SEEPAGE ANALYSIS SUMMARY REPORT:

DREDGE CELL III – CALIBRATION, SEEPAGE FAILURE, FUTURE DREDGE CELL TO 900 FOOT ELEVATION,

AND

SEEPAGE AND SLOPE STABILITY ANALYSIS FOR 842 FOOT PERMIT ELEVATION

KINGSTON, TENNESSEE

MAY 2005

Prepared for:

TENNESSEE VALLEY AUTHORITY
FOSSIL ENGINEERING

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1.0 INTRODUCTION

TVA Engineering requested that Parsons E & C perform parallel calculations with Geosyntec to verify independent analysis techniques that the seepage quantities calculated were approximately the same at the area of "blowout" of Cell III (Figure 1.1). In the first meeting to outline the scope of the effort, Geosyntec raised the issue of performing a calibration of the model against field data. Parsons E & C stated that, first, it believed that calibration would be in general of limited benefit under the best of conditions unless we stressed the aquifer sufficiently in some way, for example with a pump test and had sufficient monitoring wells / piezometers (which TVA did not have at Dredge Cell III). Second, before the team embarked on calibration exercise and the other seepage analysis tasks, Parsons E & C stated that it would be essential to collect in situ hydraulic conductivity and monitoring well data as all previous data was collected for the purposes of geotechnical and slope stability analyses, not seepage analyses. Therefore, Parsons E & C recommended a site investigation that focused on in situ, not laboratory measurements, of hydraulic conductivity and monitoring well readings over several key layers and cross sections (the mutually agreed to locations are shown in Figure 1.2). The in situ data obtained would be used for exercises such as the calibration exercise. This focused site investigation would concentrate on the data needed to predict hydraulic properties and seepage stresses within the dredge cells. Thus, Mactec and TVA were tasked to perform additional investigations to provide the necessary data and stratigraphy that would assist in the development, design, and partial verification of the seepage model. Once these data were acquired, Parsons E & C developed its own interpretation of the data along two cross sections in preparation for the January, 2005 meeting. Parsons E &C came to the meeting in January, 2005, with prepared draft cross sections with suggested material properties. At this meeting, Parsons E & C and Geosyntec worked together to develop the agreed upon geometry and hydraulic properties to calculate these seepage quantities.

In general, Parsons E & C has calculated with its TIMES (SSG, 2002) finite element model similar quantities of flow as Geosyntec has with its SEEP/W (GEO-SLOPE, 2004) model for three cases: 1) calibration; 2) the seepage failure case; 3) and the 900 foot future dredge cell. These cases are reviewed in Sections 2, 3, and 4 below. Section 4 details the trench and toe modifications required to bring heave and uplift forces under control.

Note that the factors of safety against heave and uplift are discussed in the last two cases are based on data for stack materials. Discrepancies exist among the calculated uplift factors of safety calculated by Parsons E & C and Geosyntec; Geosyntec declined Parsons E & C's request to develop an agreed to set of properties for porosity, specific gravity, and unit weights for each of the material zones because SEEP/W did not use these properties.

Finally, because Parsons E & C is responsible for the design of Dredge Cell III, Parsons E & C evaluated the overall slope stability only to the wet stack height covered by the existing permit, that is, 842 feet. The ramifications of going higher than 842 feet in terms of drainage controlled will be discussed briefly in Section 5.

2.0 CALIBRATION SEEPAGE ANALYSES

Case 1 represents the existing conditions. Figure 2.1 gives the plan view of the cross section used for these and the rest of the seepage analyses. The existing conditions have been used to for the calibration exercise. The calibration exercise should be viewed as limited in scope as it represents only a small sample of the hydraulic stresses that could be applied to the dredge cell aquifer. Specifically, the calibration exercise has been performed under quiescent geohydrologic flow conditions, not the active conditions under which the seepage or "blowout" failure occurred. In addition, this calibration exercise does not necessarily "verify" or "confirm" the model for geohydrologic conditions as the stack and pond height increases. This calibration only verifies the model in a narrow window of observed water levels that are available for comparison to the calculated heads. It is the judgment of Parsons E & C that the applicability of the calibration to future conditions cannot be stated with certainty and that the model should be viewed a more as an engineering tool for comparison of design alternatives than a straight predictive tool. This approach as to the use of calibration and use of ground water flow models is standard engineering practice as evidenced by the recommendations laid down by the National Research Council (1990). Attachment A gives further background on this practice in the enclosed paper entitled: "Numerical Modeling – Process or Prediction."

Figure 2.2 gives the general configuration and layering for Dredge Cell III along Swan Pond Road. Figure 2.3 gives the layout of the Case 1 calibration run for the existing Kingston Dredge Cell III along Swan Pond Road with the final total head contours, layering, and boundary conditions. We have assumed a no-flow boundary condition for the bottom of the domain for purposes of calculation efficiency and practicality. Note that some seepage codes cannot achieve numerical stability if vertical gradients are allowed, especially as the stack height increases. In addition, the bottom no flow boundary condition tends to overestimate the seepage pressures on the slope and produce larger calculated heads at depth. Therefore, it will lead to a safer design. Consequently, the bottom no flow boundary condition was agreed to by Parsons E & C and Geosyntec. Additional discussion follows in the paragraphs below.

Table 2.1 gives the hydraulic conductivities used for the Dredge Cell III material layers in the final calibration that gave the best agreement with observed field monitoring wells. Table 2.2 gives the unsaturated soil properties required in the unsaturated zone for the fly ash. Attachment B gives the TIMES model input sheets for the calibration run.

Table 2.1 Hydraulic Conductivities for Dredge Cell III Materials in Final Calibration.

		Hydraulic Conductivity		Max/Min
Zone	**Material**	**cm/sec**	**ft/day**	**K_h/K_v**
1	Bottom Ash	1.0E-04	0.283465	2
2	Firm Fly Ash Bottom Ash Base Material	1.73E-05	0.049039	2
3	Fly Ash	3.74E-05	0.106015	2
4	Alluvium	1.29E-04	0.365669	2
5	Clay	5.0E-06	0.014173	2
6	Shale	1.0E-06	0.002834	2

Table 2.2 Mualem - van Genutchen for Various Fly Ash Sources. Note That Kingston Main Wetting Curve Values Are Used for Both Fly Ash and Bottom Ash (Young, S. C., 1993).

	Main Drainage Curve			Main Wetting Curve		
Fly Ash	**N**	**α 1/cm**	**Moisture (% volume)**	**N**	**α 1/cm**	**Moisture (% volume)**
Kingston	-----	-----	-----	2.68	0.0030	0.104

Figure 2.4 shows the approximate location of monitoring wells within the existing cross section for Dredge Cell III. Figure 2.5 compares the calculated total heads with the observed heads from each of the monitoring wells.

Figure 2.5 shows that the calculated heads are much less than those observed at Monitoring Wells 3B and 4B. By contrast, the calculated head at Well 5B is lower than what is observed in the field. These discrepancies among the calculated and observed well measurements are due to the use of the no-flow boundary condition. For example, we calculate a larger heads at depth than what MWs-3B and 4B actually measure, especially when compared to MWs-3A and 4A. The measurement of lower heads at these well clusters suggests rather strongly downward vertical gradients near MWs-3B and 4B that would reduce, not increase, the ground water heads.
By contrast, the calculated head at MW-5B is less than the observed value, which suggests an upward gradient in this area.

Therefore, ignoring the downward vertical gradients near the toe will:

1. Over predict uplift and seepage forces.
2. Under predict factors of safety for uplift / heave at the toe and on benches of the slope.
3. Under predict factors of safety for slope stability.

Thus the modeling approach can be termed as "conservative" because results in a safer design.

3.0 SEEPAGE FAILURE

Figure 3.1 gives the layout of the Case 2 "Blow Condition" run for the existing Kingston Dredge Cell III along Swan Pond Road with the final total head contours. This blowout failure occurred in November, 2003. Table 3.1 gives the soil properties in addition to those given in Table 2.1 needed to calculate the piping and heave or uplift factors of safety.

Table 3.1 Hydraulic Conductivities for Dredge Cell III Materials in Final Calibration.

Zone	Material	Porosity n	Residual Saturation	Specific Gravity G_s	Wet Unit Weight, pcf	Reference
1	Bottom Ash	0.588247	0.104	2.37	97.6	Mactec, 2003 Bull Run
2	Firm FA / BA Base	0.559762	0.104	2.37	100.04	Mactec, 2003 Bull Run
3	Fly Ash	0.559762	0.104	2.37	100.04	Mactec, 2003 Bull Run
4	Alluvium	0.356913	0.2	2.69	129.06	Singleton (1994, US-9, Table 1)
5	Clay	0.338186	0.2	2.60	126.35	Singleton (1994, US-1, Table 1)
6	Shale	0.169322	0.14	2.69	150.0	Mactec (2003) Confidential Client

Table 3.2 gives the predicted flow rates at the three bench and slope locations that may have been involved with the seepage "blowout" failure. The highest flow rate occurs at the toe of the slope. Figure 3.2 shows the flow vectors for each of the three bench and slope locations involved that may have been involved in the seepage failure.

Table 3.2 Calculated Flow Rates at Seepage Faces Along Selected Benches.

Seepage Face	Calculated Flow Rate	
	ft3/day/ft	ft3/sec/ft
765 to 775 Bench	0.884	1.02306E-05
775 to 780 Bench	0.550	6.36019E-06
781 to 784 Bench	0.440	5.08911E-06

In addition to the calculation of flow rates, the TIMES finite element code calculated factors of safety against piping and heave / uplift through the use of user drawn polygons that define the soil volume. The equation used by TIMES to calculate uplift is the one derived by Cedergren (1967, Page 227) and Cedergren (1989, Page 109) which ultimately has the form for the factor of safety, FS:

$$FS_{\text{uplift}} = \frac{\text{Soil Volume (AB)} * \text{Unit Weight of Water } (\gamma_W) * (Gs - 1) * (n - 1)}{\gamma_W * i * (AB)}$$

Where **i** is the gradient calculated by the TIMES code with the positive Y direction as downward, as in water moving downhill is the +y direction. For many calculations this equation simplifies to:

$$FS_{\text{uplift}} = \frac{(G_S - 1) * (n - 1)}{i}$$

There are some differences in professional use of this term, "uplift factor of safety." In the geotechnical literature, Cedergren (1967, Figure3-2, b-2; and 1989, Page 227) applies the term to soil grains, not just structures. By contrast, the Corps of Engineers (1986, EM 1110-2-1901) sometimes applies this term to impermeable strata or structures.

As for the recommended values to be used for the factors of safety in design, they have evolved over time. In a 1962 Missouri River Conference held in Omaha the 27th of November, the US Army Corps of Engineers started recommending the use of a 1.5 factor of safety that was based solely on the Missouri River flood of 1952. The US Corps of Engineers have since extended that recommendation to include 1.5 to up to a factor of safety of 15 depending on knowledge of soil and seepage conditions (US Corps of Engineers, EM 1110-2-1901, 1986, Pg. 4-24). Others who have had additional experience have also raised the factor of safety "bar." For example, Harr (1962) recommended that the FS be 4 to 5. Cedergren (1967, Pg. 227; 1989, Pg. 223) states that the uplift FS for our calculations when they involve blowouts and boils should be 2 to 2.5; Cedergren (1989, Pg. 107) states that we should use 2.5 to 3.0 for uplift pressures in a down stream sand and gravel section of a dam at maximum pool elevation (Cedergren, 1989, Figure 3.22b). It appears that we should be comparing to factors of safety of a minimum of 2 and possibly 2.5 for the analysis of seepage and uplift forces associated with these dredge cells.

Because the TIMES model calculates uplift/heave and piping factors of safety through the use of user drawn polygons, the factor of safety can be determined wherever there exists high velocity gradients or a seepage face. For example, Figure 3.3 shows that the largest seepage flows do not correspond to the location of the lowest factor of safety for uplift near the toe of the slope. They occur where the largest exit gradients occur, which can occur in materials with slightly lower hydraulic conductivities. The fly ash has a hydraulic conductivity more than 2 times lower, hence the higher exit gradients. The uplift factor of safety calculated here for the fly ash, which was assumed to have a total unit weight of about 100 pcf, is calculated to be 1.28. This uplift FS of 1.28 is far below the requisite 2.0 to 2.5 and conforms to the pre-failure observations of seepage at the toe and post failure observations of approximately where one of the failures likely occurred.

Figure 3.4 suggests that another seepage failure may also been triggered at the 775 bench. The toe of the 775 bench has a FS against uplift of 1.86, which is less than the 2 to 2.5 recommended by Cedergren (1967; 1989). The calculated FS at the toe of the 780 foot Bench is 3.5, which satisfies the Cedergren criteria of 2-2.5. These seepage force calculations suggest that benches and toe buttress modifications are needed at the 765, 775, and 780 benches. In addition, because the seepage exits at around 785 and below, Benches 790 and 780 will probably require additional drainage control to lower the water table.

4.0 FUTURE DREDGE CELL TO 900 FOOT ELEVATION

The permit currently sets the maximum height of the dredge cells to an elevation of 842 feet. However seepage analyses have been conducted up to 900 feet to:

1. Evaluate the consequences of future vertical expansion of Dredge Cell goes to as high as 900 feet.
2. Estimate what will the seepage conditions may be along the face of the unimproved lower slope.
3. Evaluate alternatives to arrive at most the efficient solution to reducing seepage forces to requisite factors of safety of 2 to 2.5.
4. To evaluate alternative solutions that include trench and buttress drains parallel to the slope.
5. To help prepare the final seepage design and construction drawings.

The analyses investigated various alternatives with various trench depths, number of trenches, and buttress toe configurations. Figure 4.1 shows the final trench and buttress toe configuration that satisfied the seepage piping and heave/uplift factors of safety for a 900 foot high dredge cell option. Table 4.1 lists the calculated flows for the drains, bench trenches and buttress toe drains for a dredge cell raised to 900 feet.

Figure 4.2 shows a close-up view of the trench drains at the 795, 781, and 775 benches and the buttress toe drain near the riprap ditch. By contrast, Figure 4.3 shows a close-up view with the trenches drawn in.

Figure 4.4 shows a close-view of final water table conditions near the buttress toe drain and riprap ditch. The riprap ditch has been given a hydraulic conductivity of 5E-05 cm/sec or 1.42 ft/day to assess uplift seepage forces on the riprap. Actual hydraulic conductivity for the riprap exceeds 120,000 ft/day (Cedergren, 1989). The use of a hydraulic conductivity of 1.42 ft/day allows evaluation of the riprap buttress drain and ditch under clogged conditions. The American Institute of Steel Construction Manual (1970, Pg. 6-15) gives the unit weight of limestone riprap 80 to 85 pcf. These calculations used a riprap unit weight of 85 pcf. Figure 4.5 shows the finite element mesh used near the buttress toe drain and riprap ditch for the analysis of the 900 foot elevation at Dredge Cell III.

Figure 4.6 shows calculated uplift / heave and piping factors of safety for select portions of the toe buttress drain and riprap ditch. All factors of safety exceed the requisite 2 to 2.5. Note that the uplift / heave and piping factors of safety are calculated assuming that the water

Table 4.1 Calculated Flows for a Future Dredge Cell Option Expanded to as High as 900 feet With Bench Trenches And Buttress Toe.

	Flow	
Well /Trench	**'ft^3/day/ft**	**'ft^3/sec/ft**
Buttress Ditch	**0.921**	**1.066E-05**
Geocomposite Drainage	**5.1**	**5.903E-05**
8-Inch Pipe	**0.592**	**6.852E-07**
775 ft Elevation Bench 5-Foot Trench	**1.13**	**1.308E-05**
781 ft Elevation Bench 5-Foot Trench	**1.26**	**1.458E-05**
795 ft Elevation Bench 6-Foot Trench	**0.38**	**4.398E-06**
797 foot Elevation Pipe Drain	**0.93**	**1.076E-05**
802 foot Elevation Pipe Drain	**0**	**0**
807 foot Elevation Pipe Drain	**0**	**0**
812 foot Elevation Pipe Drain	**0.0058**	**6.713E-08**
817 foot Elevation Pipe Drain	**0.59**	**6.829E-06**
827 foot Elevation Pipe Drain	**0.29**	**3.356E-06**
832 foot Elevation Pipe Drain	**0.29**	**3.356E-06**
842 foot Elevation Pipe Drain	**0**	**0**
847 foot Elevation Pipe Drain	**0.259**	**2.998E-06**
857 foot Elevation Pipe Drain	**0.172**	**1.991E-06**
862 foot Elevation Pipe Drain	**0.0269**	**3.090E-07**
872 foot Elevation Pipe Drain	**0**	**0**
882 foot Elevation Pipe Drain	**0**	**0**
887 foot Elevation Pipe Drain	**0.804**	**9.306E-06**
892 foot Elevation Pipe Drain	**1.21**	**1.400E-05**

table lies at a seepage face. That is, they do not take into account soil overburden. Therefore, any uplift factor of safety calculated by the TIMES code for a water table below the ground surface will be greater than the calculated value. Addition of the weight of soil above the water table (that is, overburden) will increase the calculated uplift / heave and piping factors of safety.

$$FS_{uplift} = \frac{(G_S - 1) * (n - 1)}{i}$$

Where Gs equals the specific gravity and n equals the porosity.

Given that Gs equals 2.69 for the riprap and n=0.78585. Note that i in y direction at centroid of the polygon and equals -0.0731.

$$FS_{uplift} = \frac{(2.69 - 1) * (0.7858 - 1)}{-0.0731}$$

$$FS_{uplift} = 4.952,$$

Factor of Safety satisfies all criteria, the US COE 1.5 to 15, Harr's 4 to 5, and Cedergren's 2.0 to 2.5, 2.5 to 3.0. Therefore, the conclusions for this Case 3 analysis are as follows:

1. Uplift / heave and piping factors of Safety satisfy 2 to 2.5, including the ditch with rip-rap when average bulk unit weight is consider (Average factor of safety against piping = 4.952).
2. Use three trenches – 795 trench 6 feet deep, the 781 and 775 trench 5 feet deep.
3. Use the buttress toe and drain as shown.
4. Use a ditch with riprap and geocomposite drainage layer on the bottom.

5.0 SLOPE STABILITY ANALYSIS FOR EXISTING PERMIT ELEVATION OF 842 FEET

Table 1 gives the soil properties at for use in the end of construction analyses. Figure 5.1 gives the ground water conditions at end of construction for the permit elevation of 842 feet. Figure 5.2 shows the end of construction critical failure circle determined by the Spencer method by UTEXAS3 using the piezometric surface derived from Figure 5.1. In computing pore pressures from the piezometric line, UTEXAS3 determines the vertical distance between the point of interest (usually the bottom of the slice) and the piezometric line. UTEXAS3 then multiplies this distance by the unit weight of water to arrive at a pore water pressure. Pore water pressures are assumed to be positive below the piezometric line and negative above the piezometric line. For the use of a piezometric line, UTEXAS3 gives a minimum factor of safety of 1.337 for the critical circle. Appendix C gives the UTEXAS3 input data and output for this critical circle.

As a check on UTEXAS3, Figure 5.3 gives the critical failure circle determined using the Spencer method by SLOPE/W using the same piezometric surface. SLOPE/W gives a slightly higher factor of safety of 1.369. Appendix D give the SLOPE/W input soil data for this analysis run.

The UTEXAS3 and SLOPE/W slope stability programs give similar factors of safety when using the same soil properties, geometry, and method of analysis. The difference appears to lie in the algorithm used for SLOPE/W that relies on a user specified search grid that must be manually refined to get closer to the critical circle; UTEXAS3 has an automatically refined search grid that homes in on the smallest factor of safety and critical circle.

Table 1. End of Construction Soil Properties.

Layer	Unit Weight pcf	Effective Cohesion psf	Effective phi degrees	Total Cohesion/ Su, psf	Total Phi, degrees
1 Dense FA + BA	**111.9**	**110**	**36.6**		
2 Loose Fly Ash	**108.4**	**100**	**28**		
3 Medium FA+BA	**114.4**	**980.0**	**29.1**		
4 Loose FA+BA	**108.4**	**100**	**32.1**		
5 FA Loose	**108.4**	**100.0**	**18**		
6 Stiff FA+BA	**114.4**	**980.0**	**29.1**		
7 Natural Clay	**126.4**	**1200**	**29.6**	**1400**	**0.0**
8 Residuum SC-SM	**130.4**	**600**	**30**	**2200**	**0.0**
9 Bedrock – Limestone - Shale	**150**	**735**	**29.9**		

Layers 1, 2, 4, 5 - Mactec, 2004. Report of Geotechnical Exploration, Ash Disposal Area, dated May 4.

Layers 3, 6, 7, and 8 -Singleton, 1994. Kingston Fossil Plant-Dredge Cells Closure Soils Investigation.

Layer 9 – Assumed

By contrast, UTEXAS3 can compute pore water pressures from an irregular "grid" of use the actual piezometric contour heads generated by a seepage program such as TIMES instead of the piezometric surface discussed earlier. Figure 5.4 show the TIMES pressure heads in feet. Figure 5.5 illustrates the approximate contours of pore pressure (pressure heads multiplied time the unit weight of water, 62.4 pcf) input from the seepage program TIMES. Note that UTEXAS3 interpolates pore water pressures at a point corresponding to the center of the base of each vertical slice. Wright (1991) describes the interpolation procedures. Figure 5.6 gives the UTEXAS3 critical circle and factor of safety of 1.408 when pore pressures are interpolated at the base of each slice. The factor of safety determined from interpolated pore pressures at the base of each slice is slightly greater than the one (1.337) determined from use of the piezometric line. In this configuration, the piezometric line gives a lower factor of safety. Appendix C has the data file for this UTEXAS3 input file and the output file.

6.0 SUMMARY AND CONCLUSIONS

The following gives a brief summary and set of conclusions:

1. The calibration exercise yielded a model suitable for the existing conditions we currently have at the site. The calibration represents quiescent geohydrologic flow conditions. Considerable uncertainty exists in extending the model to future conditions involving higher dredge cell heights and more active hydrogeologic conditions.
2. Both Parsons E & C and Geosyntec obtained reasonable agreement in predicted heads and flows in both the calibration, failure case, and future conditions cases.
3. Based on the material parameters obtained during the investigation and from joint consultation with Geosyntec, Mactec and TVA geologists and engineers, the final design of a trench drains of 6, 5, and 5 feet deep at the 790, 781, and 775 benches, respectively, with a the proposed buttress toe drain, geocomposite drainage layer, and drainage ditch are expected to yield uplift and piping seepage safety factors of safety in the range of 2 to 2.5.
4. The end of construction factors of safety barely exceed minimum requirements of 1.3 using effective stress analysis strength parameters with both piezometric surfaces and interpolated pore pressures obtained from the seepage flow modeling for the permit elevation of 842 feet.
5. Going to full 900 foot pool elevation may require drainage techniques other than deep trenches to remain economically feasible and effective.
6. Slope stability analyses confirm that current buttress and ditch configuration needs no modification.
7. An increase in the depth of trenches or buttress will yield only small increases in the stability of the slopes and the stacks against seepage / uplift forces

7.0 REFERENCES

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FIGURES

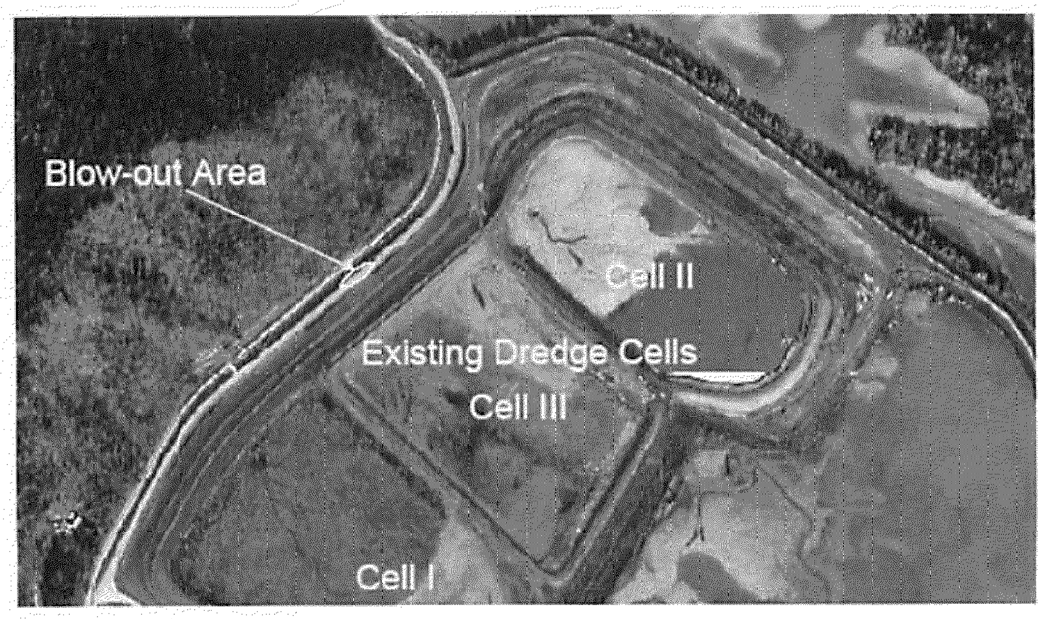


Figure 1.1 Location of "Blowout" Area in Existing Dredge Cell III.

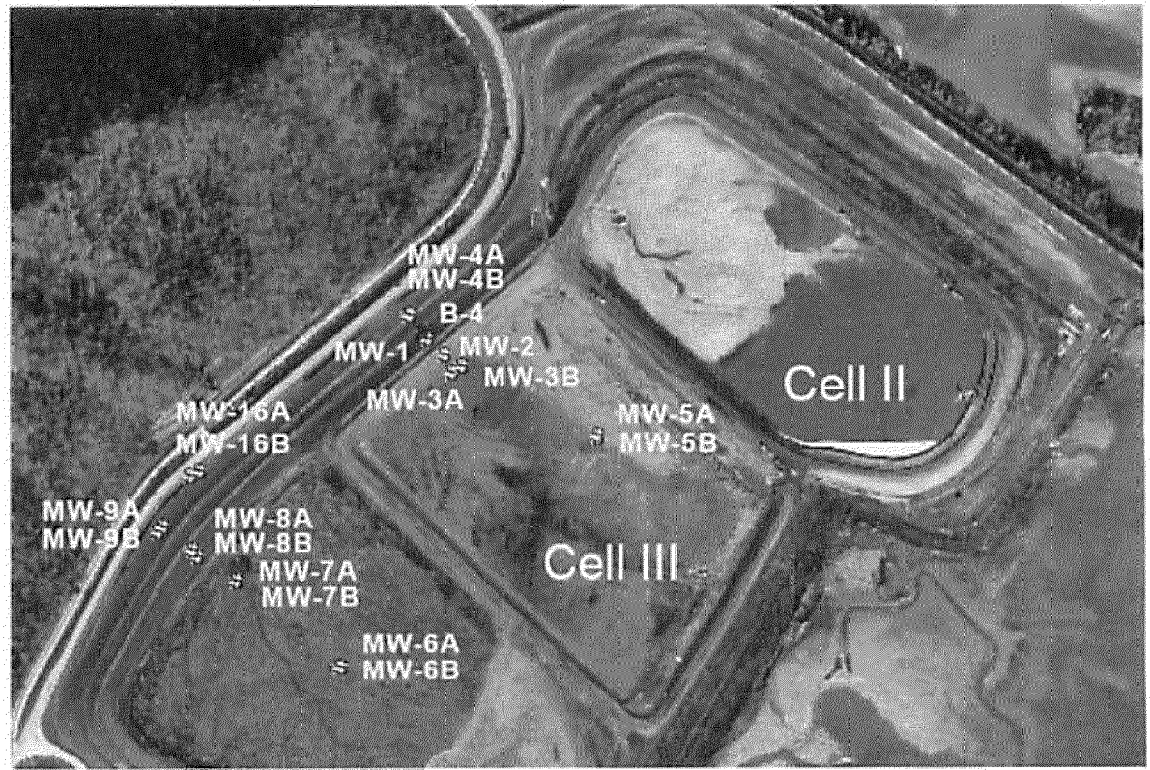


Figure 1.2 Focused Investigation Locations for Borings, Monitoring Well Locations, and In Situ Hydraulic Conductivity Tests.

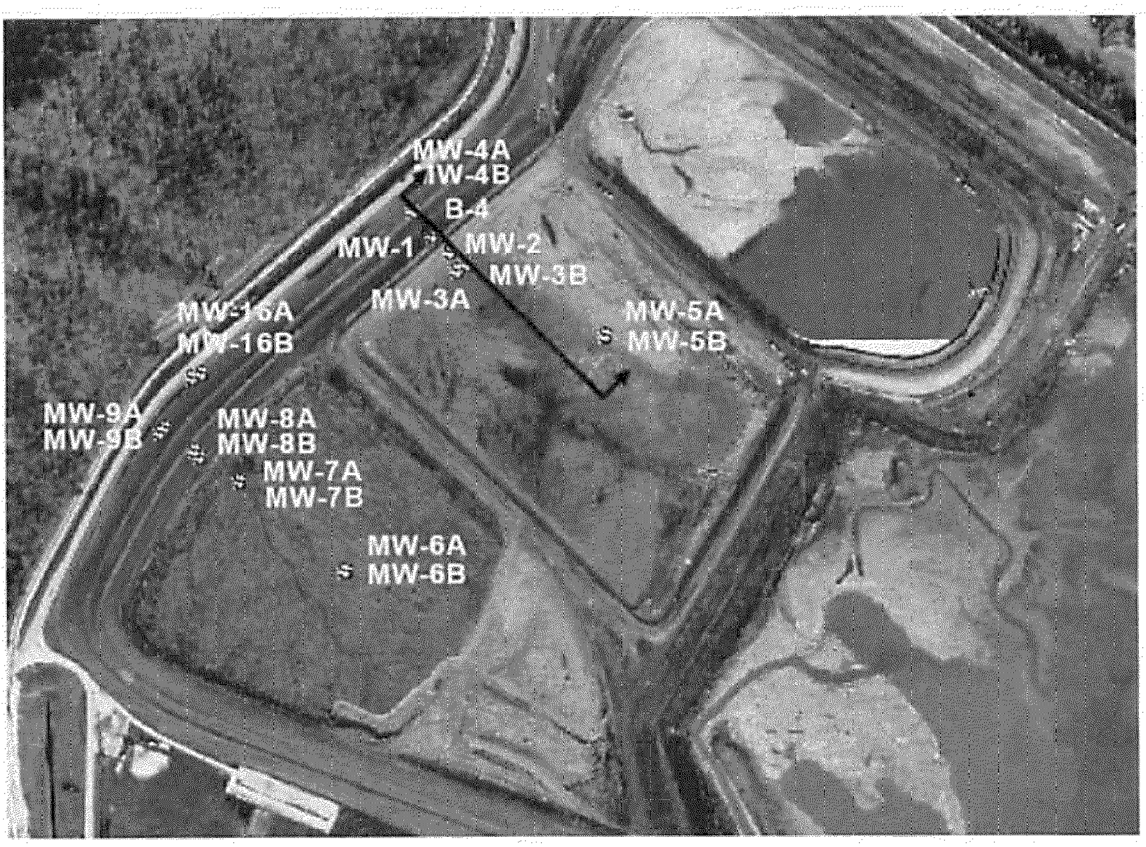


Figure 2.1 Cross Section for Cell III Analyses.

