CCR Closure Plan

TS Power Plant

Eureka County, Nevada

Prepared By:

NEWMONT

Newmont Nevada Energy Investment, LLC
TS Power Plant
450 TS Power Plant Road
Battle Mountain, NV 89445

October 11, 2016

Rev. 0

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

1. Introduction

This Closure Plan has been prepared to describe closure and post-closure care for the existing Coal Combustion Residuals (CCR) ash landfill located at the TS Power Plant (TSPP), a coal burning electrical generation unit (EGU) operated by Newmont Nevada Energy Investment (NNEI). The Closure Plan is prepared in accordance with 40CFR Part 257, regulating disposal of CCR from electrical generating utilities (CCR Rule).

The TSPP CCR Landfill is permitted as a Class III Landfill by Nevada Division of Environmental Protection – Bureau of Waste Management (Class III Permit SW270REV01). The operating permit for the facility mandates that a landfill closure plan be prepared in accordance with Nevada environmental regulations. This plan augments the existing closure plan with additional information to comply with the CCR Rule.

Under provisions of the CCR Rule, this document complies with closure and post-closure performance standards for an existing CCR Landfill that will be closed in place. This represents an initial plan that will be amended as appropriate to reflect: (1) a change in operation of the CCR Landfill that will substantially affect the written closure plan or (2) other unanticipated events that necessitate a revision of the closure plan.

2. Site Description

The TSPP facilities are located in the broad alluvial-filled Boulder Valley within Sections 11 and 14, Township 33N and Range 48E of Eureka County, Nevada. The TSPP was commissioned in 2008 and represents one of the newest EGU's in the country. It is anticipated that the TSPP will have an operational life of at least 30 years. The CCR Landfill is located approximately 0.5 miles northeast of the power plant. Under conditions of the Class III permit, the landfill is allowed to accept three (3) waste streams: fly ash, bottom ash, and water treatment filter cake. Fly ash represents the largest volume waste stream planned for disposal in the landfill.

The landfill is a fully geomembrane-lined facility (80-mil HDPE) with a total designed footprint of approximately 36 acres and a maximum design height of 60 feet. During the operational life of the power plant, the CCR Landfill will be constructed incrementally as six (6) adjoining, six (6)-acre cells plus two (2) downgradient collection ponds sized to contain run-off from the design storm event falling on the landfill. The storage ponds are composite-lined, with an upper 80-mil

HDPE liner and underlying geosynthetic clay liner. Perimeter containment for the landfill is provided by geomembrane-lined, 5-foot high perimeter berms designed to contain storm water run-off within the facility. The individual cells are to be developed in stages on an as-needed basis to provide storage capacity for the planned life of the power plant facility.

Currently, two cells (Cell 1 and Cell 2) and one pond (Pond 1) have been constructed (Figure 1). Cell 1, the southwestern cell of the landfill, was part of original plant construction and has operated from 2008 to present. Cell 2, an identical six (6) acre cell immediately north of Cell 1, was constructed in 2013 and is currently accepting the designated waste streams. Based on recent (2015) survey information, the landfill contains approximately 227,000 cubic yards (yd3) of designated waste. This represents approximately 9 percent of the total design capacity. Approximately 20 feet of material has been placed in Cell 1 and placement of ash is progressing to the north into Cell 2. As of the date of this plan, Cell 2 contains a minimal amount of material.

Disposal of CCR in the landfill to date is well below original projections, since the majority of fly ash being generated by TSPP is shipped offsite for re-use as a cement substitute. In recent years, landfill disposal rates range from 10,000-15,000 cubic yards per year (yd3/yr).

3. Fly Ash Collection and Disposal

At the TSPP, fly ash is generated in a six-compartment fabric filter baghouse that separates the fine-grained ash from the combustion gas stream. From the baghouse, the ash is transferred pneumatically to an 800-ton capacity fly ash storage silo where it is stored temporarily until offloaded to trucks for disposal in the ash landfill or re-use off site.

Ash for re-use is directly transferred from the storage silo to bulk tractor trailers for transport off-site. It is typically transported to nearby mining operations for use as a cement substitute for a portion of the cement used in the backfilling of underground mines.

When the TSPP generates fly ash in excess of the off-site demand, excess ash is transferred from the storage silo to a 20-ton haul truck for transport and disposal at the landfill. As a dust control measure, all ash unloaded in this manner passes through a pug mill where it is conditioned with water to produce an agglomerated, wetted ash for transport.

CCR at the TSPP is derived from the combustion of sub-bituminous Powder River Basin (PRB) coal. Fly ash from the TSPP is classified as a Type “C” fly ash and is naturally pozzolanic and self-cementing when wetted and dried. The moisture conditioning and compaction of the ash during placement results in the formation of a competent mass in the landfill with the engineering characteristics of low strength concrete.

4. Maximum Inventory of CCR on Site

Disposal of CCR in the landfill is considered permanent disposal. That is, there are no plans to remove CCR from the landfill for re-use once disposal has occurred. Based on historical disposal rates it is projected that all CCR disposed of at the TSPP during the 30-year operational life of the facility can be accommodated in Cells 1-3 of the facility, or one half of the design footprint. This equates to approximately an 18-acre landfill footprint subject to closure. The maximum inventory of CCR on site will occur when the TSPP permanently ceases operation, after disposal of CCR to the landfill ends, and closure activities commence. At that time, it is estimated that approximately 900,000 yd3 of material will be contained on the landfill.

5. Considerations for Closure

5.1. Landfill Leachate Generation Analysis

An engineering analysis using the Hydrologic Evaluation of Landfill Performance (HELP) computer program has been conducted to evaluate leachate flows from the ash landfill[1]. The HELP program is a tool used to develop a water-balance analysis using two-dimensional hydrologic modeling of water movement across, into, through and out of landfills. Inputs include climatological data (precipitation, evapotranspiration, temperature and solar radiation data), material characteristics, and design data.

Climatological data for a 30 year period were derived synthetically by the HELP model for Elko, Nevada. Modeled precipitation varied from approximately 6 to 10 inches on an annual basis. Four layers of material were considered in the TSPP landfill model. Material characteristics were based on laboratory testing conducted during facility construction or as part of the analysis.

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[1] AMEC (2009), TS Power Plant Ash Landfill – Leachate Generation Model (See Attachment A)

Material properties of the individual layers used in the HELP model are summarized in the following table.

Table 1 – HELP Model

Layer Parameter	Soil Cover	Fly Ash	Lower Drainage Layer	HDPE Geomembrane
Layer Type	Vertical Percolation	Vertical Percolation	Lateral Drainage	Geomembrane Barrier
Layer Thickness (Inches)	24	720	24	0.08 (80 mil)
Porosity (%)	45.7	40.6	32	--
Initial Moisture Content (%)	12	18.5	5	--
Field Capacity (%)	13.1	18.7	5	--
Saturated Hydraulic Conductivity (cm/sec)	$1.0x10^{-3}$	$1.6x10^{-7}$	0.2	$2.0x10^{-13}$

HELP model results indicated no leachate emanating from the drainage layer of the landfill once cells are fully developed and covered. This is attributed to the very low permeability, both saturated and unsaturated, of the ash.

The lack of any observed leachate draining to the Cell 1-3 pond to date supports the HELP model results.

5.2. Landfill Stability

As part of the project design and permitting, a stability analysis of the TSPP CCR Landfill was conducted[2]. The analysis was based upon a cross-section taken at the maximum crest height (60 feet) and 3:1 slopes. A computer program was used to evaluate two modes of failure: rotational (circular) failures and sliding block (translational) failures over a wide range of search limits. The results of the analysis present the failure surface with the lowest factors of safety. The minimum static and psuedostatic factors of safety presented in the study are 1.77 and 1.09, respectively. These meet the minimum criteria recommended by the design engineer (1.30 and 1.0, respectively).

[2] AMEC (2005) Revised Geotechnical and Design Report, Class III Ash Landfill and Evaporation Pond, TS Power Plant, Newmont Nevada Energy Investment LLC, Eureka County, NV. (See Attachment B)

The stability analysis also noted that actual factors of safety will be significantly above those presented in the analysis as a result of the self-cementing properties of the ash that will result in a significant strength gain in the material shortly after placement.

5.3. Settlement Analysis

The AMEC (2005) geotechnical study also included a settlement analysis of the landfill foundation soil. A computer program was employed to model a subgrade profile of differing materials. Consolidation of subgrade soil under fully saturated conditions under the full landfill height of 60 feet was assumed. The resulting settlement profile was a trough with maximum profile (approximately 6 inches) near the center of the landfill profile (0.8 percent of total landfill height). A substantial portion of the settlement would occur within a short period of time following loading.

6. Closure Process

6.1. Initiation of Closure

Closure of the TSPP CCR Landfill will commence no later than 30 days after the date that the landfill receives final receipt of CCR or non-CCR waste. In the event that there is a prolonged hiatus in TSPP operations, closure will commence if the landfill has not received CCR or non-CCR waste for a two year period. In accordance with §257.101(e)(2)(ii), additional two-year extensions to commence closure may be secured if it can be demonstrated that there is a reasonable likelihood that the landfill will accept wastes in the foreseeable future.

An underlying assumption to the closure schedule is that TSPP will operate for its full operational life of 30 to 40 years. Assuming a 30 year operational life, closure of the CCR Landfill will begin in 2038.

Prior to initiating closure, a Notification of Intent to Close the CCR Landfill will be prepared and placed in the operating record for the facility. The notification will include a certification by a qualified PE for the design of the final cover system, if applicable.

6.2. Closure Procedures

Test work performed on the soil available for use at the site indicated that it is slightly more permeable (1 x 10-3cm/s) than the maximum permeability criteria for the final cover system materials required in CFR §257.102(d)(3)(i)(A) which is 1 x 10-5cm/s. Thus, the TSPP CCR

Landfill cover will be designed and built to alternative design criteria discussed in CFR §257.102(d)(3)(ii)(A-C). The physical closure of the landfill will occur as follows:

a) The landfill has been constructed in lifts to approximate the final 3:1 slope. The side slopes of the landfill will be dozed to the final configuration. The bottom HDPE liner system will remain intact through the process. Run-on controls will also remain intact.

b) Due to the self-cementing nature of the fly ash and the moisture conditioning that occurs prior to placement, the fly ash tends to set up as a coherent mass after disposal in the landfill. Laboratory testing conducted on the fly ash indicates a saturated hydraulic conductivity of the ash of 1.6 x 10-7 cm/sec, substantially below the standard for cover material (1 x 10-5cm/s). The final lift of fly ash delivered to the CCR Landfill will represent the impermeable layer as required in CFR §257.102(d)(3)(ii)(A). This lift of fly ash will be considerably thicker than the 18 inches required by Section B of the same paragraph. The fly ash surface will be graded to approximately a one percent grade to account for minor settlement discussed in Section 5.3 of this plan and to prevent ponding of precipitation on the final erosion control layer.

c) Since the final lift of placed fly ash represents the low permeability layer, permeability of the cover (erosion control) layer is not relevant to achieving final closure goals. Thus, an erosion control layer consisting of growth media material, will be spread as a single 12 inch thick lift, moisture conditioned, and compacted to achieve an anticipated minimum permeability of 1 x 10-3 cm/sec. The proposed 12-inch erosion control layer is twice as thick as that mandated in CFR§257.102(d)(3)(i)(C). Approximately 58,000 yd3 of growth media material would be required for this final cover layer. The material will be sourced from overburden that was removed during facility construction and has been stockpiled since that time.

d) The collection pond will be emptied of any liquid and backfilled with stockpiled overburden.

e) Following placement of the final cover, the surface of the landfill cover will be scarified to a shallow depth and broadcast seeded with a reclamation seed mix. The seed mix will be based on recommendations of the Bureau of Land Management.

6.3. Completion of Closure Activities

Closure of the CCR Landfill will be completed within six months of cessation of operations at the CCR Landfill. If it is not feasible to complete closure in the six month time frame due to factors beyond the control of NNEI, an extension of the closure time frame will be requested. Documentation in support of an extension will be placed in the ash landfill operating record in accordance with §257.101(f)(2)(i).

Within 30 days of the completion of closure, a Notification of Closure of a CCR Unit will be prepared and placed in the operating record of the facility. The notification will include a certification by a qualified PE that closure has been completed in accordance with the final closure plan.

Following closure of the CCR Landfill, NNEI will record a notation on the deed of the property indicating that the property has been used for a CCR Landfill and identify any land use restrictions that would apply to the tract of land during the post-closure period. Within 30 days of the recording the deed notation, NNEI will prepare a notification that a deed notification has been completed and placed in the operating record of the facility.

7. Post-Closure Plan

7.1. Post-Closure Care and Maintenance

The CCR Landfill will be inspected on an annual basis. The objective will be to observe and evaluate:

- Overall condition of the facility;
- Evidence of instability of the facility;
- Condition of the cover layer and any impacts from erosion or sloughing;
- Any leachate draining from the facility; and
- Establishment of vegetation on the closed facility.

Results of the inspection will be documented and a report will placed in the operating record for the landfill. The report will identify issues of concern and recommendations for corrective action, as appropriate. Corrective actions will be conducted in a timely manner.

7.2. Post-Closure Groundwater Monitoring

Groundwater monitoring will continue through the post-closure period in accordance with the existing facility Groundwater Monitoring Plan[3]. The Plan has been prepared in accordance with the CCR Rule and will involve the following activities during the post-closure period:

- Groundwater monitoring of the existing four (4) monitor wells established in proximity to the CCR Landfill. The monitoring network consists of one up gradient well (TSMW-1) and three (3) down gradient wells (TSMW-3, TSMW-4, TSMW-9). The wells will be tested on a semi-annual basis.
- Groundwater will be sampled and analyzed for Detection Monitoring analytes (40CFR Part 257, Appendix III). This includes pH, TDS, boron, calcium, chloride, fluoride, and sulfate. If monitoring indicates a statistically significant increase above background levels, an assessment monitoring program (40CFR Part 257, Appendix IV) will be initiated.
- An annual Groundwater Monitoring Report will be prepared documenting the monitoring events completed in the previous year. The report will provide statistical analysis of monitoring data.

The Groundwater Monitoring Plan should be consulted for specific details on the monitoring program.

7.3. Post-Closure Contact

The individual to contact during the post-closure period is:

Environmental Manager – TS Power Plant
910 Dunphy Ranch Road
Battle Mountain, NV 89820
(775)-635-6590
Dennis.laybourn@newmont.com

7.4. Planned Property Use during Post-Closure Period

The CCR Landfill is located in Boulder Valley, a remote area in northeastern Nevada. The area is designated as open range for livestock grazing. No permanent residents are located within

[3] Newmont Nevada Energy Investment (2016), Groundwater Monitoring Plan, TS Power Plant, Eureka County, Nevada

approximately five (5) miles of the site. The majority of Boulder Valley is private property owned by Newmont Mining Corporation, the parent company of NNEI.

During the period of active operation of the TSPP, perimeter fencing excluded livestock grazing from the general area of the facility. Fencing will remain in place until vegetation has become established on the ash landfill, at which time the area will be reopened to livestock grazing. It is estimated this will occur after five years in the post-closure period.

7.5. Amendments to the Post-Closure Plan

This closure plan may be amended if there is a substantial change in the operation of the TSPP prior to closure that would affect the post-closure plan in effect, or if after post-closure activities have commenced, unanticipated events necessitate a revision of the written post-closure plan.

Any amendment to the plan will accompanied by a written certification by a qualified professional engineer that the initial plan and any subsequent amendments meet the requirements of the CCR Rule.

FIGURES

NOTE:
PHOTO DATE: AUGUST 2013. SOURCE: NAIP

KEY:
▲ MONITORING WELL

NewFields	AREA: TS POWER PLANT	CLIENT: NEWMONT	NEWMONT
PROJECT NUMBER: 475.0221	PROJECT: CCR LANDFILL		
LOCATION: EUREKA COUNTY, NEVADA			
DOCUMENT FILENAME: TSPP-221-1DK-0001_0.DWG	FIGURE TITLE: CLOSURE & POST CLOSURE PLAN		FIGURE NUMBER: 1 / REVISION: 0

ATTACHMENTS

Attachment A

TS Power Plant

Ash Landfill Leachate Generation (HELP) Model

AMEC (2009)

March 23, 2009 032309 ltr

Dennis Laybourn
Environmental Manager-TS Power Plant
Newmont Energy Investment, LLC
910 Dunphy Ranch Road
Battle Mountain, Nevada 89820

Re: TS Power Plant Ash Landfill-Leachate Generation Model

Dear Dennis:

AMEC Earth and Environmental (AMEC) has completed an engineering analysis to estimate anticipated outflows resulting from meteoric inputs to the existing ash landfill at the TS Power Plant. This analysis was performed as required by the Nevada Division of Environmental Protection (NDEP) permit (Permit No. SW270REV00) for the ash landfill. The permit requires that leachate modeling be performed using as-disposed material characteristics for the ash materials.

The TS Power Plant is a coal fire power plant owned by Newmont Energy Investment (Newmont) and has been in operation since 2008. Fly and bottom ash are produced as a by-product of the energy production process and are stored in a High Density Polyethylene (HDPE) geomembrane lined landfill. The landfill, as designed, consists of six cells. Each cell covers and area of approximately 6 acres, and will be stacked to a maximum height of 60 feet. Construction of the initial cell, Cell 1, was completed during 2008, and ash materials are currently being placed in Cell 1. The design configuration for the landfill is shown in the design report titled "*Flour Enterprises Inc, Revised Class III Landfill Permit Application, March 2005*", issued by AMEC.

Leachate Prediction Model

The Hydrological Evaluation of Landfill Performance (HELP) computer program, developed and distributed by the U.S. Army Corps of Engineers was used to develop a model to predict leachate flows from the facility. The HELP program is a tool for developing water-balance analysis using two-dimensional hydrologic modeling of water movement across, into, through and out of landfills. Inputs into the model include local climatologic data, soil characteristics, and design specifications.

Climatologic data required as input for the HELP model includes evapotranspiration, precipitation, temperature, and solar radiation data. Data for all four parameters was derived synthetically by the HELP model, for Elko, Nevada. The synthetic weather data was derived for a period of 30 years based on default data available from 1974-1978 Schroeder, Engineering Documentation for Version 3).

Four layers were considered in the model cross section. The layers, from bottom to top, consisted of the following; the geomembrane barrier layer, drainage aggregate, fly ash, and soil cover. Material properties used in developing the model for the drainage aggregate were based on laboratory tests performed on samples of the drainage material taken during construction of Cell 1 of the landfill. Properties of the fly ash are based on samples taken from the ash landfill during the third quarter of 2008. Properties of the soil used in the model for the soil cover were based on results of borrow characterizing work performed on the proposed borrow area for soil cover material at the project site. Material properties for the individual layers as used in the HELP model analysis are summarized in the following table:

Layer Parameter	**Soil Cover**	**Fly Ash**	**Drainage Aggregate**	**HDPE Geomembrane**
Layer Code	1	1	3	4
Layer Type	Vertical Percolation	Vertical Percolation	Lateral Drainage	Geomembrane Barrier
Layer Thickness (inches)	24	720	24	0.08
Porosity (%)	45.7	40.6	32.0	--
Initial Moisture Content (%)	12.0	18.5	5.0	--
Field Capacity (%)	13.1	18.7	5.0	--
Saturated Hydraulic Conductivity (cm/sec)	$1.0x10^{-3}$	$1.6x10^{-7}$	0.2	$2.0x10^{-13}$

Results

The HELP model results show no leachate emanating from the drainage layer of the landfill once cells are fully developed and covered. This is attributed to the very low permeability (both saturated and unsaturated) of the ash materials. The lack of any leachate reporting to the Cell 1-3 pond to date supports the HELP model results. It is important to note that the model does not consider flow through preferential paths, including cracks, animal burrows, or high permeability waste materials.

If you have questions, please contact us at your earliest convenience.

Sincerely,

Amec Earth and Environmental.

Kevin Lutes, P.E.
Senior Engineer

KDL
Attachments: Ash laboratory test results, HELP run printout

Reference

Schroeder, P.R., N.M. Aziz C.M. Lloyd, and P.A. Zappi. 1994. The Hydrologic Evaluation of Landfill Performance (HELP) Model: User's Guide for Version 3. EPA/600/R-94/168a, September 1994. U.S. Environmental Protection Agency Office of Research and Development, Washington D.C.

Schroeder, P.R., T.S. Dozier, P.A. Zappi, B.M. McEnroe, J.W. Sjostrom, and R.L. Peyton. 1994 The Hydrologic Evaluation of Landfill Performance (HELP) model: Engineering Documentation for Version 3. EPA/600/9-94/168b, September 1994. U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C.

