FINAL COMPLETION REPORT FOR SANDIA CANYON DRILLING PROGRAM 2006 LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NEW MEXICO PROJECT NO. 73885

Prepared for:

The US Department of Energy and the
National Nuclear Security Administration through the
US Army Corps of Engineers
Sacramento District

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LIST OF ACRONYMS AND ABBREVIATIONS

Amsl	above mean sea level
bgs	below ground surface
°C	degrees Celsius
C	drill cuttings
CS	continuous sampler with split spoon
DOE	US Department of Energy
ft	foot/feet
gal.	gallon/gallons
hrs	hours
HSA	hollow stem auger
ID	inside diameter
in.	inch/inches
Kleinfelder	Kleinfelder, Inc.
LANL	Los Alamos National Laboratory
mm	millimeter/millimeters
NA	not applicable
NR	no recovery
NTUs	nephelometric turbidity units
OD	outside diameter
P&A	plugged and abandoned
Qal	Quaternary alluvium
Qbt 1g	Tshirege Member of the Bandelier Tuff, Unit 1g
Qbo	Otowi Member of the Bandelier Tuff
Qbog	Guaje Pumice Bed of the Otowi Member of the Bandelier Tuff
Qct	Cerro Toledo interval
SCA	Sandia Canyon alluvial well
SCC	Sandia Canyon corehole
SCP	Sandia Canyon piezometer
T	Shelby Tube in pitcher sampler
TD	total depth
TOC	total organic carbon
Tb4	Cerros del Rio basalt
Tpf	Puye Formation
µS/cm	microSiemens per centimeter
WCSF	Waste Characterization Strategy Form

1.0 INTRODUCTION

This report presents summary completion data for five wells, five piezometers and six coreholes drilled to characterize hydraulic properties and the spatial distribution of chromium in perched alluvial and intermediate groundwater in Sandia Canyon. The wells, piezometers and coreholes were drilled as part of the Interim Measures Investigation for Chromium Contamination in Groundwater at Los Alamos National Laboratory (LANL or the Laboratory).

The work summarized herein was conducted in accordance with the "Interim Measures Work Plan for Chromium Contamination in Groundwater," (LANL 2006, 91987), hereafter called the Work Plan, and the "Final Drilling Plan for Sandia Canyon Drilling Program," (Kleinfelder 2006), hereafter called the Drilling Plan. The U.S. Army Corps of Engineers contracted Kleinfelder, Inc. (Kleinfelder) to conduct the drilling program for the U.S. Department of Energy; LANL scientists provided technical assistance and oversight.

Figure 1.0-1 shows Sandia Canyon and the locations of the alluvial wells (SCA designations), piezometers (SCP designations), and coreholes (SCC designations) described in this report. One corehole, SCC-1, was converted to a well that is called SCI (Sandia Canyon Intermediate)-1. Note that a separate LANL investigation report will present the results of chemical analyses and hydrologic data obtained in this investigation.

The format for this report is as follows:

- Introduction
- SCA Wells
- SCP Piezometers
- SCC Coreholes
- Appendices.

For each well, piezometer or corehole, a brief narrative and summary table are provided to describe the drilling details and construction or abandonment information, as applicable. In addition, a combined schematic and lithologic log are included for each well, piezometer or corehole in the form of a gINT© chart.

The appendices include:

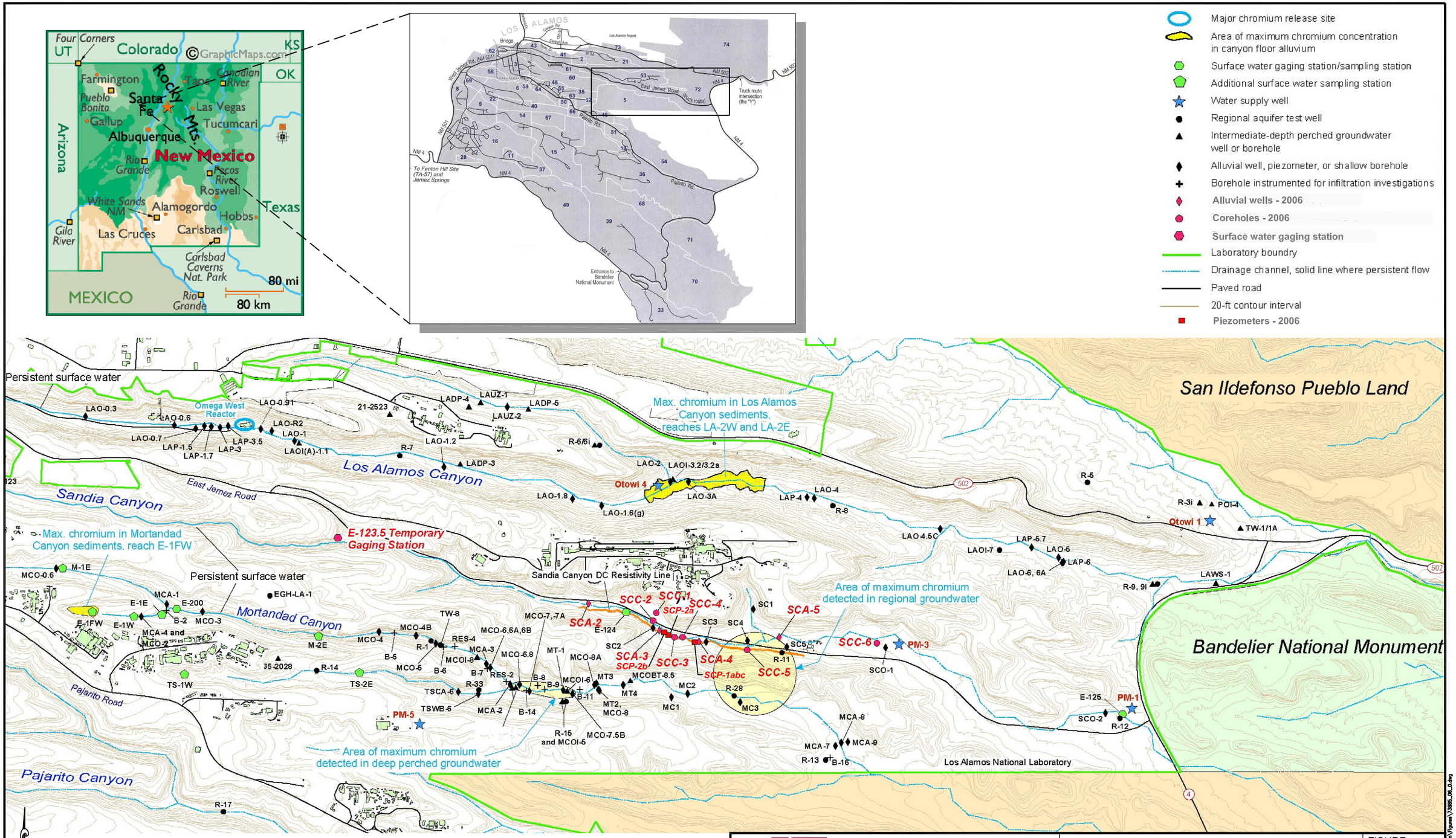
Appendix A – Samples Collected Tables

Appendix B – Hydrologic Test Results

Appendix C – Survey Data

Appendix D – Deviations Table

Appendix E – Waste Characterization Sampling



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Drawn By: D. Tideman	Date: August 2006
Project No.: 73885	Filename: 73885_06_0.dwg
Scale: 1" = 2000'	Revision: –

SITE LOCATION MAP
Sandia Canyon Drilling Program - 2006
Los Alamos National Laboratory
Los Alamos, New Mexico

FIGURE
1.0-1

2.0 SCA WELLS

The LANL Work Plan called for five alluvial wells to be installed in Sandia Canyon in order to:

- constrain the extent of alluvial saturation,
- determine the nature and extent of chromium within alluvial groundwater, and
- obtain data to calculate chromium inventories.

General drilling goals were outlined in the LANL Work Plan and refined in the Kleinfelder Drilling Plan, with input from LANL scientists.

The five wells were successfully installed in Sandia Canyon; SCA-1 was installed in upper Sandia Canyon and the remaining four wells, SCA-2, SCA-3, SCA-4 and SCA-5, were installed in lower Sandia Canyon. Per the Drilling Plan, core and groundwater samples were not collected at the alluvial wells. Additionally, geophysical logging was not planned in the shallow alluvial wells. A summary table of alluvial well deviations from the Work Plan and the Drilling Plan is provided in Appendix D; individual well deviations are described in the following writeups.

Two of the five alluvial wells, SCA-2 and SCA-3, contain low volumes of water. Consequently, well development has not been completed at SCA-2; the water level is being monitored and the well is developed whenever sufficient water is present. SCA-3 was developed, but subsequently there has not been enough water to conduct a slug test; the water level is also being monitored in this well.

2.1 SCA-1

SCA-1 was hand-augered on August 25, 2006 in a wetlands area in Reach S-2 of upper Sandia Canyon (Figure 1.0-1). The hole was augered to 2.2 feet below ground surface (ft bgs) and was completed with a screened interval between 1.3 and 1.9 ft bgs. Per the Drilling Plan, the target depth for SCA-1 was 5 ft bgs; however, hand augering became difficult at 2.2 ft bgs and project management decided to terminate the boring at that point.

Water was present at ground surface during drilling and was measured at 0.02 ft bgs in the completed well on September 1, 2006. Well development is complete with a final turbidity reading of 6.0 nephelometric turbidity units (NTUs), and a slug test was performed. Per the Drilling Plan, core and groundwater samples were not collected at SCA-1 during drilling. After drilling, a gravel pad, approximately 0.9-ft thick, was placed around the well head.

Summary data regarding drilling, well construction, well development and slug testing are presented in Table 2.1-1. Figure 2.1-1 shows the lithologic log and construction schematic for the well. The appendices present the slug test results, survey data, drilling program deviations and a summary of waste characterization activities.

Table 2.1-1 Summary Data for SCA-1

SCA-1	
DRILLING	
Date drilled	8/25/06
Method	Hand auger
Hole diameter (in.)	4
Core diameter (in.)	NA
Sample method	NA
Borehole TD (ft bgs)	2.2
WELL CONSTRUCTION	
Date completed	8/25/06
Casing ID/OD (in.)	2/2.3
Screen ID/OD (in.)	2/2.8
Screen type	Prepack
Screened interval (ft bgs)	1.3-1.9
Slot size (in.)	0.01
Sand size	10/20 in annulus; 20/40 in prepack
Casing TD (ft bgs)	2.1
STRATIGRAPHY	
Depth (ft bgs)	Qal: 0-2.2
WELL DEVELOPMENT	
Total volume purged (gal.)	3.6
Final pH	6.7
Final temperature (°C)	16.1
Final conductivity (µS/cm)	464
Final turbidity (NTUs)	6
SLUG TEST	9/01/06
DEPTH TO WATER (ft bgs)	0.02 (9/01/06)
FINAL STATUS	Well

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Sheet 1 of 1

Date	Started: 8/25/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCA-1
	Completed: 8/25/2006	Rig Type: Hand Auger	Logged By: Courtney Vallejo	TD Borehole: 2.2 ft
Northing: 1773264.37		Easting: 1622482.87	Location ID: None	TD Casing: 2.1 ft

ELEVATIONS:
Ground Surface: 7211.22
Brass Cap: NA
Casing: 7215.12

Saturation

Depth (ft)	Saturation Level	Date
0.0	Top	8/25/2006
Not observed	Bottom	8/25/2006

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
▼	0	Qal		AUGER	No Samples Analyzed		QUATERNARY ALLUVIUM - SILT (ML) - grayish olive green (5GY 3/2), Composed of 100% fines, with abundant decomposed vegetation and fibrous organics. Wet.	Bentonite chips; 2.3" OD PVC; 0.8 ft; 10/20 Sand; 1.3 ft; 0.01" screen prepack 2.8" OD; 1.9 ft; 2.1 ft bgs; Slough; TD = 2.2 ft
	1							
	2						2.0' SANDY SILT (MLS) - grayish olive green (5GY 3/2), 5-10% sand, predominantly quartz and sanidine (clear, fine to coarse, subangular to rounded). Wet. 2.2'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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2.2 SCA-2

SCA-2 was hand-drilled with a power auger on August 24, 2006 in lower Sandia Canyon (Figure 1.0-1). The hole was augered to 19 ft bgs and was completed with a screened interval between 10.3 and 15 ft bgs. Per the Drilling Plan, the target depth for SCA-2 was 20 ft bgs; however, at approximately 16 ft bgs the bottom of the hole began sloughing and project management decided to terminate the boring at 19 ft bgs.

Alluvial groundwater was encountered during drilling at 11.9 ft bgs and was present to the total depth of the borehole. It was measured in the completed well at 14.36 ft bgs on October 1, 2006, which represents a standing water column of approximately 1.4 ft. The well was bailed dry after approximately 0.6 gallon (gal.) of water was removed. Consequently, well development and slug testing could not be performed on this well. Per the Drilling Plan, core and groundwater samples were not collected at SCA-2 during drilling.

Summary data regarding drilling, construction and well development are presented in Table 2.2-1. Figure 2.2-1 shows the lithologic log and construction schematic for the well. The appendices present the survey data, drilling program deviations and a summary of waste characterization activities.

Table 2.2-1 - Summary Data for SCA-2

SCA-2	
DRILLING	
Dates drilled	8/24/06
Method	Hand auger
Hole diameter (in.)	4
Core diameter (in.)	NA
Sample method	Hand auger
Borehole TD (ft bgs)	19
WELL CONSTRUCTION	
Date completed	8/24/06
Casing ID/OD (in.)	2/2.3
Screen ID/OD (in.)	2/2.8
Screened interval (ft bgs)	10.3 – 15
Slot size (in.)	0.01
Sand size	10/20 in annulus; 20/40 in prepack
Casing TD (ft bgs)	15.6
STRATIGRAPHY	
Depth (ft bgs)	Qal: 0–19
WELL DEVELOPMENT	
Total volume purged to date (gal.)	0.6
Final pH	6.6
Final temperature (°C)	Not measured
Final conductivity (µS/cm)	Not measured
Final turbidity (NTUs)	239
SLUG TEST	Too little water
DEPTH TO WATER (ft bgs)	14.36 (10/01/06)
FINAL STATUS	Well

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Sheet 1 of 1

Date	Started: 8/24/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCA-2
	Completed: 8/24/2006	Rig Type: Hand Auger	Logged By: Courtney Vallejo	TD Borehole: 19 ft
Northing: 1770282.78		Easting: 1636115.02	Location ID: None	TD Casing: 15.6 ft

ELEVATIONS:
Ground Surface: 6748.56
Brass Cap: 6749.08
Casing: 6751.65

Saturation

Depth (ft)	Saturation Level	Date
11.9	Top	8/24/2006
Not observed	Bottom	8/24/2006

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	0	Qal		AUGER	No Samples Analyzed		QUATERNARY ALLUVIUM - SILTY SAND (SM) - dusky yellowish brown (10YR 2/2), moderately to well sorted, non-indurated. Composed of 65% sands, predominantly quartz and sanidine (clear, fine to coarse, subangular to rounded); 30% fines (silt); 5% gravels, intermediate volcanic clasts (2 to 30 mm, occasionally up to 80 mm, rounded) and tuff fragments (orange 2-20 mm, rounded). Damp.	Cement 2.3" OD PVC 2.8 ft
	5						GRAVELLY SAND (SG) - moderate yellowish brown to dark yellowish brown (10YR 5/4 to 10YR 4/2), moderately to well sorted, non-indurated. Composed of 50-60% sand, predominantly quartz and sanidine (clear, fine to coarse, subangular to rounded); 40-50% gravel, intermediate volcanic clasts (2 to 30 mm, occasionally up to 80 mm, rounded) and tuff fragments (orange 2-20 mm, rounded); trace fines (clay to silt). Damp.	Bentonite chips 9.5 ft 10/20 Sand 10.3 ft
▼	10						SILTY/CLAYEY SAND (SC-SM) - dusky yellowish brown (10YR 2/2), moderately to well sorted, non-indurated. Composed of 30-40% sand, predominantly quartz and sanidine (clear, fine to coarse, subangular to rounded); 30-40% silt/clay; 10-20% gravel, intermediate volcanic clasts (2 to 30 mm, occasionally up to 80 mm, rounded) and tuff fragments (orange 2-20 mm, rounded). Wet.	0.01" screen prepack 2.8" OD 15.0 ft
	15						SANDY CLAY (CL) - dusky yellowish brown (10YR 2/2), moderately sorted, non-indurated. Composed of 5-10% gravels, intermediate volcanic clasts (2 to 10 mm, rounded) and tuff fragments (orange, 2-10 mm, rounded); 20-30% sands, predominantly quartz and sanidine (clear, fine to coarse, subangular to rounded); 60-75% fines (clay, moderate to high plasticity). Wet.	15.6 ft 16 ft Slough TD = 19 ft

5.0' 11.2' 15.0' 19.0'

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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2.3 SCA-3

SCA-3 was drilled on September 9, 2006 in lower Sandia Canyon (Figure 1.0-1). During drilling, flowing silt and sand began entering the augers at approximately 30 ft bgs, and at approximately 43.5 ft bgs flowing sand locked the core barrel inside the auger flights. At the direction of project management, drilling was terminated at 53.5 ft bgs without reaching bedrock because of the drilling difficulties. SCA-3 was offset approximately 15 ft to the east and drilled to 58.5 ft bgs with a wooden plug at the tip of the augers. A well was then installed with a screened interval between 27.6 and 32 ft bgs.

Water was encountered at 30.6 ft bgs during drilling and was present to the borehole total depth. It was measured in the completed well at 32.10 ft bgs on October 1, 2006. The well was developed by bailing for 8 hours (hrs) with a final turbidity reading of 16.5 NTUs. Following development, a slug test could not be conducted because of the small amount of water in the well (0.5 ft); a transducer was installed on October 1, 2006 to monitor recharge.

Summary data regarding drilling, construction and well development are presented in Table 2.3-1. Figure 2.3-1 shows the lithologic log and construction schematic for the well. The appendices present the survey data, drilling program deviations and a summary of waste characterization activities.

Table 2.3-1 Summary Data for SCA-3

SCA-3	
DRILLING	
Dates drilled	9/09/06
Method	HSA
Hole diameter (in.)	8
Core diameter (in.)	2.5
Sample method	C/CS
Borehole TD (ft bgs)	58.5
WELL CONSTRUCTION	
Date completed	9/09/06
Casing ID/OD (in.)	2/2.3
Screen ID/OD (in.)	2/2.8
Screened interval (ft bgs)	27.6 to 32
Slot size (in.)	0.01
Sand size	10/20 in annulus; 20/40 in prepack
Casing TD (ft bgs)	32.6
STRATIGRAPHY	
Depth (ft bgs)	Qal: 0–58.5
WELL DEVELOPMENT	
Total volume purged (gal.)	6.9
Final pH	7.4
Final temperature (°C)	17.7
Final conductivity (µS/cm)	702
Final turbidity (NTUs)	16.5
SLUG TEST	Too little water
DEPTH TO WATER (ft bgs)	32.10 (10/01/06)
FINAL STATUS	Well

C – cuttings; CS – continuous sampler with split spoon; HSA – hollow stem auger

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Date	Started: 9/9/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCA-3
	Completed: 9/9/2006	Rig Type: CME 55 HSA	Logged By: Jordan Vaughn	TD Borehole: 58.5 ft
Northing: 1769917.84		Easting: 1637200.75	Location ID: None	TD Casing: 32.6 ft

ELEVATIONS:
Ground Surface: 6722.72
Brass Cap: 6723.22
Casing: 6725.36

Saturation

Depth (ft)	Saturation Level	Date
30.6	Top	9/9/2006
Not Observed	Bottom	9/9/2006

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	0	Qal		C	No Samples Analyzed		QUATERNARY ALLUVIUM - INTERBEDDED SILTY SAND (SM) AND SANDY CLAYEY/SILT (MLS) (layers from 4 inches to 2 feet) - moderate brown (5YR 4/4) to dark yellowish brown (10YR 4/2) to dusky yellowish brown (10YR 2/2), moderately to well sorted, non indurated to poorly indurated. Silty sand is composed of 60-90% sand, predominantly felsic grains (clear, medium to coarse, angular to subangular, sanidine noted); 10-40% clay to silt; trace gravel, pumice (vitric, white to very pale orange, up to 5 mm, rounded), inter. comp. volcanics (dark gray, up to 3 mm, subrounded). Sandy clayey silt is composed of 70% silt to clay; 20% sand, predominantly felsic grains (clear, coarse, subangular, sanidine noted), trace pumice (vitric, white, coarse, rounded), trace mafic grains (black, coarse, angular); 10% gravel, pumice (vitric, white to pale orange, up to 10 mm, rounded), inter. comp. volcanics (dark brown to dark gray, up to 5 mm, subangular), trace tuff (pale orange to tan, with vitric pumice, up to 5 mm, subrounded). Damp.	Cement 2.3" OD PVC 1.9 ft Cement grout 9.6 ft Bentonite chips
	5							
	10							
	15							
	20			CS			21.0'	
	25						INTERBEDDED SAND (SW) AND SILTY CLAYEY/SAND (SC-SM) (layers from 4 inches to 3 feet) - moderate yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/2), moderately to well sorted, non-indurated to poorly indurated. (Continued on next page). 25.0'	24 ft 10/20 Sand

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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Date	Started: 9/9/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCA-3
	Completed: 9/9/2006	Rig Type: CME 55 HSA	Logged By: Jordan Vaughn	TD Borehole: 58.5 ft
Northing: 1769917.84		Easting: 1637200.75	Location ID: None	TD Casing: 32.6 ft

ELEVATIONS:
Ground Surface: 6722.72
Brass Cap: 6723.22
Casing: 6725.36

Saturation

Depth (ft)	Saturation Level	Date
30.6	Top	9/9/2006
Not Observed	Bottom	9/9/2006

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	25						QUATERNARY ALLUVIUM - INTERBEDDED SAND (SW) AND SILTY CLAYEY/SAND (SC-SM) (continued) Sand is composed of 95-100% sand, predominantly felsic grains (clear, medium to coarse, angular to subangular), with tuff (orange, medium to coarse, subangular), pumice (white, coarse, rounded), and mafic grains (black, fine to medium, subangular); 0-5% clay to silt. Silty clayey sand is 50-80% sand (same as above); 20-50% clay to silt; trace gravel, pumice (vitric, white to pale orange, up to 8 mm, rounded) and tuff with vitric pumice (pale orange, up to 6 mm, subrounded). Damp to wet (silty clayey sand interval was wet).	10/20 Sand
								27.6 ft
								0.01" screen prepack 2.8" OD
▼	30							
							INTERBEDDED SAND (SW) AND SILTY/CLAYEY SAND (SC-SM) (layers from 4 inches to 3 feet) - moderate yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/2), moderately to well sorted, non-indurated to poorly indurated. Sand is composed of 95-100% sand, predominantly felsic grains (clear, medium to coarse, angular to subangular), with tuff (orange, medium to coarse, subrounded), vitric pumice (pale orange to white, coarse, rounded), and mafic grains (black, medium, subangular); 0-5% clay to silt; trace gravel, vitric pumice (pale orange to white, up to 10 mm, rounded). Silty clayey sand is composed of 70-90% sand (as described above); 10-30% clay to silt; trace gravel, pumice (as described above). Wet.	31.5 ft
								32 ft
								32.6 ft
				CS				
	35							
		Qal						
	40							Slough
	45							
				C				
	50						50.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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Date	Started: 9/9/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCA-3
	Completed: 9/9/2006	Rig Type: CME 55 HSA	Logged By: Jordan Vaughn	TD Borehole: 58.5 ft
Northing: 1769917.84		Easting: 1637200.75	Location ID: None	TD Casing: 32.6 ft

ELEVATIONS:
Ground Surface: 6722.72
Brass Cap: 6723.22
Casing: 6725.36

Saturation

Depth (ft)	Saturation Level	Date
30.6	Top	9/9/2006
Not Observed	Bottom	9/9/2006

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	50	Qal		C			QUATERNARY ALLUVIUM - INTERBEDDED SAND (SW) AND SILTY/CLAYEY SAND (SC-SM) - as above.	Slough
	55			CS			58.5'	TD = 58.5 ft

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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2.4 SCA-4

SCA-4 was drilled on September 10, 2006 in lower Sandia Canyon (Figure 1.0-1). The hole was drilled to 43.8 ft bgs and was completed with a screened interval between 37 and 41.5 ft bgs. Bedrock was present at 41.8 ft bgs.

Water was encountered from 36.96 to 41.8 ft bgs during drilling. It was measured in the completed well at 37.91 ft bgs on September 24, 2006. The well was developed by bailing for 8 hrs with a final turbidity reading of 844 NTUs, and a slug test was conducted.

Summary data regarding drilling, construction and well development are presented in Table 2.4-1. Figure 2.4-1 shows the lithologic log and construction schematic for the well. The appendices present the slug test results, survey data, drilling program deviations and a summary of waste characterization activities.

Table 2.4-1 Summary Data for SCA-4

SCA-4	
DRILLING	
Dates drilled	9/10/06
Method	HSA
Hole diameter (in.)	8
Core diameter (in.)	2.5
Sample method	C/CS
Borehole TD (ft bgs)	43.8
WELL CONSTRUCTION	
Date completed	9/10/06
Casing ID/OD (in.)	2/2.3
Screen ID/OD (in.)	2.05/2.8
Screened interval (ft bgs)	37.0 to 41.5
Slot size (in.)	0.01
Sand size	10/20 in annulus; 20/40 in prepack
Casing TD (ft bgs)	42
STRATIGRAPHY	
Depth (ft bgs)	Qal: 0-41.8
Depth (ft bgs)	Qbt 1g: 41.8-43.8
WELL DEVELOPMENT	
Total volume purged (gal.)	35.9
Final pH	7.3
Final temperature (°C)	13
Final conductivity (µS/cm)	532
Final turbidity (NTUs)	844
SLUG TEST	9/24/06
DEPTH TO WATER (ft bgs)	37.91 (9/24/06)
FINAL STATUS	Well

C – cuttings; CS – continuous sampler with split spoon; HSA – hollow stem auger

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Sheet 1 of 2

Date	Started: 9/10/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCA-4
	Completed: 9/10/2006	Rig Type: CME 55 HSA	Logged By: Jordan Vaughn	TD Borehole: 43.8 ft
Northing: 1769566.62		Easting: 1638261.23	Location ID: None	TD Casing: 42.0 ft

ELEVATIONS:
Ground Surface: 6703.20
Brass Cap: 6703.58
Casing: 6706.13

Saturation

Top (ft)	Bottom (ft)	Zone
13	28	Alluvial
36.96	41.8	Alluvial

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	0	Qal		C	No Samples Analyzed		QUATERNARY ALLUVIUM - SILTY SAND (SM) - moderate yellowish brown (10YR 5/4), moderately sorted, non-indurated. Composed of: 85% sand, predominantly felsic grains (clear, fine to coarse, subangular to subrounded), inter. comp. volcanics (medium gray, medium to coarse, subangular to subrounded), tuff (pale orange, coarse, rounded); 10% silt; 5% gravel, inter. comp. volcanics (medium gray, up to 17 mm, angular), tuff (pale orange to pinkish tan, up to 10 mm, subrounded, devitrified pumice). Damp. Moisture increases slightly with depth. Rootlets.	Cement 2.3" OD PVC; 3.4 ft; Cement grout; 7.4 ft; Slough; 9.4 ft
▼	13.0'						SAND (SP) - dark yellowish brown (10YR 4/2), well-sorted, non-indurated. Composed of: 95% sand, predominantly felsic grains (clear, medium to coarse, subangular), trace inter. comp. volcanics (medium gray, coarse, subangular); 5% silt; trace gravel, tuff (pale orange, up to 100 mm, rounded, devitrified pumice), trace inter. comp. volcanics (medium gray, up to 40 mm, subangular). Wet.	Bentonite chips
	22.3'			CS			SILTY/CLAYEY SAND (SC-SM) - moderate yellowish brown (10YR 5/4), moderately sorted, non-indurated. 60 to 80% sand, predominantly felsic grains (clear, predominantly fine with zones of medium to coarse, subangular to subrounded).	
	25.0'							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

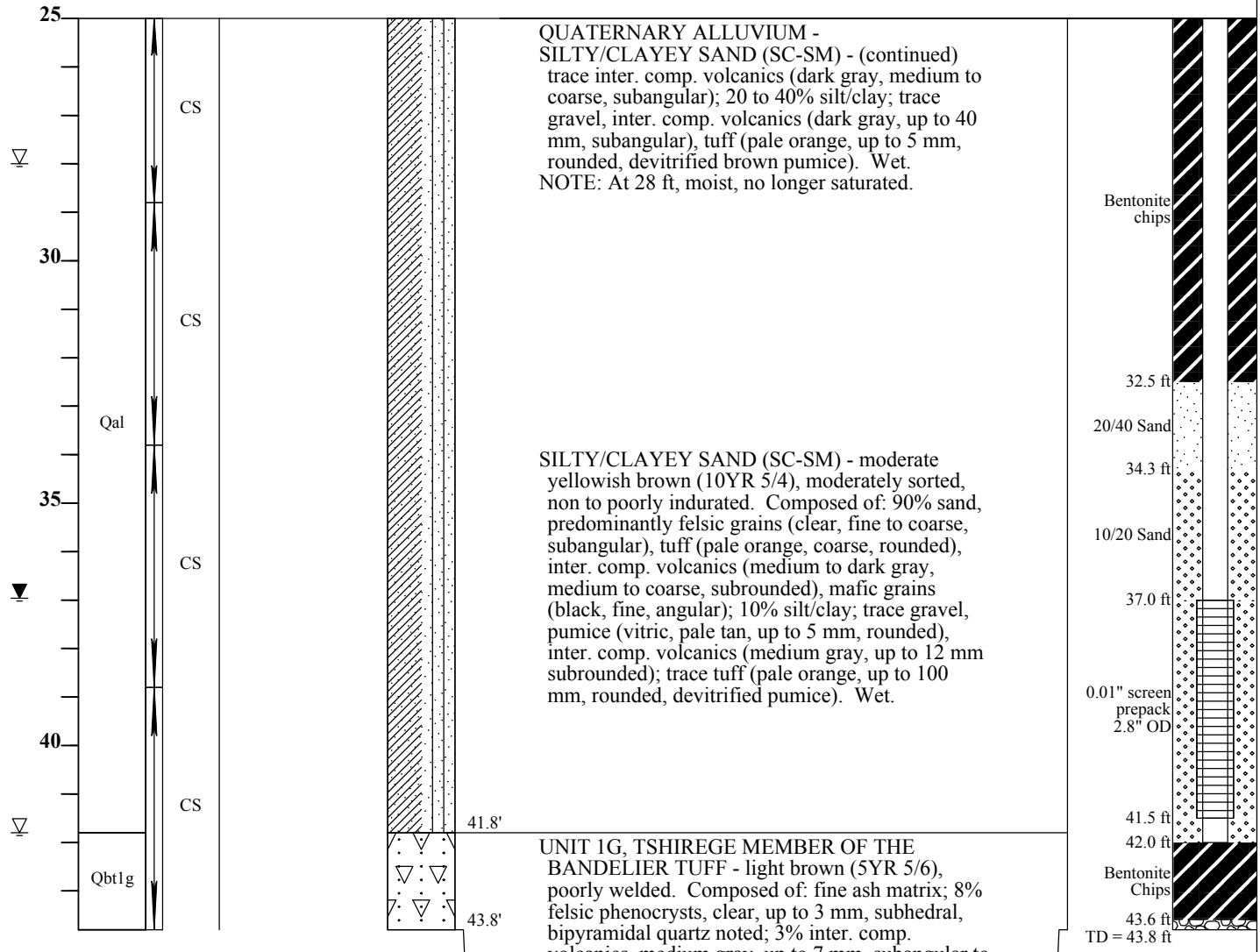
Date	Started: 9/10/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCA-4
	Completed: 9/10/2006	Rig Type: CME 55 HSA	Logged By: Jordan Vaughn	TD Borehole: 43.8 ft
Northing: 1769566.62		Easting: 1638261.23	Location ID: None	TD Casing: 42.0 ft

ELEVATIONS:
Ground Surface: 6703.20
Brass Cap: 6703.58
Casing: 6706.13

Saturation

Top (ft)	Bottom (ft)	Zone
13	28	Alluvial
36.96	41.8	Alluvial

Groundwater | Depth (ft.) | Geologic Unit | Sample Taken | Sample Type | Analytical Sample Number | Graphical Log | Visual Classification | FINAL CONSTRUCTION



QUATERNARY ALLUVIUM -
SILTY/CLAYEY SAND (SC-SM) - (continued) trace inter. comp. volcanics (dark gray, medium to coarse, subangular); 20 to 40% silt/clay; trace gravel, inter. comp. volcanics (dark gray, up to 40 mm, subangular), tuff (pale orange, up to 5 mm, rounded, devitrified brown pumice). Wet.
NOTE: At 28 ft, moist, no longer saturated.

SILTY/CLAYEY SAND (SC-SM) - moderate yellowish brown (10YR 5/4), moderately sorted, non to poorly indurated. Composed of: 90% sand, predominantly felsic grains (clear, fine to coarse, subangular), tuff (pale orange, coarse, rounded), inter. comp. volcanics (medium to dark gray, medium to coarse, subrounded), mafic grains (black, fine, angular); 10% silt/clay; trace gravel, pumice (vitric, pale tan, up to 5 mm, rounded), inter. comp. volcanics (medium gray, up to 12 mm subrounded); trace tuff (pale orange, up to 100 mm, rounded, devitrified pumice). Wet.

UNIT 1G, TSHIREGE MEMBER OF THE BANDELIER TUFF - light brown (5YR 5/6), poorly welded. Composed of: fine ash matrix; 8% felsic phenocrysts, clear, up to 3 mm, subhedral, bipyramidal quartz noted; 3% inter. comp. volcanics, medium gray, up to 7 mm, subangular to subrounded; 1% pumice, vitric, fibrous, tan up to 7 mm, rounded; 1% mafic phenocrysts, black, <1-3mm, subrounded. Damp. Altered.
TUFF (42.8 - 43.8 ft) - as above but unaltered, grayish orange (10YR 7/4). Dry. Sharp contact with overlying altered tuff. Near horizontal fracture with minor clay alteration at 43.1 bgs.

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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2.5 SCA-5

SCA-5 was drilled on September 6 and 7, 2006 in lower Sandia Canyon (Figure 1.0-1). The hole was drilled to 78.5 ft bgs and was completed with a screened interval between 55 and 64.4 ft bgs. Bedrock was encountered at 72.5 ft bgs.

Thin stringers of saturation were encountered from 39.5 to 65 ft bgs during drilling. Water was measured in the completed well at 57.80 ft bgs on September 20, 2006. The well was developed for 8 hrs with a final turbidity reading >1,000 NTUs, and a slug test was conducted.

Summary data regarding drilling, construction and well development are presented in Table 2.5-1. Figure 2.5-1 shows the lithologic log and construction schematic for the well. The appendices present the slug test results, survey data, drilling program deviations and a summary of waste characterization activities.

Table 2.5-1 – Summary Data for SCA-5

SCA-5	
DRILLING	
Dates drilled	9/06/06 – 9/07/06
Method	HSA
Hole diameter (in.)	8
Core diameter (in.)	NA
Sample method	C/CS
Borehole TD (ft bgs)	78.5
WELL CONSTRUCTION	
Date completed	9/11/06
Casing ID/OD (in.)	2/2.3
Screen ID/OD (in.)	2/2.8
Screened interval (ft bgs)	55 to 64.4
Slot size (in.)	0.01
Sand size	10/20 in annulus; 20/40 in prepack
Casing TD (ft bgs)	64.9
STRATIGRAPHY	
Depth (ft bgs)	Qal: 0–72.5
Depth (ft bgs)	Qbo 72.5-78.5
WELL DEVELOPMENT	
Total volume purged (gal.)	22.5
Final pH	7.1
Final temperature (°C)	22.5
Final conductivity (µS/cm)	270
Final turbidity (NTUs)	>1,000
SLUG TEST	9/20/06
DEPTH TO WATER (ft bgs)	57.80 (9/20/06)
FINAL STATUS	Well

C – cuttings; CS – continuous sampler with split spoon; HSA – hollow stem auger

LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/6/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCA-5
	Completed: 9/11/2006	Rig Type: CME 55 HSA	Logged By: Jordan Vaughn	TD Borehole: 78.5 ft
Northing: 1769725.47		Easting: 1639878.28	Location ID: None	TD Casing: 64.9 ft

ELEVATIONS:
Ground Surface: 6668.66
Brass Cap: 6669.02
Casing: 6671.48

Saturation

Depth (ft)	Saturation Level	Date
39.5	Top	9/7/2006
65	Bottom	9/7/2006

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	0	Qal		C	No Samples Analyzed		QUATERNARY ALLUVIUM - INTERBEDDED SAND (SW) AND SILTY SAND (SM) - alternating moderate yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/2) to grayish brown (5YR 3/2), moderately to well sorted, non-indurated. Sand layers composed of 95-100% sand, predominantly felsic grains (clear, medium to coarse, angular, sanidine and bipyramidal quartz noted), trace inter. comp. volcanics (dark gray, coarse, subangular); 0-5% clay to silt. Silty sand layers composed of 60-80% sand, predominantly felsic grains (clear, medium to coarse, angular, sanidines and bipyramidal quartz noted), trace inter. comp. volcanics (as above); 20-40% clay to silt. Damp, with moisture increasing with depth.	Cement 2.3" OD PVC 2.6 ft Cement grout 8.0 ft Slough 10.0 ft Bentonite chips
	5							
	10							
	15							
	20							
	25						25.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/6/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCA-5
	Completed: 9/11/2006	Rig Type: CME 55 HSA	Logged By: Jordan Vaughn	TD Borehole: 78.5 ft
Northing: 1769725.47		Easting: 1639878.28	Location ID: None	TD Casing: 64.9 ft

ELEVATIONS:
Ground Surface: 6668.66
Brass Cap: 6669.02
Casing: 6671.48

Saturation

Depth (ft)	Saturation Level	Date
39.5	Top	9/7/2006
65	Bottom	9/7/2006

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	25						QUATERNARY ALLUVIUM - INTERBEDDED SAND (SW) AND SILTY SAND (SM) - as above.	
	30			C				
	35							Bentonite chips
		Qal					37.0' INTERBEDDED SAND (SW) CLAYEY/SILTY SAND (SC-SM) TRACE SANDY SILTY/CLAY (SM) - (interbedded sand to 1 ft thick, clayey silty sand to 1 inch thick and trace sandy, silty clay to 1 inch thick), moderate yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/2), moderately to well sorted, non-indurated. Sand layers composed of 95-100% sand, predominantly felsic grains (clear, medium to coarse, angular, sanidines and bipyramidal quartz noted), trace tuff grains (pale orange, coarse, subrounded); trace inter. comp. volcanics (dark gray, coarse, subrounded); 0-5% clay to silt. Clayey silty sand layers composed of 60-80% sand (as above); 20-40% clay to silt. Sandy silty clay layers composed of 90-95% clay to silt; 5-10% sand (as above). Wet.	
▼	40							
				CS				
	45							48.2 ft 10/20 Sand
	50						50.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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KLI WELL LOG2 \ LIBRARY DEEP WELLS (SCA-SCP).GLB \ 73885_05_1_SCA5.GPJ 12/22/06

LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/6/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCA-5
	Completed: 9/11/2006	Rig Type: CME 55 HSA	Logged By: Jordan Vaughn	TD Borehole: 78.5 ft
Northing: 1769725.47		Easting: 1639878.28	Location ID: None	TD Casing: 64.9 ft

ELEVATIONS:
Ground Surface: 6668.66
Brass Cap: 6669.02
Casing: 6671.48

Saturation

Depth (ft)	Saturation Level	Date
39.5	Top	9/7/2006
65	Bottom	9/7/2006

Groundwater | Depth (ft.) | Geologic Unit | Sample Taken | Sample Type | Analytical Sample Number | Graphical Log | Visual Classification | FINAL CONSTRUCTION

Visual Classification

50

QUATERNARY ALLUVIUM - INTERBEDDED SAND (SW) CLAYEY/SILTY SAND (SC-SM) TRACE SANDY SILTY CLAY (SM) - as above.

55

56.0'

INTERBEDDED SANDY AND SILTY/CLAYEY SAND TRACE GRAVELS (SC-SM) (layers from 2 inches to 1 ft thick) - moderate brown (5YR 4/4) to moderate yellowish brown (10YR 5/4), moderately to well sorted, non-indurated. Sand layers composed of 90-100% sand, predominantly felsic grains (clear, medium to coarse, angular, sanidine and bipyramidal quartz noted), trace tuff grains (tan to pale orange, coarse, subrounded to rounded, vitric and devitrified pumices noted); trace pumice (white, coarse, well-rounded, vitric), trace inter. comp. volcanics (dark gray, coarse, subrounded); 0-10% clay to silt; 0-5% gravel, pumice (white, up to 8 mm, well-rounded, vitric, oxide staining on surface), tuff with devitrified pumice (pale orange, up to 15 mm, subrounded, devitrified brown pumice), tuff with vitric pumice (pale tan to pale orange, up to 15 cm, subrounded, contains very pale tan to white vitric pumice). Wet with moisture decreasing slightly below 65 feet. Cored through 5 inch thick vitric pumice tuff cobble at 60' bgs. Devitrified pumice tuff at 63' bgs.

60

Qal

CS

65

70

72.5'

Qbo

OTOWI MEMBER OF THE BANDELIER TUFF - Tuff, light brown (5YR 5/6), poorly welded. Composed of fine ash matrix; 10% pumice, vitric, orange, up to 50 mm, subrounded, common quartz phenocrysts.

75

75.0'

FINAL CONSTRUCTION

10/20 Sand
55.0 ft
0.01" screen prepack 2.8" OD
64.4 ft
64.9 ft
Bentonite chips
73.5 ft
Slough

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/6/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCA-5
	Completed: 9/11/2006	Rig Type: CME 55 HSA	Logged By: Jordan Vaughn	TD Borehole: 78.5 ft
Northing: 1769725.47		Easting: 1639878.28	Location ID: None	TD Casing: 64.9 ft

ELEVATIONS:
Ground Surface: 6668.66
Brass Cap: 6669.02
Casing: 6671.48

Saturation

Depth (ft)	Saturation Level	Date
39.5	Top	9/7/2006
65	Bottom	9/7/2006

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	75	Qbo		CS			OTOWI MEMBER OF THE BANDELIER TUFF - (continued) 5% felsic phenocrysts, up to 2 mm, euhedral to subhedral, bipyramidal. 78.5'	Slough TD = 78.5 ft

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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3.0 SCP PIEZOMETERS

The LANL Work Plan called for two piezometers nests, with up to three piezometers each, to be installed near SC2 and SC3 in lower Sandia Canyon. The nested piezometers were installed to provide data regarding infiltration rates and vertical hydraulic gradients. General drilling goals were outlined in the LANL Work Plan and refined in the Kleinfelder Drilling Plan, with input from LANL scientists.

Five piezometers were installed; three within one borehole (SCP-1abc) and two in separate boreholes (SCP-2a and SCP-2b). SCP-1abc was installed approximately 6 ft west of SCA-4; SCP-2a and 2b were installed approximately 5 and 10 ft east of SCA-3, respectively. Per the Drilling Plan, core and groundwater samples were not collected during drilling at the piezometers, and no geophysical logs were run. A summary table of deviations from the Work Plan and the Drilling Plan is provided in Appendix D; individual deviations are described in the following writeups.

3.1 SCP-1abc

Three nested piezometers, SCP-1a, SCP-1b and SCP-1c, were drilled and installed on September 11 and 12, 2006 in lower Sandia Canyon approximately 6 ft west of SCA-4 (Figure 1.0-1). The piezometers were installed in a single borehole called SCP-1abc. The borehole was drilled to 43.8 ft bgs and alluvial groundwater may have been encountered as high as 15 ft bgs; however, a clearer indication of groundwater was at 37.0 to 41.8 ft bgs. Bedrock was encountered at 42.3 ft bgs.

SCP-1a was screened from 37.8 to 38.3 ft bgs, SCP-1b was screened from 39.4 to 39.9 ft bgs, and SCP-1b was screened from 41.2 to 41.7 ft bgs. Following completion, water was measured on September 24, 2006 at 37.64 ft bgs (SCP-1a), 37.76 ft bgs (SCP-1b) and 37.45 ft bgs (SCP-1c). The wells were developed for 8 hrs with final turbidity readings of >1,000 NTUs (SCP-1a), 4 NTUs (SCP-1b) and 4.3 NTUs (SCP-1c). Slug tests were conducted in all three piezometers.

Summary data regarding drilling, construction and well development are presented in Table 3.1-1. Figure 3.1-1 shows the lithologic log and construction schematic for the well. The appendices present the slug test results, survey data, drilling program deviations and a summary of waste characterization activities.