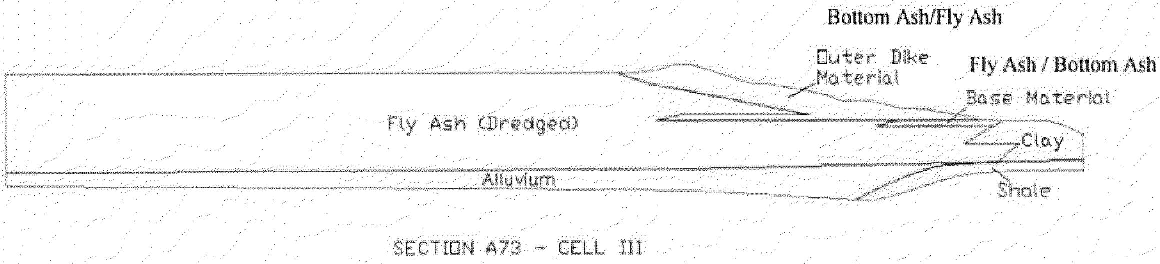


Figure 2.2. Case 1 – General Configuration and Layering for Cell III Along Swan Pond Road.

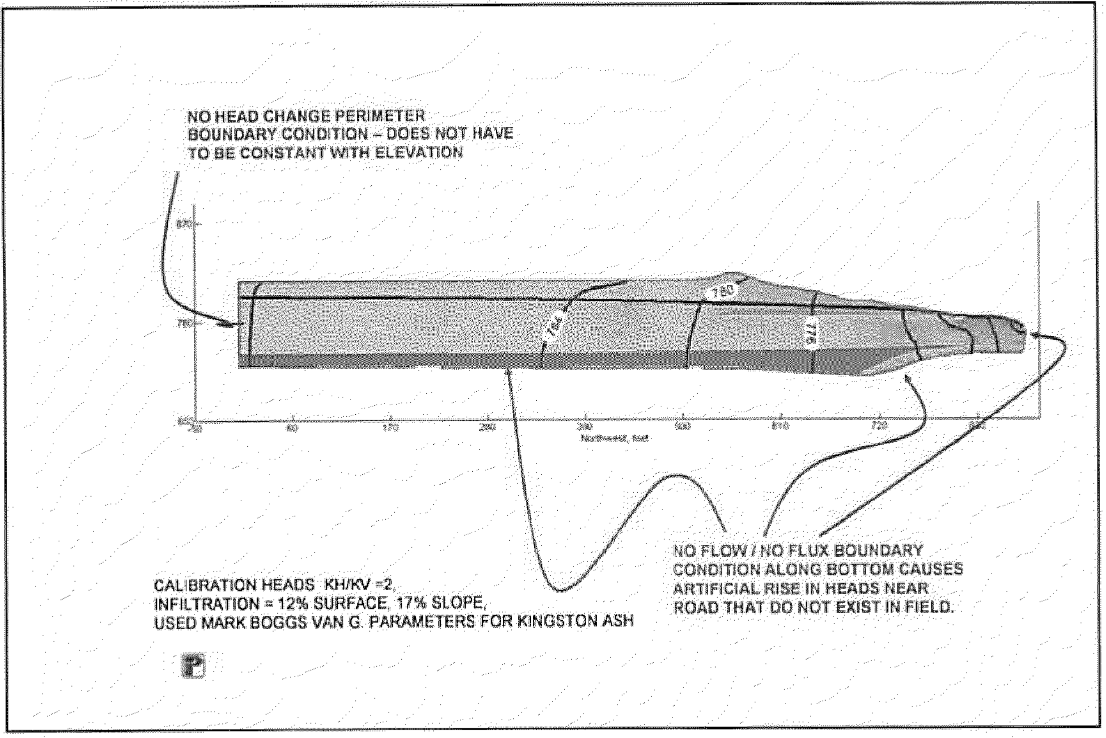


Figure 2.3. Case 1 – Layering, Boundary Conditions, Finite Element Mesh, and Final Heads for Calibration Run for Existing Dredge Cell III Along Swan Pond Road, April, 2005.

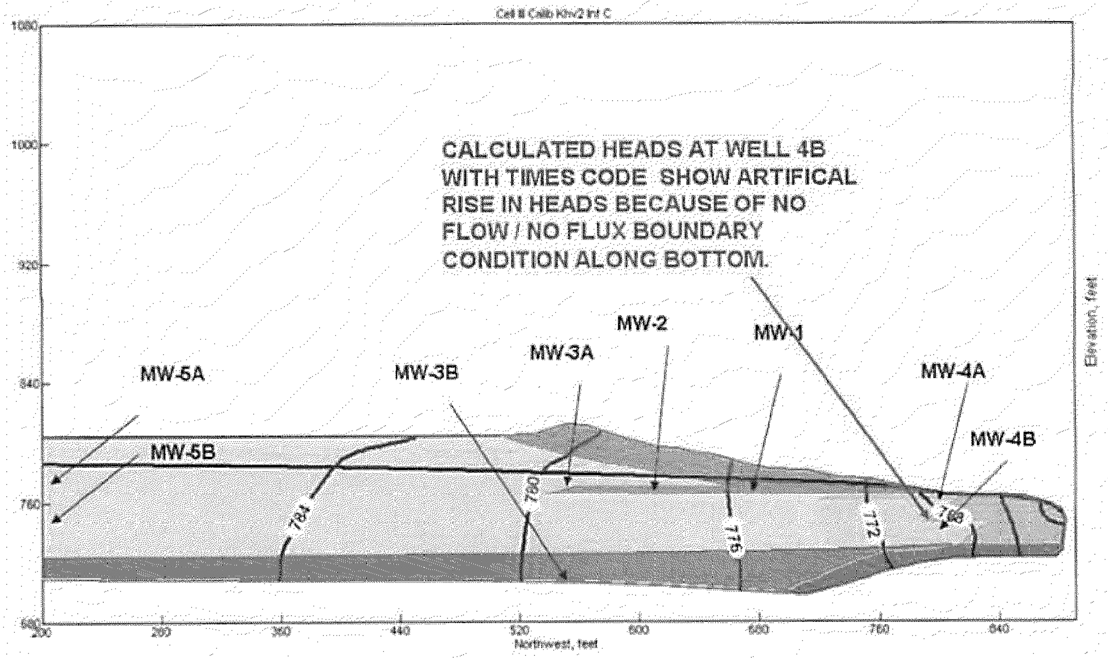


Figure 2.4 Approximate Locations of Monitoring Wells Used to Compare Calculated Heads for Calibration Runs.

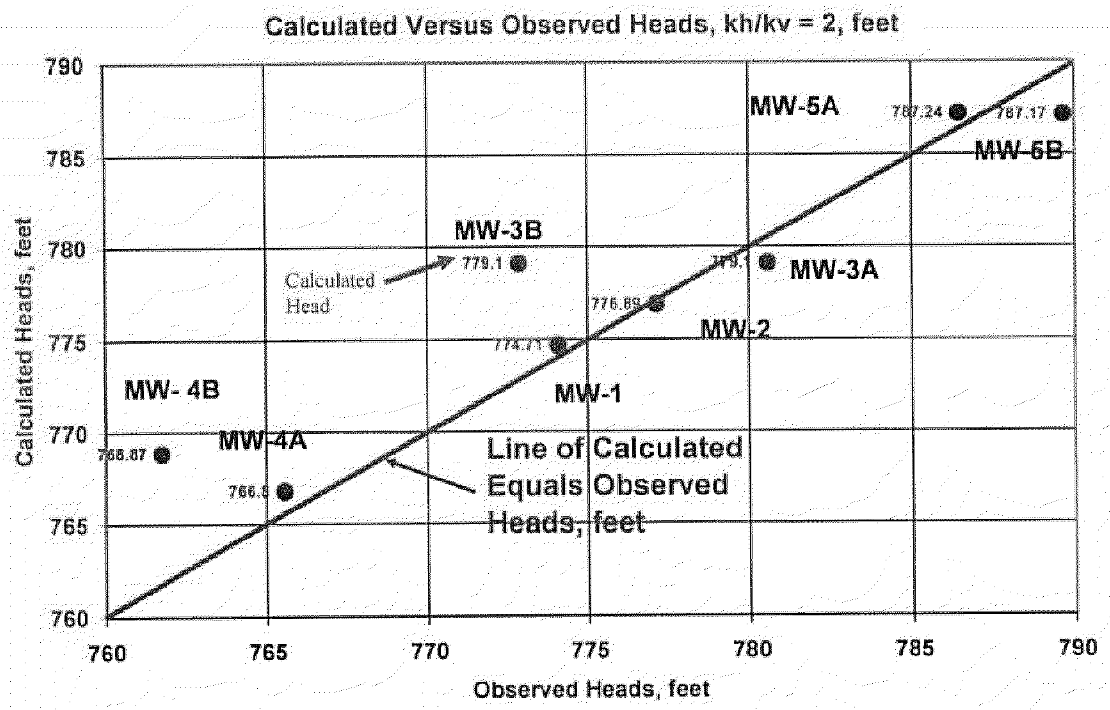


Figure 2.5 Comparison of Calculated versus Observed Heads.

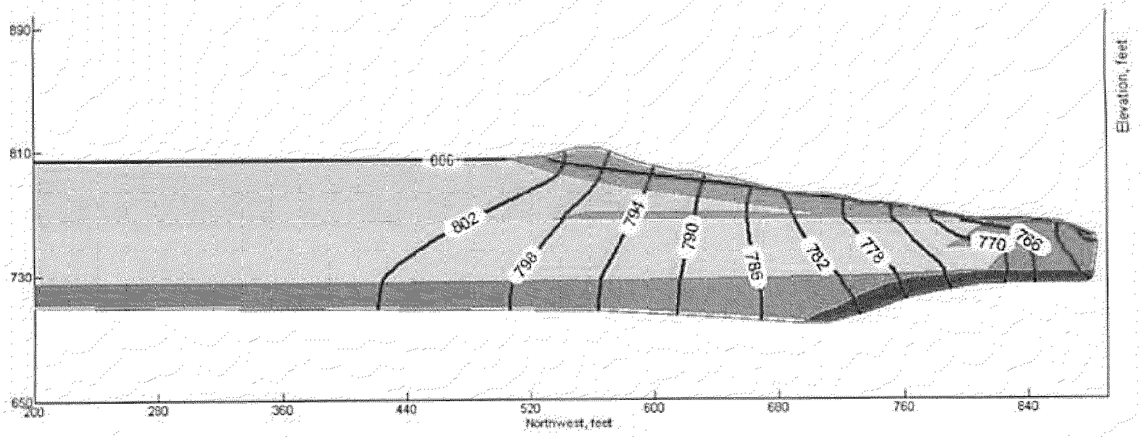


Figure 3.1 Case 2 "Blow Condition" Run For The Existing Kingston Dredge Cell III Along Swan Pond Road With The Calculated Total Head Contours.

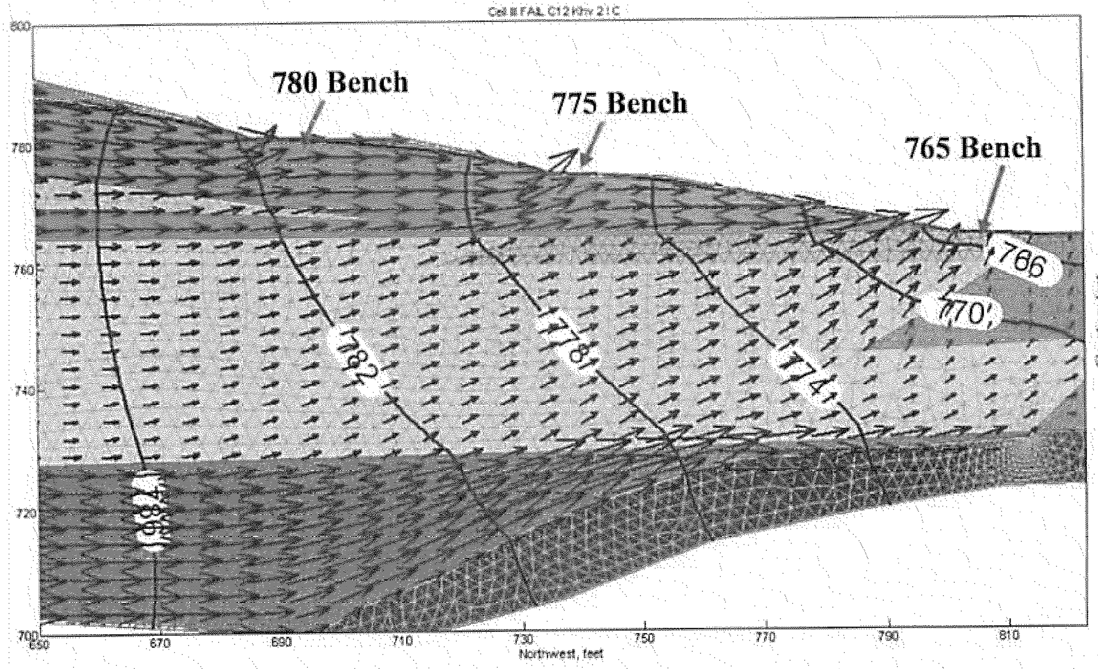
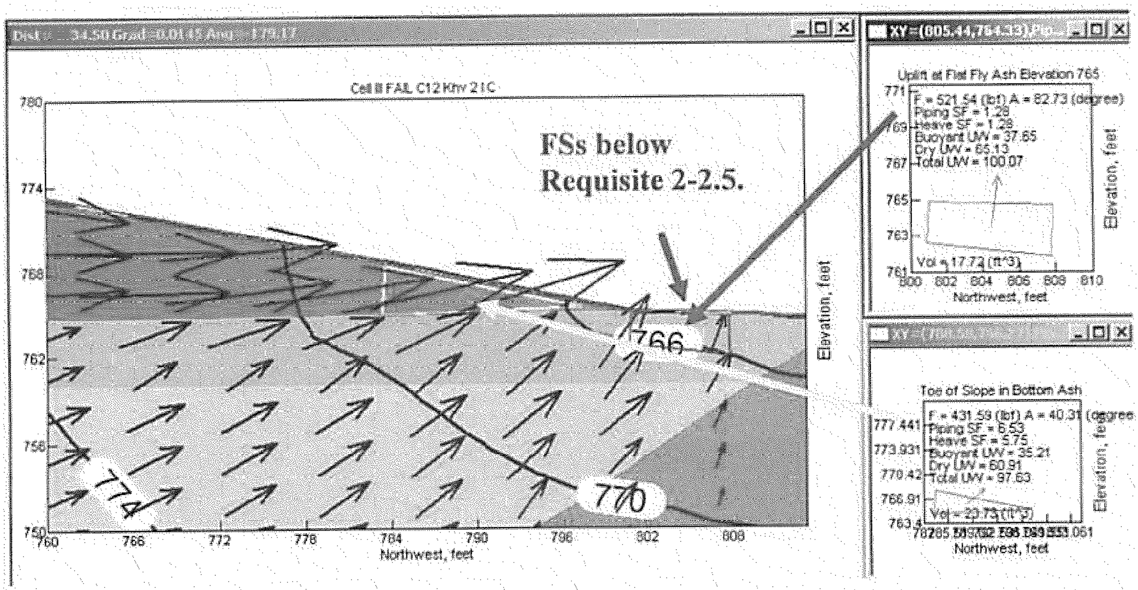


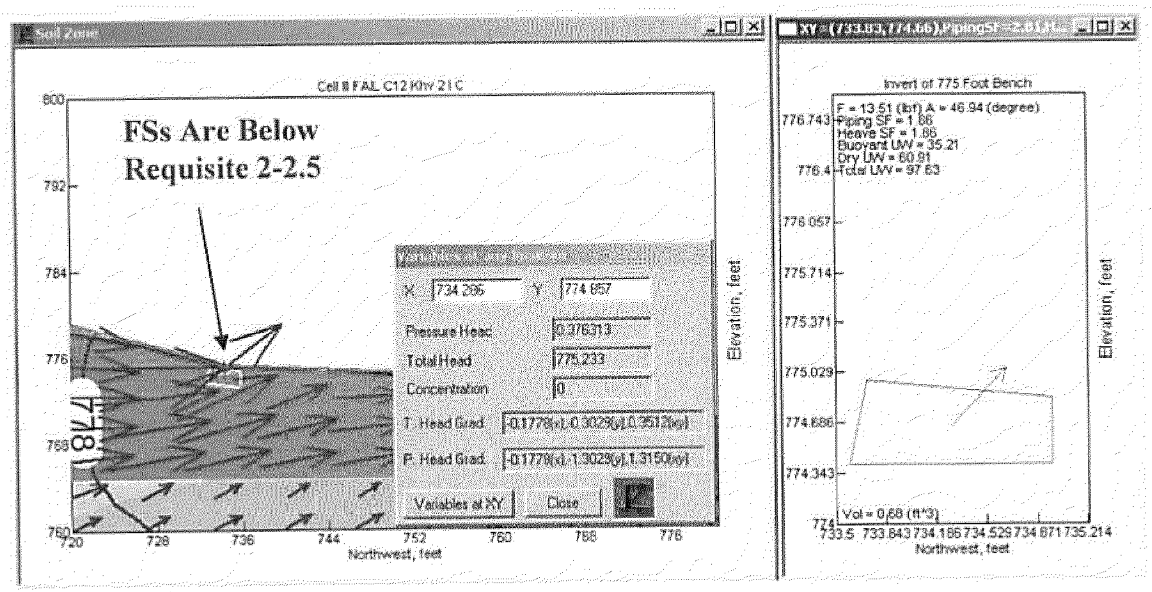
Figure 3.2 Pore Water Velocity Vectors Shown on Close Up View Of Lower Slope.



Uplift at Flat Fly Ash Elevation 765
F = 521.54 (lbf) A = 82.73 (degree)
Piping SF = 1.28
Heave SF = 1.28
Buoyant UW = 37.65
Dry UW = 65.13
Total UW = 100.07
Vol = 17.72 (ft^3)

Toe of Slope in Bottom Ash
F = 431.59 (lbf) A = 40.31 (degree
Piping SF = 6.53
Heave SF = 5.75
Buoyant UW = 35.21
Dry UW = 60.91
Total UW = 97.63
Vol = 23.73 (ft^3)

Figure 3.3 Uplift Factors of Safety at Flat in Fly Ash Fall Below Requisite Values While Those in Bottom Ash in Slope With Higher Pore Water Velocities Exceed Required Factors of Safety.



Variables at any location

X 734.286 Y 774.857

Pressure Head 0.376313

Total Head 775.233

Concentration 0

T. Head Grad. -0.1778(x),-0.3029(y),0.3512(xy)

P. Head Grad. -0.1778(x),-1.3029(y),1.3150(xy)

XY = (733.83,774.66),PipingSF=2.81,H...

F = 13.51 (lbf) A = 46.94 (degree)
Piping SF = 1.86
Heave SF = 1.86
Buoyant UW = 35.21
Dry UW = 60.91
Total UW = 97.63

Vol = 0.68 (ft^3)

Figure 3.4 Uplift Factor of Safety at Toe of Slope at the 775 foot Bench in Bottom Ash Fall Below Requisite Value of 2 to 2.5.

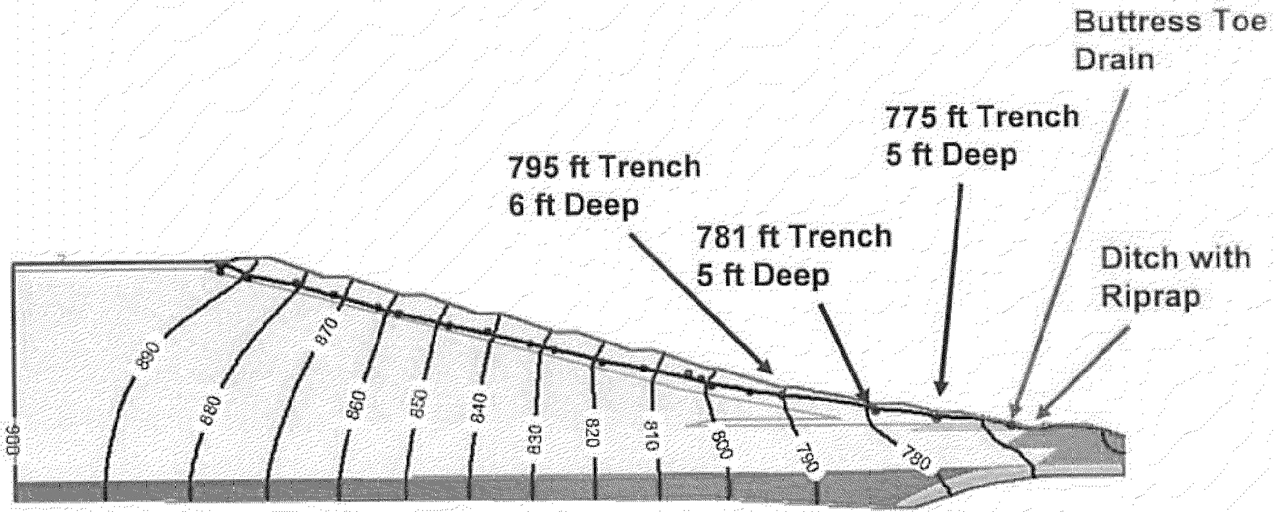


Figure 4.1 Case 3 – 900 Foot Pool Future Conditions Final Trench and Toe Buttress Design.

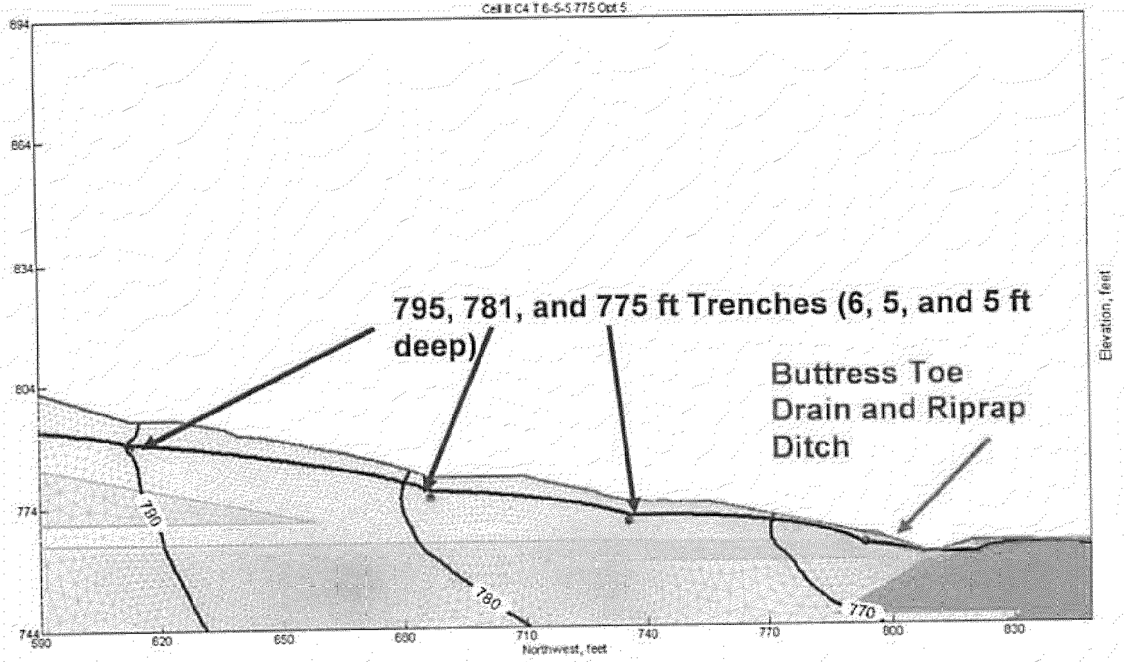


Figure 4.2 Close up of Trench Drains Without Trenches Drawn-in.

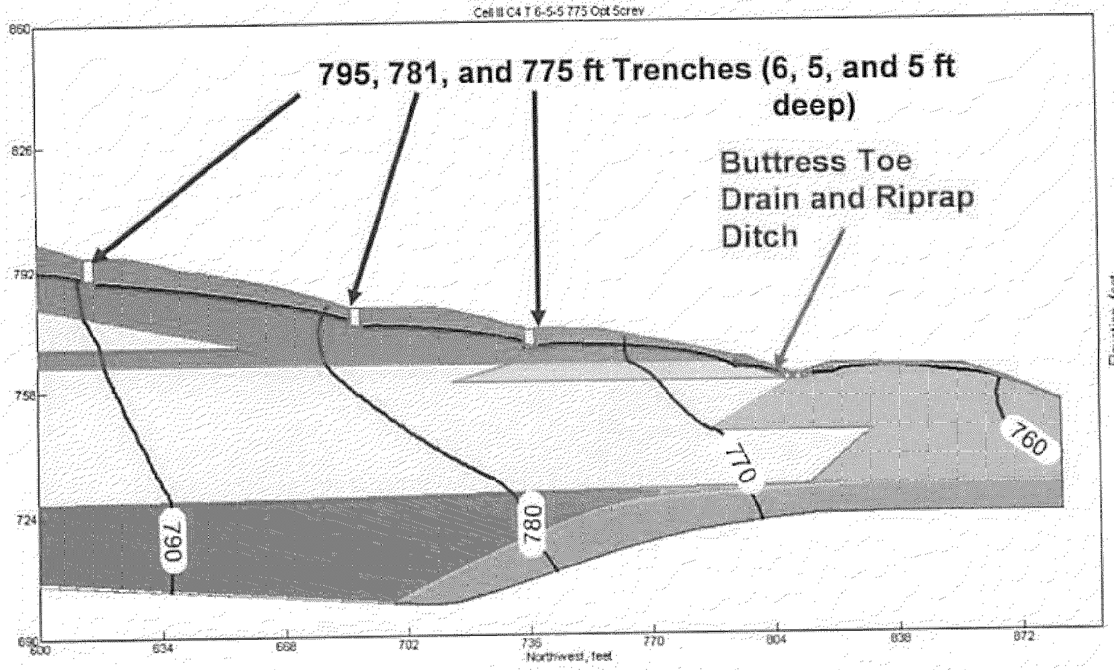


Figure 4.3 Close up of with Trenches Drawn In.

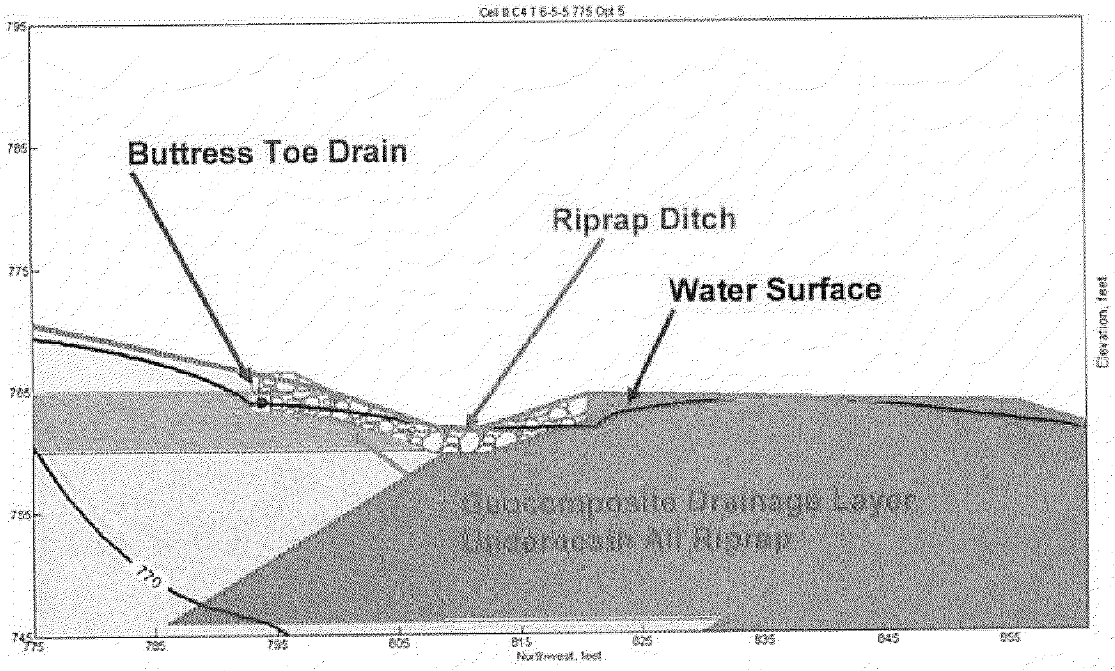


Figure 4.4 Close up View of Final Conditions Near Buttress Toe Drain and Riprap Ditch for 900 foot Elevation Dredge Cell III.