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**                                                                            **
**                                                                            **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                 **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                  **
**                 DEVELOPED BY ENVIRONMENTAL LABORATORY                      **
**                   USAE WATERWAYS EXPERIMENT STATION                        **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY                **
**                                                                            **
**                                                                            **
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PRECIPITATION DATA FILE:     C:\DOCUME~1\KEVIN~1.LUT\DESKTOP\DATA7\data4.D4
TEMPERATURE DATA FILE:       C:\DOCUME~1\KEVIN~1.LUT\DESKTOP\DATA7\DATA7.D7
SOLAR RADIATION DATA FILE:   C:\DOCUME~1\KEVIN~1.LUT\DESKTOP\DATA7\DATA13.D13
EVAPOTRANSPIRATION DATA:     C:\DOCUME~1\KEVIN~1.LUT\DESKTOP\DATA7\DATA11.D11
SOIL AND DESIGN DATA FILE:   C:\DOCUME~1\KEVIN~1.LUT\DESKTOP\DATA7\DATA10.D10
OUTPUT DATA FILE:            C:\DOCUME~1\KEVIN~1.LUT\DESKTOP\DATA7\RCRA.OUT


TIME:  16:25     DATE:   2/17/2009


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

     TITLE:  TS Power Plant Landfill

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


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                   LAYER  1
                                   --------

                        TYPE 1 - VERTICAL PERCOLATION LAYER
                           MATERIAL TEXTURE NUMBER   5
          THICKNESS                  =      24.00   INCHES
          POROSITY                   =       0.4570 VOL/VOL
          FIELD CAPACITY             =       0.1310 VOL/VOL
          WILTING POINT              =       0.0580 VOL/VOL
          INITIAL SOIL WATER CONTENT =       0.1477 VOL/VOL
          EFFECTIVE SAT. HYD. COND.  =  0.100000005000E-02 CM/SEC


                                   LAYER  2
                                   --------

                        TYPE 1 - VERTICAL PERCOLATION LAYER
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MATERIAL TEXTURE NUMBER 0

THICKNESS	=	720.00 INCHES
POROSITY	=	0.4060 VOL/VOL
FIELD CAPACITY	=	0.1870 VOL/VOL
WILTING POINT	=	0.0470 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1870 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.157000002000E-06 CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 50

THICKNESS	=	24.00 INCHES
POROSITY	=	0.3200 VOL/VOL
FIELD CAPACITY	=	0.0500 VOL/VOL
WILTING POINT	=	0.0200 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0500 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.200000003000 CM/SEC
SLOPE	=	1.40 PERCENT
DRAINAGE LENGTH	=	757.0 FEET

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.08 INCHES
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY	=	1.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	4.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	65.00
FRACTION OF AREA ALLOWING RUNOFF	=	100.0 PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	37.000 ACRES
EVAPORATIVE ZONE DEPTH	=	12.0 INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	1.974 INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	5.484 INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.696 INCHES
INITIAL SNOW WATER	=	0.000 INCHES
INITIAL WATER IN LAYER MATERIALS	=	139.414 INCHES
TOTAL INITIAL WATER	=	139.414 INCHES
TOTAL SUBSURFACE INFLOW	=	0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
ELKO NEVADA

STATION LATITUDE	=	40.50 DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00
START OF GROWING SEASON (JULIAN DATE)	=	137
END OF GROWING SEASON (JULIAN DATE)	=	273
EVAPORATIVE ZONE DEPTH	=	12.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	6.00 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	51.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	30.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	20.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	45.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ELKO NEVADA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.16	0.81	0.85	0.79	1.03	0.91
0.33	0.58	0.47	0.56	0.83	0.98

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ELKO NEVADA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
25.00	31.00	36.00	43.40	52.40	61.20
70.10	67.60	58.40	47.50	35.30	26.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ELKO NEVADA
AND STATION LATITUDE = 40.50 DEGREES

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

PRECIPITATION	0.60	0.75	0.67	0.07	0.85	0.22
	0.14	1.58	0.00	0.15	1.28	1.14
RUNOFF	0.000	0.000	0.022	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.001
EVAPOTRANSPIRATION	0.297	0.933	1.263	0.499	0.297	0.220
	0.195	1.490	0.416	0.281	0.661	0.697
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.0000	0.0000	0.0002	0.0005	0.0001	0.0000
	0.0000	0.0000	0.0001	0.0001	0.0002	0.0010

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	7.45	1000609.620	100.00
RUNOFF	0.023	3099.463	0.31
EVAPOTRANSPIRATION	7.249	973590.875	97.30
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.224	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.002231	299.699	0.03
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.176	23617.377	2.36
SOIL WATER AT START OF YEAR	140.014	18805276.000	
SOIL WATER AT END OF YEAR	140.190	18828892.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	1.991	0.00

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                 MONTHLY TOTALS (IN INCHES) FOR YEAR     2
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                            JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                            -------  -------  -------  -------  -------  -------

PRECIPITATION                 1.51     0.27     1.29     0.90     0.66     0.73
                              0.34     0.31     0.00     0.76     1.49     1.37

RUNOFF                        0.000    0.132    0.020    0.000    0.000    0.000
                              0.000    0.000    0.000    0.000    0.000    0.000

EVAPOTRANSPIRATION            0.780    0.357    1.653    0.950    0.722    0.720
                              0.510    0.183    0.153    0.162    1.486    0.886

LATERAL DRAINAGE COLLECTED    0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
  FROM LAYER  3               0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

PERCOLATION/LEAKAGE THROUGH   0.0010   0.0009   0.0010   0.0002   0.0009   0.0010
  LAYER  4                    0.0005   0.0000   0.0000   0.0000   0.0001   0.0000

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                  MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
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AVERAGE DAILY HEAD ON         0.000    0.000    0.000    0.000    0.000    0.000
  TOP OF LAYER  4             0.000    0.000    0.000    0.000    0.000    0.000

STD. DEVIATION OF DAILY       0.000    0.000    0.000    0.000    0.000    0.000
  HEAD ON TOP OF LAYER  4     0.000    0.000    0.000    0.000    0.000    0.000

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                       ANNUAL TOTALS FOR YEAR     2
-------------------------------------------------------------------------------
                                         INCHES          CU. FEET     PERCENT
                                        --------        ----------    -------
  PRECIPITATION                           9.63        1293405.750     100.00

  RUNOFF                                  0.151         20345.973       1.57

  EVAPOTRANSPIRATION                      8.563       1150050.500      88.92

  DRAINAGE COLLECTED FROM LAYER  3        0.0000            0.621       0.00

  PERC./LEAKAGE THROUGH LAYER  4          0.005717        767.865       0.06

  AVG. HEAD ON TOP OF LAYER  4            0.0000
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CHANGE IN WATER STORAGE	0.910	122241.898	9.45
SOIL WATER AT START OF YEAR	140.190	18828892.000	
SOIL WATER AT END OF YEAR	140.762	18905748.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.338	45387.051	3.51
ANNUAL WATER BUDGET BALANCE	0.0000	-1.164	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 3

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.20	0.29	0.25	1.73	1.00	0.57
	0.01	1.89	0.09	0.50	1.31	0.15
RUNOFF	0.006	0.032	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.700	0.413	0.813	1.625	1.181	0.363
	0.259	1.831	0.346	0.258	0.729	0.305
LATERAL DRAINAGE COLLECTED	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FROM LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0001	0.0002	0.0008	0.0001	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0002	0.0010	0.0010

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 4	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 4	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT

PRECIPITATION	8.99	1207446.870	100.00
RUNOFF	0.038	5124.968	0.42
EVAPOTRANSPIRATION	8.823	1185063.250	98.15
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.367	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.003548	476.577	0.04
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.125	16779.691	1.39
SOIL WATER AT START OF YEAR	140.762	18905748.000	
SOIL WATER AT END OF YEAR	141.225	18967914.000	
SNOW WATER AT START OF YEAR	0.338	45387.051	3.76
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	2.030	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 4

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.32	0.57	0.99	0.76	0.54	1.07
	0.11	1.35	0.07	0.63	1.00	1.36
RUNOFF	0.000	0.000	0.045	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.004
EVAPOTRANSPIRATION	0.320	0.765	0.609	1.072	0.566	1.224
	0.493	0.787	0.222	0.377	0.978	1.002
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.0010	0.0010	0.0010	0.0010	0.0010	0.0009
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	8.77	1177899.120	100.00
RUNOFF	0.049	6581.721	0.56
EVAPOTRANSPIRATION	8.415	1130176.750	95.95
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.651	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.005960	800.426	0.07
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.300	40341.648	3.42
SOIL WATER AT START OF YEAR	141.225	18967914.000	
SOIL WATER AT END OF YEAR	141.506	19005690.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.019	2564.912	0.22
ANNUAL WATER BUDGET BALANCE	0.0000	-2.061	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.71	0.67	1.41	1.32	0.65	1.76
	0.21	0.56	0.28	1.09	0.50	0.92
RUNOFF	0.032	0.000	0.002	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.434	0.574	1.580	1.381	0.614	1.698
	0.333	0.521	0.205	1.059	0.497	0.767
LATERAL DRAINAGE COLLECTED	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

FROM LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0002	0.0000	0.0001
LAYER 4	0.0000	0.0004	0.0010	0.0010	0.0010	0.0006

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 4	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 4	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.08	1353845.370	100.00
RUNOFF	0.035	4708.038	0.35
EVAPOTRANSPIRATION	9.663	1297889.250	95.87
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.465	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.004270	573.510	0.04
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.377	50674.398	3.74
SOIL WATER AT START OF YEAR	141.506	19005690.000	
SOIL WATER AT END OF YEAR	141.889	19057122.000	
SNOW WATER AT START OF YEAR	0.019	2564.912	0.19
SNOW WATER AT END OF YEAR	0.013	1807.369	0.13
ANNUAL WATER BUDGET BALANCE	0.0000	-0.274	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 6

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.55	0.37	0.95	1.49	1.13	1.07
	0.05	0.72	0.32	0.19	0.22	1.05
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.563	0.407	1.186	1.543	0.815	1.599
	0.413	0.278	0.217	0.189	0.153	0.584
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 6

	INCHES	CU. FEET	PERCENT
PRECIPITATION	8.11	1089254.120	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	7.948	1067492.500	98.00
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.162	21762.191	2.00
SOIL WATER AT START OF YEAR	141.889	19057122.000	
SOIL WATER AT END OF YEAR	141.649	19024916.000	
SNOW WATER AT START OF YEAR	0.013	1807.369	0.17
SNOW WATER AT END OF YEAR	0.415	55776.008	5.12
ANNUAL WATER BUDGET BALANCE	0.0000	-0.489	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 7

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.88 0.05	0.53 1.33	0.50 0.64	0.98 0.03	0.48 1.02	1.03 1.51
RUNOFF	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
EVAPOTRANSPIRATION	0.928 0.358	0.415 0.278	1.063 1.135	0.648 0.314	0.575 0.658	1.306 0.819
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

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ANNUAL TOTALS FOR YEAR 7

	INCHES	CU. FEET	PERCENT
PRECIPITATION	8.98	1206103.870	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	8.496	1141049.000	94.61
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00

AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.484	65053.922	5.39
SOIL WATER AT START OF YEAR	141.649	19024916.000	
SOIL WATER AT END OF YEAR	142.164	19094026.000	
SNOW WATER AT START OF YEAR	0.415	55776.008	4.62
SNOW WATER AT END OF YEAR	0.385	51719.793	4.29
ANNUAL WATER BUDGET BALANCE	0.0000	0.949	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 8

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.01	0.81	0.84	0.75	1.06	0.74
	0.46	0.30	1.42	1.79	0.37	0.40
RUNOFF	0.026	0.007	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.746	1.021	0.983	0.749	1.248	0.381
	1.253	0.167	0.847	1.433	0.480	0.535
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
	0.0000	0.0010	0.0010	0.0010	0.0006	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 8

	INCHES	CU. FEET	PERCENT
PRECIPITATION	9.95	1336384.750	100.00
RUNOFF	0.033	4436.983	0.33
EVAPOTRANSPIRATION	9.844	1322120.870	98.93
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.414	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.003798	510.173	0.04
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.069	9317.726	0.70
SOIL WATER AT START OF YEAR	142.164	19094026.000	
SOIL WATER AT END OF YEAR	142.618	19155064.000	
SNOW WATER AT START OF YEAR	0.385	51719.793	3.87
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-1.416	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 9

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.55	0.17	0.30	0.68	1.32	0.55
	0.37	0.29	0.55	0.33	0.24	0.59
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.528	0.121	0.297	0.247	1.242	1.415
	0.340	0.196	0.158	0.164	0.209	0.343
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.0004	0.0009	0.0010	0.0006	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 9

	INCHES	CU. FEET	PERCENT
PRECIPITATION	5.94	797801.562	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	5.260	706427.875	88.55
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.314	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.002885	387.418	0.05
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.677	90984.570	11.40
SOIL WATER AT START OF YEAR	142.618	19155064.000	
SOIL WATER AT END OF YEAR	143.067	19215306.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.229	30742.229	3.85
ANNUAL WATER BUDGET BALANCE	0.0000	1.380	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.60	1.85	1.80	1.05	0.48	0.84
	0.24	0.22	0.51	0.26	0.41	1.16
RUNOFF	0.013	0.254	0.275	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.391	0.804	1.849	0.982	0.505	1.175
	0.321	0.246	0.200	0.181	0.357	0.599

LATERAL DRAINAGE COLLECTED	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FROM LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0007
LAYER 4	0.0010	0.0010	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 4	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 4	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	9.42	1265200.370	100.00
RUNOFF	0.542	72855.266	5.76
EVAPOTRANSPIRATION	7.610	1022117.500	80.79
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.298	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.002742	368.251	0.03
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	1.265	169859.187	13.43
SOIL WATER AT START OF YEAR	143.067	19215306.000	
SOIL WATER AT END OF YEAR	143.985	19338614.000	
SNOW WATER AT START OF YEAR	0.229	30742.229	2.43
SNOW WATER AT END OF YEAR	0.575	77294.687	6.11
ANNUAL WATER BUDGET BALANCE	0.0000	-0.165	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.79	0.63	0.90	0.97	0.82	0.86
	0.20	0.86	0.39	0.57	0.78	0.96
STD. DEVIATIONS	0.36	0.48	0.50	0.47	0.30	0.41
	0.15	0.62	0.43	0.53	0.49	0.45
RUNOFF						
TOTALS	0.008	0.043	0.036	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.001
STD. DEVIATIONS	0.012	0.085	0.085	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.001
EVAPOTRANSPIRATION						
TOTALS	0.569	0.581	1.130	0.970	0.777	1.010
	0.447	0.598	0.390	0.442	0.621	0.654
STD. DEVIATIONS	0.213	0.288	0.484	0.452	0.337	0.544
	0.299	0.597	0.334	0.439	0.392	0.225
LATERAL DRAINAGE COLLECTED FROM LAYER 3						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 4						
TOTALS	0.0002	0.0003	0.0003	0.0003	0.0002	0.0003
	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003
STD. DEVIATIONS	0.0004	0.0004	0.0005	0.0004	0.0004	0.0004
	0.0003	0.0004	0.0004	0.0004	0.0004	0.0004

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
DAILY AVERAGE HEAD ON TOP OF LAYER 4						
AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

	INCHES		CU. FEET	PERCENT
PRECIPITATION	8.73	(1.271)	1172795.1	100.00
RUNOFF	0.087	(0.1659)	11715.24	0.999
EVAPOTRANSPIRATION	8.187	(1.3105)	1099597.75	93.759
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.00000	(0.00000)	0.335	0.00003
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00312	(0.00203)	418.392	0.03567
AVERAGE HEAD ON TOP OF LAYER 4	0.000	(0.000)		
CHANGE IN WATER STORAGE	0.455	(0.3894)	61063.26	5.207

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	1.27	170573.703
RUNOFF	0.270	36256.0781
DRAINAGE COLLECTED FROM LAYER 3	0.00000	0.00370
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000034	4.50561
AVERAGE HEAD ON TOP OF LAYER 4	0.000	
MAXIMUM HEAD ON TOP OF LAYER 4	0.010	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	1.08	145662.5780
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2635	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0580	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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□

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	3.4488	0.1437
2	138.7361	0.1927
3	1.2000	0.0500
4	0.0000	0.0000
SNOW WATER	0.575	

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Laboratory Report for
AMEC EARTH & ENVIRONMENTAL
(Project: 84191209)

January 9, 2009

Daniel B. Stephens & Associates, Inc.

6020 Academy NE, Suite 100 • Albuquerque, New Mexico 87109

January 9, 2009

Mr. Kevin Lutes
Amec Earth & Environmental
147 Idaho Street
Elko, NV 89801
(775) 778-3200

Re: DBS&A Laboratory Report for Amec Earth & Environmental (Project: 84191209)

Dear Mr. Lutes:

Enclosed is the final report for the Amec Earth & Environmental (Project: 84191209) sample. Please review this report and provide any comments as samples will be held for a maximum of 30 days. After 30 days samples will be returned or disposed of in an appropriate manner.

All testing results were evaluated subjectively for consistency and reasonableness, and the results appear to be reasonably representative of the material tested. However, DBS&A does not assume any responsibility for interpretations or analyses based on the data enclosed, nor can we guarantee that these data are fully representative of the undisturbed materials at the field site. We recommend that careful evaluation of these laboratory results be made for your particular application.

The testing utilized to generate the enclosed final report employs methods that are standard for the industry. The results do not constitute a professional opinion by DBS&A, nor can the results affect any professional or expert opinions rendered with respect thereto by DBS&A. You have acknowledged that all the testing undertaken by us, and the final report provided, constitutes mere test results using standardized methods, and cannot be used to disqualify DBS&A from rendering any professional or expert opinion, having waived any claim of conflict of interest by DBS&A.

We are pleased to provide this service to Amec Earth & Environmental and look forward to future laboratory testing on other projects. If you have any questions about the enclosed data, please do not hesitate to call.

Sincerely,

DANIEL B. STEPHENS & ASSOCIATES, INC.
LABORATORY / TESTING FACILITY

Joleen Hines
Laboratory Supervising Manager

Enclosure

Daniel B. Stephens & Associates, Inc.
6020 Academy Rd., NE, Suite 100 505-822-9400
Albuquerque, NM 87109-3315 FAX 505-822-8877

Summaries

Summary of Tests Performed

Laboratory Sample Number	Initial Soil Properties[1]		Saturated Hydraulic Conductivity[2]			Moisture Characteristics[3]								Particle Size[4]			Specific Gravity[5]		Air Perm-eability	Atterberg Limits	Proctor Compaction
	VM	VD	CH	FH	FW	HC	PP	FP	DPP	RH	EP	WHC	K_{unsat}	DS	WS	H	F	C			
TS Fly Ash	X				X	X	X		X	X			X		X	X	X			X	X

[1] VM = Volume Measurement Method, VD = Volume Displacement Method
[2] CH = Constant Head Rigid Wall, FH = Falling Head Rigid Wall, FW = Falling Head Rising Tail Flexible Wall
[3] HC = Hanging Column, PP = Pressure Plate, FP = Filter Paper, DPP = Dew Point Potentiometer, RH = Relative Humidity Box, EP = Effective Porosity, WHC = Water Holding Capacity, Kunsat = Calculated Unsaturated Hydraulic Conductivity
[4] DS = Dry Sieve, WS = Wet Sieve, H = Hydrometer
[5] F = Fine (<4.75mm), C = Coarse (>4.75mm)

Summary of Sample Preparation/Conditions

Sample Number	Proctor Data: Optimum Moisture Content (%, g/g)	Proctor Data: Maximum Dry Density (g/cm^3)	Target Remold Parameters: Moisture Content (%, g/g)	Target Remold Parameters: Dry Bulk Density (g/cm^3)	Target Remold Parameters: % of Maximum Density (%)	Actual Remold Data: Moisture Content (%, g/g)	Actual Remold Data: Dry Bulk Density (g/cm^3)	Actual Remold Data: % of Maximum Density (%)
TS Fly Ash*	20.3	1.57	NA	1.57	100%	19.0	1.62	103.1%

* An exothermic reaction was created upon the addition of water to the sample, resulting in initial rapid evaporation of water and cementation within about one hour. The sample was remolded by weighing the amount of dry material needed to reach the proctor determined maximum dry bulk density of 1.57g/cm³, adding water to the sample, mixing thoroughly, and quickly compacting the material into the testing ring. The final dry bulk density of the saturated hydraulic conductivity sub-sample was 1.60g/cm³, and the final dry bulk density of the moisture retention sub-sample was 1.62g/cm³. Note that the remold calculations were based on the dry mass of the material prior to the addition of water, and that the final dry bulk densities of both of the sub-samples were higher than the standard proctor determined maximum dry bulk density of 1.57g/cm³. Note also that remolding the sample without the addition of water was not possible due to the 'fluffy' nature of the material. Initial moisture content values of the remolded sample are lower than anticipated due to the initial rapid evaporation of water.

NA = Not analyzed

Summary of Initial Moisture Content, Dry Bulk Density Wet Bulk Density and Calculated Porosity

Sample Number	Moisture Content				Dry Bulk Density (g/cm^3)	Wet Bulk Density (g/cm^3)	Calculated Porosity (%)
	As Received		Remolded				
	Gravimetric (%, g/g)	Volumetric (%, cm^3/cm^3)	Gravimetric (%, g/g)	Volumetric (%, cm^3/cm^3)			
TS Fly Ash	0.6	NA	19.0	30.7	1.62	1.92	40.9

NA = Not analyzed

--- = This sample was not remolded

See sample preparation notes on 'Summary of Sample Preparation/Conditions' page in the beginning of this report.

Summary of Saturated Hydraulic Conductivity Tests

Sample Number	K_{sat} (cm/sec)	Oversize Corrected K_{sat} (cm/sec)	Method of Analysis: Flexwall	Method of Analysis: Falling Head
TS Fly Ash	1.57E-07	NA	X	

Summary of Moisture Characteristics of the Initial Drainage Curve

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
TS Fly Ash	0	35.2
	52	33.9 ‡‡
	148	34.2 ‡‡
	337	34.1 ‡‡
	1530	34.9 ‡‡
	101062	9.3 ‡‡
	851293	3.9 ‡‡

‡‡ Volume adjustments are applicable at this matric potential (see data sheet for this sample).

Daniel B. Stephens & Associates, Inc.