Table 3.1-1 Summary Data for SCP-1abc

DRILLING	**SCP-1abc**		
Date drilled	9/11/06		
Method	HSA		
Hole diameter (in.)	8		
Core diameter (in.)	NA		
Sample method	Cuttings		
Borehole TD (ft bgs)	43.8		
STRATIGRAPHY			
Depth (ft bgs)	Qal: 0-42.3		
Depth (ft bgs)	Qbt 1g: 42.3-43.8		
WELL CONSTRUCTION	**SCP-1a**	**SCP-1b**	**SCP-1c**
Date completed	9/12/06	9/12/06	9/12/06
Casing ID/OD (in.)	1/1.3	1/1.3	1/1.3
Screen ID/OD (in.)	1/1.7	1/1.7	1/1.7
Screened interval (ft bgs)	37.8-38.3	39.4-39.9	41.2-41.7
Screen size (in.)	0.01	0.01	0.01
Sand size	10/20 in annulus; 20/40 in prepack		
Casing TD (ft bgs)	38.4	40.1	41.8
WELL DEVELOPMENT			
Total volume purged (gal.)	4.1	4	5.1
Final pH	7.6	7.4	7.5
Final temperature (°C)	15.6	16.7	15.9
Final conductivity (µS/cm)	555	534	553
Final turbidity (NTUs)	>1,000	4	4.3
SLUG TEST	9/24/06	9/24/06	9/25/06
DEPTH TO WATER (ft bgs)	37.64 (9/24/06)	37.76 (9/24/06)	37.45 (9/24/06)
FINAL STATUS	Piezometer	Piezometer	Piezometer

HSA – hollow stem auger

LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/11/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCP-1abc
	Completed: 9/12/2006	Rig Type: CME 55 HSA	Logged By: Jordan Vaughn	TD Borehole: 43.8 ft
Northing: See Appendix C		Easting: See Appendix C	Location ID: None	TD Casing: See below ft

ELEVATIONS:
Ground Surface: 6703.24
Brass Cap: 6703.65
Casing: See Appendix C

Saturation

Depth (ft)	Saturation Level	Date
15	Top	9/11/2006
42.3	Bottom	9/11/2006

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	0	Qal		C	No Samples Analyzed		QUATERNARY ALLUVIUM - SILTY SAND (SM) - dark yellowish brown (10YR 4/2), poorly to moderately sorted, non-indurated. Composed of: 80% sand, predominantly felsic grains (clear, fine to coarse, subangular to subrounded), inter. comp. volcanics (medium gray, medium to coarse, subangular to subrounded), tuff (pale orange, coarse, rounded), pumice (vitric, light orangish-tan, coarse, rounded); 15% silt; 5% gravel, pumice (vitric, light orangish-tan, up to 10 mm, rounded), inter. comp. volcanics (medium to dark gray, up to 30 mm, subangular), tuff (tan, up to 10 mm, rounded, devitrified pumice). Damp. Rootlets.	Cement 1.0 ft; Cement grout; 3-1.3" OD PVC casings for SCP-1a, SCP-1b, and SCP-1c. All screens are 0.01" screen pre-pack 1.7" OD
	5							
	6.5'						SILTY CLAYEY SAND (SC-SM) - dusky yellowish brown (10YR 2/2), moderately sorted, non-indurated. Composed of: 80% sand, predominantly felsic grains (clear, medium to coarse, subangular to subrounded), inter. comp. volcanics (medium gray, medium to coarse, subangular to subrounded), tuff (pale orange, medium to coarse, rounded); 20% silt/clay. Wet.	9.0 ft Bentonite chips 10.0 ft
	10							
	10.0'						SILTY SAND (SM) - dark yellowish brown (10YR 4/2), well sorted, non-indurated. Composed of: 90% sand, predominantly felsic grains (clear, medium to coarse, subangular to subrounded, bipyramidal quartz and chatoyant sanidine noted), inter. comp. volcanics (medium gray, medium to coarse, subrounded), tuff (pale orange, medium to coarse, rounded, devitrified pumice). Wet.	
▼	15							Slough
	15.0'						SILTY CLAYEY SAND (SC-SM) - dark yellowish brown (10YR 4/2), moderately sorted, non-indurated. Composed of: 75% sand, predominantly felsic grains (clear, medium to coarse, subangular to subrounded), inter. comp. volcanics (medium gray, medium to coarse, subrounded); 20% silt/clay; 5% gravel, inter. comp. volcanics (medium gray to brownish gray, up to 10 mm, subangular), tuff (tan, up to 15 mm, rounded, devitrified pumice). Saturated.	
	20							
	20.0'						QUATERNARY ALLUVIUM - SAND (SP) - moderate yellowish brown (10YR 5/4), well sorted, non-indurated. Composed of: 95 to 100% sand, predominantly felsic grains (clear, medium to coarse, subangular to subrounded, chatoyant sanidine noted), inter. comp. volcanics (medium to dark gray, coarse, subangular, trace mafic grains (black, medium, angular); 0 to 5% silt. Wet.	
	25							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/11/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCP-1abc
	Completed: 9/12/2006	Rig Type: CME 55 HSA	Logged By: Jordan Vaughn	TD Borehole: 43.8 ft
Northing: See Appendix C		Easting: See Appendix C	Location ID: None	TD Casing: See below ft

ELEVATIONS:
Ground Surface: 6703.24
Brass Cap: 6703.65
Casing: See Appendix C

Saturation

Depth (ft)	Saturation Level	Date
15	Top	9/11/2006
42.3	Bottom	9/11/2006

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	25, 30, 35, 40	Qal		C			QUATERNARY ALLUVIUM - SAND (SP) - moderate yellowish brown (10YR 5/4), well sorted, non-indurated. Composed of: 95 to 100% sand, predominantly felsic grains (clear, medium to coarse, subangular to subrounded, chatoyant sanidine noted), inter. comp. volcanics (medium to dark gray, coarse, subangular, trace mafic grains (black, medium, angular); 0 to 5% silt. Wet.	Slough; 33.1 ft; Bentonite chips; 37.4 ft; SCP-1a (37.8-38.3 ft); 38.6-39 ft; SCP-1b (39.4-39.9 ft); 40.1-40.8 ft; SCP-1c (41.2-41.7 ft); 10/20 Sand 42.6 ft; TD = 43.8 ft
▽	42.3'	Qbt1g					UNIT 1G, TSHIREGE MEMBER OF THE BANDELIER TUFF - Light brown (5YR 5/6) to grayish orange (10YR 7/4), poorly welded. Composed of: fine ash matrix; 7 to 10% felsic phenocrysts, clear, up to 3 mm, subhedral, bipyramidal quartz noted; 1 to 10% pumice, vitric, fibrous, tan light orangish yellow to white, up to 15 mm, rounded; 2 to 3% inter. comp. volcanics, medium gray, up to 7 mm, subangular to subrounded; 1% mafic phenocrysts, black, <1 mm, platy to tabular; trace obsidian, dark gray, up to 3 mm, subrounded. Damp to dry. Note: Alluvium/tuff contact is based on drilling observations; no tuff cuttings were recovered during drilling; tuff lithologic description is based on cuttings recovered from SCA-4 (appx. 6 ft to the east).	
	43.8'							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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3.2 SCP-2a

SCP-2a was drilled on September 13, 2006 in lower Sandia Canyon (Figure 1.0-1). The hole was drilled to 45.6 ft bgs and was completed as a piezometer with a screened interval between 44.5 and 45 ft bgs. SCP-2a was installed approximately 10 ft east of SCA-3, and SCP-2b installed between them. Due to the problems with flowing sands encountered at SCA-3, SCA-2a was drilled with a center plug in the auger bit; bedrock was not reached at this location.

Water was encountered from 25 to 45.6 ft bgs during drilling. It was measured in the completed piezometer at 32.04 ft bgs on September 22, 2006. The piezometer was developed for 8 hrs with a final turbidity reading of 3.6 NTUs, and two slug tests were conducted.

Summary data regarding drilling, construction and well development are presented in Table 3.2-1. Figure 3.2-1 shows the lithologic log and construction schematic for the well. The appendices present the slug test results, survey data, drilling program deviations and a summary of waste characterization activities.

Table 3.2-1 - Summary Data for SCP-2a

SCP-2a	
DRILLING	
Dates drilled	9/13/06
Method	HSA
Hole diameter (in.)	8
Core diameter (in.)	NA
Sample method	Cuttings
Borehole TD (ft bgs)	45.6
WELL CONSTRUCTION	
Date completed	9/13/06
Casing ID/OD (in.)	1/1.3
Screen ID/OD (in.)	1/1.7
Screened interval (ft bgs)	44.5-45
Slot size (in.)	0.01
Sand size	10/20 in annulus; 20/40 in prepack
Casing TD (ft bgs)	45.1
STRATIGRAPHY	
Depth (ft bgs)	Qal: 0-45.6
WELL DEVELOPMENT	
Total volume purged (gal.)	8.5
Final pH	7.4
Final temperature (°C)	12.2
Final conductivity (µS/cm)	632
Final turbidity (NTUs)	3.6
SLUG TESTS	9/21/06 & 9/22/06
DEPTH TO WATER (ft bgs)	32.04 (9/22/06)
FINAL STATUS	Piezometer

HSA – hollow stem auger

LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/13/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCP-2a
	Completed: 9/13/2006	Rig Type: CME 55 HSA	Logged By: Jordan Vaughn	TD Borehole: 45.6 ft
Northing: 1769911.26		Easting: 1637209.65	Location ID: None	TD Casing: 45.1

ELEVATIONS:
Ground Surface: 6722.45
Brass Cap: 6722.95
Casing: 6725.48

Saturation

Top (ft)	Bottom (ft)	Zone
25	Not observed	

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	0				No Samples Analyzed		NOTE: Lithologic descriptions are from SCP-2b (approximatly 6 ft to the west).	Cement 1.3" OD PVC; 3.5 ft; Cement grout; 10.5 ft; Slough; 11.9 ft; Bentonite
	5						QUATERNARY ALLUVIUM - SILTY SAND (SM) - dark yellowish brown (10YR 4/2), moderately sorted, non-indurated. Composed of: 95% sand, predominantly felsic grains (clear, fine to coarse, subangular to subrounded, quartz and sanidine noted; trace inter. comp. volcanics (medium gray, coarse, subangular); 5% silt; trace gravel, tuff (pale orange to pale pink, up to 8 mm, subrounded, devitrified brown pumice). Damp. Rootlets and other organic matter.	
	10	Qal		C				
	15							
	20						20.0'	
							SILTY/CLAYEY SAND (SC-SM) - dark yellowish brown (10YR 4/2), moderately sorted, non-indurated. Composed of 75 to 80% sand, predominantly felsic grains (clear, fine to coarse, subangular to subrounded), trace inter. comp. volcanics (dark gray, coarse, subangular); 15 to 25% silt/clay; (Continued on next page).	
▼	25						25.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

Kleinfelder Inc., Copyright 12/29/2006

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/13/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCP-2a
	Completed: 9/13/2006	Rig Type: CME 55 HSA	Logged By: Jordan Vaughn	TD Borehole: 45.6 ft
Northing: 1769911.26		Easting: 1637209.65	Location ID: None	TD Casing: 45.1

ELEVATIONS:
Ground Surface: 6722.45
Brass Cap: 6722.95
Casing: 6725.48

Saturation

Top (ft)	Bottom (ft)	Zone
25	Not observed	

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	25	Qal		C			QUATERNARY ALLUVIUM - SILTY/CLAYEY SAND (SC-SM) - (continued) 0 to 3% gravel, inter. comp. volcanics (medium gray up to 10 mm, subangular), pumice (vitric, fibrous, very pale tan, up to 8 mm, rounded, quartz phenocrysts), tuff (pale orange, up to 12 mm, rounded, devitrified pumice). Wet. Sand percentage increases with depth.	Bentonite
	30						33.0' SILTY/CLAYEY SAND (SC-SM) - dark yellowish brown (10YR 4/2), poorly to moderately sorted, non-indurated. Composed of: 70% sand, predominantly felsic grains (clear, fine to coarse, subangular to subrounded), trace inter. comp. volcanics (dark gray, medium to coarse, subrounded); 30% silt/clay; trace gravel, tuff (pale orange, up to 15 mm, rounded, devitrified pumice). Wet.	Screen below is a 0.01" prepack 1.7" OD
	35							43.3 ft
	40							10/20 Sand
								44.5 ft
	45						45.6'	45 ft
								TD = 45.6 ft

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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3.3 SCP-2b

SCP-2b was drilled on September 12, 2006 in lower Sandia Canyon (Figure 1.0-1). The hole was drilled to 51.5 ft bgs and was completed as a piezometer with a screened interval between 49.5 and 50 ft bgs. SCP-2b was installed approximately 5 ft east of SCA-3. Due to the problems with flowing sands encountered at SCA-3, SCA-2b was drilled with a center plug in the auger bit; bedrock was not reached at this location.

Water was encountered at 25 ft bgs during drilling and was present to the total depth of the borehole. It was last measured in the completed piezometer at 34.45 ft bgs on September 21, 2006. The piezometer was developed for 8 hrs with a final turbidity reading of 4.2 NTUs, and two slug tests were conducted.

Summary data regarding drilling, construction and well development are presented in Table 3.3-1. Figure 3.3-1 shows the lithologic log and construction schematic for the well. The appendices present the slug test results, survey data, drilling program deviations and a summary of waste characterization activities.

Table 3.3-1 Summary Data for SCP-2b

SCP-2b	
DRILLING	
Date drilled	9/12/06
Method	HSA
Hole diameter (in.)	8
Core diameter (in.)	NA
Sample method	Cuttings
Borehole TD (ft bgs)	51.5
WELL CONSTRUCTION	
Date completed	9/12/06
Casing ID/OD (in.)	1/1.3
Screen ID/OD (in.)	1.03/1.7
Screened interval (ft bgs)	49.5-50
Slot size (in.)	0.01
Sand size	10/20 in annulus; 20/40 in prepack
Casing TD (ft bgs)	50.1
STRATIGRAPHY	
Depth (ft bgs)	Qal: 0-51.5
WELL DEVELOPMENT	
Total volume purged (gal.)	8.2
Final pH	7.3
Final temperature (°C)	10.3
Final conductivity (µS/cm)	653
Final turbidity (NTUs)	4.2
SLUG TESTS	9/22/06
DEPTH TO WATER (ft bgs)	34.45 (9/21/06)
FINAL STATUS	Piezometer

HSA – hollow stem auger

LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/12/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCP-2b
	Completed: 9/12/2006	Rig Type: CME 55 HSA	Logged By: Jordan Vaughn	TD Borehole: 51.5 ft
Northing: 1769914.53		Easting: 1637205.05	Location ID: None	TD Casing: 50.1 ft

ELEVATIONS:
Ground Surface: 6722.57
Brass Cap: 6723.11
Casing: 6725.31

Saturation

Depth (ft)	Saturation Level	Date
25	Top	9/12/2006
Not observed	Bottom	9/12/2006

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	0	Qal		C	No Samples Analyzed		QUATERNARY ALLUVIUM - SILTY SAND (SM) - dark yellowish brown (10YR 4/2), moderately sorted, non-indurated. Composed of: 95% sand, predominantly felsic grains (clear, fine to coarse, subangular to subrounded, quartz and sanidine noted; trace inter. comp. volcanics (medium gray, coarse, subangular); 5% silt; trace gravel, tuff (pale orange to pale pink, up to 8 mm, subrounded, devitrified brown pumice). Damp. Rootlets and other organic mater.	Cement 1.3" OD PVC; 3.5 ft; Cement grout; 9.4 ft; Bentonite chips
	5							
	10							
	15							
	20						20.0' SILTY/CLAYEY SAND (SC-SM) - dark yellowish brown (10YR 4/2), moderately sorted, non-indurated. Composed of 75 to 80% sand, predominantly felsic grains (clear, fine to coarse, subangular to subrounded), trace inter. comp. volcanics (dark gray, coarse, subangular); 15 to 25% silt/clay; (Continued on next page).	
▼	25						25.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/12/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCP-2b
	Completed: 9/12/2006	Rig Type: CME 55 HSA	Logged By: Jordan Vaughn	TD Borehole: 51.5 ft
Northing: 1769914.53		Easting: 1637205.05	Location ID: None	TD Casing: 50.1 ft

ELEVATIONS:
Ground Surface: 6722.57
Brass Cap: 6723.11
Casing: 6725.31

Saturation

Depth (ft)	Saturation Level	Date
25	Top	9/12/2006
Not observed	Bottom	9/12/2006

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	25	Qal		C			QUATERNARY ALLUVIUM - SILTY/CLAYEY SAND (SC-SM) - (continued) 0 to 3% gravel, inter. comp. volcanics (medium gray up to 10 mm, subangular), pumice (vitric, fibrous, very pale tan, up to 8 mm, rounded, quartz phenocrysts), tuff (pale orange, up to 12 mm, rounded, devitrified pumice). Wet. Sand percentage increases with depth.	
	30						33.0' SILTY/CLAYEY SAND (SC-SM) - dark yellowish brown (10YR 4/2), poorly to moderately sorted, non-indurated. Composed of: 70% sand, predominantly felsic grains (clear, fine to coarse, subangular to subrounded), trace inter. comp. volcanics (dark gray, medium to coarse, subrounded); 30% silt/clay; trace gravel, tuff (pale orange, up to 15 mm, rounded, devitrified pumice). Wet.	Bentonite chips
	35							
	40							
	45							Screen below is a 0.01" prepack 1.7" OD (49.5-50 ft) 49 ft 20/40 Sand 10/20 Sand
	50							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/12/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCP-2b
	Completed: 9/12/2006	Rig Type: CME 55 HSA	Logged By: Jordan Vaughn	TD Borehole: 51.5 ft
Northing: 1769914.53		Easting: 1637205.05	Location ID: None	TD Casing: 50.1 ft

ELEVATIONS:
Ground Surface: 6722.57
Brass Cap: 6723.11
Casing: 6725.31

Saturation

Depth (ft)	Saturation Level	Date
25	Top	9/12/2006
Not observed	Bottom	9/12/2006

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	50	Qal		C			QUATERNARY ALLUVIUM - SILTY/CLAYEY SAND (SC-SM) - as above. 51.5'	50.1 ft 10/20 Sand TD = 51.5 ft

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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4.0 SCC Coreholes

The LANL Work Plan called for six characterization coreholes to be installed in Sandia Canyon to determine the nature and extent of chromium in the upper vadose zone and obtain data to calculate chromium inventories. Drilling objectives were outlined in the LANL Work Plan and refined in the Kleinfelder Drilling Plan, with input from LANL scientists.

Six coreholes, SCC-1 through SCC-6, were successfully drilled with air rotary techniques in Sandia Canyon. Core samples were collected at 20 ft intervals and submitted for laboratory analysis; the core runs were typically 3-ft long, although some 1.5-ft split spoon samples were collected at 20 and 40 ft depth. Cuttings were collected at 5-ft intervals between the core runs for lithologic descriptions. Water samples were collected at four of the coreholes during drilling. Video and geophysical logs (induction and natural gamma) were run at each corehole. A summary table of corehole deviations from the Work Plan and the Drilling Plan is provided in Appendix D.

4.1 SCC-1/Well SCI-1

SCC-1 was drilled from September 30 to October 5, 2006 in lower Sandia Canyon (Figure 1.0-1). The hole was drilled to 400 ft bgs and core samples were collected at 20-ft intervals. Core recovery ranged from 47 to 100% and all core samples were submitted for the full suite of laboratory analyses as specified in the Work Plan. The corehole was advanced 9.5 ft into the Cerros del Rio basalt, near the range of 10 to 20 ft identified in the Drilling Plan. All other drilling objectives identified in the Work Plan were met.

Alluvial groundwater was encountered from 33.5 to approximately 58 ft bgs at SCC-1. The bottom of the alluvial groundwater zone was difficult to identify precisely because continuous core was not collected and an induction log was not run on this interval due to the presence of casing.

Intermediate perched water was present in the Puye Formation at approximately 366 ft bgs; the bottom of the zone is inferred to be within the uppermost Cerros del Rio basalt at approximately 392 ft bgs, based on the conductivity log (D. Vaniman, personal communication). One water sample was collected at SCC-1 from this zone. A monitoring well, renamed SCI-1, was installed with a screened interval between 358.4 and 377.9 ft bgs in the Puye Formation gravels.

After construction of SCI-1, filter pack sand was discovered within the sump portion of the well. The sump was apparently punctured during installation. WDC Exploration & Wells, Inc. placed a permanent cylindrical PVC plug inside the sump which effectively sealed the bottom of the well. Based on a video that was run after the plug was installed, the top of the plug is at 377.9 ft bgs.

Summary data regarding drilling, geophysical/video logging, well construction and stratigraphy are presented in Table 4.1-1. Figure 4.1-1 shows the lithologic log and well construction schematic. The appendices present survey data, drilling program deviations, groundwater sample information, core samples collected and waste characterization activities.

Table 4.1-1 Summary Data for SCC-1/SCI-1

SCC-1	
DRILLING	
Dates drilled	9/30/06 – 10/05/06
Method	Air rotary/STRATEX
Hole diameter (in.)	10
Sample method (collected every 20 ft)	2.5-in. ID Split spoon: 20-41.5 ft; 3-in. ID tube in Pitcher sampler: 60-383 ft; 2.4-in. ID core barrel: 391-400 ft
Borehole TD (ft bgs)	400
WELL CONSTRUCTION (SCI-1)	
Date completed	10/07/06
Casing ID/OD (in.)	3.8/4.5
Screen ID/OD (in.)	3.8/4.5
Screened interval (ft bgs)	358.4-377.9
Slot size (in.)	0.02
Sand size	20/40
Casing TD (ft bgs)	377.9
LOGGING (performed by LANL)	
Gamma	10/05/06
Induction	10/05/06
Video	10/05/06
STRATIGRAPHY	
Depth (ft bgs)	Qal: 0-58
Depth (ft bgs)	Qbo: 58-318
Depth (ft bgs)	Qbog: 318-333
Depth (ft bgs)	Tpf (gravel/sand): 333-380
Depth (ft bgs)	Tpf (silt): 380-390.5
Depth (ft bgs)	Tb4: 390.5-400
WELL DEVELOPMENT (SCI-1)	
Total volume purged (gal.)	821
Final pH	5.9
Final temperature (°C)	17.7
Final conductivity (µS/cm)	753
Final turbidity (NTUs)	0.7
SPECIFIC CAPACITY TEST	11/12/06 – 11/14/06
DEPTH TO WATER (ft bgs)	366.66 (10/13/06)
FINAL STATUS	Well called SCI-1

LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/30/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCI-1
	Completed: 10/7/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 400 ft
Northing: 1770297.05		Easting: 1636823.65	Location ID: SA-26996	TD Casing: 377.9 ft

ELEVATIONS:
Ground Surface: 6737.84
Brass Cap: 6738.27
Casing: 6740.60

Saturation

Top (ft)	Bottom (ft)	Zone
33.5	58	Alluvial
366	392	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	0	Qal					QUATERNARY ALLUVIUM Cuttings (0-20 ft bgs); SAND (SW), pale brown (5YR 5/2), moderately to well sorted, non-indurated. Composed of: abundant sand, predominantly felsic grains (clear, fine to coarse, subangular to subrounded, with crystal faces), minor intermediate composition volcanics (dark brown, fine to coarse, subrounded), and trace pumice (vitric, moderate brown, fine to coarse, subangular to subrounded); trace gravel, predominantly felsic grains (clear, <3 mm, subangular to subrounded, crystal faces), trace inter. comp. volcanics (dark brown, up to 5 mm, subrounded), and trace pumice (vitric, moderate brown, up to 7 mm, subangular to subrounded).	Cement 2.5 ft
	5							
	10			C			NOTE: Potable water injection began at 10 ft bgs.	4" OD PVC Cement grout
	15							
	20				CASA-06-73280		20.0'	
				CS			Core (20-21.5 ft bgs); SANDY SILT (MLS) TO GRAVELLY SILT (MLG), moderate brown (5YR 3/4), poorly to moderately sorted, non-indurated. Composed of: 50-70% silt/clay; 20-30% sand (predominantly felsic grains, minor pumice, and minor inter. comp. volcanics) 5% gravel (predominantly pumice and inter. comp. volcanics). Damp.	
				C				
	25						NOTE: Core run was 18 in. with 100% recovery.	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/30/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCI-1
	Completed: 10/7/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 400 ft
Northing: 1770297.05		Easting: 1636823.65	Location ID: SA-26996	TD Casing: 377.9 ft

ELEVATIONS:
Ground Surface: 6737.84
Brass Cap: 6738.27
Casing: 6740.60

Saturation

Top (ft)	Bottom (ft)	Zone
33.5	58	Alluvial
366	392	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	25			C			QUATERNARY ALLUVIUM Cuttings (25-40 ft bgs); SILT/CLAY (ML-CL), moderate brown (5YR 3/4), poorly to moderately sorted, non-indurated. Composed of abundant silt/clay and gravel, predominantly tuff (devitrified, pale to moderate brown up to 48 mm to subrounded, moderately to strongly welded) and inter. comp. volcanics (dark brown, up to 12 mm, subrounded, with felsic phenocrysts). Minor sand.	
	30			NR			Cuttings; as above, increase in gravel, predominantly tuff, trace pumice, and trace inter. comp. volcanics; minor sand, minor silt/clay.	
▼	35	Qal		C				Cement grout
	40			CS	CASA-06-73281		Core (40-41.5 ft bgs); SANDY SILT/CLAY (ML-CL), light brown (5YR 5/6), poorly to moderately sorted, non to poorly indurated. Composed of: 50-70% silt/clay; 20-40% sand, 7-10% gravel, Damp. NOTE: Core run was 18 in. with 100% recovery.	
	45			C			Cuttings (45-50 ft bgs); as above, abundant sand and gravel; minor silt/clay.	
	50						50.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
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NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/30/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCI-1
	Completed: 10/7/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 400 ft
Northing: 1770297.05		Easting: 1636823.65	Location ID: SA-26996	TD Casing: 377.9 ft

ELEVATIONS:
Ground Surface: 6737.84
Brass Cap: 6738.27
Casing: 6740.60

Saturation

Top (ft)	Bottom (ft)	Zone
33.5	58	Alluvial
366	392	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	50	Qal		C			QUATERNARY ALLUVIUM Cuttings (50-55 ft bgs); SILTY SAND AND GRAVEL WITH CLAY (GM-GC), pale brown (5YR 5/20 to light brown (5YR 6/4), abundant sand, predominantly pumice (vitric, pale brown to orange, fine to coarse, subrounded) with minor inter. comp. volcanics and minor felsic grains; abundant gravel. predominantly pumice (vitric, pale brown to orange, up to 35 mm, subrounded, with felsic phenocrysts), tuff (devitrified, pale to moderate brown, up to 25 mm, subrounded, with abundant felsic phenocrysts) and inter. comp. volcanics (dark to reddish brown, up to 20 mm subrounded). Cuttings (55-58 ft bgs); as above, light brown (5YR 6/4), abundant sand with abundant vitric, fibrous pumice gravel clasts up to 35 mm.	
	55							
▽							58.0'	
	60	Qbo		T NR	CASA-06-73282		OTOWI MEMBER OF THE BANDELIER TUFF Core (60-61.5 ft bgs); TUFF, light brown (5YR 6/4), poorly welded. Composed of fine ash matrix with: 20-25% felsic phenocrysts (clear, up to 2 mm, subangular to subrounded); 3-5% lithics (dark brown, generally <6 mm, up to 35 mm, subrounded); 1-5% pumice (vitric, light brown to orange, up to 7 mm, subrounded). Damp. NOTE: The top of the Qbo is 58 ft bgs based on geophysical logging.	Cement grout
	65			C			Cuttings (60-80 ft bgs): TUFF, light brown (5YR 6/4), poorly welded. Composed of fine ash matrix with: abundant pumice (vitric, light brown, up to 30 mm, manganese/iron (Mn/Fe) oxide staining); minor felsic phenocrysts (clear, up to 2 mm, subangular to subrounded); trace lithic phenocrysts (dark brown, <2 mm, subrounded).	
	70			NR				70 ft Bentonite chips
	75							

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C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/30/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCI-1
	Completed: 10/7/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 400 ft
Northing: 1770297.05		Easting: 1636823.65	Location ID: SA-26996	TD Casing: 377.9 ft

ELEVATIONS:
Ground Surface: 6737.84
Brass Cap: 6738.27
Casing: 6740.60

Saturation

Top (ft)	Bottom (ft)	Zone
33.5	58	Alluvial
366	392	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	75						OTOWI MEMBER OF THE BANDELIER TUFF	
				C				Cement grout
	80				CASA-06-73283		Core (80-82.5 ft bgs); TUFF, light brown (5YR 5/6), poorly welded. Composed of fine ash matrix with: 10-15% felsic phenocrysts (clear, <2 mm, subrounded); 2-3 % lithics (dark brown, generally <10 mm, up to 30 mm, subangular to subrounded); 1-5% pumice (vitric, light brown to orange, up to 20 mm, subangular to subrounded, abundant felsic phenocrysts). Damp.	80 ft
				T				
				NR				
	85							
		Qbo						
	90						Cuttings (80-100 ft bgs); TUFF, light brown (5YR 5/6), poorly welded. Composed of fine ash matrix with abundant pumice (vitric, pale yellowish brown to light orange, up to 13 mm, subrounded, felsic phenocrysts) and lithics, predominantly inter. comp. volcanics (dark brown, light gray, generally <15 mm, up to 50 mm, subangular to subrounded); minor felsic phenocrysts (clear, <2 mm, subrounded).	Bentonite chips
				C				
	95							
	100							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
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C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/30/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCI-1
	Completed: 10/7/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 400 ft
Northing: 1770297.05		Easting: 1636823.65	Location ID: SA-26996	TD Casing: 377.9 ft

ELEVATIONS:
Ground Surface: 6737.84
Brass Cap: 6738.27
Casing: 6740.60

Saturation

Top (ft)	Bottom (ft)	Zone
33.5	58	Alluvial
366	392	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	100			T	CASA-06-73284		OTOWI MEMBER OF THE BANDELIER TUFF Core (100-102.3 ft bgs); pale yellowish brown (10YR 6/2). Composed of fine ash matrix with: 15% felsic phenocrysts (clear, <2 mm, subrounded); 5-10% pumice (vitric, pale yellowish brown to orange, generally <15 mm, up to 18 mm, subangular to subrounded); 2-3% lithics (dark brown, up to 5 mm, subangular to subrounded). Damp.	
	105							
	110	Qbo		C			Cuttings (100-120 ft bgs); TUFF, pale yellowish brown (10YR 6/2). Composed of fine ash matrix with: abundant pumice (vitric, pale yellowish brown to light orange, generally <12 mm, up to 25 mm, subangular to subrounded, felsic phenocrysts); minor lithics (dark brown to reddish brown, generally <7 mm, up to 20 mm, subangular to subrounded); minor felsic phenocrysts (clear, <3 mm, subrounded to angular with crystal faces).	Bentonite chips
	115							
	120			T	CASA-06-73285		Core (120-122.1 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: 10-15% felsic phenocrysts (clear, <2 mm, subrounded); 7-10% pumice (vitric, pale yellowish brown to light orange, up to 9 mm, subrounded to subangular, felsic phenocrysts); 1-2% lithics (dark brown, generally <3 mm, up to 20 mm, subrounded). Damp.	
				NR				
				C				
	125							

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NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/30/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCI-1
	Completed: 10/7/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 400 ft
Northing: 1770297.05		Easting: 1636823.65	Location ID: SA-26996	TD Casing: 377.9 ft

ELEVATIONS:
Ground Surface: 6737.84
Brass Cap: 6738.27
Casing: 6740.60

Saturation

Top (ft)	Bottom (ft)	Zone
33.5	58	Alluvial
366	392	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	125						OTOWI MEMBER OF THE BANDELIER TUFF Cuttings (120-140 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: abundant pumice (vitric, fibrous, pale yellowish brown to dark yellowish orange, up to 15 mm, subrounded to subangular, minor Mn/Fe staining, felsic phenocrysts) and lithics (dark brown, up to 20 mm, subrounded to subangular); minor felsic phenocrysts (clear, <2 mm, subrounded).	
	130						(125-135 ft bgs); as above, non-fibrous pumice.	
				C				
	135							
		Qbo						Bentonite chips
	140				CASA-06-73286		Core (140-142 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: 7-15% felsic phenocrysts (clear, <2 mm, subrounded to subangular); 5-7% pumice (vitric, pale yellowish brown to dark yellowish orange, generally <2 mm, altered fragments up to 15 mm, subrounded to subangular); 2-3 % lithics (dark to reddish brown, <8 mm, subrounded to subangular). Damp.	
				T				
				NR				
	145							
				C				
	150							

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NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/30/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCI-1
	Completed: 10/7/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 400 ft
Northing: 1770297.05		Easting: 1636823.65	Location ID: SA-26996	TD Casing: 377.9 ft

ELEVATIONS:
Ground Surface: 6737.84
Brass Cap: 6738.27
Casing: 6740.60

Saturation

Top (ft)	Bottom (ft)	Zone
33.5	58	Alluvial
366	392	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	150						OTOWI MEMBER OF THE BANDELIER TUFF Cuttings (140-160 ft bgs); TUFF, pale yellowish brown (10YR 6/2) to moderate yellowish brown (10YR 4/2), poorly welded. Composed of ash matrix with: abundant pumice (vitric, pale yellowish brown to dark yellowish orange, <5 mm, subrounded to subangular) and lithics (dark brown, <5 mm, subrounded to subangular); minor felsic phenocrysts (clear, <2 mm, subrounded).	
	155			C				
	160	Qbo		T	CASA-06-73287		Core (160-163 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: 10-15% pumice (vitric, fibrous, pale yellowish brown to dark yellowish orange, generally <10 mm, up to 30 mm, felsic phenocrysts); 7-15% felsic phenocrysts (clear, <2 mm, subrounded); 1-2 % lithics (dark brown, generally <5 mm, up to 25 mm, subrounded). Damp.	Bentonite chips
	165						Cuttings (160-180 ft bgs); TUFF, pale yellowish brown (10YR 6/2) to dusky yellowish brown (10YR 2/2). Composed of: abundant lithics (dark brown, generally <12 mm, up to 25 mm, subrounded to subangular) and pumice (vitric, fibrous, pale yellowish brown to dark yellowish orange, generally <10 mm, up to 25 mm, felsic phenocrysts); minor felsic phenocrysts (clear, <2 mm, subrounded).	
	170			C				
	175							

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NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/30/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCI-1
	Completed: 10/7/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 400 ft
Northing: 1770297.05		Easting: 1636823.65	Location ID: SA-26996	TD Casing: 377.9 ft

ELEVATIONS:
Ground Surface: 6737.84
Brass Cap: 6738.27
Casing: 6740.60

Saturation

Top (ft)	Bottom (ft)	Zone
33.5	58	Alluvial
366	392	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	175						OTOWI MEMBER OF THE BANDELIER TUFF	
				C				
	180				CASA-06-73288		Core (180-181.6 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: 10-20% pumice (vitric, fibrous, pale yellowish brown to dark yellowish orange, up to 25 mm, subrounded to subangular, felsic phenocrysts); 5-10% felsic phenocrysts (clear, <2 mm, up to 5 mm, subrounded); 1-2 % lithics (dark brown, generally <5 mm, up to 75 mm, subangular to subrounded). Damp.	
				T				
				NR				
	185							
		Qbo						Bentonite chips
	190						Cuttings (180-200 ft bgs); TUFF, pale yellowish brown (10YR 6/2) to moderate yellowish brown (10YR 5/4), poorly welded. Composed of fine ash matrix with: abundant pumice (vitric, fibrous, pale yellowish brown to dark yellowish orange, up to 15 mm, subrounded to subangular, felsic phenocrysts) and lithics (dark brown, generally <5 mm, up to 75 mm, subangular to subrounded); minor felsic phenocrysts (clear, <2 mm, up to 5 mm, subrounded).	
				C				
	195							
	200							

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NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/30/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCI-1
	Completed: 10/7/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 400 ft
Northing: 1770297.05		Easting: 1636823.65	Location ID: SA-26996	TD Casing: 377.9 ft

ELEVATIONS:
Ground Surface: 6737.84
Brass Cap: 6738.27
Casing: 6740.60

Saturation

Top (ft)	Bottom (ft)	Zone
33.5	58	Alluvial
366	392	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	200			T	CASA-06-73289		OTOWI MEMBER OF THE BANDELIER TUFF Core (200-203 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: 10-15% pumice (vitric, pale yellowish brown to v. pale orange, up to 25 mm, subrounded to subangular, felsic phenocrysts); 10% felsic phenocrysts (clear, <2 mm, subrounded to subangular, bipyramidal quartz noted); 1-3 % lithics (dark brown, generally <5 mm, up to 20 mm, subangular). Damp.	
	205							
	210	Qbo		C			Cuttings (200-220 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: abundant pumice (vitric, pale yellowish brown to v. pale orange, up to 18 mm, subrounded to subangular, felsic phenocrysts) and lithics (dark brown, generally <5 mm, subangular); minor felsic phenocrysts (clear, <2 mm, subrounded to subangular, bipyramidal quartz noted).	Bentonite chips
	215							
	220			T	CASA-06-73290		Core (220-221.4 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: 15-20% pumice (vitric, pale yellowish brown, up to 15 mm, subrounded to subangular, felsic phenocrysts); 5-10% felsic phenocrysts (clear, <2 mm, rounded); 1-3 % lithics (dark brown, generally <5 mm, single clast up to 40 mm, subrounded). Damp.	
				NR				
				C				
	225							

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NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/30/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCI-1
	Completed: 10/7/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 400 ft
Northing: 1770297.05		Easting: 1636823.65	Location ID: SA-26996	TD Casing: 377.9 ft

ELEVATIONS:
Ground Surface: 6737.84
Brass Cap: 6738.27
Casing: 6740.60

Saturation

Top (ft)	Bottom (ft)	Zone
33.5	58	Alluvial
366	392	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	225						OTOWI MEMBER OF THE BANDELIER TUFF Cuttings (220-240 ft bgs); pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: abundant pumice (vitric, v. light gray to grayish pink, up to 5 mm, angular to subangular) and felsic phenocrysts (clear, <2 mm, subrounded to subangular, bipyramidal quartz noted); minor lithics (black, generally <5 mm, up to 20 mm, angular to subrounded).	
	230			C				
	235	Qbo						Bentonite chips
	240			T NR	CASA-06-73291		Core (240-242.5 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: 25-30% pumice (vitric, white, grayish pink, up to 20 mm); 5-10% felsic phenocrysts (clear, 1-2 mm, angular to subrounded); 5% lithics (black, dark brown, generally <5 mm, angular to subrounded). Damp.	
	245			C				
	250							

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Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/30/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCI-1
	Completed: 10/7/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 400 ft
Northing: 1770297.05		Easting: 1636823.65	Location ID: SA-26996	TD Casing: 377.9 ft

ELEVATIONS:
Ground Surface: 6737.84
Brass Cap: 6738.27
Casing: 6740.60

Saturation

Top (ft)	Bottom (ft)	Zone
33.5	58	Alluvial
366	392	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	250						OTOWI MEMBER OF THE BANDELIER TUFF Cuttings (240-260 ft bgs); pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: abundant pumice (vitric, white, <5 mm, angular) and felsic phenocrysts (clear, 1-2 mm, subrounded to subangular, trace with crystal faces noted); minor lithics (dark brown, black, <5 mm, angular to subrounded).	
	255			C				
	260	Qbo		T	CASA-06-73292		Core (260-263 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash with: 25% pumice (vitric, white to light gray, <5 mm, angular to subangular); 10-15% felsic phenocrysts (clear, 1-2 mm, subrounded to angular); 5% lithics (dark brown, up to 4 mm, subrounded to angular). Damp.	Bentonite chips
	265			C			Cuttings (260-270 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash with: abundant pumice (vitric, white, <5 mm, angular to subangular, trace Mn/Fe oxide specks); minor felsic phenocrysts (clear, 1-2 mm, subrounded to angular, trace with crystal faces); minor lithics (dark brown, black, up to 4 mm, angular to subangular).	
	270							
	275							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/30/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCI-1
	Completed: 10/7/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 400 ft
Northing: 1770297.05		Easting: 1636823.65	Location ID: SA-26996	TD Casing: 377.9 ft

ELEVATIONS:
Ground Surface: 6737.84
Brass Cap: 6738.27
Casing: 6740.60

Saturation

Top (ft)	Bottom (ft)	Zone
33.5	58	Alluvial
366	392	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	275						OTOWI MEMBER OF THE BANDELIER TUFF Cuttings (270-280 ft bgs); as above, marked decrease in constituent size, up to1-2 mm.	
				C				
	280				CASA-06-73293		Core (280-283 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with; 20-30% pumice (vitric, pale yellowish brown, up to 18 mm, subrounded to subangular, minor Mn/Fe oxide specks); 10-15% felsic phenocrysts (clear, <2 mm, subrounded); 1-2% lithics (dark brown, generally <5 mm, up to 10 mm, subrounded). Damp.	
				T				
	285							
		Qbo						Bentonite chips
	290						Cuttings (280-300 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash with: abundant pumice (vitric, pale yellowish brown to grayish orange pink, generally <10 mm, up to 28 mm, subangular to subrounded, felsic phenocrysts); minor felsic phenocrysts (clear, <2 mm, subrounded); minor lithics (dark brown to reddish brown, <5 mm, subangular to subrounded).	
				C				
	295							
	300							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/30/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCI-1
	Completed: 10/7/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 400 ft
Northing: 1770297.05		Easting: 1636823.65	Location ID: SA-26996	TD Casing: 377.9 ft

ELEVATIONS:
Ground Surface: 6737.84
Brass Cap: 6738.27
Casing: 6740.60

Saturation

Top (ft)	Bottom (ft)	Zone
33.5	58	Alluvial
366	392	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	300				CASA-06-73294		OTOWI MEMBER OF THE BANDELIER TUFF Core (300-303 ft bgs); pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: 25-30% pumice (vitric, fibrous, pale yellowish brown to grayish orange pink, generally <10 mm, up to 33 mm, subrounded to subangular); 10-15% felsic phenocrysts (clear, <2 mm, subrounded to subangular); 1-3 % lithics (dark brown to reddish brown, generally <5 mm, up to 18 mm, subrounded to subangular). Damp.	
				T				
	305						Cuttings (300-315 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: abundant pumice (pale yellowish brown to dark yellowish orange, up to 5 mm); minor felsic phenocrysts (clear, <2 mm, subrounded to subangular); minor lithics (dark brown to reddish brown, generally <5 mm, up to 20 mm, subrounded to subangular).	
		Qbo						
	310			C				Bentonite chips
	315							
							318.0'	
							GUAJE PUMICE BED Cuttings (315-320 ft bgs); PUMICE, pale yellowish brown (10YR 6/2) to light gray (N7), poorly welded, up to 10 mm, subrounded to subangular; minor felsic phenocrysts and lithics. Ash matrix absent.	
	320				CASA-06-73295			
				T				
		Qbog		NR			Core (320-321.5ft bgs); PUMICE, pale yellowish brown (10YR 6/2) to light gray (N7), poorly welded. Composed of: 65-70% pumice (vitric, fibrous, light gray, generally <8 mm, up to 15 mm, subrounded to subangular); 25-30% felsic phenocrysts (clear, <3 mm, subrounded); 5-7% lithics (dark brown to reddish brown, generally <8 mm, up to 17 mm, subrounded to subangular). Damp.	
				C				
	325							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/30/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCI-1
	Completed: 10/7/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 400 ft
Northing: 1770297.05		Easting: 1636823.65	Location ID: SA-26996	TD Casing: 377.9 ft

ELEVATIONS:
Ground Surface: 6737.84
Brass Cap: 6738.27
Casing: 6740.60

Saturation

Top (ft)	Bottom (ft)	Zone
33.5	58	Alluvial
366	392	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	325	Qbog		C			GUAJE PUMICE BED Cuttings (320-335 ft bgs) PUMICE, as above, composed of: abundant pumice (up to 20 mm), minor felsic phenocrysts minor lithics (up to 25 mm).	Bentonite chips
	330							
							333.0'	
	335	Tpf					PUYE FORMATION Cuttings (333-340) ft bgs) SANDY CONGLOMERATE, vari-colored, moderately sorted, poorly indurated. Composed of: abundant gravel, predominantly inter. comp. volcanics (dark brown to reddish brown, generally <25 mm, up to 55 mm, subrounded to subangular), trace pumice likely intermixing from overlying formation; trace sand, predominantly pumice (as for overlying formation, fine to coarse) and felsic grains (clear, fine to coarse, subrounded). NOTE: The top of the Tpf is 333 ft bgs based on geophysics.	
	340			T NR	CASA-06-73296		Core (340-341.6 ft bgs); SANDY CONGLOMERATE, moderate brown (5YR 4/4), poorly sorted, poorly indurated. Composed of: 75% gravel, predominantly inter. comp. volcanics (dark to reddish brown, gray, generally <15 mm, up to 35 mm, subrounded to subangular); 25% sand, predominantly inter. comp. volcanics (as described for gravels, fine to coarse grains), minor felsic grains (clear, fine to coarse, subrounded). Damp.	
	345			C				
	350							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/30/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCI-1
	Completed: 10/7/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 400 ft
Northing: 1770297.05		Easting: 1636823.65	Location ID: SA-26996	TD Casing: 377.9 ft

ELEVATIONS:
Ground Surface: 6737.84
Brass Cap: 6738.27
Casing: 6740.60

Saturation

Top (ft)	Bottom (ft)	Zone
33.5	58	Alluvial
366	392	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	350						PUYE FORMATION Cuttings (340-360 ft bgs); SANDY CONGLOMERATE, grayish brown (5YR 3/2), poorly sorted, poorly indurated. Composed of: abundant gravel, varied clasts predominantly inter. comp. volcanics (vari colored, medium gray, pale reddish brown, moderate red, light grayish green, up to 40 mm, angular to broken with rounded surfaces), trace pumice (vitric, fibrous, orange to gray, up to 5 mm, subangular, trace Mn/Fe oxide specks); trace sand, composition as for gravel; trace silt /clay.	Bentonite chips 352 ft 20/40 sand 353.8 ft
	355			C				10/20 sand 358.4 ft
	360			T	CASA-06-73297		Core (360-360.8 ft bgs); SANDY CONGLOMERATE, moderate brown (5YR 4/4), poorly sorted, poorly indurated. Poor recovery-core predominantly gravel, inter. comp. volcanics (black, dark brown, up to 60 mm, angular) with minor sand and silt/clay. Water recovered with sample may have been injection water.	
		Tpf		NR				
	365						Cuttings (360-370 ft bgs); SANDY CONGLOMERATE, moderate yellowish brown (10YR 5/4), moderately sorted, poorly indurated. Composed of: abundant gravel, varied clasts predominantly inter. comp. volcanics (vari colored, black, gray, moderate red, pale gray green up to 20 mm, angular to subrounded), trace pumice/tuff (light gray, up to 5 mm, rounded, common biotite phenocrysts); trace sand; trace silt/clay.	0.02" screen 4.5" OD PVC
				C				
	370						Cuttings, (370-380 ft bgs); as above, marked increase in sand and silt/clay content.	
	375							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/30/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCI-1
	Completed: 10/7/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 400 ft
Northing: 1770297.05		Easting: 1636823.65	Location ID: SA-26996	TD Casing: 377.9 ft

ELEVATIONS:
Ground Surface: 6737.84
Brass Cap: 6738.27
Casing: 6740.60

Saturation

Top (ft)	Bottom (ft)	Zone
33.5	58	Alluvial
366	392	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	375						PUYE FORMATION	0.02" screen 10/20 sand
				C			NOTE: PVC plug installed at 377.9 ft---------->	377.9 ft 378.5 ft
	380				CASA-06-73298		Core (380-383 ft bgs); SILTSTONE, moderate brown (5YR 3/4), moderate to well sorted, poorly indurated. Composed of: 95% silt/clay; 2-3% sand, predominantly inter. comp. volcanics (pale gray, 1-2 mm, subrounded) and pumice (vitric, v. light gray, 1-2 mm, angular), trace felsic grains (clear, up to 1 mm, angular), trace obsidian (black 1 mm, angular), trace biotite (black, 1-2 mm, platy); 2-3% gravel, predominantly inter. comp. volcanics (pale gray, 2-3 mm, subrounded) and pumice (vitric, very light gray, 2-3 mm, subrounded). Minor gravelly sandy siltstone clasts (moderate brown, up to 40 mm, angular to subangular), moderately sorted, moderately to well indurated. Composed of 10-15% sand, predominantly inter. comp. volcanics (medium gray, 1-2 mm, subrounded to round); 5-10% gravels, predominantly inter. comp. volcanics (medium and reddish gray, 2-4 mm, subrounded to round). Possible inter-bedding of siltstone. Damp to wet.	Slough
				T				381.5 ft
		Tpf						
	385				CASA-06-73478 (Water)			
				C				Bentonite chips
	390						Cuttings (380-390 ft bgs); SILTSTONE, as above.	
							390.5'	
					CASA-06-73299		CERROS DEL RIO BASALT - Cuttings (390-391 ft bgs); BASALT, grayish black (N2) to dark gray (N3), vesicular, aphanitic groundmass with 1% olivine phenocrysts (brownish green, 1 mm, subhedral), trace brown mottling, trace reddish brown clay lining in vesicles..	
▽				CORE			Core (391-397.5 ft bgs); BASALT, as above, vesicular, aphanitic groundmass with 1-2% olivine phenocrysts (brownish green, 1 mm, subhedral), trace oxidation/clay in vesicles. Water was injected during coring, moisture assessment compromised. Fractures present in 3- 4" intervals (~30°, up to 80° from horizontal).	
	395	Tb4			CASA-06-73300			395.4 ft
				CORE			Core (394.5 ft bgs); as above, clay infilling in fracture. 80° fractures (397-397.5 ft bgs).	Slough
				NR				
	400						400.0'	TD = 400 ft

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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4.2 SCC-2

SCC-2 was drilled from August 18 to 31, 2006 in lower Sandia Canyon (Figure 1.0-1). The hole was drilled to 388.6 ft bgs and core samples were collected at 20-ft intervals. Core recovery ranged between 50 and 100% and all samples were submitted for laboratory analysis as specified in the Work Plan. The corehole was advanced 11.6 ft into the Cerros del Rio basalt, within the range of 10 to 20 ft identified in the Drilling Plan. All other drilling objectives identified in the Work Plan were met.