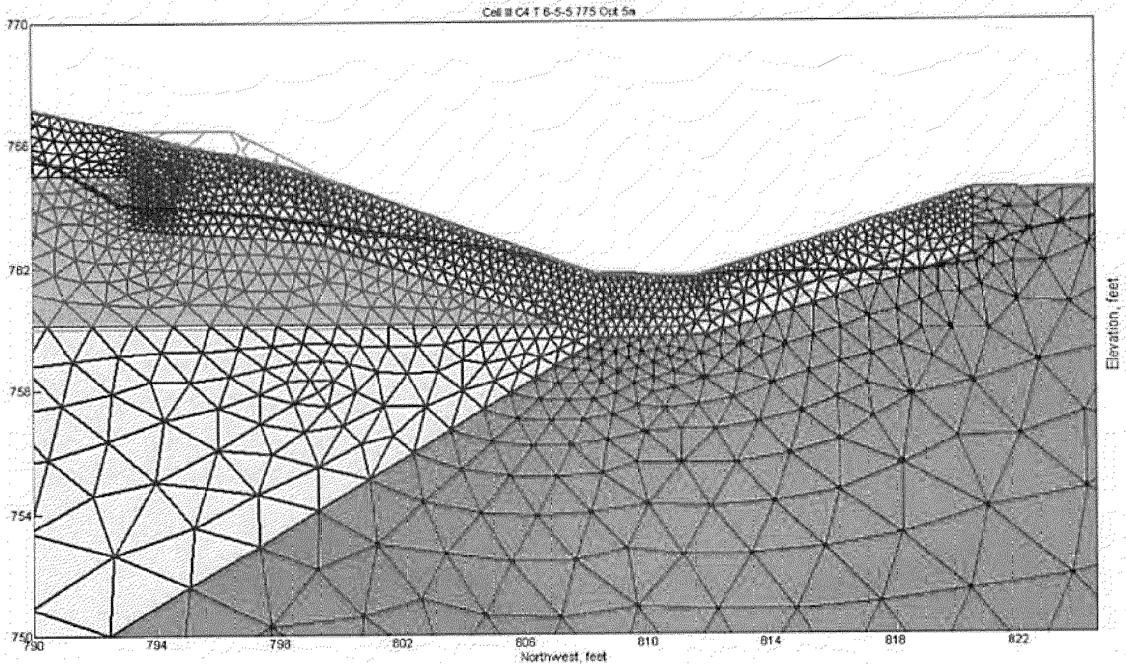
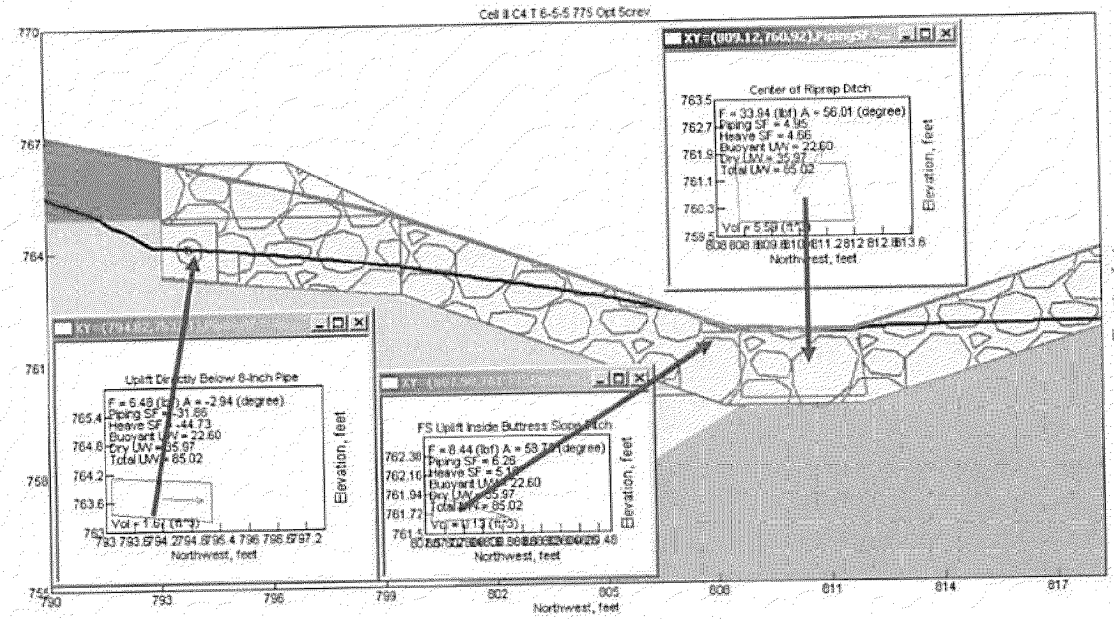


Figure 4.5 Close Up View of Finite Element Mesh Used Near Buttress Toe Drain and Riprap Ditch for 900 foot Elevation Dredge Cell III.



Center of Riprap Ditch

F = 33.94 (lbf) A = 56.01 (degree)
Piping SF = 4.95
Heave SF = 4.66
Buoyant UW = 22.60
Dry UW = 35.97
Total UW = 85.02
Vol = 5.59 (ft^3)

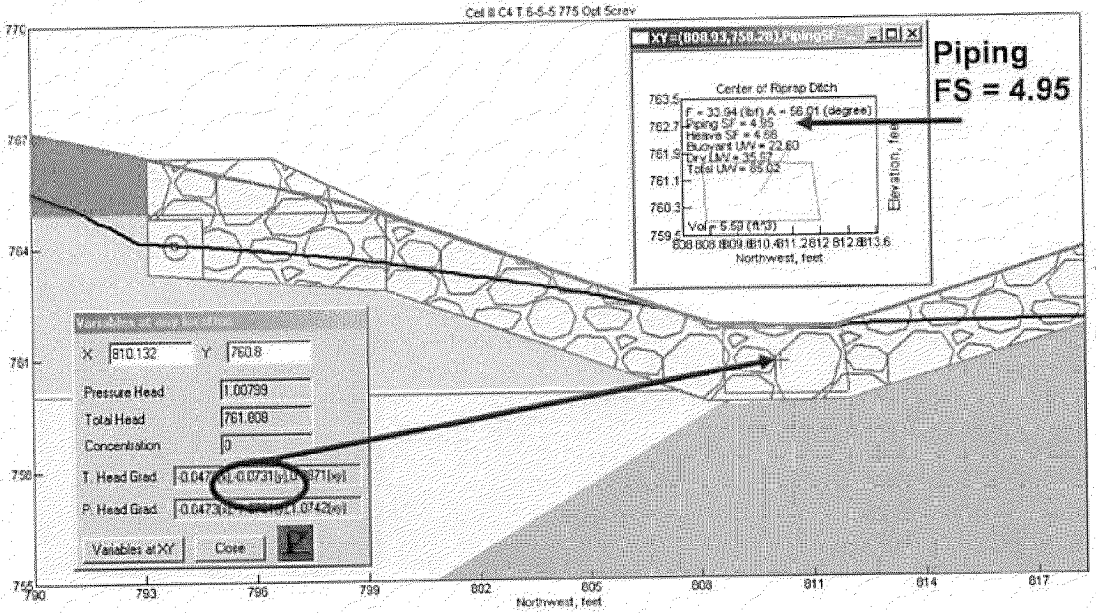
Uplift Directly Below 8-Inch Pipe

F = 6.48 (lbf) A = -2.94 (degree)
Piping SF = -31.86
Heave SF = -44.73
Buoyant UW = 22.60
Dry UW = 35.97
Total UW = 85.02
Vol = 1.67 (ft^3)

FS Uplift Inside Buttress Slope Ditch

F = 8.44 (lbf) A = 53.74 (degree)
Piping SF = 6.26
Heave SF = 5.15
Buoyant UW = 22.60
Dry UW = 35.97
Total UW = 85.02
Vol = 0.13 (ft^3)

Figure 4.6 Calculated Uplift/Heave and Piping Factors of Safety for Selected Portions of Toe Buttress Drain and Riprap Ditch.



Piping
FS = 4.95

Center of Riprap Ditch

F = 33.94 (lbf) A = 56.01 (degree)
Piping SF = 4.95
Heave SF = 4.66
Buoyant UW = 22.60
Dry UW = 35.97
Total UW = 85.02
Vol = 5.59 (ft^3)

X 810.132 Y 760.8
Pressure Head 1.00799
Total Head 761.808
Concentration 0
T. Head Grad -0.047[illegible](x),-0.0731(y),[illegible]871(z)
P. Head Grad -0.0473(x),[illegible](y),1.0742(z)

Figure 4.7 Use of "Variables at Any Location" Option in TIMES to Check on Calculated Piping Factors of Safety for Center of Riprap Ditch.

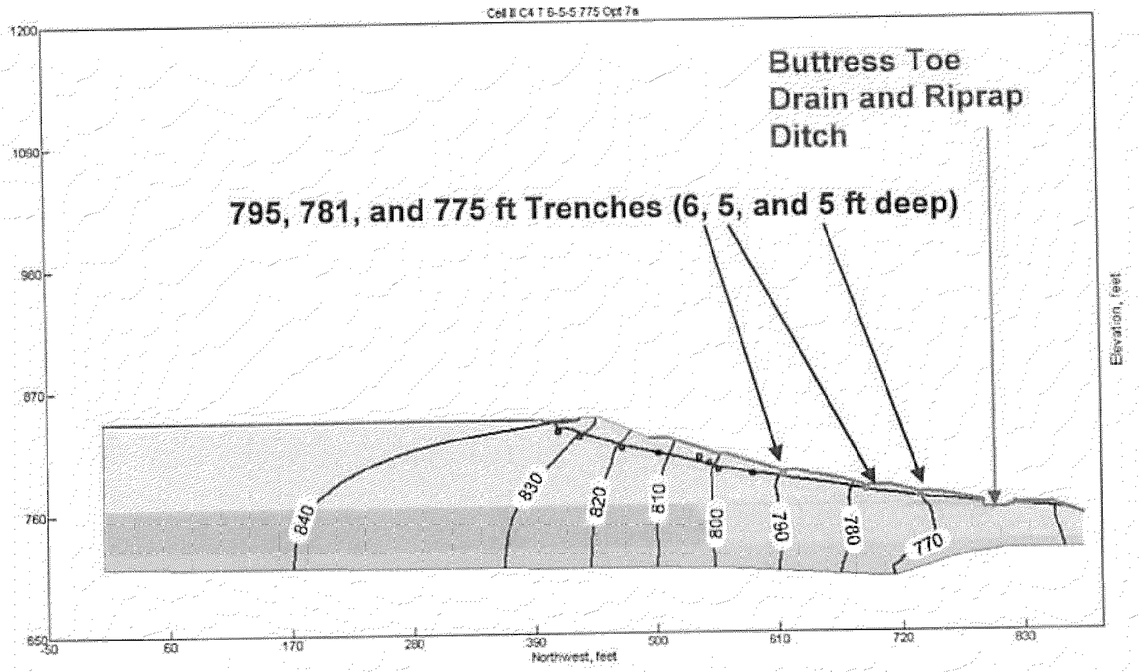


Figure 5.1 End of Construction Heads for Dredge Cell III at Permit Elevation of 842 feet.

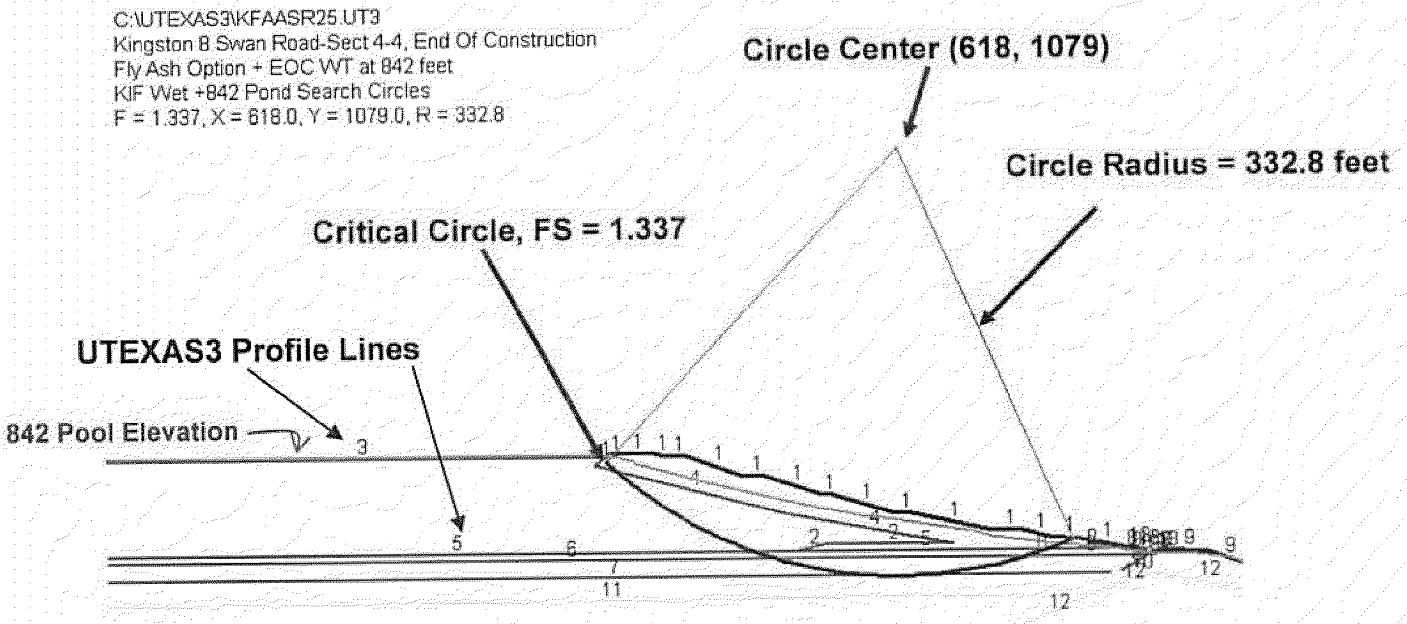

C:\UTEXAS3\KFAASR25.UT3
Kingston 8 Swan Road-Sect 4-4, End Of Construction
Fly Ash Option + EOC WT at 842 feet
KIF Wet +842 Pond Search Circles
F = 1.337, X = 618.0, Y = 1079.0, R = 332.8

Figure 5.2 End of Construction Critical Failure Circle Determined by the Spencer Method With UTEXAS3 for Dredge Cell III at Permit Elevation of 842 feet.

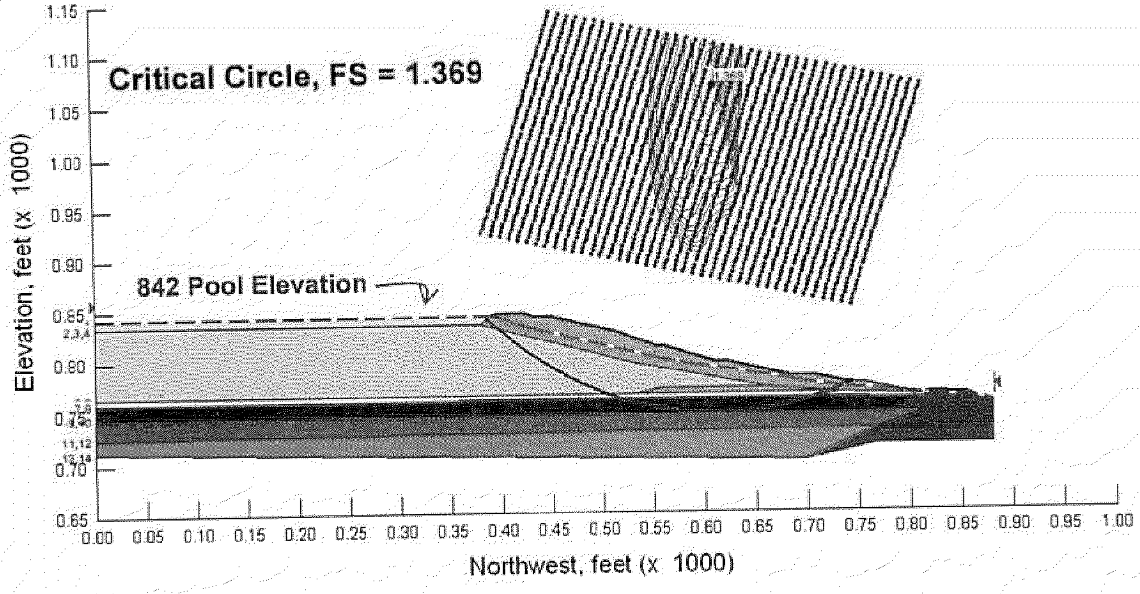


Figure 5.3 End of Construction Critical Failure Circle Check by the Spencer Method With SLOPE/W for Dredge Cell III at Permit Elevation of 842 feet.

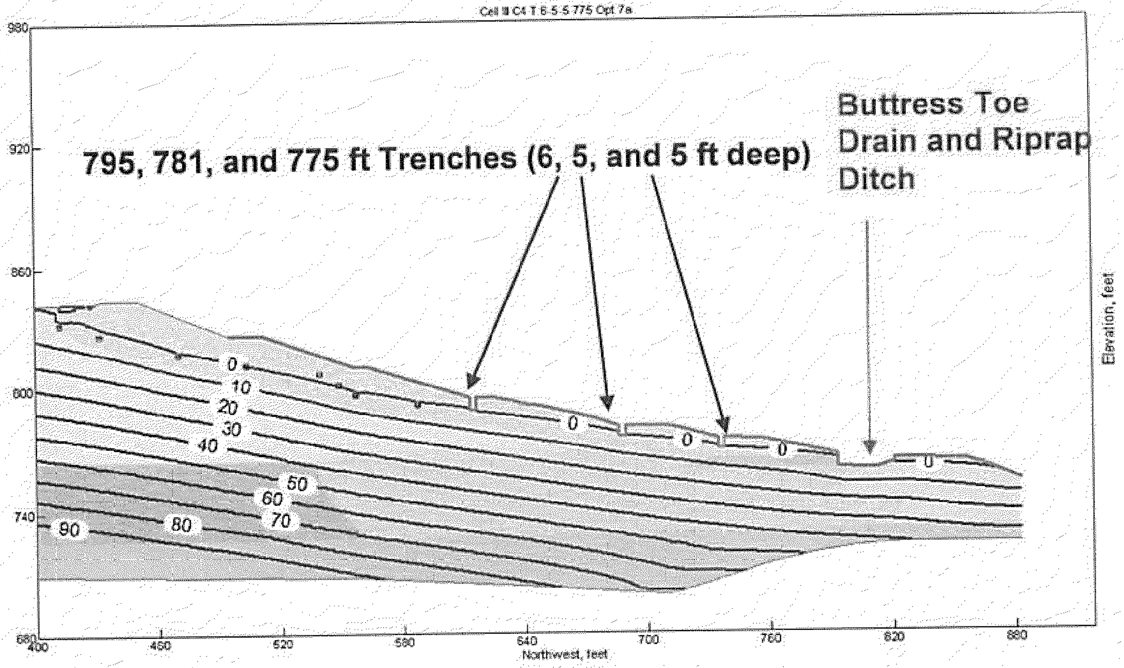


Figure 5.4 End of Construction Pressure Heads (in feet) for Dredge Cell III at Permit Elevation of 842 feet.

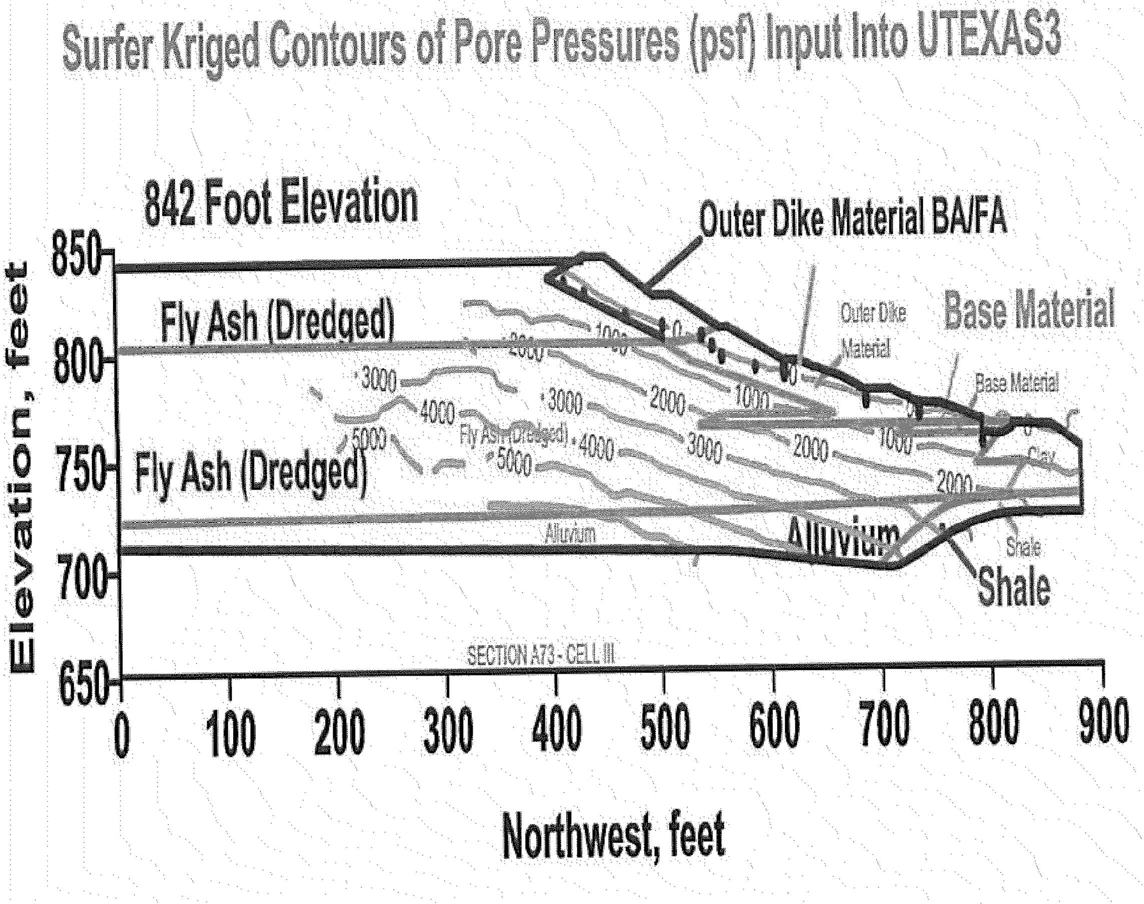


Figure 5.5 Approximate Contours of Pore Pressure Heads in Psf Used as Input to UTEXAS3 as Contoured by Surfer (Golden Software, 1997).

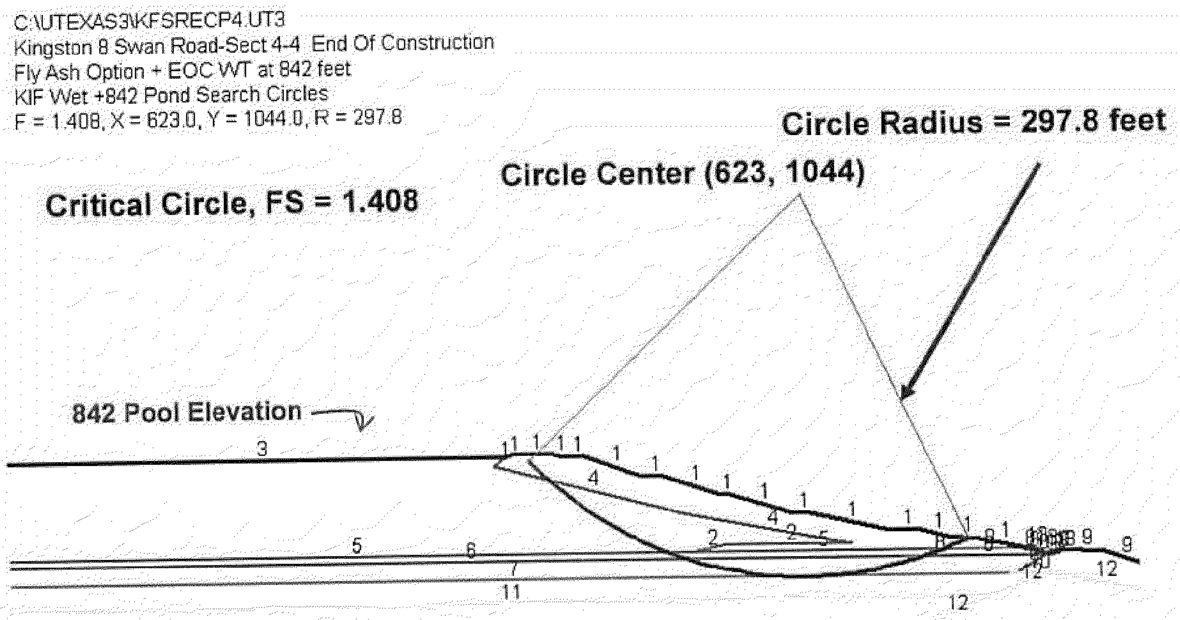


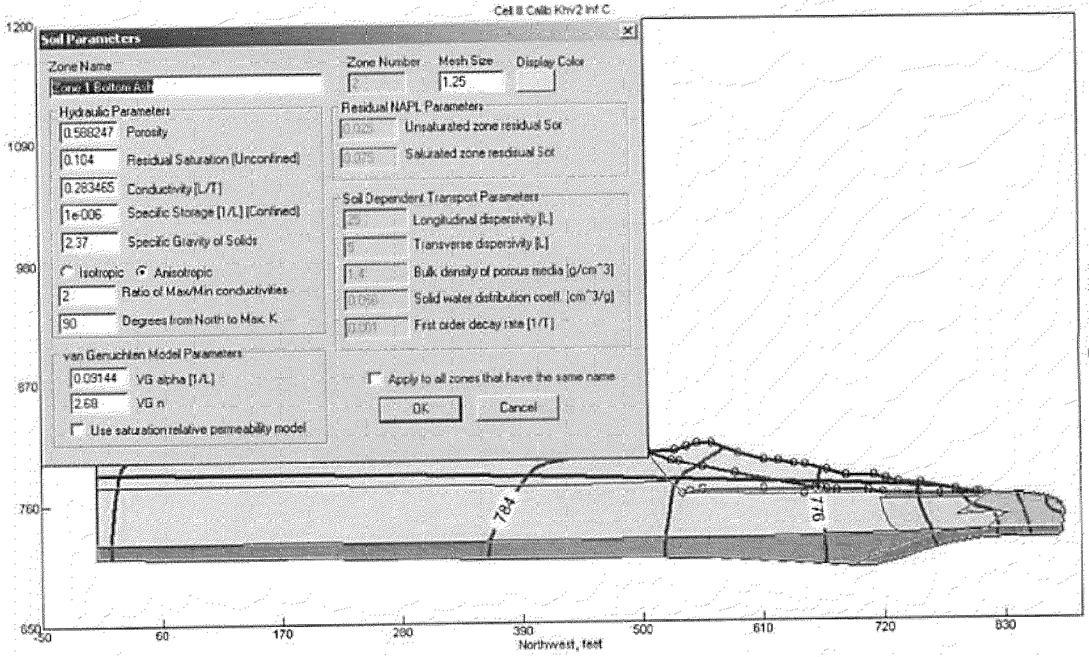
Figure 5.6 End of Construction Critical Failure Circle Determined by the Spencer Method With UTEXAS3 and Input Pore Pressures Determined at Base of Each Slice for Dredge Cell III at Permit Elevation of 842 feet.

ATTACHMENT A

Article: PROCESS VERSUS PREDICTION

ATTACHMENT B

TIMES MODEL INPUTS FOR THE CALIBRATION RUN



Soil Parameters

Zone Name: Zone 1 Bottom Ash

Mesh Size: 1.25

Hydraulic Parameters
0.588247 Porosity
0.104 Residual Saturation (Unconfined)
0.283465 Conductivity [L/T]
1e-006 Specific Storage [1/L] (Confined)
2.37 Specific Gravity of Solids

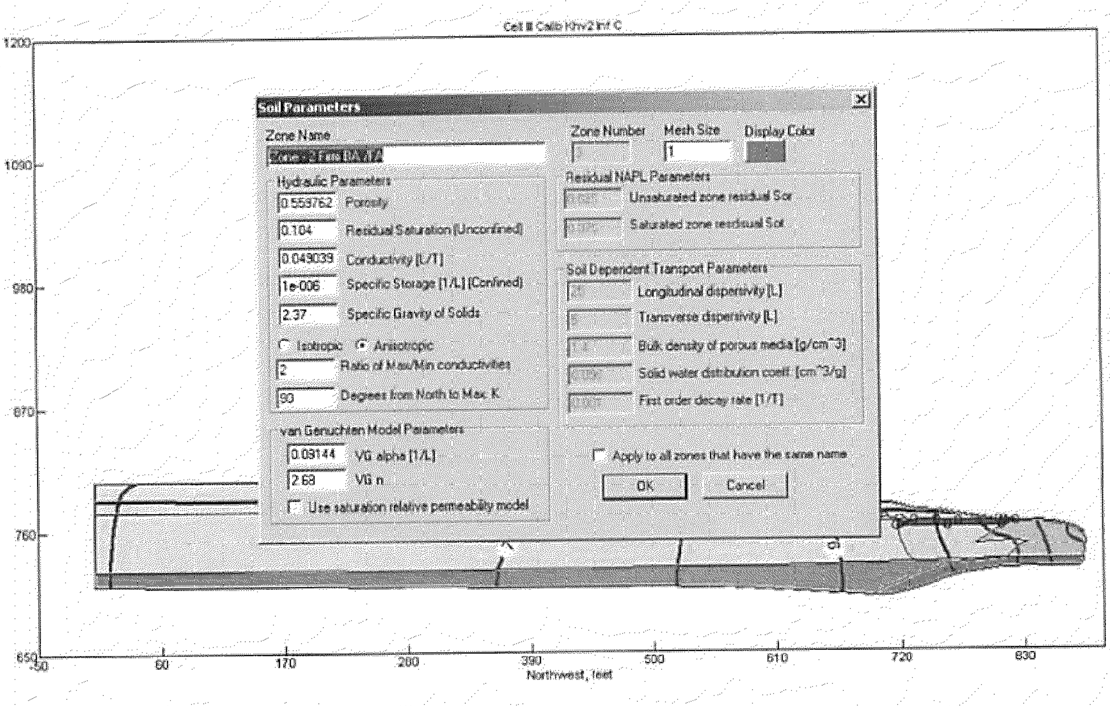
○ Isotropic ● Anisotropic
2 Ratio of Max/Min conductivities
90 Degrees from North to Max. K

van Genuchten Model Parameters
0.09144 VG alpha [1/L]
2.68 VG n
☐ Use saturation relative permeability model

Residual NAPL Parameters
0.025 Unsaturated zone residual Sor
0.075 Saturated zone residual Sor

Soil Dependent Transport Parameters
25 Longitudinal dispersivity [L]
5 Transverse dispersivity [L]
1.4 Bulk density of porous media [g/cm^3]
0.056 Solid water distribution coeff. [cm^3/g]
0.001 First order decay rate [1/T]

☐ Apply to all zones that have the same name



Soil Parameters

Zone Name: Zone 2 Fine BA 1/2

Mesh Size: 1

Hydraulic Parameters
0.559762 Porosity
0.104 Residual Saturation (Unconfined)
0.049039 Conductivity [L/T]
1e-006 Specific Storage [1/L] (Confined)
2.37 Specific Gravity of Solids