Summary of Calculated Unsaturated Hydraulic Properties

Sample Number	α (cm^{-1})	N (dimensionless)	θ_r (% vol)	θ_s (% vol)	Oversize Corrected θ_r (% vol)	Oversize Corrected θ_s (% vol)
TS Fly Ash	0.0001	1.5290	0.00	34.61	---	---

--- = Oversize correction is unnecessary since coarse fraction < 5% of composite mass

NA = Not analyzed

Summary of Particle Size Characteristics

Sample Number	d_{10} (mm)	d_{50} (mm)	d_{60} (mm)	C_u	C_c	Method	ASTM Classification	USDA Classification	
TS Fly Ash	0.0011	0.012	0.015	14	1.8	WS/H	Silt (ML)	Silt Loam	(Est)

d_{50} = Median particle diameter

Est = Reported values for d_{10}, C_u, C_c, and soil classification are estimates, since extrapolation was required to obtain the d_{1n} diameter

$$C_u = \frac{d_{60}}{d_{10}}$$

$$C_c = \frac{(d_{30})^2}{(d_{10})(d_{60})}$$

DS = Dry sieve

H = Hydrometer

WS = Wet sieve

† Greater than 10% of sample is coarse material

Summary of Atterberg Tests

Sample Number	Liquid Limit	Plastic Limit	Plasticity Index	Classification
TS Fly Ash	---	---	---	ML

--- = Soil requires visual-manual classification due to non-plasticity

Summary of Particle Density Tests

Sample Number	Particle Density (g/cm³)	Specific Gravity
TS Fly Ash	2.74	2.74

Summary of Proctor Compaction Tests

Sample Number	Measured: Optimum Moisture Content (% g/g)	Measured: Maximum Dry Bulk Density (g/cm^3)	Oversize Corrected: Optimum Moisture Content (% g/g)	Oversize Corrected: Maximum Dry Bulk Density (g/cm^3)
TS Fly Ash *	20.3	1.57	---	---

--- = Oversize correction is unnecessary since coarse fraction < 5% of composite mass

NA = Not analyzed

* An exothermic reaction was created upon the addition of water to the sample, resulting in initial rapid evaporation of water and cementation within about one hour. The proctor compaction test was performed by adding water to the sample, mixing thoroughly, and quickly compacting the sample. Proctor moisture content values are lower than anticipated due to the initial rapid evaporation of water.

Laboratory Data and Graphical Plots

Initial Properties

Summary of Initial Moisture Content, Dry Bulk Density
Wet Bulk Density and Calculated Porosity

Sample Number	Moisture Content				Dry Bulk Density	Wet Bulk Density	Calculated Porosity
	As Received		Remolded				
	Gravimetric (%, g/g)	Volumetric (%, cm^3/cm^3)	Gravimetric (%, g/g)	Volumetric (%, cm^3/cm^3)	(g/cm^3)	(g/cm^3)	(%)
TS Fly Ash	0.6	NA	19.0	30.7	1.62	1.92	40.9

NA = Not analyzed
--- = This sample was not remolded
See sample preparation notes on 'Summary of Sample Preparation/Conditions' page in the beginning of this report.

Daniel B. Stephens & Associates, Inc.

Data for Initial Moisture Content, Bulk Density, Porosity, and Percent Saturation

Job Name:	AMEC EARTH & ENVIRONMENTAL
Job Number:	LB08.0169.00
Sample Number:	TS Fly Ash
Project #:	84191209
Depth:	NA

	As Received	Remolded
Test Date:	7-Oct-08	14-Nov-08
Field weight of sample (g):*	143.71	164.59
Tare weight, ring (g):	0.00	30.17
Tare weight, pan/plate (g):	110.27	0.00
Tare weight, other (g):	0.00	0.00
Dry weight of sample (g):	33.23	112.96
Sample volume (cm^3):	NA	69.89
Measured particle density (g/cm^3):	2.74	2.74
Gravimetric Moisture Content (% g/g):	0.6	19.0
Volumetric Moisture Content (% vol):	NA	30.7
Dry bulk density (g/cm^3):	NA	1.62
Wet bulk density (g/cm^3):	NA	1.92
Calculated Porosity (% vol):	NA	40.9
Percent Saturation:	NA	75.0
Laboratory analysis by:	D. O'Dowd	D. O'Dowd
Data entered by:	C. Krous	D. O'Dowd
Checked by:	J. Hines	J. Hines

Comments:

* Weight including tares

NA = Not analyzed

--- = This sample was not remolded

Saturated Hydraulic Conductivity

Summary of Saturated Hydraulic Conductivity Tests

Sample Number	K_{sat} (cm/sec)	Oversize Corrected K_{sat} (cm/sec)	Method of Analysis	
			Flexwall	Falling Head
TS Fly Ash	1.57E-07	NA	X	

Daniel B. Stephens & Associates, Inc.

Saturated Hydraulic Conductivity
Flexible Wall Falling Head-Rising Tail Method

Job name: AMEC EARTH & ENVIRONMENTAL
Job number: LB08.0169.00
Sample number: TS Fly Ash
Project #: 84191209
Depth: NA

Remolded or Initial Sample Properties

Initial Mass (g):	432.56
Diameter (cm):	6.109
Length (cm):	7.626
Area (cm^2):	29.31
Volume (cm^3):	223.53
Dry Density (g/cm^3):	1.60
Dry Density (pcf):	100.19
Water Content (%, g/g):	20.6
Water Content (%, vol):	33.0
Void Ratio (e):	0.71
Porosity (%, vol):	41.4
Saturation (%):	79.7

Post Permeation Sample Properties

Saturated Mass (g):	452
Dry Mass (g):	358.75
Diameter (cm):	6.109
Length (cm):	7.6256
*Deformation (%)**:*	0.01
Area (cm^2):	29.31
Volume (cm^3):	223.51
Dry Density (g/cm^3):	1.61
Dry Density (pcf):	100.20
Water Content (%, g/g):	26.0
Water Content (%, vol):	41.7
Void Ratio(e):	0.71
Porosity (%, vol):	41.4
Saturation (%):*	100.7

Test and Sample Conditions

Permeant liquid used:	Water
Sample Preparation:	☐ In situ sample, extruded ☑ Remolded Sample
Number of Lifts:	3
Split:	#4
Percent Coarse Material (%):	0
Particle Density(g/cm^3):	2.74 ☐ Assumed ☑ Measured
Cell pressure (PSI):	71.0
Influent pressure (PSI):	69.0
Effluent pressure (PSI):	68.0
Panel Used:	☑ A ☐ B ☐ C
Reading:	☐ Annulus ☑ Pipette
B-Value (% saturation) prior to test*:	0.95
Date/Time:	11/17/08 840

* Per ASTM D5084 percent saturation is ensured (B-Value ≥ 95%) prior to testing, as post test saturation values may be exaggerated or skewed during depressurizing and sample removal.
**Percent Deformation: based on initial sample length and post permeation sample length.

Laboratory analysis by: D. O'Dowd
Data entered by: D. O'Dowd
Checked by: J. Hines

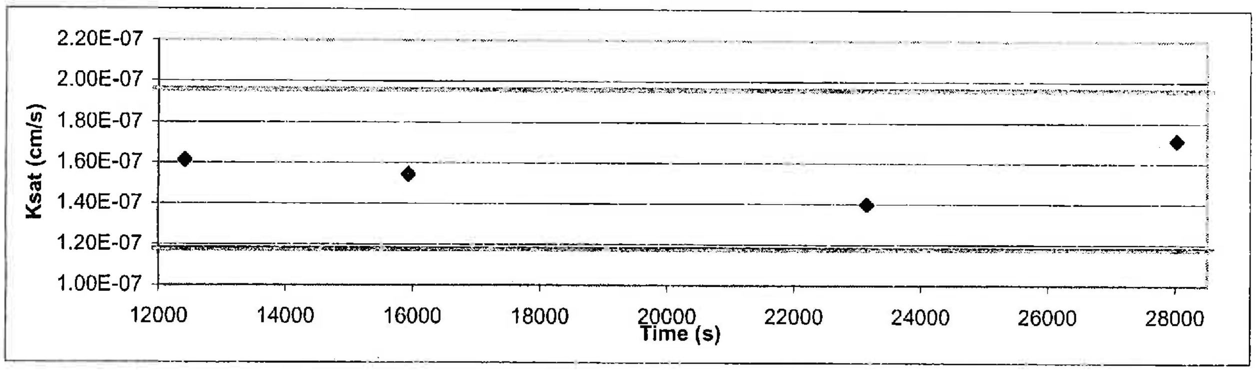
Daniel B. Stephens & Associates, Inc.

Saturated Hydraulic Conductivity
Flexible Wall Falling Head-Rising Tail Method

Job name: AMEC EARTH & ENVIRONMENTAL
Job number: LB08.0169.00
Sample number: TS Fly Ash
Project #: 84191209
Depth: NA

Date	Time	Temp (°C)	Influent Pipette Reading	Effluent Pipette Reading	Gradient ($\Delta H/\Delta L$)	Average Flow (cm^3)	Elapsed Time (s)	Ratio (outflow to inflow)	Change in Head (Not to exceed 25%)	k_{sat} T°C (cm/s)	k_{sat} Corrected (cm/s)
Test # 1:											
17-Nov-08	09:41:30	19.4	10.90	17.70	10.25	0.51	12413	1.03	2%	1.60E-07	1.61E-07
17-Nov-08	13:08:23	19.8	11.48	17.10	10.08						
Test # 2:											
17-Nov-08	13:08:23	19.8	11.48	17.10	10.08	0.14	3517	0.88	0%	1.54E-07	1.54E-07
17-Nov-08	14:07:00	20.2	11.65	16.95	10.03						
Test # 3:											
17-Nov-08	14:07:00	20.2	11.65	16.95	10.03	0.26	7215	1.00	1%	1.42E-07	1.40E-07
17-Nov-08	16:07:15	21.2	11.95	16.65	9.94						
Test # 4:											
17-Nov-08	16:07:15	21.2	11.95	16.65	9.94	0.22	4875	1.00	1%	1.77E-07	1.71E-07
17-Nov-08	17:28:30	21.5	12.20	16.40	9.86						

***Average Ksat* (cm/sec):** **1.57E-07**
Calculated Gravel Corrected Average Ksat (cm/sec): ---



ASTM Required Range (+/- 25%)

Ksat (-25%) (cm/s): 1.17E-07

Ksat (+25%) (cm/s): 1.96E-07

Moisture Retention Characteristics

Summary of Moisture Characteristics of the Initial Drainage Curve

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
TS Fly Ash	0	35.2
	52	33.9 ‡‡
	148	34.2 ‡‡
	337	34.1 ‡‡
	1530	34.9 ‡‡
	101062	9.3 ‡‡
	851293	3.9 ‡‡

‡‡ Volume adjustments are applicable at this matric potential (see data sheet for this sample).

Summary of Calculated Unsaturated Hydraulic Properties

Sample Number	α (cm^{-1})	N (dimensionless)	θ_r (% vol)	θ_s (% vol)	Oversize Corrected θ_r (% vol)	Oversize Corrected θ_s (% vol)
TS Fly Ash	0.0001	1.5290	0.00	34.61	---	---

--- = Oversize correction is unnecessary since coarse fraction < 5% of composite mass

NA = Not analyzed

Moisture Retention Data

Hanging Column / Pressure Plate

(Soil-Water Characteristic Curve)

Job Name:	AMEC EARTH & ENVIRONMENTAL
Job Number:	LB08.0169.00
Sample Number:	TS Fly Ash
Project #:	84191209
Depth:	NA

Dry wt. of sample (g):	112.96
Tare wt., ring (g):	30.17
Tare wt., screen & clamp (g):	26.05
Initial sample volume (cm^3):	69.89
Initial dry bulk density (g/cm^3):	1.62
Measured particle density (g/cm^3):	2.74
Initial calculated total porosity (%):	40.92

	Date	Time	Weight* (g)	Matric Potential (-cm water)	Moisture Content† (% vol)	
Hanging column:	18-Nov-08	13:00	193.77	0.00	35.18	
	24-Nov-08	10:25	194.27	51.50	33.91	‡‡
	1-Dec-08	8:30	194.57	148.00	34.22	‡‡
Pressure plate:	10-Dec-08	15:40	194.46	336.53	34.07	‡‡
	23-Dec-08	14:45	195.09	1529.70	34.92	‡‡

Volume Adjusted Data [1]

	Matric Potential (-cm water)	Adjusted Volume (cm^3)	% Volume Change [2] (%)	Adjusted Density (g/cm^3)	Adjusted Calculated Porosity (%)
Hanging column:	0.00	---	---	---	---
	51.50	73.98	+5.86%	1.53	44.19
	148.00	74.20	+6.17%	1.52	44.36
Pressure plate:	336.53	74.20	+6.17%	1.52	44.36
	1529.70	74.20	+6.17%	1.52	44.36

Comments:

[1] Applicable if the sample experienced volume changes during testing. 'Volume Adjusted' values represent each of the volume change measurements obtained after saturated hydraulic conductivity testing and throughout hanging column/pressure plate testing. "---" indicates no volume changes occurred.

[2] Represents percent volume change from original sample volume. A '+' denotes measured sample swelling, a '-' denotes measured sample settling, and '---' denotes no volume change occurred.

* Weight including tares

† Assumed density of water is 1.0 g/cm^3

‡‡ Volume adjustments are applicable at this matric potential (see comment #1).

Technician Notes:

See sample preparation notes on 'Summary of Sample Preparation/Conditions' page in the beginning of this report.

Laboratory analysis by: D. O'Dowd/ K. Wright
Data entered by: C. Krous
Checked by: J. Hines

Daniel B. Stephens & Associates, Inc.

Moisture Retention Data

Dew Point Potentiometer / Relative Humidity Box

(Soil-Water Characteristic Curve)

Sample Number: TS Fly Ash

Dry weight of dew point potentiometer sample* (g): 160.27
Tare weight, jar (g): 115.65
Initial sample bulk density (g/cm^3): 1.62

	Date	Time	Weight* (g)	Water Potential (-cm water)	Moisture Content† (% vol)	
Dew point potentiometer:	10-Oct-08	10:12	163.00	101062.2	9.31	‡

Volume Adjusted Data[1]

	Water Potential (-cm water)	Adjusted Volume (cm^3)	% Volume Change[2] (%)	Adjusted Density (g/cm^3)	Adjusted Calc. Porosity (%)
Dew point potentiometer:	101062.2	74.20	+6.17%	1.52	44.36

Dry weight of relative humidity box sample* (g): 72.69
Tare weight (g): 42.09
Initial sample bulk density (g/cm^3): 1.62

	Date	Time	Weight* (g)	Water Potential (-cm water)	Moisture Moisture Content† (% vol)	
Relative humidity box:	28-Oct-08	13:35	73.48	851293	3.94	‡

Volume Adjusted Data[1]

	Water Potential (-cm water)	Adjusted Volume (cm^3)	% Volume Change[2] (%)	Adjusted Density (g/cm^3)	Adjusted Calc. Porosity (%)
Relative humidity box:	851293	74.20	+6.17%	1.52	44.36

Comments:

[1] Applicable if the sample experienced volume changes during testing. 'Volume Adjusted' values represent each of the volume change measurements obtained after saturated hydraulic conductivity testing and throughout hanging column/pressure plate testing. "---" indicates no volume changes occurred.

[2] Represents percent volume change from original sample volume. A '+' denotes measured sample swelling, a '-' denotes measured sample settling, and '---' denotes no volume change occurred.

* Weight including tares

† Assumed density of water is 1.0 g/cm^3

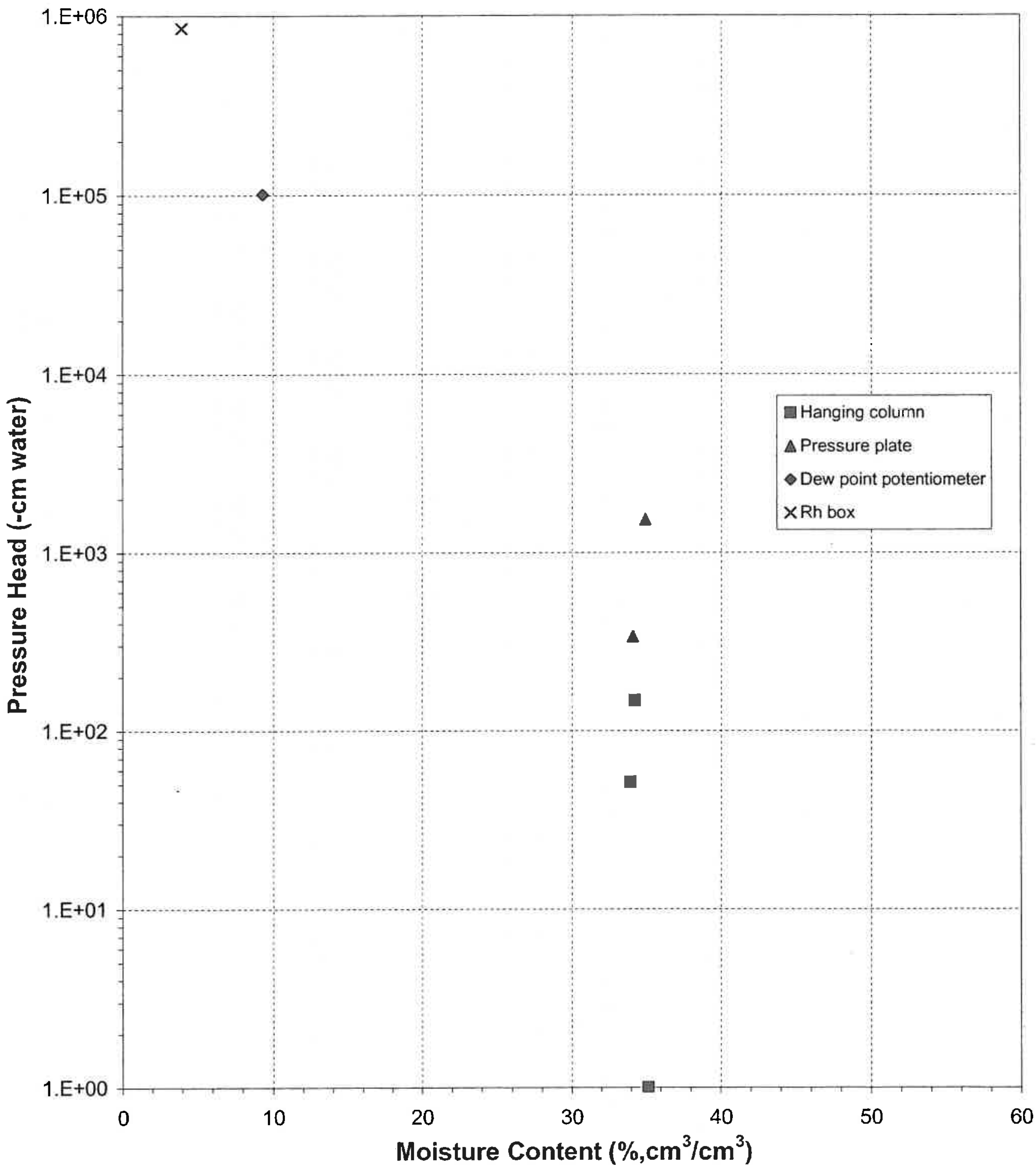
‡ Volume adjustments are applicable at this matric potential (see comment #1).

Laboratory analysis by: T. Mendez/D. O'Dowd/K. Mullen
Data entered by: C. Krous
Checked by: J. Hines

Daniel B. Stephens & Associates, Inc.

