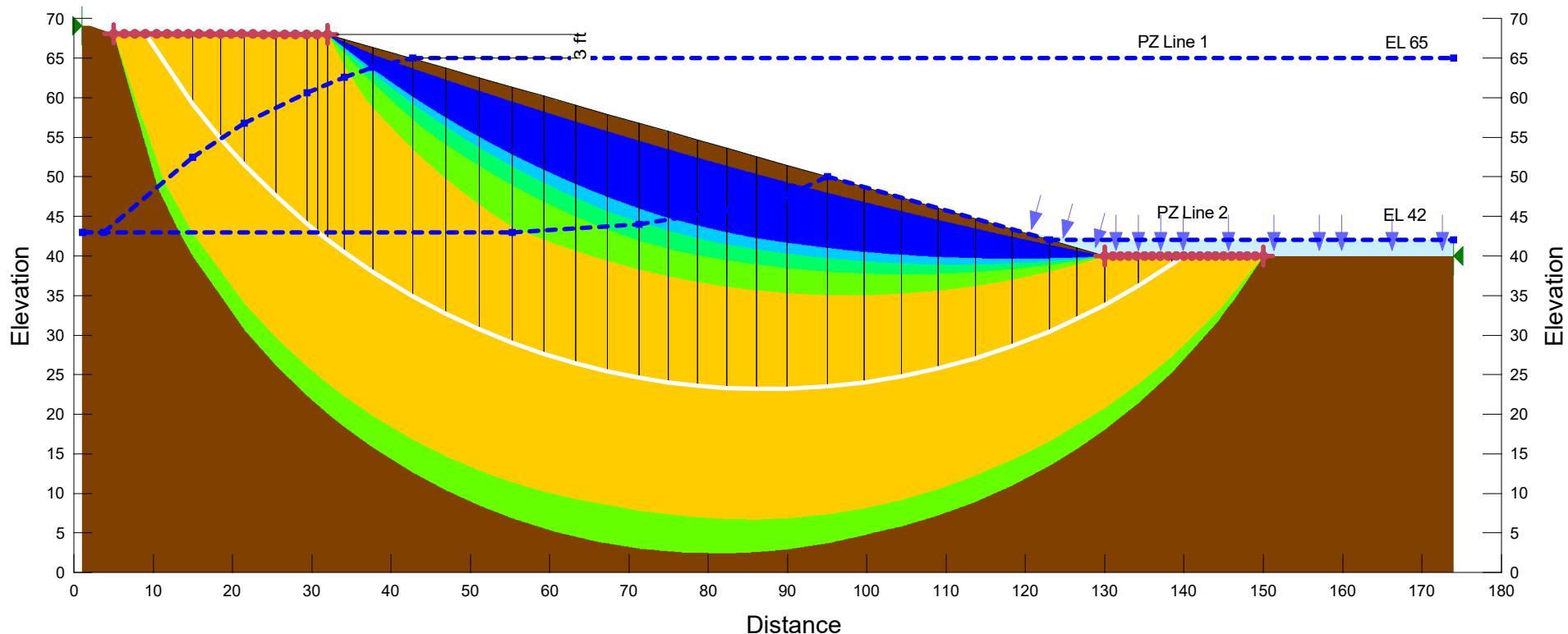
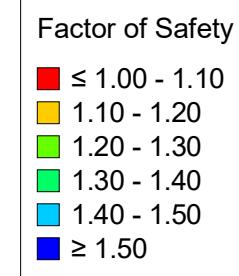
FOS: 1.74



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 28 ft; Soft Fat Clay (CH)  
 3.5 to 1 Channel Slope

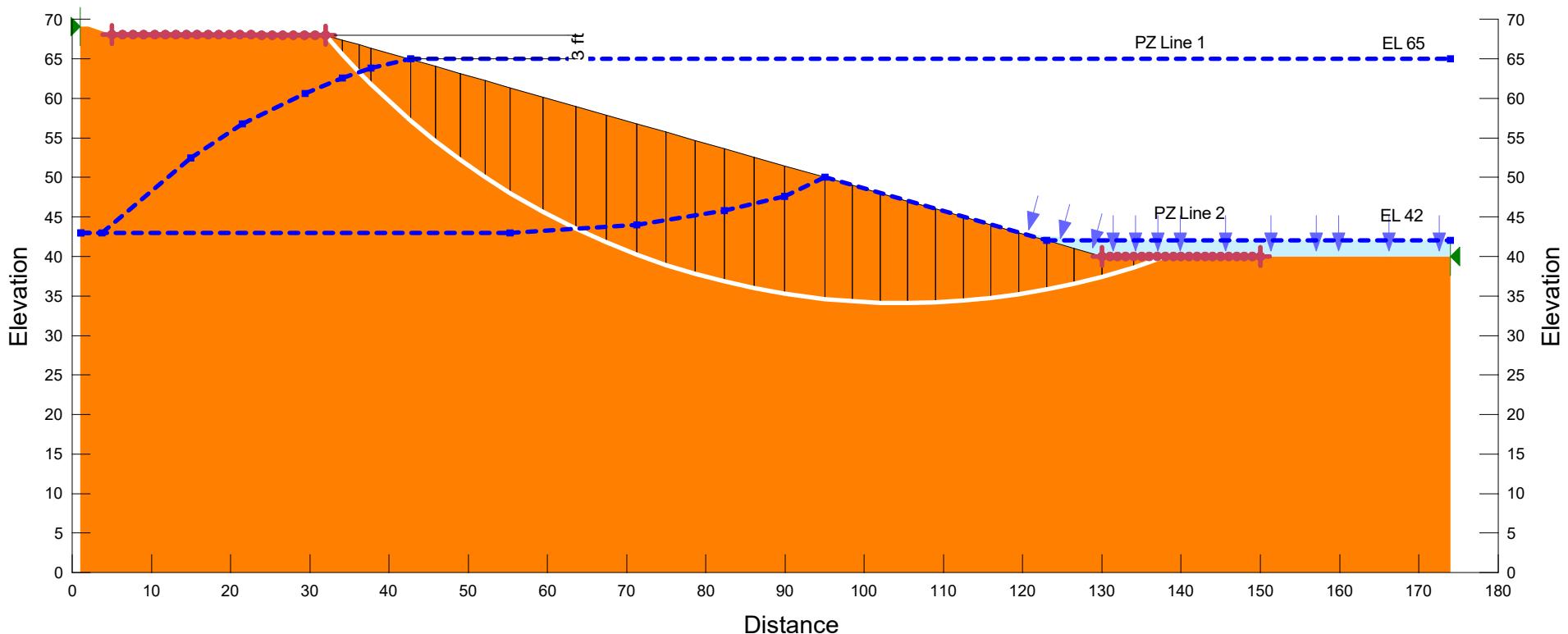
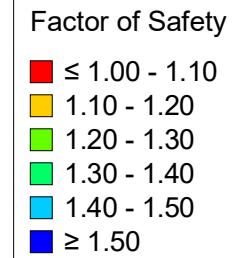
FOS: 1.10 1.10



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
█	CH Soft	120	100	22	500	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 28 ft; Stiff Fat Clay (CH)  
 3.5 to 1 Channel Slope

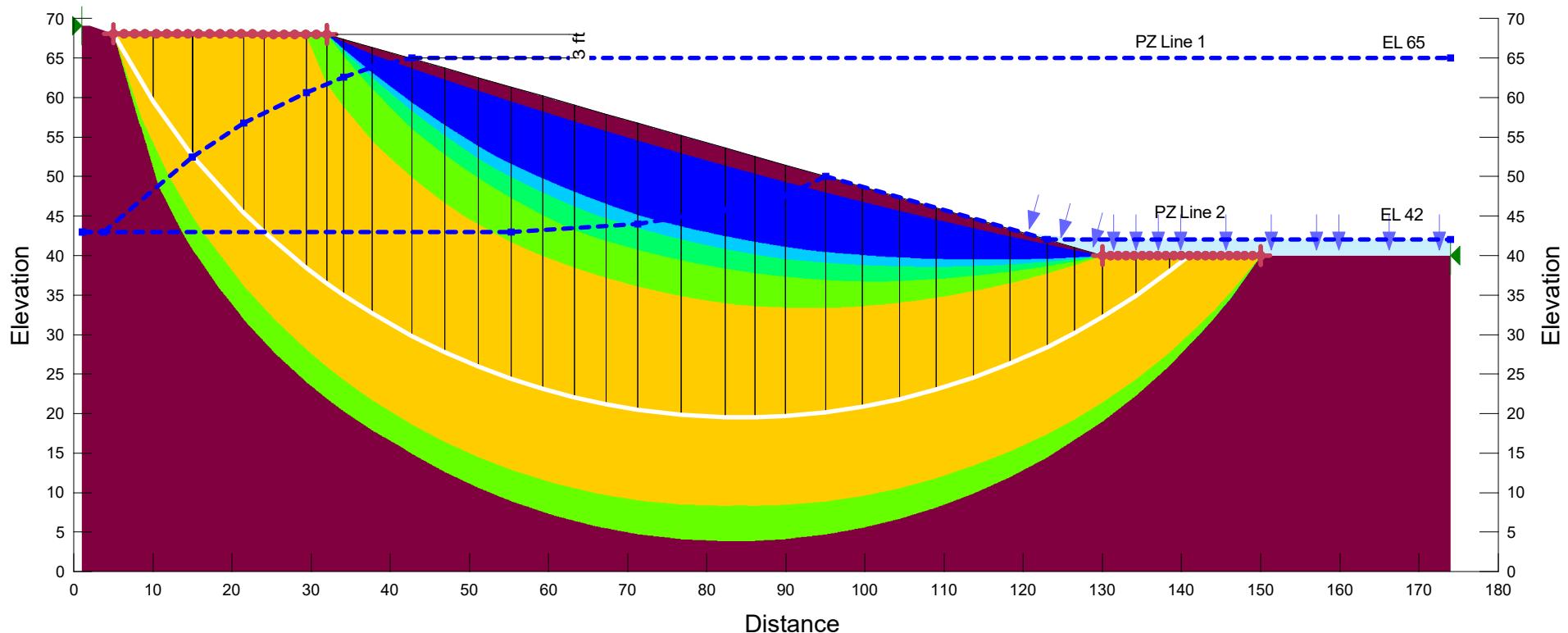
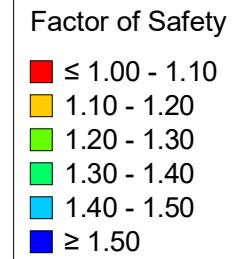
FOS: 1.81



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Soft Lean Clay (CL)**  
**3.5 to 1 Channel Slope**