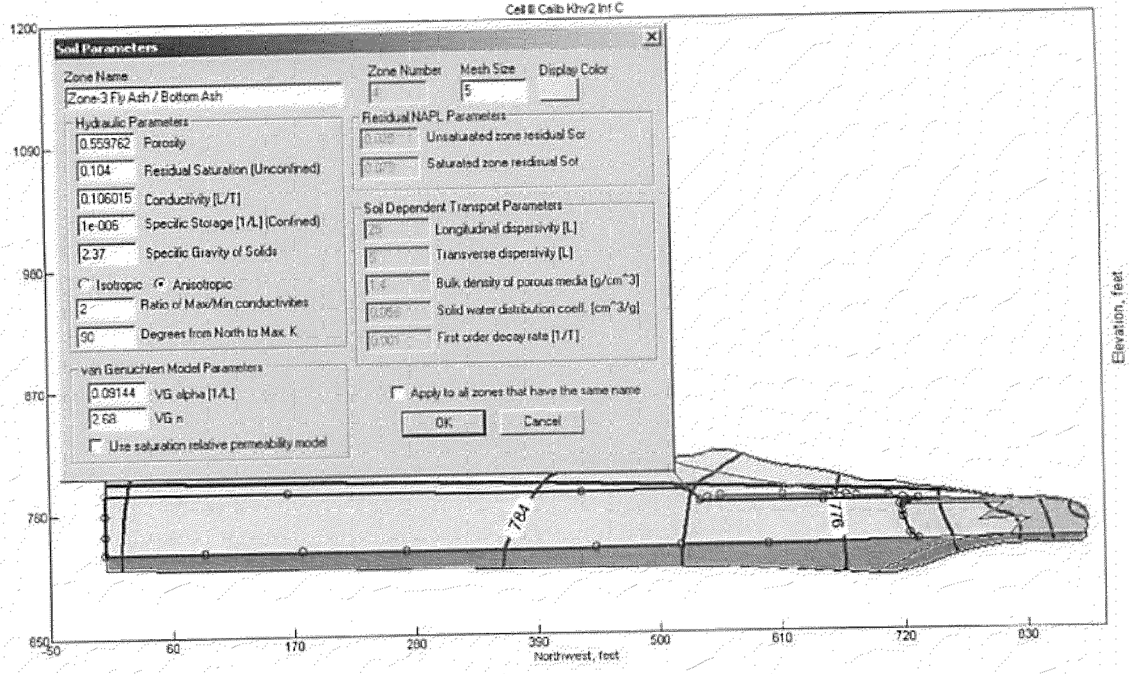
○ Isotropic ● Anisotropic
2 Ratio of Max/Min conductivities
90 Degrees from North to Max. K

van Genuchten Model Parameters
0.09144 VG alpha [1/L]
2.68 VG n
☐ Use saturation relative permeability model

Residual NAPL Parameters
Unsaturated zone residual Sor
Saturated zone residual Sor

Soil Dependent Transport Parameters
Longitudinal dispersivity [L]
Transverse dispersivity [L]
Bulk density of porous media [g/cm^3]
Solid water distribution coeff. [cm^3/g]
First order decay rate [1/T]

☐ Apply to all zones that have the same name



Soil Parameters

Zone Name: Zone-3 Fly Ash / Bottom Ash

Zone Number:

Mesh Size: 5

Display Color:

Hydraulic Parameters
- 0.559762 Porosity
- 0.104 Residual Saturation (Unconfined)
- 0.106015 Conductivity [L/T]
- 1e-006 Specific Storage [1/L] (Confined)
- 2.37 Specific Gravity of Solids
- ○ Isotropic ● Anisotropic
- 2 Ratio of Max/Min conductivities
- 90 Degrees from North to Max. K

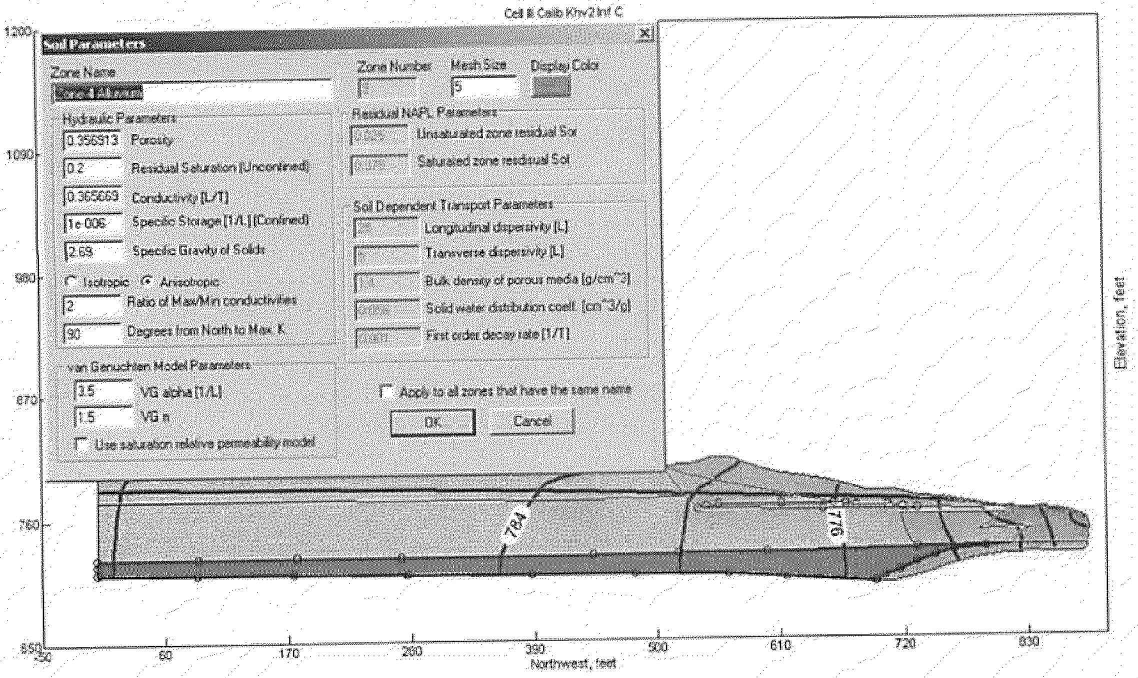
Residual NAPL Parameters
- Unsaturated zone residual Sor
- Saturated zone residual Sol

Soil Dependent Transport Parameters
- Longitudinal dispersivity [L]
- Transverse dispersivity [L]
- Bulk density of porous media [g/cm^3]
- Solid water distribution coeff. [cm^3/g]
- First order decay rate [1/T]

van Genuchten Model Parameters
- 0.09144 VG alpha [1/L]
- 2.68 VG n
- ☐ Use saturation relative permeability model

☐ Apply to all zones that have the same name

OK Cancel



Soil Parameters

Zone Name: [illegible]

Zone Number:

Mesh Size: 5

Display Color:

Hydraulic Parameters
- 0.356913 Porosity
- 0.2 Residual Saturation (Unconfined)
- 0.365669 Conductivity [L/T]
- 1e-006 Specific Storage [1/L] (Confined)
- 2.69 Specific Gravity of Solids
- ○ Isotropic ● Anisotropic
- 2 Ratio of Max/Min conductivities
- 90 Degrees from North to Max. K

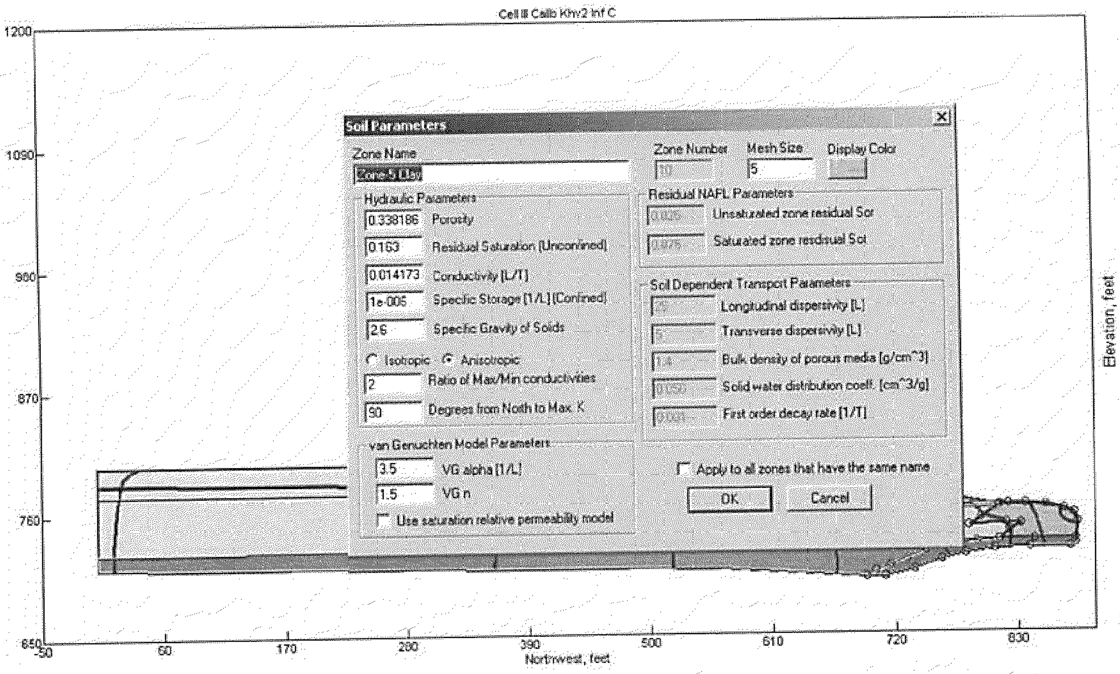
Residual NAPL Parameters
- Unsaturated zone residual Sor
- Saturated zone residual Sol

Soil Dependent Transport Parameters
- Longitudinal dispersivity [L]
- Transverse dispersivity [L]
- Bulk density of porous media [g/cm^3]
- Solid water distribution coeff. [cm^3/g]
- First order decay rate [1/T]

van Genuchten Model Parameters
- 3.5 VG alpha [1/L]
- 1.5 VG n
- ☐ Use saturation relative permeability model

☐ Apply to all zones that have the same name

OK Cancel



Soil Parameters

Zone Name: [illegible]

Zone Number: 10

Mesh Size: 5

Display Color

Hydraulic Parameters
- 0.338186 Porosity
- 0.163 Residual Saturation (Unconfined)
- 0.014173 Conductivity [L/T]
- 1e-005 Specific Storage [1/L] (Confined)
- 2.6 Specific Gravity of Solids

○ Isotropic ● Anisotropic
- 2 Ratio of Max/Min conductivities
- 90 Degrees from North to Max. K

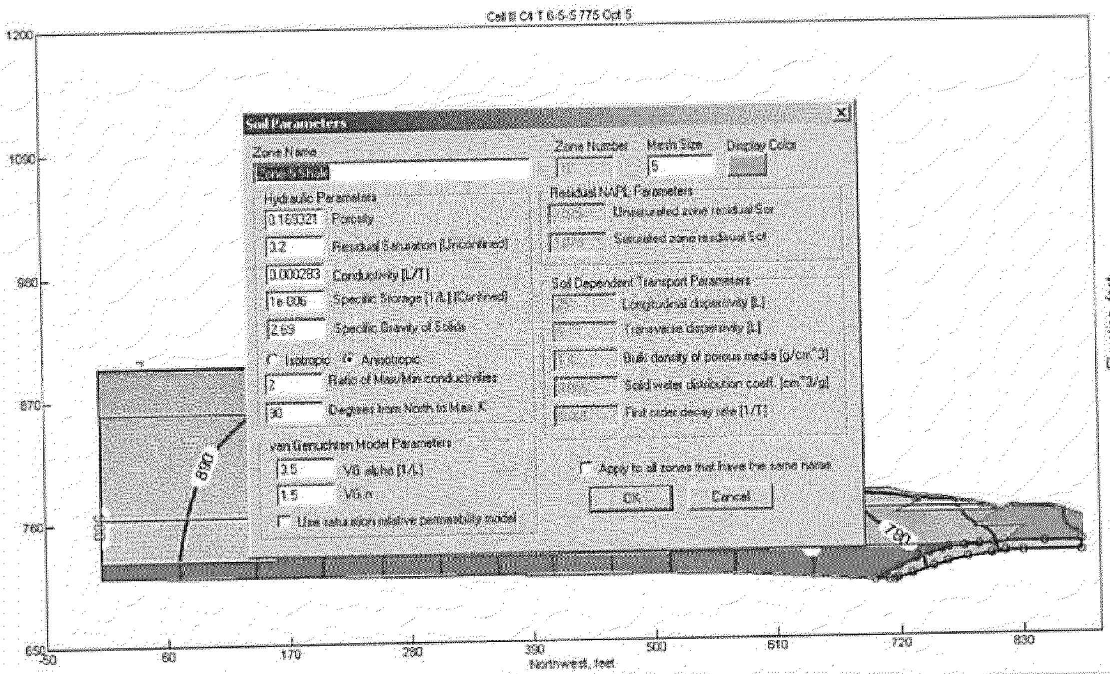
van Genuchten Model Parameters
- 3.5 VG alpha [1/L]
- 1.5 VG n

☐ Use saturation relative permeability model

Residual NAPL Parameters
- 0.025 Unsaturated zone residual Sor
- 0.975 Saturated zone residual Sor

Soil Dependent Transport Parameters
- 25 Longitudinal dispersivity [L]
- 5 Transverse dispersivity [L]
- 1.4 Bulk density of porous media [g/cm^3]
- 0.050 Solid water distribution coeff. [cm^3/g]
- 0.001 First order decay rate [1/T]

☐ Apply to all zones that have the same name



Soil Parameters

Zone Name: Zone 5 Shale

Zone Number: [illegible]

Mesh Size: 5

Display Color

Hydraulic Parameters

0.163321 Porosity

3.2 Residual Saturation (Unconfined)

0.000283 Conductivity [L/T]

1e-006 Specific Storage [1/L] (Confined)

2.69 Specific Gravity of Solids

○ Isotropic ● Anisotropic

2 Ratio of Max/Min conductivities

30 Degrees from North to Max. K

van Genuchten Model Parameters

3.5 VG alpha [1/L]

1.5 VG n

☐ Use saturation relative permeability model

Residual NAPL Parameters

Unsaturated zone residual Sor

Saturated zone residual Sot

Soil Dependent Transport Parameters

Longitudinal dispersivity [L]

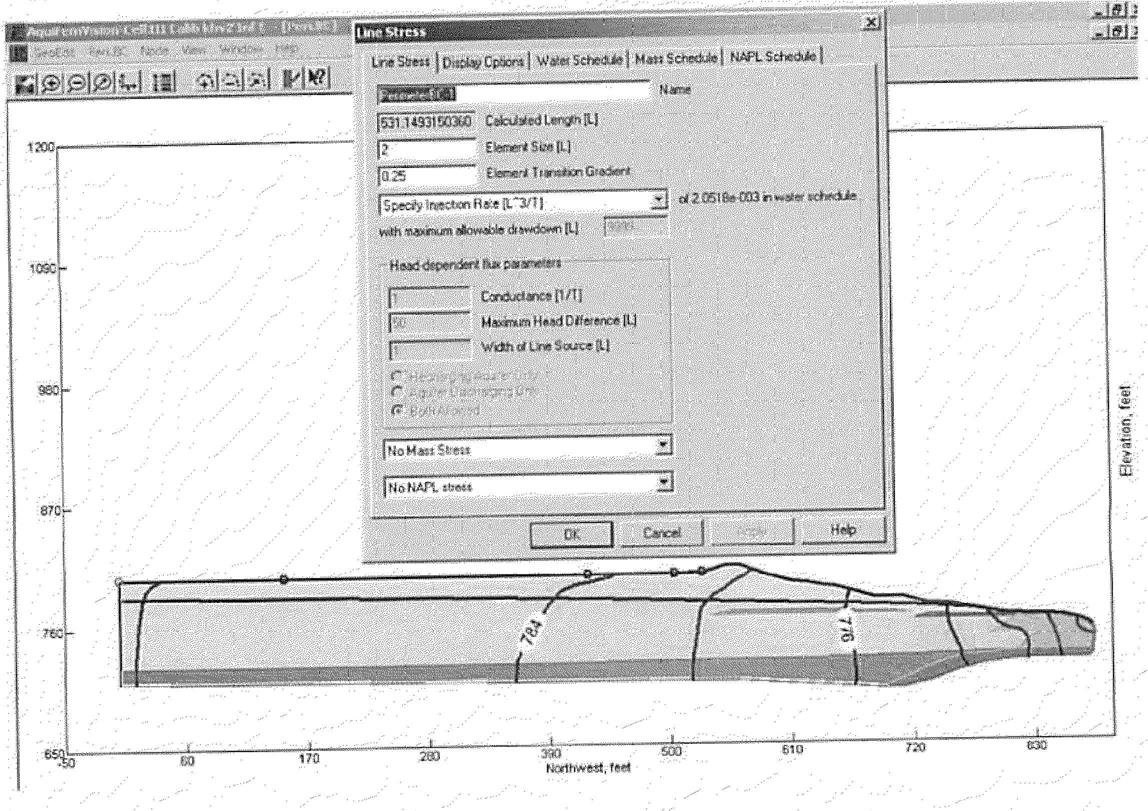
Transverse dispersivity [L]

Bulk density of porous media [g/cm^3]

Solid water distribution coeff. [cm^3/g]

First order decay rate [1/T]

☐ Apply to all zones that have the same name



Line Stress

[illegible] Name

531.1493150360 Calculated Length [L]

2 Element Size [L]

0.25 Element Transition Gradient

Specify Injection Rate [L^3/T] of 2.0518e-003 in water schedule.

with maximum allowable drawdown [L]

Head-dependent flux parameters

Conductance [1/T]

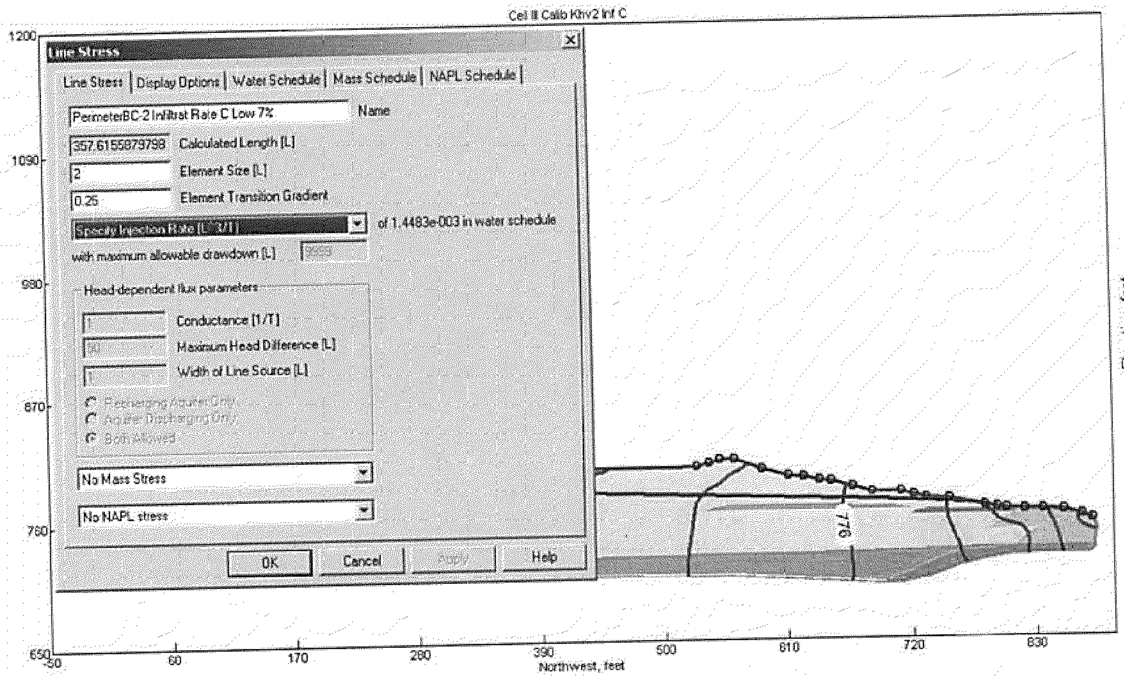
Maximum Head Difference [L]

Width of Line Source [L]

● Both Allowed

No Mass Stress

No NAPL stress



PerimeterBC-2 Infiltrat Rate C Low 7% Name

357.6155879798 Calculated Length [L]

2 Element Size [L]

0.25 Element Transition Gradient

Specify Injection Rate [L^3/T] of 1.4483e-003 in water schedule

with maximum allowable drawdown [L] 9999

Head-dependent flux parameters

1 Conductance [1/T]

10 Maximum Head Difference [L]

1 Width of Line Source [L]

○ Recharging Aquifer Only

○ Aquifer Discharging Only

● Both Allowed

No Mass Stress

No NAPL stress

ATTACHMENT C

UTEXAS3 INPUT AND OUTPUT

```
Plot
Ascii
HEAding follows - KFAASR25.DAT
Kingston 1 Swan Road-Sect 4-4, Run With UTEXAS3
Fly Ash Option EOC WT to 842 ft WT
KIF Wet +842 Pond Single Circle
PROfile line data follow -
      1 1 Dense FA + BA
       380.0  834.6
       388.9  842.0
       394.9  844.0
       424.9  844.0
       433.3  841.2
       450.8  841.3
       494.6  826.1
       512.1  826.1
       556.0  810.9
       562.9  810.9
       612.8  795.2
       624.6  795.3
       686.7  781.0
       710.7  781.0
       735.1  774.9
       755.9  774.2
       793.1  766.4

       2 1 Dense FA + BA
         535.9  765.4
         557.6  770.5
         659.2  770.5

       3 2 Fly Ash (FA) Loose
           0.0    842.0
           388.9  842.0

       4 2 Fly Ash (FA) Loose
           380.0  834.6
           529.0  795.0
           659.2  770.5

       5 4 Fly Ash (FA) Loose
           0.0  765.4
         535.9  765.4
         731.5  765.0

       6 5 Fly Ash (FA) Loose 13.3 degree
          0.0  759.8
        714.9  760.0
        808.2  759.8

       7 6 Fly Ash (FA) Stiff
          0.0  746.2
       780.2   746.2

       8 3 Medium FA+BA  Firm FA BA at Toe
             714.9  760.0
             731.5  765.0
             793.1  765.0
             793.11 763.4
             799.6  762.8
             808.2  759.8
```

```
 9  7 Natural Clay (CL)
        786.2  746.2
        808.2  759.8
        812.1  759.7
        820.4  762.1
        820.5  764.5
        855.0  763.3
        882.7  753.4

 10 7 Natural Clay (CL)
     780.2   746.2
     813.6   746.1

 11 8 Residuum - Alluvium SC
        0.00   726.0
      766.8    730.3

 12 9 Bedrock Limestone/Shale
      697.8  699.8
      766.8  730.3
      813.6  746.1
      882.7  732.4

13   10  Buttress Toe RipRap
     793.1  766.4
     796.4  766.4
     808.3  761.8
     811.8  761.7
     820.5  764.5


MATerial property data follow (for first stage) -
     1 Dense FA + BA
     111.9 = total unit weight
          Conventional shear strengths
               110 36.6
          Piezometric Line
               1
     2 Loose Fly Ash
            108.4 = total unit weight
          Conventional shear strengths
              100.0 28.0
          Piezometric Line
               1
     3 Medium FA+BA
          114.4 = total unit weight
          Conventional shear strengths
              980.0 29.1
          Piezometric Line
               1
     4 Loose FA+BA
        108.4 = total unit weight
         Conventional shear strengths
           100.0  32.1
          Piezometric Line
               1
     5 FA Loose      3
         108.4 = total unit weight
          Conventional shear strengths
               100 18.00
```

```
           Piezometric Line
                1
     6 Stiff FA+BA
          114.4 = total unit weight
          Conventional shear strengths
              980.0 29.1
          Piezometric Line
               1
     7 Natural Clay CL
         126.4 = total unit weight
          Conventional shear strengths
             1200. 29.6
          Piezometric Line
              1
    8   Residuum SC-SM
            130.4 = total unit weight
          Conventional shear strengths
             600 30
        Piezometric Line
              1
   9   Bedrock Limestone/Shale
          150 = total unit weight
          Conventional shear strengths
           735.0  29.9
          Piezometric Line
               1
  10   Buttress Riprap Ditch Drain
         85 = total unit weight
         Conventional shear strengths
         0.0  45.0
         Piezometric Line
              1

PIEzometric line follows -
     1 End of Construction Piezometric Surface Case 2 after 20-25 years
        0.0  842.00
      393.446 842.0
     409.9    837.8
      411.8  835.30
      432.5  829.9
      467.2  820.0
      512.0  810.0
      553.4  799.90
      577.13 795.45
      587.32 793.0
      614.30 789.9
     645.80  784.60
     675.50  780.00
     689.70  776.00
     738.10  769.80
     773.50  767.30
     818.70  761.40
     847.50  760.80
     873.60  757.50
     882.60  753.70
     883.60  753.70


 ANAlysis/computation data follow -
      Circle Search
      450 1000 10.0 703.0
```

```
     Tangent line elevation follows -
          703.
    ITERATION
     1000
   PROCEDURE
    Spencer
    Crack
    5

COMpute
HEADING
Kingston 2 Swan Road-Sect 4-4, End Of Construction
Fly Ash Option + EOC
KIF Wet +842 Pond
ANAlysis/computation data follow -
     Circle  Search
     500.0 1557.8 10 737.0
   Tangent line elevation follows -
          737.
   ITERATION
     1000
   PROCEDURE
    Spencer

COMpute
HEADING
Kingston 3 Swan Road-Sect 4-4, End Of Construction
Fly Ash Option + EOC WT at 842 feet
KIF Wet +842 Pond Tan at 733.5
ANAlysis/computation data follow -
     Circle Search
     645 1300 10.0 733.5
     Tangent line elevation follows -
          733.5
   ITERATION
     1000
   PROCEDURE
    Spencer
    crack
    5

COMpute
HEADING
Kingston 4 Swan Road-Sect 4-4, End Of Construction
Fly Ash Option + EOC WT at 842 feet
KIF Wet +842 Pond
ANAlysis/computation data follow -
     Circle Search
     613.5 1123.6 10.0 730.
     Tangent line elevation follows -
          730.
  ITERATION
     1000
   PROCEDURE
    Spencer
    crack
    5

COMpute
HEADING
Kingston 5 Swan Road-Sect 4-4, End Of Construction
```

```
Fly Ash Option + EOC WT at 842 feet
KIF Wet +842 Pond
ANAlysis/computation data follow -
     Circle Search
     800 1000 5.0 718.
     Tangent line elevation follows -
          718.
 ITERATION
     1000
   PROCEDURE
    Spencer
     Crack
     5

COMpute
HEADING
Kingston 6 Swan Road-Sect 4-4, End Of Construction
Fly Ash Option + EOC WT at 842 feet
KIF Wet +842 Pond Single Circle
ANAlysis/computation data follow -
     Circle
  489.0 1450.  740.0
   PROCEDURE
    Spencer
    crack
    5

COMpute
HEADING
Kingston 7 Swan Road-Sect 4-4, End Of Construction
Fly Ash Option + EOC WT at 842 feet
KIF Wet +842 Pond Search Circles
ANAlysis/computation data follow -
   Circle Search
  489.0 1450. 5.0 740.0
    Tangent line elevation follows -
          740.
    ITERATION
     1000
   PROCEDURE
    Spencer
    crack
    5

COMpute
HEADING
Kingston 8 Swan Road-Sect 4-4, End Of Construction
Fly Ash Option + EOC WT at 842 feet
KIF Wet +842 Pond Search Circles
ANAlysis/computation data follow -
   Circle Search
  748.0 1084. 5.0 746.2
  Tangent line elevation follows -
          746.2
    ITERATION
     1000
   PROCEDURE
    Spencer
    crack
    5
```

```
COMpute
HEADING
Kingston 9 Swan Road-Sect 4-4, End Of Construction
Fly Ash Option + EOC Tangent at 735
KIF Wet +842 Pond
ANAlysis/computation data follow -
     Circle  Search
     500.0 1557.8 10 735.0
   Tangent line elevation follows -
          735.
   ITERATION
     1000
   PROCEDURE
    Spencer

 COMpute
 end
```

```
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           TABLE NO. 1
           *****************************************
           * COMPUTER PROGRAM DESIGNATION - UTEXAS3 *
           * Originally Coded By Stephen G. Wright  *
           * Version No. 1.209                      *
           * Last Revision Date  2/28/98            *
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           * All Rights Reserved                    *
           *****************************************

           *************************************************************
           *                                                           *
           *      RESULTS OF COMPUTATIONS PERFORMED USING THIS COMPUTER *
           * PROGRAM SHOULD NOT BE USED FOR DESIGN PURPOSES UNLESS THEY *
           * HAVE BEEN VERIFIED BY INDEPENDENT ANALYSES, EXPERIMENTAL   *
           * DATA OR FIELD EXPERIENCE. THE USER SHOULD UNDERSTAND THE   *
           * ALGORITHMS AND ANALYTICAL PROCEDURES USED IN THE COMPUTER  *
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           *                                                           *
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           Kingston 1 Swan Road-Sect 4-4, Run With UTEXAS3
           Fly Ash Option EOC WT to 842 ft WT
           KIF Wet +842 Pond Single Circle

           TABLE NO.  2
           *************************
           * NEW PROFILE LINE DATA *
           *************************

           PROFILE LINE   1 - MATERIAL TYPE =   1
           Dense FA + BA

                Point        X             Y

                  1       380.000       834.600
                  2       388.900       842.000
                  3       394.900       844.000
                  4       424.900       844.000
                  5       433.300       841.200
                  6       450.800       841.300
                  7       494.600       826.100
                  8       512.100       826.100
                  9       556.000       810.900
                 10       562.900       810.900
                 11       612.800       795.200
                 12       624.600       795.300
                 13       686.700       781.000
```

```
     14        710.700        781.000
     15        735.100        774.900
     16        755.900        774.200
     17        793.100        766.400

PROFILE LINE  2 - MATERIAL TYPE =  1
Dense FA + BA

      Point       X              Y

        1      535.900        765.400
        2      557.600        770.500
        3      659.200        770.500

PROFILE LINE  3 - MATERIAL TYPE =  2
Fly Ash (FA) Loose

      Point       X              Y

        1         .000        842.000
        2      388.900        842.000

PROFILE LINE  4 - MATERIAL TYPE =  2
Fly Ash (FA) Loose

      Point       X              Y

        1      380.000        834.600
        2      529.000        795.000
        3      659.200        770.500

PROFILE LINE  5 - MATERIAL TYPE =  4
Fly Ash (FA) Loose

      Point       X              Y

        1         .000        765.400
        2      535.900        765.400
        3      731.500        765.000

PROFILE LINE  6 - MATERIAL TYPE =  5
Fly Ash (FA) Loose 13.3 degree

      Point       X              Y

        1         .000        759.800
        2      714.900        760.000
        3      808.200        759.800

PROFILE LINE  7 - MATERIAL TYPE =  6
Fly Ash (FA) Stiff

      Point       X              Y

        1         .000        746.200
        2      780.200        746.200

PROFILE LINE  8 - MATERIAL TYPE =  3
Medium FA+BA  Firm FA BA at Toe

      Point       X              Y
```

```
        1        714.900        760.000
        2        731.500        765.000
        3        793.100        765.000
        4        793.110        763.400
        5        799.600        762.800
        6        808.200        759.800

   PROFILE LINE  9 - MATERIAL TYPE =  7
   Natural Clay (CL)

       Point       X              Y

        1        786.200        746.200
        2        808.200        759.800
        3        812.100        759.700
        4        820.400        762.100
        5        820.500        764.500
        6        855.000        763.300
        7        882.700        753.400

   PROFILE LINE 10 - MATERIAL TYPE =  7
   Natural Clay (CL)

       Point       X              Y

        1        780.200        746.200
        2        813.600        746.100

   PROFILE LINE 11 - MATERIAL TYPE =  8
   Residuum - Alluvium SC

       Point       X              Y

        1           .000        726.000
        2        766.800        730.300

   PROFILE LINE 12 - MATERIAL TYPE =  9
   Bedrock Limestone/Shale

       Point       X              Y

        1        697.800        699.800
        2        766.800        730.300
        3        813.600        746.100
        4        882.700        732.400

   PROFILE LINE 13 - MATERIAL TYPE = 10
   Buttress Toe RipRap

       Point       X              Y

        1        793.100        766.400
        2        796.400        766.400
        3        808.300        761.800
        4        811.800        761.700
        5        820.500        764.500

   All new profile lines defined - No old lines retained
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```