Water Retention Data Points

Sample Number: TS Fly Ash



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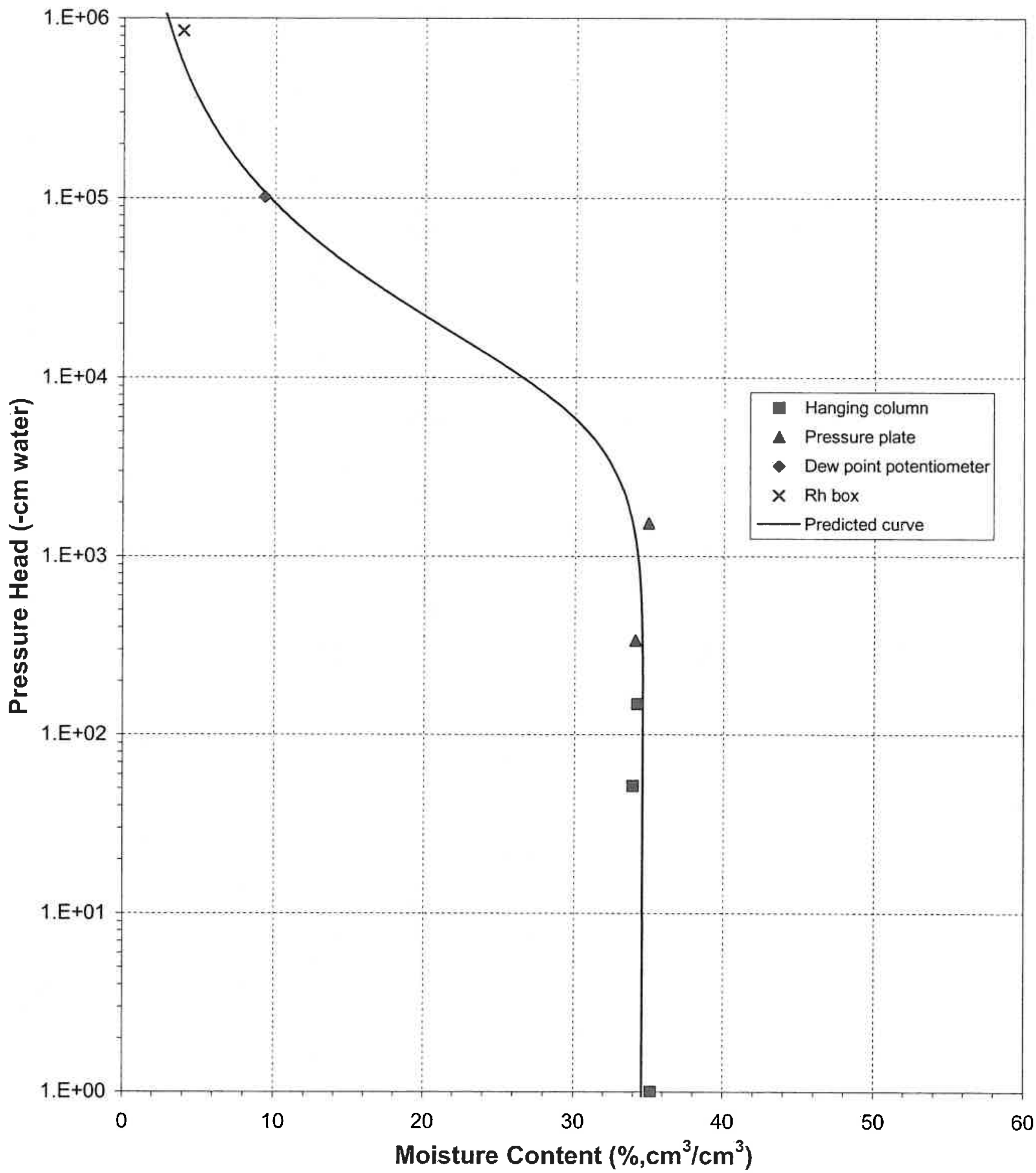
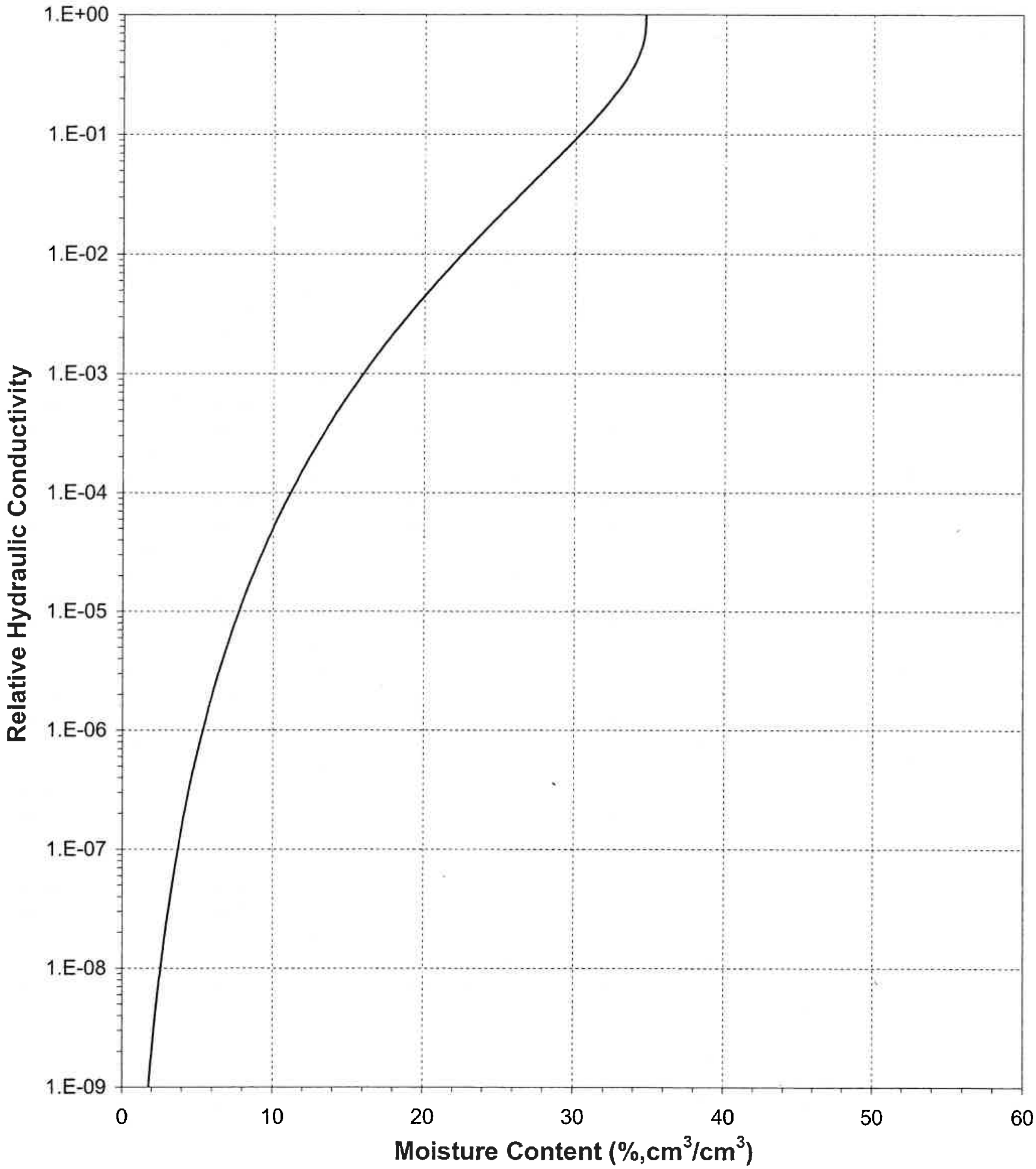
Predicted Water Retention Curve and Data Points

Sample Number: TS Fly Ash



Plot of Relative Hydraulic Conductivity vs Moisture Content

Sample Number: TS Fly Ash



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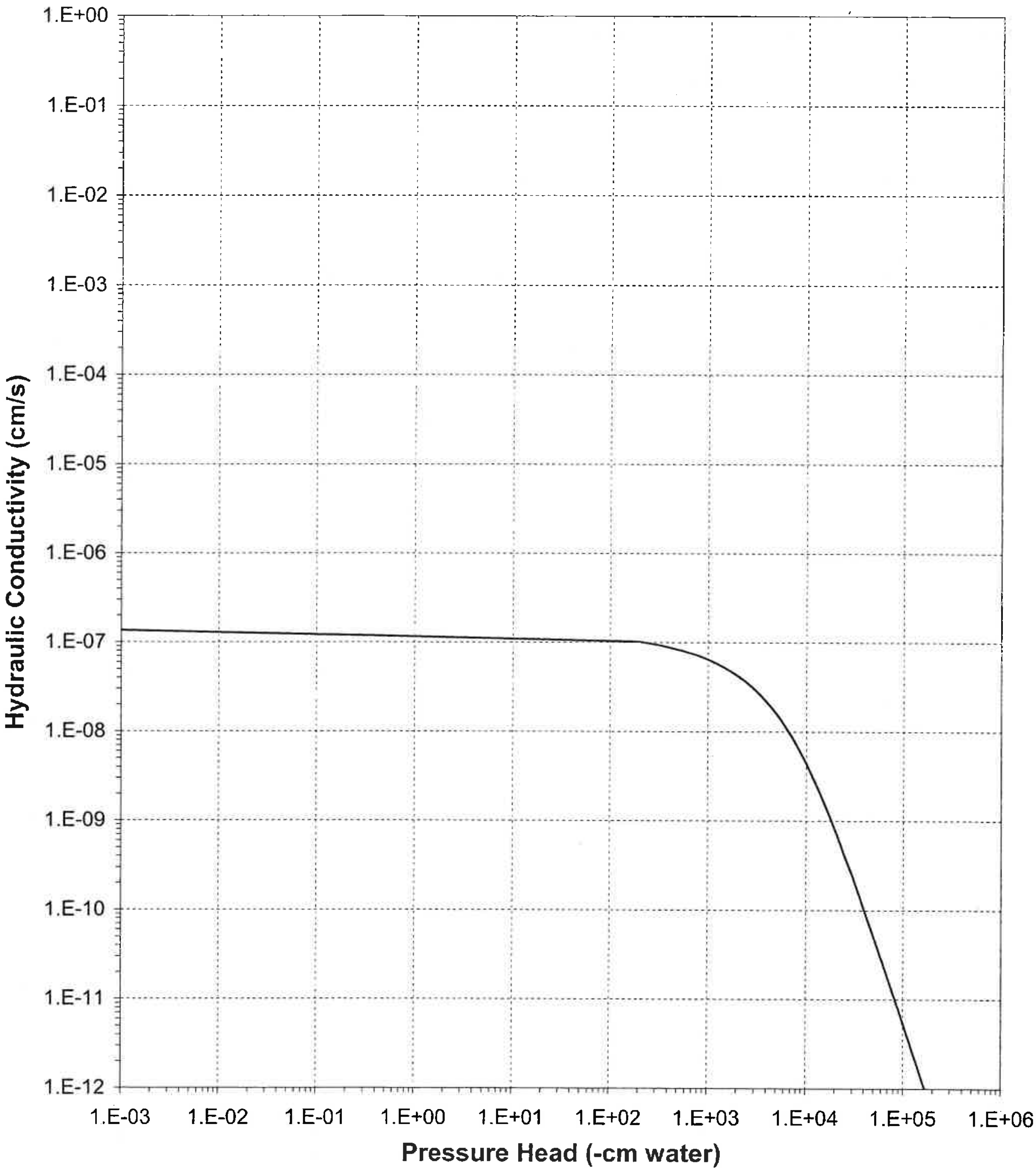
Plot of Hydraulic Conductivity vs Pressure Head

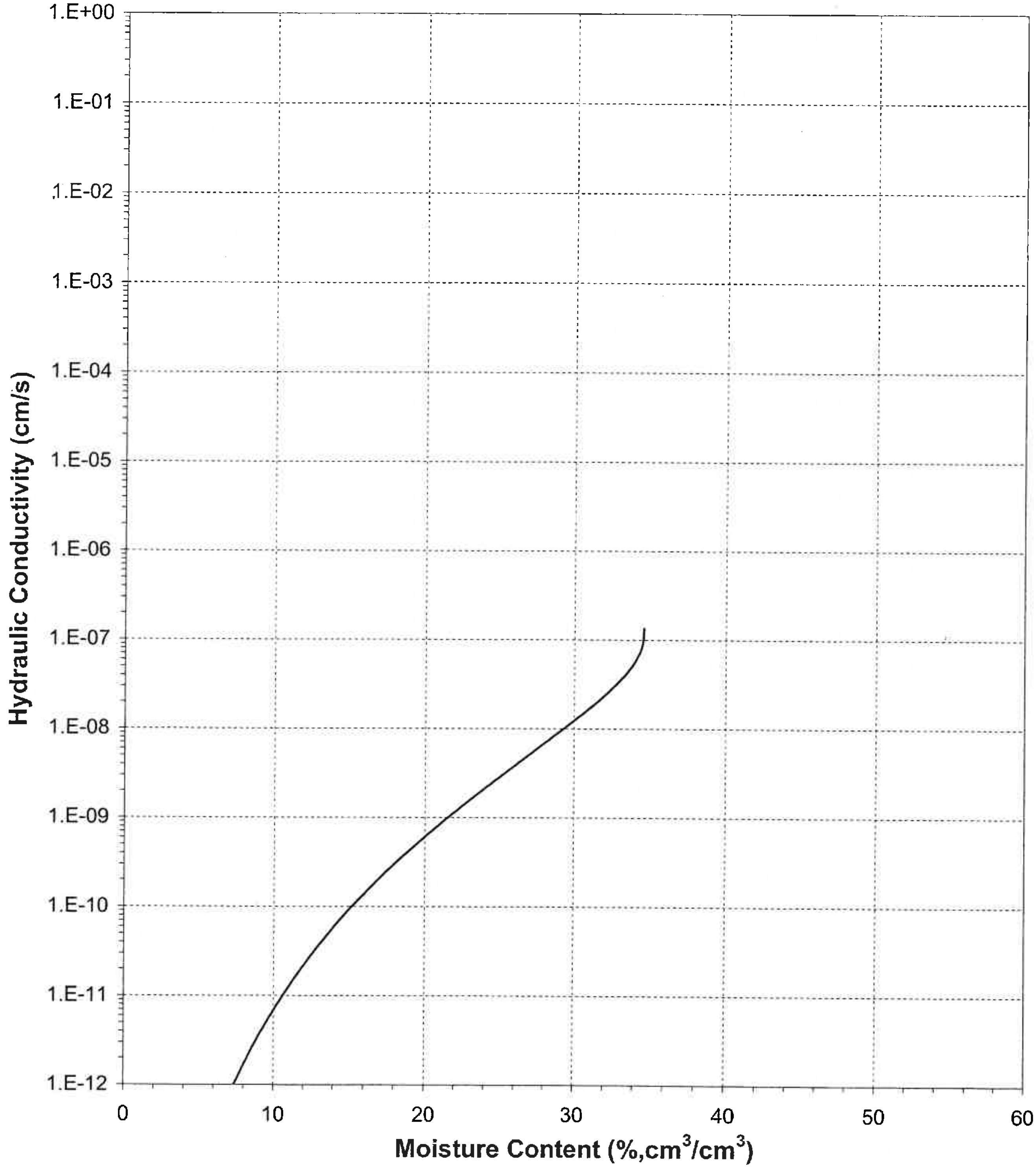
Sample Number: TS Fly Ash



Particle Size Analysis

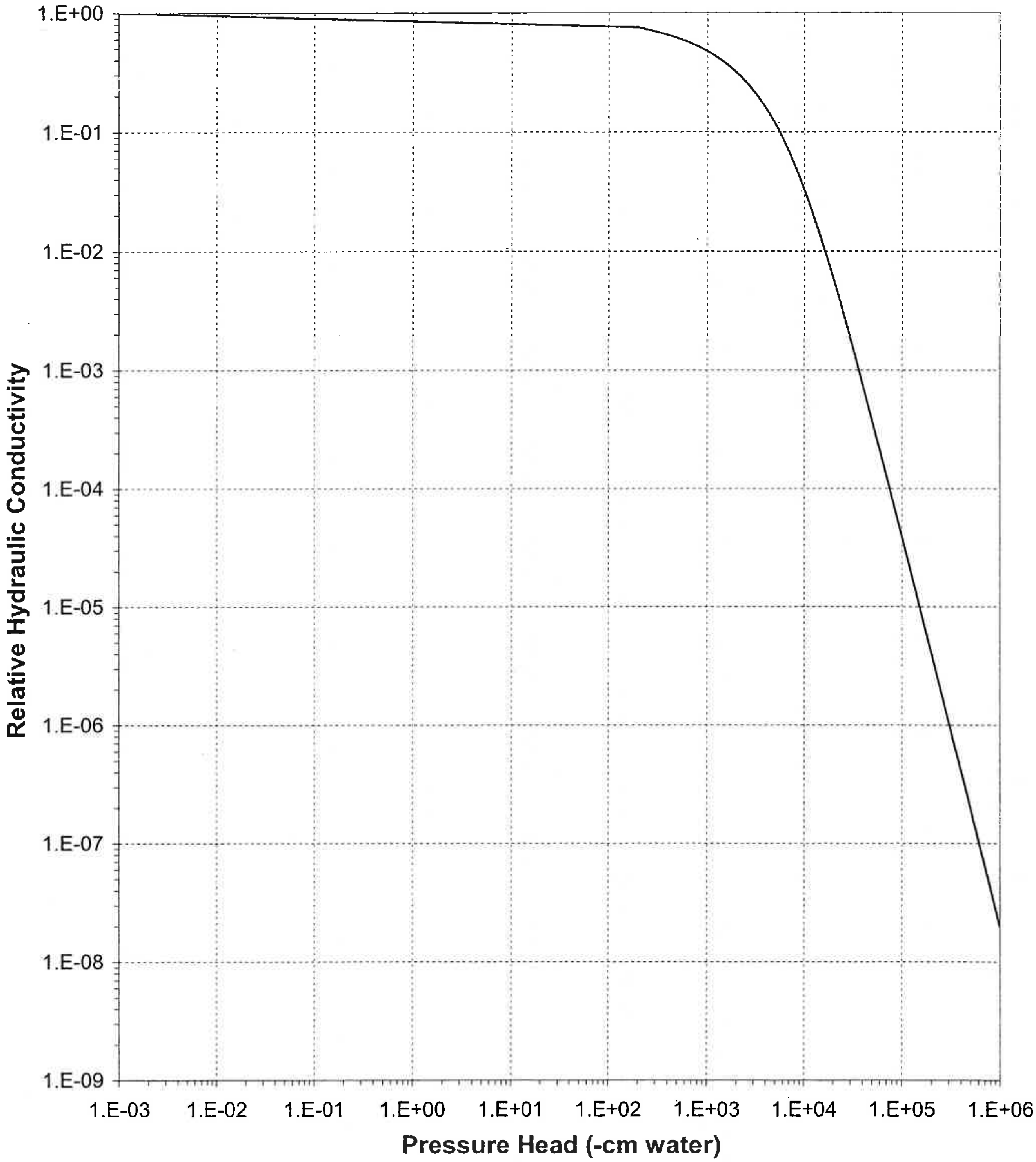
Plot of Hydraulic Conductivity vs Moisture Content

Sample Number: TS Fly Ash



Plot of Relative Hydraulic Conductivity vs Pressure Head

Sample Number: TS Fly Ash



Summary of Particle Size Characteristics

Sample Number	d_{10} (mm)	d_{50} (mm)	d_{60} (mm)	C_u	C_c	Method	ASTM Classification	USDA Classification	
TS Fly Ash	0.0011	0.012	0.015	14	1.8	WS/H	Silt (ML)	Silt Loam	(Est)

d_{50} = Median particle diameter

Est = Reported values for d_{10}, C_u, C_c, and soil classification are estimates, since extrapolation was required to obtain the d_{10} diameter

$$C_u = \frac{d_{60}}{d_{10}}$$

$$C_c = \frac{(d_{30})^2}{(d_{10})(d_{60})}$$

DS = Dry sieve

H = Hydrometer

WS = Wet sieve

† Greater than 10% of sample is coarse material

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Particle Size Analysis
Wet Sieve Data (#10 Split)

Job Name:	AMEC EARTH & ENVIRONMENTAL	*Initial Dry Weight of Sample (g):*	292.73
Job Number:	LB08.0169.00	*Weight Passing #10 (g):*	292.73
Sample Number:	TS Fly Ash	*Weight Retained #10 (g):*	0.00
Project #:	84191209	*Weight of Hydrometer Sample (g):*	37.89
Depth:	NA	*Calculated Weight of Sieve Sample (g):*	37.89
Test Date:	7-Oct-08	*Shape:*	Angular
		Hardness:	Soft

Test Fraction	Sieve Number	Diameter (mm)	Wt. Retained	Cum Wt. Retained	Wt. Passing	% Passing
+10						
	3"	75	0.00	0.00	292.73	100.00
	2"	50	0.00	0.00	292.73	100.00
	1.5"	38.1	0.00	0.00	292.73	100.00
	1"	25	0.00	0.00	292.73	100.00
	3/4"	19.0	0.00	0.00	292.73	100.00
	3/8"	9.5	0.00	0.00	292.73	100.00
	4	4.75	0.00	0.00	292.73	100.00
	10	2.00	0.00	0.00	292.73	100.00
-10			(Based on calculated sieve wt.)			
	20	0.85	0.01	0.01	37.88	99.97
	40	0.425	0.06	0.07	37.82	99.82
	60	0.250	0.10	0.17	37.72	99.55
	140	0.106	0.37	0.54	37.35	98.57
	200	0.075	0.47	1.01	36.88	97.33
	dry pan		0.02	1.03	36.86	
	wet pan			36.86	0.00	

d_{10} (mm): 0.0011 | d_{50} (mm): 0.012

d_{16} (mm): 0.0021 | d_{60} (mm): 0.015

d_{30} (mm): 0.0055 | d_{84} (mm): 0.031

Median Particle Diameter --d_{50} (mm): 0.012

Uniformity Coefficient, Cu --[d_{60}/d_{10}] (mm): 14

Coefficient of Curvature, Cc --[$(d_{30})^2/(d_{10}*d_{60})$] (mm): 1.8

Mean Particle Diameter --[$(d_{16}+d_{50}+d_{84})/3$] (mm): 0.015

Note: Reported values for d_{10}, C_u, C_c, and soil classification are estimates, since extrapolation was required to obtain the d_{10} diameter

Classification of fines (visual method): ML

ASTM Soil Classification: Silt (ML)