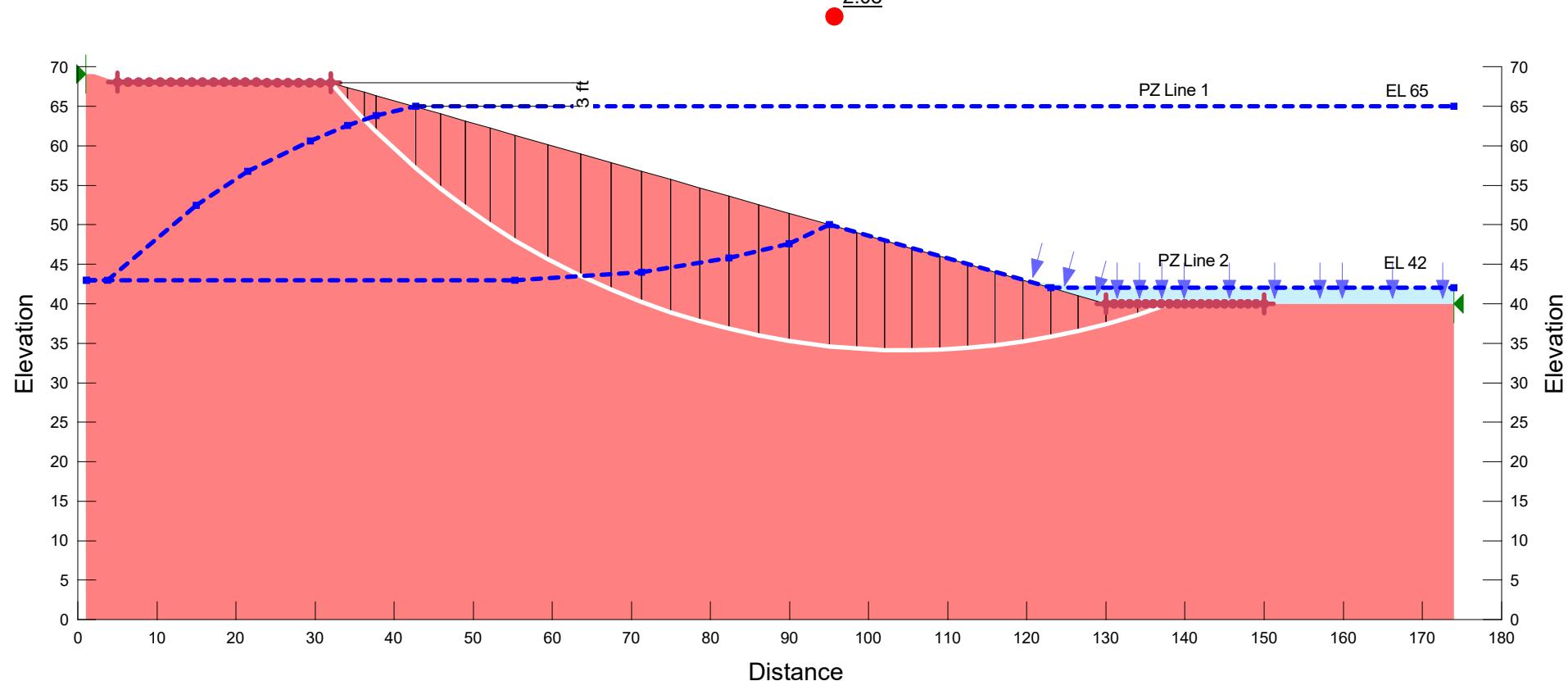
FOS: 1.12



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■ CL Soft	CL Soft	120	100	24	500	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 28 ft; Stiff Lean Clay (CL)  
 3.5 to 1 Channel Slope

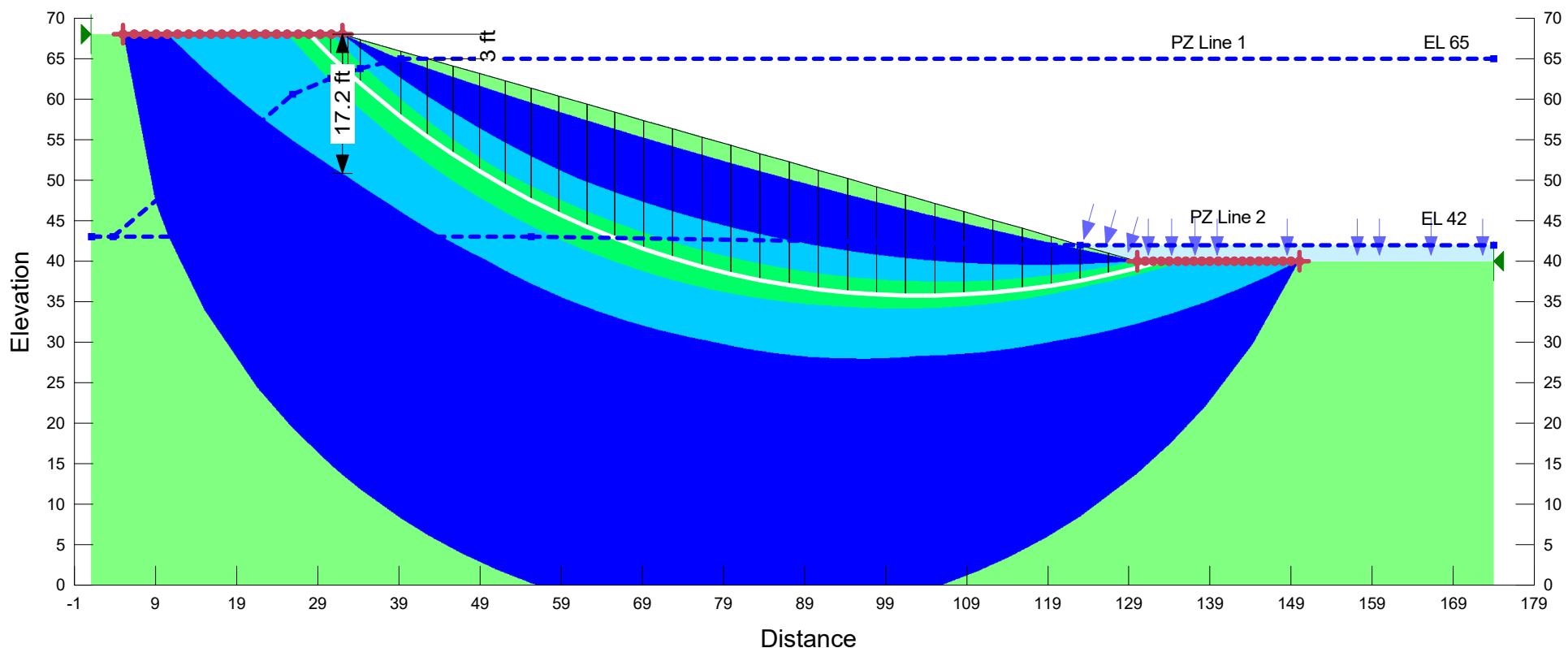
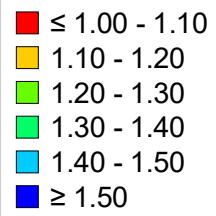
FOS: 2.08



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle ( $^{\circ}$ )	Cohesion R (psf)	Phi R ( $^{\circ}$ )	Piezometric Surface	Piezometric Surface After Drawdown
Red	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Loose Sand (SM/SC)**  
**3.5 to 1 Channel Slope**

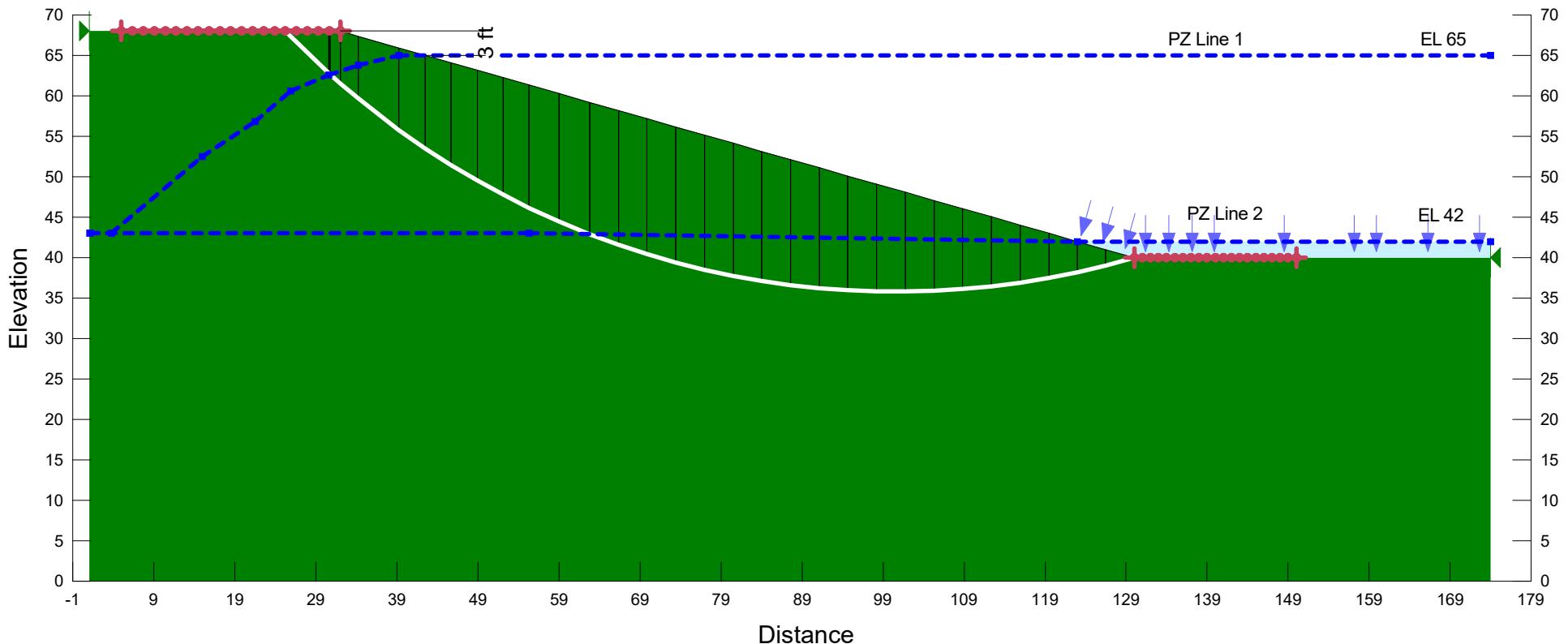
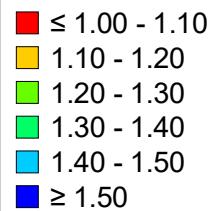
FOS: 1.39



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Green	SM/SC Loose	120	100	28	110	20	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Dense Sand (SM/SC)**  
**3.5 to 1 Channel Slope**