```
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          Kingston 1 Swan Road-Sect 4-4, Run With UTEXAS3
          Fly Ash Option EOC WT to 842 ft WT
          KIF Wet +842 Pond Single Circle

          TABLE NO.  3

**********************************************************************
          * NEW MATERIAL PROPERTY DATA - CONVENTIONAL/FIRST-STAGE
COMPUTATIONS *

**********************************************************************

          DATA FOR MATERIAL TYPE  1
          Dense FA + BA

               Unit weight of material =  111.900

               CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
               Cohesion - - - - - - - - -     110.000
               Friction angle - - - - -  36.600 degrees

               Pore water pressures defined by piezometric line
               Number of the piezometric line used =  1
               Negative pore pressures set to zero

          DATA FOR MATERIAL TYPE  2
          Loose Fly Ash

               Unit weight of material =  108.400

               CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
               Cohesion - - - - - - - - -     100.000
               Friction angle - - - - -  28.000 degrees

               Pore water pressures defined by piezometric line
               Number of the piezometric line used =  1
               Negative pore pressures set to zero

          DATA FOR MATERIAL TYPE  3
          Medium FA+BA

               Unit weight of material =  114.400

               CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
               Cohesion - - - - - - - - -     980.000
               Friction angle - - - - -  29.100 degrees

               Pore water pressures defined by piezometric line
               Number of the piezometric line used =  1
               Negative pore pressures set to zero

          DATA FOR MATERIAL TYPE  4
          Loose FA+BA

               Unit weight of material =  108.400

               CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
               Cohesion - - - - - - - - -     100.000
               Friction angle - - - - -  32.100 degrees
```

```
     Pore water pressures defined by piezometric line
     Number of the piezometric line used =  1
     Negative pore pressures set to zero

DATA FOR MATERIAL TYPE  5
FA Loose     3

     Unit weight of material =  108.400

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -     100.000
     Friction angle - - - - -  18.000 degrees

     Pore water pressures defined by piezometric line
     Number of the piezometric line used =  1
     Negative pore pressures set to zero

DATA FOR MATERIAL TYPE  6
Stiff FA+BA

     Unit weight of material =  114.400

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -     980.000
     Friction angle - - - - -  29.100 degrees

     Pore water pressures defined by piezometric line
     Number of the piezometric line used =  1
     Negative pore pressures set to zero

DATA FOR MATERIAL TYPE  7
Natural Clay CL

     Unit weight of material =  126.400

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -    1200.000
     Friction angle - - - - -  29.600 degrees

     Pore water pressures defined by piezometric line
     Number of the piezometric line used =  1
     Negative pore pressures set to zero

DATA FOR MATERIAL TYPE  8
Residuum SC-SM

     Unit weight of material =  130.400

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -     600.000
     Friction angle - - - - -  30.000 degrees

     Pore water pressures defined by piezometric line
     Number of the piezometric line used =  1
     Negative pore pressures set to zero

DATA FOR MATERIAL TYPE  9
Bedrock Limestone/Shale

     Unit weight of material =  150.000
```

```
          CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
          Cohesion - - - - - - - -     735.000
          Friction angle - - - - -  29.900 degrees

          Pore water pressures defined by piezometric line
          Number of the piezometric line used =  1
          Negative pore pressures set to zero

     DATA FOR MATERIAL TYPE 10
     Buttress Riprap Ditch Drain

          Unit weight of material =   85.000

          CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
          Cohesion - - - - - - - -        .000
          Friction angle - - - - -  45.000 degrees

          Pore water pressures defined by piezometric line
          Number of the piezometric line used =  1
          Negative pore pressures set to zero

     All new material properties defined - No old data retained
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     Fly Ash Option EOC WT to 842 ft WT
     KIF Wet +842 Pond Single Circle

     TABLE NO.  5

*******************************************************************
     * NEW PIEZOMETRIC LINE DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS
*

*******************************************************************

     Line
      No.    Point       X          Y

       1 - Unit weight of water =  62.40   End of Construction
Piezometri
       1       1        .000     842.000   End of Construction
Piezometri
       1       2     393.446     842.000   End of Construction
Piezometri
       1       3     409.900     837.800   End of Construction
Piezometri
       1       4     411.800     835.300   End of Construction
Piezometri
       1       5     432.500     829.900   End of Construction
Piezometri
       1       6     467.200     820.000   End of Construction
Piezometri
       1       7     512.000     810.000   End of Construction
Piezometri
       1       8     553.400     799.900   End of Construction
Piezometri
       1       9     577.130     795.450   End of Construction
Piezometri
```

```
              1        10       587.320      793.000    End of Construction
Piezometri
              1        11       614.300      789.900    End of Construction
Piezometri
              1        12       645.800      784.600    End of Construction
Piezometri
              1        13       675.500      780.000    End of Construction
Piezometri
              1        14       689.700      776.000    End of Construction
Piezometri
              1        15       738.100      769.800    End of Construction
Piezometri
              1        16       773.500      767.300    End of Construction
Piezometri
              1        17       818.700      761.400    End of Construction
Piezometri
              1        18       847.500      760.800    End of Construction
Piezometri
              1        19       873.600      757.500    End of Construction
Piezometri
              1        20       882.600      753.700    End of Construction
Piezometri
              1        21       883.600      753.700    End of Construction
Piezometri

             All new piezometric lines defined - No old lines retained
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             Kingston 8 Swan Road-Sect 4-4, End Of Construction
             Fly Ash Option + EOC WT at 842 feet
             KIF Wet +842 Pond Search Circles

             TABLE NO. 15
             ********************************
             * NEW ANALYSIS/COMPUTATION DATA *
             ********************************

             Circular Shear Surface(s)

             Automatic Search Performed

             Starting Center Coordinate for Search at -
                                                         X =      748.000
                                                         Y =     1084.000

             Required accuracy for critical center (= minimum
             spacing between grid points) =      5.000

             Critical shear surface not allowed to pass below Y =      746.200

             For the initial mode of search
             all circles are tangent to horizontal line at -
                                                         Y =      746.200

             Maximum number of iterations allowed for
             calculating the factor of safety = 1000

             Procedure used to compute the factor of safety: SPENCER

             Depth of crack =       5.000
```

```
          -----------------------------------------------------------------
--
          THE FOLLOWING REPRESENT EITHER DEFAULT OR PREVIOUSLY DEFINED
VALUES:

          Initial trial estimate for the factor of safety =   3.000

          Initial trial estimate for side force inclination =  15.000 degrees
          (Applicable to Spencer's procedure only)

          Allowed force imbalance for convergence =     100.000

          Allowed moment imbalance for convergence =     100.000

          Initial trial values for factor of safety (and side force
inclination
          for Spencer's procedure) will be kept constant during search

          Maximum subtended angle to be used for subdivision of the
          circle into slices =   3.00 degrees

          Search will be continued to locate a more critical shear
          surface (if one exists) after the initial mode is complete

          Depth of water in crack =        .000

          Unit weight of water in crack =    62.400

          Seismic coefficient =  .000

          Conventional (single-stage) computations to be performed
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          Fly Ash Option + EOC WT at 842 feet
          KIF Wet +842 Pond Search Circles

          TABLE NO. 18
          INFORMATION FOR CURRENT MODE OF SEARCH - All Circles Are Tangent
          to a Horizontal Line at    Y =   746.200
          --------------------------------------------------------------
                                              1-Stage
          Center Coordinates                  Factor  Side Force
                                                of    Inclination
              X          Y          Radius    Safety   (degrees)    Iterations


              598.00     934.00     187.80    1.439      -8.50           7
              748.00     934.00     187.80    2.676      -4.75           4
              898.00     934.00     187.80 See Message on Next Line(s)
          CIRCLE DOES NOT INTERSECT SLOPE
              598.00    1084.00     337.80    1.359      -8.56           7
              748.00    1084.00     337.80    2.719      -5.50           4
              898.00    1084.00     337.80 See Message on Next Line(s)
          CIRCLE DOES NOT INTERSECT SLOPE
              598.00    1234.00     487.80    1.453      -7.74           7
              748.00    1234.00     487.80    2.361      -6.68           5
              898.00    1234.00     487.80 See Message on Next Line(s)
          CIRCLE DOES NOT INTERSECT SLOPE
```

```
 448.00    934.00    187.80   2.862      -4.48        6
 448.00   1084.00    337.80   2.479      -4.90        4
 448.00   1234.00    487.80   2.442      -4.77        4

 573.00   1059.00    312.80   1.404      -8.11        8
 598.00   1059.00    312.80   1.356      -8.63        7
 623.00   1059.00    312.80   1.345      -8.98        8
 573.00   1084.00    337.80   1.418      -7.96        8
 623.00   1084.00    337.80   1.389      -8.65        7
 573.00   1109.00    362.80   1.433      -7.82        8
 598.00   1109.00    362.80   1.365      -8.46        7
 623.00   1109.00    362.80   1.391      -8.57        7

 598.00   1034.00    287.80   1.358      -8.69        8
 623.00   1034.00    287.80   1.359      -8.90        8
 648.00   1034.00    287.80   1.480      -8.29        7
 648.00   1059.00    312.80   1.455      -8.40        8
 648.00   1084.00    337.80   1.432      -8.51        8

 608.00   1044.00    297.80   1.347      -8.90        7
 623.00   1044.00    297.80   1.353      -8.93        8
 638.00   1044.00    297.80   1.436      -8.45        7
 608.00   1059.00    312.80   1.343      -8.89        7
 638.00   1059.00    312.80   1.427      -8.49        8
 608.00   1074.00    327.80   1.342      -8.85        7
 623.00   1074.00    327.80   1.390      -8.68        7
 638.00   1074.00    327.80   1.419      -8.52        8

 593.00   1059.00    312.80   1.364      -8.50        7
 593.00   1074.00    327.80   1.368      -8.45        6
 593.00   1089.00    342.80   1.372      -8.39        7
 608.00   1089.00    342.80   1.343      -8.80        7
 623.00   1089.00    342.80   1.389      -8.64        7

 603.00   1069.00    322.80   1.348      -8.74       10
 608.00   1069.00    322.80   1.342      -8.86        7
 613.00   1069.00    322.80   1.339      -8.96        7
 603.00   1074.00    327.80 See Message on Next Line(s)
Last Trial Values =             1.486       6.64        5
(Last Trial Values Shown Above Are Not Correct Final Values)
VALUE OF SIDE FORCE INCLINATION BECAME OUTSIDE RANGE OF
FROM  -80.00 TO   10.00 DEGREES
 613.00   1074.00    327.80   1.338      -8.95        7
 603.00   1079.00    332.80 See Message on Next Line(s)
Last Trial Values =             1.517       6.59        5
(Last Trial Values Shown Above Are Not Correct Final Values)
VALUE OF SIDE FORCE INCLINATION BECAME OUTSIDE RANGE OF
FROM  -80.00 TO   10.00 DEGREES
 608.00   1079.00    332.80   1.342      -8.83        7
 613.00   1079.00    332.80   1.338      -8.93        7

 618.00   1069.00    322.80   1.338      -9.01        8
 618.00   1074.00    327.80   1.337      -9.00        8
 618.00   1079.00    332.80   1.337      -8.99        8

 623.00   1079.00    332.80   1.389      -8.67        7
 613.00   1084.00    337.80   1.339      -8.91        7
 618.00   1084.00    337.80   1.337      -8.97        8

At the end of the current mode of search the most critical
```

```
        circle which was found has the following values -
        X-center =    618.00    Y-center =   1079.00    Radius =
332.80
        Factor of Safety =    1.337    Side Force Inclination =  -8.99
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        Fly Ash Option + EOC WT at 842 feet
        KIF Wet +842 Pond Search Circles

        TABLE NO. 19
        INFORMATION FOR CURRENT MODE OF SEARCH - All Circles Have the
        Same Radius   -   Radius =   332.800
        ------------------------------------------------------------------
                                              1-Stage
                                              Factor  Side Force
        Center Coordinates                      of    Inclination
                                              Safety  (degrees)   Iterations
            X          Y          Radius

          468.00     929.00     332.80 Bottom of circle exceeds allowable
                                       depth - CIRCLE REJECTED
          618.00     929.00     332.80 Bottom of circle exceeds allowable
                                       depth - CIRCLE REJECTED
          768.00     929.00     332.80 Bottom of circle exceeds allowable
                                       depth - CIRCLE REJECTED
          468.00    1079.00     332.80  2.181      -5.34          5
          768.00    1079.00     332.80  3.453      -5.28          4
          468.00    1229.00     332.80 See Message on Next Line(s)
         CIRCLE DOES NOT INTERSECT SLOPE
          618.00    1229.00     332.80 See Message on Next Line(s)
         CIRCLE DOES NOT INTERSECT SLOPE
          768.00    1229.00     332.80 See Message on Next Line(s)
         CIRCLE DOES NOT INTERSECT SLOPE

          593.00    1054.00     332.80 Bottom of circle exceeds allowable
                                       depth - CIRCLE REJECTED
          618.00    1054.00     332.80 Bottom of circle exceeds allowable
                                       depth - CIRCLE REJECTED
          643.00    1054.00     332.80 Bottom of circle exceeds allowable
                                       depth - CIRCLE REJECTED
          593.00    1079.00     332.80  1.369      -8.43          7
          643.00    1079.00     332.80  1.426      -8.51          8
          593.00    1104.00     332.80  1.788     -10.67          7
          618.00    1104.00     332.80  1.849     -10.77          7
          643.00    1104.00     332.80  2.056     -10.30          8

          603.00    1064.00     332.80 Bottom of circle exceeds allowable
                                       depth - CIRCLE REJECTED
          618.00    1064.00     332.80 Bottom of circle exceeds allowable
                                       depth - CIRCLE REJECTED
          633.00    1064.00     332.80 Bottom of circle exceeds allowable
                                       depth - CIRCLE REJECTED
          603.00    1079.00     332.80 See Message on Next Line(s)
         Last Trial Values =            1.517       6.59          5
         (Last Trial Values Shown Above Are Not Correct Final Values)
         VALUE OF SIDE FORCE INCLINATION BECAME OUTSIDE RANGE OF
         FROM  -80.00 TO   10.00 DEGREES
          633.00    1079.00     332.80  1.406      -8.60          8
          603.00    1094.00     332.80  1.874     -10.34          6
```

```
          618.00     1094.00      332.80    1.910      -10.44          6
          633.00     1094.00      332.80    1.967      -10.48          6

          613.00     1074.00      332.80 Bottom of circle exceeds allowable
                                         depth - CIRCLE REJECTED
          618.00     1074.00      332.80 Bottom of circle exceeds allowable
                                         depth - CIRCLE REJECTED
          623.00     1074.00      332.80 Bottom of circle exceeds allowable
                                         depth - CIRCLE REJECTED
          613.00     1079.00      332.80    1.338       -8.93          7
          623.00     1079.00      332.80    1.389       -8.67          7
          613.00     1084.00      332.80    1.424       -9.20          8
          618.00     1084.00      332.80    1.423       -9.27          8
          623.00     1084.00      332.80    1.426       -9.29          8

       At the end of the current mode of search the most critical
       circle which was found has the following values -
       X-center =     618.00      Y-center =    1079.00      Radius =
 332.80
       Factor of Safety =   1.337     Side Force Inclination =  -8.99


       ***** CAUTION ***** FACTOR OF SAFETY COULD NOT BE COMPUTED FOR SOME
                           OF GRID POINTS AROUND THE MINIMUM
       ***** RESULTS MAY BE ERRONEOUS *****
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       Kingston 8 Swan Road-Sect 4-4, End Of Construction
       Fly Ash Option + EOC WT at 842 feet
       KIF Wet +842 Pond Search Circles

       TABLE NO. 21
       *****  1-STAGE FINAL CRITICAL CIRCLE INFORMATION   *****
       X Coordinate of Center - - - - - - -   618.000
       Y Coordinate of Center - - - - - - -  1079.000
       Radius - - - - - - - - - - - - - - -   332.800
       Factor of Safety - - - - - - - - - -     1.337
       Side Force Inclination - - - - - - -     -8.99

       Number of circles tried  - - - - - -   84
       No. of circles F calc. for - - - - -   63


       ***** CAUTION ***** FACTOR OF SAFETY COULD NOT BE COMPUTED FOR SOME
                           OF GRID POINTS AROUND THE MINIMUM
       ***** RESULTS MAY BE ERRONEOUS *****
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       Fly Ash Option + EOC WT at 842 feet
       KIF Wet +842 Pond Search Circles

       TABLE NO. 26
       ***************************************************************
       *  Coordinate, Weight, Strength and Pore Water Pressure       *
       *  Information for Individual Slices for Conventional         *
       *  Computations or First Stage of Multi-Stage Computations.   *
       *  (Information is for the Critical Shear Surface in the      *
       *  Case of an Automatic Search.)                              *
```

```
          **************************************************************
                                                                 Friction     Pore
          Slice                          Slice    Matl.
           No.       X          Y        Weight   Type  Cohesion   Angle
Pressure

                   389.4      837.2
            1      391.4      835.3     3447.1     1    110.00     36.60
420.1
                   393.4      833.4
            2      394.2      832.7     1796.7     1    110.00     36.60
567.8
                   394.9      832.1
            3      396.0      831.0     3256.1     1    110.00     36.60
642.3
                   397.1      830.0
            4      403.5      824.7    27427.7     2    100.00     28.00
921.2
                   409.9      819.3
            5      410.8      818.5     5362.3     2    100.00     28.00
1124.3
                   411.8      817.8
            6      418.3      812.9    45113.5     2    100.00     28.00
1293.4
                   424.9      807.9
            7      428.7      805.3    31382.2     2    100.00     28.00
1595.6
                   432.5      802.7
            8      432.9      802.4     3432.3     2    100.00     28.00
1707.3
                   433.3      802.2
            9      440.7      797.5    71053.3     2    100.00     28.00
1875.4
                   448.0      792.9
           10      449.4      792.1    14961.7     2    100.00     28.00
2060.0
                   450.8      791.3
           11      458.4      787.1    86807.9     2    100.00     28.00
2210.6
                   466.1      782.9
           12      466.6      782.6     6501.5     2    100.00     28.00
2343.0
                   467.2      782.3
           13      475.1      778.6    93896.6     2    100.00     28.00
2474.8
                   482.9      774.8
           14      488.8      772.4    71411.0     2    100.00     28.00
2671.0
                   494.6      769.9
           15      500.6      767.7    76978.8     2    100.00     28.00
2800.7
                   506.6      765.4
           16      509.3      764.5    36595.1     4    100.00     32.10
2878.9
                   512.0      763.5
           17      512.0      763.5      687.6     4    100.00     32.10
2899.9
                   512.1      763.5
           18      517.7      761.7    77092.4     4    100.00     32.10
2925.4
                   523.3      759.9
```

```
          19   526.2     759.1     38606.9     5      100.00     18.00
2958.3
               529.0     758.3
          20   532.5     757.4     46708.8     5      100.00     18.00
2970.7
               535.9     756.5
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          Fly Ash Option + EOC WT at 842 feet
          KIF Wet +842 Pond Search Circles

          TABLE NO. 26
          ************************************************************
          *  Coordinate, Weight, Strength and Pore Water Pressure      *
          *  Information for Individual Slices for Conventional        *
          *  Computations or First Stage of Multi-Stage Computations.  *
          *  (Information is for the Critical Shear Surface in the     *
          *  Case of an Automatic Search.)                             *
          ************************************************************

          Slice                       Slice    Matl.              Friction       Pore
           No.      X        Y        Weight   Type    Cohesion    Angle
Pressure

                 535.9     756.5
           21    544.4     754.6    112652.0     5      100.00     18.00
2966.4
                 552.9     752.6
           22    553.1     752.6      3314.0     5      100.00     18.00
2956.6
                 553.4     752.5
           23    554.7     752.3     16882.1     5      100.00     18.00
2956.4
                 556.0     752.0
           24    556.8     751.9     10382.9     5      100.00     18.00
2956.9
                 557.6     751.7
           25    560.3     751.3     34764.3     5      100.00     18.00
2955.0
                 562.9     750.8
           26    570.0     749.8     92185.5     5      100.00     18.00
2934.6
                 577.1     748.7
           27    582.2     748.2     63469.9     5      100.00     18.00
2873.9
                 587.3     747.6
           28    596.0     747.0    102130.4     5      100.00     18.00
2805.5
                 604.7     746.5
           29    608.8     746.4     44594.6     5      100.00     18.00
2757.1
                 612.8     746.2
           30    613.5     746.2      8075.7     5      100.00     18.00
2730.4
                 614.3     746.2
           31    616.2     746.2     19943.7     5      100.00     18.00
2706.8
                 618.0     746.2
```

```
              32    621.3     746.2     35613.9     5      100.00      18.00
 2651.3
                    624.6     746.3
              33    633.3     746.7     89390.8     5      100.00      18.00
 2498.3
                    642.0     747.1
              34    643.9     747.2     18255.9     5      100.00      18.00
 2352.7
                    645.8     747.4
              35    652.5     748.1     60337.5     5      100.00      18.00
 2215.2
                    659.2     748.8
              36    667.3     750.0     63837.9     5      100.00      18.00
 1951.9
                    675.5     751.2
              37    681.1     752.3     37099.9     5      100.00      18.00
 1630.9
                    686.7     753.4
              38    688.2     753.7      9047.7     5      100.00      18.00
 1418.4
                    689.7     754.0
              39    693.8     755.0     23313.5     5      100.00      18.00
 1280.4
                    697.8     755.9
              40    704.3     757.6     33385.4     5      100.00      18.00
 1029.4
                    710.7     759.4
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             Fly Ash Option + EOC WT at 842 feet
             KIF Wet +842 Pond Search Circles

             TABLE NO. 26
             ***********************************************************
             *  Coordinate, Weight, Strength and Pore Water Pressure    *
             *  Information for Individual Slices for Conventional      *
             *  Computations or First Stage of Multi-Stage Computations. *
             *  (Information is for the Critical Shear Surface in the   *
             *  Case of an Automatic Search.)                           *
             ***********************************************************

             Slice                      Slice   Matl.            Friction     Pore
              No.      X          Y     Weight  Type   Cohesion    Angle
  Pressure

                     710.7     759.4
              41     711.8     759.7     4997.9    5     100.00     18.00
  841.6
                     712.8     760.0
              42     713.9     760.3     4554.8    4     100.00     32.10
  785.9
                     714.9     760.6
              43     721.6     762.8    23066.5    4     100.00     32.10
  567.9
                     728.3     765.0
              44     729.9     765.6     3814.7    1     110.00     36.60
  328.9
                     731.5     766.2
```

```
                45     733.3     766.8     3437.3    1     110.00     36.60
  224.5
                       735.1     767.5
                46     736.6     768.1     2281.2    1     110.00     36.60
  120.9
                       738.1     768.6
                47     739.4     769.1     1600.3    1     110.00     36.60
  36.6
                       740.6     769.6
                48     746.3     772.0     3214.5    1     110.00     36.60
  .0
                       751.9     774.3
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               Fly Ash Option + EOC WT at 842 feet
               KIF Wet +842 Pond Search Circles

               TABLE NO. 27
               **********************************************************
               *  Seismic Forces and Forces Due to Surface Pressures for  *
               *  Individual Slices for Conventional  Computations or the *
               *  First Stage of Multi-Stage Computations.                *
               *  (Information is for the Critical Shear Surface in the   *
               *  Case of an Automatic Search.)                           *
               **********************************************************

                                                     FORCES DUE TO SURFACE
   PRESSURES
                                          Y for
               Slice               Seismic Seismic   Normal   Shear
                No.        X        Force   Force    Force    Force       X          Y

                 1       391.4       0.     839.1      0.       0.       .0
   .0
                 2       394.2       0.     838.2      0.       0.       .0
   .0
                 3       396.0       0.     837.5      0.       0.       .0
   .0
                 4       403.5       0.     834.4      0.       0.       .0
   .0
                 5       410.8       0.     831.4      0.       0.       .0
   .0
                 6       418.3       0.     828.5      0.       0.       .0
   .0
                 7       428.7       0.     824.2      0.       0.       .0
   .0
                 8       432.9       0.     822.0      0.       0.       .0
   .0
                 9       440.7       0.     819.6      0.       0.       .0
   .0
                10       449.4       0.     816.9      0.       0.       .0
   .0
                11       458.4       0.     813.1      0.       0.       .0
   .0
                12       466.6       0.     809.4      0.       0.       .0
   .0
                13       475.1       0.     805.9      0.       0.       .0
   .0
```

```
          14    488.8      0.      800.5      0.      0.      .0
  .0
          15    500.6      0.      797.1      0.      0.      .0
  .0
          16    509.3      0.      795.5      0.      0.      .0
  .0
          17    512.0      0.      795.1      0.      0.      .0
  .0
          18    517.7      0.      793.2      0.      0.      .0
  .0
          19    526.2      0.      790.4      0.      0.      .0
  .0
          20    532.5      0.      788.5      0.      0.      .0
  .0
          21    544.4      0.      784.9      0.      0.      .0
  .0
          22    553.1      0.      782.4      0.      0.      .0
  .0
          23    554.7      0.      782.0      0.      0.      .0
  .0
          24    556.8      0.      781.6      0.      0.      .0
  .0
          25    560.3      0.      781.3      0.      0.      .0
  .0
          26    570.0      0.      779.4      0.      0.      .0
  .0
          27    582.2      0.      776.7      0.      0.      .0
  .0
          28    596.0      0.      773.9      0.      0.      .0
  .0
          29    608.8      0.      771.6      0.      0.      .0
  .0
          30    613.5      0.      770.9      0.      0.      .0
  .0
          31    616.2      0.      770.9      0.      0.      .0
  .0
          32    621.3      0.      770.9      0.      0.      .0
  .0
          33    633.3      0.      770.1      0.      0.      .0
  .0
          34    643.9      0.      769.2      0.      0.      .0
  .0
          35    652.5      0.      768.6      0.      0.      .0
  .0
          36    667.3      0.      767.9      0.      0.      .0
  .0
          37    681.1      0.      767.4      0.      0.      .0
  .0
          38    688.2      0.      767.5      0.      0.      .0
  .0
          39    693.8      0.      768.1      0.      0.      .0
  .0
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          Fly Ash Option + EOC WT at 842 feet
          KIF Wet +842 Pond Search Circles

          TABLE NO. 27
          ***************************************************************
```

```
           *  Seismic Forces and Forces Due to Surface Pressures for   *
           *  Individual Slices for Conventional  Computations or the  *
           *  First Stage of Multi-Stage Computations.                 *
           *  (Information is for the Critical Shear Surface in the    *
           *  Case of an Automatic Search.)                            *
           ************************************************************
                                                   FORCES DUE TO SURFACE
PRESSURES
                                  Y for
           Slice           Seismic   Seismic   Normal   Shear
            No.      X      Force     Force     Force    Force       X         Y

            40     704.3      0.      769.4      0.       0.        .0
.0
            41     711.8      0.      770.3      0.       0.        .0
.0
            42     713.9      0.      770.3      0.       0.        .0
.0
            43     721.6      0.      770.6      0.       0.        .0
.0
            44     729.9      0.      770.9      0.       0.        .0
.0
            45     733.3      0.      771.1      0.       0.        .0
.0
            46     736.6      0.      771.5      0.       0.        .0
.0
            47     739.4      0.      771.9      0.       0.        .0
.0
            48     746.3      0.      773.3      0.       0.        .0
.0
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           Fly Ash Option + EOC WT at 842 feet
           KIF Wet +842 Pond Search Circles

           TABLE NO. 29

************************************************************
           *  Information Generated During Iterative Solution for the Factor
*
           *  of Safety and Side Force Inclination by Spencer's Procedure
*

************************************************************

                  Trial      Trial
                  Factor   Side Force    Force      Moment                 Delta
           Iter-    of     Inclination  Imbalance  Imbalance    Delta-F    Theta
           ation  Safety    (degrees)    (lbs.)    (ft.-lbs.)
(degrees)

             1   3.00000   -15.0000   -.1768E+06   .1524E+09
           First-order corrections to F and THETA .........   -.311E+01 -
.132E+02
           Values factored by  .161E+00 - Deltas too large    -.500E+00 -
.212E+01

             2   2.50000   -17.1238   -.1430E+06   .1226E+09
```

```
             First-order corrections to F and THETA .........    .637E+01 -
.368E+03
             Values factored by  .233E-01 - Deltas too large     .149E+00 -
.859E+01

                3   2.64857   -25.7182  -.1386E+06   .1167E+09
             First-order corrections to F and THETA .........   -.281E+01
.309E+02
             Values factored by  .178E+00 - Deltas too large    -.500E+00
.550E+01

                4   2.14857   -20.2138  -.1066E+06   .8904E+08
             First-order corrections to F and THETA .........   -.155E+01
.270E+02
             Values factored by  .318E+00 - Deltas too large    -.493E+00
.859E+01

                5   1.65557   -11.6195  -.5944E+05   .4952E+08
             First-order corrections to F and THETA .........   -.431E+00
.593E+01
             Second-order correction - Iteration   1 ........   -.362E+00
.593E+01
             Second-order correction - Iteration   2 ........   -.360E+00
.593E+01
             Second-order correction - Iteration   3 ........   -.360E+00
.593E+01

                6   1.29529    -5.6935   .3013E+04  -.1627E+06
             First-order corrections to F and THETA .........    .400E-01 -
.326E+01
             Second-order correction - Iteration   1 ........    .417E-01 -
.326E+01
             Second-order correction - Iteration   2 ........    .417E-01 -
.326E+01

                7   1.33702    -8.9497   .7289E+01   .1926E+05
             First-order corrections to F and THETA .........    .374E-03 -.353E-
01
             Second-order correction - Iteration   1 ........    .374E-03 -.353E-
01