USDA Soil Classification: Silt Loam

Laboratory analysis by: K. Wright/R. Marshall

Data entered by: C. Krous

Checked by: J. Hines

Particle Size Analysis
Hydrometer Data

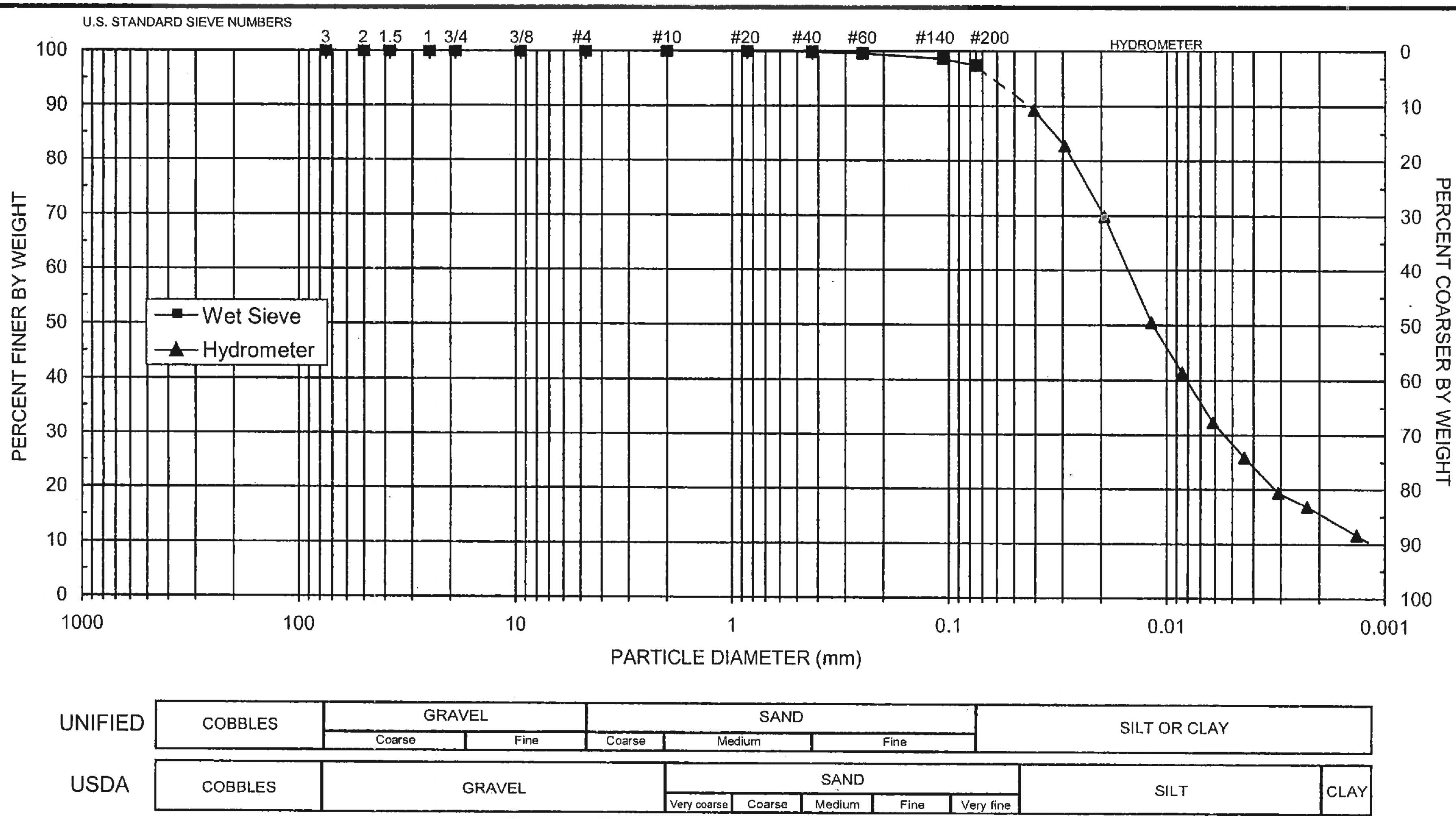
Job Name:	AMEC EARTH & ENVIRONMENTAL	*Type of Water Used:*	DISTILLED
Job Number:	LB08.0169.00	*Reaction with H_2O_2:*	NA
Sample Number:	TS Fly Ash	*Dispersant*:*	$(NaPO_3)_6$.
Project #:	84191209	*Measured particle density:*	2.74
Depth:	NA	*Initial Wt. (g):*	37.89
Test Date:	22-Oct-08	*Total Sample Wt. (g):*	292.73
Start Time:	9:00	*Wt. Passing #10 (g):*	292.73

Date	Time (min)	Temp (°C)	R (g/L)	R_L (g/L)	R_{corr} (g/L)	L (cm)	D (mm)	P (%)	% Finer
22-Oct-08	1	20.9	41.0	6.5	34.5	9.6	0.04065	89.2	89.2
	2	20.9	38.5	6.5	32.0	10.0	0.02936	82.8	82.8
	5	20.9	33.5	6.5	27.0	10.8	0.01931	69.8	69.8
	15	21.0	26.0	6.5	19.5	12.0	0.01175	50.4	50.4
	30	21.0	22.5	6.5	16.0	12.6	0.00851	41.4	41.4
	60	21.0	19.0	6.5	12.5	13.2	0.00615	32.3	32.3
	120	21.1	16.5	6.5	10.0	13.6	0.00441	25.9	25.9
	250	21.5	14.0	6.5	7.5	14.0	0.00309	19.4	19.4
	465	21.5	13.0	6.5	6.5	14.2	0.00228	16.8	16.8
23-Oct-08	1396	20.3	11.0	6.5	4.5	14.5	0.00135	11.6	11.6

Comments:

* Dispersion device: mechanically operated stirring device

Laboratory analysis by: K. Wright
Data entered by: C. Krous
Checked by: J. Hines



d_{10} = **0.0011**	d_{30} = **0.0055**	d_{50} = **0.012**	d_{60} = **0.015**	C_u = **14**	C_c = **1.8**

SAMPLE NUMBER	DEPTH	ASTM CLASSIFICATION	USDA CLASSIFICATION
TS Fly Ash	**NA**	**Silt (ML)**	**Silt Loam**

Note: Reported values for d_{10}, C_u, C_c, and ASTM classification are estimates, since extrapolation was required to obtain the d_{10} diameter

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Atterberg Limits/ Identification of Fines

Summary of Atterberg Tests

Sample Number	Liquid Limit	Plastic Limit	Plasticity Index	Classification
TS Fly Ash	---	---	---	ML

--- = Soil requires visual-manual classification due to non-plasticity

Specific Gravity

Summary of Particle Density Tests

Sample Number	Particle Density (g/cm^3)	Specific Gravity
TS Fly Ash	2.74	2.74

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Specific Gravity and Particle Density

Job Name:	AMEC EARTH & ENVIRONMENTAL
Job Number:	LB08.0169.00
Sample Number:	TS Fly Ash
Project #:	84191209
Depth:	NA
Test Date:	22-Oct-08

Trial 1

Weight of pycnometer filled w/air (g):	92.81
Weight of pycnometer filled w/soil (g):	128.06
Weight of pycnometer filled w/soil & water (g):	364.57
Weight of pycnometer filled w/water (g):	342.23
Observed temperature (°C):	19.90
Density of water at observed temperature (g/cm^3):	0.9982
Particle Density (g/cm^3):	2.73
Specific Gravity:	2.73
Correction factor, K:	1.0000
Particle Density at 20°C (g/cm^3):	2.73
Specific Gravity at 20°C:	2.73

Trial 2

Weight of pycnometer filled w/air (g):	95.44
Weight of pycnometer filled w/soil (g):	130.61
Weight of pycnometer filled w/soil & water (g):	367.12
Weight of pycnometer filled w/water (g):	344.74
Observed temperature (°C):	20.00
Density of water at observed temperature (g/cm^3):	0.9982
Particle Density (g/cm^3):	2.75
Specific Gravity:	2.75
Correction factor, K:	1.0000
Particle Density at 20°C (g/cm^3):	2.75
Specific Gravity at 20°C:	2.75

Average Particle Density (g/cm^3):	2.74
Average Specific Gravity:	**2.74**

Comments:

Laboratory analysis by:	T. Mendez
Data entered by:	T. Mendez
Checked by:	J. Hines

Proctor Compaction

Summary of Proctor Compaction Tests

Sample Number	Measured		Oversize Corrected	
	Optimum Moisture Content (% g/g)	Maximum Dry Bulk Density (g/cm^3)	Optimum Moisture Content (% g/g)	Maximum Dry Bulk Density (g/cm^3)
TS Fly Ash *	20.3	1.57	---	---

--- = Oversize correction is unnecessary since coarse fraction < 5% of composite mass

NA = Not analyzed

* An exothermic reaction was created upon the addition of water to the sample, resulting in initial rapid evaporation of water and cementation within about one hour. The proctor compaction test was performed by adding water to the sample, mixing thoroughly, and quickly compacting the sample. Proctor moisture content values are lower than anticipated due to the initial rapid evaporation of water.

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Proctor Compaction Data

Job Name: AMEC EARTH & ENVIRONMENTAL
Job Number: LB08.0169.00
Sample Number: TS Fly Ash
Project #: 84191209
Depth: NA

Test Date: 7-Oct-08

As Received Moisture Content (% g/g): 0.63

Split (3/4", 3/8", #4): #4
Mass of coarse material (g): 0
Mass of fines material (g): 12908
Mold weight (g): 4209
Mold volume (cm^3): 940.32

Compaction Method: Standard A
Preparation Method: Dry
Type of Rammer: Mechanical

Trial	Weight of Mold and Compacted Soil (g)	Weight of Container and Wet Soil (g)	Weight of Container and Dry Soil (g)	Weight of Container (g)	Dry Bulk Density (g/cm^3)	Moisture Content (% g/g)
1	5972	1153.70	988.57	283.76	1.52	23.43
2	5928	788.45	701.91	212.92	1.55	17.70
3	5968	815.20	716.74	210.27	1.57	19.44
4	5989	1105.70	961.30	268.12	1.57	20.83
5	5850	1153.40	1045.45	297.96	1.52	14.44

Soil Fractions
Coarse Fraction (% g/g): 0.0
Fines Fraction (% g/g): 100.0

Properties of Coarse Material
Measured particle density (g/cm^3): 2.74
Assumed Initial Moisture Content (% g/g): 0.0

Oversize Corrected Values for Dry Bulk Density and Moisture Content

Trial	Dry Bulk Density of Composite (g/cm^3)	Moisture Content of Composite (% g/g)
1	---	---
2	---	---
3	---	---
4	---	---
5	---	---

--- = Oversize correction is unnecessary since coarse fraction < 5% of composite mass
NA = Not analyzed

Laboratory analysis by: D. O'Dowd
Data entered by: D. O'Dowd
Checked by: J. Hines

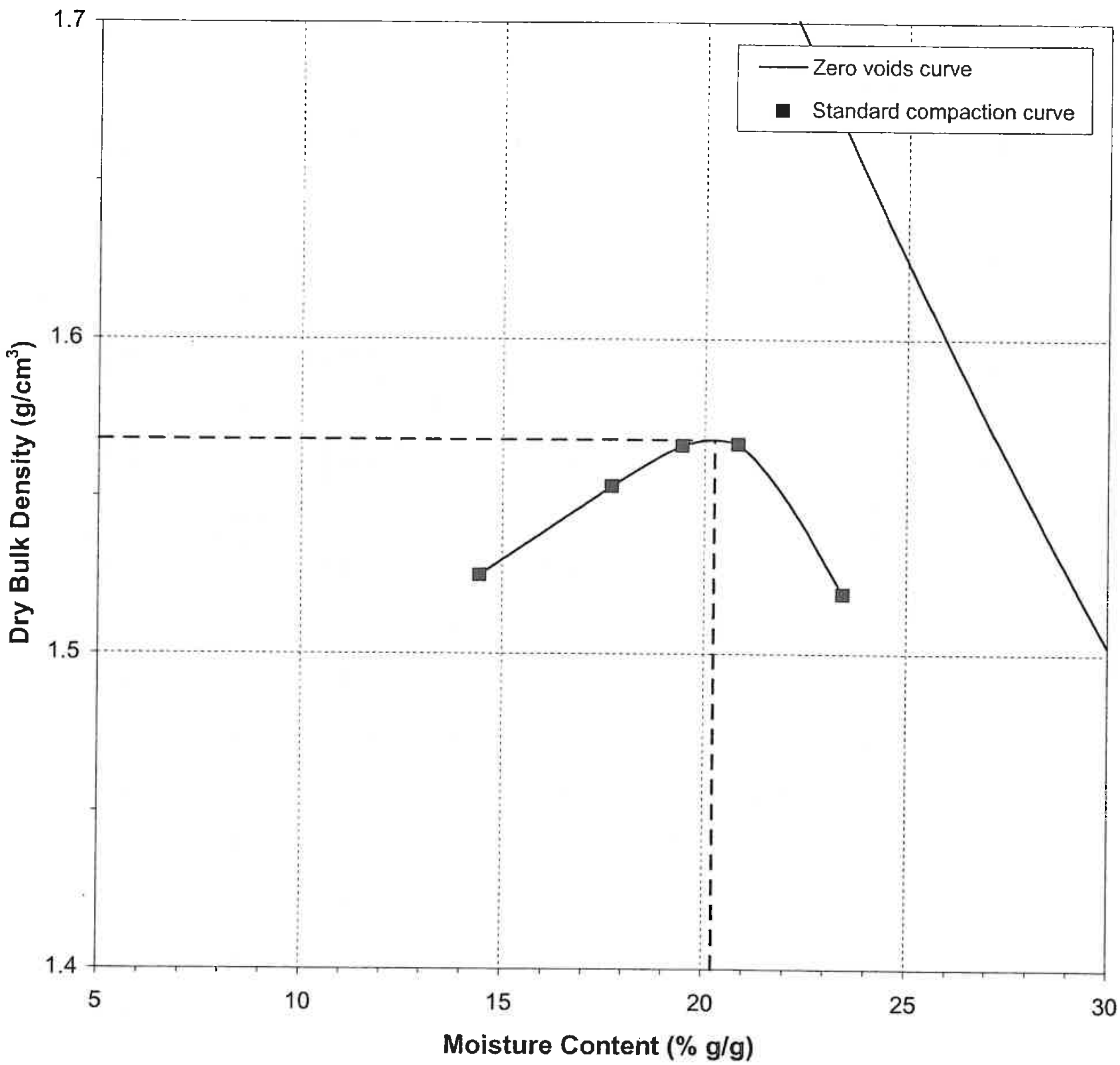
Daniel B. Stephens & Associates, Inc.

Proctor Compaction Data Points with Fitted Curve

Sample Number: TS Fly Ash

	Measured	Corrected
Optimum Moisture Content (% g/g):	20.3	---
Maximum Dry Bulk Density (g/cm^3):	1.57	---

Test Date: 7-Oct-08



--- = Oversize correction is unnecessary since coarse fraction < 5% of composite mass

NA = Not analyzed

Laboratory analysis by: D. O'Dowd
Data entered by: D. O'Dowd
Checked by: J. Hines

Laboratory Tests and Methods

Tests and Methods

Dry Bulk Density:	ASTM D6836
Moisture Content:	ASTM D2216; ASTM D6836
Calculated Porosity:	ASTM D6836
Saturated Hydraulic Conductivity: Falling Head Rising Tail: (Flexible Wall)	ASTM D5084
Hanging Column Method:	ASTM D6836; Klute, A. 1986. Porosity. Chp.26, in A. Klute (ed.), Methods of Soil Analysis, American Society of Agronomy, Madison, WI
Pressure Plate Method:	ASTM D6836; ASTM D2325
Water Potential (Dewpoint Potentiometer) Method:	ASTM D6836; Rawlins, S.L. and G.S. Campbell, 1986. Water Potential: Thermocouple Psychrometry. Chp. 24, pp. 597-619, in A. Klute (ed.), Methods of Soil Analysis, Part 1. American Society of Agronomy, Madison, WI.
Relative Humidity (Box) Method:	Karathanasis & Hajek. 1982. Quantitative Evaluation of Water Adsorption on Soil Clays.SSA Journal 46:1321-1325; Campbell, G. and G. Gee. 1986. Water Potential: Miscellaneous Methods.Chp. 25, pp. 631-632, in A. Klute (ed.), Methods of Soil Analysis, American Society of Agronomy, Madison, WI
Moisture Retention Characteristics & Calculated Unsaturated Hydraulic Conductivity:	ASTM D6836; van Genuchten, M.T. 1980. A closed-form equation for predicting the hydraulic conductivity of unsaturated soils. SSSAJ 44:892-898; van Genuchten, M.T., F.J. Leij, and S.R. Yates. 1991. The RETC code for quantifying the hydraulic functions of unsaturated soils. Robert S. Kerr Environmental Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Ada, Oklahoma. EPA/600/2091/065. December 1991
Specific Gravity Fine	ASTM D854
Particle Size Analysis:	ASTM D422
Atterberg Limits:	ASTM D4318
Visual-Manual Description:	ASTM D2488
Standard Proctor Compaction:	ASTM D698

Attachment B

Revised Geotechnical and Design Report, Class III Ash Landfill and Evaporation Pond, TS Power Plant, Newmont Nevada Energy Investment LLC, Eureka County, NV, AMEC (2005)

(excerpts regarding landfill slope stability and settlement analysis) amec

REVISED GEOTECHNICAL AND DESIGN REPORT
CLASS III ASH DISPOSAL LANDFILL AND EVAPORATION POND
TS POWER PLANT PROJECT
NEWMONT NEVADA ENERGY INVESTMENT LLC
EUREKA COUNTY, NEVADA

Submitted to:

Fluor Enterprises, Inc.
100 Fluor Daniel Drive
Greenville, South Carolina 29607-2770

Submitted by:

AMEC Earth & Environmental, Inc.
780 Vista Boulevard, Suite 100
Sparks, Nevada 89434

March 2005
AMEC Project No. 4-417-000652

March 11, 2005
AMEC Project No. 4-417-000652

Fluor Enterprises, Inc.
100 Fluor Daniel Drive
Greenville, South Carolina 29607-2770

Attention: **Dan Rogers, P.E.**
Director – Design Engineering

RE: REVISED GEOTECHNICAL AND DESIGN REPORT
Class III Ash Disposal Landfill and Evaporation Pond
TS Power Plant Project, Newmont Nevada Energy Investment LLC
Eureka County, Nevada

Dear Mr. Rogers:

Transmitted herewith is our revised geotechnical report for the referenced project. This report presents the results of our field investigations, laboratory testing, and provides recommendations for earthwork related elements specific to the ash disposal landfill and evaporation pond.

Should you have any questions concerning this report and the supporting information, please contact the undersigned.

Respectfully submitted,
AMEC Earth & Environmental, Inc.

3/10/5

Kevin White, P.E.
Senior Geotechnical Engineer

Reviewed by,

PROFESSIONAL ENGINEER STATE OF NEVADA
PAUL KAPLAN
CIVIL
Exp: 6·30·05
No. 8034
3·11·05

Paul Kaplan, P.E.
Unit Manager

JKW/PK/mm

Enclosures

c: Newmont Mining Corporation (7)
Nevada Operations
427 Ridge Street, Suite C
Reno, Nevada 89501-1738
Mr. Glenn King

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8.3 Landfill Slope Stability

8.4 Embankment Design Considerations

The following sections describe the engineering parameters selected for design, seepage considerations, and stability analysis. The slope stability analysis was conducted considering a nominal height of the landfill of 60 feet above the liner. The 60-foot height was provided as design criteria by Fluor Enterprises, Inc. and is the anticipated maximum height of material to be placed on the landfill cells. The 60-foot limit meets the design storage requirements for the facility. The stability analysis will need to be reevaluated if the height is increased above 60 feet.

A technical specification for the placement of waste material within the landfill is provided in Appendix D as an initial guideline to meet the intent of the design. The design intent is to dispose the waste stream in an efficient, stable manner while minimizing environmental impacts. The waste material must be placed in a well-densified state to support truck traffic and compaction equipment (trafficability), provide embankment stability, minimize dust and erosion, and minimize the generation of leachate. Short-term placement and compaction control will ensure adequate trafficability for the placement of additional waste, and dust and erosion control. Control of compaction and lift thickness is not as critical for long-term slope stability, because the self-cementing flyash will develop significant additional strength derived from the cementitious products formed during the hydration process.

The embankment will be placed to a maximum height of 60 feet with 3H:1V sideslopes (18 degrees). The embankment foundation soils will be graded to 1 percent and covered with a liner system. The worst-case condition modeled includes the 1-percent foundation soil slope sloping with the perimeter slope.

8.4.1 Engineering Design Parameters

The engineering characteristics of the waste stream mixture will vary somewhat depending upon several factors. Key factors include the relative proportions of the waste (flyash, bottom ash, and filter cake), and short and long term strength properties of the mixture. It must be noted that, due to the self-cementing nature of the flyash, moistened flyash mixtures may harden prematurely, resulting in potential handling problems and the inability to achieve the required degree of compaction.

The engineering characteristics of Coal Combustion By-Products (CCB's) vary considerably with the type of coal, grinding process, combustion method and collection process. The proposed coal source is from the Powder River Basin. The Powder River Basin Coal source may vary over the life of the plant. The burning of subbituminous Powder River Basin coal will result in Class C flyash. Class C flyash contains enough lime that it exhibits self-cementing properties.

At this time, no CCB source is available that adequately simulates the TS Power Plant process. As a result, approximate and conservative material property characteristics have been estimated for the waste stream materials to be placed in the landfill. Engineering characteristics have been based on published studies and limited laboratory testing of a Powder River Basin Coal source obtained from the Detroit Edison Belle River Power Plant located in China, Michigan. The Belle River plant burns Powder River Basin coal; however, unlike the TS Power Plant, this plant does not use a scrubber for air pollution control. The resulting lower lime content in their ash may lead to underestimation of the ash self-cementing characteristics at the TS Power Plant.

The testing, engineering, and construction practices for coal ash fills are similar to generally accepted practices for natural soil fills. Coal ash structural fills should be designed using generally accepted engineering practices (ASTM, 2003). Test methods and general engineering characteristics are presented in ASTM E 2277-03. A summary description of the general CCB material properties is presented in the flowing paragraphs.

Flyash: Flyash is a fine powder that is collected from the combustion gases of a coal fired power plant. Flyash particles are very fine, mostly spherical and vary in diameter. All flyash is pozzolanic and Class C flyash is also self-cementing. Because the hydration process commences immediately after wetting, higher compressive strengths will be attained when the flyash is placed and compacted immediately following the addition of water. Self-cementing flyash is relatively impermeable.