Shallow perched water was encountered from 54 to 60 ft bgs in the Tshirege Member of the Bandelier Tuff and the upper Cerro Toledo interval. Water was measured at 50.2 ft bgs, with a borehole depth of 60 ft, and a groundwater sample was collected. Intermediate perched water was present in the Puye Formation from approximately 356 to 377 ft bgs; two groundwater samples were collected from that zone.

Summary data regarding drilling, geophysical/video logging, and stratigraphy are presented in Table 4.2-1. Figure 4.2-1 shows the lithologic log and backfill schematic for the corehole. The appendices present survey data, drilling program deviations, groundwater samples collected, core samples collected and a summary of waste characterization activities.

Table 4.2-1 - Summary Data for SCC-2

SCC-2	
DRILLING	
Dates drilled	8/18/06 – 8/31/06
Method	Air rotary/STRATEX
Hole diameter (in.)	10
Sample method (collected every 20 ft)	2.5-in. ID Split spoon: 20-143 ft; 3-in. ID tube in Pitcher sampler: 160-363 ft; 2.4-in. ID core barrel: 363-386 ft
Borehole TD (ft bgs)	388.6
LOGGING (performed by LANL)	
Gamma	9/01/06
Induction	9/05/06
Video	9/05/06
STRATIGRAPHY	
Depth (ft bgs)	Qal: 0-18
Depth (ft bgs)	Qbt 1g: 18-55
Depth (ft bgs)	Qct: 55-105
Depth (ft bgs)	Qbo: 105-313
Depth (ft bgs)	Qbog: 313-332
Depth (ft bgs)	Tpf (gravel): 332-350
Depth (ft bgs)	Tpf (silt): 350-377
Depth (ft bgs)	Tb4: 377-388.6
DEPTH TO WATER (ft bgs)	350.75 (9/05/06)
FINAL STATUS	Plugged & Abandoned

LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 8/21/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-2
	Completed: 8/31/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 388.6 ft
Northing: 1769868.04		Easting: 1637145.53	Location ID: SA-26997	TD Casing: NA

ELEVATIONS:
Ground Surface: 6723.25
Brass Cap: 6723.74
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
54	60	Shallow
356	377	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	0	Qal		C			QUATERNARY ALLUVIUM - GRAVELLY SILTY/CLAYEY SAND (SWG) - Cuttings (0-20 ft bgs); light brown (5YR 6/4) to moderate brown (5YR 5/6), poorly sorted, poorly indurated. Composed of: 50-60% sand (predominantly felsic grains, clear, very fine to coarse, subangular to subrounded, trace with trace crystal faces with lesser amounts of pumice and intermediate composition volcanics (inter. comp. volcanics)); 30-40% silt/clay; 10% gravel (predominantly moderately to poorly welded tuff fragments, purple gray to orange brown, up to 30 mm, subangular to subrounded, crystal rich with no apparent pumices), minor inter. comp. volcanics (vari-colored, generally <10 mm, subrounded), trace vitric pumice (pale yellow, <5 mm, rounded) across interval. Damp.	P&A Cement; 4.6 ft; Cement grout
	5							
	10							
	15						Cuttings (15-20 ft bgs); GRADING TO SILTY/CLAYEY SANDY GRAVEL (GWS), Increase in gravels to 30%, decrease in silt/clay to 10-15%.	
	18.0'							
	20	Qbt 1g		CS	CASA-06-73311		UNIT 1G, TSHIREGE MEMBER OF THE BANDELIER TUFF - Core (20-22.4 ft bgs); TUFF, grayish orange (10YR 7/4) to very pale orange (10YR 8/2), poorly welded. Composed of: ash matrix; 10-15% pumice (vitric, very pale orange, up to 25 mm, subrounded, trace manganese/iron (Mn/Fe) oxide specks, fibrous); 5-10% felsic phenocrysts (clear, <2 mm, broken to subrounded, trace quartz crystals); trace lithic fragments (black to reddish brown, <5 mm, subangular). Dry to damp. NOTE: The top of the Qbt 1g is 18 ft bgs based on geophysical logging.	
				NR				
	25			C				
	25.0'							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 8/21/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-2
	Completed: 8/31/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 388.6 ft
Northing: 1769868.04		Easting: 1637145.53	Location ID: SA-26997	TD Casing: NA

ELEVATIONS:
Ground Surface: 6723.25
Brass Cap: 6723.74
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
54	60	Shallow
356	377	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	25						UNIT 1G, TSHIREGE MEMBER OF THE BANDELIER TUFF - Cuttings (20-40 ft bgs); TUFF, very pale orange (10YR 8/2), poorly welded. Composed of: fine ash; minor to abundant pumice (vitric, very pale orange, <2 mm up to 25 mm, angular, trace mafic and felsic phenocrysts, minor fibrous structure) and felsic phenocrysts (clear, <2 mm, subrounded to subangular, trace with crystal faces); trace lithic fragments (black, to grayish red, <2 mm, trace up to 5 mm, angular to subangular). Dry to damp.	Cement grout
	30							30 ft
				C				
	35							
		Qbt 1g						
	40				CASA-06-73312		Core (40-42.4 ft bgs); TUFF, grayish orange (10YR 7/4), poorly welded. Composed of: fine ash; 10% pumice (vitric, predominantly very pale orange, trace light brown, up to 25 mm, subrounded, fibrous, trace felsic phenocrysts); 10-15% felsic phenocrysts (clear, <2 mm, angular to subrounded, trace with crystal faces); trace lithic fragments (<2 mm). Damp.	Bentonite chips
				CS				
				NR				
	45						Cuttings (40-60 ft bgs); TUFF, grayish orange (10YR 7/4). Composed of: minor ash; abundant pumice (vitric, very pale orange to light brown, <2 mm up to 25 mm, angular to subangular, trace mafic phenocrysts); minor felsic phenocrysts (clear, <2 mm, subangular to subrounded); trace lithics. Damp to wet.	
				C				
	50						50.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 8/21/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-2
	Completed: 8/31/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 388.6 ft
Northing: 1769868.04		Easting: 1637145.53	Location ID: SA-26997	TD Casing: NA

ELEVATIONS:
Ground Surface: 6723.25
Brass Cap: 6723.74
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
54	60	Shallow
356	377	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	50	Qbt 1g					UNIT 1G, TSHIREGE MEMBER OF THE BANDELIER TUFF - Cuttings (50-60 ft bgs), slight color change to grayish orange (10YR 7/4) and light brown (5YR 6/4), slight increase in altered pumices. At 51 ft bgs, slight increase in moisture from damp to damp to wet. At 54 ft bgs, saturated returns.	
▼	55			C	CASA-06-73336 (Water)		55.0' CERRO TOLEDO INTERVAL - Cuttings (59-60 ft bgs); CLAYEY/SILTY SAND, light brown (5YR 5/6), well sorted, poorly indurated. Composed of: 70-80% sand (very fine to medium grains, predominantly felsic, clear to opaque, <2 mm, angular to subround); 20-30% silt/clay (medium plasticity). Wet. Material available for lithologic logging was collected from drill bit upon removal of the drill string. NOTE: The contact of the Qct is 55 ft bgs based on geophysical logging.	
▽	60			CS	CASA-06-73313		Core (60-61.5 ft bgs); SILTY GRAVELLY SAND, light brown (5YR 5/6), poorly sorted, poorly indurated. Composed of: 40-50% sand (very fine to coarse grains, predominantly felsic, clear, up to 2 mm, angular to subrounded, trace with crystal faces), minor amounts of pumice (white, <2 mm, subrounded) and inter. comp. volcanics (dark brown/gray, <2 mm, angular to subrounded); 30% gravels, predominantly pumice (orange brown to very pale gray, up to 10 mm, subrounded, vitric, fibrous with minor felsic phenocrysts, trace pumices altering to a waxy clay texture); 20-30% silt/clay, minor waxy texture. Wet.	Bentonite chips
	65	Qct						
				C				
	70						Cuttings (70-80 ft bgs); increase in sand and silt/clay, likely due to sloughing of material accumulating in discharge lines.	
	75						75.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 8/21/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-2
	Completed: 8/31/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 388.6 ft
Northing: 1769868.04		Easting: 1637145.53	Location ID: SA-26997	TD Casing: NA

ELEVATIONS:
Ground Surface: 6723.25
Brass Cap: 6723.74
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
54	60	Shallow
356	377	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	75						CERRO TOLEDO INTERVAL - SILTY GRAVELLY SAND, same as above. Returns are drying up.	
				C				
	80				CASA-06-73314		Core (80-82.5 ft bgs); SILTY/CLAYEY SAND, light brown (5YR 5/6), well sorted, poorly indurated. Composed of: 70-80% sand, predominantly felsic grains (clear, fine to medium grain, subrounded, trace with crystal faces), with trace inter. comp. volcanics and pumice grains; 20-30% silt/clay, nonplastic; trace gravel, inter. comp. volcanics (black, up to 5 mm, subrounded). Damp to Wet.	
				CS				
				NR				
	85							
		Qct						Bentonite chips
	90							
				C				
	95							
	100						100.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

Kleinfelder Inc., Copyright 12/29/2006

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 8/21/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-2
	Completed: 8/31/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 388.6 ft
Northing: 1769868.04		Easting: 1637145.53	Location ID: SA-26997	TD Casing: NA

ELEVATIONS:
Ground Surface: 6723.25
Brass Cap: 6723.74
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
54	60	Shallow
356	377	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	100	Qct		CS	CASA-06-73315		CERRO TOLEDO INTERVAL - SILTY/CLAYEY SAND - Core (100-101.5 ft bgs); light brown (5YR 5/6), well sorted, poorly indurated. Composed of: 70-80% sand (predominantly felsic grains, clear, very fine to med. grains, subrounded, trace crystal form, trace inter. comp. volcanic and pumice grains. 20-30% silt/clay nonplastic); trace gravel (up to 5 mm, subrounded, felsic to mafic). Wet (slight decrease in moisture compared to core from 80-82.5 ft bgs). No water present in borehole.	
	105	Qbo		C			105.0' OTOWI MEMBER OF THE BANDELIER TUFF NOTE: The top of the Qbo is 105 ft bgs based on geophysical logging.	Bentonite chips
	110							
	115							
	120			CS			Core (120-122 ft bgs); TUFF, moderate yellowish brown (10YR 5/4), poorly welded. Composed of: predominantly fine ash with trace lithics (grayish red/brown, 1 to 2 mm, subangular) and trace felsic phenocrysts (clear, 1 mm, angular). Damp to wet. No water present in borehole. Core appears altered to a silt-like material.	
				NR	CASA-06-73316			
				C				
	125						125.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 8/21/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-2
	Completed: 8/31/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 388.6 ft
Northing: 1769868.04		Easting: 1637145.53	Location ID: SA-26997	TD Casing: NA

ELEVATIONS:
Ground Surface: 6723.25
Brass Cap: 6723.74
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
54	60	Shallow
356	377	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	125	Qbo		C			OTOWI MEMBER OF THE BANDELIER TUFF - Cuttings (120-140 ft bgs); TUFF, composed of: trace fine ash; 35-40% pumice (very pale orange to yellowish gray to very light gray, up to 10 mm, angular, vitric, fibrous, trace felsic phenocrysts and Mn/Fe oxide specks); 35-40% lithics (dark brown, reddish brown, black, up to 15 mm, angular to subangular); 20-25% felsic phenocrysts (clear, <2 mm, broken with crystal faces to subrounded). Damp.	Bentonite chips
	130							
	135						Increase in orange vitric pumice.	
	140			CS	CASA-06-73317		Core (140-143 ft bgs); TUFF, moderate yellowish brown (10YR 5/4), non-welded. Composed of: predominantly fine ash; trace felsic phenocrysts (clear, <2 mm, trace with crystal faces); trace pumice (white to orange, <2 mm, subrounded to angular). Wet, but no water present in borehole. Core appears to be altered to a silt-like material. NOTE: Potable water injection during drilling began at 140 ft bgs following core recovery.	
	145			C			Cuttings, as above, TUFF, marked decrease in pumice to 20%; increase in lithics to 35%; increase in felsic phenocrysts to 35%.	
	150						150.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 8/21/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-2
	Completed: 8/31/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 388.6 ft
Northing: 1769868.04		Easting: 1637145.53	Location ID: SA-26997	TD Casing: NA

ELEVATIONS:
Ground Surface: 6723.25
Brass Cap: 6723.74
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
54	60	Shallow
356	377	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	150						OTOWI MEMBER OF THE BANDELIER TUFF - Cuttings (140-160 ft bgs); moderate yellowish brown (10YR 5/4), poorly welded. TUFF, Composed of: minor fine ash; 40-45% pumice (pale gray to orangish brown, generally <2 mm, up to 10 mm, angular to subangular, vitric fibrous, trace felsic phenocrysts); 20% felsic phenocrysts (clear, 1-2 mm, angular to subrounded, trace bipyramidal quartz and chatoyance noted); 20% lithics (dark reddish brown to black, generally 2-3 mm up to 10 mm, angular to subangular).	
	155			C				
	160				CASA-06-73318		Core (160-162.2 ft bgs); TUFF, light brown (5YR 6/4) to pale yellowish brown (10YR 6/2), poorly welded. Composed of: fine to coarse ash; 2-5% pumice (light brown, up to 20 mm, subangular, vitric, fibrous, trace felsic phenocrysts and Mn/Fe oxide specks); 2-5% felsic phenocrysts (clear, 2 mm, angular); 2-5% lithics (dark brown/black, generally 2 mm up to 25 mm, subrounded to angular). Damp.	
				T				
		Qbo		NR				Bentonite chips
	165							
				C				
	170						(170-180 ft bgs) injection water reaching surface, increase in fine ash.	
	175						175.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 8/21/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-2
	Completed: 8/31/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 388.6 ft
Northing: 1769868.04		Easting: 1637145.53	Location ID: SA-26997	TD Casing: NA

ELEVATIONS:
Ground Surface: 6723.25
Brass Cap: 6723.74
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
54	60	Shallow
356	377	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	175						OTOWI MEMBER OF THE BANDELIER TUFF - Cuttings (160-180 ft bgs); dark yellowish brown (10YR 6/6) to light brown (5YR 5/6), poorly welded. TUFF, Composed of: 20-25% felsic phenocrysts (clear, up to 2 mm, angular to subrounded, crystal faces noted), 15-20% pumice (light brown, up to 15 mm, angular to subangular, vitric, fibrous trace felsic phenocrysts, 20-25% lithics (dark brown to black, up to 25 mm, angular to subrounded). Damp.	
				C				
	180				CASA-06-73319		Core (180-181.7 ft bgs); TUFF, light brown (5YR 6/4), poorly welded. Composed of: fine to coarse ash; 15% felsic grains (clear 1 mm angular with crystal faces); 2% pumice (light brown, vitric, trace felsic fibrous, 3-20 mm angular grains), 2-3 % lithics (dark brown to black to 1-2 mm). Damp.	
				T				
				NR				
	185						Cuttings (185-200 ft bgs); TUFF, dark yellowish brown (10YR 4/2) to moderate yellowish brown (10YR 5/4), poorly welded. Composed of: abundant felsic crystals (clear, <2 mm, angular to subrounded) and pumice (very pale gray, up to 5 mm, subangular to subround); minor lithics (dark brown to black, up to 7 mm, angular to subrounded).	
		Qbo						Bentonite chips
	190							
				C				
	195							
	200						200.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 8/21/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-2
	Completed: 8/31/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 388.6 ft
Northing: 1769868.04		Easting: 1637145.53	Location ID: SA-26997	TD Casing: NA

ELEVATIONS:
Ground Surface: 6723.25
Brass Cap: 6723.74
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
54	60	Shallow
356	377	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	200			T	CASA-06-73320		OTOWI MEMBER OF THE BANDELIER TUFF - Core (200-203 ft bgs); pale yellowish brown (10YR 6/2) poorly welded. TUFF, Composed of: very fine to fine ash matrix; 5-10% pumice (white to very pale gray, 2-5 mm, subrounded, fibrous); 3-5% felsic grains (clear, 2 mm, angular). Damp.	
	205						Cuttings (205-220 ft bgs); TUFF, pale yellowish brown (10YR 6/2) to dark yellowish brown (10YR 4/2), poorly welded. Composed of: fine ash matrix with abundant phenocrysts (clear, up to 2 mm, broken with crystal faces, subrounded), trace pumice (very pale gray up to 15 mm, angular to subrounded, vitric, weakly fibrous, trace felsic phenocrysts) and lithics (dark brown/black, up to 5 mm, angular to subangular, aphyric). Damp.	
	210	Qbo		C				Bentonite chips
	215						Cuttings (215-220 ft bgs) TUFF, slight increase in pumice and size up to 15 mm.	
	220			T NR C	CASA-06-73321		Core (220-222.3 ft bgs); TUFF, light brown (5YR 6/4) and pale yellowish brown (10YR 6/2), poorly welded. Composed of: fine ash matrix; 5% pumice (white, <5 mm, rounded, vitric, fibrous); 2-5% lithics (dark brown, <2 mm, subrounded to angular). Damp.	
	225						225.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 8/21/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-2
	Completed: 8/31/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 388.6 ft
Northing: 1769868.04		Easting: 1637145.53	Location ID: SA-26997	TD Casing: NA

ELEVATIONS:
Ground Surface: 6723.25
Brass Cap: 6723.74
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
54	60	Shallow
356	377	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	225	Qbo		C			OTOWI MEMBER OF THE BANDELIER TUFF - Cuttings (225-240 ft bgs); grayish orange (10YR 7/4), poorly welded. TUFF, Composed of: abundant pumice (grayish orange with very pale orange interiors up to 15 mm, angular to subrounded, vitric, fibrous with trace felsic phenocrysts), lesser amounts of felsic crystals (clear, up to 2 mm, angular to subrounded, minor crystal faces noted) and lithics (dark brown/black, up to 10 mm, angular with trace subrounded, aphyric).	Bentonite chips
	230							
	235							
	240			T	CASA-06-73322		Core (240-242.1 ft bgs); TUFF, light brown (5YR 6/4) and pale yellowish brown (10YR 6/2), poorly welded. Composed of: fine ash matrix; 10% pumice (white, <5 mm, generally <2 mm, subangular, vitric, fibrous, trace felsic phenocrysts); 2-5% lithics (red brown to black, up to 10 mm, angular); 2-5% felsic phenocrysts (clear, <1-2 mm, broken with trace bipyramidal quartz). Damp.	
				NR				
	245			C				
	250						250.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 8/21/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-2
	Completed: 8/31/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 388.6 ft
Northing: 1769868.04		Easting: 1637145.53	Location ID: SA-26997	TD Casing: NA

ELEVATIONS:
Ground Surface: 6723.25
Brass Cap: 6723.74
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
54	60	Shallow
356	377	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	250						OTOWI MEMBER OF THE BANDELIER TUFF - Cuttings (240-260 ft bgs); dark to moderate yellowish brown (10YR 6/6 to 10YR 5/4), poorly welded. TUFF, Composed of: abundant pumice (dark yellowish orange with pale gray interiors, up to 15 mm, generally 5 mm, angular to subrounded, vitric, weakly fibrous, trace felsic phenocrysts, trace mafic phenocrysts, and Mn/Fe oxide specks); lesser amounts of lithics (dark brown/black, up to 10mm, generally <5 mm, angular to subangular); trace felsic phenocrysts (clear, up to 2 mm, broken with crystal faces to subrounded).	
	255			C				
	260				CASA-06-73323		Core (260-261.7 ft bgs); TUFF, as core above (240-243 ft bgs) except pale yellowish brown (10YR 6/2) with slight increase in pumice to 10-15%.	
		Qbo		T				Bentonite chips
				NR				
	265							
				C				
	270							
	275						275.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 8/21/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-2
	Completed: 8/31/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 388.6 ft
Northing: 1769868.04		Easting: 1637145.53	Location ID: SA-26997	TD Casing: NA

ELEVATIONS:
Ground Surface: 6723.25
Brass Cap: 6723.74
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
54	60	Shallow
356	377	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	275			C			OTOWI MEMBER OF THE BANDELIER TUFF - Cuttings (260-280 ft bgs); TUFF, moderate yellowish brown (10YR 5/4) to pale yellow brown (10YR 6/2), poorly welded. Composed of: ash matrix; abundant pumice (pale gray, up to 5 mm, angular to subangular, vitric as in 240-250 ft bgs); felsic phenocrysts as in 240-250 ft bgs; lesser amounts of lithics (as in 240-250 ft bgs, up to 7 mm).	
	280			T NR	CASA-06-73324		Core (280-282.2 ft bgs); TUFF, light brown (5YR 6/4) to pale yellowish brown (10YR 6/2), poorly welded. Composed of: fine ash matrix; 5-10% pumice (pale yellow, up to 10 mm, subangular, fibrous); 5-10% felsic phenocrysts (clear, <2 mm, trace broken crystal faces to subrounded); trace lithic fragments (<2 mm), trace mafic phenocrysts. Damp.	
	285	Qbo					Cuttings (280-300 ft bgs); TUFF, dark yellowish orange (10YR 6/6) to pale yellowish brown (10YR 6/2) to dark yellowish brown (10YR 4/2), poorly welded. Composed of: minor ash matrix; abundant pumice and felsic phenocrysts; minor amounts of lithics (as in 240-260 ft bgs). Damp.	Bentonite chips
	290			C			Increasing amounts of ash from 290-300 ft bgs.	
	295							
	300						300.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 8/21/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-2
	Completed: 8/31/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 388.6 ft
Northing: 1769868.04		Easting: 1637145.53	Location ID: SA-26997	TD Casing: NA

ELEVATIONS:
Ground Surface: 6723.25
Brass Cap: 6723.74
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
54	60	Shallow
356	377	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	300	Qbo		T	CASA-06-73325		OTOWI MEMBER OF THE BANDELIER TUFF - Core (300-302.5 ft bgs); TUFF, grayish orange pink (5YR 7/2), poorly welded. Composed of: fine ash matrix; 5% pumice (very pale yellow up to 10 mm, angular, vitric, fibrous, Mn/Fe oxide specks); 10-15% felsic phenocrysts (clear, up to 2 mm, trace broken crystal faces to angular to subrounded); 2-3% lithics (black, <2 mm, trace up to 5 mm, angular, aphyric). Damp.	
				NR				
	305						Cuttings (300-310 ft bgs); TUFF, dark yellowish orange (10YR 6/6), poorly welded. Composed of: fine ash matrix; abundant pumice (very pale gray up to 10 mm, subangular to subrounded, vitric, fibrous, trace felsic phenocrysts, minor Mn/Fe oxide specks); lesser amounts of felsic phenocrysts (angular, crystal faces noted); minor lithics (dark brown to black, up to 3 mm, angular to subrounded).	
	310			C			Cuttings (310-315 ft bgs); TUFF, grayish orange (10YR 7/4) to pale yellowish brown (10YR 6/2), poorly welded. Composition: as above.	Bentonite chips
							313.0'	
	315	Qbog					GUAJE PUMICE BED - Core (320-322.4 ft bgs); PUMICE, light gray (N7), poorly welded. Composed of: 5-10% ash; 85-90% pumice (light gray, up to 10 mm, subrounded to angular, weakly fibrous to non-fibrous, phenocryst poor; 2-5% felsic phenocrysts (bipyramidal quartz noted); trace lithic fragments (generally up to 3 mm up to 25 mm, medium brown to red altered oxidized appearance). Damp. NOTE: The top of the Qbog is 312 ft bgs based on geophysical logging. (315-320 ft bgs) abundant felsic crystals (clear, <2 mm, angular to rounded, trace with trace crystal faces).	
	320			T	CASA-06-73326		Cuttings (320-330 ft bgs); PUMICE, dark yellowish orange (10YR 6/6) coating over abundant pumices (as in above core, up to 25 mm); trace felsic crystals (as in above core); trace lithics (as in above core).	
				NR				
				C				
	325						325.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 8/21/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-2
	Completed: 8/31/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 388.6 ft
Northing: 1769868.04		Easting: 1637145.53	Location ID: SA-26997	TD Casing: NA

ELEVATIONS:
Ground Surface: 6723.25
Brass Cap: 6723.74
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
54	60	Shallow
356	377	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	325	Qbog					GUAJE PUMICE BED - same as above.	Bentonite chips
	330						332.0'	
		Tpf		C	CASA-06-73327		PUYE FORMATION NOTE: The top of the Tpf is 332 ft bgs based on geophysical logging.	
	335						Cuttings (335-340 ft bgs); CONGLOMERATE, moderate yellowish brown (10YR 5/4) poorly indurated, poorly sorted. Composed of: abundant gravel clasts (inter. comp. volcanics, dark gray to brown, up to 25 mm, angular to subrounded, aphyric to weakly porphyritic); minor silt clay; minor sand (inter. comp. volcanics as above with trace of pumice fragments).	
	340			T			Core (340-341.6 ft bgs); GRAVELLY SANDSTONE, moderate brown (5YR 4/4), poorly sorted, poorly indurated. Composed of: 60% sand [(very fine to coarse, predominantly felsic (clear, generally <1 mm, angular to rounded) and minor amounts of inter. comp. volcanics (vari-colored,1-2 mm, angular to subrounded)]; 40% gravels (inter. comp. volcanics, vari-colored, generally <5 mm up to 10 mm, angular to broken with rounded surfaces, aphyric to weakly porphyritic). Damp to wet.	
				NR				
	345			C				
	350						350.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 8/21/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-2
	Completed: 8/31/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 388.6 ft
Northing: 1769868.04		Easting: 1637145.53	Location ID: SA-26997	TD Casing: NA

ELEVATIONS:
Ground Surface: 6723.25
Brass Cap: 6723.74
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
54	60	Shallow
356	377	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	350						PUYE FORMATION - CONGLOMERATE - Cuttings (340-355 ft bgs); Gravel, moderate brown (5YR 3/4), poorly sorted, non indurated. Composed of: abundant gravels (predominantly inter. comp. volcanics, angular to subrounded, up to 20 mm, aphyric to to weakly porphyritic; trace sand and silt/clay fraction (inter. comp. volcanics, angular to subrounded, predominantly coarse grained).	
▼	355			C			Cuttings (355-360 ft bgs); increasing silt/clay.	
					CASA-06-73473 (Water)			
	360				CASA-06-73328		Core (360-362.5 ft bgs); SILTSTONE, light brown (5YR 5/6), moderately sorted, poorly to moderately indurated. Composed of: 95% silt/clay (clay occurs as thin lenses); 2-3% gravels inter. comp. volcanics (gray to reddish gray, 2-3 mm, subrounded); 2-3% sand (inter. comp. volcanics); trace gravel (obsidian grain noted). Damp.	
		Tpf		T NR				Bentonite chips
	365						Cuttings (360-380 ft bgs); SILTSTONE, light brown (5YR 5/6), well sorted, poorly indurated. Composed of: predominantly silt/clay; abundant very fine to medium sand (predominantly inter. comp. volcanics (multi-colored, commonly orange pink (10YR 7/4), generally <1 mm, up to 2 mm, angular to subrounded).	
				C				
	370							
					CASA-06-73474 (Water)			
	375						375.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 8/21/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-2
	Completed: 8/31/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 388.6 ft
Northing: 1769868.04		Easting: 1637145.53	Location ID: SA-26997	TD Casing: NA

ELEVATIONS:
Ground Surface: 6723.25
Brass Cap: 6723.74
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
54	60	Shallow
356	377	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	375	Tpf		C	CASA-06-73329		PUYE FORMATION - SILTSTONE - as above. (377.0')	Bentonite chips 375.9 ft
▽	380	Tb4		CORE			CERROS DEL RIO BASALT - Cuttings (377-380 ft bgs) (5YR 5/6). Composed of: abundant basalt [(black, weakly vesicular, trace olivine phenocrysts (pale green, 1 mm, round), trace clay (on basalt surfaces and in vesicles)], fragments up to 25 mm, angular to very rough and uneven surface texture. NOTE: The top of the Tb4 is 377 ft bgs based on geophysical logging.	Slough
				NR			Core (379.2-383.2 ft bgs); BASALT, grayish black (N3), chiefly vesicular, occasionally massive. Aphanitic groundmass; 1% olivine phenocrysts (pale green to honey-colored to reddish brown, 1 mm, euhedral, subrounded to rounded); trace clay (orange pink, lining vesicles). Wet core exterior. Fractures observed at 379.2-380.7 ft bgs, horizontal, apertures 1-2 mm, at 380 ft bgs minor clay lining of apertures.	
	385			CORE	CASA-06-73330		Core (384-388.6 ft bgs) BASALT. At 385.5-386 ft bgs near horizontal fractures with 1 mm clay lined apertures, additional horizontal partings across interval without clay. (388.6')	TD = 388.6 ft

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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4.3 SCC-3

SCC-3 was drilled from September 8 to 13, 2006 in lower Sandia Canyon (Figure 1.0-1). The hole was drilled to 344 ft bgs and core samples were collected at 20-ft intervals. Core recovery ranged between 50 and 100% and all samples were submitted for laboratory analysis as specified in the Work Plan. The corehole was advanced 16 ft into the Cerros del Rio basalt, in the range of 10 to 20 ft identified in the Drilling Plan. All other drilling objectives identified in the Work Plan were met.

Alluvial groundwater was encountered from 35 to approximately 45 ft bgs, near the base of the alluvium. The bottom of the alluvial groundwater zone was difficult to identify precisely because continuous core was not collected, and an induction log was not run on this interval due to the presence of casing. It is possible the alluvial groundwater zone extends slightly deeper into the uppermost portion of Unit 1g of the Tshirege Member of the Bandelier Tuff. Per the Work Plan, a groundwater sample was not obtained from the alluvial groundwater.

Two thin zones of intermediate perched water were present in the Puye Formation from approximately 325.4 to 328 ft bgs, just above the Cerros del Rio basalt. When the borehole TD ranged from 323 to 332 ft bgs, water levels inside the casing rose to between 315.3 and 315.5 ft bgs. Two groundwater samples were collected from this interval.

Summary data regarding drilling, geophysical/video logging, and stratigraphy are presented in Table 4.3-1. Figure 4.3-1 shows the lithologic log and backfill schematic for the corehole. The appendices present survey data, drilling program deviations, groundwater samples collected, core samples collected and a summary of waste characterization activities.

Table 4.3-1 Summary Data for SCC-3

SCC-3	
DRILLING	
Dates drilled	9/8/06 – 9/13/06
Method	Air rotary/STRATEX
Hole diameter (in.)	10
Sample method (collected every 20 ft)	2.5-in. ID Split spoon: 20-21.5 ft; 3-in. ID tube in Pitcher sampler: 40-332 ft; 2.4-in. ID core barrel: 332-344 ft
Borehole TD (ft bgs)	344
LOGGING (performed by LANL)	
Gamma	9/13/06
Induction	9/13/06
Video	9/13/06
STRATIGRAPHY	
Depth (ft bgs)	Qal: 0-45
Depth (ft bgs)	Qbt1g: 45-65
Depth (ft bgs)	Qct: 65-90
Depth (ft bgs)	Qbo: 90-300
Depth (ft bgs)	Qbog: 300-319
Depth (ft bgs)	Tpf: 319-328
Depth (ft bgs)	Tb4: 328-344
DEPTH TO WATER (ft bgs)	315.55 (9/13/06 after TD reached)
FINAL STATUS	Plugged & Abandoned

LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-3
	Completed: 9/13/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 344 ft
Northing: 1769575.70		Easting: 1637740.85	Location ID: SA-26998	TD Casing: NA

ELEVATIONS:
Ground Surface: 6712.64
Brass Cap: 6712.99
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35	45	Alluvial
325.4	328	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	0						QUATERNARY ALLUVIUM - SANDY SILTY CLAY (CH-ML) - Cuttings (0-20 ft bgs); dusky yellowish brown (10YR 2/2), moderately sorted, non-indurated. Composed of: 50-60% silt/clay; 40-50% sand, predominantly felsic grains (clear, very fine to coarse, subangular to subrounded, abundant bipyramidal quartz and sanidine chatoyance noted); 3-5 % gravel, predominantly felsic grains (clear, generally 2-4 mm, subangular to subrounded, abundant crystal faces) with minor vitric pumice, intermediate composition volcanics (inter. comp. volcanics), and tuff fragments. Damp.	Cement 2 ft
	5							
	10	Qal		C				P&A Cement grout
	15						As above, increase in sand content to 85%, decrease in silt/clay to 10-15%.	
	20			CS	CASA-06-73342		Core (20-21.5 ft bgs); damp, colluvial block of tuff. NOTE: The core run was 18 in. with 100% recovery.	
				C				
	25						25.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-3
	Completed: 9/13/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 344 ft
Northing: 1769575.70		Easting: 1637740.85	Location ID: SA-26998	TD Casing: NA

ELEVATIONS:
Ground Surface: 6712.64
Brass Cap: 6712.99
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35	45	Alluvial
325.4	328	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	25						QUATERNARY ALLUVIUM - Cuttings (20-40 ft bgs); SILTY SAND (SM) - light brown (5YR 5/6) to moderate brown (5YR 4/4), poorly sorted, non-indurated. Composed of: abundant sand, predominantly felsic grains (clear, fine to coarse, subangular to subrounded, trace bipyramidal quartz and sanidine chatoyance noted), and tuff (grayish orange, fine to coarse, subangular to subrounded); minor gravel, predominantly tuff (grayish orange, up to 15 mm, generally <5 mm, subangular to subrounded), trace felsic grains (clear, 2-3 mm, subangular); minor to trace silt/clay. Damp. Cuttings (30-35 ft bgs); alluvium, as above, sand grains predominantly tuff with minor felsic grains.	
	30			C				
▼	35	Qal					Cuttings (30-40 ft bgs); alluvium, as above, wet.	P&A Cement grout
	40			T	CASA-06-73343	40.0'	Core (40-42.9 ft bgs); SANDY SILTY CLAY (CL-ML) - dark yellowish brown (10YR 4/2), moderately sorted, non-indurated. Composed of: 85-90% silt/clay; 10-15% sand, predominantly felsic grains (clear to opaque, very fine to coarse, subrounded); trace gravel, predominantly pumice. Damp.	
				NR		43.0'	Cuttings (40-45 ft bgs); SILTY SAND (SM) - dark yellowish brown (10YR 4/2), poorly sorted, non-indurated to poorly indurated. Composed of: abundant sand, predominantly felsic grains (clear, fine to coarse, subangular to subrounded, bipyramidal quartz and sanidine chatoyance noted) with tuff (light brown, fine to coarse, subangular to subrounded); minor silt/clay; trace to minor gravel. Wet, saturated.	
▽	45	Qbt 1g		C		45.0'	UNIT 1G, TSHIREGE MEMBER OF THE BANDELIER TUFF - Cuttings (45-60 ft bgs); TUFF, dark yellowish brown (10YR 4/2) to pale yellowish brown (10YR 4/2), poorly welded. (Continued on next page).	
	50					50.0'		

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-3
	Completed: 9/13/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 344 ft
Northing: 1769575.70		Easting: 1637740.85	Location ID: SA-26998	TD Casing: NA

ELEVATIONS:
Ground Surface: 6712.64
Brass Cap: 6712.99
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35	45	Alluvial
325.4	328	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	50						UNIT 1G, TSHIREGE MEMBER OF THE BANDELIER TUFF - (continued) composed of fine ash matrix with: minor to abundant pumice (vitric, fibrous, grayish orange, 4-20 mm, subrounded, trace felsic phenocrysts, manganese/iron (Mn/Fe) oxide staining); abundant felsic phenocrysts (clear, up to 2 mm, subangular to subrounded, trace bipyramidal quartz noted); trace lithics (black, subangular). Wet. NOTE: The top of the Qbt 1g is 45 ft bgs based on geophysical logging.	
	55	Qbt 1g		C			Cuttings (50-55 ft bgs); as above, decrease in felsic phenocrysts. Cuttings (55-60 ft bgs); as above, increase in ash, likely due to clearing of accumulated formation material in discharge line.	P&A Cement grout
	60			T	CASA-06-73344		NOTE: Drillers began injecting water at 60 ft bgs. Core (60-63 ft bgs); TUFF, yellowish gray (5YR 7/2). Composed of fine ash matrix with: 30% pumice (vitric, yellowish gray to light gray, 1-35 mm, subrounded, trace felsic phenocrysts, trace Mn/Fe oxide specks); 10% felsic phenocrysts (clear, 1-2 mm, subangular to subrounded); trace lithics (black, 1-2 mm, subangular). Damp. Cuttings (60-65 ft bgs); TUFF, yellowish gray (5YR 7/2), poorly welded. Composed of fine ash matrix with abundant pumice (vitric, yellowish gray exteriors, with light gray interiors, 1-35 mm, subrounded); trace felsic phenocrysts; trace lithics.	60.5 ft
	65	Qct		C		65.0'	CERRO TOLEDO INTERVAL - Cuttings (65-80 ft bgs); SILTY GRAVELLY SAND (SM-SG), moderate yellowish brown (10YR 5/4), poorly sorted, poorly indurated. Composed of: abundant sand, predominantly felsic grains (clear, fine to medium, subangular to subrounded) with trace pumice (vitric, grayish orange, 1-2 mm, subrounded, trace felsic phenocrysts, trace Mn/Fe oxide staining) and minor inter. comp. volcanics (dark brown, fine to coarse, subangular to subrounded); 20-30% silt/clay; 10% gravel, predominantly pumice (grayish orange, fine, subangular to subrounded) and inter. comp. volcanics (dark brown, 2-5 mm, subangular to subrounded). Damp. NOTE: The top of the Qct is 65 ft bgs based on geophysical logging.	Bentonite chips
	70							
	75					75.0'		

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-3
	Completed: 9/13/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 344 ft
Northing: 1769575.70		Easting: 1637740.85	Location ID: SA-26998	TD Casing: NA

ELEVATIONS:
Ground Surface: 6712.64
Brass Cap: 6712.99
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35	45	Alluvial
325.4	328	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	75			C			CERRO TOLEDO INTERVAL - Cuttings (75-80 ft bgs); as above, predominantly felsic and inter. comp. volcanic grains; gravel, up to 30 mm, porphyritic inter. comp. volcanics.	
	80	Qct		T	CASA-06-73345		Core (80-83 ft bgs); SANDY GRAVEL (GW), light brown (5YR 5/6), poorly sorted, poorly indurated. Composed of: 40-45% gravel, predominantly inter. comp. volcanics (reddish gray to black, up to 70 mm, angular to subrounded); 40-45% sand, predominantly felsic grains (clear, very fine to coarse, angular) with minor inter. comp. volcanics, and trace pumice; 5-10% silt/clay. Damp.	
	85						Cuttings (80-90 ft bgs); SANDY GRAVEL (GW), light brown, (5YR 5/6) to moderate yellowish brown (10YR 5/4), poorly sorted, poorly indurated. Composed of abundant gravel, predominantly pumice (vitric, fibrous, light gray, up to 10 mm, trace felsic phenocrysts, trace Mn/Fe oxide staining, subangular to subrounded) and inter. comp. volcanics (dark brown/black/gray, up to 35 mm, subrounded to subangular); minor to abundant sand, predominantly pumice (vitric, fibrous, light gray, fine to coarse, subangular to subrounded) with minor lithics and felsic grains; minor silt/clay.	Bentonite chips
	90			C		90.0'	OTOWI MEMBER OF THE BANDELIER TUFF - Cuttings (90-95 ft bgs); TUFF, moderate yellowish brown (10YR 5/4), minor pumice. Likely intermixed with overlying formation.	
	95	Qbo					Cuttings (95-100 ft bgs); as above, fine ash with trace lithics, felsic phenocrysts, and pumice.	
	100					100.0'		

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-3
	Completed: 9/13/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 344 ft
Northing: 1769575.70		Easting: 1637740.85	Location ID: SA-26998	TD Casing: NA

ELEVATIONS:
Ground Surface: 6712.64
Brass Cap: 6712.99
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35	45	Alluvial
325.4	328	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	100	Qbo		T	CASA-06-73346		OTOWI MEMBER OF THE BANDELIER TUFF - Core (100-103 ft bgs); TUFF, grayish orange pink (5YR 7/2), poorly welded. Composed of fine ash matrix with: 5-10% felsic phenocrysts (clear, 1 mm, subangular); 5-10% pumice (vitric, very pale orange, generally 2 mm.	Bentonite chips
	105							
	110			C			Cuttings (110-120 ft bgs); as above, marked decrease in pumice and lithics and size, possibly due to clearing of accumulated formation material in discharge line.	
	115							
	120			T	CASA-06-73347		Core (120-123 ft bgs); TUFF, light brown (5YR 6/4), poorly welded. Composed of fine ash matrix with: 5% felsic phenocrysts (clear, up to 2 mm, angular to subrounded); 2-5% pumice (vitric, fibrous, orange brown, pale yellowish brown, up to 20 mm, angular); 2-3 % lithics (dark brown/black, up to 15 mm, angular, aphyric). Damp.	
				C				
	125						125.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-3
	Completed: 9/13/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 344 ft
Northing: 1769575.70		Easting: 1637740.85	Location ID: SA-26998	TD Casing: NA

ELEVATIONS:
Ground Surface: 6712.64
Brass Cap: 6712.99
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35	45	Alluvial
325.4	328	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	125						OTOWI MEMBER OF THE BANDELIER TUFF - Cuttings (120-140 ft bgs); TUFF, pale yellowish brown (10YR 6/2) poorly welded. Composed of ash matrix with: abundant felsic phenocrysts (clear, 1-2 mm, angular); abundant pumice (vitric, fibrous, pale yellowish brown to orange brown, up to 10 mm, subangular, common felsic phenocrysts); minor lithics (dark brown/black, generally < 5 mm, up to 20 mm, angular).	
	130			C				
	135						Cuttings (135-140 ft bgs); as above, marked increase in ash returns, likely due to clearing of accumulated formation material discharge lines.	
		Qbo						Bentonite chips
	140			T	CASA-06-73348		Core (140-143 ft bgs); TUFF, light brown (5YR 6/4), poorly welded. Composed of predominantly fine ash matrix with: 1% pumice (vitric, white, < 2 mm, subrounded); trace felsic phenocrysts (clear, < 1 mm, angular to subrounded); trace lithics (dark brown/black, < 1 mm, angular). Damp.	
	145			C			Cuttings (140-145 ft bgs); TUFF, as above, predominantly ash.	
	150						150.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-3
	Completed: 9/13/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 344 ft
Northing: 1769575.70		Easting: 1637740.85	Location ID: SA-26998	TD Casing: NA