                8   1.33740    -8.9850  -.1611E-01  -.1158E+02
             First-order corrections to F and THETA .........   -.406E-06  .350E-
04

             Factor of Safety - - - - - - - -     1.337
             Side Force Inclination - - - - -     -8.99
             Number of Iterations - - - - - -     8
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             KIF Wet +842 Pond Search Circles

             TABLE NO. 38
             ***************************************************************
             *  Final Results for Stresses Along the Shear Surface         *
             *  (Results for Critical Shear Surface in Case of a Search.)  *
             ***************************************************************
```

```
                SPENCER'S PROCEDURE USED TO COMPUTE FACTOR OF SAFETY
                Factor of Safety =  1.337     Side Force Inclination =  -8.99
Degrees

                     -------- VALUES AT CENTER OF BASE OF SLICE---------

                                                  Total     Effective
                Slice                             Normal     Normal       Shear
                 No.    X-center   Y-center       Stress     Stress       Stress

                  1       391.4      835.3        611.6      191.5        188.6
                  2       394.2      832.7        903.9      336.1        268.9
                  3       396.0      831.0       1064.9      422.6        316.9
                  4       403.5      824.7       1672.0      750.8        373.3
                  5       410.8      818.5       2218.5     1094.2        509.8
                  6       418.3      812.9       2735.6     1442.1        648.1
                  7       428.7      805.3       3350.6     1755.0        772.5
                  8       432.9      802.4       3513.4     1806.1        792.8
                  9       440.7      797.5       3990.3     2114.9        915.6
                 10       449.4      792.1       4545.9     2486.0       1063.1
                 11       458.4      787.1       4827.5     2616.9       1115.2
                 12       466.6      782.6       5039.5     2696.5       1146.8
                 13       475.1      778.6       5207.4     2732.6       1161.2
                 14       488.8      772.4       5447.5     2776.6       1178.6
                 15       500.6      767.7       5794.6     2993.9       1265.1
                 16       509.3      764.5       6135.9     3257.0       1602.4
                 17       512.0      763.5       6252.6     3352.7       1647.4
                 18       517.7      761.7       6284.4     3359.0       1650.3
                 19       526.2      759.1       6411.3     3453.0        913.7
                 20       532.5      757.4       6402.1     3431.4        908.4
                 21       544.4      754.6       6340.9     3374.5        894.6
                 22       553.1      752.6       6285.0     3328.4        883.4
                 23       554.7      752.3       6269.8     3313.4        879.8
                 24       556.8      751.9       6278.2     3321.3        881.7
                 25       560.3      751.3       6365.5     3410.6        903.4
                 26       570.0      749.8       6343.3     3408.7        902.9
                 27       582.2      748.2       6166.9     3293.0        874.8
                 28       596.0      747.0       5888.6     3083.1        823.8
                 29       608.8      746.4       5583.8     2826.7        761.5
                 30       613.5      746.2       5479.7     2749.3        742.7
                 31       616.2      746.2       5500.3     2793.5        753.4
                 32       621.3      746.2       5535.0     2883.7        775.4
                 33       633.3      746.7       5330.5     2832.2        762.9
                 34       643.9      747.2       5044.8     2692.0        728.8
                 35       652.5      748.1       4763.3     2548.1        693.8
                 36       667.3      750.0       4208.2     2256.3        622.9
                 37       681.1      752.3       3618.9     1988.0        557.8
                 38       688.2      753.7       3331.3     1912.9        539.5
                 39       693.8      755.0       3209.9     1929.5        543.5
  1

                     -------- VALUES AT CENTER OF BASE OF SLICE---------

                                                  Total     Effective
                Slice                             Normal     Normal       Shear
                 No.    X-center   Y-center       Stress     Stress       Stress

                 40       704.3      757.6       2943.1     1913.8        539.7
                 41       711.8      759.7       2699.5     1857.9        526.1
                 42       713.9      760.3       2815.1     2029.2       1026.5
                 43       721.6      762.8       2262.1     1694.2        869.4
```

```
         44        729.9      765.6      1729.1     1400.1      859.7
         45        733.3      766.8      1437.4     1212.9      755.8
         46        736.6      768.1      1200.7     1079.8      681.8
         47        739.4      769.1      1049.9     1013.3      644.9
         48        746.3      772.0       541.1      541.1      382.8


        CHECK SUMS - (ALL SHOULD BE SMALL)
        SUM OF FORCES IN VERTICAL DIRECTION    =          .05  (=  .451E-01)
             SHOULD NOT EXCEED      .100E+03
        SUM OF FORCES IN HORIZONTAL DIRECTION  =          .12  (=  .117E+00)
             SHOULD NOT EXCEED      .100E+03
        SUM OF MOMENTS ABOUT COORDINATE ORIGIN =        -2.67  (= -.267E+01)
             SHOULD NOT EXCEED      .100E+03
        SHEAR STRENGTH/SHEAR FORCE CHECK-SUM   =          .02  (=  .184E-01)
             SHOULD NOT EXCEED      .100E+03
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        Kingston 8 Swan Road-Sect 4-4, End Of Construction
        Fly Ash Option + EOC WT at 842 feet
        KIF Wet +842 Pond Search Circles

        TABLE NO. 39
        *****************************************************************
        *  Final Results for Side Forces and Stresses Between Slices.   *
        *  (Results for Critical Shear Surface in Case of a Search.)    *
        *****************************************************************

        SPENCER'S PROCEDURE USED TO COMPUTE FACTOR OF SAFETY
        Factor of Safety =  1.337     Side Force Inclination =  -8.99
Degrees

               --------------- VALUES AT RIGHT SIDE OF SLICE --------------
--

                                        Y-Coord. of  Fraction   Sigma    Sigma
        Slice                   Side    Side Force      of        at       at
         No.      X-Right       Force    Location     Height     Top     Bottom

          1        393.4        1566.       834.9      .155    -163.4
468.4
          2        394.9        2379.       834.0      .162    -202.0
595.4
          3        397.1        3827.       832.6      .183    -245.0
786.7
          4        409.9       17212.       825.2      .239    -389.3
1765.2
          5        411.8       19625.       824.1      .241    -410.0
1888.5
          6        424.9       38247.       817.1      .253    -507.1
2602.9
          7        432.5       50135.       813.2      .271    -474.5
3028.8
          8        433.3       51397.       812.8      .273    -468.6
3069.2
          9        448.0       75251.       806.0      .271    -570.3
3640.8
         10        450.8       79740.       804.8      .271    -590.7
3738.0
```

11	466.1	103319.	798.6	.296	-430.0	4273.6
12	467.2	104924.	798.2	.298	-414.5	4304.5
13	482.9	125893.	792.6	.322	-153.4	4650.0
14	494.6	139091.	789.0	.339	83.3	4807.9
15	506.6	150264.	785.6	.332	-18.4	4908.7
16	512.0	153099.	784.3	.332	-15.8	4849.6
17	512.1	153145.	784.3	.332	-15.7	4848.4
18	523.3	156968.	782.0	.354	310.1	4670.2
19	529.0	162281.	780.4	.356	351.2	4825.5
20	535.9	167832.	778.5	.359	419.3	4982.8
21	552.9	177189.	774.6	.371	667.1	5231.1
22	553.4	177377.	774.5	.371	676.1	5235.8
23	556.0	178258.	774.0	.374	723.9	5257.4
24	557.6	178733.	773.7	.372	684.7	5282.2
25	562.9	179904.	772.7	.365	562.0	5350.7
26	577.1	180215.	770.4	.377	799.2	5370.3
27	587.3	178070.	769.1	.386	1004.5	5322.3
28	604.7	170435.	767.3	.406	1425.3	5140.2
29	612.8	165466.	766.6	.416	1652.3	5024.1
30	614.3	164449.	766.5	.414	1598.2	5032.7
31	618.0	161742.	766.2	.409	1470.0	5044.8
32	624.6	156194.	765.9	.400	1260.8	5031.8
33	642.0	138426.	765.4	.415	1516.2	4667.0
34	645.8	134113.	765.4	.419	1579.8	4573.6
35	659.2	117963.	765.5	.434	1828.6	4212.8
36	675.5	97267.	766.0	.456	2180.8	3754.4
37	686.7	83017.	766.4	.471	2453.2	3481.8
38	689.7	79195.	766.5	.463	2257.4	3540.2
39	697.8	68584.	766.9	.439	1709.1	3690.7
40	710.7	51219.	767.7	.384	713.6	3964.5 1

```
               --------------- VALUES AT RIGHT SIDE OF SLICE --------------
--

                                         Y-Coord. of   Fraction    Sigma      Sigma
                                  Side   Side Force       of         at         at
          Slice                                                               Bottom
           No.     X-Right        Force   Location      Height      Top

           41        712.8       48362.       767.8        .381       672.8
3995.4
           42        714.9       44454.       768.1        .388       747.7
3795.2
           43        728.3       22619.       770.1        .440      1234.8
2618.7
           44        731.5       17820.       770.8        .477      1573.3
2075.5
           45        735.1       13130.       771.5        .540      2171.7
1325.0
           46        738.1        9668.       772.2        .573      2222.0
872.1
           47        740.6        6954.       772.9        .638      2461.7
235.5
           48        751.9           0.       130.3       BELOW          .0
.0

          CHECK SUMS - (ALL SHOULD BE SMALL)
          SUM OF FORCES IN VERTICAL DIRECTION    =           .05   (=   .451E-01)
               SHOULD NOT EXCEED      .100E+03
          SUM OF FORCES IN HORIZONTAL DIRECTION  =           .12   (=   .117E+00)
               SHOULD NOT EXCEED      .100E+03
          SUM OF MOMENTS ABOUT COORDINATE ORIGIN =         -2.67   (= -.267E+01)
               SHOULD NOT EXCEED      .100E+03
          SHEAR STRENGTH/SHEAR FORCE CHECK-SUM   =           .02   (=   .184E-01)
               SHOULD NOT EXCEED      .100E+03
```

```
Plot
Ascii
HEAding follows - KFSREOCP.DAT
Kingston 1 Swan Road-Sect 4-4, Run 1 With UTEXAS3
Fly Ash Option EOC WT to 842 ft Pore Pressure Inter
KIF Wet +842 Pond Single Circle
PROfile line data follow -
     1 1 Dense FA + BA
      380.0  834.6
      388.9  842.0
      394.9  844.0
      424.9  844.0
      433.3  841.2
      450.8  841.3
      494.6  826.1
      512.1  826.1
      556.0  810.9
      562.9  810.9
      612.8  795.2
      624.6  795.3
      686.7  781.0
      710.7  781.0
      735.1  774.9
      755.9  774.2
      793.1  766.4

      2 1 Dense FA + BA
        535.9  765.4
        557.6  770.5
        659.2  770.5

      3 2 Fly Ash (FA) Loose
          0.0    842.0
          388.9  842.0

      4 2 Fly Ash (FA) Loose
          380.0  834.6
          529.0  795.0
          659.2  770.5

      5 4 Fly Ash (FA) Loose
          0.0  765.4
        535.9  765.4
        731.5  765.0

      6 5 Fly Ash (FA) Loose 13.3 degree
          0.0  759.8
        714.9  760.0
        808.2  759.8

      7 6 Fly Ash (FA) Stiff
          0.0  746.2
      780.2   746.2

      8 3 Medium FA+BA  Firm FA BA at Toe
            714.9  760.0
            731.5  765.0
            793.1  765.0
            793.11 763.4
            799.6  762.8
            808.2  759.8
```

```
9  7 Natural Clay (CL)
     786.2  746.2
     808.2  759.8
     812.1  759.7
     820.4  762.1
     820.5  764.5
     855.0  763.3
     882.7  753.4

10 7 Natural Clay (CL)
   780.2   746.2
   813.6   746.1

11 8 Residuum - Alluvium SC
     0.00   726.0
   766.8   730.3

12 9 Bedrock Limestone/Shale
   697.8  699.8
   766.8  730.3
   813.6  746.1
   882.7  732.4

13  10  Buttress Toe RipRap
   793.1  766.4
   796.4  766.4
   808.3  761.8
   811.8  761.7
   820.5  764.5


MATerial property data follow (for first stage) -
     1 Dense FA + BA
     120.4 = total unit weight
          Conventional shear strengths use to c=110
               110 36.6
          Interpolate Pore water pressure
     2 Loose Fly Ash
            108.4 = total unit weight
          Conventional shear strengths
              100.0 28.0
          Interpolate Pore water pressure
     3 Medium FA+BA
          114.4 = total unit weight
          Conventional shear strengths
              980.0 29.1
        Interpolate Pore water pressure
     4 Loose FA+BA
        108.4 = total unit weight
         Conventional shear strengths
           100.0  32.1
       Interpolate Pore water pressure
     5 FA Loose      3
         108.4 = total unit weight
           Conventional shear strengths
                100 18.00
       Interpolate Pore water pressure
     6 Stiff FA+BA
           114.4 = total unit weight
           Conventional shear strengths
```

```
             980.0 29.1
      Interpolate Pore water pressure
    7 Natural Clay CL
        126.4 = total unit weight
         Conventional shear strengths
            1400. 0.0
      Interpolate Pore water pressure
    8   Residuum SC-SM
           130.4 = total unit weight
         Conventional shear strengths
            2200 0.0
       Interpolate Pore water pressure
    9   Bedrock Limestone/Shale
         150 = total unit weight
         Conventional shear strengths
          735.0  29.9
       Interpolate Pore water pressure
   10   Buttress Riprap Ditch Drain
         85 = total unit weight
         Conventional shear strengths
         0.0  45.0
         Interpolate Pore water pressure

Interpolate Pore N
     P
836.2799  760.4052  70.46582  0
813.9963  758.3794  153.2014  0
785.6354  764.4567  70.56816  0
748.1584  768.5083  49.9059 0
717.7716  770.5341  185.4135  0
693.4622  774.5856  88.54996  0
667.1271  778.6372  167.081 0
622.5599  786.7403  57.34011  0
591.1602  791.8048  52.00703  0
573.9411  794.8435  69.14232  0
559.7606  795.8564  125.3335  0
542.5414  800.9208  114.4397  0
530.3867  804.9724  57.61554  0
518.232 804.9724  214.0676  0
518.232 805.9853  156.6427  0
503.0387  812.0626  0 0
478.7293  815.1013  118.7422  0
458.4715  823.2044  0 0
437.2007  829.2818  0 0
425.046 832.3204  36.83572  0
408.8398  836.372 26.28762  0
392.6335  840.4236  51.1587 0
879.8343  749.2634  489.9124  0
855.5249  755.3407  298.423 0
832.2284  754.3278  484.8212  0
808.9319  754.3278  466.3239  0
786.6483  755.3407  565.3228  0
770.442 756.3536  677.3083  0
759.3002  760.4052  507.1429  0
758.2873  760.4052  513.9564  0
757.2744  760.4052  520.6631  0
745.1197  760.4052  600.1295  0
730.9392  761.418 642.9821  0
716.7587  763.4438  637.5345  0
686.372 766.4825  696.6086  0
675.2302  769.5212  630.4334  0
```

```
665.1013  770.5341  676.6344  0
646.8692  772.5599  721.2567  0
637.7532  773.5727  743.0717  0
621.547 774.5856  833.8075  0
621.547 775.5985  768.0504  0
620.5341  775.5985  778.1467  0
620.5341  776.6114  712.3085  0
619.5212  777.6243  656.6227  0
618.5083  777.6243  666.8812  0
609.3923  778.6372  696.5837  0
600.2762  781.6759  598.4297  0
600.2762  782.6888  536.3635  0
573.9411  782.6888  810.9067  0
572.9282  782.6888  822.4694  0
571.9153  782.6888  834.0447  0
548.6188  786.7403  861.7065  0
507.0902  793.8306  1003.417  0
472.6519  798.895 1137.77 0
458.4715  798.895 1317.383  0
457.4586  798.895 1330.231  0
457.4586  799.9079  1271.906  0
456.4457  799.9079  1284.866  0
440.2394  804.9724  1203.896  0
413.9042  811.0497  1172.39 0
396.6851  820.1657  876.2333  0
380.4788  830.2947  515.2898  0
373.3886  835.3591  305.5815  0
356.1694  840.4236  78.86923  0
879.8343  743.186 952.9666  0
858.5635  744.1989  991.3737  0
817.035 745.2118  1173.482  0
783.6096  746.2247  1228.75 0
756.2615  746.2247  1426.982  0
755.2486  746.2247  1434.445  0
748.1584  747.2376  1422.552  0
751.1971  731.0313  2429.9  0
737.0166  727.9926  2723.254  0
722.8361  717.8637  3288.611  0
713.7201  709.7606  3778.245  0
711.6943  701.6575  4266.668  0
787.6611  744.1989  1345.263  0
787.6611  731.0313  2192.474  0
780.5709  722.9282  2747.534  0
777.5322  718.8766  3022.55 0
835.267 758.3794  204.5927  0
832.2284  747.2376  983.8671  0
829.1897  734.07  1827.889  0
817.035 724.954 2458.335  0
702.5783  766.4825  554.3928  0
702.5783  753.3149  1402.652  0
700.5525  732.0442  2762.567  0
700.5525  731.0313  2825.16 0
695.488 713.8122  3788.422  0
689.4107  701.6575  4505.317  0
672.1915  763.4438  1046.248  0
674.2173  746.2247  2115.266  0
670.1657  719.8895  3760.692  0
664.0884  704.6961  4721.303  0
641.8048  774.5856  643.1194  0
640.7919  756.3536  1803.298  0
641.8048  734.07  3203.597  0
```

```
637.7532  714.825 4418.794  0
634.7145  705.709 5003.082  0
607.3665  779.6501  653.3218  0
611.418 754.3278  2223.992  0
612.4309  727.9926  3876.357  0
610.4052  708.7477  5073.875  0
574.954 787.7532  477.5372  0
574.954 769.5212  1643.31 0
579.0055  747.2376  3005.596  0
580.0184  721.9153  4576.41 0
581.0313  709.7606  5314.945  0
549.6317  795.8564  286.1396  0
551.6575  780.663 1202.623  0
550.6446  758.3794  2610.317  0
550.6446  733.0571  4203.938  0
550.6446  732.0442  4266.987  0
550.6446  731.0313  4329.98 0
551.6575  710.7735  5583.041  0
529.3738  802.9466  185.2444  0
523.2965  794.8435  730.8787  0
524.3094  769.5212  2237.514  0
526.3352  751.2891  3352.864  0
525.3223  727.9926  4838.958  0
526.3352  707.7348  6085.785  0
509.116 805.9853  270.0628  0
505.0645  798.895 729.1877  0
505.0645  797.8821  789.3038  0
505.0645  796.8692  849.264 0
504.0516  796.8692  862.3929  0
503.0387  782.6888  1720.293  0
501.0129  752.302 3600.299  0
501.0129  751.2891  3663.286  0
500 750.2762  3738.272  0
498.9871  732.0442  4896.335  0
502.0258  711.7864  6122.607  0
485.8195  815.1013  40.12944  0
480.7551  796.8692  1156.334  0
473.6648  774.5856  2564.646  0
473.6648  749.2634  4099.78 0
474.6777  729.0055  5343.83 0
470.6262  710.7735  6517.992  0
457.4586  799.9079  1271.906  0
446.3168  770.5341  3110.041  0
439.2265  741.1602  4951.377  0
438.2136  709.7606  6903.374  0
438.2136  803.9595  1283.874  0
427.0718  783.7017  2542.488  0
417.9558  761.418 3926.801  0
410.8656  733.0571  5704.633  0
410.8656  734.07  5642.214  0
409.8527  734.07  5650.645  0
408.8398  734.07  5659.025  0
408.8398  735.0829  5596.719  0
409.8527  708.7477  7216.123  0
411.8785  811.0497  1193.132  0
390.6077  789.779 2527.412  0
372.3757  765.4696  4046.927  0
363.2597  740.1473  5622.134  0
359.2081  710.7735  7458.921  0
365.2855  795.8564  2363.113  0
339.9632  778.6372  3468.055  0
```

324.7698	757.3665	4792.083	0
324.7698	756.3536	4852.798	0
323.7569	756.3536	4857.403	0
294.3831	709.7606	7844.679	0
332.8729	811.0497	1670.379	0
291.3444	789.779	2997.502	0
291.3444	788.7661	3056.751	0
290.3315	788.7661	3059.422	0
266.0221	765.4696	4509.873	0
266.0221	764.4567	4571.068	0
265.0092	764.4567	4573.664	0
263.9963	764.4567	4576.241	0
244.7514	744.1989	5860.121	0
236.6483	711.7864	7889.544	0
325.7827	827.256	799.918	0
324.7698	827.256	801.3283	0
253.8674	809.0239	1937.089	0
213.3517	788.7661	3199.192	0
212.3389	788.7661	3200.421	0
212.3389	789.779	3139.082	0
181.9521	766.4825	4596.596	0
169.7974	730.0184	6867.494	0
169.7974	713.8122	7877.126	0
169.7974	712.7993	7940.275	0
170.8103	712.7993	7938.965	0
205.2486	819.1529	1373.281	0
119.1529	787.7532	3338.487	0
40.1473	713.8122	7978.526	0
122.1915	838.3978	221.2754	0
121.1786	838.3978	221.3322	0
69.5212	840.4236	97.61607	0
68.5083	840.4236	97.62168	0
67.4954	840.4236	97.64102	0
66.4825	840.4236	97.64664	0
65.4696	840.4236	97.66536	0
63.4438	840.4236	97.68969	0
30.0184	836.372	350.0852	0
10.7735	836.372	350.7978	0
30.0184	790.7919	3186.106	0
868.9331	758.6144	-3.291644	0
857.2373	760.4611	-27.99202	0
845.2337	761.0767	-6.03861	0
827.6899	761.3845	21.58665	0
820.3031	761.0767	29.24937	0
815.3785	760.4611	19.36596	0
809.8384	759.23	41.41051	0
801.2205	759.8455	18.20426	0
795.6803	759.8455	33.47255	0
792.9103	759.8455	67.26907	0
792.2947	763.2312	18.88698	0
791.0636	764.4623	17.31369	0
785.5234	765.3857	25.1882	0
779.9833	766.0012	32.97428	0
774.1354	766.9246	16.5803	0
765.8252	767.2324	47.48777	0
763.9785	768.1557	0.1450519	0
759.6695	768.7713	-16.63284	0
754.745	768.7713	5.837851	0
748.8971	769.0791	10.79239	0
760.2851	768.7713	-19.54936	0
768.5953	768.1557	-24.32427	0

```
774.4432  767.2324  -4.051476 0
779.06  766.9246  -16.34705 0
784.9079  766.0012  -5.678225 0
791.0636  765.3857  -18.46092 0
758.1306  768.7713  -9.415973 0
750.7438  769.3869  -16.00161 0
746.7426  769.6947  -19.86872 0
740.2791  770.0024  -18.79263 0
744.5881  769.6947  -11.96289 0
736.5857  769.3869  33.76021  0
734.739 770.0024  13.83115  0
734.1234  771.2336  -8.895869 0
731.9689  771.8491  -18.27509 0
727.0444  772.7725  -26.38004 0
721.812 773.0803  -1.423456 0
717.1952  774.3114  -40.74034 0
712.5785  774.0036  10.30811  0
715.9641  772.7725  61.95784  0
712.5785  772.7725  86.22744  0
711.0395  774.6192  -17.40698 0
707.6539  775.5426  -53.4738  0
705.4994  775.2348  -21.24651 0
702.4216  775.2348  -3.177558 0
697.1892  775.8504  -14.52042 0
694.1114  776.4659  -41.52545 0
691.6491  776.4659  -33.85543 0
685.4934  777.6971  5.208572  0
685.1856  778.6204  -28.54295 0
681.4922  779.236 -22.13085 0
679.3377  780.1593  -49.40439 0
676.5677  780.1593  -19.7939  0
674.4132  781.0827  -50.15406 0
671.6431  781.3905  -39.86468 0
667.6419  782.3138  -54.49623 0
663.9485  782.9294  -55.86017 0
660.2551  783.2372  -40.23957 0
657.1772  783.2372  -12.61641 0
654.4072  783.8528  -24.80313 0
651.6371  784.4683  -37.50009 0
647.3281  785.0839  -37.7764  0
645.7892  786.0072  -80.2932  0
639.3257  786.0072  -27.59028 0
636.2479  786.6228  -40.35439 0
633.17  786.9306  -35.30598 0
627.9377  787.2384  -15.11259 0
625.1676  788.1617  -52.83183 0
621.4742  788.1617  -25.99453 0
619.9353  789.0851  -75.79229 0
616.8574  789.3929  -74.85192 0
610.7017  790.9318  -31.08157 0
607.6239  791.5474  -41.24359 0
604.8538  791.8552  -38.06687 0
599.0059  792.7785  -48.57328 0
595.6203  792.4707  -8.320853 0
592.5425  793.3941  -43.89228 0
589.4646  793.7019  -47.03307 0
586.6945  793.7019  -24.1385  0
583.9245  795.2408  -67.82818 0
580.5389  795.5486  -44.7131  0
574.6909  796.4719  -32.40432 0
572.2287  797.7031  -77.4434  0
```

```
569.7664  797.7031  -53.31699 0
559.3017  798.9342  -37.711 0
556.5316  799.8576  -49.60288 0
551.9149  801.0887  -39.99272 0
546.6825  802.6276  -42.21485 0
542.3736  803.8588  -46.27491 0
537.7568  805.7055  -83.13365 0
532.5244  806.6288  -63.48763 0
528.831 807.5522  -66.53961 0
526.3688  807.86  -52.06244 0
514.9807  810.63  -66.23511 0
508.825 812.1689  -79.0789  0
503.2849  813.0923  -64.6152  0
464.504 822.018 -52.00434 0
470.0442  820.7869  -81.99485 0
478.0466  819.248 -96.70565 0
471.5831  827.5582  -424.715  0
484.8178  822.6336  -354.3003 0
459.8873  831.8672  -461.8349 0


ANAlysis/computation data follow -
     Circle Search
     450 1000 10.0 703.0
     Tangent line elevation follows -
          715.
    ITERATION
     1000
   PROCEDURE
    Spencer
    Crack
    5

COMpute
HEADING
Kingston 2 Swan Road-Sect 4-4  End Of Construction
Fly Ash Option + EOC
KIF Wet +842 Pond
ANAlysis/computation data follow -
     Circle  Search
     500.0 1557.8 10 737.0
   Tangent line elevation follows -
          737.
   ITERATION
     1000
   PROCEDURE
    Spencer

COMpute
HEADING
Kingston 3 Swan Road-Sect 4-4  End Of Construction
Fly Ash Option + EOC WT at 842 feet
KIF Wet +842 Pond Tan at 733.5
ANAlysis/computation data follow -
     Circle Search
     645 1300 10.0 733.5
     Tangent line elevation follows -
          733.5
   ITERATION
     1000
   PROCEDURE
```

```
    Spencer
    crack
    5

COMpute
HEADING
Kingston 4 Swan Road-Sect 4-4  End Of Construction
Fly Ash Option + EOC WT at 842 feet
KIF Wet +842 Pond
ANAlysis/computation data follow -
     Circle Search
     613.5 1123.6 10.0 730.
     Tangent line elevation follows -
          730.
  ITERATION
     1000
   PROCEDURE
    Spencer
    crack
    5

COMpute
HEADING
Kingston 5 Swan Road-Sect 4-4  End Of Construction
Fly Ash Option + EOC WT at 842 feet
KIF Wet +842 Pond
ANAlysis/computation data follow -
     Circle Search
     800 1000 5.0 718.
     Tangent line elevation follows -
          718.
 ITERATION
     1000
   PROCEDURE
    Spencer
     Crack
     5

COMpute
HEADING
Kingston 6 Swan Road-Sect 4-4  End Of Construction
Fly Ash Option + EOC WT at 842 feet
KIF Wet +842 Pond Single Circle
ANAlysis/computation data follow -
     Circle
  489.0 1450.  740.0
  ITERATION
     1000
   PROCEDURE
    Spencer
    crack
    5

COMpute
HEADING
Kingston 7 Swan Road-Sect 4-4  End Of Construction
Fly Ash Option + EOC WT at 842 feet
KIF Wet +842 Pond Search Circles
ANAlysis/computation data follow -
   Circle Search
  489.0 1450. 5.0 740.0
```

```
   Tangent line elevation follows -
         740.
   ITERATION
    1000
  PROCEDURE
   Spencer
   crack
   5

COMpute
HEADING
Kingston 8 Swan Road-Sect 4-4  End Of Construction
Fly Ash Option + EOC WT at 842 feet
KIF Wet +842 Pond Search Circles
ANAlysis/computation data follow -
   Circle Search
  748.0 1084. 5.0 746.2
  Tangent line elevation follows -
          746.2
    ITERATION
     1000
   PROCEDURE
    Spencer
    crack
    5

COMpute
HEADING
Kingston 9 Swan Road-Sect 4-4  End Of Construction
Fly Ash Option + EOC Tangent at 735
KIF Wet +842 Pond
ANAlysis/computation data follow -
     Circle  Search
     500.0 1557.8 10 735.0
   Tangent line elevation follows -
          735.
   ITERATION
     1000
   PROCEDURE
    Spencer

COMpute
end
```

```
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          TABLE NO. 1
          ******************************************
          * COMPUTER PROGRAM DESIGNATION - UTEXAS3 *
          * Originally Coded By Stephen G. Wright  *
          * Version No. 1.209                      *
          * Last Revision Date  2/28/98            *
          * (C) Copyright 1985-1998 S. G. Wright   *
          * All Rights Reserved                    *
          ******************************************

          ************************************************************
          *                                                          *
          *     RESULTS OF COMPUTATIONS PERFORMED USING THIS COMPUTER *
          * PROGRAM SHOULD NOT BE USED FOR DESIGN PURPOSES UNLESS THEY *
          * HAVE BEEN VERIFIED BY INDEPENDENT ANALYSES, EXPERIMENTAL  *
          * DATA OR FIELD EXPERIENCE. THE USER SHOULD UNDERSTAND THE  *
          * ALGORITHMS AND ANALYTICAL PROCEDURES USED IN THE COMPUTER *
          * PROGRAM AND MUST HAVE READ ALL DOCUMENTATION FOR THIS     *
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          Kingston 1 Swan Road-Sect 4-4, Run 1 With UTEXAS3
          Fly Ash Option EOC WT to 842 ft Pore Pressure Inter
          KIF Wet +842 Pond Single Circle

          TABLE NO.  2
          *************************
          * NEW PROFILE LINE DATA *
          *************************

          PROFILE LINE  1 - MATERIAL TYPE =  1
          Dense FA + BA

               Point      X            Y

                 1      380.000      834.600
                 2      388.900      842.000
                 3      394.900      844.000
                 4      424.900      844.000
                 5      433.300      841.200
                 6      450.800      841.300
                 7      494.600      826.100
                 8      512.100      826.100
                 9      556.000      810.900
                10      562.900      810.900
                11      612.800      795.200
                12      624.600      795.300
                13      686.700      781.000
```