A limited amount of laboratory classification and strength testing has been conducted on the Belle River Power Plant flyash. The testing includes gradation, Atterberg limits, specific gravity, moisture density relationship, compressive strength, and permeability. A summary of the laboratory test results is presented in the following table. Again, the actual material properties of the flyash placed at the TS Power Plant site will depend on the specific coal source, process methods, etc.

Table 13
Material Properties, Belle River Power Plant Flyash

Test Description	Sample	Result	Test Method
Liquid limit		13	
Plastic Limit		2	
Coefficient of Saturated Permeability	% molded moisture 1 day 7 days 14 days 28 days	 1.37E-05 1.00E-05 9.29E-06 7.95E-06	ASTM D5084, Method C
Maximum Dry Density-optimum moisture		119 pcf @ 12.2%	ASTM D1557B
Unconfined Compressive Strength	3 to 4 % molded moisture 1 day 7 days 14 days 28 days 7 % molded moisture 1 day 7 days 14 days 28 days	 121 psi 66 psi 91 psi 154 psi 219 psi 130 psi 219 psi 834 psi	ASTM D2166
Gradation		24.9 % sand 57.8 % silt 17.3 % clay	ASTM D422
Specific Gravity		2.73	ASTM D854

Bottom Ash: Bottom ash particles are much coarser than flyash with typical grain sizes in the range of fine sand to gravel. The actual gradation can vary widely based on the pulverization and burning process in the power plant. Bottom ash tends to be chemically inert because of the greater particle size. The shear strength of bottom ash is derived primarily from internal friction. Bottom ash is usually free-draining material that can be compacted into a relatively dense, incompressible mass. Bottom ash is typically as permeable as granular soils with similar gradation. A sample of bottom ash was not tested for this study. As demonstrated in Table 14, bottom ash is expected to make up slightly less than 10% of the waste stream by volume.

Filter Cake: The percentage by volume of filter cake is considered insignificant considering that the filter cake will be blended with the bottom ash and flyash during placement, with the mixture compacted to a relatively high density.

Table 14
Waste Stream Volumes

Waste	Composition	Tons Per Day	Approximate Unit Weight (pcf)	Volume per day (cubic feet)	Relative Volume (percent)
CCB's	Flyash	194.40	90	4320	88
	Bottom Ash [1]	21.60	90	480	10
Water Treatment Filter Cake	Solids	4.45	80	111	2
	Water	8.25	NA		
	Total	228.7			
Note: [1] Assumed 10 percent of total ash					

Engineering properties for the proposed landfill were selected based on the results of our field and laboratory investigations, the expected behavior of the soil materials, and published values in the literature. Our investigation focused on delineating the types and engineering classifications of the materials encountered, but did not include extensive engineering property tests. Rather, the engineering tests were used as an index to estimate, in a conservative manner, the engineering properties. The following engineering design parameters were selected:

Table 15
Summary of Engineering Design Parameters

Description	Total Unit Weight (pcf)	Saturated Unit Weight (pcf)	Angle of Internal Friction ϕ	Cohesion Intercept (psf)	Basis
Waste Ash	100	110	25	0	Published Data - conservative
Overliner	125	135	35	0	Conservative Estimate
Liner Interface	100	100	15.8	648	Published data, peak
Silts-fine sands	102	115	38	0	Laboratory Tests
Sand	110	115	40	0	Conservative Estimate
Perimeter Embankment	118	125	40	0	Conservative Estimate

8.4.2 Seepage Conditions

The landfill and evaporation ponds are geomembrane-lined. Therefore, there will be no seepage within the landfill or evaporation pond embankments.

8.4.3 Stability Analysis

Our stability analyses were based upon a cross-section taken at the maximum crest height of the landfill with 3:1 slopes and a basal grade at the liner interface of 1 percent . This maximum section represents the design embankment condition. For the design cross section, the embankment subgrade has been modeled as 8 feet of silt and fine sand underlain by 24 feet of medium sand. The overliner and HDPE geomembrane were modeled with 1-foot thick layers each.

Stability analyses were performed utilizing the computer program SLIDE, version 5.013 by Rocscience. SLIDE is a two-dimensional slope stability program for evaluating the circular or noncircular failure surfaces in soil slopes using vertical slice limit equilibrium methods. For this study two-dimensional failure surfaces were analyzed using Spencer's methods of analysis. Spencer's Method generates a stability solution that satisfies both moment and force equilibrium.

In evaluating the stability of the landfill, two modes of failure are considered critical; rotational failure surfaces and translational failure surfaces. The translational surface was defined to pass along the subgrade/geomembrane interface. Various failure surface geometries were considered and a search was performed to find the most critical failure surface.

During AMEC's analysis, trial failure surfaces were routinely generated over a wide range of search limits. Sliding is considered through the waste only, through the foundation soils and any containment dikes, along the liner interface, and along the liner interface and the embankment. Both rotational (circular) failure surfaces and sliding block (translational) are considered.

The results of the analysis present the failure surfaces for the 10 lowest FOS's and the failure surface with the lowest FOS. The results presented on Figures 6a through 11b of the geotechnical report represent a small fraction of the trial surfaces generated during the analysis, but represent the critical surfaces evaluated or the surfaces with the lowest FOS.

For landfills with basal liner systems, the failure surfaces with the lowest FOS will follow the liner surface because this plane has the lowest frictional resistance. This is inherent in the analysis because the frictional resistance along the liner interface is lower than it is within the waste ash fill or the foundation. The upper failure surface exit point for the lowest FOS (critical failure surface) varies depending upon many factors, including relative material strengths, failure mode, slope and landfill height.

The maximum landfill section was also analyzed to determine the effects of the earthquake events. The USGS National Seismic Hazards Maps indicate a maximum earthquake site acceleration of 0.38 g. The seismic stability was calculated using a pseudo static coefficient equivalent to 50 percent of the peak horizontal ground acceleration.

Table 16 summarizes the factors of safety (FOS) calculated in our stability analyses. Plots of the critical failure surfaces are presented on the referenced figures.

Table 16
Summary of Stability Analysis

Stability Case	Static		Pseudostatic	
	FOS	Figure Number	FOS	Figure Number
Shallow Rotational	2.28	6a	1.40	6b
Intermediate Rotational	1.85	7a	1.14	7b
Deep Rotational	1.77	8a	1.08	8b
Shallow Translational	3.25	9a	1.09	9b
Intermediate Translational	2.46	10a	1.52	10b
Deep Translational	2.18	11a	1.31	11b

Engineering stability analyses are considerably judgment based, and as such the results are subject to interpretation by experienced professional geotechnical engineers. The acceptable factor of safety is related to many factors. Principal factors include loading condition; type of structure; our knowledge of the material properties used in the analysis, including the built in level of conservatism for the material properties; and consequences of slope failure.

ASTM and EPRI suggest FOS's for flyash embankments ranging from 1.5 (static) to 1.2 (seismic) (ASTM, 2003)(EPRI, 1995). The desired FOS's presented do not differentiate between self-cementing and non self-cementing flyash and are based on comparisons to FOS's typically used for soil embankments.

Considering the very conservative shear strength used for the waste ash in our slope stability analyses, AMEC recommends minimum FOS values of 1.3 (static) 1.0 (pseudostatic) The minimum static and pseudostatic FOS values presented in our report are 1.77 and 1.09, respectively. These FOS meet the minimum criteria stated above. It must be noted that the actual FOS's for hardened fly ash will be significantly above those presented in our analysis. Laboratory testing completed subsequent to the Application confirmed that the proposed Class C flyash has significant self cementing properties.

The results of our stability analyses indicate that suitable factors of safety are achieved under static and pseudostatic conditions for all cases analyzed using conservative strength parameters. The stability of the landfill is largely dependant upon the strength of the waste ash. Conservative strengths have been used in our analysis. The fly ash is expected to experience significant strength gain shortly after placement. Therefore, much higher factors of safety are projected to occur under actual field conditions.

8.5 Settlement and Deformation

8.6 Settlement Analysis

A settlement analysis of the landfill foundation soils was performed to determine if the anticipated settlements would hinder the flow of solution. The subgrade soils were conservatively assumed to consolidate under fully saturated conditions under the full landfill height of 60 feet and a waste unit weight of 100 pounds per cubic foot. The subgrade profile used in our analysis consists of 2 feet of properly prepared silts underlain by 6 feet of natural silts. The upper silt layers are in turn underlain by dense granular soils to a depth of 150 feet. Further design assumptions and basis are presented in the following table.

Table 17
Summary of Engineering Design Parameters

Description	Depth, feet	Total Unit Weight (pcf)	Coefficient of Compression, C'c	Coefficient of Recompression, C'r	Basis
Properly Prepared Silts	0 to 2	100	0.05	0.005	Published Correlations
Natural Silts	2 to 6	125	0.110	0.012	Consolidation tests
Dense granular sols	6 to 150	100	0.003	0.003	Published Correlations

The stress increase imposed on the underlying soils is dependent on the geometry of the embankment. Variables include the height, crest width, groundwater depth and the sideslopes. The settlement analysis was conducted using the computer program WinSaf-I, version 1 by Prototype Engineering. Projected settlements under the landfill with groundwater depths of 16 and 30 feet are presented in the following table.

Table 18
Summary of Projected Settlements

Groundwater Depth, feet	Settlement, inches					
	60 feet Beyond Toe	Perimeter Drain Channel	Toe	Mid-height of Slope	Crest	Center
16	0.31	0.52	0.62	3.48	5.88	6.18
30	0.27	0.46	0.55	3.34	5.70	5.98

The resulting profile is shaped like a trough, with maximum settlement value near the center of the landfill profile. The pad is graded at 1 percent to the perimeter drainage channels. The potential loss in grade considering the projected settlements is less than 0.01 percent. Therefore, the settlements at the top of the liner are not expected to hinder flow.

A significant portion of the projected settlements will occur within a short period of time following loading.

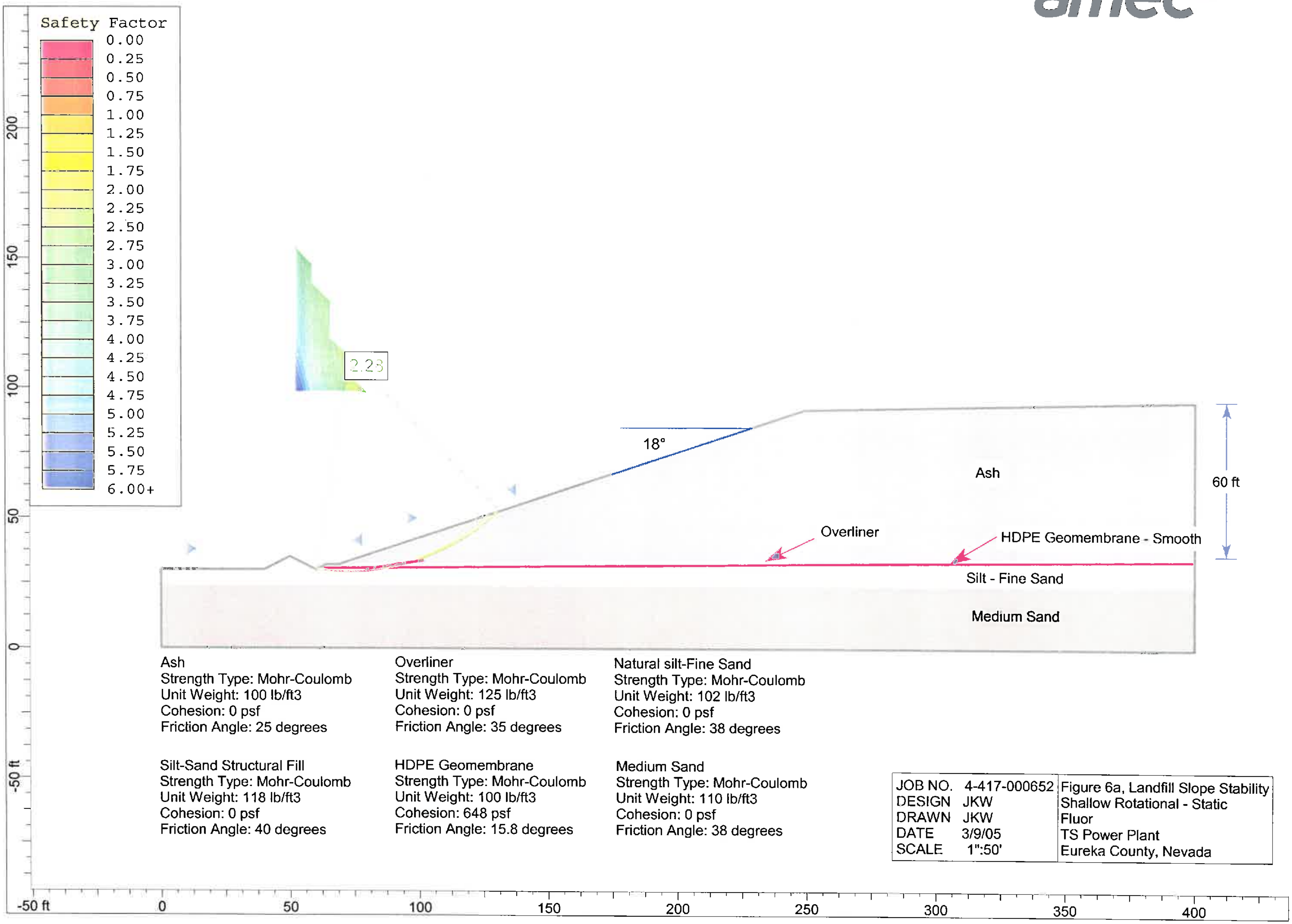
8.7 Horizontal Deformation and Strain

The horizontal deformation profile was computed using a method presented by Lee and Shen (1969). The procedure uses a beam analogy to relate horizontal movement to vertical deformation. The horizontal movement, m, at a point along the settlement profile is determined by the settlement slope, α, by the equation:

$$m = {}^{2}/_{3}\, H\, \alpha$$

Where H is the beam thickness, which is taken as the embankment height. The coefficient was derived through model testing and a comparison of movements computed using the equation versus movements calculated using finite element methods.

Values of horizontal strain were then computed as the slope of any point on the horizontal displacement profile. The maximum horizontal extensional strain calculated is approximately 10.4 percent, which is below the typical yield strain of HDPE liners, which is about 13 percent. Strain at break for HDPE liners is in excess of 700 percent.



Ash
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 25 degrees

Overliner
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees

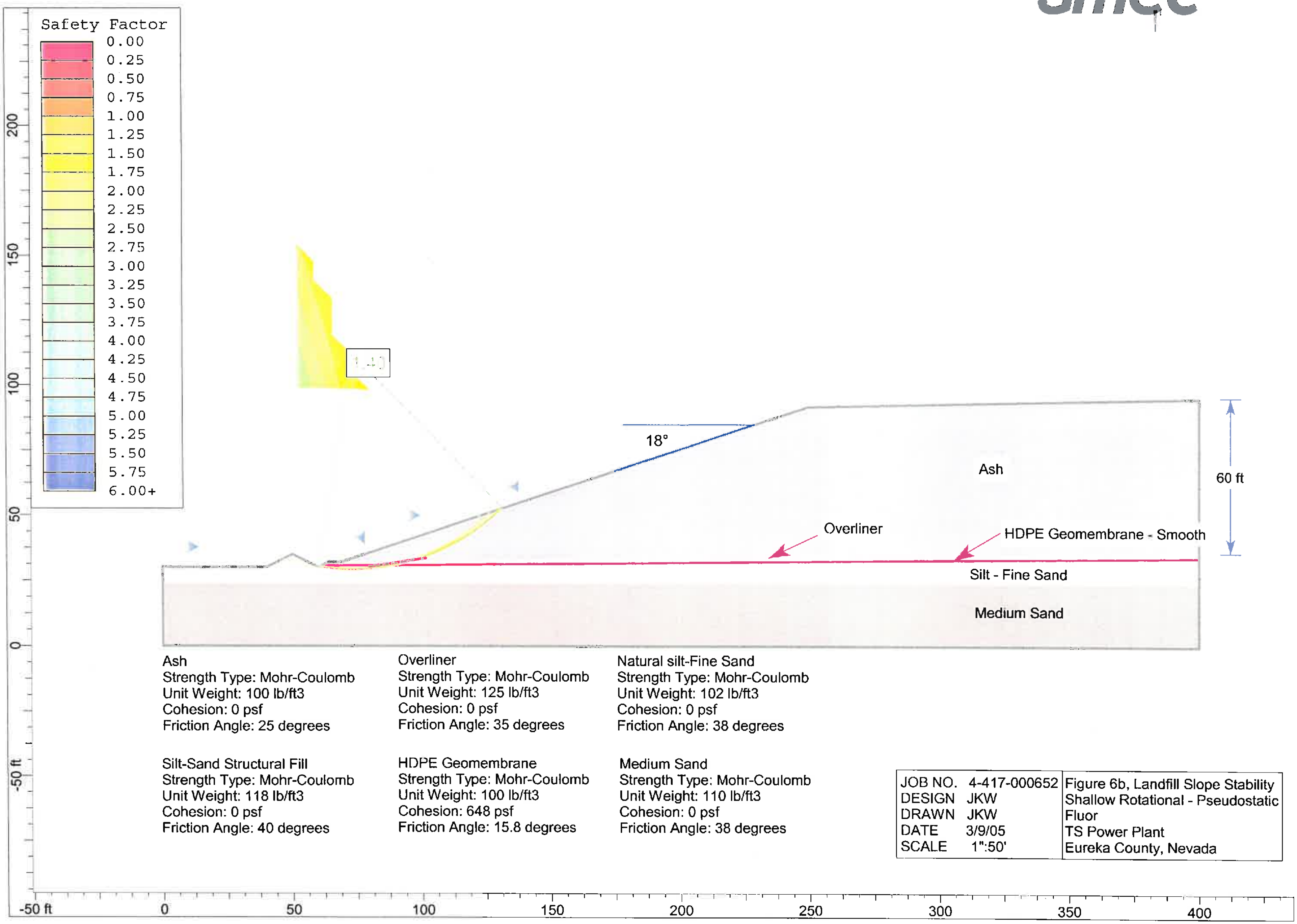
Natural silt-Fine Sand
Strength Type: Mohr-Coulomb
Unit Weight: 102 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees

Silt-Sand Structural Fill
Strength Type: Mohr-Coulomb
Unit Weight: 118 lb/ft3
Cohesion: 0 psf
Friction Angle: 40 degrees

HDPE Geomembrane
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 648 psf
Friction Angle: 15.8 degrees

Medium Sand
Strength Type: Mohr-Coulomb
Unit Weight: 110 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees

JOB NO.	4-417-000652	Figure 6a, Landfill Slope Stability
DESIGN	JKW	Shallow Rotational - Static
DRAWN	JKW	Fluor
DATE	3/9/05	TS Power Plant
SCALE	1":50'	Eureka County, Nevada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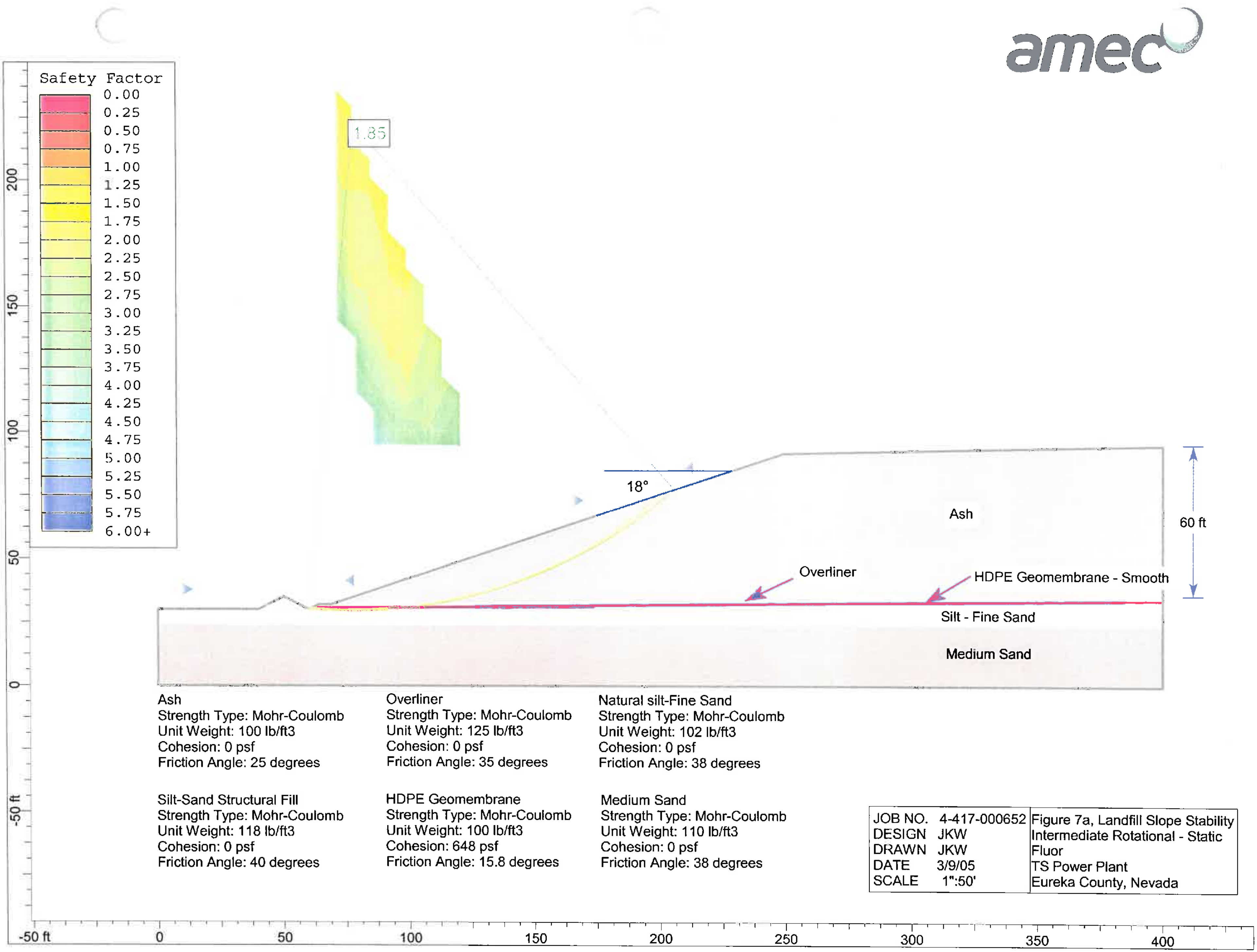
3.25
3.50
3.75
4.00
4.25
4.50
4.75
5.00
5.25
5.50
5.75
6.00+
18°
Ash
60 ft
Overliner
HDPE Geomembrane - Smooth
Silt - Fine Sand
Medium Sand
Ash
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 25 degrees
Overliner
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Natural silt-Fine Sand
Strength Type: Mohr-Coulomb
Unit Weight: 102 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Silt-Sand Structural Fill
Strength Type: Mohr-Coulomb
Unit Weight: 118 lb/ft3
Cohesion: 0 psf
Friction Angle: 40 degrees
HDPE Geomembrane
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 648 psf
Friction Angle: 15.8 degrees
Medium Sand
Strength Type: Mohr-Coulomb
Unit Weight: 110 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
JOB NO. 4-417-000652
DESIGN JKW
DRAWN JKW
DATE 3/9/05
SCALE 1":50'
Figure 6b, Landfill Slope Stability
Shallow Rotational - Pseudostatic
Fluor
TS Power Plant
Eureka County, Nevada
-50 ft
0
50
100
150
200
250
300
350
400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1.50
1.75
2.00
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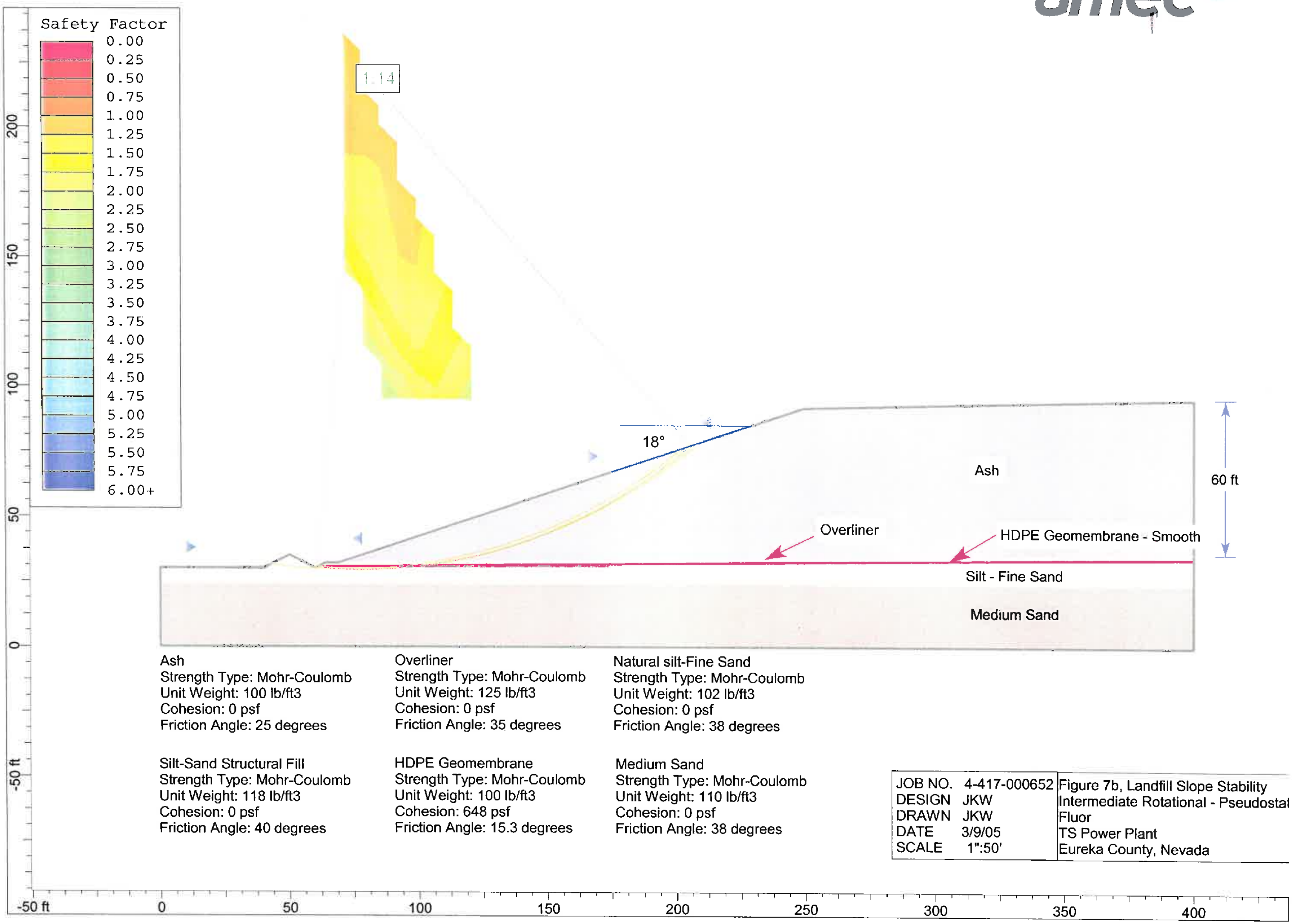
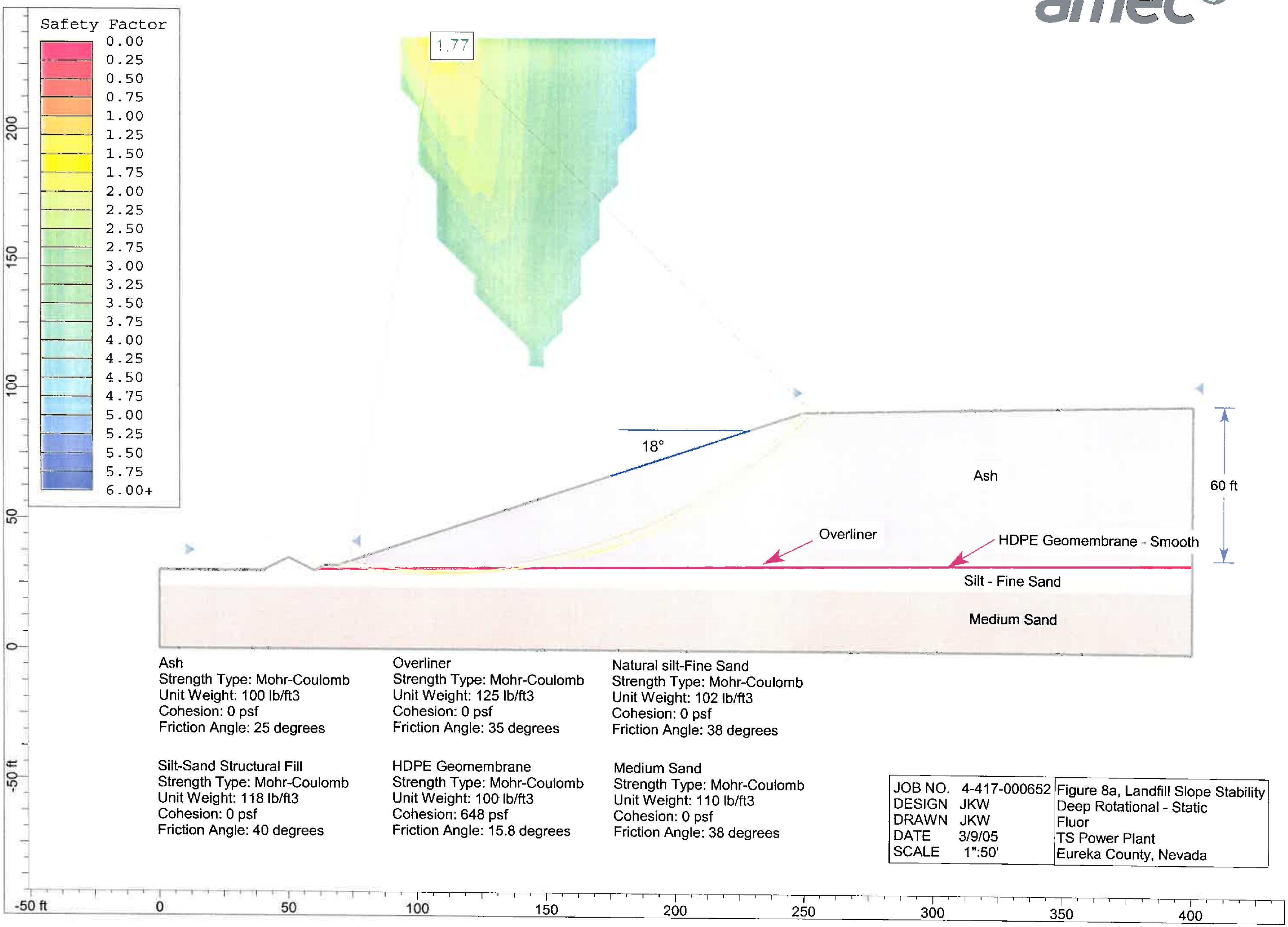
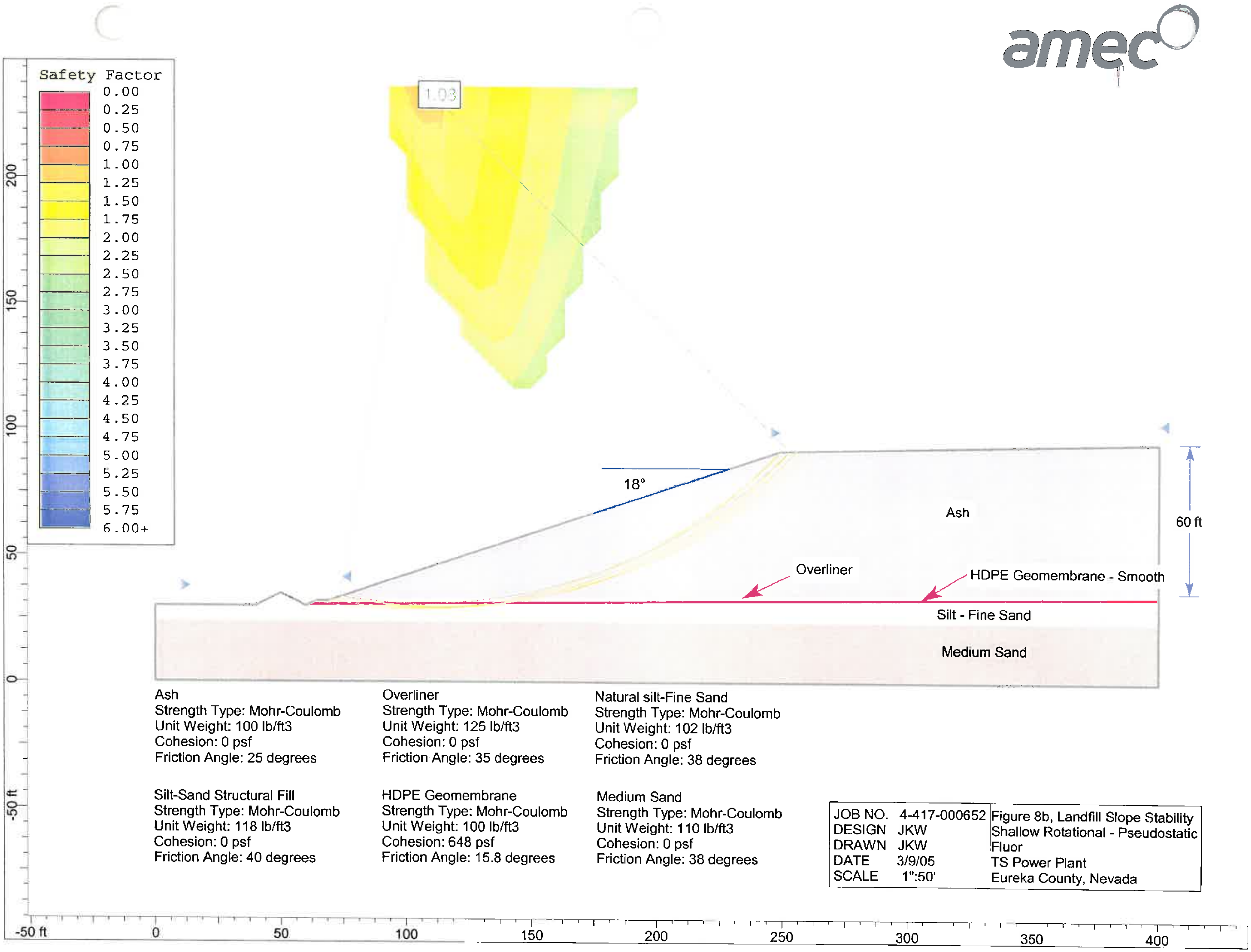
3.00
3.25
3.50
3.75
4.00
4.25
4.50
4.75
5.00
5.25
5.50
5.75
6.00+
1.85
18°
60 ft
Ash
Overliner
HDPE Geomembrane - Smooth
Silt - Fine Sand
Medium Sand
Ash
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 25 degrees
Overliner
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Natural silt-Fine Sand
Strength Type: Mohr-Coulomb
Unit Weight: 102 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Silt-Sand Structural Fill
Strength Type: Mohr-Coulomb
Unit Weight: 118 lb/ft3
Cohesion: 0 psf
Friction Angle: 40 degrees
HDPE Geomembrane
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 648 psf
Friction Angle: 15.8 degrees
Medium Sand
Strength Type: Mohr-Coulomb
Unit Weight: 110 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
JOB NO. 4-417-000652
DESIGN JKW
DRAWN JKW
DATE 3/9/05
SCALE 1":50'
Figure 7a, Landfill Slope Stability
Intermediate Rotational - Static
Fluor
TS Power Plant
Eureka County, Nevada
-50 ft
0
50
100
150
200
250
300
350
400



JOB NO.	4-417-000652	Figure 7b, Landfill Slope Stability
DESIGN	JKW	Intermediate Rotational - Pseudostat
DRAWN	JKW	Fluor
DATE	3/9/05	TS Power Plant
SCALE	1":50'	Eureka County, Nevada



JOB NO.	4-417-000652	Figure 8a, Landfill Slope Stability
DESIGN	JKW	Deep Rotational - Static
DRAWN	JKW	Fluor
DATE	3/9/05	TS Power Plant
SCALE	1":50'	Eureka County, Nevada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0.75
1.00
1.25
1.50
1.75
2.00
2.25
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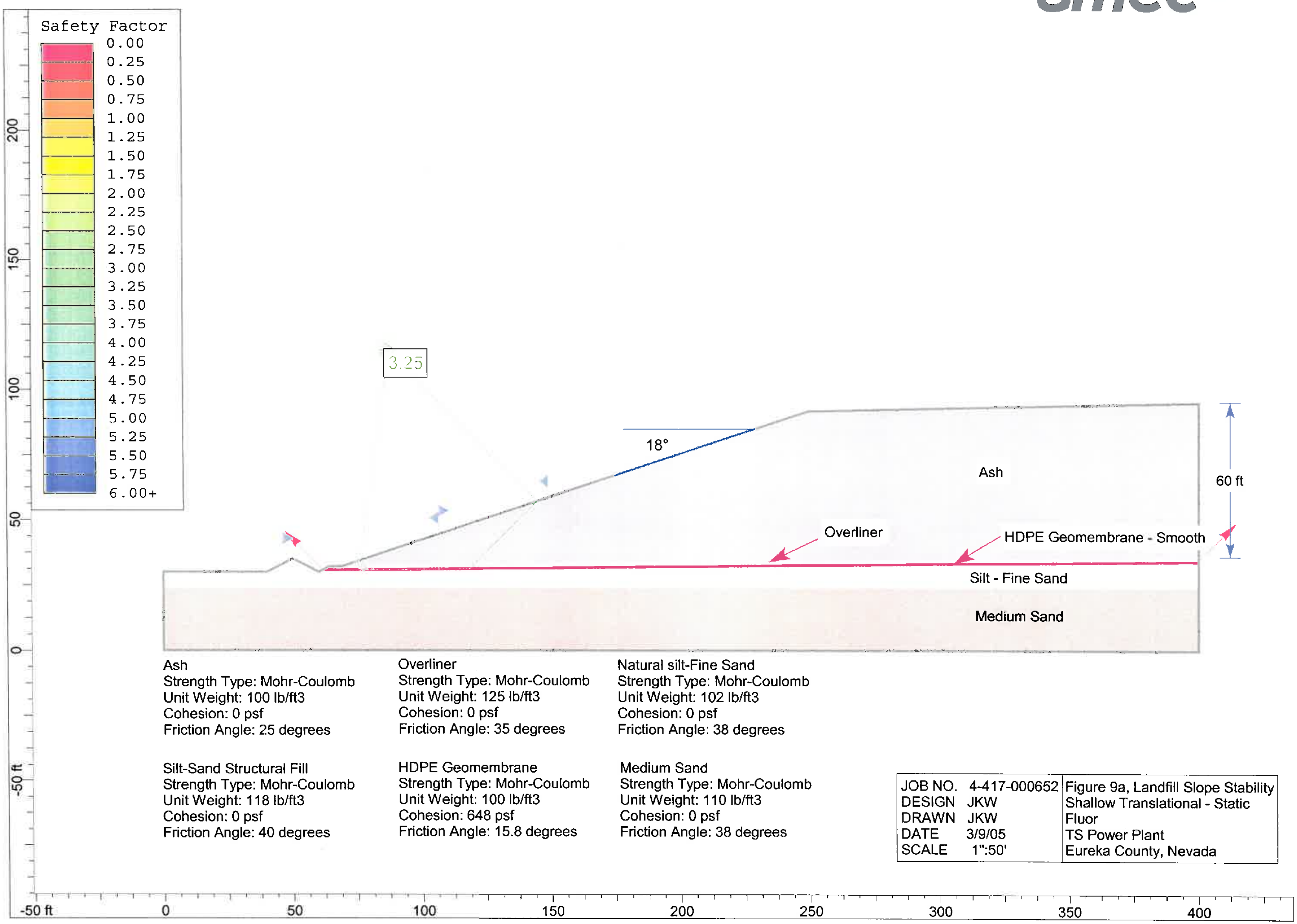
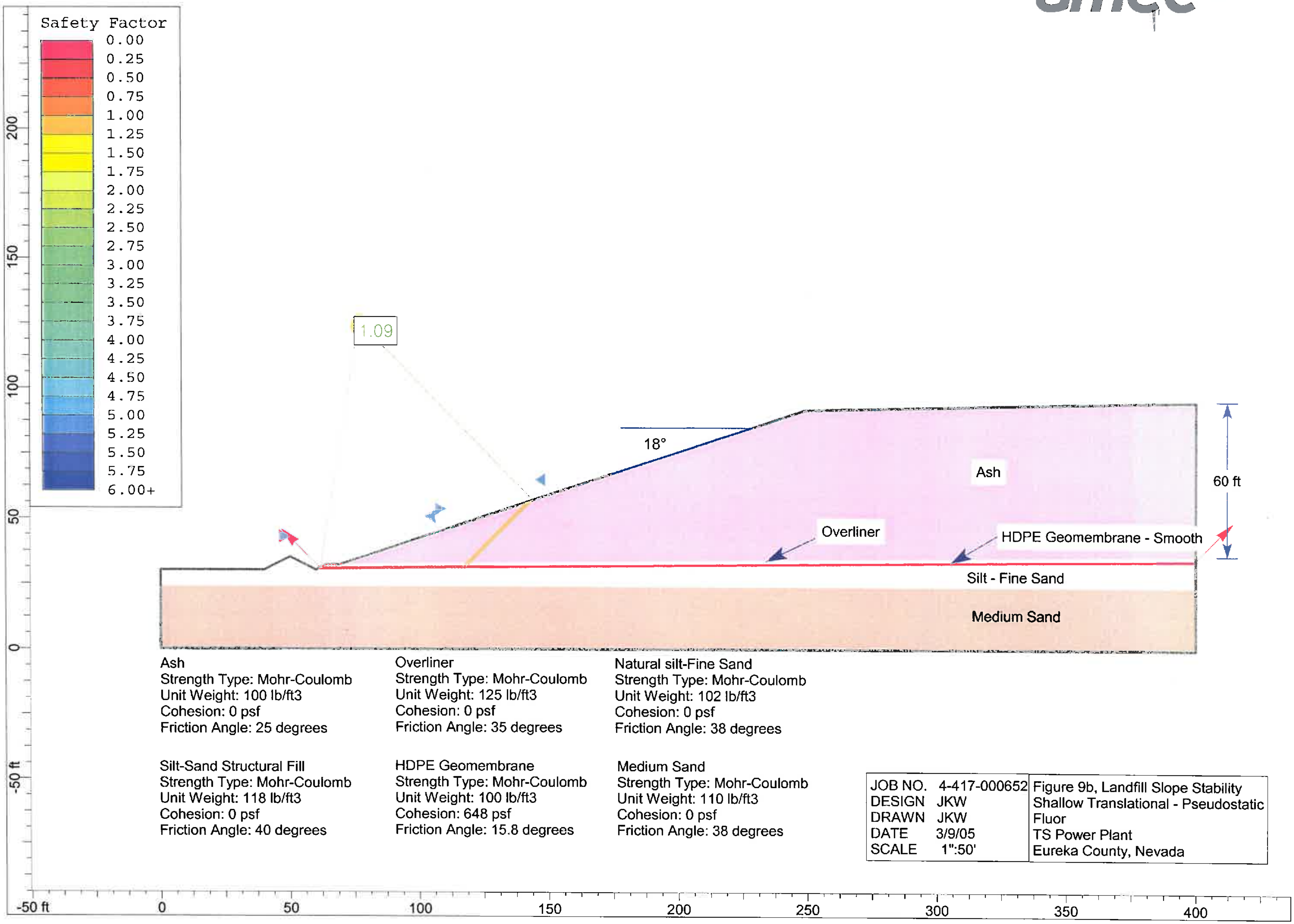
2.75
3.00
3.25
3.50
3.75
4.00
4.25
4.50
4.75
5.00
5.25
5.50
5.75
6.00+
1.03
18°
Ash
60 ft
Overliner
HDPE Geomembrane - Smooth
Silt - Fine Sand
Medium Sand
Ash
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 25 degrees
Overliner
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Natural silt-Fine Sand
Strength Type: Mohr-Coulomb
Unit Weight: 102 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Silt-Sand Structural Fill
Strength Type: Mohr-Coulomb
Unit Weight: 118 lb/ft3
Cohesion: 0 psf
Friction Angle: 40 degrees
HDPE Geomembrane
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 648 psf
Friction Angle: 15.8 degrees
Medium Sand
Strength Type: Mohr-Coulomb
Unit Weight: 110 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
JOB NO. 4-417-000652
DESIGN JKW
DRAWN JKW
DATE 3/9/05
SCALE 1":50'
Figure 8b, Landfill Slope Stability
Shallow Rotational - Pseudostatic
Fluor
TS Power Plant
Eureka County, Nevada
-50 ft
0
50
100
150
200
250
300
350
400