ELEVATIONS:
Ground Surface: 6712.64
Brass Cap: 6712.99
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35	45	Alluvial
325.4	328	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	150						OTOWI MEMBER OF THE BANDELIER TUFF - Cuttings (140-160 ft bgs); TUFF, light brown (5YR 6/4) poorly welded. Composed of ash matrix with: abundant pumice (vitric, fibrous, pale gray, up to 5 mm, angular to subangular, trace felsic phenocrysts, common Mn/Fe oxide specks); abundant lithics (dark brown/black, up to 7 mm, angular, weakly porphyritic); minor felsic phenocrysts (clear, 1-2 mm, angular to subrounded, trace broken with crystal faces).	
	155			C				
	160	Qbo		T	CASA-06-73349		Core (160-163 ft bgs); TUFF, light brown (5YR 6/4), poorly welded. Composed of fine ash matrix with: 10% pumice (vitric, fibrous, orange brown to white, up to 10 mm, angular to subrounded, common felsic phenocrysts); 2-5% felsic phenocrysts (clear, 1-2 mm, angular); trace lithics. Damp.	Bentonite chips
	165			C			Cuttings (160-180 ft bgs); TUFF, light brown (5YR 6/4) to dark yellowish orange (10YR 6/6), poorly welded. Composed of ash matrix with: abundant pumice (vitric, fibrous, orange brown, 2- 15 mm, trace felsic phenocrysts, subangular to subrounded); abundant felsic phenocrysts (clear, 1-2 mm, angular to subrounded, broken with crystal faces); minor lithics (dark brown/black, 12 mm, subangular).	
	170							
	175						175.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-3
	Completed: 9/13/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 344 ft
Northing: 1769575.70		Easting: 1637740.85	Location ID: SA-26998	TD Casing: NA

ELEVATIONS:
Ground Surface: 6712.64
Brass Cap: 6712.99
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35	45	Alluvial
325.4	328	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	175	Qbo		C			OTOWI MEMBER OF THE BANDELIER TUFF - Cuttings (170-180 ft bgs); as above, increase in ash due to clearing of formation material in discharge lines.	Bentonite chips
	180			T	CASA-06-73350		Core (180-183 ft bgs); TUFF, light brown (5YR 6/4), poorly welded. Composed of fine ash matrix with: 15-20% felsic phenocrysts (clear, 1-2 mm, trace crystal face noted, subrounded to subangular); 2-5% pumice (vitric, pale yellowish brown, up to 9 mm, generally 2-3 mm with ill-defined edges); 7% lithics (dark brown, up to 2 mm, subangular to subrounded). Damp.	
	185							
	190			C			Cuttings (180-200 ft bgs); TUFF, moderate yellowish brown (10YR 5/4), poorly welded. Composed of ash matrix with: abundant pumice (vitric, fibrous, dark yellowish orange to light gray, 10 mm, trace felsic phenocrysts); abundant to minor felsic phenocrysts (clear, 1-2 mm, angular to subrounded, broken with crystal faces); minor lithics (dark brown/black, 12 mm, subangular).	
	195							
	200						200.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-3
	Completed: 9/13/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 344 ft
Northing: 1769575.70		Easting: 1637740.85	Location ID: SA-26998	TD Casing: NA

ELEVATIONS:
Ground Surface: 6712.64
Brass Cap: 6712.99
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35	45	Alluvial
325.4	328	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	200			T	CASA-06-73351		OTOWI MEMBER OF THE BANDELIER TUFF - Core (200-203 ft bgs); TUFF, light brown (5YR 6/4), poorly welded. Composed of fine ash matrix with: 15-20% felsic phenocrysts (clear, 1-2 mm, subrounded to subangular); 15-20% pumice (vitric, pale gray to pale yellow to pinkish orange, up to 13 mm, minor Mn/Fe oxide staining, trace felsic phenocrysts, ill-defined edges with ash matrix); 2% lithics (dark to reddish brown, up to 5 mm, subangular to subrounded). Damp.	
	205						Cuttings (200-220 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of ash matrix with: abundant pumice (vitric, yellowish gray, up to 10 mm, generally <5 mm, angular to subangular); minor felsic phenocrysts (clear, 1-2 mm, angular to subrounded); trace lithics (dark brown/black, generally 2-4 mm, subangular).	
	210			C				
		Qbo						Bentonite chips
	215							
	220			T	CASA-06-73352		Core (220-223 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: 30% pumice (vitric, pale yellowish brown to very light gray, up to 25 mm, abundant felsic phenocrysts, minor Mn/Fe oxide staining); 10% felsic phenocrysts (clear, 1-2 mm, subrounded to subangular); 1-2% lithics (dark brown to reddish brown, up to 7 mm, subangular to subrounded). Damp.	
				C				
	225						225.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-3
	Completed: 9/13/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 344 ft
Northing: 1769575.70		Easting: 1637740.85	Location ID: SA-26998	TD Casing: NA

ELEVATIONS:
Ground Surface: 6712.64
Brass Cap: 6712.99
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35	45	Alluvial
325.4	328	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	225						OTOWI MEMBER OF THE BANDELIER TUFF - Cuttings (225-240 ft bgs) as above, increase in ash.	
	230			C				
	235	Qbo						Bentonite chips
	240			T	CASA-06-73353		Core (240-243 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: 35% pumice (vitric, light gray to moderate orange, up to 20 mm, minor felsic phenocrysts, minor Mn/Fe oxide staining); 10% felsic phenocrysts (clear, 1-2 mm, subrounded to subangular); 1-3% lithics (dark brown to reddish brown, up to 5 mm, subangular to subrounded). Damp.	
	245			C				
	250						250.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-3
	Completed: 9/13/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 344 ft
Northing: 1769575.70		Easting: 1637740.85	Location ID: SA-26998	TD Casing: NA

ELEVATIONS:
Ground Surface: 6712.64
Brass Cap: 6712.99
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35	45	Alluvial
325.4	328	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	250						OTOWI MEMBER OF THE BANDELIER TUFF - Cuttings (240-260 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of ash matrix with: abundant pumice (vitric, very light gray, up to 20 mm, angular to subangular); minor lithics (dark brown/black, generally 2-4 mm, subangular); trace felsic phenocrysts (clear, 1-2 mm, angular to subrounded).	
	255			C				
	260				CASA-06-73354		Core (260-262 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: 35-40% pumice (vitric, grayish orange to moderate orange, up to 20 mm, felsic phenocrysts); 10% felsic phenocrysts (clear, 1-2 mm, subrounded to subangular); 1-3% lithics (dark brown to reddish brown, up to 5 mm, subangular to subrounded). Damp.	
		Qbo		T				Bentonite chips
				NR				
	265							
				C				
	270							
	275						275.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-3
	Completed: 9/13/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 344 ft
Northing: 1769575.70		Easting: 1637740.85	Location ID: SA-26998	TD Casing: NA

ELEVATIONS:
Ground Surface: 6712.64
Brass Cap: 6712.99
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35	45	Alluvial
325.4	328	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	275			C			OTOWI MEMBER OF THE BANDELIER TUFF - Cuttings (260-280 ft bgs); TUFF, moderate yellowish brown (10YR 5/4), poorly welded. Composed of ash matrix with: abundant pumice (vitric, very pale orange to moderate orange pink, up to 10 mm, angular to subangular, trace felsic phenocrysts, trace Mn/Fe oxide specks); minor to abundant lithics (dark brown/black, up to 7 mm, angular to subangular); minor felsic phenocrysts (clear, 1-2 mm, broken with crystal faces to subrounded).	
	280			T NR	CASA-06-73355		Core (280-281.5 ft bgs); TUFF, light brown (5YR 6/4), poorly welded. Composed of fine ash matrix with: 15-20% pumice (vitric, up to 10 mm, trace felsic phenocrysts, subangular, slightly altered with edges ill-defined with ash matrix); 15-20% felsic phenocrysts (clear, 1-2 mm, subrounded to subangular, single 3 mm bipyramidal quartz noted); trace biotite phenocrysts (bronze, up to 1-2 mm, platy); trace lithics (black, up to 2 mm, subangular). Tuff has slightly altered/clay-like appearance. Damp.	
	285	Qbo					Cuttings (280-300 ft bgs); TUFF, grayish orange (10YR 7/4), poorly welded. Composed of ash matrix with: abundant pumice (vitric, fibrous, grayish orange exteriors with light gray fresh surfaces, up to 15 mm, subrounded to subangular, trace felsic phenocrysts, trace Mn/Fe oxide specks); abundant felsic phenocrysts (clear, generally 1 mm, angular); trace lithics (dark brown/black, up to 5 mm, angular to subangular).	Bentonite chips
	290			C				
	295						Cuttings (295-300 ft bgs); as above, abundant very light gray pumice.	
	300						300.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-3
	Completed: 9/13/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 344 ft
Northing: 1769575.70		Easting: 1637740.85	Location ID: SA-26998	TD Casing: NA

ELEVATIONS:
Ground Surface: 6712.64
Brass Cap: 6712.99
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35	45	Alluvial
325.4	328	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	300				CASA-06-73356		GUAJE PUMICE BED - Core (300-301.7 ft bgs); PUMICE, light gray (N7) to very light gray (N8), poorly welded. Composed of 80-85% pumice (vitric, very light gray, up to 15 mm, generally < 4 mm, subrounded to subangular, trace felsic and mafic phenocrysts); 15-20% felsic phenocrysts (clear, 1-2 mm, trace broken with crystal faces to angular); trace lithics (red/reddish brown, < 4 mm, angular to subangular). Wet. NOTE: The top of the Qbog is 300 ft bgs based on geophysical logging.	
				T				
				NR				
	305						NOTE: No water present in borehole after core run.	
		Qbog						
	310			C			Cuttings (300-320 ft bgs); PUMICE, light gray (N7), poorly welded. Abundant pumice (vitric, light gray, up to 20 mm, subrounded to subangular); abundant felsic phenocrysts (clear, 1-2 mm, trace broken with crystal faces to angular); minor lithics.	Bentonite chips
	315						Cuttings (315-320 ft bgs); as above, abundant lithics, decrease in pumice, slight brown color in discharge at end of interval.	
							319.0'	
	320				CASA-06-73357		PUYE FORMATION - SILTSTONE/CLAYSTONE - Core (320-321.9 ft bgs); light brown (5YR 5/6) to moderate brown (5YR 4/4), well sorted, poorly indurated. Composed of 99% silt/clay, low to medium plasticity; trace sand, predominantly felsic grains (clear, fine grained) with trace inter. comp. volcanics (dark brown, <1 mm). Damp. NOTE: The top of the Tpf is 319 ft bgs based on geophysical logging.	
				T				
		Tpf		NR				
				C			Cuttings (320-340 ft bgs); SILTSTONE CLAYSTONE, light brown (5YR 5/6) to moderate brown (5YR 4/4) (Continued on next page).	
	325						325.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-3
	Completed: 9/13/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 344 ft
Northing: 1769575.70		Easting: 1637740.85	Location ID: SA-26998	TD Casing: NA

ELEVATIONS:
Ground Surface: 6712.64
Brass Cap: 6712.99
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35	45	Alluvial
325.4	328	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
▼	325	Tpf		C	CASA-06-73358		PUYE FORMATION - SILTSTONE/CLAYSTONE - (continued), poorly sorted, poorly indurated. composed of abundant sand, predominantly pumice (pale reddish brown, fine to coarse, subangular to subrounded) and inter. comp. volcanics (medium gray, fine to coarse, subangular to subrounded) with minor felsic grains (clear, fine, subangular to subrounded); trace silt/clay; trace gravel, predominantly pumice (up to 5 mm) and inter. comp. volcanics (up to 8 mm). Cuttings (325-330 ft bgs); as above, increase in gravel, trace clasts up to 50 mm.	Bentonite chips
▽	328.0'						CERROS DEL RIO BASALT - Core (332-337 and 339-340.5 ft bgs); BASALT, grayish black (N2) with trace reddish brown mottling, highly vesicular. Composed of aphanitic groundmass with: 1-2% olivine phenocrysts (pale green to pale yellow brown, 1-2 mm, euhedral, rounded); trace clay lining of vesicles. Potable water injected during coring. NOTE: The top of the Tb4 is 328 ft bgs based on geophysical logging.	
	330			CS				
	335	Tb4		NR				337.9 ft
	340			CS				Slough
				NR				
							344.0'	TD = 344 ft

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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4.4 SCC-4

SCC-4 was drilled in lower Sandia Canyon from September 14 to 21, 2006 (Figure 1.0-1). The hole was drilled to 323 ft bgs and core samples were collected at 20-ft intervals. Core recovery ranged from 17 to 100%; the core run with 17% recovery (from 123 to 123.5 ft bgs) did not have enough sample volume to submit for tritium analyses. All other core samples were submitted for the full suite of laboratory analyses as specified in the Work Plan (LANL 2006). The corehole was advanced 1 ft into the Cerros del Rio basalt when coring was halted by LANL project personnel due to mechanical problems with the coring device. All other drilling objectives identified in the Work Plan were met.

Alluvial groundwater was encountered from 35.5 to approximately 45 ft bgs. The bottom of the alluvial zone was difficult to identify precisely because continuous core was not collected and potable water injection began at 45 ft bgs. Per the Work Plan, a groundwater sample was not obtained from the alluvial groundwater.

A thin zone of intermediate perched water was present in the Puye Formation from approximately 320.7 to 321.8 ft bgs, just above the Cerros del Rio basalt. Water was measured at 322.4 ft bgs, at the corehole total depth of 323 ft bgs, but there was not enough water volume to collect a sample. One water sample was collected at SCC-4 from the 123 to 126 ft bgs core run in the Otowi Member of the Bandelier Tuff; this may have been injection water because potable water was used during drilling above the core run.

Summary data regarding drilling, geophysical/video logging, and stratigraphy are presented in Table 4.4-1. Figure 4.4-1 shows the lithologic log and backfill schematic for the corehole. The appendices present survey data, drilling program deviations, groundwater sample collected, core samples collected and a summary of waste characterization activities.

Table 4.4-1 Summary Data for SCC-4

SCC-4	
DRILLING	
Dates drilled	9/14/06 – 9/21/06
Method	Air rotary/STRATEX
Hole diameter (in.)	10
Sample method (collected every 20 ft)	2.5-in. ID Split spoon: 0-41.5 ft; 3-in. ID tube in Pitcher sampler: 60-322.3 ft
Borehole TD (ft bgs)	323
LOGGING (performed by LANL)	
Gamma	9/21/06
Induction	9/21/06
Video	9/21/06
STRATIGRAPHY	
Depth (ft bgs)	Qal: 0-57
Depth (ft bgs)	Qbt 1g: 57-67
Depth (ft bgs)	Qct: 67-105
Depth (ft bgs)	Qbo: 105-287
Depth (ft bgs)	Qbog: 287-307
Depth (ft bgs)	Tpf: 307-322
Depth (ft bgs)	Tb4: 322-323
DEPTH TO WATER (ft bgs)	322.4 (9/21/06 after TD reached)
FINAL STATUS	Plugged & Abandoned

LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/14/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-4
	Completed: 9/22/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 323 ft
Northing: 1739635.60		Easting: 1637906.51	Location ID: SA-26999	TD Casing: NA

ELEVATIONS:
Ground Surface: 6708.95
Brass Cap: 6709.16
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35.5	45	Alluvial
320.7	321.8	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	0						QUATERNARY ALLUVIUM - GRAVELLY SILTY CLAYEY SAND TO GRAVELLY SAND (SWG) - Cuttings (0-20 ft bgs); moderate brown (5YR 3/4), poorly sorted, non-indurated. Composed of: 60-70% sand, predominantly felsic grains (clear, fine to coarse, subrounded to subangular, abundant crystal faces) with minor tuff and pumice fragments; 15-25% gravel, predominantly tuff fragments, moderate orange pink to moderate reddish orange, up to 30 mm, subrounded; 5-15% silt/clay. Damp.	Cement 2 ft
	5							
	10	Qal		C			Cuttings (10-15 ft bgs); as above, moderately sorted, decrease in gravel content.	P&A Cement grout
	15						Cuttings (15-20 ft bgs); as above, trace intermediate composition volcanics (intermediate composition volcanics).	
	20			CS	CASA-06-73373		Core (20-21.5 ft bgs): GRAVELLY SAND (SWG), moderate brown (5YR 3/4), poorly to moderately sorted, poorly-indurated. Composed of: 60-70% sand, predominantly felsic grains (clear, v. fine to coarse, subrounded to subangular) with minor pumice and inter. comp. volcanics; 10-20% gravel, predominantly tuff (poorly welded, moderate reddish orange pink, up to 10 mm, subangular to subrounded), with minor pumice (vitric, pale yellow, up to 5 mm); 10-20% silt/clay. Damp. NOTE: The core run was 18 in. with 100% recovery.	
				C				
	25						25.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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Date	Started: 9/14/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-4
	Completed: 9/22/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 323 ft
Northing: 1739635.60		Easting: 1637906.51	Location ID: SA-26999	TD Casing: NA

ELEVATIONS:
Ground Surface: 6708.95
Brass Cap: 6709.16
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35.5	45	Alluvial
320.7	321.8	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	25						QUATERNARY ALLUVIUM - Cuttings (20-40 ft bgs); SAND (SW), moderate brown (5YR 3/4) to grayish brown (5YR 3/2), poorly sorted, poorly-indurated. Composed of: abundant sand, predominantly felsic grains (clear, v. fine to coarse, subrounded to subangular, trace with crystal faces) and abundant pumice (vitric, pale yellow, subrounded) and inter. comp. volcanics; minor gravel, predominantly tuff (moderately to poorly welded, grayish orange to dark yellowish orange, up to 30 mm, subrounded to subangular, crystal rich), with minor inter. comp. volcanics. Minor to trace silt and clay. Damp.	
	30			C		30.0'	Cuttings (30-35 ft bgs); as above, decrease in silt/clay content.	
▼	35						NOTE: Alluvial water estimated at 35.5 ft bgs.	
		Qal					Cuttings (35-40 ft bgs); as above, increase in gravel content, predominantly vitric pumice (up to 20 mm). Cuttings (35-40 ft bgs); as above, increase in silt and clay content.	P&A Cement grout
	40			CS	CASA-06-73374		Core (40-41.5 ft bgs); GRAVELLY SILTY CLAYEY SAND (SWG), moderate brown (5YR 3/4) to moderate yellow brown (10YR 5/4), moderately sorted, poorly indurated. Composed of: 60-70% sand, predominantly felsic grains (clear, very fine to coarse, subrounded to subangular) with minor tuff (subangular to subrounded), pumice (vitric), and inter. comp. volcanics; 15-25% silt/clay; 5-15% gravel, predominantly pumice (vitric, fibrous, grayish orange to dark yellowish orange, up to 15 mm, subangular to subrounded), with trace inter. comp. volcanics (varied color, <5 mm, subrounded). Wet.	
▽	45			C			NOTE: Potable water was injected from from 45 to 140 ft bgs.	
	50					50.0'		

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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Date	Started: 9/14/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-4
	Completed: 9/22/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 323 ft
Northing: 1739635.60		Easting: 1637906.51	Location ID: SA-26999	TD Casing: NA

ELEVATIONS:
Ground Surface: 6708.95
Brass Cap: 6709.16
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35.5	45	Alluvial
320.7	321.8	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	50	Qal		C			QUATERNARY ALLUVIUM - Cuttings (40-55 ft bgs); SAND WITH GRAVEL (SWG), moderate brown (5YR 3/4) to moderate yellowish brown (10YR 5/4), moderately sorted, poorly indurated. Composed of: abundant sand, predominantly felsic grains; minor gravel, predominantly pumice grains; trace to minor silt/clay.	
	55						57.0'	
	60	Qbt 1g		T NR	CASA-06-73375		UNIT 1G, TSHIREGE MEMBER OF THE BANDELIER TUFF - Cuttings (55-60 ft bgs); TUFF, dark yellow orange (10YR 6/6), poorly welded. Composed of ash matrix with: abundant felsic phenocrysts (clear, 1-3 mm, broken with crystal faces to subangular); trace pumice, (vitric, very pale orange, <2 mm, subrounded); trace lithics. Wet. NOTE: the top of the Qbt 1g is 57 ft bgs based on geophysical logging. Core (60-63 ft bgs); TUFF, light brown (5YR 5/6), poorly welded. Composed of ash matrix (minor clay-like appearance) with: 10-15% pumice, (vitric, white to very pale orange, up to 15 mm, subrounded to subangular, minor alteration); 3-5% felsic phenocrysts (clear, <2 mm, subangular to subrounded); trace lithics. Damp. Cuttings (60-65 ft bgs); TUFF, moderate yellowish brown (10YR 5/4), poorly welded. Composed of trace ash matrix with: abundant felsic phenocrysts (clear, up to 3 mm, angular to subangular, broken with crystal faces, minor bipyramidal quartz); minor pumice (very light gray to very pale orange, up to 3 mm, subrounded); trace lithics, inter. comp. volcanics (reddish gray to black, up to 4 mm, subangular to subrounded).	P&A Cement grout
	65						67.0'	
	70	Qct		C			CERRO TOLEDO INTERVAL - SANDY GRAVEL - Cuttings (67-70 ft bgs); grayish orange (10YR 7/4), poorly sorted, poorly indurated. Abundant gravel, predominantly inter. comp. volcanics (varied color, up to 20 mm, angular to subrounded) with trace pumice (vitric, light gray, up to 20 mm, angular); minor sand, predominantly felsic grains (clear, 1-2 mm, angular to subrounded), single obsidian grain noted. NOTE: the top of the Qct is 67 ft bgs based on geophysical logging. Cuttings (70-75 ft bgs); as above, gravel predominantly pumice (generally <5 mm) and inter. comp. volcanics.	
	75						75.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/14/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-4
	Completed: 9/22/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 323 ft
Northing: 1739635.60		Easting: 1637906.51	Location ID: SA-26999	TD Casing: NA

ELEVATIONS:
Ground Surface: 6708.95
Brass Cap: 6709.16
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35.5	45	Alluvial
320.7	321.8	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	75						CERRO TOLEDO INTERVAL - SANDY GRAVEL - Cuttings (75-80 ft bgs); as above, increase in silt/clay.	
				C				P&A Cement grout
	80				CASA-06-73376		Core (80-82 ft bgs); SANDY GRAVEL, light brown (5YR 5/6), poorly sorted, poor to moderately indurated. Composed of: 40-50% gravel, predominantly inter. comp. volcanics (medium gray to black, 2 to 30 mm, numerous clasts from 10-30 mm, angular to subrounded), trace pumice (altered, white, up to 10 mm, subrounded/broken); 30-40% sand, predominantly felsic grains (clear, very fine to coarse, angular) with lesser content of inter. comp. volcanic grains; 10-15% silt/clay. Damp.	79.8 ft
				T				
				NR			Cuttings (80-85 ft bgs): GRAVELLY SAND, light brown (5YR 5/6) to grayish orange (10YR 7/4), poorly to moderately sorted, poorly indurated. Abundant sand, predominantly pumice (vitric, white to pale yellow to light gray to light brown, up to 2 mm, subrounded) and felsic grains (clear, up to 2 mm angular to subangular); minor to abundant gravel, predominantly pumice (vitric, white to pale yellow to light brown, up to 15 mm, generally <5 mm, subangular to subrounded) with minor inter. comp. volcanics (black, 5 mm, subangular to subrounded); trace silt/clay.	
	85							
		Qct					Cuttings (85-95 ft bgs), as above, abundant gravel, predominantly inter. comp. volcanics, trace pumice; trace sand.	
	90							Bentonite chips
				C				
	95						Cuttings (95-100 ft bgs), as above, increase in silt/clay.	
	100						100.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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Date	Started: 9/14/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-4
	Completed: 9/22/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 323 ft
Northing: 1739635.60		Easting: 1637906.51	Location ID: SA-26999	TD Casing: NA

ELEVATIONS:
Ground Surface: 6708.95
Brass Cap: 6709.16
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35.5	45	Alluvial
320.7	321.8	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	100				CASA-06-73377		CERRO TOLEDO INTERVAL - SAND WITH GRAVEL - Core (100-102.5 ft bgs); light brown (5YR 5/6), moderately sorted, poorly indurated. Composed of 65-70% sand, predominantly felsic grains (clear, very fine to medium, trace coarse, angular to trace subrounded) with minor pumice (pale yellow to light brown, 1 mm, subrounded) and trace inter. comp. volcanics; 20-25% silt and clay; 10% gravel. Damp.	
				T				
		Qct		NR				
	105					105.0'	Cuttings (100-105 ft bgs); SAND, light brown (5YR 5/6) to dark yellowish orange (10YR 6/6), poorly sorted, poorly indurated. Composed of abundant sand, approximately equal content of felsic grains (clear, v. fine to coarse, angular, trace crystal faces, trace rounded) and inter. comp. volcanics (dark brown/black, 1-2 mm, subrounded to angular); minor gravel, predominantly pumice (vitric, light gray interiors, up to 10 mm) and inter. comp. volcanics (medium gray to black, generally <5 mm, subangular, subrounded); trace silt and clay. Damp.	
	110						OTOWI MEMBER OF THE BANDELIER TUFF - Cuttings (115-120 ft bgs); TUFF, moderate yellowish brown (10YR 5/4), poorly welded. Composed of fine ash matrix with: abundant felsic phenocrysts (clear, 1-2 mm, angular to subrounded, trace crystal face and fragments of bipyramidal quartz), pumice (pale yellow, <2 mm, subrounded) and lithics (dark brown to black to very light gray, up to 10 mm, angular). NOTE: The top of the Qbo is 105 ft bgs based on geophysical logging.	Bentonite chips
				C				
	115	Qbo						
	120						Core (120-123 ft bgs); TUFF, moderate yellowish brown (10YR 5/4), poorly welded. Composed of ash matrix with: 40-50% pumice (pale yellow, light gray, up to 2-3 mm, subrounded); 10-15% felsic phenocrysts (clear, 1 mm, subangular to subrounded). Damp to wet. NOTE: Water sample was collected from water present in the core barrel, and was likely injection water.	
				T				
				T	CASA-06-73382 CASA-06-73477 (Water)			
				NR				
	125					125.0'	Core (123-123.5 ft bgs); TUFF, moderate yellowish brown (10YR 5/4), poorly welded. Composed of	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
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C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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Date	Started: 9/14/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-4
	Completed: 9/22/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 323 ft
Northing: 1739635.60		Easting: 1637906.51	Location ID: SA-26999	TD Casing: NA

ELEVATIONS:
Ground Surface: 6708.95
Brass Cap: 6709.16
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35.5	45	Alluvial
320.7	321.8	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	125			NR			ash matrix with: 10-15% felsic phenocrysts (clear, 1 mm, subrounded); 10-15% lithics (dark brown/black, 1-2 mm, subrounded. Damp to wet. Cuttings (120-125 ft bgs); as above, poor recovery. OTOWI MEMBER OF THE BANDELIER TUFF - Cuttings (120-140 ft bgs); TUFF, moderate yellowish brown (10YR 5/4), poorly welded. Composed of ash matrix with: abundant felsic phenocrysts (clear, up to 2 mm, angular to round); trace pumice (vitric, light gray, up to 2 mm, subangular to subrounded); trace lithics (black to medium gray, up to 5 mm, generally 1-2 mm, angular). Cuttings (130-140 ft bgs); as above, no recovery.	
	130			C				
	135	Qbo						Bentonite chips
	140			T	CASA-06-73379		Core (140-143 ft bgs); TUFF, moderate yellowish brown (10YR 5/4), poorly welded. Composed of fine ash matrix with: 25-30% felsic phenocrysts (clear, 1-2 mm, angular to subrounded); 15% lithics (black, 2 mm, angular); trace pumice (white, <2 mm, subrounded). Damp. Cuttings (140-145 ft bgs); TUFF, very pale orange (10YR 8/2) to pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: abundant pumice (vitric, fibrous, pale orange to reddish orange, up to 20 mm, subrounded, abundant felsic phenocrysts) and lithics, predominantly inter. comp. volcanics (dark gray, 1-8 mm, up to 30 mm, subangular to subrounded); minor felsic phenocrysts (clear, 1-5 mm, subangular to subrounded). Damp. NOTE: From 140 to 200 ft bgs, no water was injected during drilling.	
	145			C			Cuttings (145-150 ft bgs); TUFF, as above, decrease in constituent size; abundant felsic phenocrysts.	
	150						150.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
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C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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Date	Started: 9/14/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-4
	Completed: 9/22/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 323 ft
Northing: 1739635.60		Easting: 1637906.51	Location ID: SA-26999	TD Casing: NA

ELEVATIONS:
Ground Surface: 6708.95
Brass Cap: 6709.16
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35.5	45	Alluvial
320.7	321.8	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	150						OTOWI MEMBER OF THE BANDELIER TUFF - Cuttings (150-155 ft bgs); TUFF as above, moderate brown (5YR 4/4), increase in fine ash; minor pumice and felsic phenocrysts; trace inter. comp. volcanics.	
	155			C				
	160				CASA-06-73378		Core (160-163 ft bgs); TUFF, pale brown (5YR 5/2) to pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: 10-20% pumice (vitric, fibrous, pale orange to reddish orange, 1-10 mm, up to 40 mm, subrounded to subangular, abundant felsic phenocrysts, trace manganese/iron (Mn/Fe) staining); 15-20% felsic phenocrysts (clear, up to 2 mm, subrounded to subangular); 2% lithics (dark brown, up to 3 mm, subrounded to subangular). Damp.	
		Qbo		T				Bentonite chips
	165						Cuttings (160-180 ft bgs): TUFF, pale brown (5YR 5/2) to pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: abundant pumice (vitric, fibrous, pale orange to reddish orange, 1-15 mm, subrounded, felsic phenocrysts, trace Mn/Fe oxide staining); abundant lithics (dark brown, 1-20 mm, subangular to subrounded); minor felsic phenocrysts (clear, up to 2 mm, subrounded). Damp.	
				C				
	170							
	175						175.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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Date	Started: 9/14/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-4
	Completed: 9/22/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 323 ft
Northing: 1739635.60		Easting: 1637906.51	Location ID: SA-26999	TD Casing: NA

ELEVATIONS:
Ground Surface: 6708.95
Brass Cap: 6709.16
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35.5	45	Alluvial
320.7	321.8	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	175			C			OTOWI MEMBER OF THE BANDELIER TUFF - Core (180-183 ft bgs): pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: 10-15% pumice (vitric, fibrous, grayish orange to yellowish orange, 1-7 mm, subrounded, abundant felsic phenocrysts); 10-15% felsic phenocrysts (clear, up to 2 mm, subrounded); 2% lithics (dark brown, up to 2 mm, subrounded to subangular). Damp.	
	180			T	CASA-06-73380		Cuttings (180-200 ft bgs); TUFF, moderate brown (5YR 4/4) to pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: minor pumice (vitric, pale yellowish brown, up to 2 mm, subrounded); trace felsic phenocrysts (clear, up to 1 mm, subrounded; trace lithics (dark brown, up to 2 mm, subrounded to subangular). Damp.	
	185	Qbo						Bentonite chips
	190			C				
	195							
	200						200.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/14/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-4
	Completed: 9/22/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 323 ft
Northing: 1739635.60		Easting: 1637906.51	Location ID: SA-26999	TD Casing: NA

ELEVATIONS:
Ground Surface: 6708.95
Brass Cap: 6709.16
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35.5	45	Alluvial
320.7	321.8	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	200				CASA-06-73381		OTOWI MEMBER OF THE BANDELIER TUFF - Core (200-203 ft bgs); TUFF, pale yellowish brown (10YR 6/2) to moderate yellowish brown (10YR 5/4), poorly welded. Composed of fine ash matrix with: 10-20% pumice (vitric, fibrous, pale orange to grayish orange, generally <1 mm to 2 mm, up to 35 mm, abundant felsic phenocrysts); 10-15% felsic phenocrysts (clear, <1 mm, subrounded); 1% lithics (dark brown, up to 4 mm, subrounded to subangular). Damp.	
				T			NOTE: Potable water was injected from 200 ft bgs to TD.	
	205						Cuttings (200-220 ft bgs); TUFF, moderate yellowish brown (10YR 5/4), poorly welded. Composed of ash matrix with: abundant felsic phenocrysts (clear, 1-2 mm, angular to subrounded, trace crystal faces); minor pumice (white, 1-2 mm, subrounded); minor lithics (brown, black, red, 1-2 mm, angular to subrounded); single biotite phenocryst noted.	
	210							
				C				
		Qbo						Bentonite chips
	215						Cuttings (215-220 ft bgs); as above, returns intermixed with clearing of accumulated material in discharge line.	
	220				CASA-06-73383		Core (220-223 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: 10-15% pumice (vitric, fibrous, pale yellow to moderate orange pink, up to 8 mm, subangular); 2-5% felsic phenocrysts (clear, 1-2 mm, subangular); 2-5% lithics (dark brown/ black, up to 1-2 mm, trace up to 15 mm, subrounded). Damp.	
				T				
				C				
	225						225.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/14/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-4
	Completed: 9/22/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 323 ft
Northing: 1739635.60		Easting: 1637906.51	Location ID: SA-26999	TD Casing: NA

ELEVATIONS:
Ground Surface: 6708.95
Brass Cap: 6709.16
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35.5	45	Alluvial
320.7	321.8	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	225						OTOWI MEMBER OF THE BANDELIER TUFF - Cuttings (220-240 ft bgs); TUFF, grayish orange (10YR 7/4), poorly welded. Composed of ash matrix with: abundant pumice (vitric, fibrous, very light gray interior, up to 10 mm, generally <3 mm, subrounded); abundant felsic phenocrysts (clear, 1-2 mm, subangular to angular); minor lithics (dark brown/ black, up to 10 mm, generally <4 mm, angular).	
	230			C			Cuttings (220-225 ft bgs); as above, trace felsic phenocrysts; constituents generally coarser than remainder of interval.	
	235	Qbo					Cuttings (230-240 ft bgs); as above, increase in ash.	Bentonite chips
	240			T	CASA-06-73384		Core (240-243 ft bgs); TUFF, grayish orange pink (5YR 7/2), poorly welded. Composed of fine ash matrix with: 3-5% pumice (vitric, very light gray, up to 30 mm, subrounded); 2-5% felsic phenocrysts (clear, 1-2 mm, angular); 2-5% lithics (black, 1-3 mm, subangular to subrounded). Damp. Cuttings (240-260 ft bgs); TUFF, grayish orange (10YR 7/4) to pale yellowish brown (10YR 6/2), poorly welded. Composed of ash matrix with: abundant pumice (vitric, light gray to white, generally <3mm, up to 10 mm, subrounded); minor to trace felsic phenocrysts (clear, 1-2 mm, angular to subrounded); minor to trace lithics (dark brown/ black, generally <3 mm, up to 7 mm, angular to subrounded).	
	245			C			Cuttings (240-245 ft bgs); as above, returns are generally coarser.	
	250						250.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/14/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-4
	Completed: 9/22/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 323 ft
Northing: 1739635.60		Easting: 1637906.51	Location ID: SA-26999	TD Casing: NA

ELEVATIONS:
Ground Surface: 6708.95
Brass Cap: 6709.16
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35.5	45	Alluvial
320.7	321.8	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	250						OTOWI MEMBER OF THE BANDELIER TUFF - Cuttings (250-255 ft bgs); as above, minor felsic phenocrysts.	
	255			C				
	260	Qbo		T	CASA-06-73385		Core (260-263 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: 15-20% pumice (vitric, fibrous, pale yellowish brown to moderate orange pink, generally 1-8 mm, up to 35 mm, subrounded to subangular); 5-10% felsic phenocrysts (clear, up to 2 mm, subrounded); 1-2% lithics (dark to reddish brown, up to 6 mm, subangular to subrounded). Damp.	Bentonite chips
	265			C			Cuttings (260-280 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: abundant pumice (vitric, fibrous, pale yellowish brown to grayish orange pink, up to 10 mm, subrounded to subangular); minor felsic phenocrysts (clear, up to 2 mm, subrounded); minor lithics (dark to reddish brown, up to 6 mm, subangular to subrounded).	
	270							
	275						275.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/14/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-4
	Completed: 9/22/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 323 ft
Northing: 1739635.60		Easting: 1637906.51	Location ID: SA-26999	TD Casing: NA

ELEVATIONS:
Ground Surface: 6708.95
Brass Cap: 6709.16
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35.5	45	Alluvial
320.7	321.8	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	275						OTOWI MEMBER OF THE BANDELIER TUFF - Core (280-283 ft bgs): TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: 15-20% pumice (vitric, fibrous, pale yellowish brown to very pale orange, up to 11 mm, subrounded, trace Mn/Fe oxide staining); 5-7% felsic phenocrysts (clear, up to 2 mm, subrounded); <1% lithics (dark to reddish brown, up to 3 mm, subrounded). Damp.	
				C				
	280				CASA-06-73386			
		Qbo		T				
	285							
							287.0'	
							GUAJE PUMICE BED - Cuttings (287-300 ft bgs); PUMICE, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: abundant pumice (vitric, fibrous, pale yellowish brown, up to 15 mm, subrounded, trace Mn/Fe oxide staining); minor felsic phenocrysts (clear, up to 2 mm, subrounded); minor lithics (dark to reddish brown, up to 3 mm, subangular to subrounded). NOTE: The top of the Qbog is at 287 ft bgs based on geophysical logging.	Bentonite chips
	290			C				
		Qbog						
	295						Cuttings (295-300 ft bgs); PUMICE, very light gray (N8) to light gray (N7), poorly welded. Composed of: abundant pumice (vitric, fibrous, light gray, up to 10 mm, subrounded, felsic phenocrysts); trace felsic phenocrysts (clear, up to 1 mm, subrounded to subangular); trace lithics (dark to reddish brown, generally <2 mm, up to 6 mm, subangular to subrounded).	
	300						300.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/14/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-4
	Completed: 9/22/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 323 ft
Northing: 1739635.60		Easting: 1637906.51	Location ID: SA-26999	TD Casing: NA

ELEVATIONS:
Ground Surface: 6708.95
Brass Cap: 6709.16
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
35.5	45	Alluvial
320.7	321.8	Intermediate

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	300				CASA-06-73387		GUAJE PUMICE BED - Core (300-303 ft bgs): PUMICE light gray (N7), poorly welded. Composed of: 90% pumice (vitric, fibrous, light gray, up to 45 mm, subrounded to subangular, felsic phenocrysts, trace clay-like appearance); 5-7% felsic phenocrysts (clear, <1 mm, subrounded); 3-5% lithics (dark to reddish brown and olive green, generally <5 mm, up to 20 mm, subangular to subrounded). Damp.	
		Qbog		T			Cuttings (300-307 ft bgs); PUMICE light gray (N7), poorly welded. Composed of: abundant pumice (vitric, fibrous, light gray, up to 15 mm, subrounded to subangular); trace felsic phenocrysts (clear, up to 2 mm, subrounded); trace lithics (dark to reddish brown and orange, up to 10 mm, subangular to subrounded).	
	305						307.0'	
	310	Tpf		C			PUYE FORMATION - SANDSTONE - Cuttings (307-310 ft bgs); light brown (5YR 5/6) to pale yellowish brown (10YR 6/2), poorly sorted, poorly indurated. Composed of: abundant sand, predominantly pumice and inter. comp. volcanics, minor felsic grains, minor felsic sandstone clasts; minor gravel, predominantly pumice, and inter. comp. volcanics. minor felsic sandstone clasts. NOTE: the top of the Tpf is 307 ft bgs based on geophysical logging.	Bentonite chips
	315						Cuttings (318-320 ft bgs); as above, increased gravel content.	
							Core (320-321.8 ft bgs); GRAVELLY SANDSTONE, dusky brown (5YR 2/2), poorly sorted, poorly indurated. Damp to wet.	
▼	320				CASA-06-73388			
▽				T			Core (321.8-322 ft bgs); SILTSTONE, light brown (5YR 5/6), Damp to dry.	
							322.0'	
		Tb4		NR			CERROS DEL RIO BASALT - Core (322-322.3 ft bgs); BASALT grayish black (N2), highly vesicular. Aphanitic groundmass with 1% olivine phenocrysts; trace clay lining in vesicles. Dry to Damp. NOTE: The top of the Tb4 is 322 ft bgs based on geophysical logging.	
							323.0'	TD = 323 ft

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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4.5 SCC-5

SCC-5 was drilled from September 23 to 29, 2006 in lower Sandia Canyon (Figure 1.0-1). The hole was drilled to 290 ft bgs and core samples were collected at 20-ft intervals. Core recovery ranged from 50 to 100% and all core samples were submitted for the full suite of laboratory analyses as specified in the Work Plan. Additionally, at the request of LANL scientists, a sample from a thin, moist silt/clay layer from 60.2 to 60.3 ft bgs (the uppermost Otowi Member of the Bandelier Tuff) was submitted for moisture and anion analyses, and a basalt sample from 287.3 to 287.5 ft bgs in the final core run was submitted for metal and total organic carbon analyses. The corehole was advanced 9.5 ft into the Cerros del Rio basalt, near the range of 10 to 20 ft proposed in the Drilling Plan. All other drilling objectives identified in the Work Plan were met. Alluvial and intermediate zone groundwater were not encountered at SCC-5 and the corehole was plugged and abandoned.

Summary data regarding drilling, geophysical/video logging and stratigraphy are presented in Table 4.5-1 Figure 4.5-1 shows the lithologic log and backfill schematic. The appendices present survey data, drilling program deviations, core samples collected and a summary of waste characterization activities.