FOS: 1.95

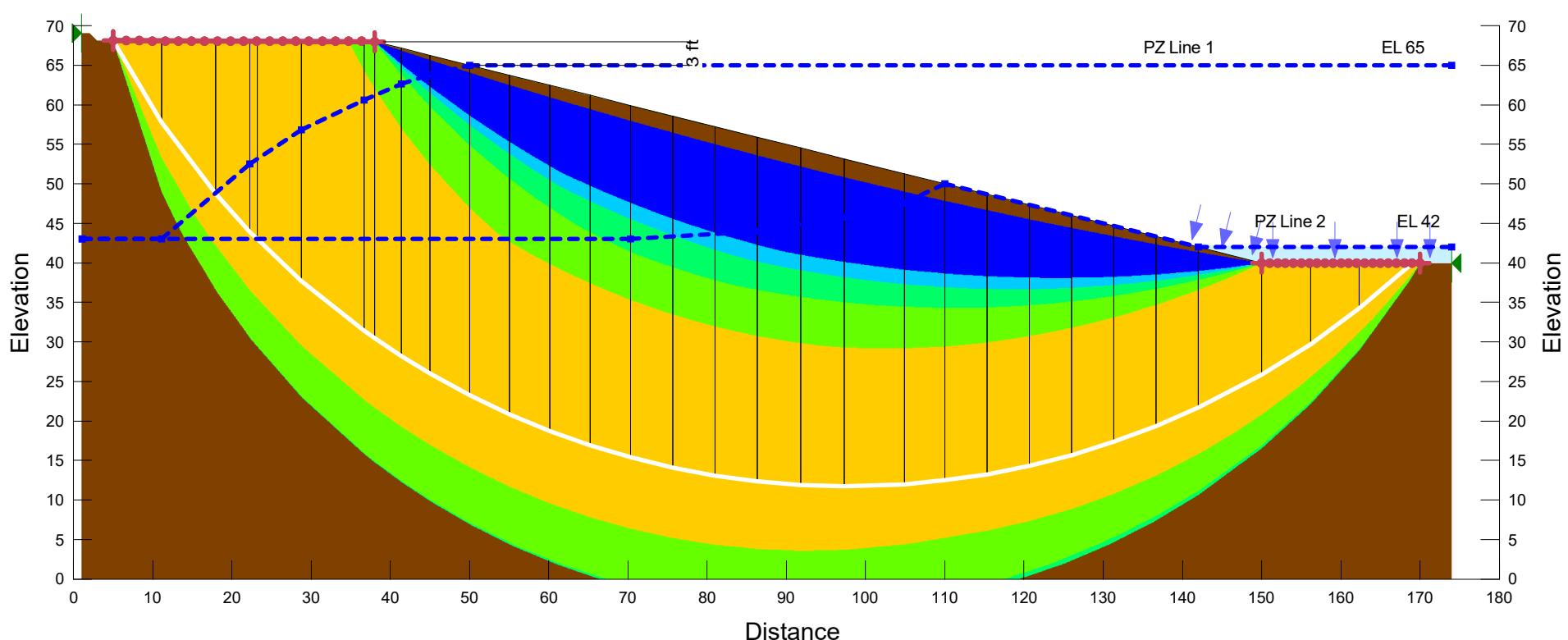


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 28 ft; Soft Fat Clay (CH)  
 4.0 to 1 Channel Slope

FOS: 1.13

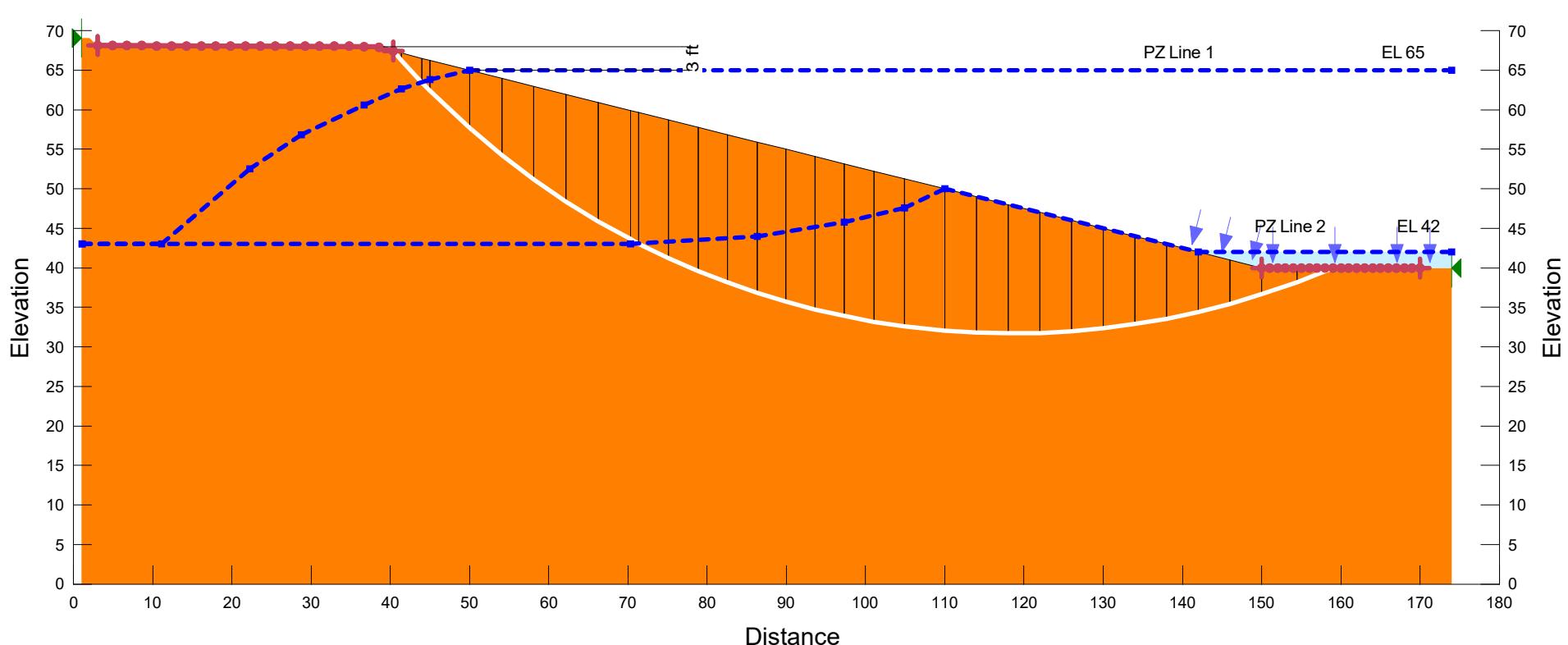
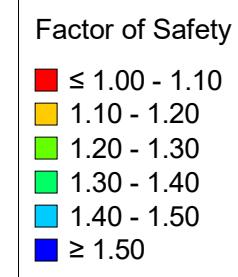
Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
█	CH Soft	120	100	22	500	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
 Bank Height = 28 ft; Stiff Fat Clay (CH)  
 4.0 to 1 Channel Slope

FOS: 1.99

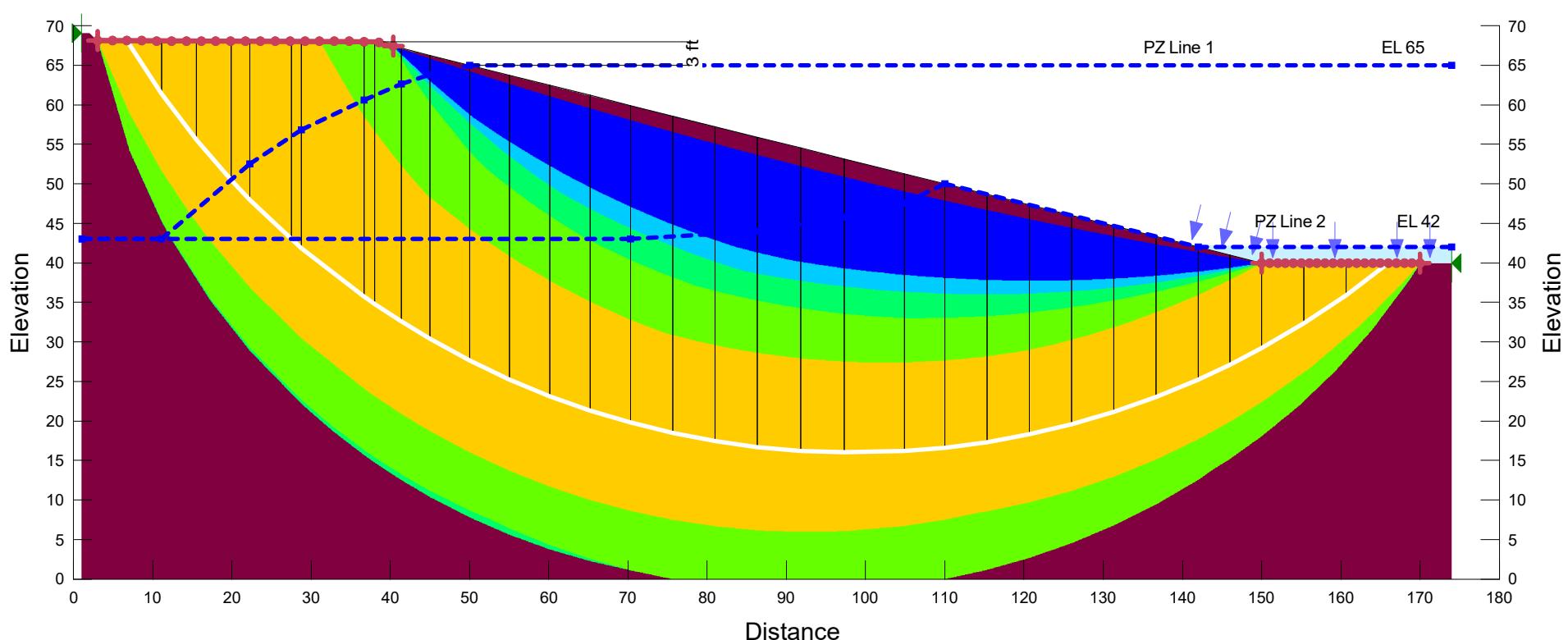


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Orange	CH Stiff	120	100	26	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Soft Lean Clay (CL)**  
**4.0 to 1 Channel Slope**

FOS: 1.14

Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50

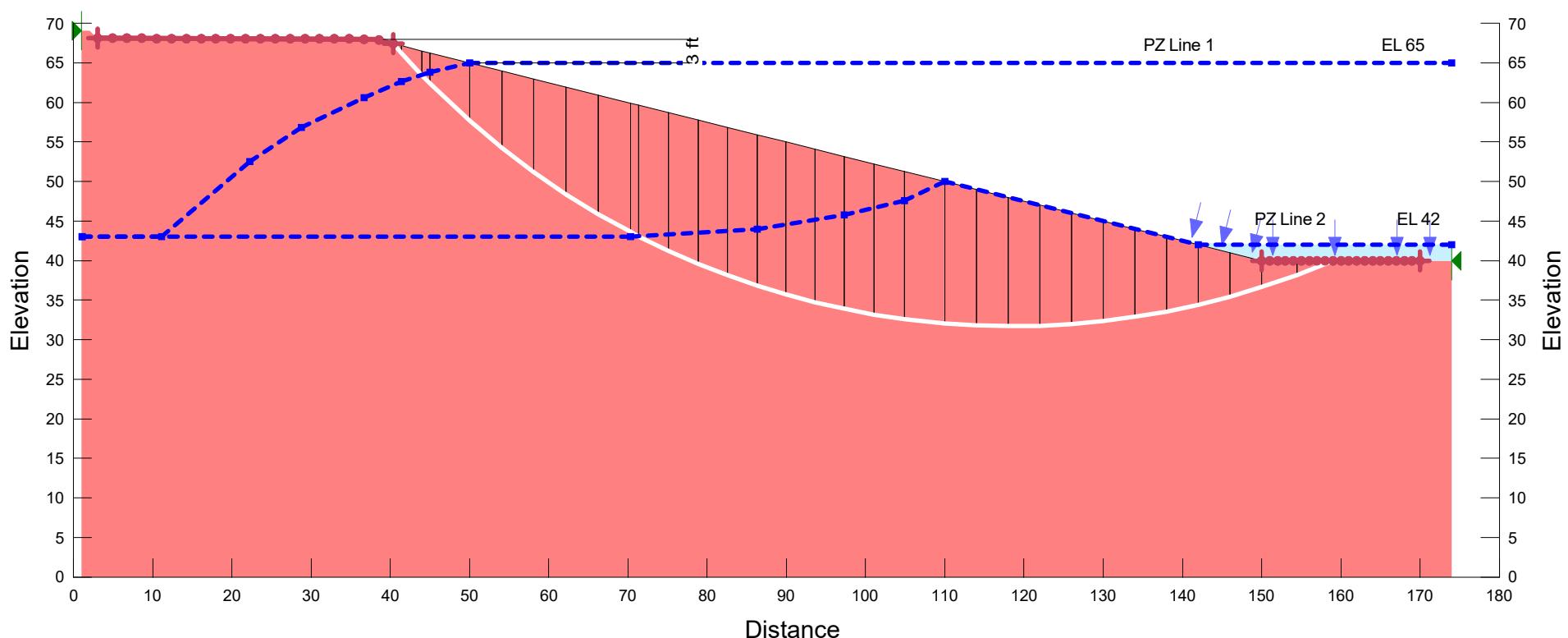


Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Soft	120	100	24	500	0	1	2

Rapid Drawdown Slope Stability Analysis  
 Bank Height = 28 ft; Stiff Lean Clay (CL)  
 4.0 to 1 Channel Slope