```
      14         710.700         781.000
      15         735.100         774.900
      16         755.900         774.200
      17         793.100         766.400

PROFILE LINE   2 - MATERIAL TYPE =   1
Dense FA + BA

     Point        X               Y

       1       535.900         765.400
       2       557.600         770.500
       3       659.200         770.500

PROFILE LINE   3 - MATERIAL TYPE =   2
Fly Ash  (FA)  Loose

     Point        X               Y

       1          .000         842.000
       2       388.900         842.000

PROFILE LINE   4 - MATERIAL TYPE =   2
Fly Ash  (FA)  Loose

     Point        X               Y

       1       380.000         834.600
       2       529.000         795.000
       3       659.200         770.500

PROFILE LINE   5 - MATERIAL TYPE =   4
Fly Ash  (FA)  Loose

     Point        X               Y

       1          .000         765.400
       2       535.900         765.400
       3       731.500         765.000

PROFILE LINE   6 - MATERIAL TYPE =   5
Fly Ash  (FA)  Loose 13.3 degree

     Point        X               Y

       1          .000         759.800
       2       714.900         760.000
       3       808.200         759.800

PROFILE LINE   7 - MATERIAL TYPE =   6
Fly Ash  (FA)  Stiff

     Point        X               Y

       1          .000         746.200
       2       780.200         746.200

PROFILE LINE   8 - MATERIAL TYPE =   3
Medium FA+BA   Firm FA BA at Toe

     Point        X               Y
```

```
          1        714.900        760.000
          2        731.500        765.000
          3        793.100        765.000
          4        793.110        763.400
          5        799.600        762.800
          6        808.200        759.800

   PROFILE LINE  9 - MATERIAL TYPE =  7
   Natural Clay (CL)

        Point       X              Y

          1        786.200        746.200
          2        808.200        759.800
          3        812.100        759.700
          4        820.400        762.100
          5        820.500        764.500
          6        855.000        763.300
          7        882.700        753.400

   PROFILE LINE 10 - MATERIAL TYPE =  7
   Natural Clay (CL)

        Point       X              Y

          1        780.200        746.200
          2        813.600        746.100

   PROFILE LINE 11 - MATERIAL TYPE =  8
   Residuum - Alluvium SC

        Point       X              Y

          1           .000        726.000
          2        766.800        730.300

   PROFILE LINE 12 - MATERIAL TYPE =  9
   Bedrock Limestone/Shale

        Point       X              Y

          1        697.800        699.800
          2        766.800        730.300
          3        813.600        746.100
          4        882.700        732.400

   PROFILE LINE 13 - MATERIAL TYPE = 10
   Buttress Toe RipRap

        Point       X              Y

          1        793.100        766.400
          2        796.400        766.400
          3        808.300        761.800
          4        811.800        761.700
          5        820.500        764.500

   All new profile lines defined - No old lines retained
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```

```
          Date:  5: 3:2005   Time: 22:28:10   Input file: kfsrecp4.dat
          Kingston 1 Swan Road-Sect 4-4, Run 1 With UTEXAS3
          Fly Ash Option EOC WT to 842 ft Pore Pressure Inter
          KIF Wet +842 Pond Single Circle

          TABLE NO.  3

**********************************************************************
          * NEW MATERIAL PROPERTY DATA - CONVENTIONAL/FIRST-STAGE
COMPUTATIONS *

**********************************************************************

          DATA FOR MATERIAL TYPE  1
          Dense FA + BA

               Unit weight of material =  120.400

               CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
               Cohesion - - - - - - - - -     110.000
               Friction angle - - - - -  36.600 degrees

               Pore water pressures defined by interpolation of pressures
               Negative pore pressures set to zero

          DATA FOR MATERIAL TYPE  2
          Loose Fly Ash

               Unit weight of material =  108.400

               CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
               Cohesion - - - - - - - - -     100.000
               Friction angle - - - - -  28.000 degrees

               Pore water pressures defined by interpolation of pressures
               Negative pore pressures set to zero

          DATA FOR MATERIAL TYPE  3
          Medium FA+BA

               Unit weight of material =  114.400

               CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
               Cohesion - - - - - - - - -     980.000
               Friction angle - - - - -  29.100 degrees

               Pore water pressures defined by interpolation of pressures
               Negative pore pressures set to zero

          DATA FOR MATERIAL TYPE  4
          Loose FA+BA

               Unit weight of material =  108.400

               CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
               Cohesion - - - - - - - - -     100.000
               Friction angle - - - - -  32.100 degrees

               Pore water pressures defined by interpolation of pressures
               Negative pore pressures set to zero
```

```
DATA FOR MATERIAL TYPE  5
FA Loose     3

     Unit weight of material =  108.400

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -      100.000
     Friction angle - - - - -  18.000 degrees

     Pore water pressures defined by interpolation of pressures
     Negative pore pressures set to zero

DATA FOR MATERIAL TYPE  6
Stiff FA+BA

     Unit weight of material =  114.400

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -      980.000
     Friction angle - - - - -  29.100 degrees

     Pore water pressures defined by interpolation of pressures
     Negative pore pressures set to zero

DATA FOR MATERIAL TYPE  7
Natural Clay CL

     Unit weight of material =  126.400

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -     1400.000
     Friction angle - - - - -     .000 degrees

     Pore water pressures defined by interpolation of pressures
     Negative pore pressures set to zero

DATA FOR MATERIAL TYPE  8
Residuum SC-SM

     Unit weight of material =  130.400

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -     2200.000
     Friction angle - - - - -     .000 degrees

     Pore water pressures defined by interpolation of pressures
     Negative pore pressures set to zero

DATA FOR MATERIAL TYPE  9
Bedrock Limestone/Shale

     Unit weight of material =  150.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -      735.000
     Friction angle - - - - -  29.900 degrees

     Pore water pressures defined by interpolation of pressures
     Negative pore pressures set to zero

DATA FOR MATERIAL TYPE 10
```

```
         Buttress Riprap Ditch Drain

              Unit weight of material =   85.000

              CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
              Cohesion - - - - - - - -          .000
              Friction angle - - - - -  45.000 degrees

              Pore water pressures defined by interpolation of pressures
              Negative pore pressures set to zero

         All new material properties defined - No old data retained
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         Kingston 1 Swan Road-Sect 4-4, Run 1 With UTEXAS3
         Fly Ash Option EOC WT to 842 ft Pore Pressure Inter
         KIF Wet +842 Pond Single Circle

         TABLE NO.  7
         *****************************************
         * NEW PORE PRESSURE INTERPOLATION DATA  *
         * CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
         *****************************************

         All new data input - No old data retained

         Point
Material
           No.       X           Y       Pore Water Pressure or R-sub-u    Type

            1     836.28      760.41        70.47 pore water pressure       0
            2     814.00      758.38       153.20 pore water pressure       0
            3     785.64      764.46        70.57 pore water pressure       0
            4     748.16      768.51        49.91 pore water pressure       0
            5     717.77      770.53       185.41 pore water pressure       0
            6     693.46      774.59        88.55 pore water pressure       0
            7     667.13      778.64       167.08 pore water pressure       0
            8     622.56      786.74        57.34 pore water pressure       0
            9     591.16      791.80        52.01 pore water pressure       0
           10     573.94      794.84        69.14 pore water pressure       0
           11     559.76      795.86       125.33 pore water pressure       0
           12     542.54      800.92       114.44 pore water pressure       0
           13     530.39      804.97        57.62 pore water pressure       0
           14     518.23      804.97       214.07 pore water pressure       0
           15     518.23      805.99       156.64 pore water pressure       0
           16     503.04      812.06          .00 pore water pressure       0
           17     478.73      815.10       118.74 pore water pressure       0
           18     458.47      823.20          .00 pore water pressure       0
           19     437.20      829.28          .00 pore water pressure       0
           20     425.05      832.32        36.84 pore water pressure       0
           21     408.84      836.37        26.29 pore water pressure       0
           22     392.63      840.42        51.16 pore water pressure       0
           23     879.83      749.26       489.91 pore water pressure       0
           24     855.52      755.34       298.42 pore water pressure       0
           25     832.23      754.33       484.82 pore water pressure       0
           26     808.93      754.33       466.32 pore water pressure       0
           27     786.65      755.34       565.32 pore water pressure       0
           28     770.44      756.35       677.31 pore water pressure       0
           29     759.30      760.41       507.14 pore water pressure       0
           30     758.29      760.41       513.96 pore water pressure       0
```

31	757.27	760.41	520.66	pore water pressure	0
32	745.12	760.41	600.13	pore water pressure	0
33	730.94	761.42	642.98	pore water pressure	0
34	716.76	763.44	637.53	pore water pressure	0
35	686.37	766.48	696.61	pore water pressure	0
36	675.23	769.52	630.43	pore water pressure	0
37	665.10	770.53	676.63	pore water pressure	0
38	646.87	772.56	721.26	pore water pressure	0
39	637.75	773.57	743.07	pore water pressure	0
40	621.55	774.59	833.81	pore water pressure	0
41	621.55	775.60	768.05	pore water pressure	0
42	620.53	775.60	778.15	pore water pressure	0
43	620.53	776.61	712.31	pore water pressure	0
44	619.52	777.62	656.62	pore water pressure	0
45	618.51	777.62	666.88	pore water pressure	0
46	609.39	778.64	696.58	pore water pressure	0
47	600.28	781.68	598.43	pore water pressure	0
48	600.28	782.69	536.36	pore water pressure	0
49	573.94	782.69	810.91	pore water pressure	0
50	572.93	782.69	822.47	pore water pressure	0
51	571.92	782.69	834.04	pore water pressure	0
52	548.62	786.74	861.71	pore water pressure	0
53	507.09	793.83	1003.42	pore water pressure	0
54	472.65	798.90	1137.77	pore water pressure	0
55	458.47	798.90	1317.38	pore water pressure	0
56	457.46	798.90	1330.23	pore water pressure	0
57	457.46	799.91	1271.91	pore water pressure	0
58	456.45	799.91	1284.87	pore water pressure	0
59	440.24	804.97	1203.90	pore water pressure	0
60	413.90	811.05	1172.39	pore water pressure	0
61	396.69	820.17	876.23	pore water pressure	0
62	380.48	830.29	515.29	pore water pressure	0
63	373.39	835.36	305.58	pore water pressure	0
64	356.17	840.42	78.87	pore water pressure	0
65	879.83	743.19	952.97	pore water pressure	0
66	858.56	744.20	991.37	pore water pressure	0
67	817.03	745.21	1173.48	pore water pressure	0
68	783.61	746.22	1228.75	pore water pressure	0
69	756.26	746.22	1426.98	pore water pressure	0
70	755.25	746.22	1434.44	pore water pressure	0
71	748.16	747.24	1422.55	pore water pressure	0
72	751.20	731.03	2429.90	pore water pressure	0
73	737.02	727.99	2723.25	pore water pressure	0
74	722.84	717.86	3288.61	pore water pressure	0
75	713.72	709.76	3778.25	pore water pressure	0
76	711.69	701.66	4266.67	pore water pressure	0
77	787.66	744.20	1345.26	pore water pressure	0
78	787.66	731.03	2192.47	pore water pressure	0
79	780.57	722.93	2747.53	pore water pressure	0
80	777.53	718.88	3022.55	pore water pressure	0
81	835.27	758.38	204.59	pore water pressure	0
82	832.23	747.24	983.87	pore water pressure	0
83	829.19	734.07	1827.89	pore water pressure	0
84	817.03	724.95	2458.33	pore water pressure	0
85	702.58	766.48	554.39	pore water pressure	0
86	702.58	753.31	1402.65	pore water pressure	0
87	700.55	732.04	2762.57	pore water pressure	0
88	700.55	731.03	2825.16	pore water pressure	0
89	695.49	713.81	3788.42	pore water pressure	0
90	689.41	701.66	4505.32	pore water pressure	0
91	672.19	763.44	1046.25	pore water pressure	0

92	674.22	746.22	2115.27	pore water pressure	0
93	670.17	719.89	3760.69	pore water pressure	0
94	664.09	704.70	4721.30	pore water pressure	0
95	641.80	774.59	643.12	pore water pressure	0
96	640.79	756.35	1803.30	pore water pressure	0
97	641.80	734.07	3203.60	pore water pressure	0
98	637.75	714.83	4418.79	pore water pressure	0
99	634.71	705.71	5003.08	pore water pressure	0
100	607.37	779.65	653.32	pore water pressure	0
101	611.42	754.33	2223.99	pore water pressure	0
102	612.43	727.99	3876.36	pore water pressure	0
103	610.41	708.75	5073.88	pore water pressure	0
104	574.95	787.75	477.54	pore water pressure	0
105	574.95	769.52	1643.31	pore water pressure	0
106	579.01	747.24	3005.60	pore water pressure	0
107	580.02	721.92	4576.41	pore water pressure	0
108	581.03	709.76	5314.94	pore water pressure	0
109	549.63	795.86	286.14	pore water pressure	0
110	551.66	780.66	1202.62	pore water pressure	0
111	550.64	758.38	2610.32	pore water pressure	0
112	550.64	733.06	4203.94	pore water pressure	0
113	550.64	732.04	4266.99	pore water pressure	0
114	550.64	731.03	4329.98	pore water pressure	0
115	551.66	710.77	5583.04	pore water pressure	0
116	529.37	802.95	185.24	pore water pressure	0
117	523.30	794.84	730.88	pore water pressure	0
118	524.31	769.52	2237.51	pore water pressure	0
119	526.34	751.29	3352.86	pore water pressure	0
120	525.32	727.99	4838.96	pore water pressure	0
121	526.34	707.73	6085.79	pore water pressure	0
122	509.12	805.99	270.06	pore water pressure	0
123	505.06	798.90	729.19	pore water pressure	0
124	505.06	797.88	789.30	pore water pressure	0
125	505.06	796.87	849.26	pore water pressure	0
126	504.05	796.87	862.39	pore water pressure	0
127	503.04	782.69	1720.29	pore water pressure	0
128	501.01	752.30	3600.30	pore water pressure	0
129	501.01	751.29	3663.29	pore water pressure	0
130	500.00	750.28	3738.27	pore water pressure	0
131	498.99	732.04	4896.33	pore water pressure	0
132	502.03	711.79	6122.61	pore water pressure	0
133	485.82	815.10	40.13	pore water pressure	0
134	480.76	796.87	1156.33	pore water pressure	0
135	473.66	774.59	2564.65	pore water pressure	0
136	473.66	749.26	4099.78	pore water pressure	0
137	474.68	729.01	5343.83	pore water pressure	0
138	470.63	710.77	6517.99	pore water pressure	0
139	457.46	799.91	1271.91	pore water pressure	0
140	446.32	770.53	3110.04	pore water pressure	0
141	439.23	741.16	4951.38	pore water pressure	0
142	438.21	709.76	6903.37	pore water pressure	0
143	438.21	803.96	1283.87	pore water pressure	0
144	427.07	783.70	2542.49	pore water pressure	0
145	417.96	761.42	3926.80	pore water pressure	0
146	410.87	733.06	5704.63	pore water pressure	0
147	410.87	734.07	5642.21	pore water pressure	0
148	409.85	734.07	5650.65	pore water pressure	0
149	408.84	734.07	5659.02	pore water pressure	0
150	408.84	735.08	5596.72	pore water pressure	0
151	409.85	708.75	7216.12	pore water pressure	0
152	411.88	811.05	1193.13	pore water pressure	0

153	390.61	789.78	2527.41	pore water pressure	0
154	372.38	765.47	4046.93	pore water pressure	0
155	363.26	740.15	5622.13	pore water pressure	0
156	359.21	710.77	7458.92	pore water pressure	0
157	365.29	795.86	2363.11	pore water pressure	0
158	339.96	778.64	3468.05	pore water pressure	0
159	324.77	757.37	4792.08	pore water pressure	0
160	324.77	756.35	4852.80	pore water pressure	0
161	323.76	756.35	4857.40	pore water pressure	0
162	294.38	709.76	7844.68	pore water pressure	0
163	332.87	811.05	1670.38	pore water pressure	0
164	291.34	789.78	2997.50	pore water pressure	0
165	291.34	788.77	3056.75	pore water pressure	0
166	290.33	788.77	3059.42	pore water pressure	0
167	266.02	765.47	4509.87	pore water pressure	0
168	266.02	764.46	4571.07	pore water pressure	0
169	265.01	764.46	4573.66	pore water pressure	0
170	264.00	764.46	4576.24	pore water pressure	0
171	244.75	744.20	5860.12	pore water pressure	0
172	236.65	711.79	7889.54	pore water pressure	0
173	325.78	827.26	799.92	pore water pressure	0
174	324.77	827.26	801.33	pore water pressure	0
175	253.87	809.02	1937.09	pore water pressure	0
176	213.35	788.77	3199.19	pore water pressure	0
177	212.34	788.77	3200.42	pore water pressure	0
178	212.34	789.78	3139.08	pore water pressure	0
179	181.95	766.48	4596.60	pore water pressure	0
180	169.80	730.02	6867.49	pore water pressure	0
181	169.80	713.81	7877.13	pore water pressure	0
182	169.80	712.80	7940.27	pore water pressure	0
183	170.81	712.80	7938.96	pore water pressure	0
184	205.25	819.15	1373.28	pore water pressure	0
185	119.15	787.75	3338.49	pore water pressure	0
186	40.15	713.81	7978.53	pore water pressure	0
187	122.19	838.40	221.28	pore water pressure	0
188	121.18	838.40	221.33	pore water pressure	0
189	69.52	840.42	97.62	pore water pressure	0
190	68.51	840.42	97.62	pore water pressure	0
191	67.50	840.42	97.64	pore water pressure	0
192	66.48	840.42	97.65	pore water pressure	0
193	65.47	840.42	97.67	pore water pressure	0
194	63.44	840.42	97.69	pore water pressure	0
195	30.02	836.37	350.09	pore water pressure	0
196	10.77	836.37	350.80	pore water pressure	0
197	30.02	790.79	3186.11	pore water pressure	0
198	868.93	758.61	-3.29	pore water pressure	0
199	857.24	760.46	-27.99	pore water pressure	0
200	845.23	761.08	-6.04	pore water pressure	0
201	827.69	761.38	21.59	pore water pressure	0
202	820.30	761.08	29.25	pore water pressure	0
203	815.38	760.46	19.37	pore water pressure	0
204	809.84	759.23	41.41	pore water pressure	0
205	801.22	759.85	18.20	pore water pressure	0
206	795.68	759.85	33.47	pore water pressure	0
207	792.91	759.85	67.27	pore water pressure	0
208	792.29	763.23	18.89	pore water pressure	0
209	791.06	764.46	17.31	pore water pressure	0
210	785.52	765.39	25.19	pore water pressure	0
211	779.98	766.00	32.97	pore water pressure	0
212	774.14	766.92	16.58	pore water pressure	0
213	765.83	767.23	47.49	pore water pressure	0

214	763.98	768.16	.15	pore water pressure	0
215	759.67	768.77	-16.63	pore water pressure	0
216	754.74	768.77	5.84	pore water pressure	0
217	748.90	769.08	10.79	pore water pressure	0
218	760.29	768.77	-19.55	pore water pressure	0
219	768.60	768.16	-24.32	pore water pressure	0
220	774.44	767.23	-4.05	pore water pressure	0
221	779.06	766.92	-16.35	pore water pressure	0
222	784.91	766.00	-5.68	pore water pressure	0
223	791.06	765.39	-18.46	pore water pressure	0
224	758.13	768.77	-9.42	pore water pressure	0
225	750.74	769.39	-16.00	pore water pressure	0
226	746.74	769.69	-19.87	pore water pressure	0
227	740.28	770.00	-18.79	pore water pressure	0
228	744.59	769.69	-11.96	pore water pressure	0
229	736.59	769.39	33.76	pore water pressure	0
230	734.74	770.00	13.83	pore water pressure	0
231	734.12	771.23	-8.90	pore water pressure	0
232	731.97	771.85	-18.28	pore water pressure	0
233	727.04	772.77	-26.38	pore water pressure	0
234	721.81	773.08	-1.42	pore water pressure	0
235	717.20	774.31	-40.74	pore water pressure	0
236	712.58	774.00	10.31	pore water pressure	0
237	715.96	772.77	61.96	pore water pressure	0
238	712.58	772.77	86.23	pore water pressure	0
239	711.04	774.62	-17.41	pore water pressure	0
240	707.65	775.54	-53.47	pore water pressure	0
241	705.50	775.23	-21.25	pore water pressure	0
242	702.42	775.23	-3.18	pore water pressure	0
243	697.19	775.85	-14.52	pore water pressure	0
244	694.11	776.47	-41.53	pore water pressure	0
245	691.65	776.47	-33.86	pore water pressure	0
246	685.49	777.70	5.21	pore water pressure	0
247	685.19	778.62	-28.54	pore water pressure	0
248	681.49	779.24	-22.13	pore water pressure	0
249	679.34	780.16	-49.40	pore water pressure	0
250	676.57	780.16	-19.79	pore water pressure	0
251	674.41	781.08	-50.15	pore water pressure	0
252	671.64	781.39	-39.86	pore water pressure	0
253	667.64	782.31	-54.50	pore water pressure	0
254	663.95	782.93	-55.86	pore water pressure	0
255	660.26	783.24	-40.24	pore water pressure	0
256	657.18	783.24	-12.62	pore water pressure	0
257	654.41	783.85	-24.80	pore water pressure	0
258	651.64	784.47	-37.50	pore water pressure	0
259	647.33	785.08	-37.78	pore water pressure	0
260	645.79	786.01	-80.29	pore water pressure	0
261	639.33	786.01	-27.59	pore water pressure	0
262	636.25	786.62	-40.35	pore water pressure	0
263	633.17	786.93	-35.31	pore water pressure	0
264	627.94	787.24	-15.11	pore water pressure	0
265	625.17	788.16	-52.83	pore water pressure	0
266	621.47	788.16	-25.99	pore water pressure	0
267	619.94	789.09	-75.79	pore water pressure	0
268	616.86	789.39	-74.85	pore water pressure	0
269	610.70	790.93	-31.08	pore water pressure	0
270	607.62	791.55	-41.24	pore water pressure	0
271	604.85	791.86	-38.07	pore water pressure	0
272	599.01	792.78	-48.57	pore water pressure	0
273	595.62	792.47	-8.32	pore water pressure	0
274	592.54	793.39	-43.89	pore water pressure	0

```
         275      589.46      793.70        -47.03 pore water pressure        0
         276      586.69      793.70        -24.14 pore water pressure        0
         277      583.92      795.24        -67.83 pore water pressure        0
         278      580.54      795.55        -44.71 pore water pressure        0
         279      574.69      796.47        -32.40 pore water pressure        0
         280      572.23      797.70        -77.44 pore water pressure        0
         281      569.77      797.70        -53.32 pore water pressure        0
         282      559.30      798.93        -37.71 pore water pressure        0
         283      556.53      799.86        -49.60 pore water pressure        0
         284      551.91      801.09        -39.99 pore water pressure        0
         285      546.68      802.63        -42.21 pore water pressure        0
         286      542.37      803.86        -46.27 pore water pressure        0
         287      537.76      805.71        -83.13 pore water pressure        0
         288      532.52      806.63        -63.49 pore water pressure        0
         289      528.83      807.55        -66.54 pore water pressure        0
         290      526.37      807.86        -52.06 pore water pressure        0
         291      514.98      810.63        -66.24 pore water pressure        0
         292      508.83      812.17        -79.08 pore water pressure        0
         293      503.28      813.09        -64.62 pore water pressure        0
         294      464.50      822.02        -52.00 pore water pressure        0
         295      470.04      820.79        -81.99 pore water pressure        0
         296      478.05      819.25        -96.71 pore water pressure        0
         297      471.58      827.56       -424.71 pore water pressure        0
         298      484.82      822.63       -354.30 pore water pressure        0
         299      459.89      831.87       -461.83 pore water pressure        0
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         Fly Ash Option + EOC WT at 842 feet
         KIF Wet +842 Pond Search Circles

         TABLE NO. 15
         *********************************
         * NEW ANALYSIS/COMPUTATION DATA *
         *********************************

         Circular Shear Surface(s)

         Automatic Search Performed

         Starting Center Coordinate for Search at -
                                                  X =     748.000
                                                  Y =    1084.000

         Required accuracy for critical center (= minimum
         spacing between grid points) =       5.000

         Critical shear surface not allowed to pass below Y =     746.200

         For the initial mode of search
         all circles are tangent to horizontal line at -
                                                  Y =     746.200

         Maximum number of iterations allowed for
         calculating the factor of safety = 1000

         Procedure used to compute the factor of safety: SPENCER

         Depth of crack =       5.000
```

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                  -------------------------------------------------------------------
--
                  THE FOLLOWING REPRESENT EITHER DEFAULT OR PREVIOUSLY DEFINED
VALUES:

                  Initial trial estimate for the factor of safety =   3.000

                  Initial trial estimate for side force inclination =  15.000 degrees
                  (Applicable to Spencer's procedure only)

                  Allowed force imbalance for convergence =     100.000

                  Allowed moment imbalance for convergence =     100.000

                  Initial trial values for factor of safety (and side force
inclination
                  for Spencer's procedure) will be kept constant during search

                  Maximum subtended angle to be used for subdivision of the
                  circle into slices =   3.00 degrees

                  Search will be continued to locate a more critical shear
                  surface (if one exists) after the initial mode is complete

                  Depth of water in crack =        .000

                  Unit weight of water in crack =    62.400

                  Seismic coefficient =  .000

                  Conventional (single-stage) computations to be performed
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                  TABLE NO. 18
                  INFORMATION FOR CURRENT MODE OF SEARCH - All Circles Are Tangent
                  to a Horizontal Line at   Y =   746.200
                  ----------------------------------------------------------------
                                                        1-Stage
                  Center Coordinates                    Factor  Side Force
                                                          of    Inclination
                       X          Y         Radius      Safety   (degrees)   Iterations