Table 4.5-1 – Summary Data for SCC-5

SCC-5	
DRILLING	
Dates drilled	9/23/06 – 9/29/06
Method	Air rotary/STRATEX
Hole diameter (in.)	10
Sample method (collected every 20 ft)	3-in. ID tube in Pitcher sampler: 20-263 ft; 2.4-in. ID core barrel: 280-290 ft
Borehole TD (ft bgs)	290
LOGGING (performed by LANL)	
Gamma	9/27/06
Induction	9/27/06
Video	9/27/06
STRATIGRAPHY	
Depth (ft bgs)	Qal: 0-50
Depth (ft bgs)	Qct: 50-60
Depth (ft bgs)	Qbo: 60-246
Depth (ft bgs)	Qbog: 246-266
Depth (ft bgs)	Tpf (gravel/sand): 266-275
Depth (ft bgs)	Tpf (silt): 275-280.5
Depth (ft bgs)	Tb4: 280.5-290
DEPTH TO WATER (ft bgs)	No groundwater encountered
FINAL STATUS	Plugged & Abandoned

LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/23/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-5
	Completed: 9/29/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 290 ft
Northing: 1769450.89		Easting: 1639331.58	Location ID: SA-27000	TD Casing: NA

ELEVATIONS:
Ground Surface: 6683.11
Brass Cap: 6683.61
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	0						QUATERNARY ALLUVIUM - SANDY SILTY CLAY (CH-ML) to GRAVELLY SILTY SAND (SWG) - Cuttings (0-20 ft bgs); moderate brown (5YR 4/4), moderately sorted, non-indurated. Composed of: abundant sand, predominantly felsic grains (clear, very fine to coarse, rounded to subangular, trace broken with crystal faces), trace intermediate composition volcanics (inter. comp. volcanics) (vari - colored, <2 mm, angular to rounded), trace pumice (vitric, white, <2 mm, rounded), trace tuff (gray, up to 2 mm, rounded); abundant silt/clay. Damp.	
	5						Cuttings (5-10 ft bgs); as above, minor gravel, predominantly tuff clasts (light gray, up to 30 mm, angular to subrounded, felsic rich, generally pumice poor, devitrified pumice noted), and inter. comp. volcanics (black, up to 25 mm, subangular).	
	10	Qal		C			Cuttings (10-15 ft bgs); SILTY CLAY (ML), as above, light brown, moderately sorted, poorly indurated. Composed of: abundant silt/clay; trace sand (predominantly felsic grains, clear, up to 2 mm, angular, common crystal faces) with trace inter. comp. volcanic grains and tuff fragments. Damp.	P&A Cement grout
	15						Cuttings (15-20 ft bgs); as above, trace gravel predominantly inter. comp. volcanic grains (medium gray, up to 25 mm, subangular).	
	20			T	CASA-06-73404		SANDY SILTY CLAY (CL-ML) - Core (20-21.5 ft bgs); grayish orange (10 YR 6/6), poorly to moderately sorted, poorly indurated. Composed of: 70-75% silt/clay; 10-15% sand (felsic grains, clear, up to 2 mm, angular to subrounded, crystal faces noted), trace tuff/pumice fragments (light gray to light brown, up to 7 mm, subrounded). Dry to damp.	
				NR				
				C				
	25							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/23/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-5
	Completed: 9/29/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 290 ft
Northing: 1769450.89		Easting: 1639331.58	Location ID: SA-27000	TD Casing: NA

ELEVATIONS:
Ground Surface: 6683.11
Brass Cap: 6683.61
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	25						QUATERNARY ALLUVIUM - SANDY SILTY CLAY (CH-ML) to GRAVELLY SILTY SAND (SWG) - Cuttings (0-20 ft bgs); moderate brown (5YR 4/4), moderately sorted, non-indurated. Composed of: abundant sand, predominantly felsic grains (clear, very fine to coarse, rounded to subangular, trace broken with crystal faces), trace intermediate composition volcanics (inter. comp. volcanics) (vari - colored, <2 mm, angular to rounded), trace pumice (vitric, white, <2 mm, rounded), trace tuff (gray, up to 2 mm, rounded); abundant silt/clay. Damp.	
	30			C			QUATERNARY ALLUVIUM Cuttings (20-40 ft bgs); GRAVELLY SILTY SAND (SWG), dark yellowish orange (10YR 6/6) to moderate yellowish brown (10YR 5/4), moderate to well sorted, poorly indurated. Composed of: abundant silt/clay; minor sand, predominantly felsic grains (clear, up to 2 mm, angular, broken with crystal faces), trace inter. comp. volcanic grains and tuff fragments; single gravel clast of tuff (gray, 20 mm, angular, felsic phenocrysts rich). Damp.	
	35	Qal					Cuttings (30-35 ft bgs); As above, increase in sand and gravel content. Cuttings (35-40 ft bgs) As above, marked increase in sand and gravel.	P&A Cement grout
							NOTE: Potable water injection began at 40 ft bgs.	
	40				CASA-06-73405		40.0'	
				T			Core (40-42.5 ft bgs); Colluvial boulder of devitrified tuff, grayish orange pink (5YR 7/2) mottled light brown (5YR 5/6), poorly welded. Composed of: ash matrix with 20% felsic phenocrysts and trace pumice with silty sand adhering to tuff. Damp.	
				NR			42.5'	
				C			Cuttings (40-45 ft bgs); SILTY CLAYEY SAND (SC-SM), moderate brown (5YR 3/4) to moderate yellowish brown (10YR 5/4), moderately sorted, poorly indurated. Composed of: sand (felsic grains, clear, generally coarse, angular to rounded, minor bipyramidal quartz) with trace to minor inter. comp. volcanics (dark red to black, up to 2 mm, angular to subrounded); minor gravel. Damp.	
	45							
				NR				
	50						50.0'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/23/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-5
	Completed: 9/29/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 290 ft
Northing: 1769450.89		Easting: 1639331.58	Location ID: SA-27000	TD Casing: NA

ELEVATIONS:
Ground Surface: 6683.11
Brass Cap: 6683.61
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	50–55	Qct		C			CERRO TOLEDO INTERVAL Cuttings (50-55 ft bgs) GRAVELLY SILTY SAND (SWG) SILTY CLAYEY SAND (SC-SM), dark yellowish orange (10YR 6/6), poorly sorted, poorly indurated. Composed of: abundant sand, predominantly felsic grains (clear, up to 2 mm, angular to subangular) and inter. comp. volcanics (dark red, black, up to 2 mm, angular to subangular); minor to trace gravel, predominantly pumice (vitric, pale yellow, up to 10 mm, subangular to subrounded) and inter. comp. volcanics (dark red to black, up to 15 mm, angular to subangular); minor silt/clay. Damp. NOTE: The top of the Qct is 50 ft bgs based on geophysical logging.	
	60				CASA-06-73406 CASA-06-73428		60.0'	
	60–65	Qbo		T NR C			OTOWI MEMBER OF THE BANDELIER TUFF Core (60-62.6 ft bgs): TUFF, light brown (5YR 6/4), poorly welded. Composed of: fine ash matrix with 5-7% felsic phenocrysts (clear, 1-2 mm, subangular to angular); 5-7% lithics (black, up to 10 mm, subangular to subrounded); 5-10% pumice (vitric, fibrous, pale yellowish orange, light brown, up to 30 mm, subrounded, felsic phenocrysts). NOTE: The upper portion of the core contained a thin layer of moist silt/clay, and sample 73428 was collected from this zone for moisture content analysis. Damp. NOTE: The top of the Qbo is 60 ft bgs based on geophysical logging. Cuttings (60-75 ft bgs); as above, increasing pumice.	P&A Cement grout
	65							
	70							
	75							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/23/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-5
	Completed: 9/29/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 290 ft
Northing: 1769450.89		Easting: 1639331.58	Location ID: SA-27000	TD Casing: NA

ELEVATIONS:
Ground Surface: 6683.11
Brass Cap: 6683.61
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	75						OTOWI MEMBER OF THE BANDELIER TUFF Cuttings (75-80 ft bgs); as above, abundant lithics, single clast up to 30 mm.	
				C				P&A Cement grout
	80				CASA-06-73407		Core (80-81.5 ft bgs); TUFF, grayish orange pink (5YR 7/2), poorly welded. Composed of ash matrix with: 10-15% pumice (vitric, white to pale yellowish orange, generally <4 mm, up to 20 mm, fibrous, manganese/iron (Mn/Fe) oxide specks); 10% felsic phenocrysts (clear, 2-3 mm, subrounded to broken with crystal faces); 5% lithics, predominantly inter. comp. volcanics (dark brown, black, generally <2 mm, up to 30 mm, angular to subangular. Damp.	
				T				81.5 ft
				NR				Slough
								83.7 ft
	85						Cuttings (80-100 ft bgs); TUFF, grayish orange (10YR 7/4), poorly welded. Composed of ash matrix with: abundant pumice (vitric, fibrous, very pale orange to light brown, up to 20 mm, subrounded, felsic phenocrysts); minor to abundant lithics (dark brown to black, up to 25 mm, angular to subrounded, gray clast with spherulites noted); minor felsic phenocrysts (clear, 1-2 mm, subrounded to broken, with crystal faces).	
		Qbo						
	90							
				C				Bentonite chips
	95							
	100							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/23/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-5
	Completed: 9/29/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 290 ft
Northing: 1769450.89		Easting: 1639331.58	Location ID: SA-27000	TD Casing: NA

ELEVATIONS:
Ground Surface: 6683.11
Brass Cap: 6683.61
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	100			T	CASA-06-73408		OTOWI MEMBER OF THE BANDELIER TUFF Core (100-101.5 ft bgs); grayish orange (10YR 7/4), poorly welded. Composed of ash matrix with: 15-20% pumice (vitric, fibrous, very pale orange, generally <4 mm, pale yellowish orange pumices up to 10 mm, felsic phenocrysts noted in larger pumice); 5-10% felsic phenocrysts (clear, up to 2 mm, subrounded to broken with crystal faces); 5-10% lithics (black, dark brown, up to 8 mm, subrounded to subangular). Damp.	
				NR				
	105						Cuttings (100-120 ft bgs); TUFF, moderate yellowish brown (10YR 5/4), poorly welded. Composed of ash matrix with: abundant pumice (vitric, fibrous, light brown, up to 20 mm, minor felsic phenocrysts); minor to abundant lithics (dark brown, black, up to 20 mm, generally <5 mm, angular to subrounded); trace felsic phenocrysts (clear, 1-2 mm, subrounded to subangular).	
	110			C				
		Qbo						Bentonite chips
	115							
	120			T	CASA-06-73409		Core (120-122 ft bgs); TUFF, grayish orange pink (5YR 7/2), poorly welded. Composed of ash matrix with: 10-15% felsic phenocrysts (clear, 1-2 mm, angular to subrounded, trace with crystal faces); 15-20% pumice (vitric, white, dark yellowish orange, up to 20 mm, generally <5 mm,); 2-3% lithics (dark brown, black, up to 20 mm, angular to subangular). Damp.	
				NR				
				C				
	125							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
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C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/23/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-5
	Completed: 9/29/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 290 ft
Northing: 1769450.89		Easting: 1639331.58	Location ID: SA-27000	TD Casing: NA

ELEVATIONS:
Ground Surface: 6683.11
Brass Cap: 6683.61
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	125	Qbo		C			OTOWI MEMBER OF THE BANDELIER TUFF Cuttings (120-140 ft bgs); TUFF, moderate yellowish brown (10YR 5/4), poorly welded. Composed of ash matrix with: abundant pumice (vitric, slightly fibrous, white, up to 5 mm, subrounded); minor lithics (dark gray, black, up to 15 mm, generally <5 mm, subangular); minor felsic phenocrysts (clear, 1-2 mm, angular to subangular).	Bentonite chips
	130							
	135							
	140			T	CASA-06-73410		Core (140-143 ft bgs); TUFF, grayish orange pink (5YR 7/2) to light brown (5YR 6/4), poorly welded. Composed of ash matrix with: 15% pumice (vitric, fibrous, dark yellowish orange, up to 30 mm, felsic phenocrysts, subrounded); 5-10% felsic phenocrysts (clear, up to 2 mm, angular); 5% lithics (dark brown, black, generally <2 mm, up to 10 mm, angular to subangular). Damp.	
	145			C			Cuttings (140-160 ft bgs); TUFF, moderate yellowish brown (10YR 5/4), poorly welded. Composed of ash matrix with: abundant pumice (vitric, fibrous, dark yellowish orange, white, up to 5 mm, subrounded to angular) and lithics (dark brown, black, medium gray, up to 10 mm, angular to subrounded); trace to minor felsic phenocrysts (clear, 1-2 mm, angular, broken with crystal faces).	
	150							

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C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/23/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-5
	Completed: 9/29/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 290 ft
Northing: 1769450.89		Easting: 1639331.58	Location ID: SA-27000	TD Casing: NA

ELEVATIONS:
Ground Surface: 6683.11
Brass Cap: 6683.61
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	150						OTOWI MEMBER OF THE BANDELIER TUFF Cuttings (150-155 ft bgs); as above, single obsidian fragment (smoky gray, 6 mm, round).	
	155			C				
	160	Qbo		T	CASA-06-73411		Core (160-163 ft bgs); TUFF, grayish orange pink (5YR 7/2), poorly welded. Composed of fine ash matrix with: 20-25% pumice (vitric, fibrous, white to dark yellowish brown, up to 15 mm, subrounded); 10% lithics (dark brown, black, numerous clasts up to 55 mm, subangular); 2-5% felsic phenocrysts (clear, 1-2 mm, angular, broken with crystal faces). Damp.	Bentonite chips
	165			C			Cuttings (160-180 ft bgs); TUFF, moderate yellowish brown (10YR 5/4), poorly welded. Composed of fine ash matrix with: abundant felsic phenocrysts (clear, 1-2 mm, broken to subangular with crystal faces) and pumice (vitric, fibrous, white, generally <4 mm, up to 10 mm, subangular to angular); minor lithics (dark reddish brown, black, up to 8 mm, subangular).	
	170							
	175							

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NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/23/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-5
	Completed: 9/29/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 290 ft
Northing: 1769450.89		Easting: 1639331.58	Location ID: SA-27000	TD Casing: NA

ELEVATIONS:
Ground Surface: 6683.11
Brass Cap: 6683.61
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	175			C			OTOWI MEMBER OF THE BANDELIER TUFF	
	180			T	CASA-06-73412		Core (180-183 ft bgs); TUFF, grayish orange pink (5YR 7/2), poorly welded. Composed of fine ash matrix with: 30-40% pumice (vitric, fibrous, white, moderate orange pink, felsic phenocrysts, up to 40 mm, generally 10 mm, subangular to subrounded); 5-10% felsic phenocrysts (clear, 1-3 mm, angular to subrounded, trace bipyramidal quartz); 2-5% lithics (dark brown, black, 5 mm, subangular). Damp.	
	185	Qbo					Cuttings (180-200 ft bgs); TUFF, dark yellowish orange (10YR 6/6) to grayish orange (10YR 7/4), poorly welded. Composed of fine ash matrix with: abundant pumice (vitric, very light gray, very pale orange, up to 15 mm, subangular to subrounded); minor to abundant lithics (dark brown, black, up to 15 mm, angular); trace felsic phenocrysts (clear, generally 1 mm, angular to subrounded).	Bentonite chips
	190			C				
	195							
	200							

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C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/23/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-5
	Completed: 9/29/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 290 ft
Northing: 1769450.89		Easting: 1639331.58	Location ID: SA-27000	TD Casing: NA

ELEVATIONS:
Ground Surface: 6683.11
Brass Cap: 6683.61
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	200				CASA-06-73413		OTOWI MEMBER OF THE BANDELIER TUFF Core (200-203 ft bgs); TUFF, very pale orange (10YR 8/2), poorly welded. Composed of fine ash matrix with: 10% felsic phenocrysts (clear, up to 3 mm, trace with crystal faces to subrounded); 5% pumice (vitric, weakly fibrous, white to moderate orange pink, generally 5 mm, up to 20 mm, subrounded to angular); 5% lithics, (dark brown to black, up to 10 mm, angular). Damp.	
				T				
	205						Cuttings (200-220 ft bgs); TUFF, dark yellowish orange (10YR 6/6) to pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: abundant pumice (vitric, light gray, pale yellow to light brown, generally 4 mm, up to 15 mm, subangular); minor lithics (black, up to 5 mm, subangular); trace felsic phenocrysts.	
	210						Cuttings (210-220 ft bgs); as above, color change to pale yellowish brown; abundant felsic phenocrysts, bipyramidal quartz noted; trace pumice.	
				C				
		Qbo						Bentonite chips
	215							
	220				CASA-06-73414		Core (220-223 ft bgs); TUFF, grayish orange pink (5YR 7/2), to very pale orange (10YR 8/2), poorly welded. Composed of fine ash matrix with: 10% felsic phenocrysts (clear, up to 3 mm, subangular to subrounded); 5% pumice (vitric, fibrous, white, grayish orange, generally 5 mm, up to 20 mm, subangular); 2-3% lithics (dark brown, black, up to 3 mm, subangular). Damp.	
				T				
				NR				
				C				
	225							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
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C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/23/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-5
	Completed: 9/29/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 290 ft
Northing: 1769450.89		Easting: 1639331.58	Location ID: SA-27000	TD Casing: NA

ELEVATIONS:
Ground Surface: 6683.11
Brass Cap: 6683.61
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	225			NR			OTTOWI MEMBER OF THE BANDELIER TUFF Cuttings (220-240 ft bgs); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: abundant pumice (vitric, white, up to 10 mm, subangular to subrounded); minor lithics (dark brown, black, up to 5 mm, angular); trace felsic phenocrysts (clear, 1-2 mm, angular to subrounded, bipyramidal quartz noted).	
	230			C				
	235	Qbo						Bentonite chips
	240			T	CASA-06-73415		Core (240-243 ft bgs); TUFF, grayish orange pink (5YR 7/2), poorly welded. Composed of fine ash matrix with: 5-10% pumice (vitric, white, up to 10 mm, generally 3 mm, subangular to subrounded); 2-5% felsic phenocrysts (clear, 1-2 mm, angular); 2-3 % lithics (black, 1-2 mm, angular to subangular). Damp. Cuttings (240-245 ft bgs); TUFF, grayish orange (10YR 7/4), poorly welded. Composed of trace fine ash matrix with: abundant pumice, trace lithics, trace felsic phenocrysts.	
	245						246.0'	
	250	Qbog		C			GUAJE PUMICE BED - Cuttings (246-260 ft bgs): PUMICE, grayish orange (10YR 7/4), poorly welded. Composed of: abundant pumice (vitric, weakly fibrous, up to 10 mm, generally <5 mm, subrounded to subangular); trace felsic phenocrysts (clear, 1-2 mm, angular, trace bipyramidal quartz); trace lithics (dark brown, up to 5 mm, angular to subangular, oxidized appearance on some fragments).	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/23/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-5
	Completed: 9/29/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 290 ft
Northing: 1769450.89		Easting: 1639331.58	Location ID: SA-27000	TD Casing: NA

ELEVATIONS:
Ground Surface: 6683.11
Brass Cap: 6683.61
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Depth (ft.)	Geologic Unit	Sample Type	Analytical Sample Number	Visual Classification	FINAL CONSTRUCTION
250				GUAJE PUMICE BED NOTE: The top of the Qbog is 246 ft bgs based on geophysical logging.	
255	Qbog	C			
260		T	CASA-06-73416	Core: (260-263 ft bgs); PUMICE, light gray (N8), poorly welded. Composed of 98% pumice (very light gray, slightly fibrous, up to 25 mm, trace damp to wet interiors); 1-2% felsic phenocrysts (clear, 1-2 mm, angular, trace bipyramidal quartz); 1-2% lithics (dark brown, up to 20 mm, angular; single grayish orange rhyolitic clast with abundant felsic phenocrysts). Damp. Cuttings (260-266 ft bgs); PUMICE, grayish orange (10YR 7/4), poorly welded. Composed of: abundant pumice (vitric, light gray, up to 10 mm), trace lithics, trace felsic phenocrysts.	Bentonite chips
265				266.0'	
270	Tpf	C		PUYE FORMATION - Cuttings (266- 270 ft bgs); GRAVELLY SILTSTONE/ CLAYSTONE, light brown (5YR 5/6), moderately sorted, poorly to moderately indurated. Composed of: abundant fine-grained gravel (predominantly inter. comp. volcanics, black, gray, up to 3 mm, angular to subangular); minor sand (predominantly pumice, vitric, white, up to 2 mm, subrounded to subangular, and inter. comp. volcanics) with minor to abundant silt/claystone clasts (up to 5 mm, subrounded, fine grain matrix with <1 mm grains of felsic, inter. comp. volcanic, and white pumice constituents). Clasts may represent interbedding of silt/claystone with fine-grained gravel deposit. NOTE: The top of the Tpf is 266 ft bgs based on geophysical logging.	
275					

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 9/23/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-5
	Completed: 9/29/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 290 ft
Northing: 1769450.89		Easting: 1639331.58	Location ID: SA-27000	TD Casing: NA

ELEVATIONS:
Ground Surface: 6683.11
Brass Cap: 6683.61
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	275	Tpf		C			PUYE FORMATION - Cuttings (275-280 ft bgs); SILTSTONE/CLAYSTONE, light brown (5YR 5/6), Composed of abundant silt/clay and trace consolidated silt/claystone clasts (light brown, up to 15 mm, rounded), trace gravel (predominantly inter. comp. volcanics) and trace pumice.	
	280			NR	CASA-06-73417		280.0'	
		Tb4		C			CERROS DEL RIO BASALT - Core (280.5-284 ft bgs); BASALT, black (N1), highly vesicular, aphanitic groundmass with 1-2% olivine phenocrysts (brownish green, 1-2 mm, anhedral, trace planar partings noted). Exterior wet from injected potable water. Interior appears dry. NOTE: The top of the Tb4 is 280.5 ft bgs based on geophysical logging.	Bentonite chips
				NR				
	285			CORE	CASA-06-73418		Core (285-288.5 ft bgs); as above, vesicular with brownish-black alteration.	287.5 ft
				NR				Slough
	290						290.0'	TD = 290 ft

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
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C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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4.6 SCC-6

SCC-6 was cored in lower Sandia Canyon from October 8 to 11, 2006 (Figure 1.0-1). The hole was cored to 259.5 ft bgs and core samples were collected at 20-ft intervals. Core recovery ranged from 23 to 100% and all core samples were submitted for the full suite of laboratory analyses as specified in the Work Plan. The corehole was advanced 10.5 ft into the Cerros del Rio basalt, in the range of 10 to 20 ft proposed in the Drilling Plan. All other drilling objectives identified in the Work Plan were met. Alluvial and intermediate zone groundwater was not encountered at SCC-6, and the corehole was plugged and abandoned.

Summary data regarding drilling, geophysical/video logging and stratigraphy are presented in Table 4.6-1. Figure 4.6-1 shows the lithologic log and backfill schematic. The appendices present survey data, drilling program deviations, core samples collected and a summary of waste characterization activities.

Table 4.6-1 – Summary Data for SCC-6

SCC-6	
DRILLING	
Dates drilled	10/08/06 – 10/11/06
Method	Air rotary/STRATEX
Hole diameter (in.)	10
Sample method (collected every 20 ft)	2.5-in. ID Split spoon: 20-21.3 ft; 3-in. ID tube in Pitcher sampler: 40-241.5 ft; 2.4-in. ID core barrel: 251-259.5 ft
Borehole TD (ft bgs)	259.5
LOGGING (performed by LANL)	
Gamma	10/11/06
Induction	10/11/06
Video	10/11/06
STRATIGRAPHY	
Depth (ft bgs)	Qal: 0-77
Depth (ft bgs)	Qbo: 77-194
Depth (ft bgs)	Qbog: 194-211
Depth (ft bgs)	Tpf (gravel/sand): 211-225
Depth (ft bgs)	Tpf (silt): 225-229
Depth (ft bgs)	Tpf (gravel/sand): 229-249
Depth (ft bgs)	Tb4: 249-259.5
DEPTH TO WATER (ft bgs)	No groundwater encountered
FINAL STATUS	Plugged & abandoned

LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 10/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-6
	Completed: 10/14/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 259.5 ft
Northing: 1769505.8		Easting: 1642266.73	Location ID: SA-27001	TD Casing: NA

ELEVATIONS:
Ground Surface: 6618.96
Brass Cap: 6619.29
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	0						QUATERNARY ALLUVIUM Cuttings (0-20 ft); SANDY SILT (MLS) TO GRAVELLY SILT (MLG), moderate yellowish brown (10YR 5/4), moderate to well sorted, non-indurated. Composed of: abundant silt; minor sand, predominantly felsic grains (clear, 1-2 mm, broken with crystal faces) and tuff fragments (moderate orange pink, up to 2 mm, subangular, possibly devitrified); minor to trace gravel, predominantly tuff fragments (devitrified, moderate orange pink, up to 20 mm, angular), plus pumice (vitric, light brown, up to 20 mm, angular, felsic phenocrysts). Dry to damp.	Cement 1 ft
	5							
	10	Qal		C				P&A Cement grout
	15							
	20			CS NR C	CASA-06-74272		Core (20-21.3 ft); SANDY SILT (MLS), moderate yellowish brown (10YR 5/4), well sorted, non-indurated. Composed of: 75-80% silt; 20-25% sand, predominantly felsic grains (clear, generally very fine grained, trace medium to coarse, subangular to subrounded, trace with crystal faces), trace tuff grains (very pale orange, very fine to fine, subrounded); trace gravel, pumice fragments (vitric, fibrous, very pale orange, up to 4 mm, subangular). Dry NOTE: Core run was 18 in. with 16 in. recovered.	
	25							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 10/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-6
	Completed: 10/14/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 259.5 ft
Northing: 1769505.8		Easting: 1642266.73	Location ID: SA-27001	TD Casing: NA

ELEVATIONS:
Ground Surface: 6618.96
Brass Cap: 6619.29
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	25						QUATERNARY ALLUVIUM Cuttings (20-40 ft); SANDY SILT (MLS), moderate yellowish brown (10YR 5/4), moderately sorted, non-indurated. Composed of: abundant sand, predominantly felsic grains (clear, fine to coarse, broken, subrounded, common crystal faces, bipyramidal quartz), trace tuff fragments (moderate orange pink, up to 2 mm, subrounded); minor silt; trace gravel, predominantly intermediate composition volcanics (inter. comp. volcanics) (up to 10 mm, subangular) and tuff fragments (devitrified, moderate orange pink, <4 mm, subrounded).	
	30			C				
	35						Cuttings (35-40 ft); as above, color change to moderate brown (5 YR 3/4); marked decrease in sand and increase in silt; gravel composed of tuff fragments, pale brown, felsic phenocryst-rich, devitrified.	
		Qal						P&A
								Cement grout
	40				CASA-06-74273		Core (40-42 ft); SILT (ML) to SANDY SILT (MLS), moderate brown (5YR 3/4), well sorted, poorly indurated. Composed of: 90-95% silt; 5-10% sand, predominantly felsic grains (clear, very fine to coarse, angular, common crystal faces). Damp.	
				T				
				NR				
	45						Cuttings (40-50 ft); SILT (ML), light brown (5 YR 5/6), moderately sorted, poorly indurated. Composed of: abundant silt; trace sand, predominantly felsic grains (clear, fine to coarse, angular to subrounded, common crystal faces) and pumice (vitric, white, 1-2 mm, subrounded); trace gravel, predominantly pumice (vitric, fibrous, up to 10 mm, subrounded, felsic phenocrysts).	
				C				
	50							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 10/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-6
	Completed: 10/14/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 259.5 ft
Northing: 1769505.8		Easting: 1642266.73	Location ID: SA-27001	TD Casing: NA

ELEVATIONS:
Ground Surface: 6618.96
Brass Cap: 6619.29
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	50						QUATERNARY ALLUVIUM Cuttings (50-55 ft bgs); as above, marked increase in gravel including tuff fragments (devitrified, grayish orange pink, up to 40 mm, subrounded); marked increase in sand grains (clear, fine to coarse, angular, crystal faces noted).	
	55			C			Cuttings (55-60 ft bgs); as above, color change to dusky yellowish brown (10 YR 2/2); abundant very fine to fine sand; trace gravel, up to 3-4 mm, including vitric pumice fragments, devitrified tuff, and bipyramidal quartz.	
	60			T	CASA-06-74274		Core (60-61.5 ft); SILT (ML) to SANDY SILT (MLS), light brown (5YR 6/4), well sorted, poorly indurated. Composed of 90-95% silt; 5-10% sand, predominantly felsic grains (clear, very fine to medium, angular). Damp. NOTE: moist stringer, 1 in. thick, at approximately 61 ft bgs.	
		Qal		NR			Cuttings (60-70 ft); SILT (ML) to SAND (SW), light brown (5YR 6/4), well sorted, poorly indurated. Composed of: abundant silt; minor to abundant sand, predominantly felsic grains (clear, generally <1 mm, angular) and pumice (vitric, white, up to 2 mm, angular), trace mafic grains (black, dark green, up to 1 mm, rectangular), possible trace obsidian; trace gravel, predominantly pumice (vitric, fibrous, yellowish orange, up to 20 mm, angular, felsic phenocrysts), trace tuff (devitrified, pale gray, felsic phenocryst-rich).	P&A Cement grout
	65							
				C				
	70						Cuttings (70-75 ft); as above, minor gravel, predominantly tuff fragments (devitrified, grayish orange pink, up to 20 mm, subrounded, felsic phenocryst-rich) and inter. comp. volcanics (dark brown, black, medium gray, up to 35 mm, angular) and pumice.	
	75							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
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C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 10/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-6
	Completed: 10/14/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 259.5 ft
Northing: 1769505.8		Easting: 1642266.73	Location ID: SA-27001	TD Casing: NA

ELEVATIONS:
Ground Surface: 6618.96
Brass Cap: 6619.29
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	75	Qal					QUATERNARY ALLUVIUM.	
							77.0'	
		Qbo		C			OTOWI MEMBER OF THE BANDELIER TUFF - Cuttings (77-80 ft); TUFF, light brown (5YR 6/4), poorly welded. Composed of fine ash matrix with: abundant felsic phenocrysts (clear, up to 2 mm, angular, broken with crystal faces, trace bipyramidal quartz) and pumice (vitric, fibrous, yellowish orange, very pale orange, up to 20 mm, angular to subangular, minor manganese (Mn)/ iron (Fe) oxide specks); trace lithics (black, up to 35 mm, angular to subrounded).	P&A
	80				CASA-06-74275			Cement grout
				T			NOTE: Cuttings include tuff intermixed with overlying formation. NOTE: The top of the Qbo is 77 ft bgs based on the geophysical logging and cuttings.	80.8 ft
	85						Core (80-83 ft); TUFF, grayish orange pink (5YR 7/2), poorly welded. Composed of fine ash matrix with: 30% pumice (vitric, fibrous, generally very pale orange to white, minor yellowish orange, up to 25 mm, generally <5 mm, subrounded to angular); 10-15% felsic phenocrysts (clear, 1-2 mm, angular to subrounded, trace with crystal faces); 2-5 % lithics (black, up to 5 mm, angular to subangular). Damp.	
							Cuttings (80-101 ft); TUFF, moderate yellowish brown (10YR 5/4), poorly welded. Composed of ash matrix with: abundant pumice (vitric, fibrous, very pale orange to white, up to 5 mm, subrounded to angular, trace Mn/Fe oxide specks); minor to trace felsic phenocrysts (clear, 1-2 mm, subrounded to angular, trace with crystal faces); minor to trace lithics (black, up to 5 mm, angular).	P&A
	90			C				Bentonite chips
							NOTE: Potable water injection began at 80 ft bgs.	
	95							
	100							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
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C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 10/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-6
	Completed: 10/14/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 259.5 ft
Northing: 1769505.8		Easting: 1642266.73	Location ID: SA-27001	TD Casing: NA

ELEVATIONS:
Ground Surface: 6618.96
Brass Cap: 6619.29
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	100			C	CASA-06-74276		OTOWI MEMBER OF THE BANDELIER TUFF	
				T			Core (101-104 ft); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of ash matrix with: 25% pumice (vitric, very pale orange to white, trace yellowish orange, up to 25 mm, angular to subrounded); 15-20% felsic phenocrysts (clear, 1-2 mm, angular to subrounded, trace with crystal faces); 5-10% lithics (dark brown to black, up to 10 mm, angular). Damp.	
	105						Cuttings (100-120 ft); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of ash matrix with: abundant pumice (vitric, very pale orange to white, trace yellowish orange, up to 10 mm, angular to subrounded); minor felsic phenocrysts (clear, 1-2 mm, angular to subrounded, trace with crystal faces); minor lithics (dark brown to black, up to 5 mm, angular).	
	110			C				
		Qbo						P&A Bentonite chips
	115							
	120				CASA-06-74277		Core: (120-121.5 ft); TUFF, grayish orange pink (5YR 7/2), poorly welded. Composed of fine ash matrix with: 30% pumice (vitric, fibrous, white to very pale orange, up to 15 mm, generally 2-5 mm, angular to subangular); 5-10% felsic phenocrysts (clear, 1-2 mm, subrounded to broken with crystal faces); 2-5% lithics (dark brown, generally <3 mm, up to 20 mm, angular). Damp.	
				T				
				NR				
				C				
	125							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 10/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-6
	Completed: 10/14/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 259.5 ft
Northing: 1769505.8		Easting: 1642266.73	Location ID: SA-27001	TD Casing: NA

ELEVATIONS:
Ground Surface: 6618.96
Brass Cap: 6619.29
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	125						OTOWI MEMBER OF THE BANDELIER TUFF Cuttings (120-140 ft); TUFF, grayish orange (10YR 7/4), poorly welded. Composed of fine ash matrix with: minor felsic phenocrysts (clear, 1-2 mm, subrounded to angular, trace with crystal faces); trace to minor pumice (white to very orange, trace yellowish orange, vitric, up to 10 mm, generally <4 mm, subangular to subrounded); trace lithics (black, up to 4 mm, subangular).	
	130			C				
	135							
		Qbo						P&A Bentonite chips
	140				CASA-06-74278		Core (140-143 ft); TUFF, grayish orange pink (5YR 7/2), poorly welded. Composed of fine ash matrix with: 10-15% pumice (vitric, fibrous, white to very pale orange, generally 2-5 mm, angular to subangular); 5-7% felsic phenocrysts (clear, 1-2 mm, subrounded, trace with crystal faces); 2-3% lithics (black, 1-3 mm, angular to subangular). Damp.	
				T				
	145			C			Cuttings (140-160 ft); TUFF, moderate yellowish brown (10YR 5/4), poorly welded. Composed of fine ash matrix with: abundant felsic phenocrysts (clear, 1-2 mm, rounded to angular, trace with crystal faces); minor pumice (very pale orange to white, <3 mm, subangular to subrounded); minor lithics (black, reddish brown, up to 4 mm, angular to subrounded).	
	150							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 10/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-6
	Completed: 10/14/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 259.5 ft
Northing: 1769505.8		Easting: 1642266.73	Location ID: SA-27001	TD Casing: NA

ELEVATIONS:
Ground Surface: 6618.96
Brass Cap: 6619.29
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	150						OTOWI MEMBER OF THE BANDELIER TUFF	
	155			C				
	160			T	CASA-06-74279		Core (160-161.5 ft); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine to coarse ash matrix with: 40% pumice (vitric, fibrous, significant open area, grayish orange pink, to very pale orange, up to 55 mm, Mn/Fe staining, felsic phenocrysts); 2-5% felsic phenocrysts (clear, 1 mm, subangular); trace lithics (black, <1 mm, angular). Damp.	
		Qbo		NR			Cuttings (160-180 ft); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of ash matrix with: abundant felsic phenocrysts (clear, 1 mm, subangular) and pumice (vitric, white, generally <5 mm, subangular to subrounded); minor lithics (black, up to 4 mm, subangular to subrounded).	P&A Bentonite chips
	165							
				C				
	170							
	175							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 10/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-6
	Completed: 10/14/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 259.5 ft
Northing: 1769505.8		Easting: 1642266.73	Location ID: SA-27001	TD Casing: NA

ELEVATIONS:
Ground Surface: 6618.96
Brass Cap: 6619.29
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	175			C			OTOWI MEMBER OF THE BANDELIER TUFF	
	180			T	CASA-06-74280		Core (180-183 ft); TUFF, grayish orange pink (5YR 7/2) to pale yellowish brown (10YR 6/2), poorly welded. Composed of fine to coarse ash matrix with: 30% pumice (vitric, fibrous, very pale orange to moderate orange pink, numerous pumice up to 50 mm, subangular to subrounded, felsic phenocrysts); 2-5% felsic phenocrysts (clear, 1-2 mm, subangular to subrounded, trace with crystal faces); 2-3% lithics (dark brown, up to 3 mm, angular to subrounded). Damp. Cuttings (180-195 ft); TUFF, pale yellowish brown (10YR 6/2), poorly welded. Composed of fine ash matrix with: abundant pumice (vitric, weakly fibrous, very light gray to very pale orange, up to 10 mm, generally <5 mm, subangular to subrounded); minor felsic phenocrysts (clear, 1-2 mm, angular to subrounded); minor lithics (dark brown, up to 3 mm, angular to subrounded).	
	185	Qbo						P&A Bentonite chips
	190			C				
							194.0'	
	195	Qbog					GUAJE PUMICE BED - Cuttings (194-200 ft); PUMICE, pale yellowish brown (10YR 6/2), poorly welded. Composed of: abundant pumice (vitric, weakly fibrous, very light gray to very pale orange, up to 10 mm, generally <5 mm, subangular to subrounded); trace to minor felsic phenocrysts (clear, 1-2 mm, angular to subrounded); trace to minor lithics (dark brown, up to 3 mm, angular to subrounded). NOTE: The top of the Qbog is 194 ft bgs based on geophysical logging.	
	200							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 10/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-6
	Completed: 10/14/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 259.5 ft
Northing: 1769505.8		Easting: 1642266.73	Location ID: SA-27001	TD Casing: NA

ELEVATIONS:
Ground Surface: 6618.96
Brass Cap: 6619.29
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	200			T	CASA-06-74281		GUAJE PUMICE BED - Core (200-201.5 ft); PUMICE, very pale orange (10YR 8/2), poorly welded. Composed of: 90-95% pumice (vitric, fibrous, very pale orange, very light gray, up to 20 mm, angular to subangular, altered appearance, Mn/Fe staining, trace felsic phenocrysts); 5% felsic phenocrysts (clear, up to 2 mm, angular, trace bipyramidal quartz); 2-3% lithics (black, dark brown, up to 5 mm, subangular, oxidized appearance). Damp. Altered appearance with Mn/Fe oxide stringers throughout core. Cuttings (200-210 ft); PUMICE, as above.	
				NR				
	205	Qbog						
	210						211.0'	
				C			PUYE FORMATION Cuttings (210-220 ft); GRAVELLY SILTY/ CLAYEY SANDSTONE, moderate brown (5YR 4/4), moderately sorted, poorly indurated. Composed of: abundant sand, predominantly felsic grains (clear, 1 mm, subrounded) and siltstone fragments (moderate brown, up to 2 mm, subrounded) with lesser amounts of inter. comp. volcanics (gray, reddish brown, up to 2 mm, angular) and trace pumice (vitric, weakly fibrous, very pale orange, very light gray, up to 2 mm); trace gravel, up to 3 mm, composition as for sand fraction; trace silt/clay.	P&A Bentonite chips
	215							
		Tpf					NOTE: The top of the Tpf is 211 ft bgs based on geophysical logging.	
	220			T	CASA-06-74282		Core (220-221.3 ft); GRAVELLY SILTY/ CLAYEY SANDSTONE, light brown (5YR 5/6), moderately sorted, poorly indurated. Composed of 40-50% sand, predominantly siltstone fragments (light brown up to 2 mm, angular to subangular) and inter. comp. volcanics (varicolored, black, gray, reddish brown, 1-2 mm, subrounded), minor felsic grains (clear, up to 2 mm, subangular); 30-40% silt; 10-30% gravel, predominantly inter. comp. volcanics and pumice. Contains trace pumice stringers approximately 2-3 mm thick. Damp.	
				NR				
				C				
	225							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

Kleinfelder Inc., Copyright 12/29/2006

KLI WELL LOG2 \ LIBRARY DEEP WELLS (SCC-SCI).GLB \ 73885_11_1_SCC6.GPJ 12/29/06

LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 10/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-6
	Completed: 10/14/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 259.5 ft
Northing: 1769505.8		Easting: 1642266.73	Location ID: SA-27001	TD Casing: NA

ELEVATIONS:
Ground Surface: 6618.96
Brass Cap: 6619.29
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	225						PUYE FORMATION Cuttings (220-240 ft); light brown (5YR 5/6), GRAVELLY SANDY SILTSTONE, poorly sorted, poorly indurated. Composed of: abundant silt; trace to minor gravel, predominantly pumice (vitric, white, up to 3 mm, subrounded to angular) with lesser amounts of inter. comp. volcanics (medium gray to black, generally 3-4 mm, up to 20 mm, subangular to angular); trace sand, predominantly pumice (white, vitric, up to 2 mm, subrounded).	
	230			C			Cuttings (230-240 ft); as above, no pumice.	
	235	Tpf					Cuttings (235- 240 ft); as above, abundant inter. comp. volcanic gravels, generally <5 mm; decreased silt.	P&A Bentonite chips
	240			T NR	CASA-06-74283		Core (240-241.5 ft); SANDY SILTSTONE, moderate brown (5YR 4/4), moderate to well sorted, poorly indurated. Composed of: 50-60% silt; 45-50% sand, predominantly siltstone grains (moderate brown, up to 2 mm, angular, well indurated), trace inter. comp. volcanics, trace felsic grains; trace gravel, predominantly siltstone fragments and inter. comp. volcanics, up to 5 mm, angular to subangular. Damp. Cuttings (240-251 ft); SILTY CONGLOMERATE, light brown (5YR 6/4), poorly sorted, poorly indurated. Composed of abundant gravel, predominantly siltstone clasts (moderate brown, up to 5 mm, angular to subangular), trace inter. comp. volcanics (black/gray, up to 4 mm angular to subangular), trace calcareous clasts (very pale orange, up to 10 mm); minor silt; trace sand, composition as for gravel fraction.	
	245			C				
		Tb4					249.0' CERROS DEL RIO BASALT	
	250							

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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KLI WELL LOG2 \ LIBRARY DEEP WELLS (SCC-SCI).GLB \ 73885_11_1_SCC6.GPJ 12/29/06

LANL - Sandia Canyon Interim Measures Chromium Investigation

Date	Started: 10/8/2006	Kleinfelder Inc.	LITHOLOGIC LOG	Well No. SCC-6
	Completed: 10/14/2006	Rig Type: Speedstar 50k	Logged By: Cath Goetz	TD Borehole: 259.5 ft
Northing: 1769505.8		Easting: 1642266.73	Location ID: SA-27001	TD Casing: NA

ELEVATIONS:
Ground Surface: 6618.96
Brass Cap: 6619.29
Casing: NA

Saturation

Top (ft)	Bottom (ft)	Zone
No groundwater		

Groundwater	Depth (ft.)	Geologic Unit	Sample Taken	Sample Type	Analytical Sample Number	Graphical Log	Visual Classification	FINAL CONSTRUCTION
	250	Tb4		C	CASA-06-74284		CERROS DEL RIO BASALT Core (251-252.2 ft); poor recovery, fragments of basalt, black (N1) to brownish black (5YR 2/1), highly vesicular. Aphanitic groundmass with 1-2 % olivine phenocrysts (brownish green, 1-2 mm, subhedral); minor infilling of vesicles with very pale orange sediment; basalt groundmass exhibits a weathered/altered appearance, trace olive gray clasts. Single clast of calcareous sedimentary rock "caliche" (well indurated, very pale orange, fine texture, clast of basalt in groundmass) recovered in cored interval. NOTE: Water injected during coring. NOTE: The top of the Tb4 is 249 ft bgs based on geophysical logging. Core (256- 258 ft); as above, poor recovery, less altered, minor infilling of vesicles with reddish brown clay.	P&A Bentonite chips 255.7 ft Slough TD = 259.5 ft
				CORE				
				NR				
	255			CORE	CASA-06-74285			
				NR				
							259.5'	

Notes: All depths are in feet below ground surface. All geologic contacts are preliminary and subject to change.
▼ - Top of saturation; ▽ - Bottom of saturation (not shown if not observed).
C - Drill Cuttings; CORE - Core Barrel; CS - Continuous Sampler (Split Spoon); T - Shelby Tube (in Pitcher Sampler);
NR - No Recovery; OD - Outer Diameter; P&A - Plugged and Abandoned; TD - Total Depth; amsl - above mean sea level

Log Completed By:_____ **Log Approved By:** _____ **Category (B)**

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KLI WELL LOG2 \ LIBRARY DEEP WELLS (SCC-SCI).GLB \ 73885_11_1_SCC6.GPJ 12/29/06

5.0 REFERENCES

LANL 2006, Interim Measures Work Plan for Chromium Contamination in Groundwater, 91987, ER2006-0214, LA-UR-06-1961, Los Alamos National Laboratory, Los Alamos, New Mexico, March 2006.

Kleinfelder 2006, Final Drilling Plan for Sandia Canyon Drilling Program, Los Alamos National Laboratory, Los Alamos, New Mexico, Project No. 73885, August 2006.