FOS: 2.29

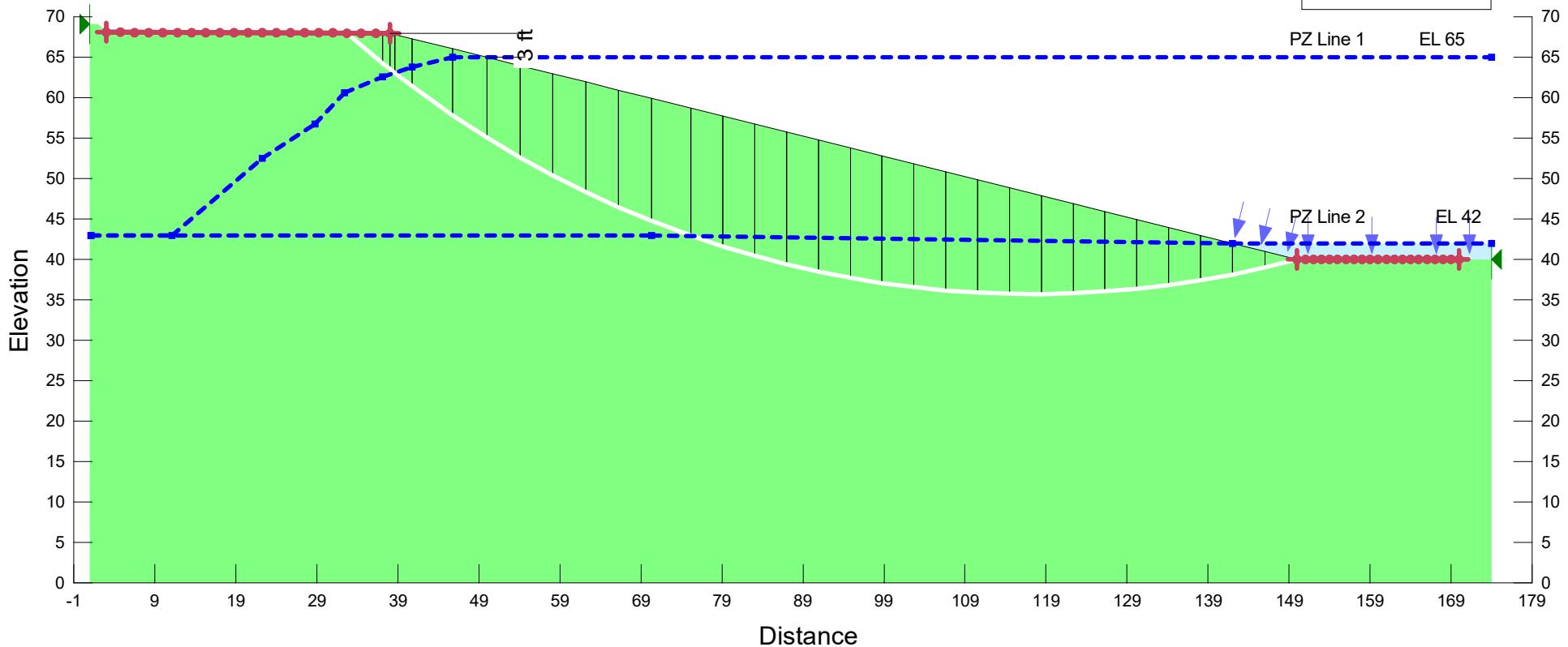
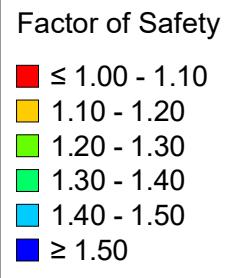
Factor of Safety
≤ 1.00 - 1.10
1.10 - 1.20
1.20 - 1.30
1.30 - 1.40
1.40 - 1.50
≥ 1.50



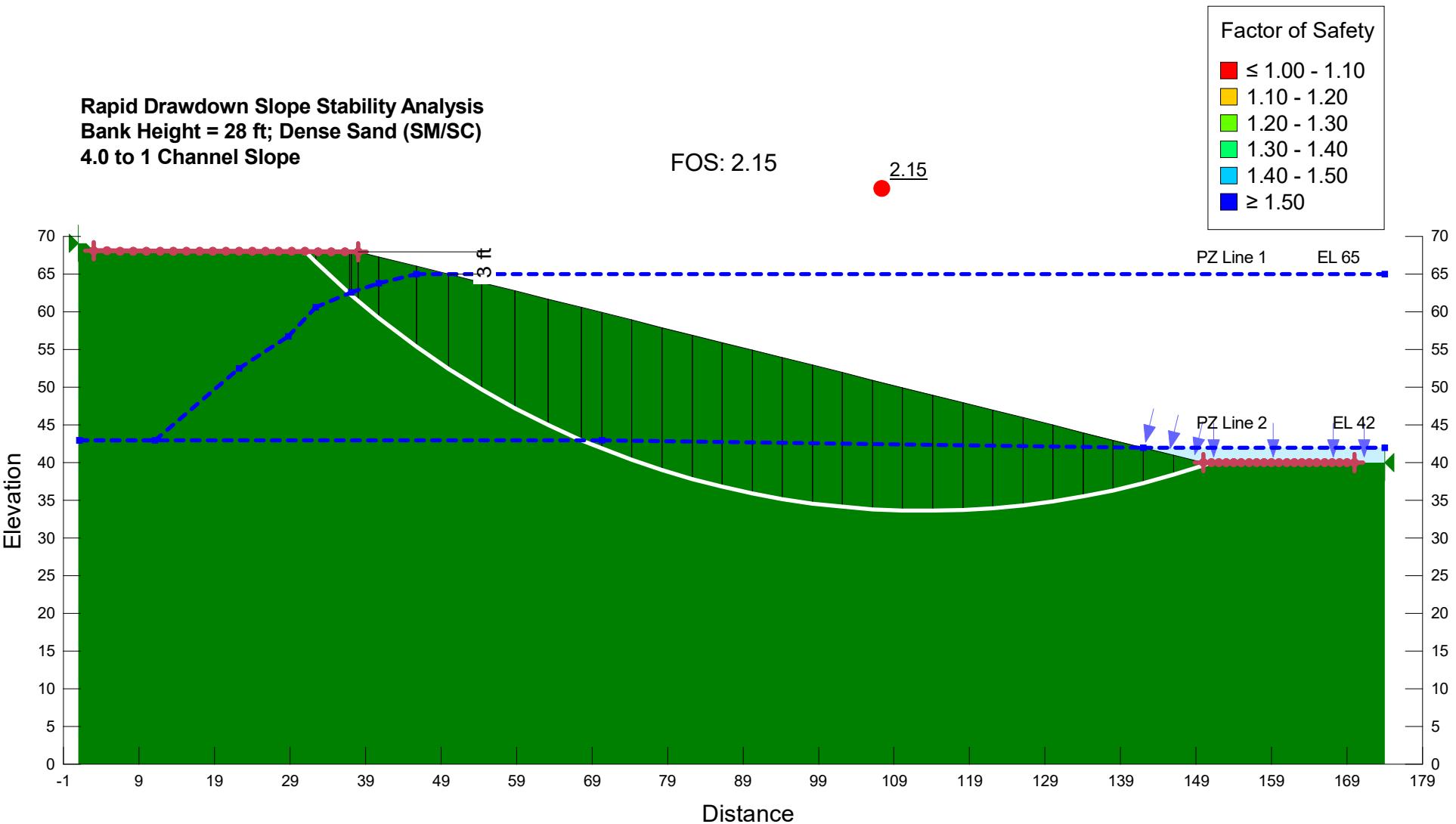
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	CL Stiff	120	100	30	2,000	0	1	2

**Rapid Drawdown Slope Stability Analysis**  
**Bank Height = 28 ft; Loose Sand (SM/SC)**  
**4.0 to 1 Channel Slope**

FOS: 1.53



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
Green	SM/SC Loose	120	100	28	110	20	1	2



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Surface	Piezometric Surface After Drawdown
■	SM/SC Dense	120	100	35	150	27	1	2

# **Appendix D**

## **Slope Stability Comparison to Historical Charts Technical Memo**

# MEMO

To:

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Fax 423 756 7197

From:

Tim Newton, PG

Date:

October 10, 2017

Arcadis Project No.:

B0085883.1701

Subject:

Task 4 Factor of Safety Correlation to Stream Bank Attributes  
Global Pipeline Integrity Water Crossing Program

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Additional evaluations have been performed on the bank stability factor of safety (FOS) graph tool in response to comments on the April 17<sup>th</sup> submittal. The slope stability FOS graphs were created from a parametric analysis that was performed using variables of soil type, soil consistency, bank height, and slope angle. A series of safety factor curves produced from the results allow an initial assessment of slope stability. Arcadis developed the FOS charts from parametric stability analyses performed using Spencer's Method coupled with a three-stage drawdown method. Spencer's Method is the preferred solution for stability calculations using computer software because it satisfies both force and moment equilibrium conditions. The slope stability analyses are based on post-flood, rapid drawdown conditions where undrained loading may develop as the river stage recedes. Analysis for rapid drawdown is performed using a three-stage method by Duncan, Wright and Wong (1990). This method accounts for the effects of drainage, the fact that undrained strength could be greater than drained strength, and the effects of anisotropic consolidation.

Historically, simpler methods which are less calculation intensive have been used to estimate stability. Janbu's Simplified Method ignores interslice shear forces and does not satisfy moment equilibrium. This method is intended to evaluate steady state conditions and does not consider the effects of drawdown. Janbu developed slope stability charts based on his methods, which were published in the 1968 paper *Slope Stability Computations* (Reference 1). The slope stability graphs from the Arcadis parametric analysis are compared to the Janbu chart methods that are documented in Appendix E of the publicly available USACE engineer manual EM-1110-2-1902 (Reference 2). The specific Janbu charts used to generate the data points in this comparison are provided as attachments 1 and 2.

The Janbu charts for soils having both cohesion and an internal angle of friction and uniform strength throughout the bank slope are used to determine a slope stability factor of safety for each bank height, slope angle and material included in the parametric study. The Janbu seepage adjustment factors for saturated slopes are applied to the chart variables that determine factor of safety.