                      598.00     934.00     187.80    1.486      -8.70          8
                      748.00     934.00     187.80    2.518      -4.85          4
                      898.00     934.00     187.80 See Message on Next Line(s)
                  CIRCLE DOES NOT INTERSECT SLOPE
                      598.00    1084.00     337.80    1.465      -8.30          7
                      748.00    1084.00     337.80    2.496      -5.61          4
                      898.00    1084.00     337.80 See Message on Next Line(s)
                  CIRCLE DOES NOT INTERSECT SLOPE
                      598.00    1234.00     487.80 See Message on Next Line(s)
                  Last Trial Values =                 2.070       2.86          4
                  (Last Trial Values Shown Above Are Not Correct Final Values)
                  VALUE OF SIDE FORCE INCLINATION BECAME OUTSIDE RANGE OF
                  FROM  -80.00 TO   10.00 DEGREES
```

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    748.00    1234.00     487.80   2.181       -6.83          7
    898.00    1234.00     487.80 See Message on Next Line(s)
CIRCLE DOES NOT INTERSECT SLOPE

    448.00     934.00     187.80   3.336       -4.43          5
    448.00    1084.00     337.80   2.821       -4.89          4
    448.00    1234.00     487.80   2.757       -4.76          4

    573.00    1059.00     312.80   1.540       -7.82          7
    598.00    1059.00     312.80   1.453       -8.39          7
    623.00    1059.00     312.80 See Message on Next Line(s)
Last Trial Values =             501.000      -20.96       1001
(Last Trial Values Shown Above Are Not Correct Final Values)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN1000 ITERATIONS
    573.00    1084.00     337.80   1.556       -7.72          7
    623.00    1084.00     337.80   1.460       -8.53          8
    573.00    1109.00     362.80   1.578       -7.60          7
    598.00    1109.00     362.80   1.468       -8.33          6
    623.00    1109.00     362.80   1.472       -8.39          7

    573.00    1034.00     287.80   1.514       -8.04          8
    598.00    1034.00     287.80   1.444       -8.51          7
    623.00    1034.00     287.80   1.411       -8.94          7

    598.00    1009.00     262.80 See Message on Next Line(s)
Last Trial Values =             501.000      -19.27       1001
(Last Trial Values Shown Above Are Not Correct Final Values)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN1000 ITERATIONS
    623.00    1009.00     262.80   1.425       -8.88          7
    648.00    1009.00     262.80   1.541       -8.24          7
    648.00    1034.00     287.80   1.511       -8.39          7
    648.00    1059.00     312.80   1.490       -8.49          7

    608.00    1019.00     272.80 See Message on Next Line(s)
Last Trial Values =             502.473      -24.45       1001
(Last Trial Values Shown Above Are Not Correct Final Values)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN1000 ITERATIONS
    623.00    1019.00     272.80   1.417       -8.92          7
    638.00    1019.00     272.80   1.492       -8.45          7
    608.00    1034.00     287.80 See Message on Next Line(s)
Last Trial Values =             501.000      -21.05       1001
(Last Trial Values Shown Above Are Not Correct Final Values)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN1000 ITERATIONS
    638.00    1034.00     287.80   1.483       -8.48          7
    608.00    1049.00     302.80   1.422       -8.77          7
    623.00    1049.00     302.80   1.408       -8.93          7
    638.00    1049.00     302.80   1.473       -8.53          6

    608.00    1064.00     317.80   1.415       -8.83          8
    623.00    1064.00     317.80 See Message on Next Line(s)
Last Trial Values =             503.000      -28.74       1001
(Last Trial Values Shown Above Are Not Correct Final Values)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN1000 ITERATIONS
    638.00    1064.00     317.80   1.468       -8.56          7

    618.00    1044.00     297.80 See Message on Next Line(s)
```

```
          Last Trial Values =              501.000     -28.42      1001
          (Last Trial Values Shown Above Are Not Correct Final Values)
          FATAL ERROR IN CALCULATING FACTOR OF SAFETY
          SOLUTION DID NOT CONVERGE WITHIN1000 ITERATIONS
              623.00   1044.00     297.80   1.408       -8.94          7
              628.00   1044.00     297.80   1.462       -8.60          7
              618.00   1049.00     302.80 See Message on Next Line(s)
          Last Trial Values =              500.000     -30.04      1001
          (Last Trial Values Shown Above Are Not Correct Final Values)
          FATAL ERROR IN CALCULATING FACTOR OF SAFETY
          SOLUTION DID NOT CONVERGE WITHIN1000 ITERATIONS
              628.00   1049.00     302.80   1.461       -8.61          7
              618.00   1054.00     307.80 See Message on Next Line(s)
          Last Trial Values =              502.000     -20.23      1001
          (Last Trial Values Shown Above Are Not Correct Final Values)
          FATAL ERROR IN CALCULATING FACTOR OF SAFETY
          SOLUTION DID NOT CONVERGE WITHIN1000 ITERATIONS
              623.00   1054.00     307.80 See Message on Next Line(s)
          Last Trial Values =              503.000     -20.06      1001
          (Last Trial Values Shown Above Are Not Correct Final Values)
          FATAL ERROR IN CALCULATING FACTOR OF SAFETY
          SOLUTION DID NOT CONVERGE WITHIN1000 ITERATIONS
              628.00   1054.00     307.80   1.460       -8.61          7

              618.00   1039.00     292.80   1.411       -8.93          7
              623.00   1039.00     292.80   1.410       -8.94          7
              628.00   1039.00     292.80   1.460       -8.63          7

          At the end of the current mode of search the most critical
          circle which was found has the following values -
          X-center =    623.00     Y-center =   1044.00     Radius =
297.80
          Factor of Safety =   1.408     Side Force Inclination =  -8.94


          ***** CAUTION ***** FACTOR OF SAFETY COULD NOT BE COMPUTED FOR SOME
                              OF GRID POINTS AROUND THE MINIMUM
          ***** RESULTS MAY BE ERRONEOUS *****
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          TABLE NO. 19
          INFORMATION FOR CURRENT MODE OF SEARCH - All Circles Have the
          Same Radius   -   Radius =   297.800
          ------------------------------------------------------------
                                                1-Stage
          Center Coordinates                    Factor  Side Force
                                                  of    Inclination
               X          Y          Radius     Safety   (degrees)   Iterations


              473.00     894.00      297.80 Bottom of circle exceeds allowable
                                            depth - CIRCLE REJECTED
              623.00     894.00      297.80 Bottom of circle exceeds allowable
                                            depth - CIRCLE REJECTED
              773.00     894.00      297.80 Bottom of circle exceeds allowable
                                            depth - CIRCLE REJECTED
```

```
        473.00   1044.00     297.80   2.405      -5.49         4
        773.00   1044.00     297.80   3.287      -5.03         4
        473.00   1194.00     297.80 See Message on Next Line(s)
    CIRCLE DOES NOT INTERSECT SLOPE
        623.00   1194.00     297.80 See Message on Next Line(s)
    CIRCLE DOES NOT INTERSECT SLOPE
        773.00   1194.00     297.80 See Message on Next Line(s)
    CIRCLE DOES NOT INTERSECT SLOPE

        598.00    1019.00     297.80 Bottom of circle exceeds allowable
                                     depth - CIRCLE REJECTED
        623.00    1019.00     297.80 Bottom of circle exceeds allowable
                                     depth - CIRCLE REJECTED
        648.00    1019.00     297.80 Bottom of circle exceeds allowable
                                     depth - CIRCLE REJECTED
        598.00    1044.00     297.80   1.448      -8.45          7
        648.00    1044.00     297.80   1.502      -8.42          7
        598.00    1069.00     297.80   1.880     -10.79          8
        623.00    1069.00     297.80   1.963     -10.92          8
        648.00    1069.00     297.80   2.251     -10.02          5

        608.00    1029.00     297.80 Bottom of circle exceeds allowable
                                     depth - CIRCLE REJECTED
        623.00    1029.00     297.80 Bottom of circle exceeds allowable
                                     depth - CIRCLE REJECTED
        638.00    1029.00     297.80 Bottom of circle exceeds allowable
                                     depth - CIRCLE REJECTED
        608.00    1044.00     297.80   1.421      -8.79          7
        638.00    1044.00     297.80   1.477      -8.52          7
        608.00    1059.00     297.80   1.983     -10.55          7
        623.00    1059.00     297.80   2.023     -10.62          6
        638.00    1059.00     297.80   2.087     -10.53          6

        618.00    1039.00     297.80 Bottom of circle exceeds allowable
                                     depth - CIRCLE REJECTED
        623.00    1039.00     297.80 Bottom of circle exceeds allowable
                                     depth - CIRCLE REJECTED
        628.00    1039.00     297.80 Bottom of circle exceeds allowable
                                     depth - CIRCLE REJECTED
        618.00    1044.00     297.80 See Message on Next Line(s)
    Last Trial Values =              501.000    -28.42      1001
    (Last Trial Values Shown Above Are Not Correct Final Values)
    FATAL ERROR IN CALCULATING FACTOR OF SAFETY
    SOLUTION DID NOT CONVERGE WITHIN1000 ITERATIONS
        628.00    1044.00     297.80   1.462      -8.60          7
        618.00    1049.00     297.80   1.502      -9.18          7
        623.00    1049.00     297.80   1.489      -9.35          8
        628.00    1049.00     297.80   1.501      -9.24          8

    At the end of the current mode of search the most critical
    circle which was found has the following values -
    X-center =    623.00     Y-center =    1044.00     Radius =
297.80
    Factor of Safety =    1.408     Side Force Inclination =  -8.94


    ***** CAUTION ***** FACTOR OF SAFETY COULD NOT BE COMPUTED FOR SOME
                        OF GRID POINTS AROUND THE MINIMUM
    ***** RESULTS MAY BE ERRONEOUS *****
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          TABLE NO. 21
          *****  1-STAGE FINAL CRITICAL CIRCLE INFORMATION  *****
          X Coordinate of Center - - - - - - - -   623.000
          Y Coordinate of Center - - - - - - - -  1044.000
          Radius - - - - - - - - - - - - - - - -   297.800
          Factor of Safety - - - - - - - - - - -     1.408
          Side Force Inclination - - - - - - - -     -8.94

          Number of circles tried  - - - - - -   82
          No. of circles F calc. for - - - - -   53


          ***** CAUTION ***** FACTOR OF SAFETY COULD NOT BE COMPUTED FOR SOME
                              OF GRID POINTS AROUND THE MINIMUM
          ***** RESULTS MAY BE ERRONEOUS *****
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          KIF Wet +842 Pond Search Circles

          TABLE NO. 26
          ****************************************************************
          *  Coordinate, Weight, Strength and Pore Water Pressure         *
          *  Information for Individual Slices for Conventional           *
          *  Computations or First Stage of Multi-Stage Computations.     *
          *  (Information is for the Critical Shear Surface in the        *
          *  Case of an Automatic Search.)                                *
          ****************************************************************

          Slice                      Slice    Matl.             Friction     Pore
           No.     X        Y        Weight   Type   Cohesion    Angle
Pressure

                 407.0    839.0
            1    412.5    833.5     13953.7    1      110.00     36.60
116.4
                 418.0    828.0
            2    420.7    825.5     11711.6    1      110.00     36.60
416.9
                 423.3    823.1
            3    424.1    822.4      4197.5    2      100.00     28.00
533.3
                 424.9    821.6
            4    429.1    818.0     24483.3    2      100.00     28.00
671.2
                 433.3    814.4
            5    439.4    809.6     45354.1    2      100.00     28.00
973.6
                 445.6    804.8
            6    448.2    802.9     23282.5    2      100.00     28.00
1231.4
                 450.8    801.0
            7    457.3    796.7     63352.6    2      100.00     28.00
1463.5
```

```
                    463.8      792.4
             8      470.4      788.4     70778.3      2       100.00       28.00
  1786.6
                    477.1      784.4
             9      484.0      780.7     77070.7      2       100.00       28.00
  2080.0
                    490.9      777.1
            10      492.8      776.2     21091.2      2       100.00       28.00
  2247.0
                    494.6      775.3
            11      501.7      772.1     87380.1      2       100.00       28.00
  2372.0
                    508.8      769.0
            12      510.5      768.3     21464.4      2       100.00       28.00
  2502.2
                    512.1      767.6
            13      515.0      766.5     38019.0      2       100.00       28.00
  2553.2
                    517.8      765.4
            14      523.4      763.4     74806.7      4       100.00       32.10
  2633.9
                    529.0      761.4
            15      531.3      760.7     30394.7      4       100.00       32.10
  2704.2
                    533.6      759.9
            16      534.7      759.6     15586.8      5       100.00       18.00
  2730.6
                    535.9      759.2
            17      543.4      757.1     99114.3      5       100.00       18.00
  2779.3
                    550.9      755.1
            18      553.5      754.4     33106.8      5       100.00       18.00
  2826.9
                    556.0      753.8
            19      556.8      753.7     10429.7      5       100.00       18.00
  2840.6
                    557.6      753.5
            20      560.3      752.9     35035.9      5       100.00       18.00
  2850.8
                    562.9      752.3
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             KIF Wet +842 Pond Search Circles

             TABLE NO. 26
             *************************************************************
             *  Coordinate, Weight, Strength and Pore Water Pressure      *
             *  Information for Individual Slices for Conventional        *
             *  Computations or First Stage of Multi-Stage Computations.  *
             *  (Information is for the Critical Shear Surface in the     *
             *  Case of an Automatic Search.)                             *
             *************************************************************

             Slice                          Slice   Matl.            Friction     Pore
              No.       X          Y        Weight  Type   Cohesion    Angle
   Pressure

                      562.9      752.3
```

```
                21    570.6    751.0    100588.2    5     100.00    18.00
2861.6
                      578.2    749.6
                22    586.0    748.6     96833.8    5     100.00    18.00
2847.6
                      593.7    747.6
                23    601.5    747.1     91333.7    5     100.00    18.00
2783.9
                      609.3    746.5
                24    611.0    746.4     19790.5    5     100.00    18.00
2729.9
                      612.8    746.4
                25    617.9    746.3     56851.7    5     100.00    18.00
2667.0
                      623.0    746.2
                26    623.8    746.2      8963.7    5     100.00    18.00
2614.0
                      624.6    746.2
                27    632.4    746.5     83836.8    5     100.00    18.00
2513.3
                      640.2    746.7
                28    648.0    747.3     75918.3    5     100.00    18.00
2303.5
                      655.7    748.0
                29    657.5    748.2     15843.4    5     100.00    18.00
2155.0
                      659.2    748.4
                30    666.9    749.6     63954.5    5     100.00    18.00
1978.0
                      674.6    750.7
                31    680.7    751.9     42430.8    5     100.00    18.00
1691.5
                      686.7    753.1
                32    692.3    754.4     34102.8    5     100.00    18.00
1424.2
                      697.8    755.7
                33    704.3    757.6     35222.5    5     100.00    18.00
1102.1
                      710.7    759.4
                34    711.7    759.7      4700.1    5     100.00    18.00
917.4
                      712.6    760.0
                35    713.8    760.4      5369.6    4     100.00    32.10
858.4
                      714.9    760.7
                36    721.0    762.9     22626.7    4     100.00    32.10
635.6
                      727.2    765.0
                37    729.3    765.8      5491.7    1     110.00    36.60
379.4
                      731.5    766.7
                38    733.3    767.4      3451.6    1     110.00    36.60
323.1
                      735.1    768.1
                39    742.2    771.2      5904.4    1     110.00    36.60
18.2
                      749.4    774.3
                40    749.5    774.4          .6    1     110.00    36.60
.0
                      749.5    774.4
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```

```
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                    Fly Ash Option + EOC WT at 842 feet
                    KIF Wet +842 Pond Search Circles

                    TABLE NO. 27
                    ************************************************************
                    *  Seismic Forces and Forces Due to Surface Pressures for  *
                    *  Individual Slices for Conventional  Computations or the *
                    *  First Stage of Multi-Stage Computations.                *
                    *  (Information is for the Critical Shear Surface in the   *
                    *  Case of an Automatic Search.)                           *
                    ************************************************************

                                                               FORCES DUE TO SURFACE
          PRESSURES
                                               Y for
                    Slice            Seismic   Seismic    Normal    Shear
                     No.       X      Force     Force     Force     Force       X          Y

                      1      412.5      0.      838.7       0.        0.        .0
          .0
                      2      420.7      0.      834.8       0.        0.        .0
          .0
                      3      424.1      0.      833.2       0.        0.        .0
          .0
                      4      429.1      0.      830.5       0.        0.        .0
          .0
                      5      439.4      0.      825.8       0.        0.        .0
          .0
                      6      448.2      0.      822.6       0.        0.        .0
          .0
                      7      457.3      0.      818.4       0.        0.        .0
          .0
                      8      470.4      0.      812.0       0.        0.        .0
          .0
                      9      484.0      0.      805.9       0.        0.        .0
          .0
                     10      492.8      0.      802.1       0.        0.        .0
          .0
                     11      501.7      0.      799.8       0.        0.        .0
          .0
                     12      510.5      0.      797.9       0.        0.        .0
          .0
                     13      515.0      0.      796.6       0.        0.        .0
          .0
                     14      523.4      0.      793.6       0.        0.        .0
          .0
                     15      531.3      0.      790.8       0.        0.        .0
          .0
                     16      534.7      0.      789.7       0.        0.        .0
          .0
                     17      543.4      0.      786.9       0.        0.        .0
          .0
                     18      553.5      0.      783.7       0.        0.        .0
          .0
                     19      556.8      0.      782.8       0.        0.        .0
          .0
                     20      560.3      0.      782.5       0.        0.        .0
          .0
```

```
               21    570.6       0.      780.3       0.       0.       .0
  .0
               22    586.0       0.      776.7       0.       0.       .0
  .0
               23    601.5       0.      773.5       0.       0.       .0
  .0
               24    611.0       0.      771.6       0.       0.       .0
  .0
               25    617.9       0.      771.3       0.       0.       .0
  .0
               26    623.8       0.      771.3       0.       0.       .0
  .0
               27    632.4       0.      770.5       0.       0.       .0
  .0
               28    648.0       0.      769.2       0.       0.       .0
  .0
               29    657.5       0.      768.5       0.       0.       .0
  .0
               30    666.9       0.      768.0       0.       0.       .0
  .0
               31    680.7       0.      767.5       0.       0.       .0
  .0
               32    692.3       0.      768.0       0.       0.       .0
  .0
               33    704.3       0.      769.6       0.       0.       .0
  .0
               34    711.7       0.      770.4       0.       0.       .0
  .0
               35    713.8       0.      770.5       0.       0.       .0
  .0
               36    721.0       0.      770.7       0.       0.       .0
  .0
               37    729.3       0.      771.1       0.       0.       .0
  .0
               38    733.3       0.      771.4       0.       0.       .0
  .0
               39    742.2       0.      772.9       0.       0.       .0
  .0
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               Fly Ash Option + EOC WT at 842 feet
               KIF Wet +842 Pond Search Circles

               TABLE NO. 27
               ***********************************************************
               *  Seismic Forces and Forces Due to Surface Pressures for  *
               *  Individual Slices for Conventional  Computations or the *
               *  First Stage of Multi-Stage Computations.                *
               *  (Information is for the Critical Shear Surface in the   *
               *  Case of an Automatic Search.)                           *
               ***********************************************************

                                                    FORCES DUE TO SURFACE
 PRESSURES
                                         Y for
               Slice           Seismic  Seismic   Normal   Shear
                 No.     X     Force    Force     Force    Force       X        Y
```

```
               40    749.5        0.        774.4        0.        0.        .0
.0
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               KIF Wet +842 Pond Search Circles

               TABLE NO. 29

*******************************************************************
               *  Information Generated During Iterative Solution for the Factor
*
               *  of Safety and Side Force Inclination by Spencer's Procedure
*

*******************************************************************

                       Trial      Trial
                      Factor   Side Force    Force       Moment                Delta
               Iter-    of     Inclination  Imbalance   Imbalance    Delta-F    Theta
               ation  Safety    (degrees)    (lbs.)    (ft.-lbs.)
(degrees)

                  1   3.00000   -15.0000  -.1624E+06   .1405E+09
               First-order corrections to F and THETA .........  -.272E+01 -
.126E+02
               Values factored by  .184E+00 - Deltas too large   -.500E+00 -
.232E+01

                  2   2.50000   -17.3216  -.1270E+06   .1091E+09
               First-order corrections to F and THETA .........  -.211E+02
.774E+03
               Values factored by  .111E-01 - Deltas too large   -.234E+00
.859E+01

                  3   2.26580    -8.7272  -.1239E+06   .1050E+09
               First-order corrections to F and THETA .........  -.139E+01
.466E+00
               Values factored by  .359E+00 - Deltas too large   -.500E+00
.167E+00

                  4   1.76580    -8.5599  -.6687E+05   .5675E+08
               First-order corrections to F and THETA .........  -.426E+00 -
.214E+01
               Second-order correction - Iteration  1 ........  -.354E+00 -
.214E+01
               Second-order correction - Iteration  2 ........  -.352E+00 -
.214E+01
               Second-order correction - Iteration  3 ........  -.352E+00 -
.214E+01

                  5   1.41378   -10.6995   .3137E+04  -.3862E+07
               First-order corrections to F and THETA .........  -.566E-02
.167E+01
               Second-order correction - Iteration  1 ........  -.509E-02
.167E+01
               Second-order correction - Iteration  2 ........  -.509E-02
.167E+01
```

```
             6   1.40869     -9.0309  -.7104E+01  -.5079E+05
            First-order corrections to F and THETA .........  -.980E-03  .873E-
    01
            Second-order correction - Iteration   1 ........  -.978E-03  .873E-
    01

             7   1.40771     -8.9436   .2923E-01  -.4449E+02
            First-order corrections to F and THETA .........  -.202E-06  .303E-
    04

            Factor of Safety - - - - - - - -     1.408
            Side Force Inclination - - - - -     -8.94
            Number of Iterations - - - - - -     7
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            TABLE NO. 38
            *************************************************************
            *  Final Results for Stresses Along the Shear Surface         *
            *  (Results for Critical Shear Surface in Case of a Search.)  *
            *************************************************************

            SPENCER'S PROCEDURE USED TO COMPUTE FACTOR OF SAFETY
            Factor of Safety =  1.408     Side Force Inclination =  -8.94
     Degrees

                    -------- VALUES AT CENTER OF BASE OF SLICE---------

                                           Total    Effective
            Slice                          Normal    Normal       Shear
             No.    X-center   Y-center    Stress    Stress       Stress

              1       412.5      833.5      781.3     664.9       428.9
              2       420.7      825.5     1503.2    1086.3       651.3
              3       424.1      822.4     1896.5    1363.2       585.9
              4       429.1      818.0     2173.7    1502.4       638.5
              5       439.4      809.6     2854.2    1880.6       781.4
              6       448.2      802.9     3521.9    2290.6       936.2
              7       457.3      796.7     3955.3    2491.7      1012.2
              8       470.4      788.4     4406.7    2620.1      1060.7
              9       484.0      780.7     4786.9    2706.9      1093.5
             10       492.8      776.2     4996.6    2749.6      1109.6
             11       501.7      772.1     5406.0    3034.0      1217.0
             12       510.5      768.3     5867.7    3365.5      1342.2
             13       515.0      766.5     5985.1    3431.9      1367.3
             14       523.4      763.4     6029.7    3395.8      1584.2
             15       531.3      760.7     6095.8    3391.6      1582.4
             16       534.7      759.6     6215.5    3484.9       875.4
             17       543.4      757.1     6221.7    3442.4       865.6
             18       553.5      754.4     6216.0    3389.2       853.3
             19       556.8      753.7     6234.6    3394.0       854.4
             20       560.3      752.9     6344.2    3493.4       877.4
             21       570.6      751.0     6356.3    3494.7       877.7
             22       586.0      748.6     6164.7    3317.1       836.7
             23       601.5      747.1     5873.1    3089.2       784.1
             24       611.0      746.4     5654.2    2924.3       746.0
             25       617.9      746.3     5665.4    2998.5       763.1
```

```
          26          623.8       746.2      5731.3      3117.4       790.6
          27          632.4       746.5      5553.5      3040.2       772.8
          28          648.0       747.3      5129.1      2825.6       723.2
          29          657.5       748.2      4828.8      2673.8       688.2
          30          666.9       749.6      4448.3      2470.3       641.2
          31          680.7       751.9      3832.2      2140.7       565.1
          32          692.3       754.4      3410.7      1986.5       529.5
          33          704.3       757.6      3104.1      2002.0       533.1
          34          711.7       759.7      2854.7      1937.3       518.2
          35          713.8       760.4      2968.6      2110.3      1011.4
          36          721.0       762.9      2416.0      1780.4       864.4
          37          729.3       765.8      1829.9      1450.5       843.4
          38          733.3       767.4      1409.4      1086.4       651.3
          39          742.2       771.2       735.3       717.1       456.4
1

              -------- VALUES AT CENTER OF BASE OF SLICE---------

                                        Total    Effective
        Slice                           Normal    Normal       Shear
         No.     X-center   Y-center    Stress    Stress       Stress

          40       749.5      774.4       89.2       89.2       125.2


        CHECK SUMS - (ALL SHOULD BE SMALL)
        SUM OF FORCES IN VERTICAL DIRECTION     =          .04   (=  .401E-01)
             SHOULD NOT EXCEED     .100E+03
        SUM OF FORCES IN HORIZONTAL DIRECTION  =          .10   (=  .102E+00)
             SHOULD NOT EXCEED     .100E+03
        SUM OF MOMENTS ABOUT COORDINATE ORIGIN =        24.45   (=  .244E+02)
             SHOULD NOT EXCEED     .100E+03
        SHEAR STRENGTH/SHEAR FORCE CHECK-SUM    =          .01   (=  .122E-01)
             SHOULD NOT EXCEED     .100E+03
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        KIF Wet +842 Pond Search Circles

        TABLE NO. 39
        ****************************************************************
        *  Final Results for Side Forces and Stresses Between Slices.  *
        *  (Results for Critical Shear Surface in Case of a Search.)   *
        ****************************************************************

        SPENCER'S PROCEDURE USED TO COMPUTE FACTOR OF SAFETY
        Factor of Safety =  1.408     Side Force Inclination =  -8.94
Degrees
              --------------- VALUES AT RIGHT SIDE OF SLICE --------------
--

                                   Y-Coord. of  Fraction   Sigma     Sigma
        Slice                Side  Side Force      of        at        at
         No.     X-Right    Force   Location    Height     Top      Bottom

          1       418.0     3932.     832.6       .290     -63.2
548.1
```

```
                 2      423.3     7884.      828.4    .256    -172.8
   918.0
                 3      424.9     9710.      827.1    .243    -232.9
   1091.1
                 4      433.3    20142.      821.4    .261    -323.6
   1810.5
                 5      445.6    38210.      814.4    .262    -444.0
   2515.3
                 6      450.8    46767.      811.5    .261    -500.6
   2795.4
                 7      463.8    68248.      805.1    .288    -415.6
   3449.0
                 8      477.1    89513.      799.3    .312    -231.8
   3932.2
                 9      490.9   109518.      793.9    .335      21.7
   4281.1
                10      494.6   114426.      792.6    .341      98.2
   4352.3
                11      508.8   131644.      787.8    .330     -39.4
   4590.5
                12      512.1   135120.      786.8    .328     -67.3
   4632.1
                13      517.8   140678.      785.1    .336      40.7
   4692.0
                14      529.0   146983.      782.5    .358     366.2
   4570.5
                15      533.6   148787.      781.5    .367     508.1
   4497.9
                16      535.9   151286.      780.8    .368     525.2
   4572.1
                17      550.9   164374.      776.6    .375     697.0
   4940.7
                18      556.0   167660.      775.4    .378     777.1
   5027.5
                19      557.6   168579.      775.0    .375     733.2
   5066.2
                20      562.9   171209.      773.9    .368     595.8
   5179.2
                21      578.2   175240.      771.0    .378     826.6
   5302.3
                22      593.7   174236.      768.6    .392    1131.0
   5296.0
                23      609.3   168591.      766.9    .409    1514.2
   5174.9
                24      612.8   166736.      766.5    .413    1612.9
   5134.0
                25      623.0   159858.      765.8    .399    1262.2
   5171.9
                26      624.6   158553.      765.7    .397    1212.8
   5167.6
                27      640.2   143598.      765.1    .409    1428.7
   4873.6
                28      655.7   125438.      765.1    .425    1694.7
   4480.7
                29      659.2   121031.      765.1    .429    1763.0
   4380.2
                30      674.6   100666.      765.6    .450    2098.5
   3914.9
                31      686.7    84506.      766.1    .467    2391.2
   3591.3
```

```
                 32         697.8     69391.        766.7      .435      1650.1
3778.7
                 33         710.7     50930.        767.6      .381       670.9
3988.9
                 34         712.6     48219.        767.8      .379       636.4
4004.9
                 35         714.9     43655.        768.2      .387       724.3
3764.3
                 36         727.2     22476.        770.3      .448      1287.5
2451.4
                 37         731.5     15694.        771.4      .523      1928.6
1467.1
                 38         735.1     11272.        772.4      .625      2871.1
406.1
                 39         749.4        24.        771.6     BELOW    -78524.0
79188.1
                 40         749.5         0.       5252.2     ABOVE-
10000000.010000000.0


                CHECK SUMS - (ALL SHOULD BE SMALL)
                SUM OF FORCES IN VERTICAL DIRECTION     =          .04   (=  .401E-01)
                     SHOULD NOT EXCEED      .100E+03
                SUM OF FORCES IN HORIZONTAL DIRECTION  =          .10   (=  .102E+00)
                     SHOULD NOT EXCEED      .100E+03
                SUM OF MOMENTS ABOUT COORDINATE ORIGIN =        24.45   (=  .244E+02)
                     SHOULD NOT EXCEED      .100E+03
                SHEAR STRENGTH/SHEAR FORCE CHECK-SUM   =          .01   (=  .122E-01)
                     SHOULD NOT EXCEED      .100E+03

                ***** CAUTION ***** SOME OF THE FORCES BETWEEN SLICES ACT AT POINTS
                                    ABOVE THE SURFACE OF THE SLOPE OR BELOW THE
                                    SHEAR SURFACE - EITHER A TENSION CRACK MAY BE
                                    NEEDED OR THE SOLUTION MAY NOT BE A VALID
SOLUTION.
```

ATTACHMENT D

SELECTED SLOPE/W INPUT

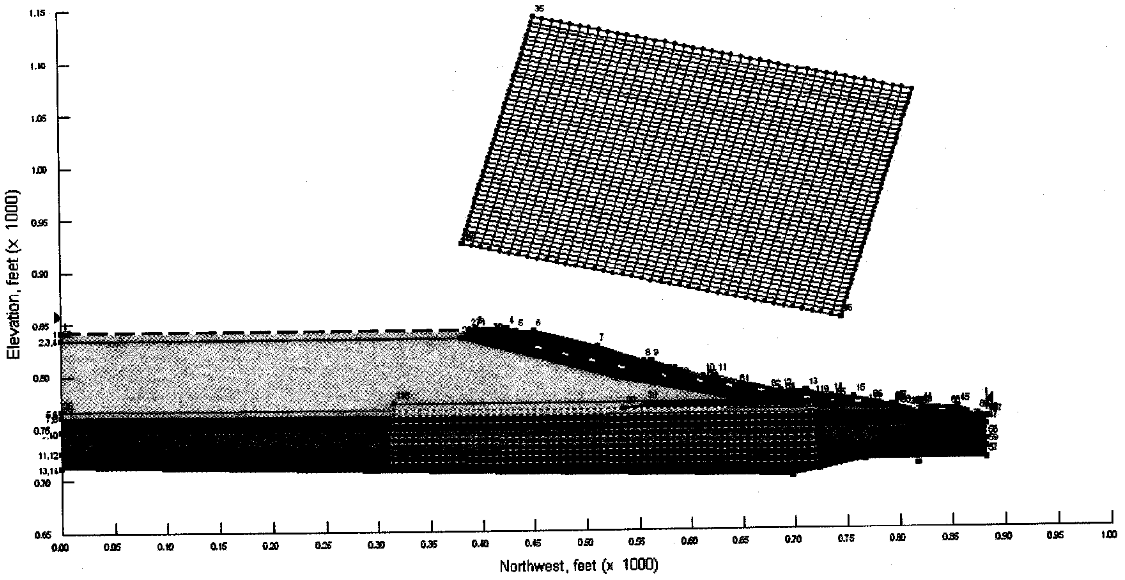

Figure D.1 Profile Lines, Piezometric Line, Search Tangent for Circles, Circles Center Grid.

SLOPE/W INPUT SOIL PROPERTIES

All Soils
Soil 1
Loose Fly Ash
Soil Model Mohr-Coulomb
Unit Weight 108.4
Cohesion 100
Phi 28
Piezometric Line # 1
B-bar 0
Pore-Air Pressure 0

Soil 2
Buttress Ditch Data
Soil Model Mohr-Coulomb
Unit Weight 85
Cohesion 0
Phi 45
Piezometric Line # 1
B-bar 0
Pore-Air Pressure 0

Soil 3
Dense BA and FA
Soil Model Mohr-Coulomb
Unit Weight 111.9
Cohesion 110
Phi 36.6
Piezometric Line # 1
B-bar 0
Pore-Air Pressure 0

Soil 4
Loose FA+BA
Soil Model Mohr-Coulomb
Unit Weight 108.4
Cohesion 100
Phi 32.1
Piezometric Line # 1
B-bar 0
Pore-Air Pressure 0

Soil 5
Dense BA and FA
Soil Model Mohr-Coulomb
Unit Weight 111.9
Cohesion 110
Phi 36.6
Piezometric Line # 1

B-bar 0
Pore-Air Pressure 0

Soil 6
Loose FA + BA
Soil Model Mohr-Coulomb
Unit Weight 108.4
Cohesion 100
Phi 28
Piezometric Line # 1
B-bar 0
Pore-Air Pressure 0

Soil 7
Firm FA BA 5 foot Wedge at Toe
Soil Model Mohr-Coulomb
Unit Weight 114.4
Cohesion 980
Phi 29.1
Piezometric Line # 1
B-bar 0
Pore-Air Pressure 0

Soil 8
Loose FA
Soil Model Mohr-Coulomb
Unit Weight 108.4
Cohesion 100
Phi 18
Piezometric Line # 1
B-bar 0
Pore-Air Pressure 0

Soil 9
Natural Clay
Soil Model Mohr-Coulomb
Unit Weight 126.4
Cohesion 1200
Phi 29.6
Piezometric Line # 1
B-bar 0
Pore-Air Pressure 0

Soil 10
Firm to Stiff FA + BA
Soil Model Mohr-Coulomb
Unit Weight 114.4
Cohesion 980
Phi 29.1
Piezometric Line # 1

B-bar 0
Pore-Air Pressure 0

Soil 11
Natural Clay
Soil Model Mohr-Coulomb
Unit Weight 126.4
Cohesion 1200
Phi 29.6
Piezometric Line # 1
B-bar 0
Pore-Air Pressure 0

Soil 12
Alluvium
Soil Model Mohr-Coulomb
Unit Weight 130.4
Cohesion 600
Phi 30
Piezometric Line # 1
B-bar 0
Pore-Air Pressure 0

Soil 13
Shale
Soil Model Mohr-Coulomb
Unit Weight 150
Cohesion 735
Phi 29.9
Piezometric Line # 1
B-bar 0
Pore-Air Pressure 0

Soil 14
Bedrock
Soil Model Mohr-Coulomb
Unit Weight 150
Cohesion 10000
Phi 29.9
Piezometric Line # 1
B-bar 0
Pore-Air Pressure 0