Appendix A

Samples Collected Tables

SCC-1 : Core Samples Collected				Analyses					
Location ID	Sample ID	Sample interval (ft bgs)	Date/Time	Moisture	Anions	TAL Metals	TOC	Tritium	ARS (DOT screening)
SA-26996	CASA-06-73280	20.0-21.5	9/30/2006 14:07	1	1	1	1		
SA-26996	CASA-06-73281	40-41.5	9/30/2006 14:54	1	1	1	1	1	1
SA-26996	CASA-06-73282	60-61.5	10/1/2006 8:40	1	1	1	1		
SA-26996	CASA-06-73283	80-82.5	10/1/2006 10:04	1	1	1	1	1	1
SA-26996	CASA-06-73284	100-102.3	10/1/2006 13:50	1	1	1	1		
SA-26996	CASA-06-73285	120-122.1	10/1/2006 15:13	1	1	1	1	1	1
SA-26996	CASA-06-73286	140-142	10/1/2006 18:30	1	1	1	1		
SA-26996	CASA-06-73287	160-163	10/2/2006 9:50	1	1	1	1	1	1
SA-26996	CASA-06-73288	180-181.6	10/2/2006 11:34	1	1	1	1		
SA-26996	CASA-06-73289	200-203	10/2/2006 14:22	1	1	1	1	1	1
SA-26996	CASA-06-73290	220-221.4	10/2/2006 16:05	1	1	1	1		
SA-26996	CASA-06-73291	240-242.5	10/3/2006 10:05	1	1	1	1	1	1
SA-26996	CASA-06-73292	260-263	10/3/2006 12:35	1	1	1	1		
SA-26996	CASA-06-73293	280-283	10/3/2006 17:13	1	1	1	1	1	1
SA-26996	CASA-06-73294	300-303	10/3/2006 23:06	1	1	1	1		
SA-26996	CASA-06-73295	320-321.5	10/4/2006 1:44	1	1	1	1	1	1
SA-26996	CASA-06-73296	340-341.6	10/4/2006 4:56	1	1	1	1		
SA-26996	CASA-06-73297	360-360.8	10/4/2006 10:00	1	1	1	1	1	1
SA-26996	CASA-06-73298	380-383	10/4/2006 14:45	1	1	1	1		
SA-26996	CASA-06-73299	391-396	10/4/2006 23:00	1	1	1	1	1	1
SA-26996	CASA-06-73300	396-397.5	10/4/2006 23:44	1	1	1	1	1	1
SCC-1 Groundwater Sample Collected									
Location ID	Sample ID	Water Column/ Sample Depth (ft bgs)	Date/Time	EES-6 Cations	EES-6 Anions	EES-6 Per-chlorate	EES-6 Trace Elements		
SA-26996	CASA-06-73478	382.2-390/ ~386	10/5/2006 4:10	1	1	1	1		

SCC-2 : Core Samples Collected				Analyses					
Location ID	Sample ID	Sample interval (ft bgs)	Date/Time	Moisture	Anions	TAL Metals	TOC	Tritium	ARS (DOT screening)
SA-26997	CASA-06-73311	20-22.4	8/23/2006 12:05	1	1	1	1		
SA-26997	CASA-06-73312	40-42.4	8/23/2006 13:05	1	1	1	1	1	1
SA-26997	CASA-06-73313	60-61.5	8/23/2006 17:04	1	1	1	1		
SA-26997	CASA-06-73314	80-82.5	8/24/2006 9:55	1	1	1	1	1	1
SA-26997	CASA-06-73315	100-101.5	8/25/2006 10:05	1	1	1	1		
SA-26997	CASA-06-73316	120-122	8/25/2006 11:35	1	1	1	1	1	1
SA-26997	CASA-06-73317	140-143	8/26/2006 16:00	1	1	1	1		
SA-26997	CASA-06-73318	160-162.5	8/26/2006 17:55	1	1	1	1	1	1
SA-26997	CASA-06-73319	180-181.7	8/27/2006 10:12	1	1	1	1		
SA-26997	CASA-06-73320	200-203	8/27/2006 12:10	1	1	1	1	1	1
SA-26997	CASA-06-73321	220-222.5	8/27/2006 16:00	1	1	1	1		
SA-26997	CASA-06-73322	240-242.1	8/28/2006 9:00	1	1	1	1	1	1
SA-26997	CASA-06-73323	260-261.7	8/28/2006 12:00	1	1	1	1		
SA-26997	CASA-06-73324	280-282.2	8/28/2006 16:25	1	1	1	1	1	1
SA-26997	CASA-06-73325	300-302.5	8/29/2006 10:30	1	1	1	1		
SA-26997	CASA-06-73326	320-322.4	8/29/2006 15:20	1	1	1	1	1	1
SA-26997	CASA-06-73327	340-341.6	8/30/2006 9:50	1	1	1	1		
SA-26997	CASA-06-73328	360-362.5	8/30/2006 15:50	1	1	1	1	1	1
SA-26997	CASA-06-73329	379.2-380.7	8/31/2006 12:10	1	1	1	1		
SA-26997	CASA-06-73330	385.5-386	8/31/2006 14:30	1	1	1	1	1	1
SCC-2 Groundwater Sample Collected									
Location ID	Sample ID	Water Column/ Sample Depth (ft bgs)	Date/Time	EES-6 Cations	EES-6 Anions	EES-6 Per-chlorate	EES-6 Trace Elements		
SA-26997	CASA-06-73336	51.5-60/ ~55	8/23/2006 16:33	1	1	1	1		
SA-26997	CASA-06-73473	357-360/ ~358	8/30/2006 13:40	1	1	1	1		
SA-26997	CASA-06-73474	369.9-388.6/ ~373	9/1/2006 11:35	1	1	1	1		

SCC-3 : Core Samples Collected				Analyses					
Location ID	Sample ID	Sample interval (ft bgs)	Date/Time	Moisture	Anions	TAL Metals	TOC	Tritium	ARS (DOT screening)
SA-26998	CASA-06-73342	20-21.5	9/8/2006 9:50	1	1	1	1		
SA-26998	CASA-06-73343	40-43	9/8/2006 14:57	1	1	1	1	1	1
SA-26998	CASA-06-73344	60-63	9/8/2006 17:00	1	1	1	1		
SA-26998	CASA-06-73345	80-82	9/9/2006 16:13	1	1	1	1	1	1
SA-26998	CASA-06-73346	100-103	9/9/2006 17:49	1	1	1	1		
SA-26998	CASA-06-73347	120-123	9/10/2006 9:17	1	1	1	1	1	1
SA-26998	CASA-06-73348	140-143	9/10/2006 11:18	1	1	1	1		
SA-26998	CASA-06-73349	160-163	9/10/2006 14:25	1	1	1	1	1	1
SA-26998	CASA-06-73350	180-183	9/10/2006 16:19	1	1	1	1		
SA-26998	CASA-06-73351	200-203	9/11/2006 8:58	1	1	1	1	1	1
SA-26998	CASA-06-73352	220-223	9/11/2006 10:54	1	1	1	1		
SA-26998	CASA-06-73353	240-243	9/11/2006 16:01	1	1	1	1	1	1
SA-26998	CASA-06-73354	260-262	9/12/2006 8:14	1	1	1	1		
SA-26998	CASA-06-73355	280-281.5	9/12/2006 11:00	1	1	1	1	1	1
SA-26998	CASA-06-73356	300-301.7	9/12/2006 15:39	1	1	1	1		
SA-26998	CASA-06-73357	320-321.9	9/12/2006 22:10	1	1	1	1	1	1
SA-26998	CASA-06-73358	332-337	9/13/2006 6:45	1	1	1	1	1	1

SCC-3 Groundwater Samples Collected								
Location ID	Sample ID	Water Column/ Sample Depth (ft bgs)	Date/Time	EES-6 Cations	EES-6 Anions	EES-6 Per-chlorate	EES- 6 Trace Elements	
SA-26998	CASA-06-73475	315.3-323/ ~319	9/12/2006 02:50	1	1	1	1	
SA-26998	CASA-06-73476	315.5-332/ ~319	9/12/2006 22:19	1	1	1	1	

SCC-4 : Core Samples Collected				Analyses					
Location ID	Sample ID	Sample interval (ft bgs)	Date/Time	Moisture	Anions	TAL Metals	TOC	Tritium	ARS (DOT screening)
SA-26999	CASA-06-73373	20-21.5	9/14/2006 20:57	1	1	1	1		
SA-26999	CASA-06-73374	40-41.5	9/14/2006 22:11	1	1	1	1	1	1
SA-26999	CASA-06-73375	60-62.9	9/14/2006 23:55	1	1	1	1		
SA-26999	CASA-06-73376	80-82	9/15/2006 01:45	1	1	1	1	1	1
SA-26999	CASA-06-73377	100-102.5	9/15/2006 04:40	1	1	1	1		
SA-26999	CASA-06-73382	123-123.5	9/19/2006 15:40	1	1	1	1		1
SA-26999	CASA-06-73379	140-143	9/19/2006 21:34	1	1	1	1		
SA-26999	CASA-06-73378	160-163	9/20/2006 0:12	1	1	1	1	1	1
SA-26999	CASA-06-73380	180-183	9/20/2006 2:49	1	1	1	1		
SA-26999	CASA-06-73381	200-203	9/20/2006 5:05	1	1	1	1	1	1
SA-26999	CASA-06-73383	220-223	9/20/2006 13:45	1	1	1	1		
SA-26999	CASA-06-73384	240-243	9/20/2006 16:35	1	1	1	1	1	1
SA-26999	CASA-06-73385	260-263	9/20/2006 18:08	1	1	1	1		
SA-26999	CASA-06-73386	280-283	9/20/2006 23:50	1	1	1	1	1	1
SA-26999	CASA-06-73387	300-303	9/21/2006 02:50	1	1	1	1		
SA-26999	CASA-06-73388	320-322.3	9/21/2006 06:50	1	1	1	1	1	1

SCC-4 Groundwater Sample Collected								
Location ID	Sample ID	Water Column/ Sample Depth (ft bgs)	Date/Time	EES-6 Cations	EES-6 Anions	EES-6 Per-chlorate	EES- 6 Trace Elements	
SA-26999	CASA-06-73477	123-126/ ~121	9/19/2006 15:45	1	1	1	1	

SCC-5 : Core Samples Collected				Analyses					
Location ID	Sample ID	Sample interval (ft)	Date/Time	Moisture	Anions	TAL Metals	TOC	Tritium	ARS (DOT screening)
SA-27000	CASA-06-73404	20-21.5	9/23/2006 8:30	1	1	1	1		
SA-27000	CASA-06-73405	40-42.5	9/23/2006 9:45	1	1	1	1	1	1
SA-27000	CASA-06-73406	60-62.6	9/23/2006 11:05	1	1	1	1		
SA-27000	CASA-06-73428	60.2-60.3	9/23/2006 11:05	1	1				
SA-27000	CASA-06-73407	80-81.5	9/23/2006 12:35	1	1	1	1	1	1
SA-27000	CASA-06-73408	100-101.5	9/23/2006 14:00	1	1	1	1		
SA-27000	CASA-06-73409	120-122	9/23/2006 17:10	1	1	1	1	1	1
SA-27000	CASA-06-73410	140-143	9/24/2006 9:55	1	1	1	1		
SA-27000	CASA-06-73411	160-163	9/24/2006 14:20	1	1	1	1	1	1
SA-27000	CASA-06-73412	180-183	9/24/2006 15:25	1	1	1	1		
SA-27000	CASA-06-73413	200-203	9/25/2006 8:40	1	1	1	1	1	1
SA-27000	CASA-06-73414	220-223	9/25/2006 11:15	1	1	1	1		
SA-27000	CASA-06-73415	240-243	9/25/2006 14:20	1	1	1	1	1	1
SA-27000	CASA-06-73416	260-263	9/25/2006 17:25	1	1	1	1		
SA-27000	CASA-06-73417	280.5-282	9/26/2006 13:59	1	1	1	1	1	1
SA-27000	CASA-06-73418	287.3-287.5	9/26/2006 14:52			1	1		

SCC-6 : Core Samples Collected				Analyses					
Location ID	Sample ID	Sample interval (ft)	Date/Time	Moisture	Anions	TAL Metals	TOC	Tritium	ARS (DOT screening)
SA-27232	CASA-06-74272	20-21.3	10/8/2006 17:05	1	1	1	1		
SA-27232	CASA-06-74273	40-42	10/8/2006 17:50	1	1	1	1	1	1
SA-27232	CASA-06-74274	60-61.5	10/8/2006 18:35	1	1	1	1		
SA-27232	CASA-06-74275	80-83	10/9/2006 8:55	1	1	1	1	1	1
SA-27232	CASA-06-74276	101-104	10/9/2006 10:42	1	1	1	1		
SA-27232	CASA-06-74277	120-121.5	10/9/2006 12:25	1	1	1	1	1	1
SA-27232	CASA-06-74278	140-143	10/9/2006 14:55	1	1	1	1		
SA-27232	CASA-06-74279	160-161.5	10/9/2006 16:30	1	1	1	1	1	1
SA-27232	CASA-06-74280	180-183	10/9/2006 18:15	1	1	1	1		
SA-27232	CASA-06-74281	200-201.5	10/10/2006 10:25	1	1	1	1	1	1
SA-27232	CASA-06-74282	220-221.3	10/10/2006 13:20	1	1	1	1		
SA-27232	CASA-06-74283	240-241.5	10/10/2006 17:20	1	1	1	1	1	1
SA-27232	CASA-06-74284	251-252.2	10/11/2006 10:25	1	1	1	1	1	1
SA-27232	CASA-06-74285	256-258	10/11/2006 11:30	1	1	1	1		

Appendix B

Hydrologic Test Results

Slug Test Analyses – Pages B-1 – B-45

SCI-1 Pump Test Analysis – Pages B-46 – B-67

SLUG TEST ANALYSES

INTRODUCTION

As part of the groundwater hydraulics evaluation in Sandia Canyon, slug tests were performed in eight shallow alluvial wells during September 2006. Tested wells included three 2-inch (in.) wells (SCA-1, SCA-4 and SCA-5) and five 1-in. piezometers (SCP-1a, SCP-1b, SCP-1c, SCP-2a and SCP-2b). The SCP-1 piezometers were nested within the same borehole, while all other wells were completed in individual, separate boreholes.

All wells were completed in 8-in. diameter boreholes and varied in depth from about 2 feet (ft) to 65 ft below land surface. Completion materials consisted of 1-in. and 2-in. PVC casing and pre-packed screens. The pre-packed screens were slotted Schedule 40 PVC pipe with an outer molded filter pack and wire mesh wrapping included as part of the screen assembly. Table 1 summarizes the applicable casing and borehole dimensions for the eight tested wells.

TEST METHOD

The wells were tested using standard slug test procedures. In this method a slug of known volume is quickly lowered into the well below the static water level, raising the water level suddenly. The subsequent rate of decay of the water level in the well can be used to support calculation of a lower-bound hydraulic conductivity for the sediments surrounding the well screen. In some cases, a check on the results is obtained by quickly removing the slug and monitoring the rate of refilling of the well casing following slug removal.

The analytical method used to analyze the data is based on the assumption of a 100 percent efficient well. Because the actual well may be less than 100 percent efficient, the water level response rate may be slowed somewhat, resulting in a lower calculated value of conductivity than would be obtained from a 100 percent efficient well. Thus, the calculated conductivity value is less than or equal to the true value and is considered a lower bound estimate of actual formation properties. The actual conductivity can exceed the computed value by up to one or two orders of magnitude if the well is inefficient. On the other hand, for relatively efficient wells the computed value may be fairly representative of formation properties. One of the limitations of the method is that there is no way to determine the well efficiency and, consequently, the degree to which the computed value of conductivity underestimates actual conditions. Such a determination can only be achieved by constant-rate test pumping.

The 2-in. wells (SCA-1, SCA-4 and SCA-5) were slug tested by immersing a PVC slug made from standard 1-in. PVC pipe while monitoring water levels with a vented pressure transducer. In SCA-1, the PVC slug and the pressure transducer and cable were dropped into the water simultaneously and, thus, the transducer and cable comprised a portion of the “slug” volume. Slug-in tests were conducted for all three 2-in. wells, while slug-out tests were conducted only for SCA-1 and SCA-5.

In the 1-in. piezometers (SCP-1a, SCP-1b, SCP-1c, SCP-2a and SCP-2b), the diameter limitation precluded running both a pressure transducer and a separate slug inside the 1-in. casing. Therefore, the pressure transducer itself was used as the slug. To accomplish this, the transducer and cable were suspended just above the water level and then plunged suddenly to the bottom of

the well. Thus, the transducer and a portion of the cable comprised the slug volume. This method meant that only slug-in tests could be conducted for the 1-in. piezometers.

ANALYTICAL METHOD

The analytical procedure used to analyze the slug tests was the Hvorslev slug test method. This procedure analyzes recovery data following a sudden lowering or raising of the water level in the well.

When water levels equilibrate back toward the static level following a slug immersion or removal event, the observed water levels can be used to estimate a lower-bound value for hydraulic conductivity based on the rate of water level recovery. The following formula can be applied to perform the calculation according to the Hvorslev method:

$$K = \frac{720}{Lt} r_c^2 \ln \frac{y_1}{y_2} \ln\left(\frac{L}{r_w} + \sqrt{1 + \frac{L^2}{r_w^2}} \right) \tag{1}$$

where,

K = lower-bound hydraulic conductivity, in ft per day
y_1, y_2 = measurements of the water level change from static conditions, in ft
t = elapsed time between measurements, in minutes
L = saturated well screen length, in ft
r_w = borehole radius, in ft
r_c = inside radius of well casing, in ft

This formula was modified to account for the reduction in casing volume corresponding to the space taken up by the transducer cable and additional slug length above the water level, as follows:

$$K = \frac{720}{Lt} \left(r_c^2 - r_{slug}^2 - r_{cable}^2 \right) \ln \frac{y_1}{y_2} \ln\left(\frac{L}{r_w} + \sqrt{1 + \frac{L^2}{r_w^2}} \right) \tag{2}$$

where,

r_{slug} = radius of slug extending above the water level, in feet
r_{cable} = radius of transducer cable, in feet

For the case where the slug is completely submerged, only the cable volume needs to be considered. In that case, the term rslug is omitted from equation 2.

These formulas account for water refilling, or draining from, only the well casing and/or well screen. A separate formula has been crafted to account for refilling/draining both the casing/screen and the surrounding filter packed annulus, as follows:

$$K = \frac{720}{Lt}\left[r_c^2 + S_y\left(r_w^2 - r_o^2\right)\right]\ln\frac{y_1}{y_2}\ln\left(\frac{L}{r_w} + \sqrt{1 + \frac{L^2}{r_w^2}}\right) \quad (3)$$

where,

r_o = outside radius of well casing, in feet
S_y = short-term specific yield of filter pack

As before, equation 3 can be modified to account for the transducer cable and excess slug volumes as follows:

$$K = \frac{720}{Lt}\left[r_c^2 - r_{slug}^2 - r_{cable} + S_y\left(r_w^2 - r_o^2\right)\right]\ln\frac{y_1}{y_2}\ln\left(\frac{L}{r_w} + \sqrt{1 + \frac{L^2}{r_w^2}}\right) \quad (4)$$

These latter formulas are applicable whenever the water levels intersect the filter pack surrounding the casing and well screen. This occurred only for the tests conducted in SCA-4 and SCA-5. For all other tests, the filter pack remained fully saturated throughout the testing process.

The volume of water draining from and/or refilling the filter pack is related to the term Sy, the short-term specific yield of the pack. Usually this parameter must be estimated. For the calculations presented here, an assumed value of 0.20 was used.

For each analysis, the initial water level displacement, y_0, was computed to guide the analysis. In theory, this value should be evident in the recorded data set. In practice, however, filter pack effects and transient effects associated with movement of the slug and pressure transducer can distort the early data. Thus, the interpretation can be enhanced by knowing the actual initial displacement volume. Formulas used for calculating the displacement volumes for each test are presented below. The formulas rely on the dimensions of borehole, casings, transducers and transducer cable, as summarized in Table 2.

SLUG TEST RESULTS

The Hvorslev slug test analysis method was applied to all of the Sandia Canyon slug tests. Slug-in and slug-out tests were conducted in SCA-1 and SCA-5, while all other wells were tested only with the slug-in approach. Filter pack effects (filling and draining) occurred only in SCA-4 and SCA-5, while the filter pack remained fully saturated in all of the other wells. To guide the analyses, calculations were performed to determine the theoretical initial slug displacement volume and head change for each well, as detailed below.

Well SCA-1

Well SCA-1 was tested using both the slug-in and slug-out approaches. Three sets of slug-in and slug-out data were collected by repeating the tests. The slug-in procedure was accomplished by

suspending both the slug and the transducer assembly above the water table and plunging both into the water and to the bottom of the well at the same time. Thus, the transducer and cable contributed to the effective slug volume in the slug-in portion of the test. The slug-out procedure involved sudden removal of only the slug, leaving the transducer in place to record water level data. After collecting sufficient slug-out data, the transducer and cable were removed and preparations were made to re-run the test. No filter pack effects had to be considered for the SCA-1 tests, as the water levels remained above the top of the filter pack for all tests.

For the slug-in tests, an equation was derived for the theoretical initial water level displacement, y_0, based on the combined volumes of the slug, transducer and cable:

$$y_0 = \frac{V_{XD} + HA_{OD1} + (H - L_{XD})A_C}{A_{ID2} - A_{OD1} - A_C} \tag{5}$$

In this equation, the term H represents the initial saturated height of water above the bottom cap on the well casing and screen assembly. For SCA-1, H had a value of 2.1 feet. The transducer used in the tests was Serial Number 19966, having the dimensions shown in Table 2. All terms in the equation are presented in Tables 1 and 2. Using the inputs identified in the tables, the computed initial displacement value was 1.77 ft.

Figure 1 shows the water level response data from the first slug-in test conducted in Well SCA-1. The theoretical water level displacement value of 1.77 ft is plotted on the left edge of the graph (red square) at time zero. The location of the initial displacement data point fits the measured data fairly well. The lower-bound hydraulic conductivity value obtained from the line of fit shown on the graph was 6.7 ft per day.

For the slug-out tests, a similar equation was derived for the theoretical water level displacement as follows:

$$y_0 = \frac{HA_{OD1}}{A_{ID2} - A_C} \tag{6}$$

Using this equation and the input parameter values from Tables 1 and 2 yielded a displacement value of 0.87 ft for the slug-out tests. Note that this value is substantially less than the slug-in displacement value of 1.77 ft. This is because during the slug-in event, the water level was forced up into the annulus between the 2-in. casing and the 1-in. slug (which extended above the water level after immersion), whereas during the slug-out event the water level was lowered within the full 2-in. casing. The greater cross sectional area of the full 2-in. casing, compared to that of the annulus between the 2-in. and 1-in. pipes, resulted in a smaller water level change for the slug-out tests.

Figure 2 shows the water level response data from the first slug-out test conducted in Well SCA-1. The computed lower-bound conductivity value shown on the graph was 4.0 ft per day – in

poor agreement with the slug-in derived value. Of note on Figure 2 is that the early data described a distinctly steeper slope than the later data. Further, after several minutes, the observed displacement remained greater than the corresponding displacement from the slug-in test and even greater than that observed in the subsequent slug-out tests on SCA-1, described next. The likely explanation for this apparent anomaly is that removal of the slug may have raised the transducer slightly causing the measured displacement values to be larger than what would have been observed if the transducer had remained stationary. Such an occurrence has a minor effect on analysis of the early data, but a significant effect on the late data.

Therefore, the line of fit was adjusted to reflect just the first minute of recovery response, as shown on Figure 3. The corresponding lower-bound hydraulic conductivity was 7.1 ft per day, in better agreement with the slug-in derived value and likely a more valid interpretation of the data.

Figures 4 and 5 show the slug-in and slug-out responses from the second set of tests. As indicated, the resulting lower-bound hydraulic conductivity values were 6.7 and 5.3 ft per day, respectively.

Figures 6 and 7 show the slug-in and slug-out responses from the third set of tests. As indicated, the resulting lower-bound hydraulic conductivity values were 6.8 and 6.4 ft per day, respectively.

The results of the SCA-1 analyses are summarized in Table 3. As shown in the table, the composite average lower-bound hydraulic conductivity of all six tests was 6.5 ft per day.

Well SCA-4

Well SCA-4 was tested using only the slug-in procedure, with a total of three tests being conducted. For the SCA-4 tests, the transducer was installed before the slug. After water levels had equilibrated, the slug was immersed and water level response data were recorded. The slug used in the SCA-4 tests was only 2.6 ft long and, thus, was fully submerged when immersed. This was different than the tests on SCA-1 in which the slug was much longer and extended above the water level after immersion.

The water table fell within the filter pack in SCA-4 and, therefore, the volume of the filter pack pores were considered in the analysis. A formula for the theoretical initial water level displacement within the casing and filter pack was derived as follows:

$$y_0 = \frac{L_S A_{OD1}}{S_y \left(A_B - A_{OD2}\right) + A_{ID2} - A_C} \tag{7}$$

In this equation, the term LS represents the length of the slug – 2.6 ft – while the remaining terms are presented in Table 2. A value of 0.2 was used for the short-term specific yield of the filter pack, Sy. Based on the input parameter values, the displacement value was determined to be 0.284 ft.

Figures 8, 9, and 10 show the data recorded from the SCA-4 slug tests. The measured response from the first test shown on Figure 8 was anomalous and inexplicable and was not analyzed. The responses from the final two tests were used to support calculations.

On Figures 9 and 10, it is apparent that the very early data points fell above the level of the theoretical displacement. This is because immersion of the slug caused an immediate water level rise within the 2-in. casing, but it took a few moments for the water to move from the casing and screen into the filter pack pores.

Analysis of the data using the lines of fit shown on Figures 9 and 10 resulted in lower-bound hydraulic conductivity values of 16.2 and 18.0 ft per day, respectively. These values, along with the corresponding average value of 17.1 ft per day are summarized in Table 3.

Well SCA-5

Well SCA-5 was tested using both the slug-in and slug-out approaches. Three sets of slug-in and slug-out data were collected by repeating the tests. The transducer was placed below the water level prior to running the slug, so that only the slug volume contributed to the initial water level displacement. As was the case with the SCA-1 tests, a long slug was used in the SCA-5 tests and extended above the water level after immersion.

The water levels intersected the filter pack during the SCA-5 slug tests and, thus, the drainable volume of the filter pack pores had to be considered when computing the initial displacement value as well as the lower-bound hydraulic conductivity values.

A formula for the theoretical initial water level displacement within the casing and filter pack was derived for the SCA-5 slug-in tests as follows:

$$y_0 = \frac{HA_{OD1}}{S_y\left(A_B - A_{OD2}\right) + A_{ID2} - A_{OD1} - A_C} \tag{8}$$

The saturated water height, H, was 7.4 feet in SCA-5. Based on the input values summarized in Tables 1 and 2, the computed initial displacement value for the slug-in tests was 0.907 ft.

For the slug-out tests, a similar equation was derived for the theoretical water level displacement as follows:

$$y_0 = \frac{HA_{OD1}}{S_y\left(A_B - A_{OD2}\right) + A_{ID2} - A_C} \tag{9}$$

Using this equation and the input parameter values from Tables 1 and 2 yielded a displacement value of 0.808 feet for the slug out tests.

Figures 11 and 12 show the slug-in and slug-out data from the first set of tests from SCA-5. Note that the early data showed an initial displacement greater than the theoretical expectation because of the delayed equalization of water levels within the casing and filter pack following slug immersion and removal. As indicated on the figures, the calculations yielded lower-bound hydraulic conductivity values of 61.9 and 79.9 ft per day, respectively.

Figures 13 and 14 show the results of the second set of slug-in and slug-out tests. Figure 13 shows that erratic water level data were recorded during the slug-in event. There was no apparent explanation for this unusual response, although the transducer may have malfunctioned briefly. A hydraulic conductivity value was not computed from the slug-in data shown on Figure 13. As indicated on Figure 14, the slug-out test produced a lower-bound hydraulic conductivity value of 67.5 ft per day.

Figures 15 and 16 show the results of the third set of slug-in and slug-out tests. The calculations yielded lower-bound hydraulic conductivity values of 84.9 and 64.6 ft per day.

The lower-bound hydraulic conductivity values obtained from SCA-5 are summarized in Table 3 along with the computed average value of 71.8 ft per day.

Piezometer SCP-1a

Slug-in tests were conducted in SCP-1a using the transducer and cable as the slug. The transducer was suspended above the water table and plunged suddenly into the water and to the bottom of the piezometer. The transducer used in the tests was Serial Number 19672, having the dimensions outlined in Table 2. Filter pack pore volume did not have to be considered for the SCP-1a tests because the water levels remained above the top of the filter pack during the tests. A total of three separate slug-in tests were conducted.

A formula for the theoretical initial water level displacement was derived for the SCP-1a slug-in tests as follows:

$$y_0 = \frac{V_{XD} + (H - L_{XD})A_C}{A_{ID1} - A_C} \tag{10}$$

For the parameter values listed for SCP-1a in Tables 1 and 2, the theoretical initial water level displacement was 0.65 ft.

Figures 17, 18 and 19 show the slug test responses for the SCP-1a slug-in tests, yielding calculated lower-bound hydraulic conductivity values of 8.5, 8.8 and 8.3 ft per day, respectively. These values and the computed average of 8.5 ft per day are summarized in Table 3.

Piezometer SCP-1b

Slug-in tests were conducted in SCP-1b using the transducer and cable as the slug. The transducer was suspended above the water table and plunged suddenly into the water and to the bottom of the piezometer. The transducer used in the tests was Serial Number 19672, having the dimensions outlined in Table 2. Filter pack pore volume did not have to be considered for the SCP-1b tests because the water levels remained above the top of the filter pack during the tests. A total of three separate slug-in tests were conducted.

Equation (10) was applicable for calculating the theoretical initial water level displacement for the SCP-1b slug-in tests. For the parameter values listed for SCP-1b in Tables 1 and 2, the theoretical initial water level displacement was 0.73 ft.

Figures 20, 21 and 22 show the slug test responses for the SCP-1b slug-in tests, yielding calculated lower-bound hydraulic conductivity values of 10.5, 11.1 and 11.0 feet per day, respectively. These values and the computed average of 10.9 ft per day are summarized in Table 3.

Piezometer SCP-1c

Slug-in tests were conducted in SCP-1c using the transducer and cable as the slug. The transducer was suspended above the water table and plunged suddenly into the water and to the bottom of the piezometer. The transducer used in the tests was Serial Number 19672, having the dimensions outlined in Table 2. Filter pack pore volume did not have to be considered for the SCP-1c tests because the water levels remained above the top of the filter pack during the tests. A total of three separate slug-in tests were conducted.

Equation (10) was applicable for calculating the theoretical initial water level displacement for the SCP-1c slug-in tests. For the parameter values listed for SCP-1c in Tables 1 and 2, the theoretical initial water level displacement was 0.94 ft.

Figures 23, 24 and 25 show the slug test responses for the SCP-1c slug-in tests, yielding calculated lower-bound hydraulic conductivity values of 10.4, 12.9 and 12.8 ft per day, respectively. These values and the computed average of 12.0 ft per day are summarized in Table 3.

Piezometer SCP-2a

Slug-in tests were conducted in SCP-2a using the transducer and cable as the slug. The transducer used in the tests was Serial Number 19966, having the dimensions outlined in Table 2. Filter pack pore volume did not have to be considered for the SCP-A tests because the water levels remained above the top of the filter pack during the tests. A total of three separate slug-in tests were conducted.

Equation (10) was applicable for calculating the theoretical initial water level displacement for the SCP-2a slug-in tests. For the parameter values listed for SCP-2a in Tables 1 and 2, the theoretical initial water level displacement was 1.83 ft.

Figures 26, 27 and 28 show the slug test responses for the SCP-2a slug-in tests, yielding calculated lower-bound hydraulic conductivity values of 84, 99 and 87 feet per day, respectively. These values and the computed average of 90 ft per day are summarized in Table 3.

Piezometer SCP-2b

Slug-in tests were conducted in SCP-2b using the transducer and cable as the slug. The transducer used in the tests was Serial Number 19966, having the dimensions outlined in Table 2. Filter pack pore volume did not have to be considered for the SCP-2b tests because the water levels remained above the top of the filter pack during the tests. A total of five separate slug-in tests were conducted.

Equation (10) was applicable for calculating the theoretical initial water level displacement for the SCP-2b slug-in tests. For the parameter values listed for SCP-2b in Tables 1 and 2, the theoretical initial water level displacement was 2.11 ft.

Figures 29 through 33 show the slug test responses for the SCP-2b slug-in tests, yielding calculated lower-bound hydraulic conductivity values of 0.93, 1.01, 0.94, 1.23 and 1.01 ft per day, respectively. These values and the computed average of 1.0 ft per day are summarized in Table 3.

SUMMARY

As part of the groundwater hydraulics evaluation in Sandia Canyon, slug tests were performed in three shallow alluvial wells and five shallow alluvial piezometers during September 2006. Tested wells included three 2-in. wells (SCA-1, SCA-4 and SCA-5) and five 1-in. piezometers (SCP-1a, SCP-1b, SCP-1c, SCP-2a and SCP-2b). The SCP-1 wells were nested within the same borehole, while all other wells were completed in individual, separate boreholes.

Multiple slug-in tests were conducted in all eight wells/piezometers, while multiple slug-out tests were performed only in SCA-1 and SCA-5. The lower-bound hydraulic conductivity values computed from the test data are summarized in Table 3. Most of the tests produced reasonable, reproducible results. Out of a total of 32 tests, only two of the tests produced anomalous data that were not used to support computations of lower-bound hydraulic conductivity values. Considering the challenges associated with testing small diameter wells, especially the 1-in. piezometers, test execution was highly successful based on the quality of the data sets obtained.

REFERENCES

Hvorslev, M. J., 1951. Time Lag and Soil Permeability in Ground Water Observations. U. S. Army Corps of Engineers Waterways Experimentation Station, Bulleting 36, 50 pp.

Table 1. Casing and Borehole Dimensions
2006 Sandia Canyon Alluvial Wells/Piezometers
Los Alamos National Laboratory
Los Alamos, New Mexico

Well	Borehole Diameter (inches)	Nominal Casing Size (inches)	Screen Depth Interval (feet)	Filter Pack Interval (feet)	Casing Outside Radius (feet)	Casing Inside Radius (feet)	Static Water Level (feet)	Saturated Screen Length *L* (feet)	Water Height Above Bottom *H* (feet)
SCA-1	8	2	1.3 to 1.9	0.8 to 2.1	0.09896	0.08613	0.0	0.6	2.1*
SCA-4	8	2	37 to 41.5	32.5 to 42	0.09896	0.08613	37.9	3.6	4.1*
SCA-5	8	2	55 to 64.4	48.2 to 65.2	0.09896	0.08613	57.8	6.6	7.4*
SCP-1a	8	1	37.8 to 38.3	37.4 to 38.6	0.05479	0.04371	36.9	0.5	1.4
SCP-1b	8	1	39.4 to 39.9	39 to 40.1	0.05479	0.04371	37.7	0.5	2.2
SCP-1c	8	1	41/2 to 41.7	40.8 to 42.6	0.05479	0.04371	37.5	0.5	4.2
SCP-2a	8	1	44.5 to 45	43.3 to 45.6	0.05479	0.04371	32.1	0.5	12.9
SCP-2b	8	1	49.6 to 50.1	49 to 51.5	0.05479	0.04371	34.5	0.5	15.6

SCA-1, SCA-4 and SCA-5 have sump depths of 0.2 feet, 0.5 feet and 0.8 feet, respectively.

Table 2. Dimensions Used In Calculations
2006 Sandia Canyon Alluvial Wells/Piezometers
Los Alamos National Laboratory
Los Alamos, New Mexico

Item	Diameter (inches)	Length (feet)	Cross Sectional Area (square feet)	Volume (cubic feet)	Symbol For Length / Area
8-inch Borehole	8		0.34906		A_B
2-Inch Casing	2.375-Inch OD		0.03076		A_{OD2}
	2.067-inch ID		0.02330		A_{ID2}
1-Inch Casing	1.315-inch OD		0.00943		A_{OD1}
	1.049-inch ID		0.00600		A_{ID1}
Transducer Cable	0.324		0.00057		A_C
Transducer (SN 19966)	0.725	1.1		0.00315	L_{XD} / V_{XD}
Transducer (SN 19672)	0.75	1.09		0.00334	L_{XD} / V_{XD}

Table 3. Sandia Canyon Slug Test Results
Los Alamos National Laboratory
Los Alamos, New Mexico

Well	Test	Lower-Bound Hydraulic Conductivity (feet per day)	Average Lower-Bound Hydraulic Conductivity (feet per day)
SCA-1	Slug In 1	6.7	6.5
	Slug Out 1	7.1	
	Slug In 2	6.7	
	Slug Out 2	5.3	
	Slug In 3	6.8	
	Slug Out 3	6.4	
SCA-4	Slug In 1	Not Calculated	17.1
	Slug In 2	16.2	
	Slug In 3	18.0	
SCA-5	Slug In 1	79.9	71.8
	Slug Out 1	61.9	
	Slug In 2	Not Calculated	
	Slug Out 2	67.5	
	Slug In 3	84.9	
	Slug Out 3	64.6	
SCP-1 Upper	Slug In 1	8.5	8.5
	Slug In 2	8.8	
	Slug In 3	8.3	
SCP-1 Middle	Slug In 1	10.5	10.9
	Slug In 2	11.1	
	Slug In 3	11.0	
SCP-1 Lower	Slug In 1	10.4	12.0
	Slug In 2	12.9	
	Slug In 3	12.8	
SCP-2A	Slug In 1	84.0	90.0
	Slug In 2	99.0	
	Slug In 3	87.0	
SCP-2B	Slug In 1	0.93	1.0
	Slug In 2	1.01	
	Slug In 3	0.94	
	Slug In 4	1.23	
	Slug In 5	1.01	