The trendlines of the Janbu FOS results are plotted on the graphs to contrast the two methods as shown in Attachment 3. Curves on the charts represent a slope stability FOS of 1.1 and 1.3 with conditionally stable conditions falling between the two curves and stable conditions falling along and to the right of the 1.3 FOS curve. Potentially unstable conditions are in the area on the left of the 1.1 FOS line.

The Janbu correlations for the soft lean clays (CL) and the soft fat clays (CH) were very similar to the Arcadis results with FOS differences ranging from 0.01 to 0.5 and an average FOS difference of 0.16. The remaining material types had an average FOS difference of 0.5, meaning that the Janbu factors of safety are typically 0.5 lower for the same bank height, slope angle, and material. The Janbu charts appear to be extremely conservative relative to the Arcadis graphs that are based on drawdown slope stability analyses.

Morgenstern's *Stability Charts for Earth Slopes during Rapid Drawdown* (Reference 3) are also referenced for comparison. The charts correlate drawdown slope stability FOS to drawdown ratio and are limited to four slope angles. Slopes of 2:1, 3:1, and 4:1 are evaluated at full drawdown (ratio of 1.0) for the six material types addressed by the Arcadis FOS tool. The Morgenstern charts are provided as Attachment 4. The Morgenstern graphs generally predicted a slightly higher factor of safety with differences ranging from 0 to 0.26 with an average difference of 0.12. The results indicate a close correlation with the FOS graphs produced by Arcadis as shown in tables 1 and 2. The Morgenstern charts did not allow enough points to generate trendlines on the existing graphs for visual comparison.

**Table 1. Morgenstern Drawdown Stability FOS from Charts for Clay Soils**

Slope	Soft Lean Clay (CL)	Stiff Lean Clay (CL)	Soft Fat Clay (CH)	Stiff Fat Clay (CH)
	Chart FOS	Arcadis FOS	Chart FOS	Arcadis FOS
2:1	0.95	0.80	1.10	1.11
3:1	1.30	1.15	1.50	1.42
4:1	1.65	1.39	1.90	1.77

**Table 2. Morgenstern Drawdown Stability FOS from Charts for Sands**

Slope	Loose Silty/Clayey Sand (SM/SC)	Dense Silty/Clayey Sand (SM/SC)
	Chart FOS	Arcadis FOS
2:1	1.05	0.90
3:1	1.45	1.39
4:1	1.80	1.74

## MEMO

The FOS tool is further evaluated using three case studies where known slope failures occurred on stream banks. The first failure is along a 40-foot-tall bank on the Trinity River with the steepest section being on a 1.4:1 slope and consisting of medium stiff to soft layers of fat and lean clay. The soft fat and soft lean clay charts indicate that the bank is “unsafe” while the stiff fat and lean clay charts indicate it’s “conditionally” safe. Additional investigative actions would be recommended based on the FOS tool.

A documented failure on a 35-foot-tall, 3:1 slope composed of stiff fat clay and dense clayey sand could not be predicted by the FOS tool due to its flat slope and higher strength materials. Stability charts for stiff fat clay and dense sand show the slope as being in the “safe” zones of the graphs. It is likely this failure on the Colorado River was induced by progressive erosion of the sand layer during a highwater event rather than a rotational landslide.

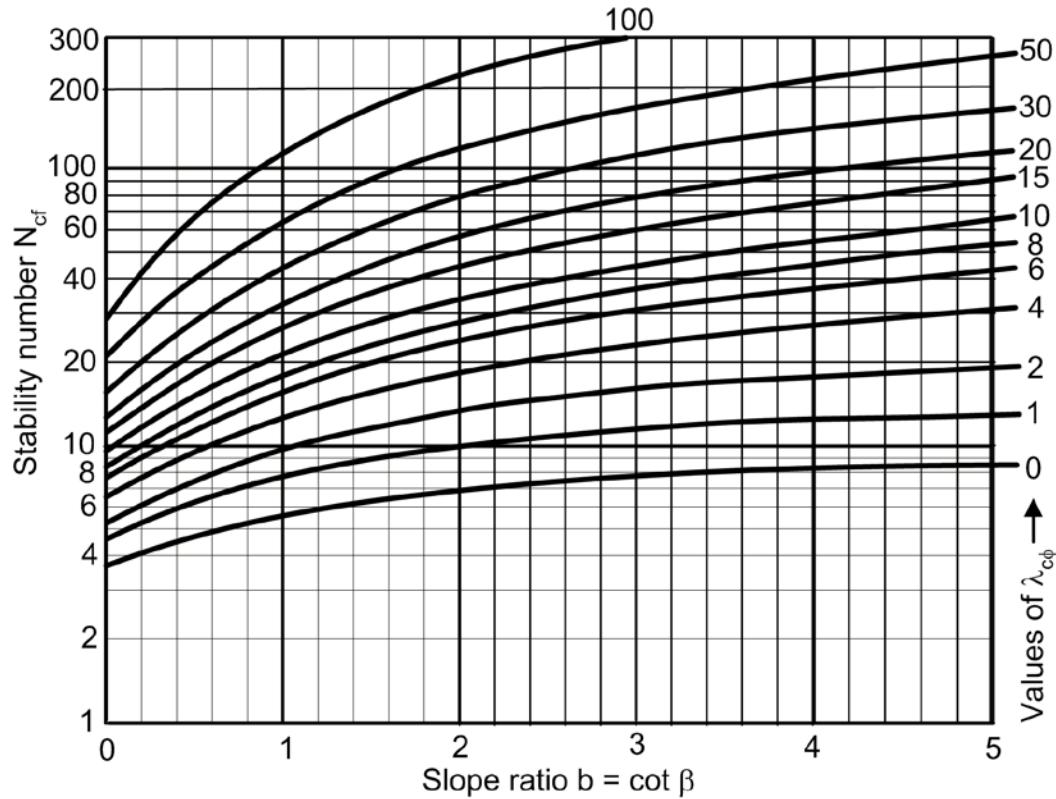
The third failure occurred at Clear Creek on an 18-foot-tall bank composed of clayey sand and having a 0.5:1 slope at its steepest section. The density of the in-situ sand is unknown. Both the loose and dense clayey sand charts show the slope falling in the “unsafe” zone of the graph and requiring action.

The evaluation shows that the FOS tool is less conservative than the Janbu charts and slightly more conservative than the Morgenstern drawdown graphs. Arcadis wishes to discuss these results with Exxon to determine appropriate adjustments, if any, to the FOS tool. One possible action is to shift the factors of safety by 0.25 to better match the Janbu charts.

## REFERENCES

1. Janbu, N. 1968. “Slope Stability Computations,” Institutt for Geotknikk og Fundamenteringslære, Norges Tekniske Høgskole, Soils Mechanics and Foundation Engineering, the Technical University of Norway.
2. U.S. Army Corps of Engineers. 2003. Engineering Manual 1110-2-1902, Slope Stability, October 31, 2003.
3. Morgenstern, N. 1963. “Stability Charts for Earth Slopes During Rapid Drawdown” Géotechnique Vol 13, No 2, pp. 121-131.

**Attachment 1. Slope stability charts for  $\Phi > 0$  soils (after Janbu, N. 1968. "Slope Stability Computations")**

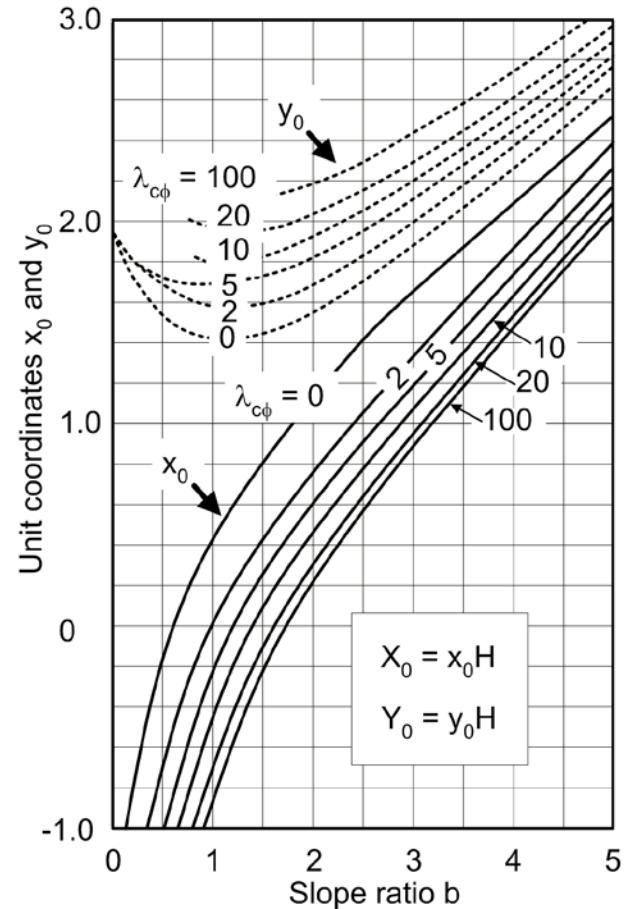


$$F = N_{cf} \frac{C}{P_d}$$

$$P_d = \frac{\gamma H + q - \gamma_w H_w}{\mu_q \mu_w \mu_t}$$

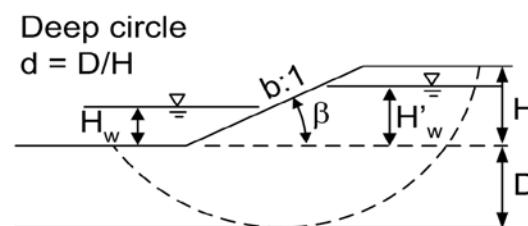
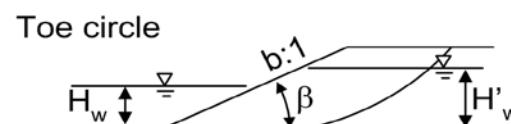
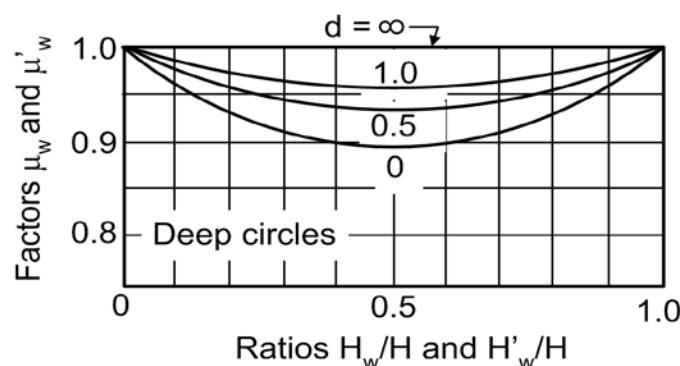
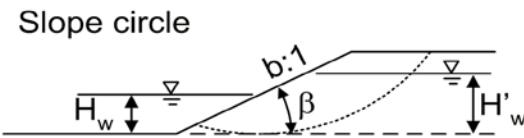
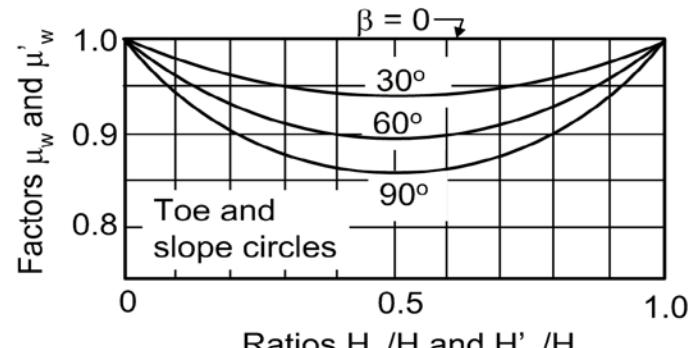
$$\lambda_{c\phi} = \frac{P_e \tan \phi}{C}$$

$$P_e = \frac{\gamma H + q - \gamma_w H_w}{\mu_q \mu_w}$$



Stability numbers and center coordinates for circles passing through the toe of the slope.