JOB NO.	4-417-000652	Figure 9a, Landfill Slope Stability
DESIGN	JKW	Shallow Translational - Static
DRAWN	JKW	Fluor
DATE	3/9/05	TS Power Plant
SCALE	1":50'	Eureka County, Nevada



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1.50
1.75
2.00
2.25
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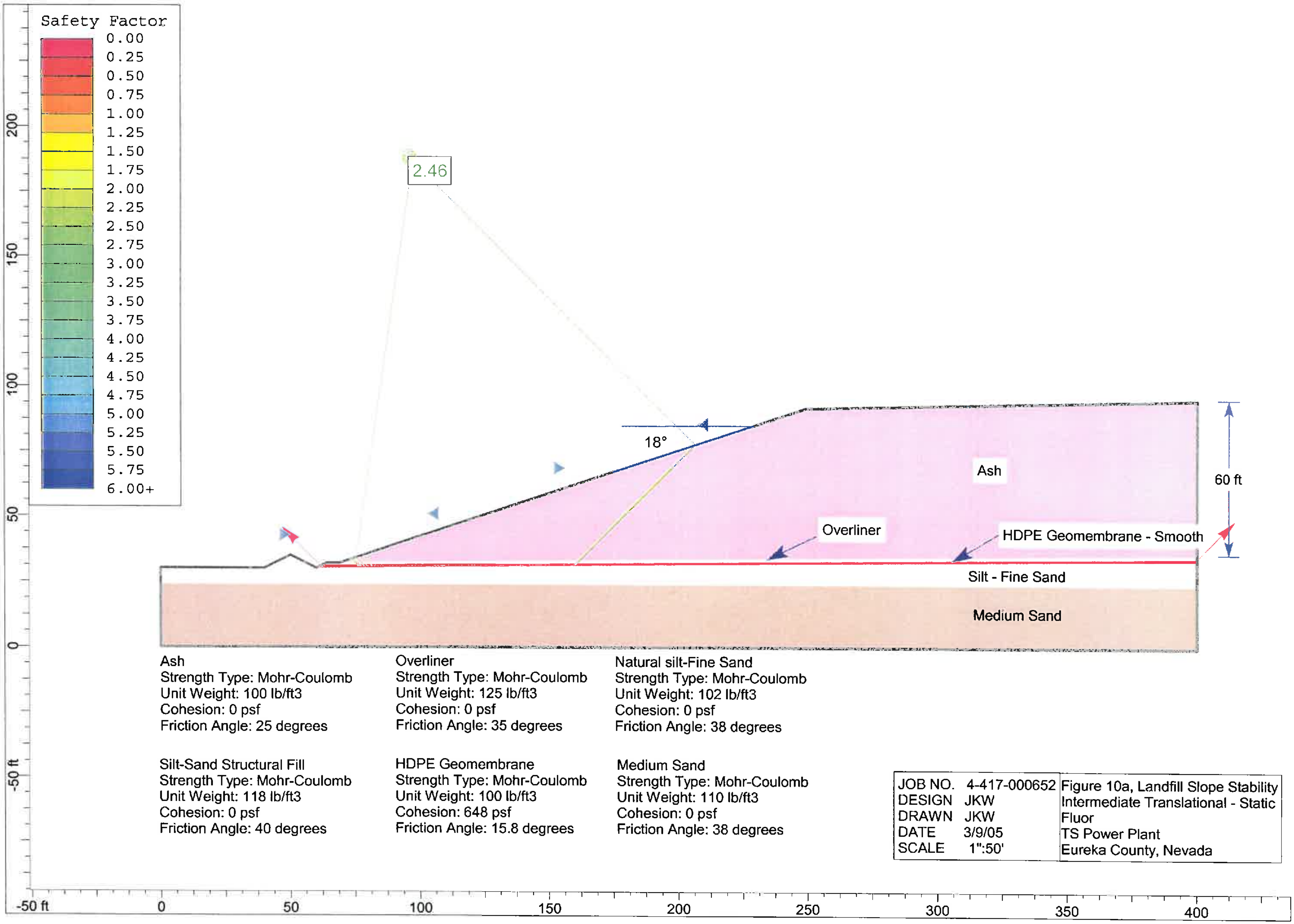
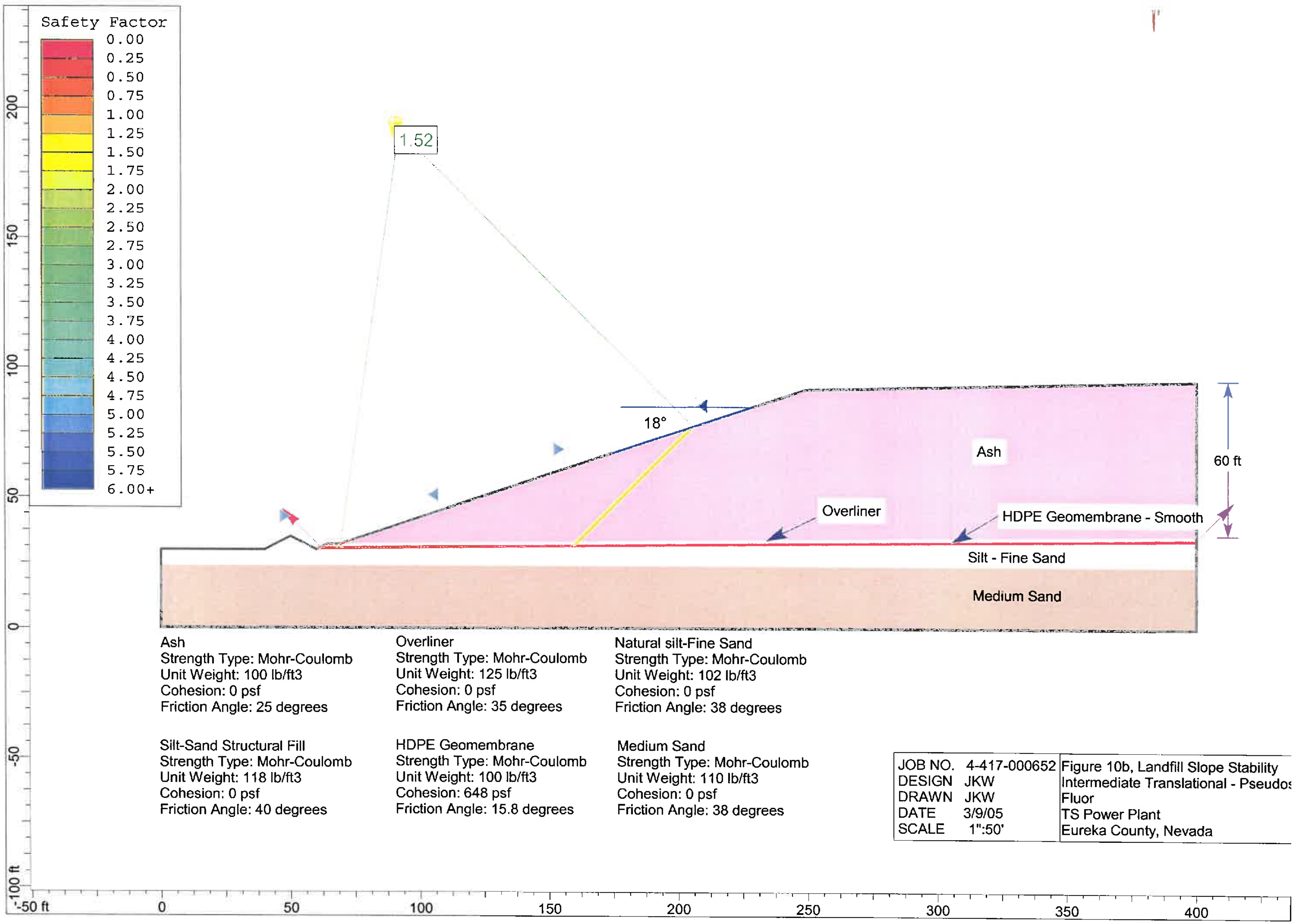
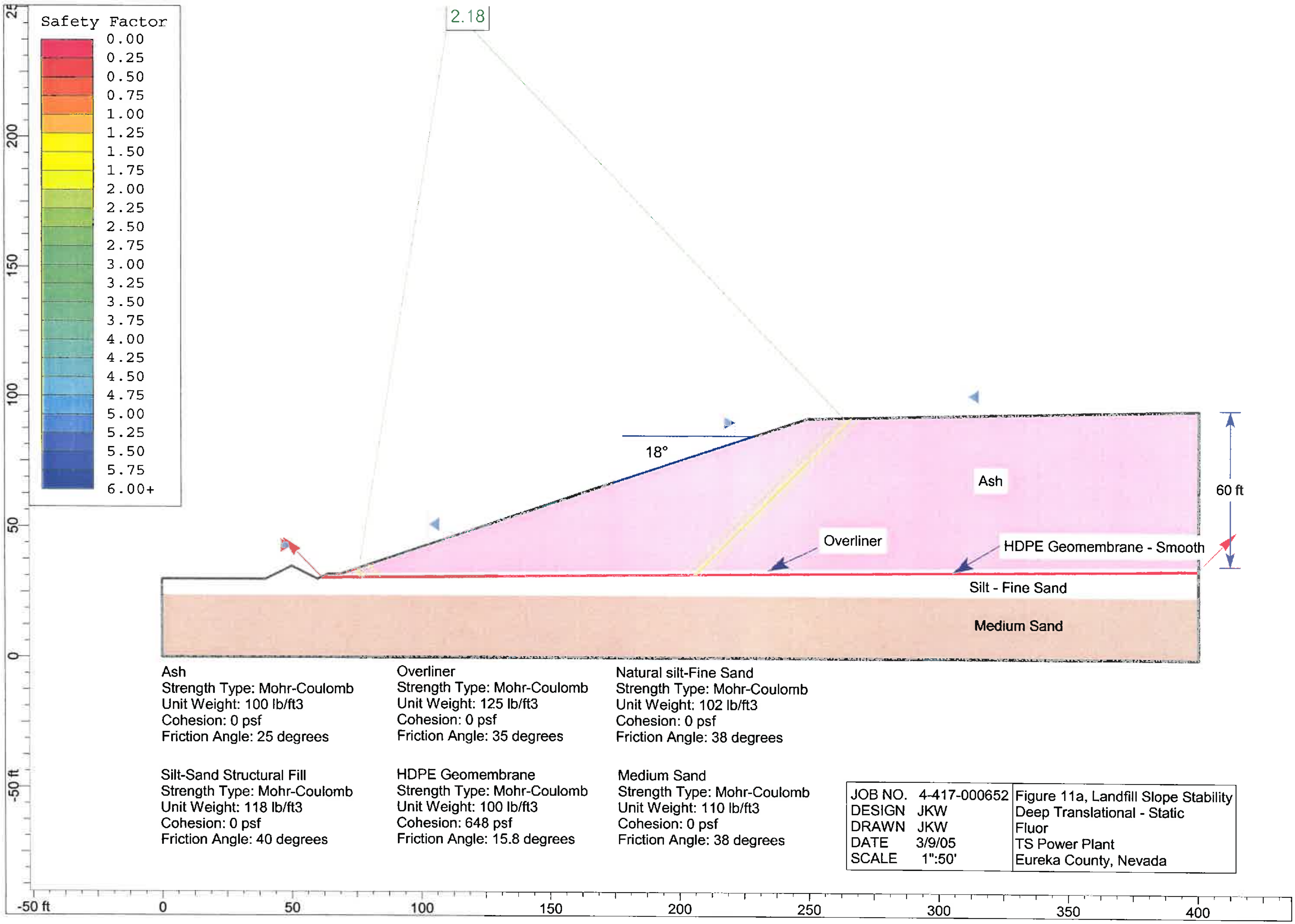
3.25
3.50
3.75
4.00
4.25
4.50
4.75
5.00
5.25
5.50
5.75
6.00+
1.09
18°
Ash
60 ft
Overliner
HDPE Geomembrane - Smooth
Silt - Fine Sand
Medium Sand
Ash
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 25 degrees
Overliner
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Natural silt-Fine Sand
Strength Type: Mohr-Coulomb
Unit Weight: 102 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Silt-Sand Structural Fill
Strength Type: Mohr-Coulomb
Unit Weight: 118 lb/ft3
Cohesion: 0 psf
Friction Angle: 40 degrees
HDPE Geomembrane
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 648 psf
Friction Angle: 15.8 degrees
Medium Sand
Strength Type: Mohr-Coulomb
Unit Weight: 110 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
JOB NO. 4-417-000652
DESIGN JKW
DRAWN JKW
DATE 3/9/05
SCALE 1":50'
Figure 9b, Landfill Slope Stability
Shallow Translational - Pseudostatic
Fluor
TS Power Plant
Eureka County, Nevada
-50 ft
0
50
100
150
200
250
300
350
400
200
150
100
50
0
-50 ft



JOB NO.	4-417-000652	Figure 10a, Landfill Slope Stability
DESIGN	JKW	Intermediate Translational - Static
DRAWN	JKW	Fluor
DATE	3/9/05	TS Power Plant
SCALE	1":50'	Eureka County, Nevada



JOB NO.	4-417-000652	Figure 10b, Landfill Slope Stability
DESIGN	JKW	Intermediate Translational - Pseudos
DRAWN	JKW	Fluor
DATE	3/9/05	TS Power Plant
SCALE	1":50'	Eureka County, Nevada



Safety Factor
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0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
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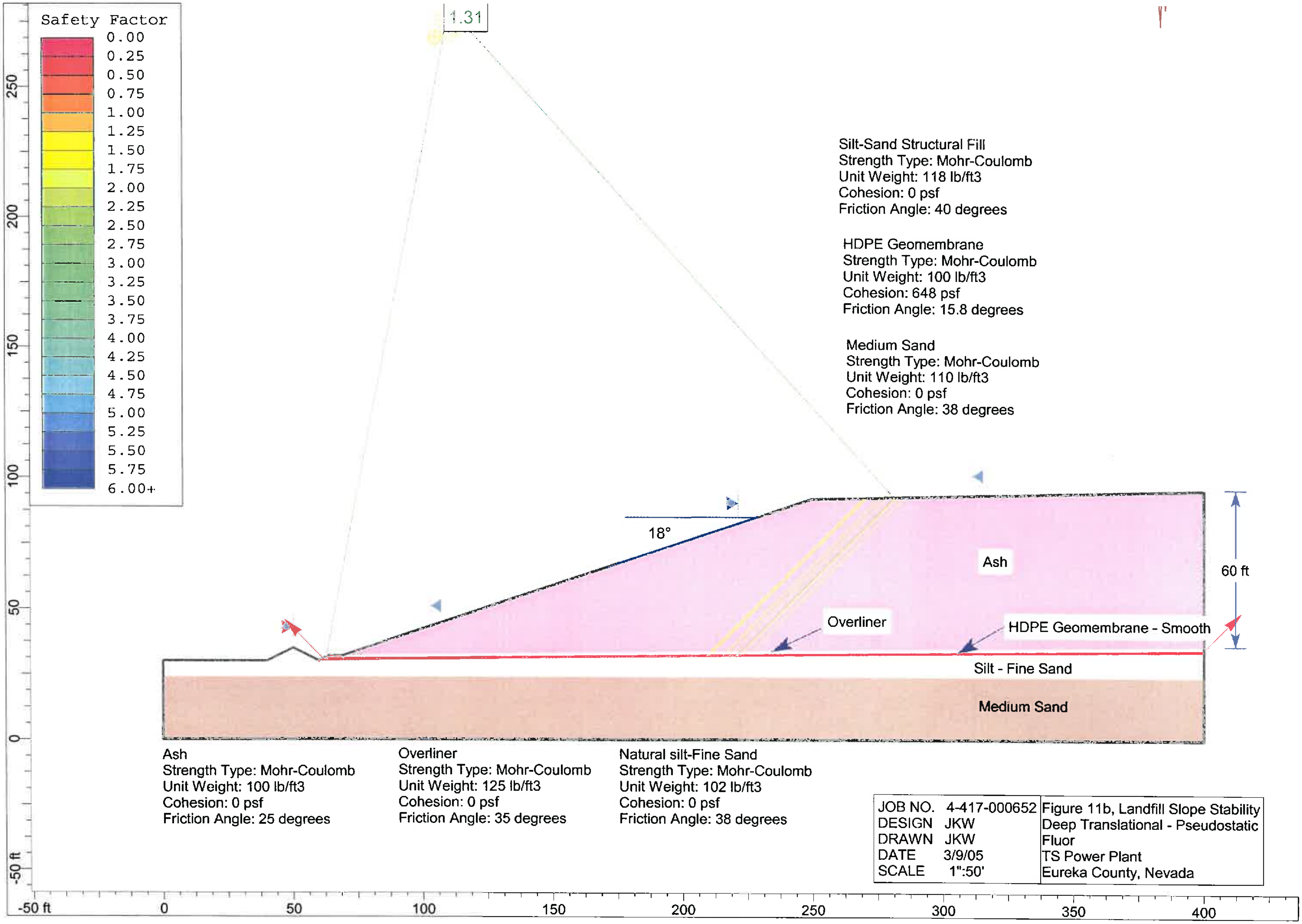
3.00
3.25
3.50
3.75
4.00
4.25
4.50
4.75
5.00
5.25
5.50
5.75
6.00+
2.18
18°
Ash
60 ft
Overliner
HDPE Geomembrane - Smooth
Silt - Fine Sand
Medium Sand
Ash
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 25 degrees
Overliner
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Natural silt-Fine Sand
Strength Type: Mohr-Coulomb
Unit Weight: 102 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Silt-Sand Structural Fill
Strength Type: Mohr-Coulomb
Unit Weight: 118 lb/ft3
Cohesion: 0 psf
Friction Angle: 40 degrees
HDPE Geomembrane
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 648 psf
Friction Angle: 15.8 degrees
Medium Sand
Strength Type: Mohr-Coulomb
Unit Weight: 110 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
JOB NO. 4-417-000652
DESIGN JKW
DRAWN JKW
DATE 3/9/05
SCALE 1":50'
Figure 11a, Landfill Slope Stability
Deep Translational - Static
Fluor
TS Power Plant
Eureka County, Nevada
-50 ft
0
50
100
150
200
250
300
350
400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1.00
1.25
1.50
1.75
2.00
2.25
2.50
2.75
3.00
3.25
3.50
3.75
4.00
4.25
4.50
4.75
5.00
5.25
5.50
5.75
6.00+
1.31
Silt-Sand Structural Fill
Strength Type: Mohr-Coulomb
Unit Weight: 118 lb/ft3
Cohesion: 0 psf
Friction Angle: 40 degrees
HDPE Geomembrane
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 648 psf
Friction Angle: 15.8 degrees
Medium Sand
Strength Type: Mohr-Coulomb
Unit Weight: 110 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
18°
Ash
60 ft
Overliner
HDPE Geomembrane - Smooth
Silt - Fine Sand
Medium Sand
Ash
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 25 degrees
Overliner
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Natural silt-Fine Sand
Strength Type: Mohr-Coulomb
Unit Weight: 102 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
JOB NO. 4-417-000652
DESIGN JKW
DRAWN JKW
DATE 3/9/05
SCALE 1":50'
Figure 11b, Landfill Slope Stability
Deep Translational - Pseudostatic
Fluor
TS Power Plant
Eureka County, Nevada
250
200
150
100
50
0
-50 ft
-50 ft
0
50
100
150
200
250
300
350
400