Figure 1. Well SCA-1 Slug In 1

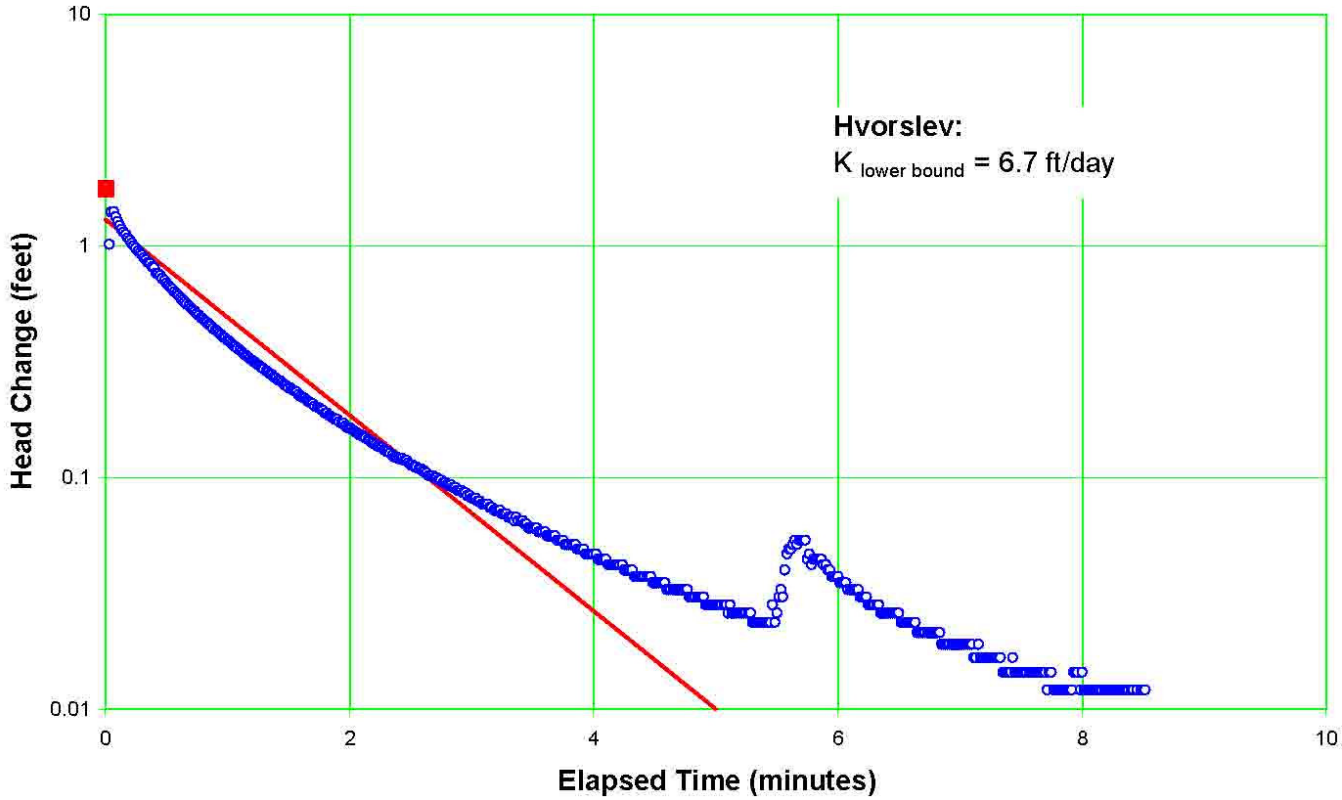


Figure 2. Well SCA-1 Slug Out 1

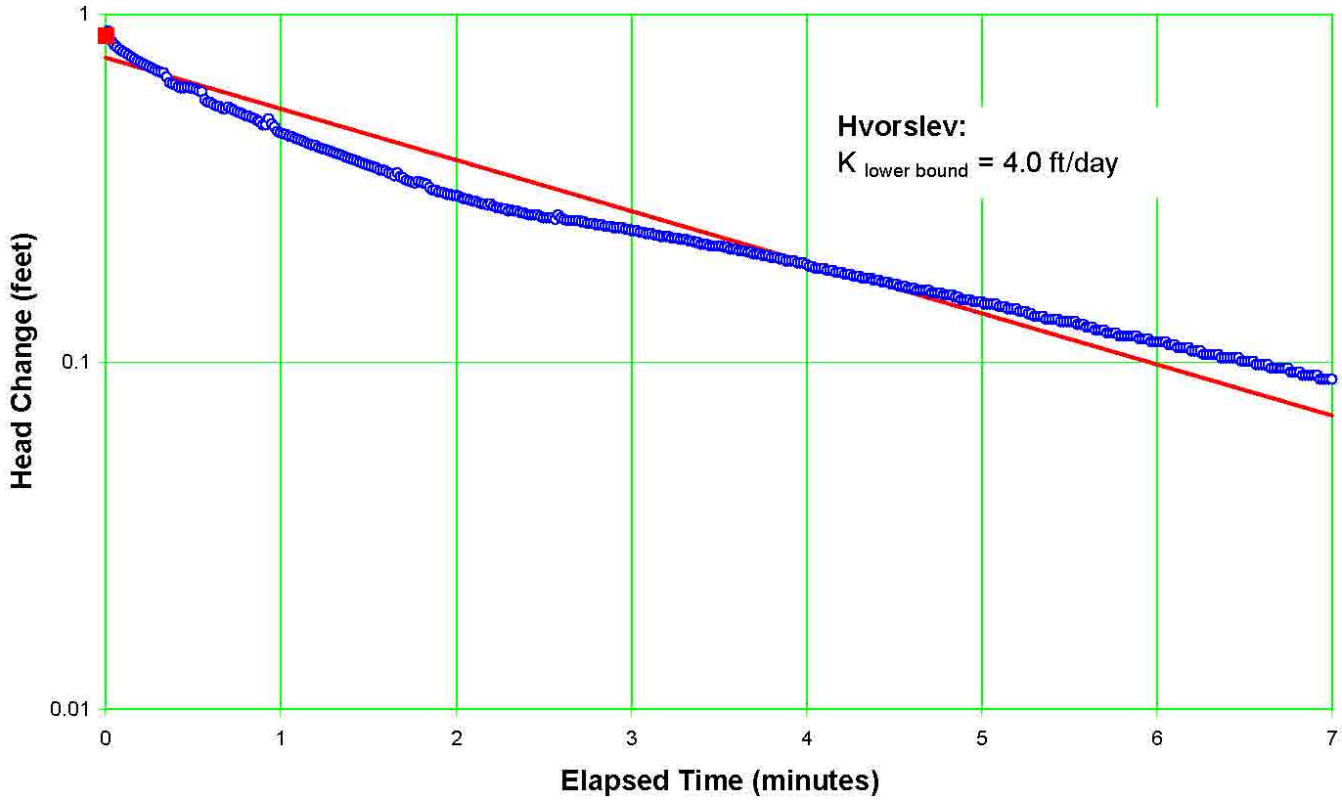


Figure 3. Well SCA-1 Slug Out 1 - Early Data

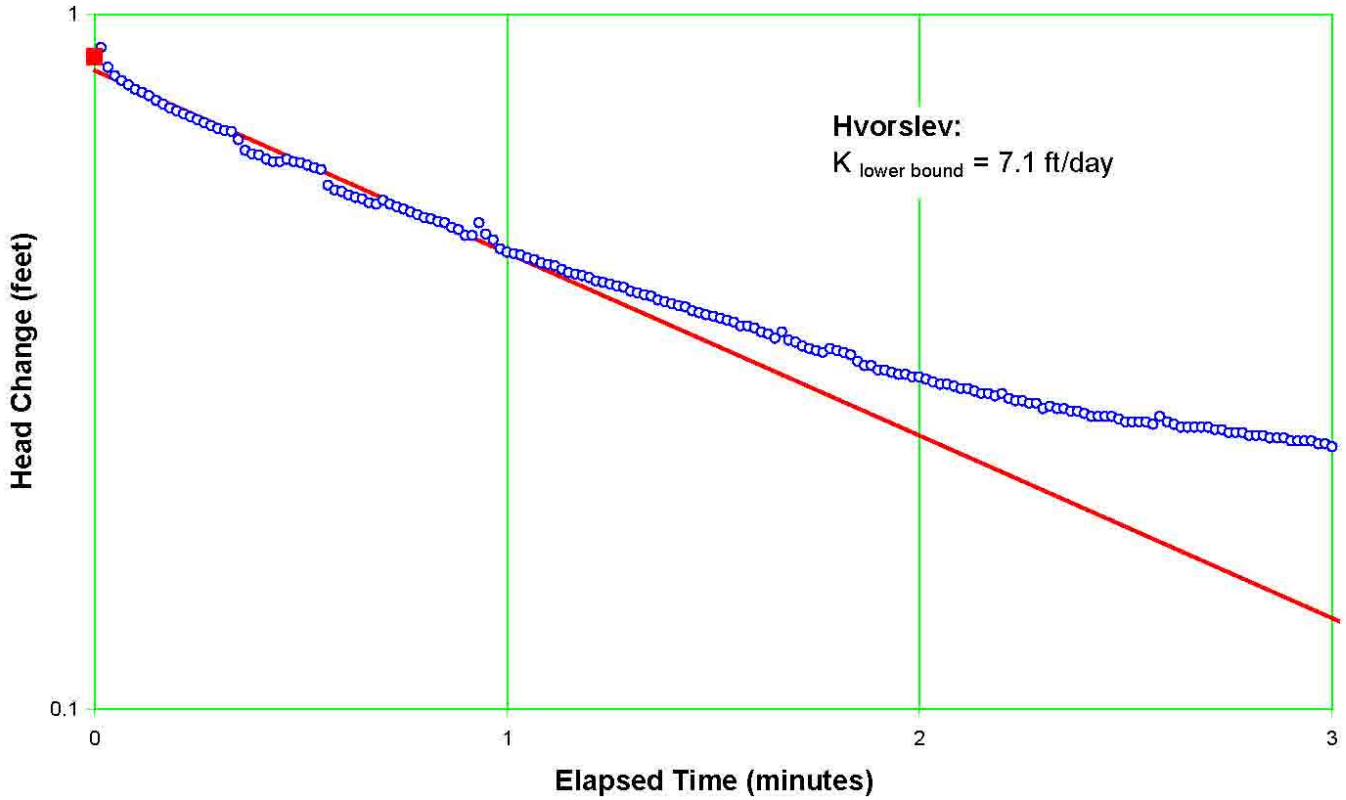


Figure 4. Well SCA-1 Slug In 2

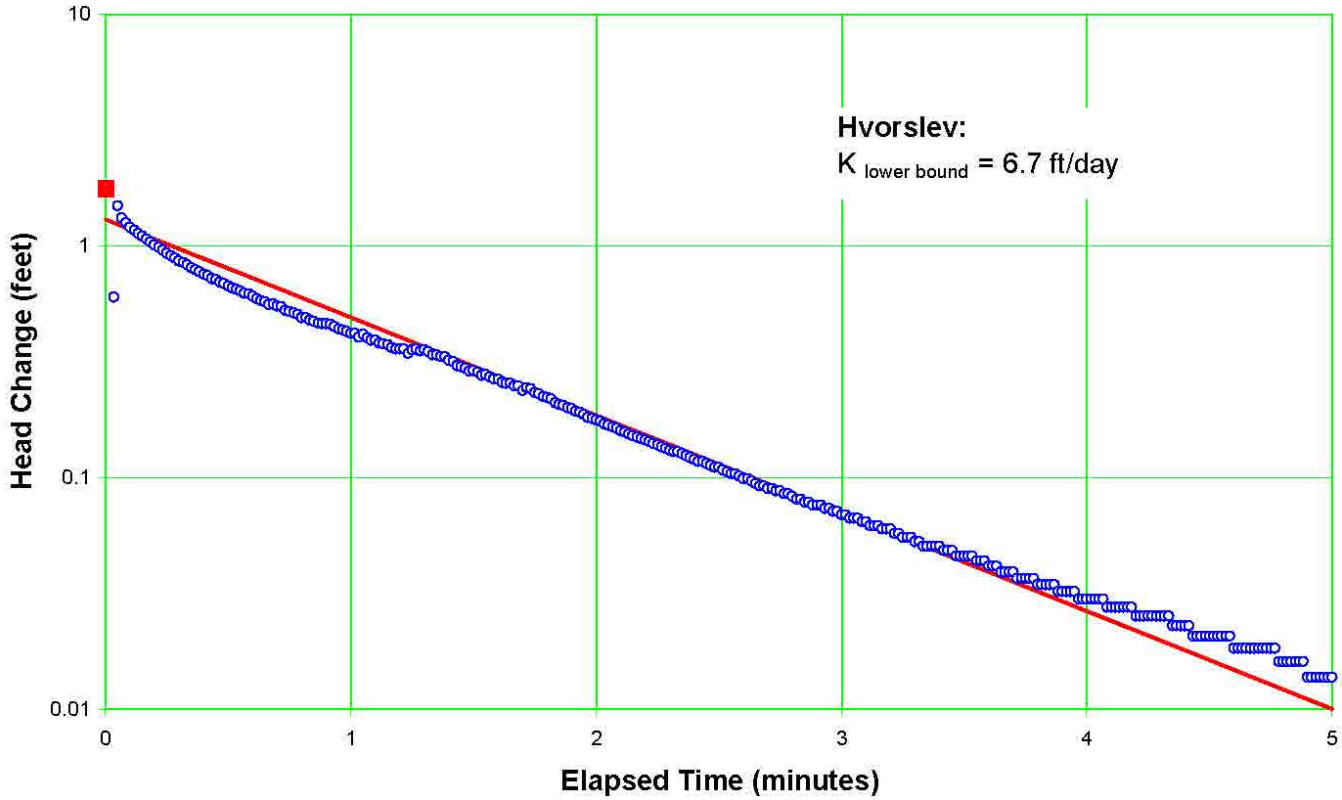


Figure 5. Well SCA-1 Slug Out 2

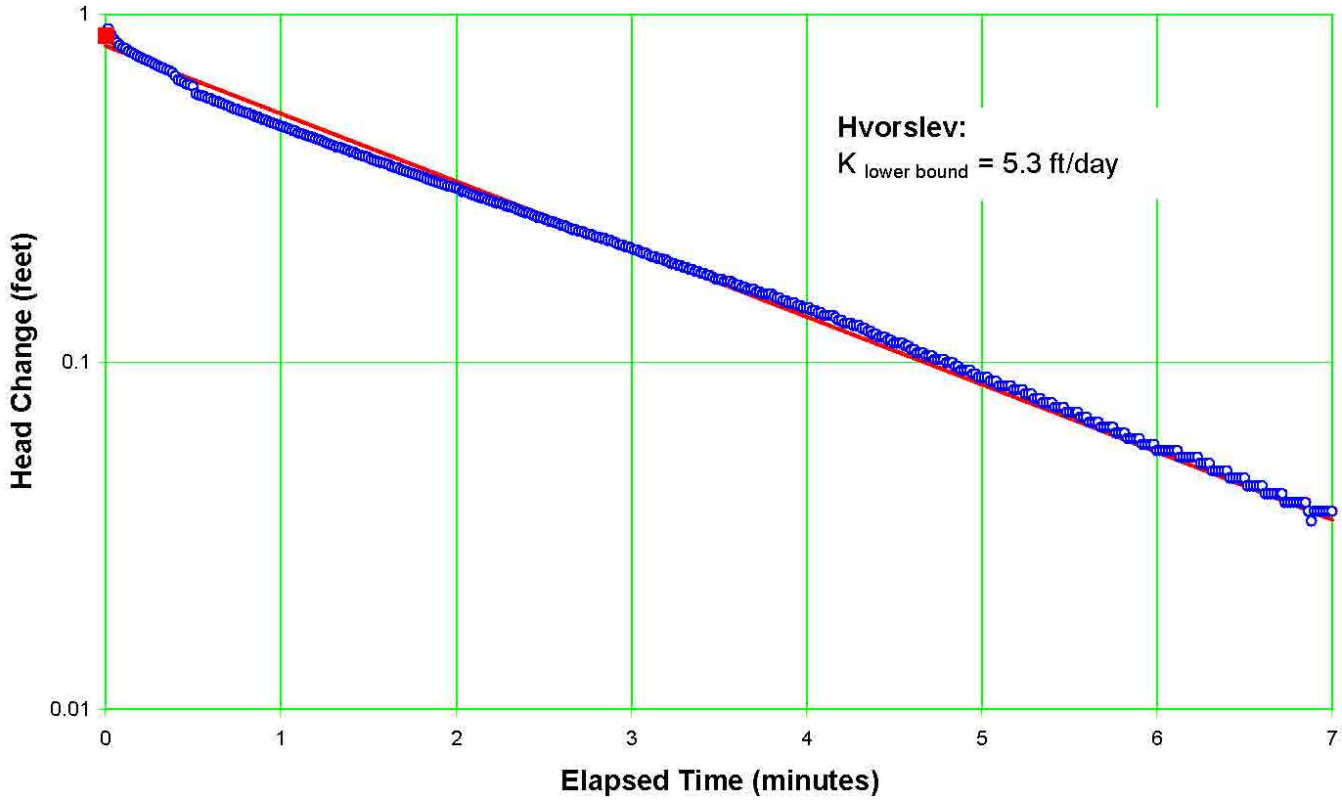


Figure 6. Well SCA-1 Slug In 3

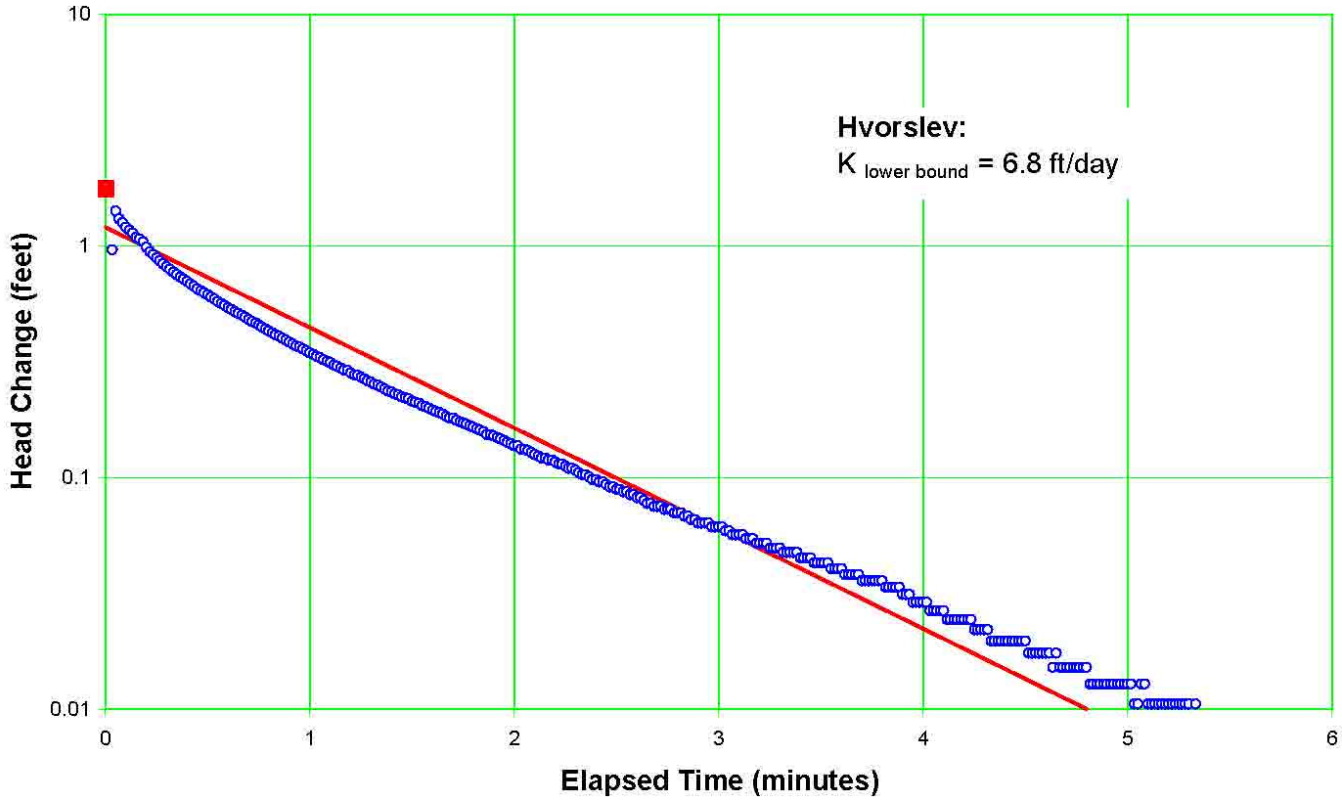


Figure 7. Well SCA-1 Slug Out 3

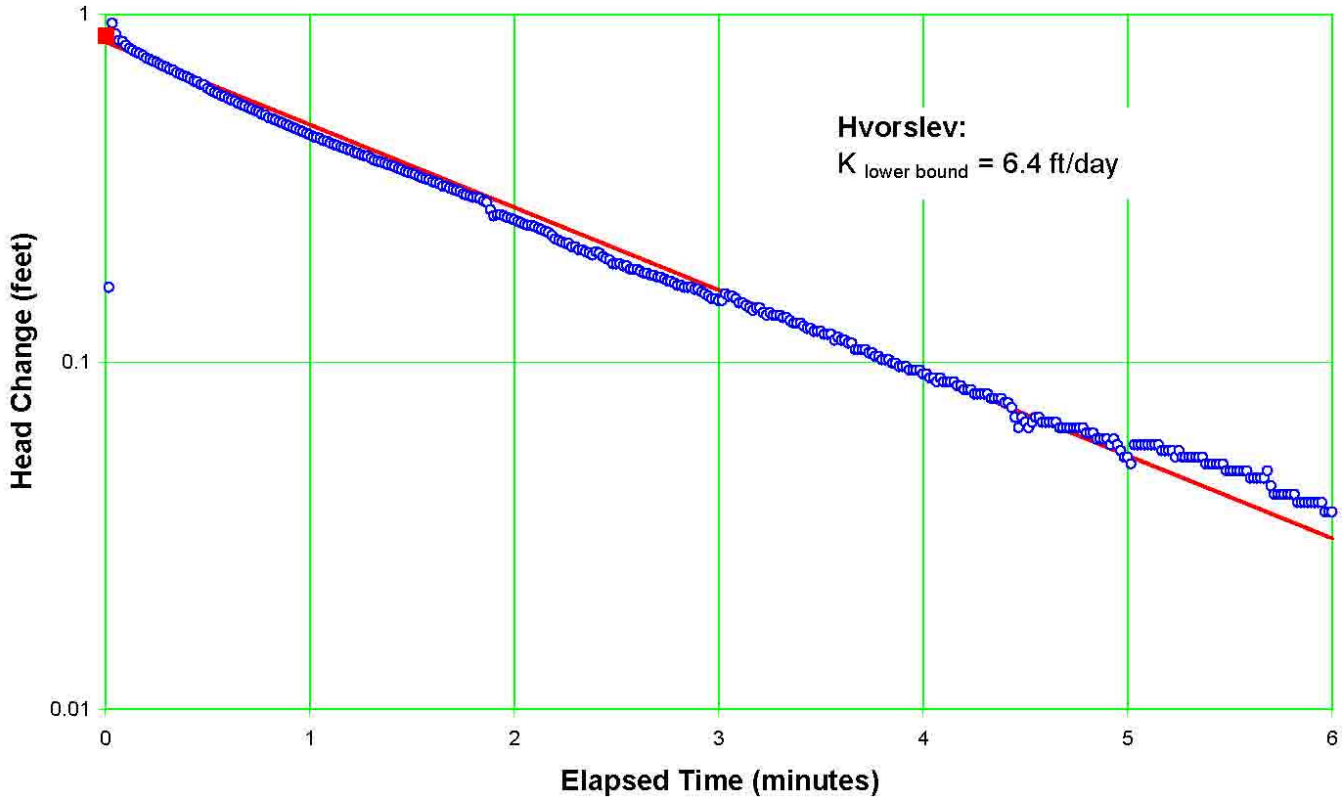


Figure 8. Well SCA-4 Slug In 1

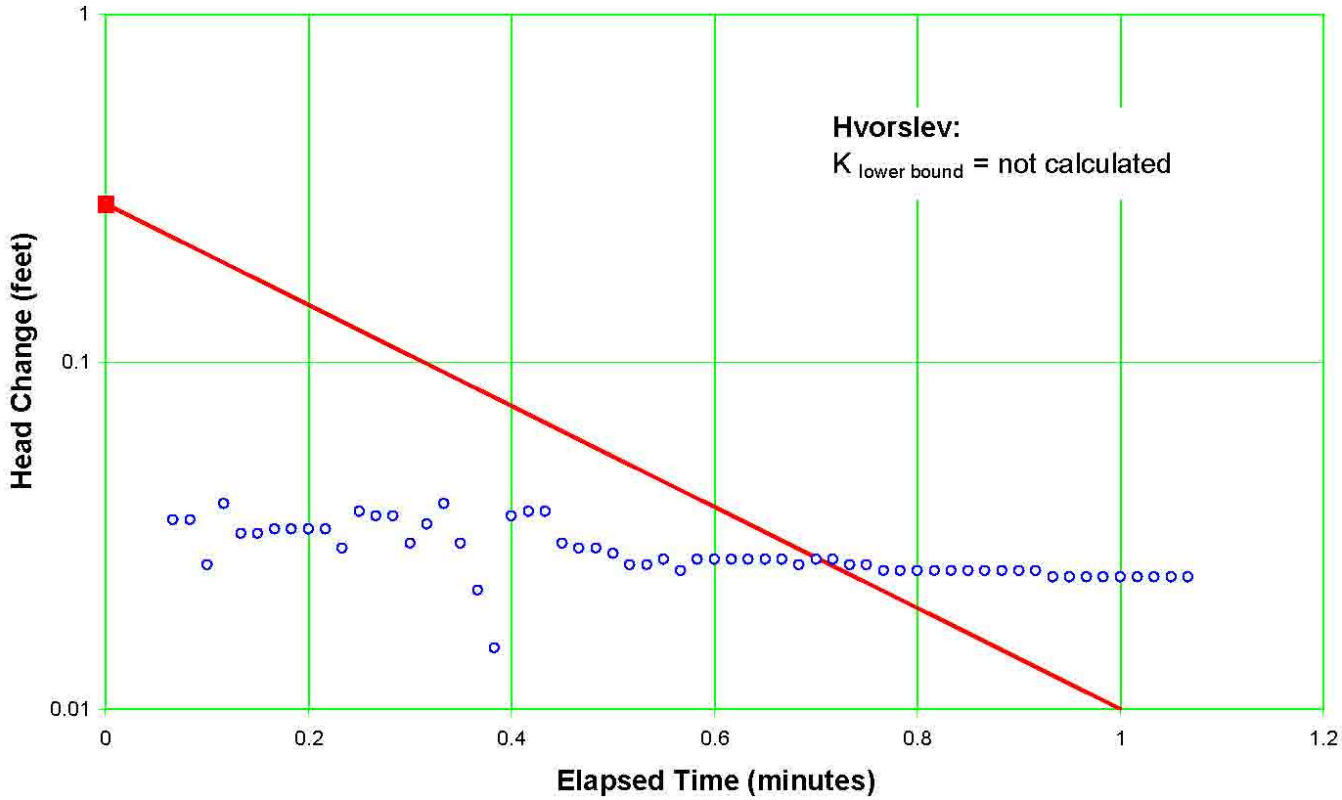


Figure 9. Well SCA-4 Slug In 2

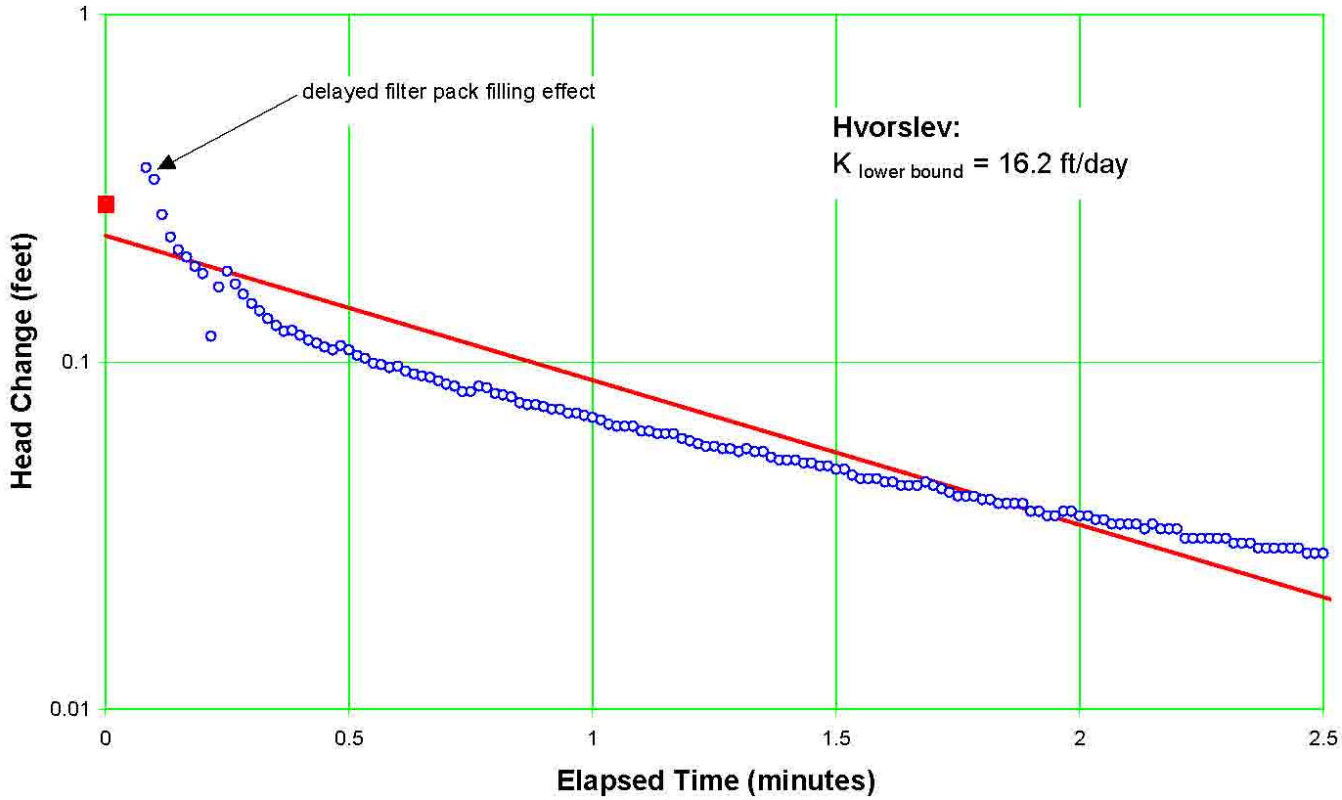


Figure 10. Well SCA-4 Slug In 3

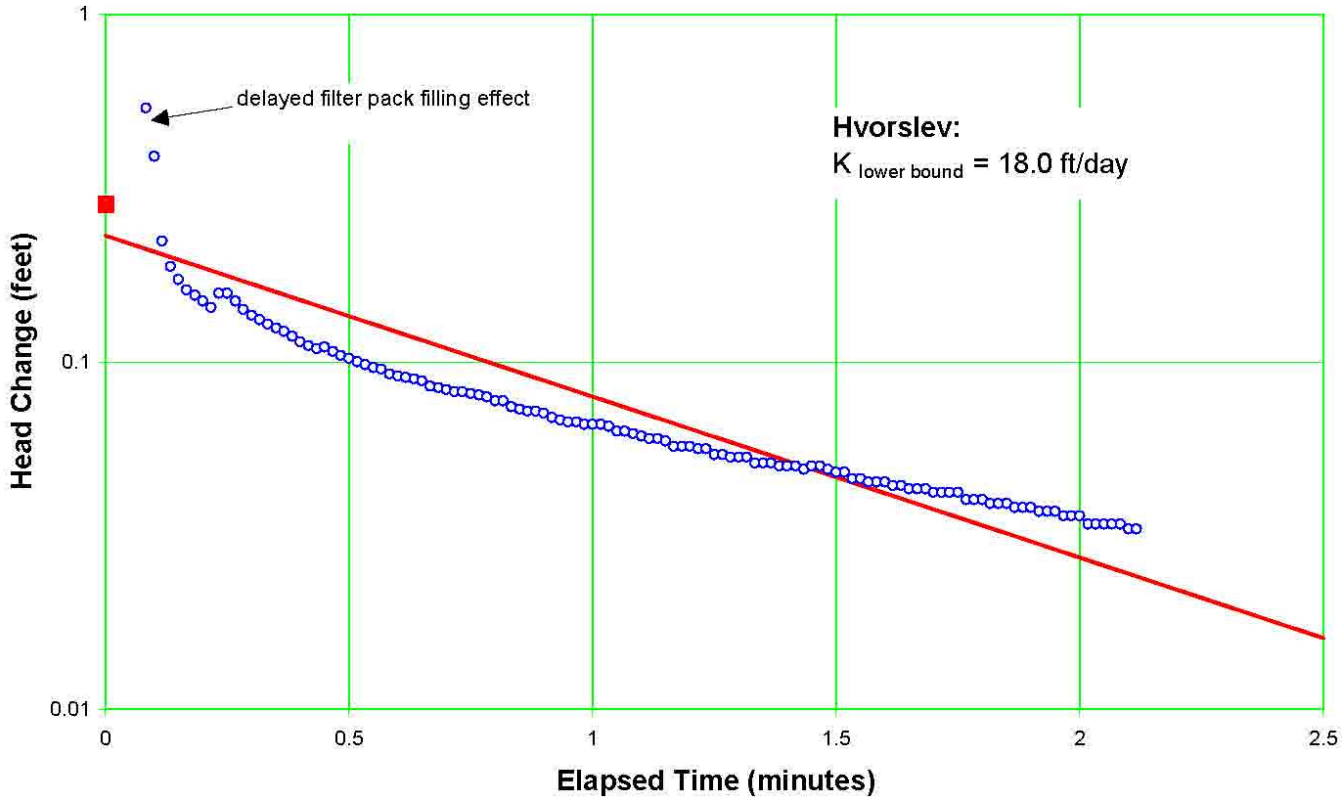


Figure 11. Well SCA-5 Slug In 1

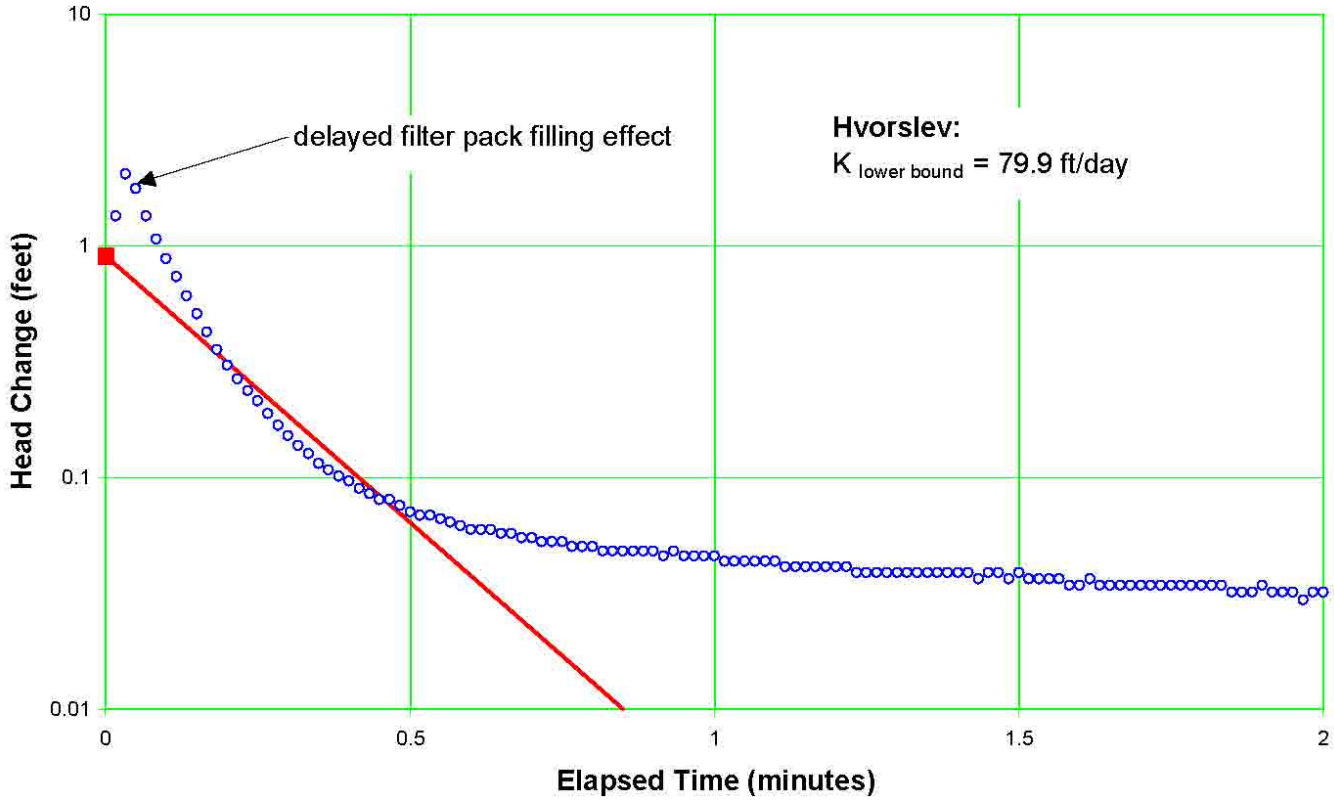


Figure 12. Well SCA-5 Slug Out 1

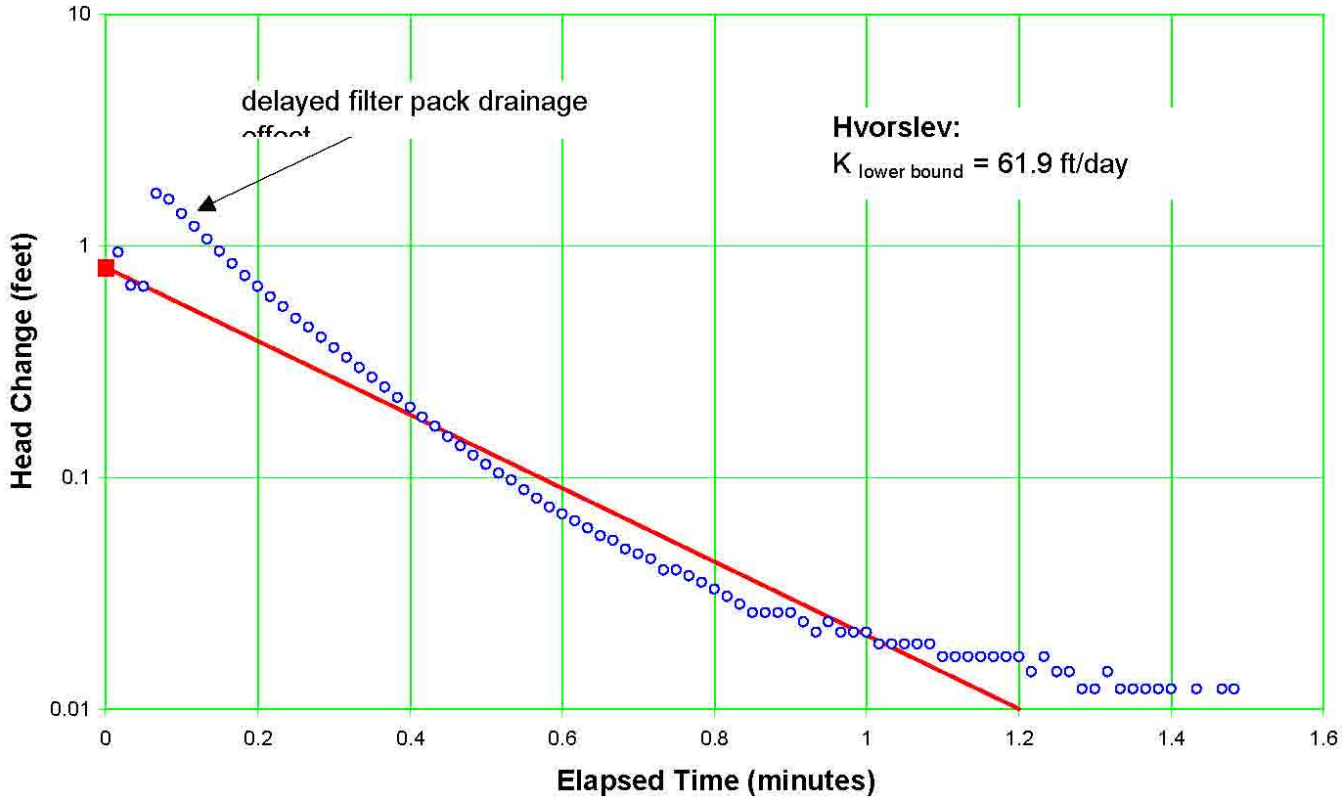


Figure 13. Well SCA-5 Slug In 2

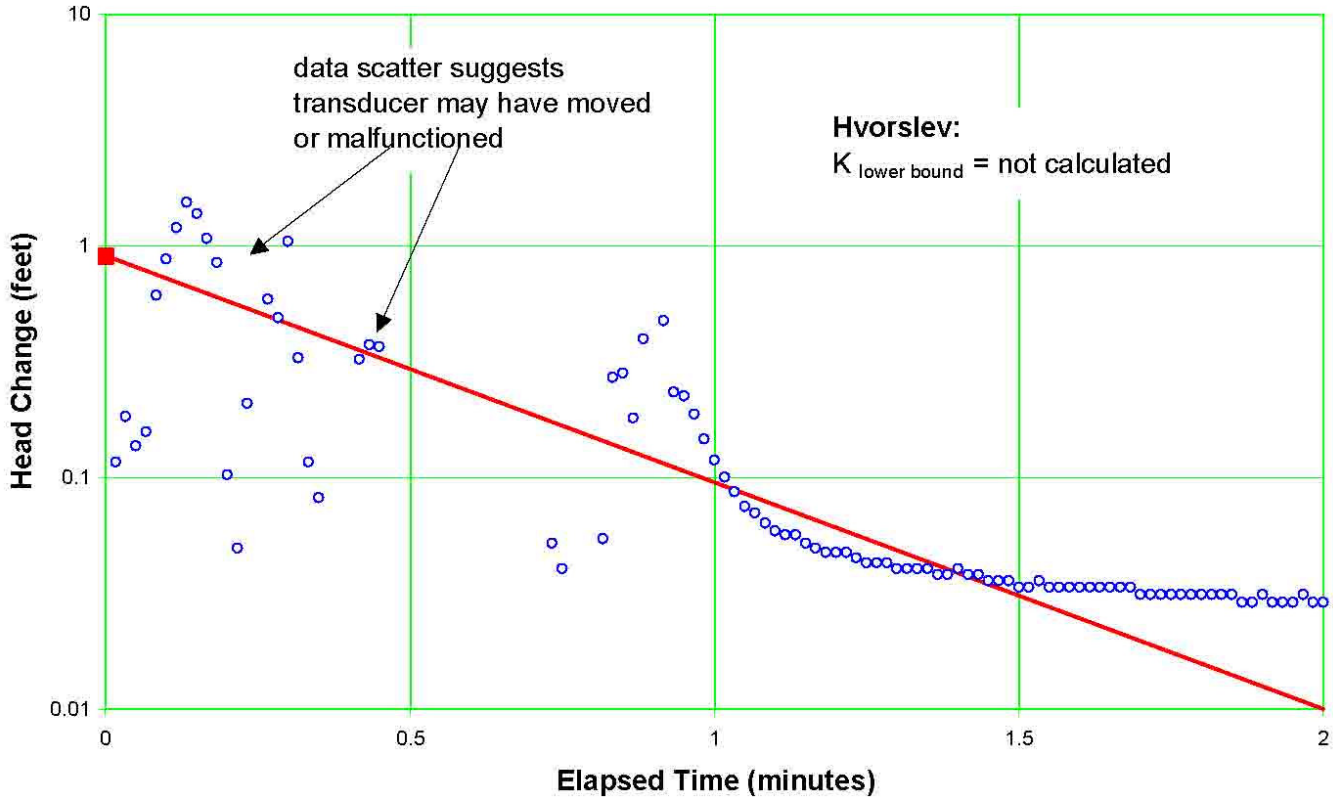


Figure 14. Well SCA-5 Slug Out 2

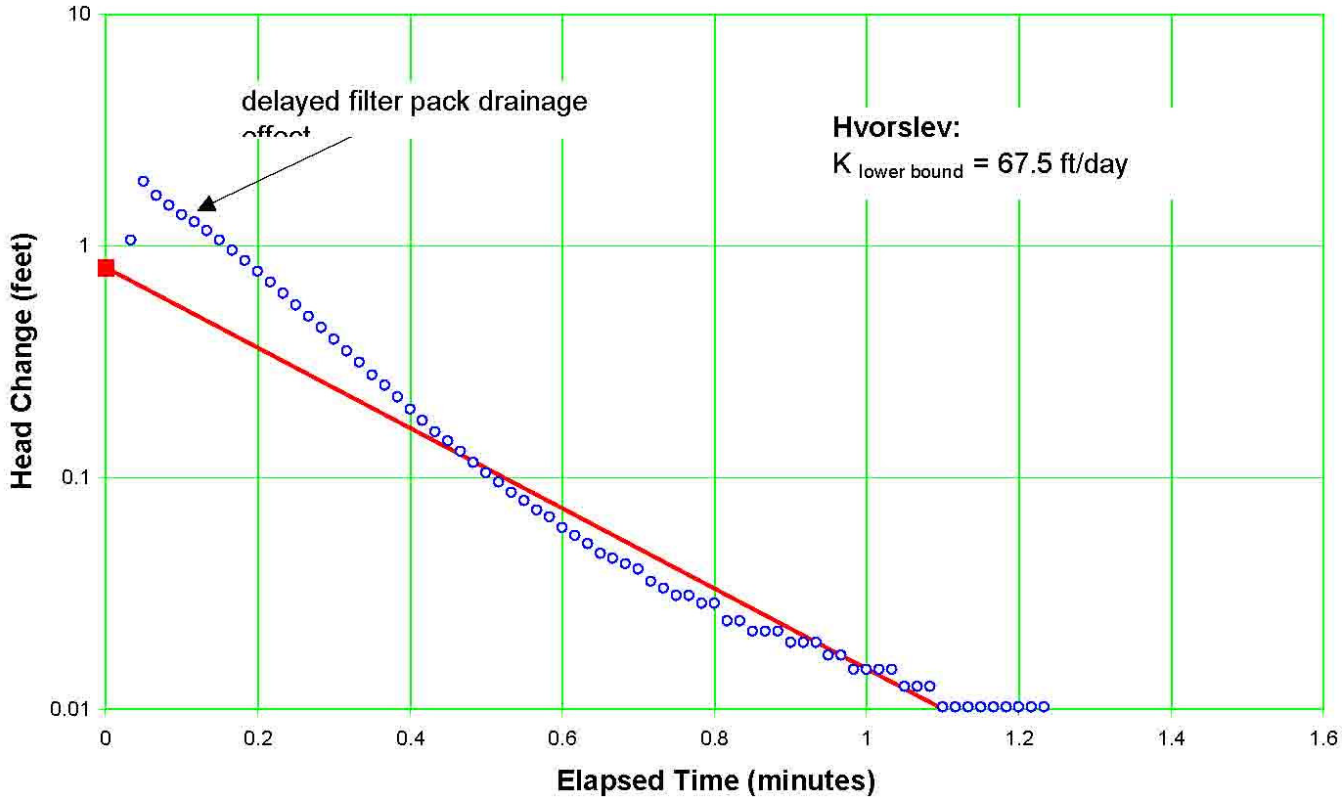


Figure 15. Well SCA-5 Slug In 3

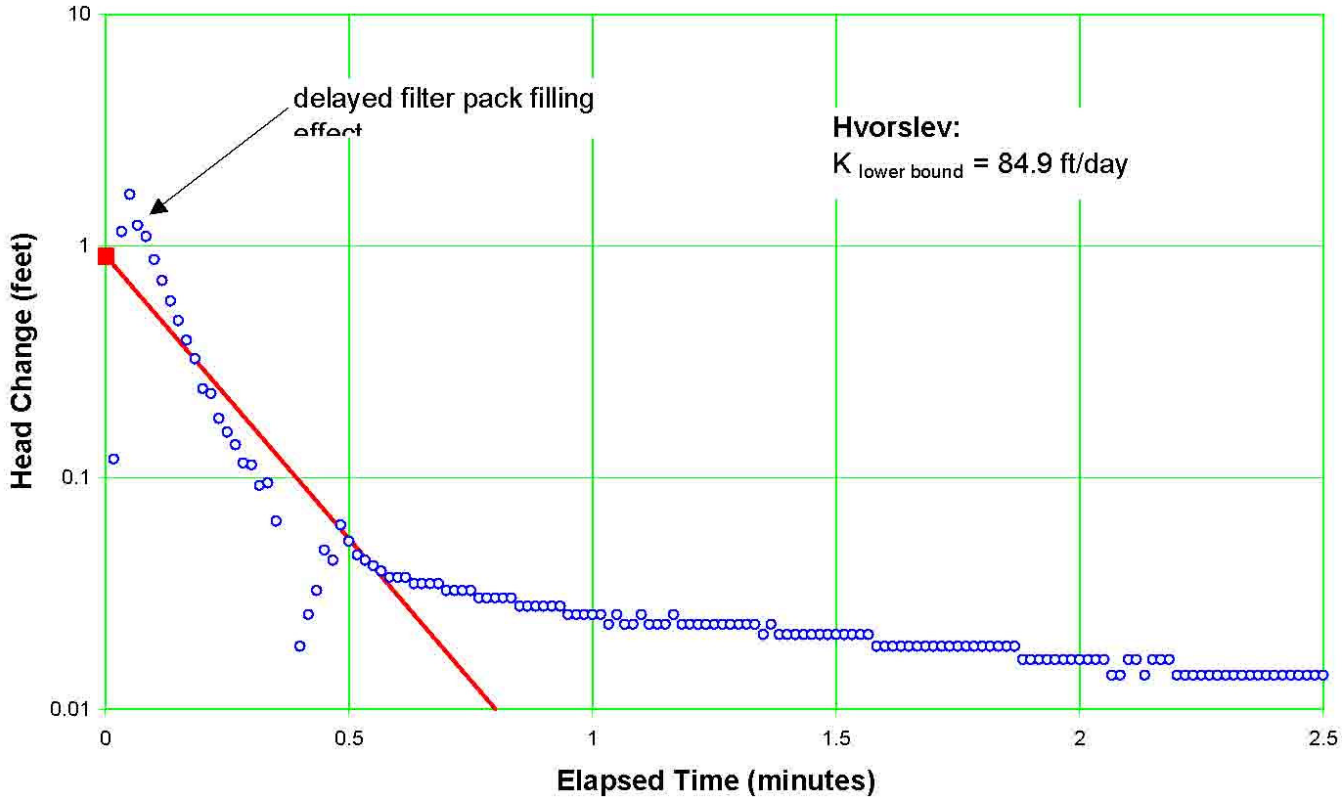


Figure 16. Well SCA-5 Slug Out 3

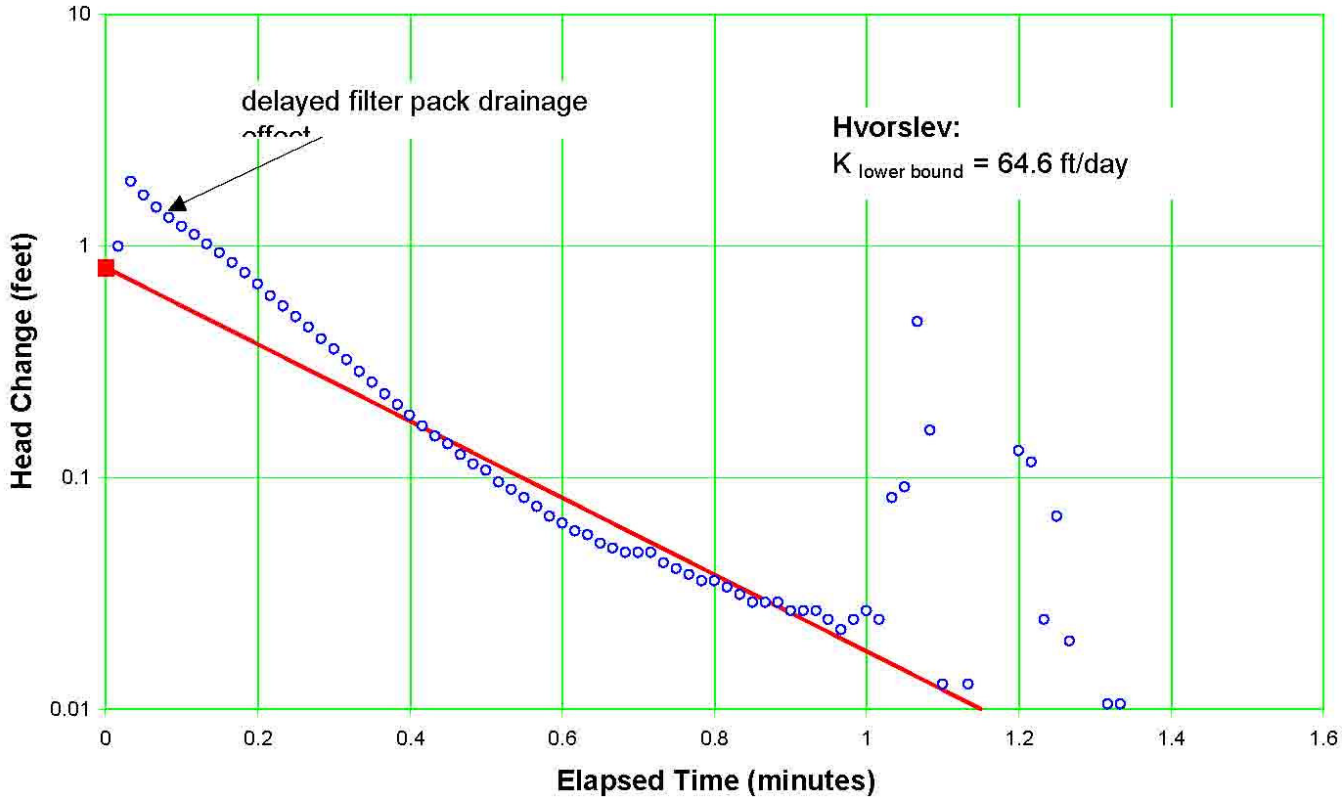