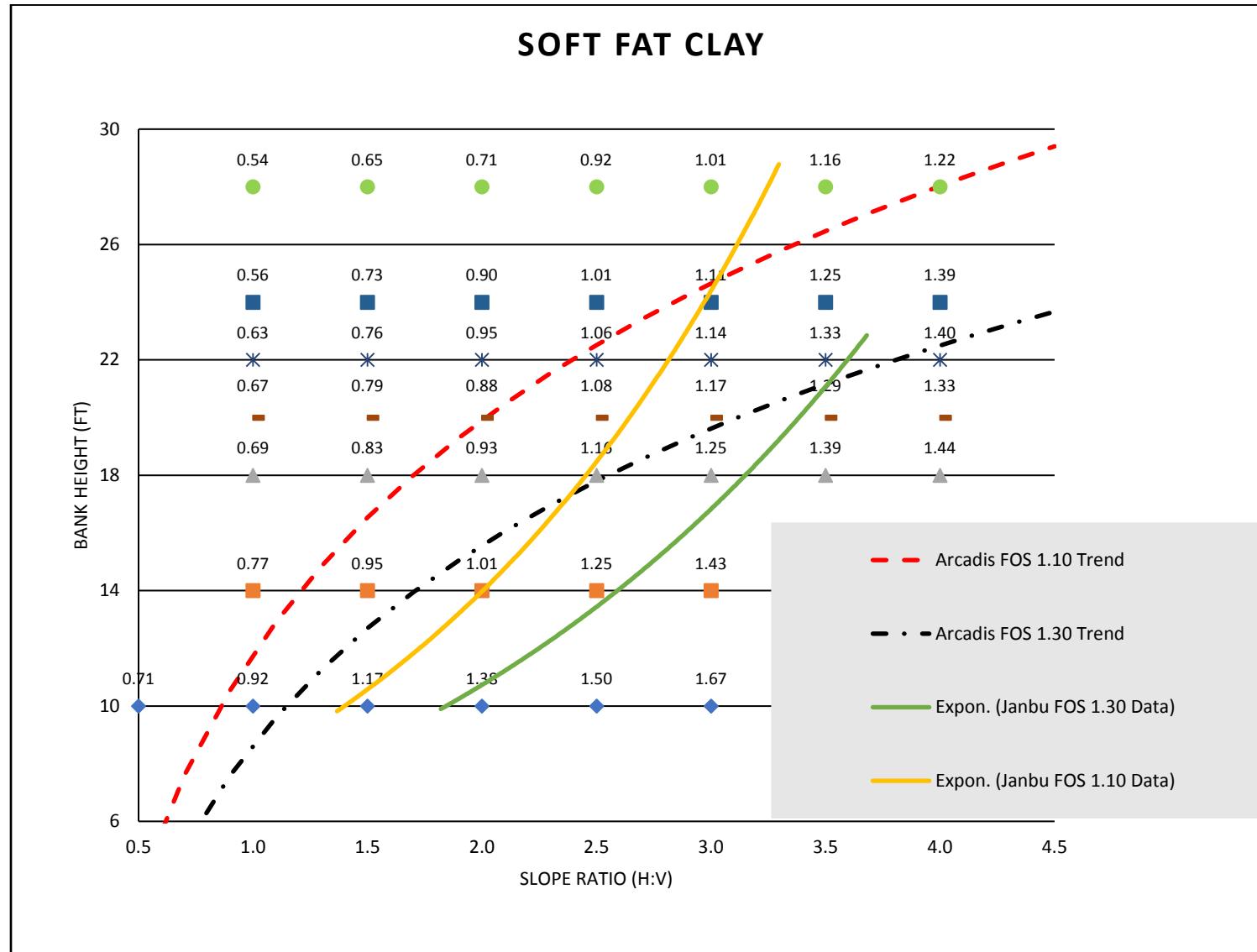
**Attachment 2. Submergence and seepage adjustment factors  $\Phi = 0$  and  $\Phi > 0$  soils (after Janbu, N. 1968. "Slope Stability Computations")**



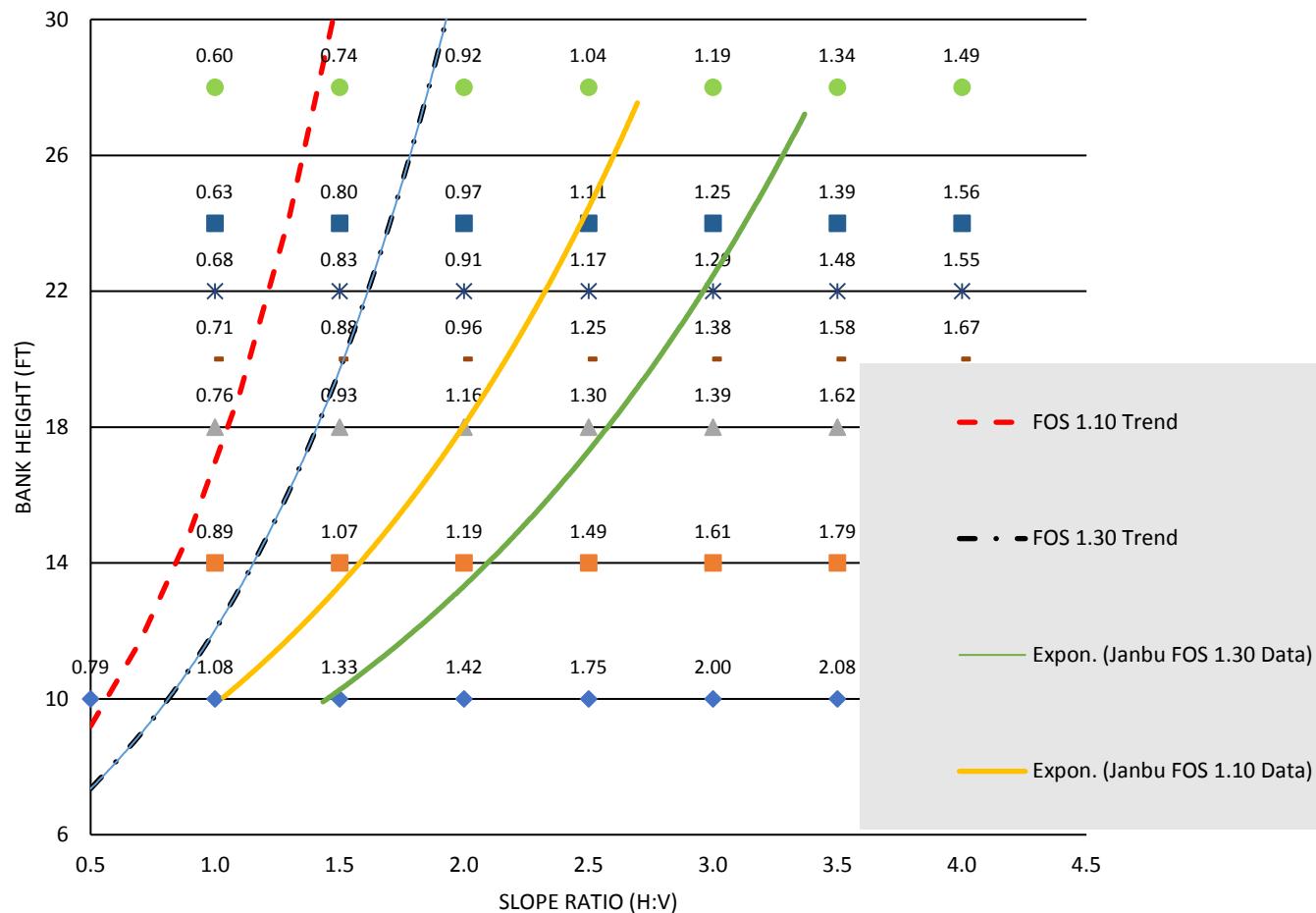
$\mu_w$  = submergence factor, depends on  $H_w$

$\mu'_w$  = seepage factor, depends on  $H'_w$

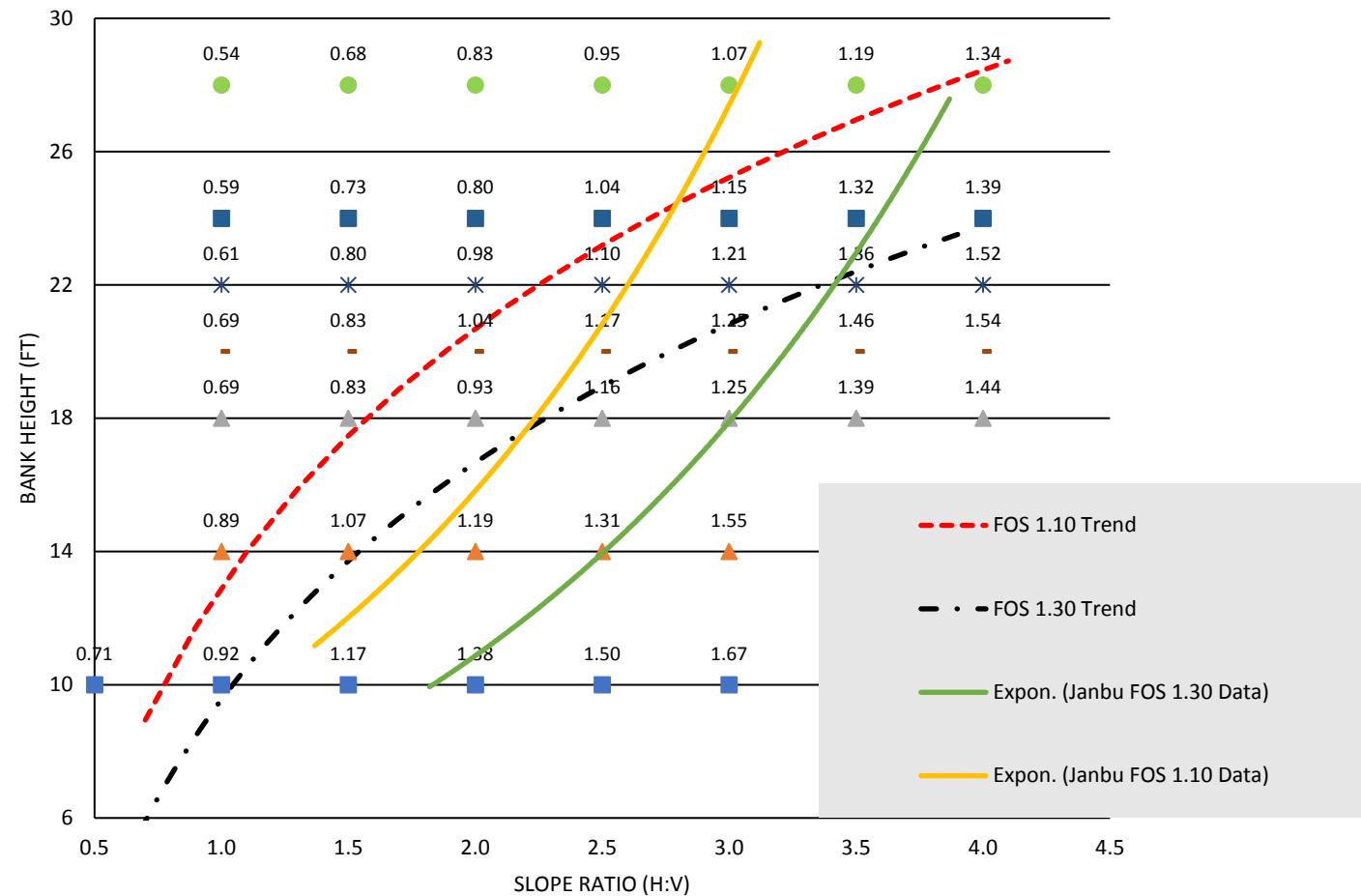
### **Attachment 3. Arcadis FOS Tool Compared to Janbu Chart Method (Green/Gold Lines). Janbu Conditions are Saturated Slopes and Empty Channel.**



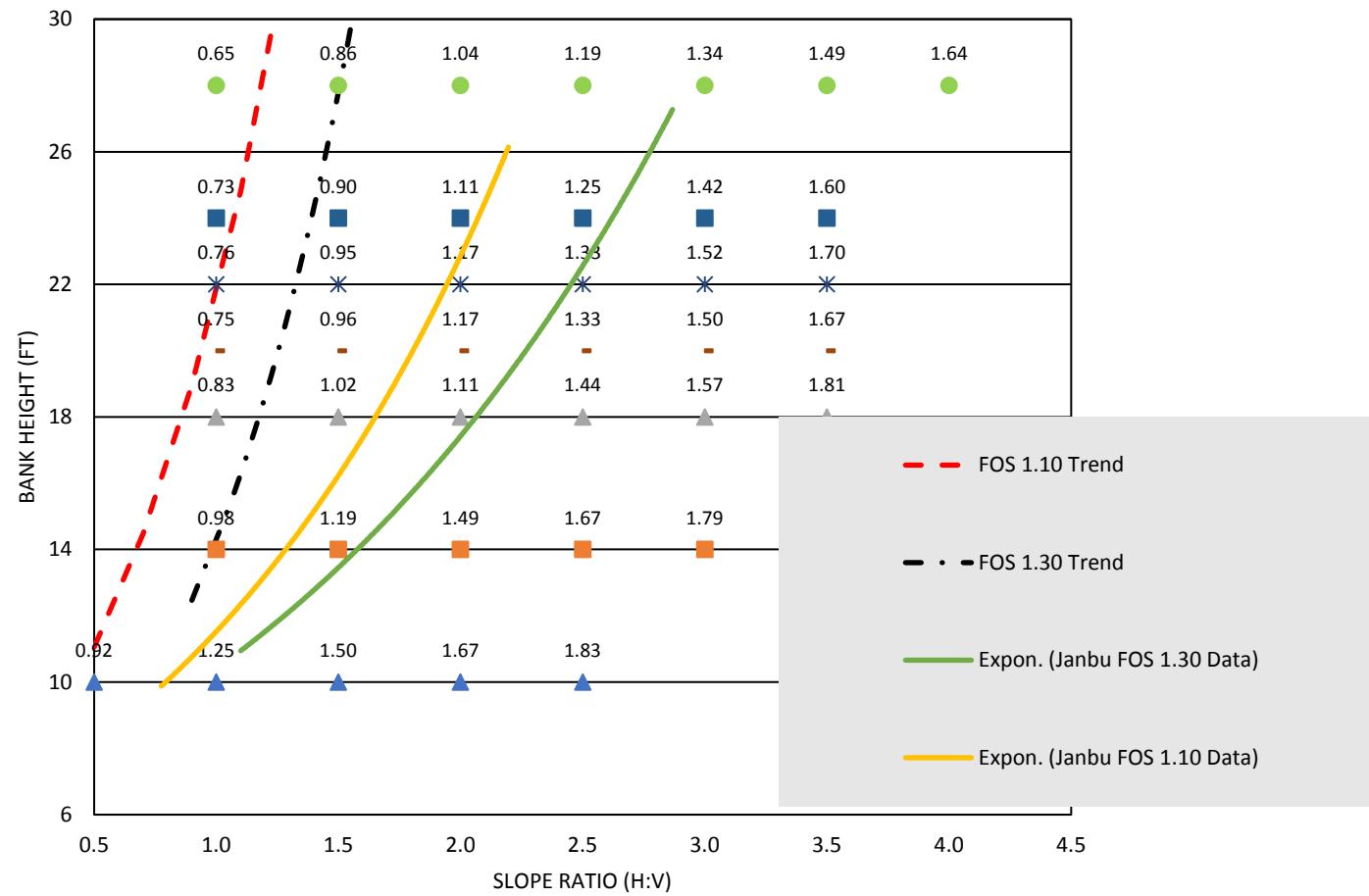
## STIFF FAT CLAY



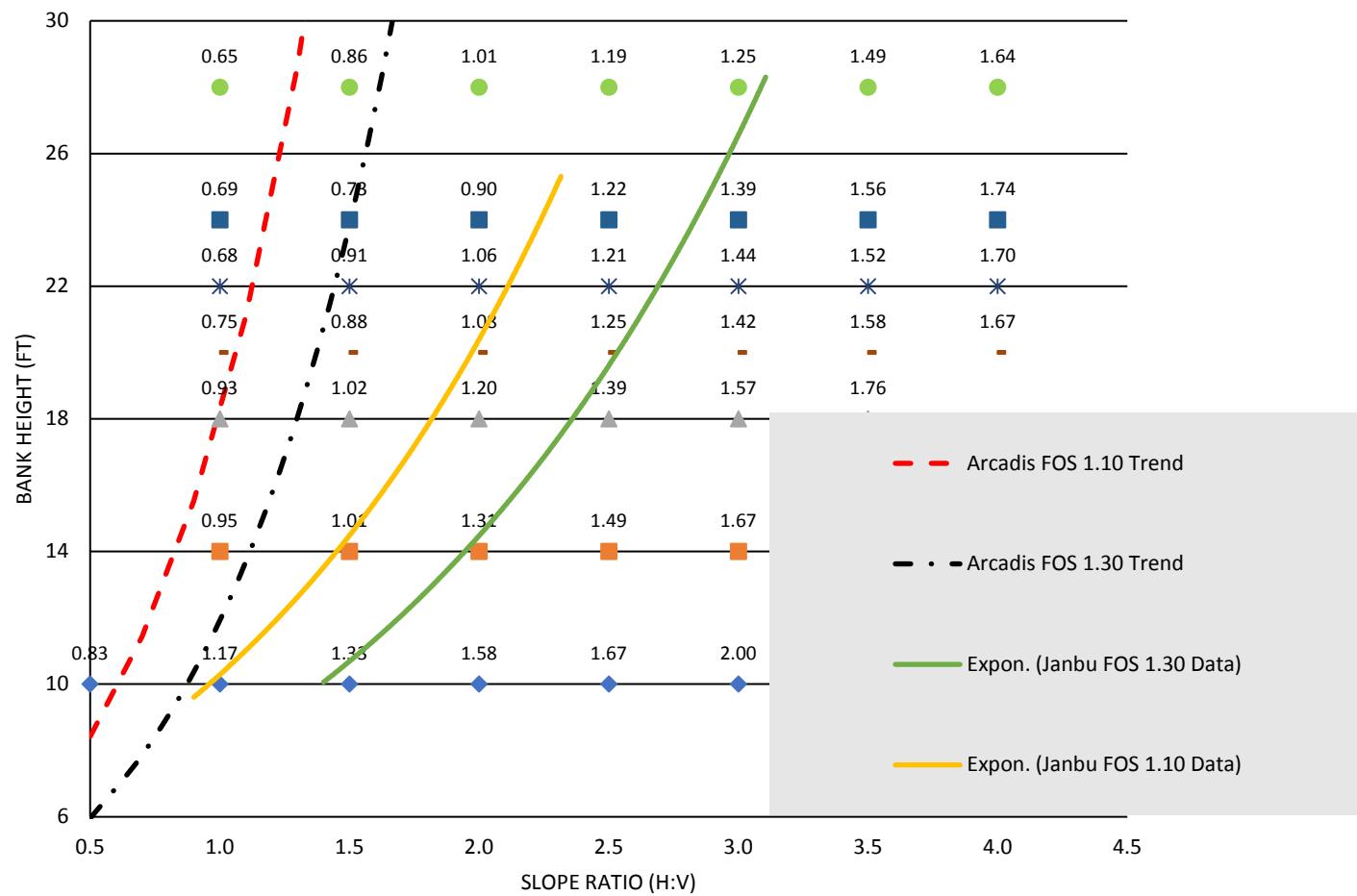
## SOFT LEAN CLAY



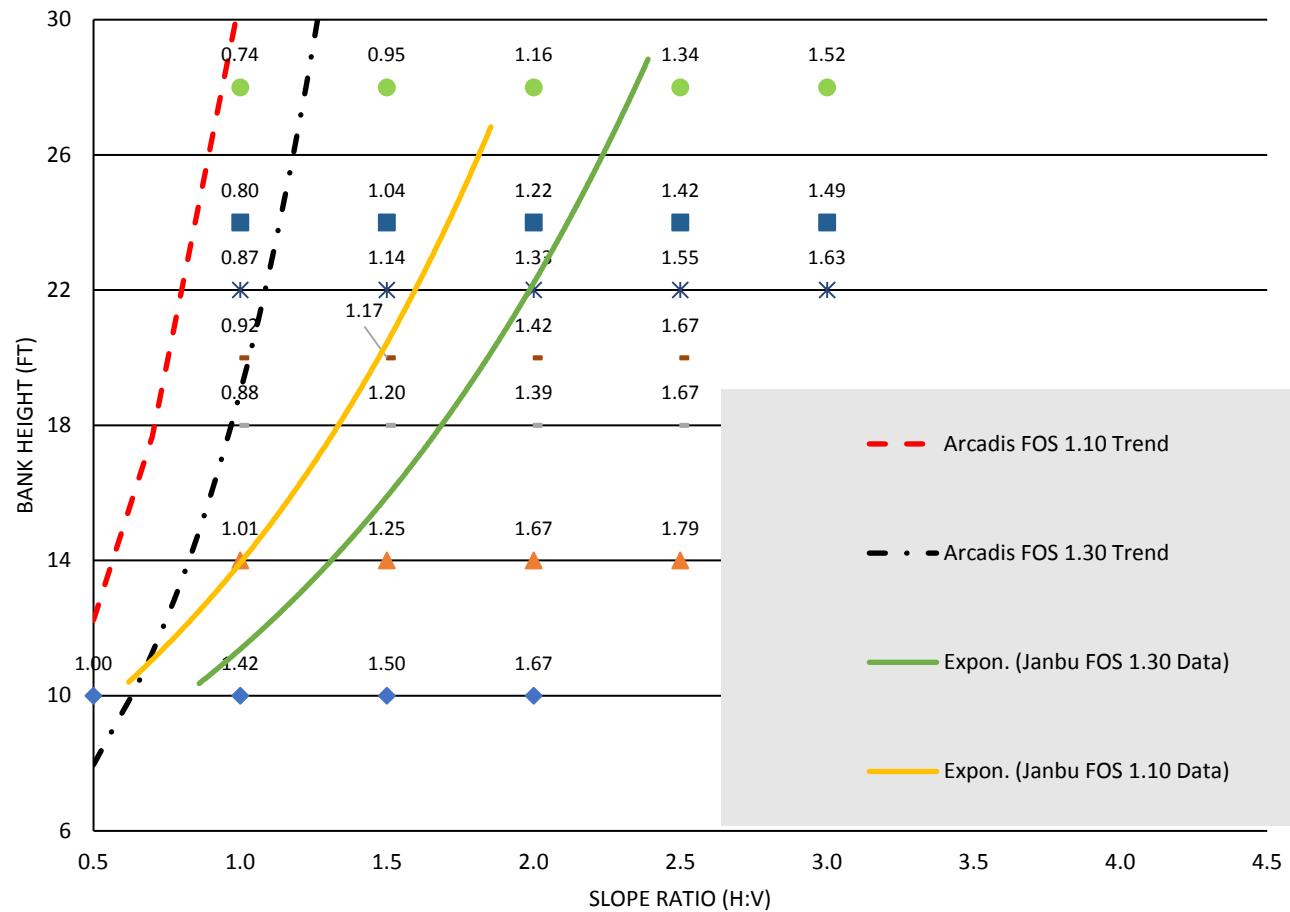
## STIFF LEAN CLAY



## LOOSE CLAYEY/SILTY SAND



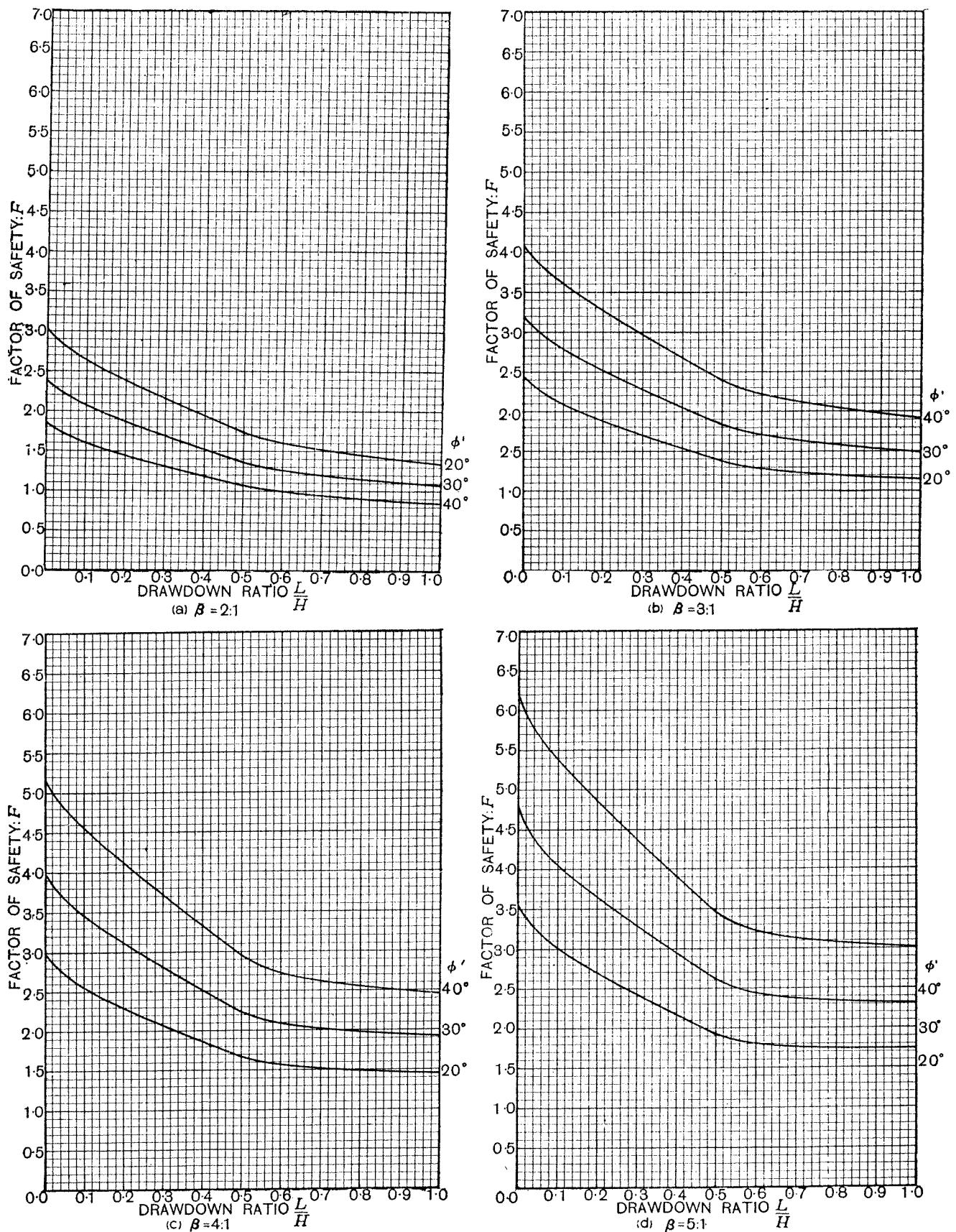
## DENSE CLAYEY/SILTY SAND



## Attachment 4. Morgenstern Drawdown Stability Charts used for Comparison

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NORBERT MORGENSTERN



*Fig. 6. Drawdown stability chart for  $\frac{c'}{\gamma H} = 0.05$*

**Reference:** Morgenstern, N. 1963. "Stability Charts for Earth Slopes During Rapid Drawdown" *Géotechnique* Vol 13, No 2, p. 128

# **Appendix E**

## **Matrix of Slope Stability and Pipeline Vulnerability**

Slope Stability Matrix for Pipeline Water Crossings					
Color Category	Slope Vulnerability		Pipeline Vulnerability		
	Slope Stability	Slope Failure	Sufficient setback (Pipeline >5 ft from Failure Planes*)	Unknown setback (Pipeline location unknown)	Insufficient setback (Pipeline within 5 ft of Failure Planes or Progressive Sloughing*)
			Negligible	Marginal	Serious
Red	Very Low (Unstable)	Very Likely	Action 5	Action 1	Action 1
Yellow	Medium (Conditionally Stable)	Somewhat Likely	Action 5	Action 3	Action 2
Light Green	High (Likely Stable)	Unlikely	Action 5	Action 3	Action 4
Green	Very High (Stable)	Very Unlikely	Action 6	Action 6	Action 6

\*If Slope W has not been run: "Failure Planes" is defined as critical failure plane pre-drawn in 2017 Stability Hazard Assessment Report. If Slope W has been run: "Failure Planes" is defined as those with FOS up to 1.5 for steady state and rapid drawdown loading.

ACTION #	WCE Actions Based on Assessment
1	Immediately engage Third Party SME to review inspection documents & Pro survey, and schedule Third Party SME site visit. Notify Operations of recommended next steps, including obtaining professional survey if one is not available, following site visit. Third Party SME will run preliminary slope W analysis based on conservative soil assumptions and advise on need for soil borings, refined Third Party SME Slope/W assessment, and interim trigger monitoring or HWAP. Assess the structural condition/capacity of the pipe vs. predicted strain demand (run Soil Springs). Assess for bank stability threat per Third Party SME guidance, have reviewed by ExxonMobil SME, and risk assess as needed. Based on risk assessment results, consider operational controls including HWAP and engineering controls or pipe reroute as needed. Assign scheduled monitoring frequency and trigger monitoring per Third Party/ExxonMobil SME input.
2	Engage Third Party SME to review WCE inspection documents & Pro survey and confirm that Third Party SME site visit is needed. Third Party SME will run preliminary Slope/W analysis based on conservative soil assumptions and advise on need for soil borings, refined Third Party SME Slope/W assessment, and interim trigger monitoring or HWAP. Assess the structural condition/capacity of the pipe vs. predicted strain demand (run Soil Springs). Assess for bank stability threat per Third Party SME guidance, have reviewed by ExxonMobil SME, and risk assess as needed. Based on risk assessment results, consider operational controls including HWAP and engineering controls as needed. Assign scheduled monitoring frequency and trigger monitoring per Third Party/ExxonMobil SME input.

<b>3</b>	Request Pro Survey & consider WCE site visit as needed to finalize inspection checklist inputs. Assign trigger monitoring in interim as needed. Update score card based on site visit. Third Party SME shall run preliminary Slope W analysis based on conservative soil assumptions to determine if pipeline is located within failure planes with FOS up to 1.5 for Rapid Drawdown loading or Steady State loading condition. Re-plot crossing in Slope Stability Matrix based on updated pipeline vulnerability and evaluate need for soil boring to eliminate conservatism from Slope W analysis as-needed.
<b>4</b>	<p>If insufficient setback was determined based on overlay with pre-populated critical failure plane from 2017 Stability Hazard Assessment report, then:</p> <ul style="list-style-type: none"> <li>Third Party SME shall complete preliminary Slope W analysis based on conservative soil assumptions to see if pipeline is still located within failure planes with FOS &lt; 1.5 for Rapid Drawdown or Steady State condition. Re-plot crossing in Slope Stability Matrix based on updated pipeline vulnerability and evaluate need for soil boring to eliminate conservatism from Slope W analysis as-needed.</li> </ul> <p>If insufficient setback was determined based on Slope W analysis:</p> <ul style="list-style-type: none"> <li>Consult with ExxonMobil Geotech SME to assess the structural condition/capacity of the pipe vs. predicted soil loading (run Soil Spring) and risk assess crossings that are predicted to exceed pipeline limitations. Consult with ExxonMobil Geotech SME when risk assessing and provide SME with Slope W analysis and Soil Spring results to aid in determination of probability that soil loading will exceed pipeline limitations and result in LOC.</li> <li>Assign scheduled monitoring and trigger monitoring per Third-Party SME input.</li> </ul>
<b>5</b>	<p>If sufficient setback was determined based on survey overlay with pre-populated critical failure plane from 2017 Stability Hazard Assessment report, then:</p> <ul style="list-style-type: none"> <li>Third Party SME shall run preliminary Slope W analysis based on conservative soil assumptions to determine if pipeline is located within failure planes with FOS up to 1.5 for Rapid Drawdown or Steady State loading condition. Re-plot crossing in Slope Stability Matrix based on updated pipeline vulnerability and evaluate need for soil boring to eliminate conservatism from Slope W analysis as-needed.</li> </ul> <p>If sufficient setback was determined based on SlopeW analysis:</p> <ul style="list-style-type: none"> <li>Assign scheduled monitoring &amp; trigger monitoring per Third Party SME input.</li> <li>For crossings with red/unstable or yellow/conditionally stable bank score, review recommendations with ExxonMobil SME and discuss if an SBRA should be performed to capture potential risk associated with future progressive bank failure.</li> </ul>
<b>6</b>	Assign scheduled monitoring & trigger monitoring per WCP Guidelines.

WCE = Water Crossing Engineer, SME = Subject Matter Expert, HWAP = High Water Action Plan

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