Figure 17. Well SCP-1 Upper Slug In 1

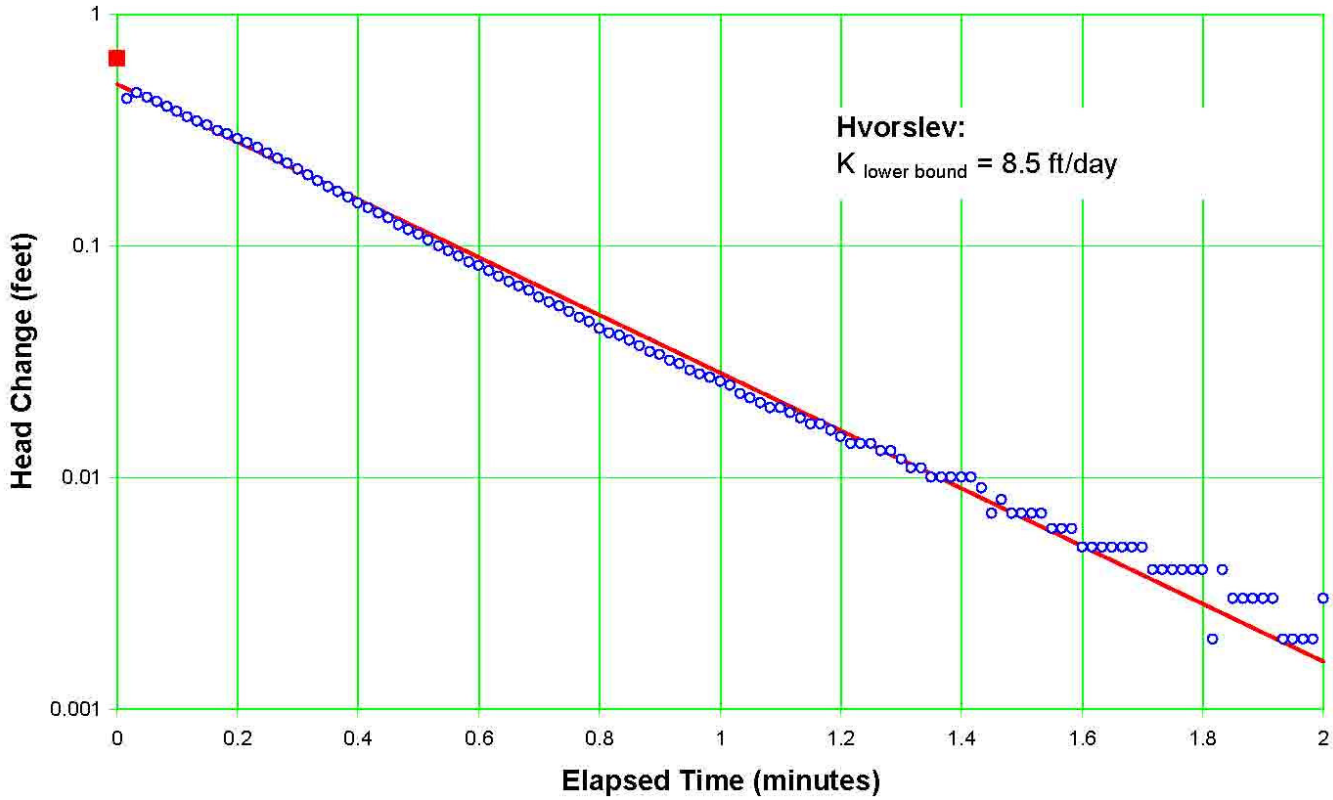


Figure 18. Well SCP-1 Upper Slug In 2

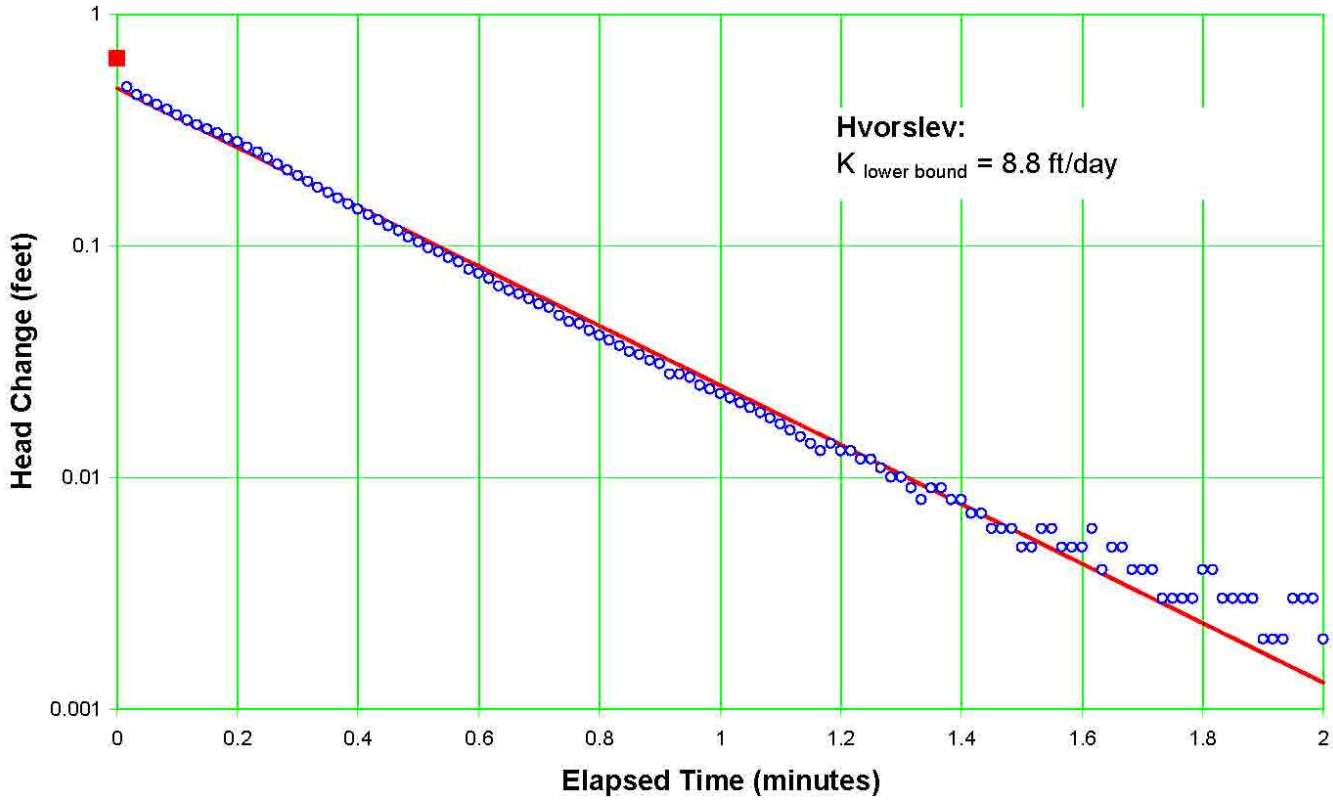


Figure 19. Well SCP-1 Upper Slug In 3

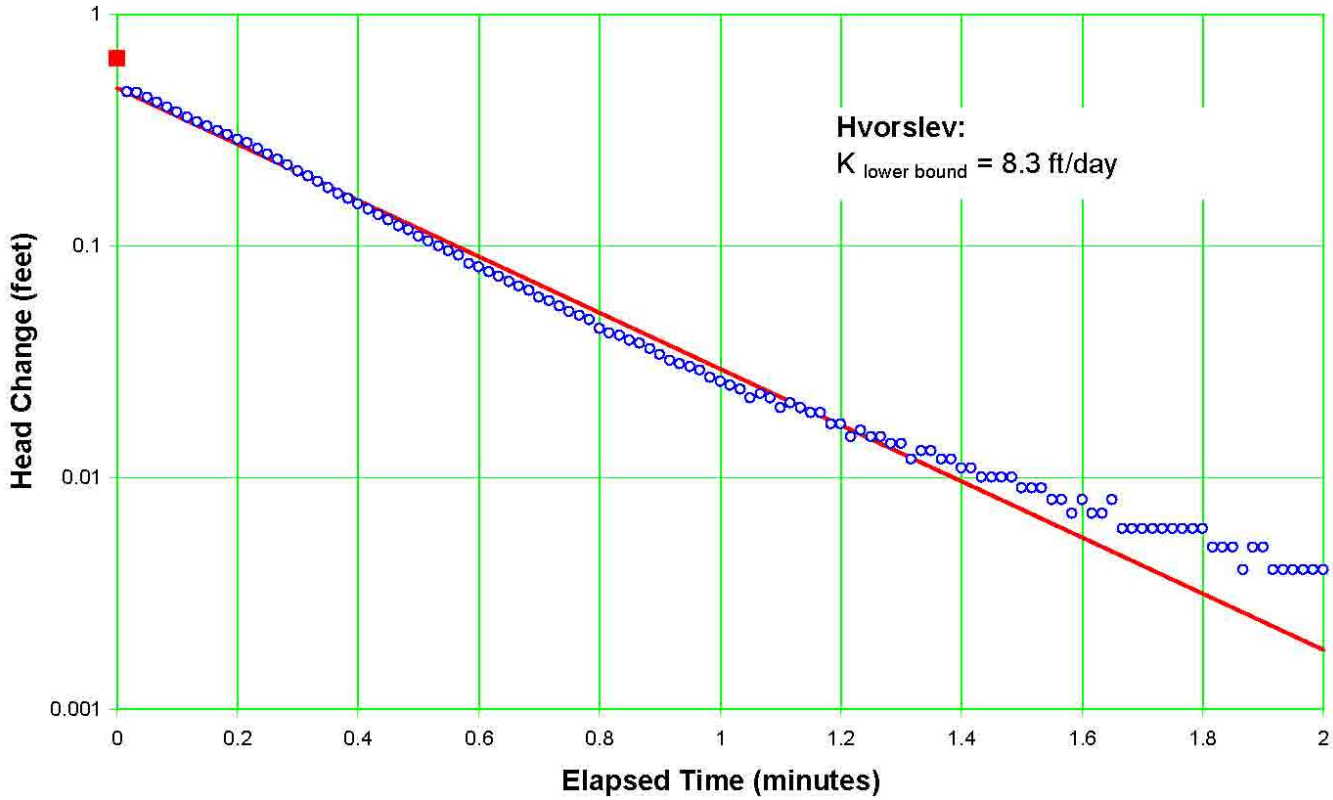


Figure 20. Well SCP-1 Middle Slug In 1

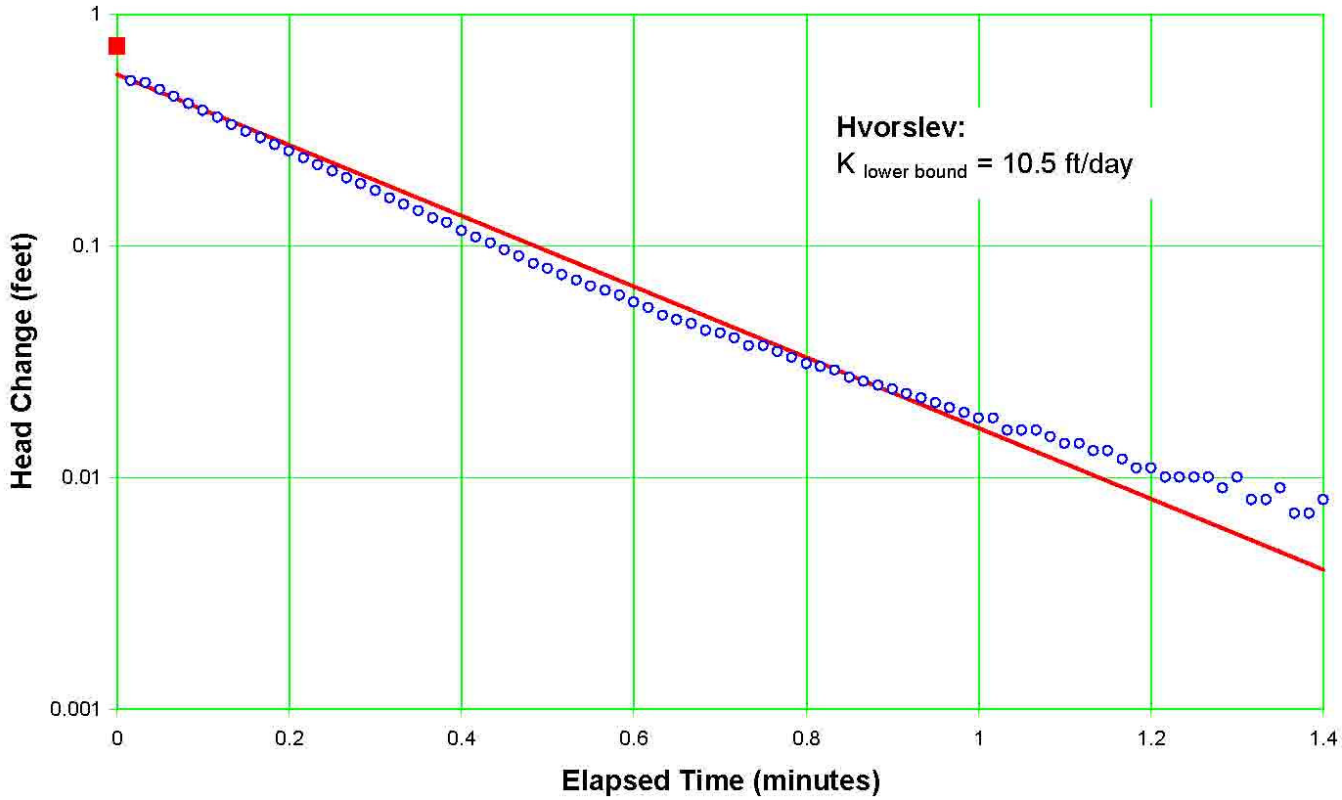


Figure 21. Well SCP-1 Middle Slug In 2

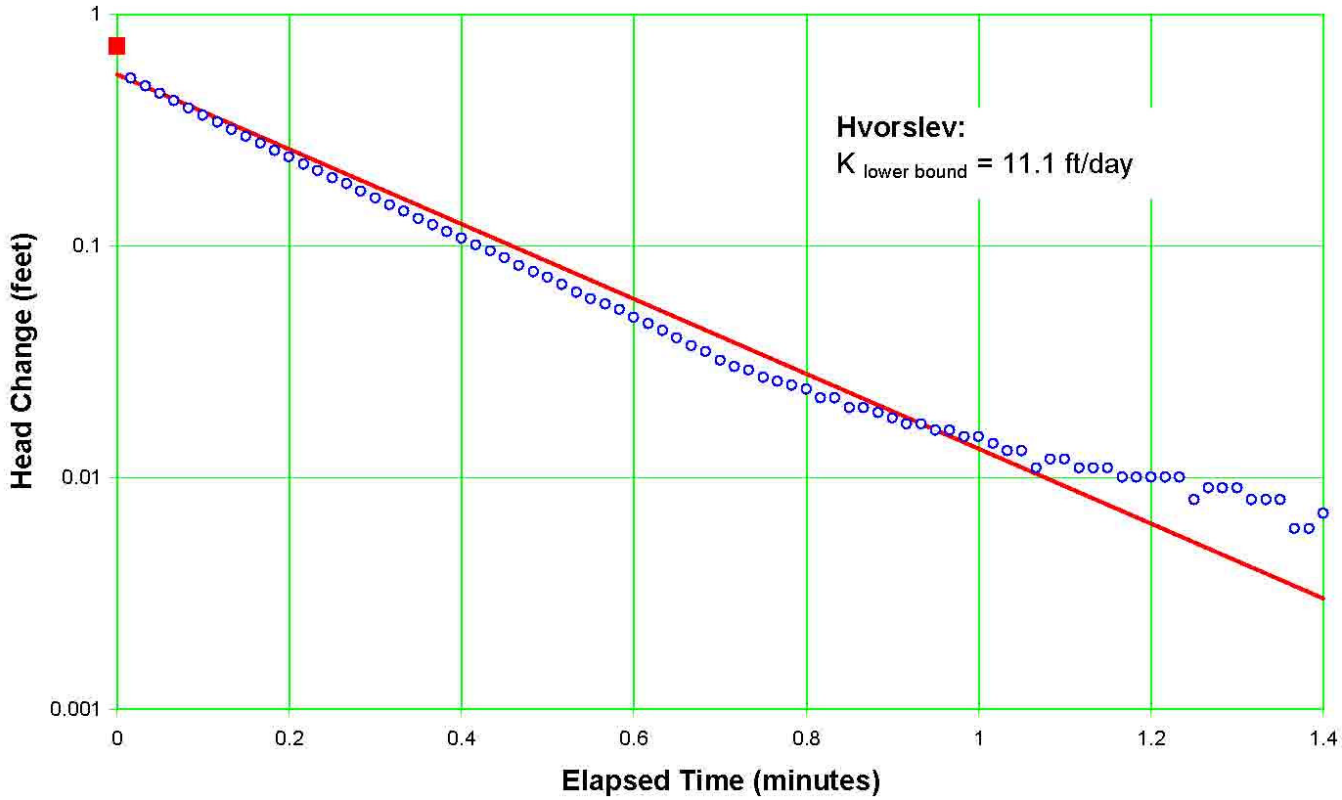


Figure 22. Well SCP-1 Middle Slug In 3

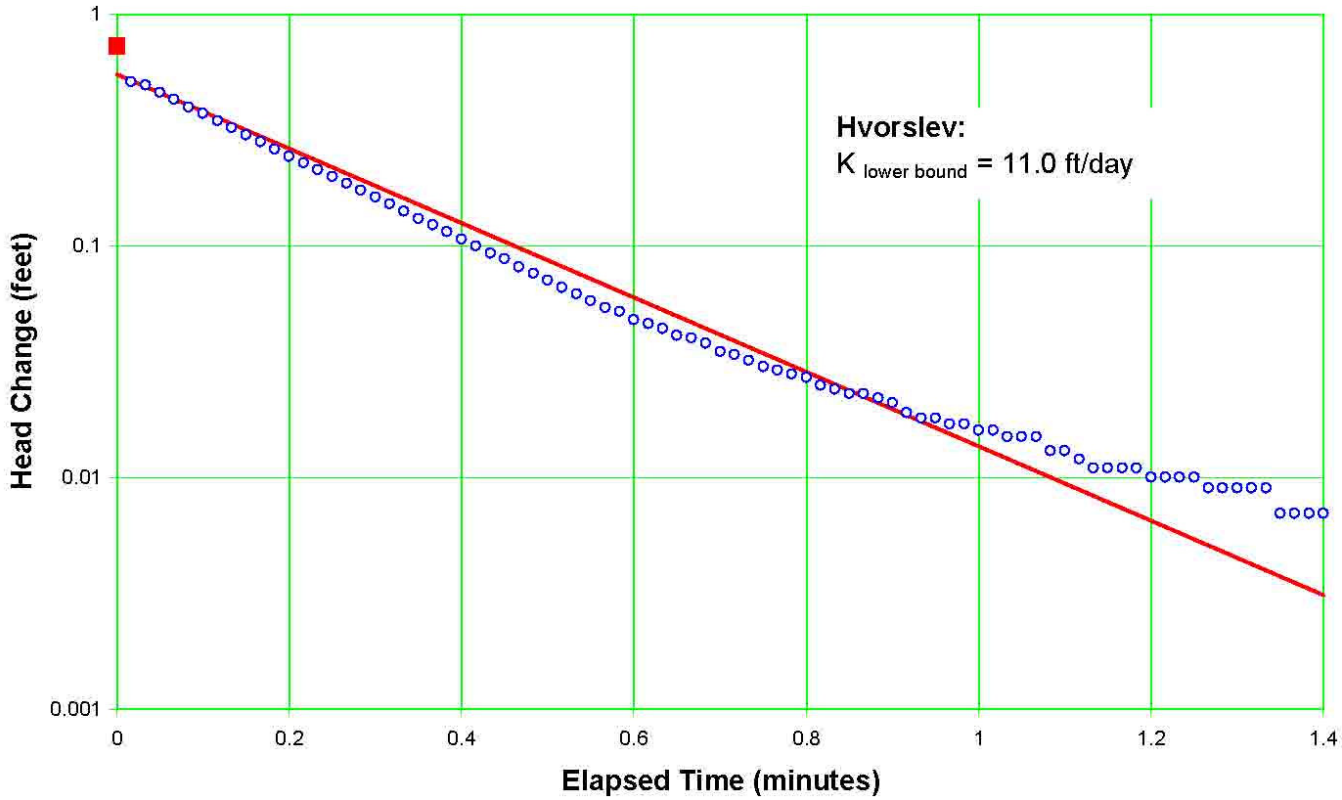


Figure 23. Well SCP-1 Lower Slug In 1

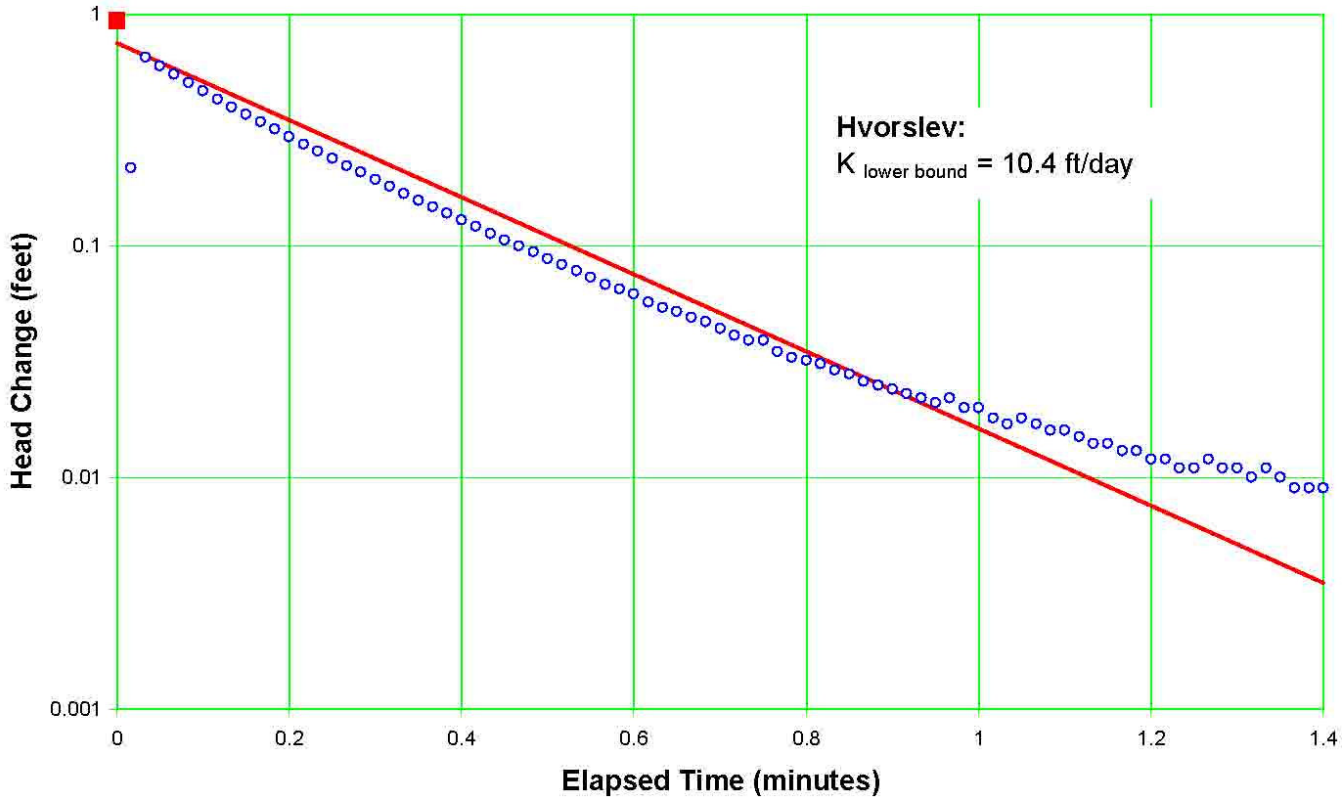


Figure 24. Well SCP-1 Lower Slug In 2

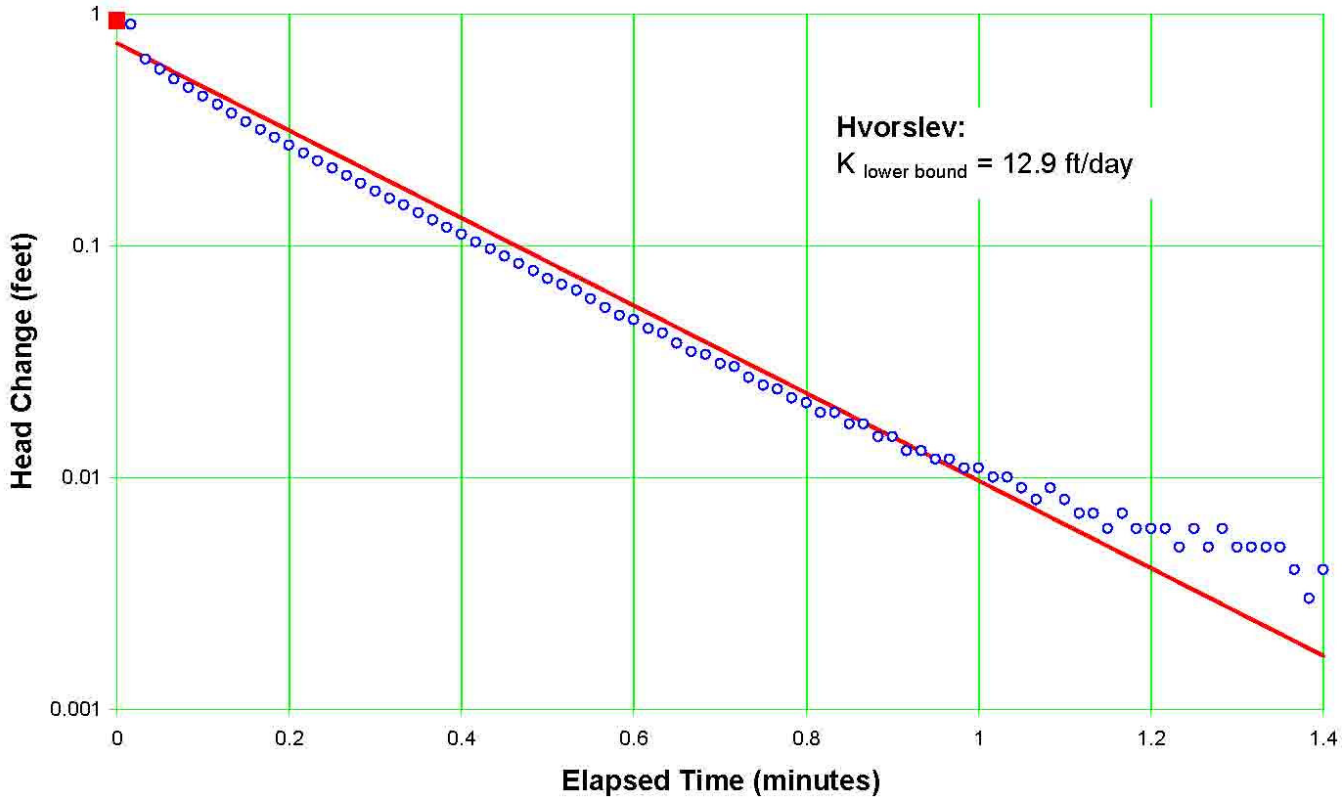


Figure 25. Well SCP-1 Lower Slug In 3

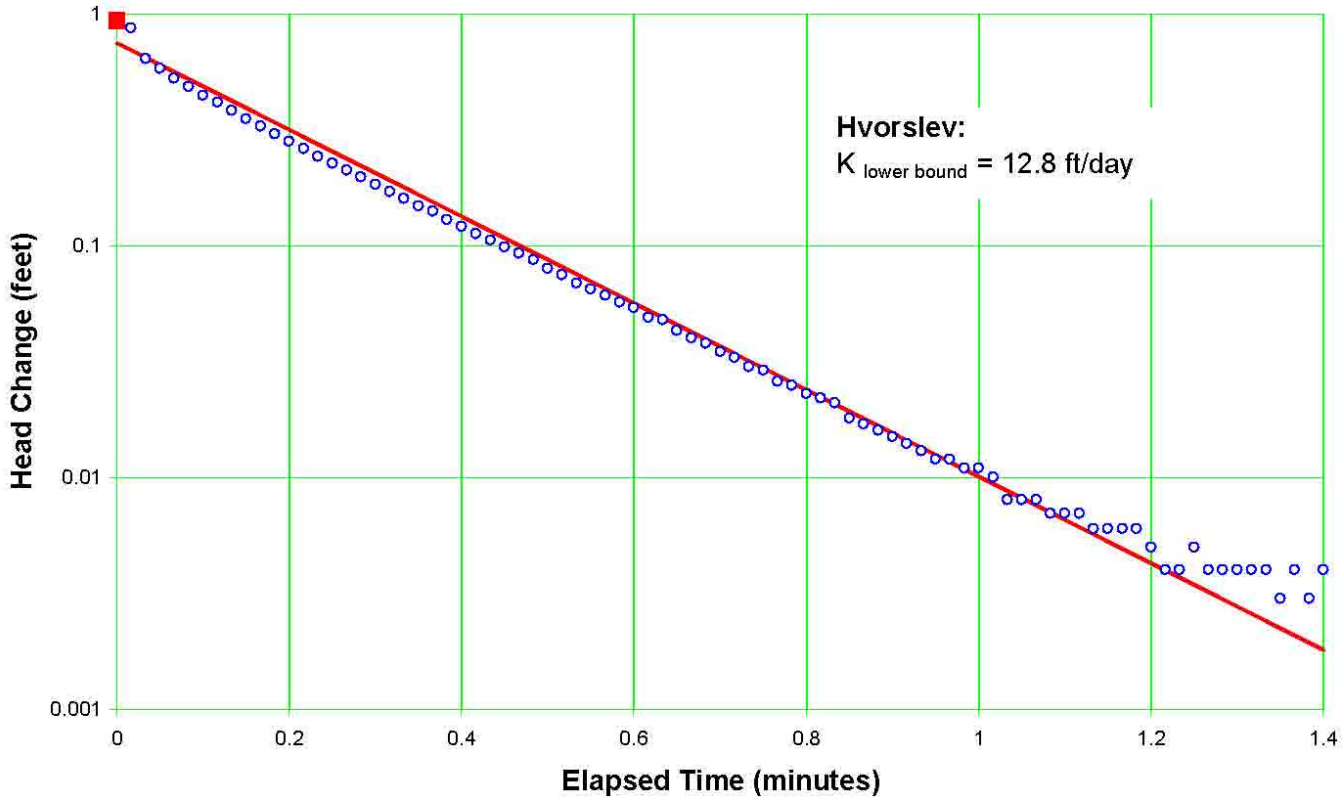


Figure 26. Well SCP-2A Slug In 1

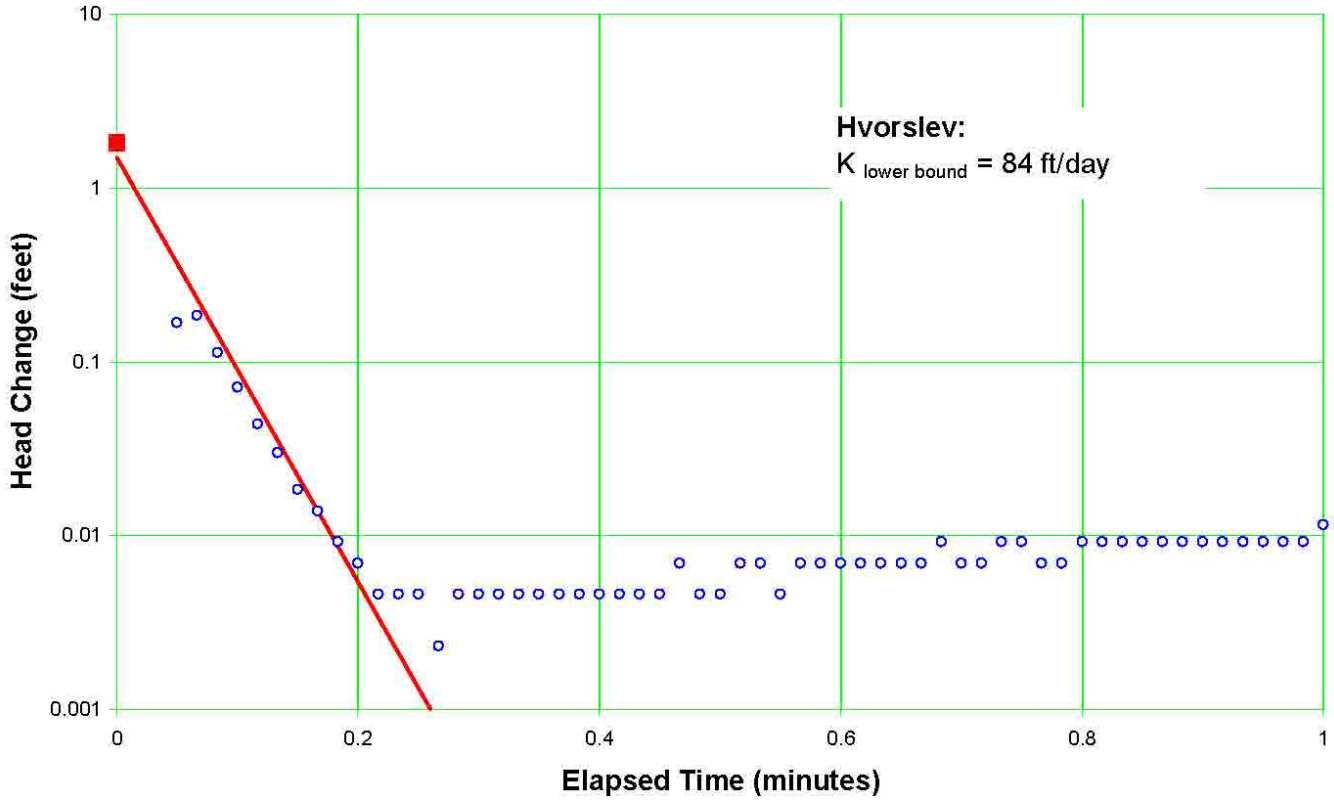


Figure 27. Well SCP-2A Slug In 2

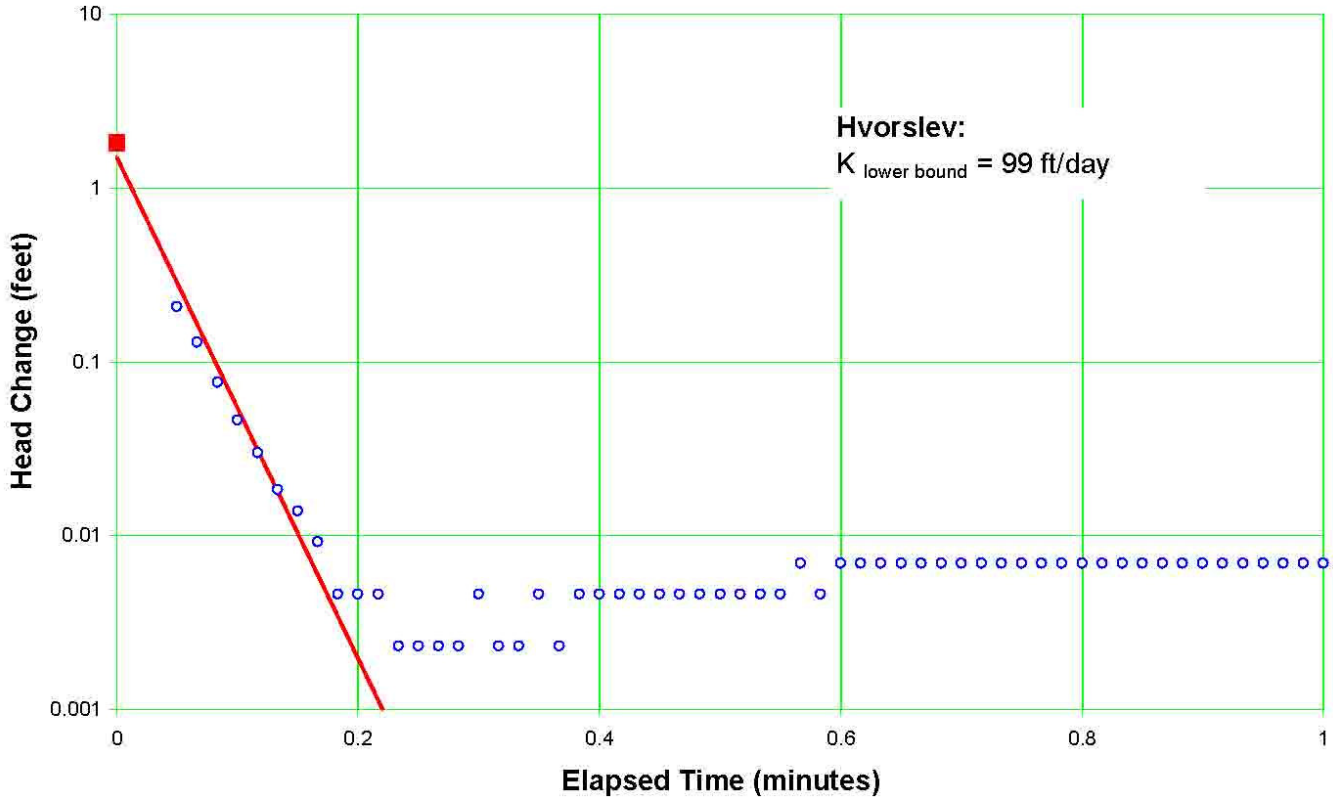


Figure 28. Well SCP-2A Slug In 3

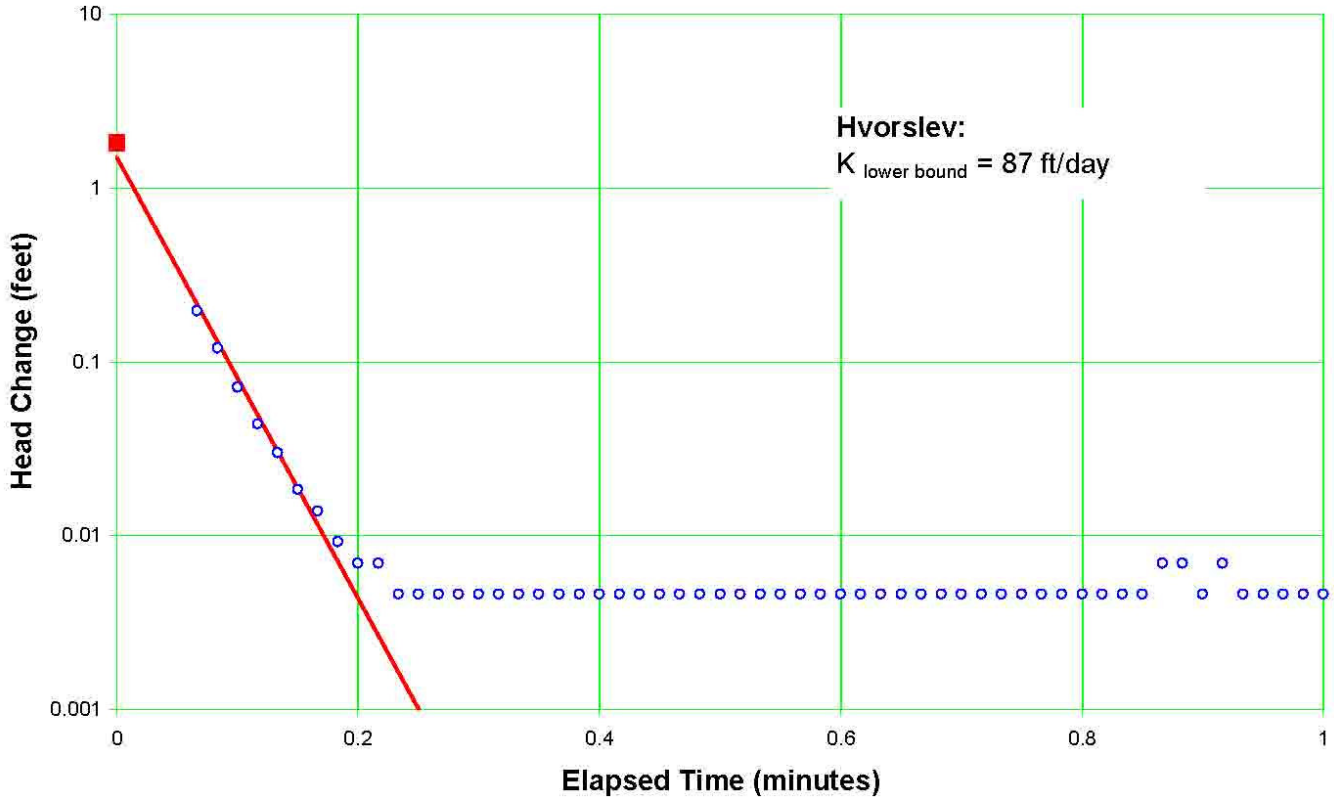


Figure 29. Well SCP-2B Slug In 1

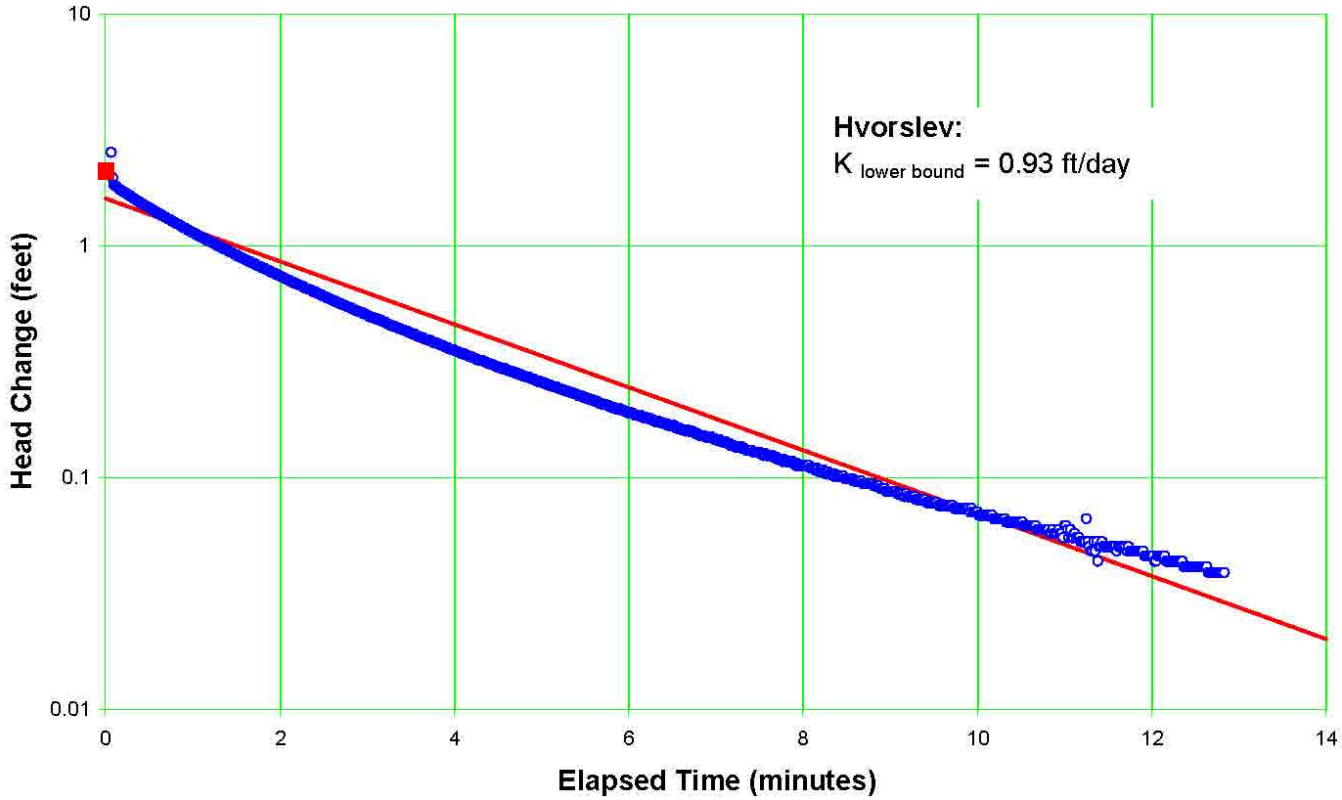


Figure 30. Well SCP-2B Slug In 2

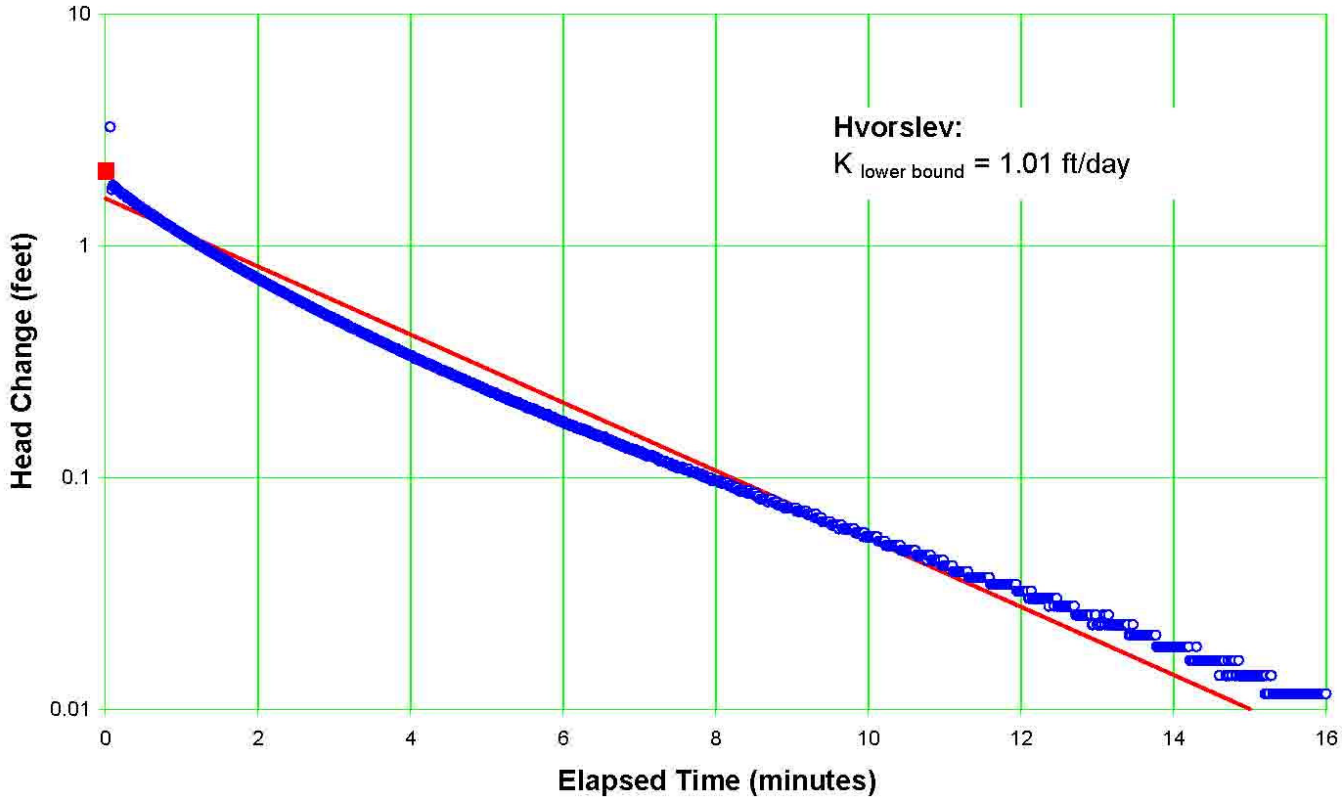


Figure 31. Well SCP-2B Slug In 3

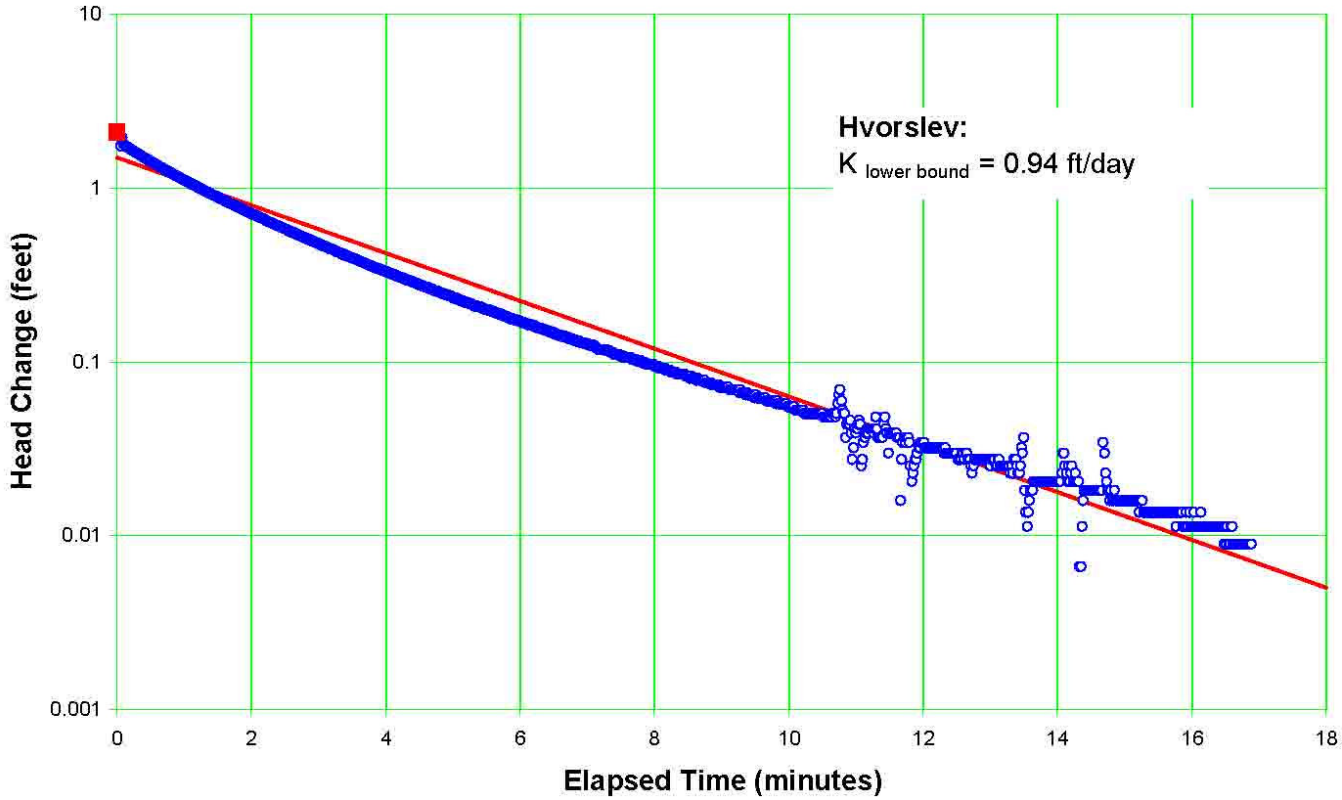


Figure 32. Well SCP-2B Slug In 4

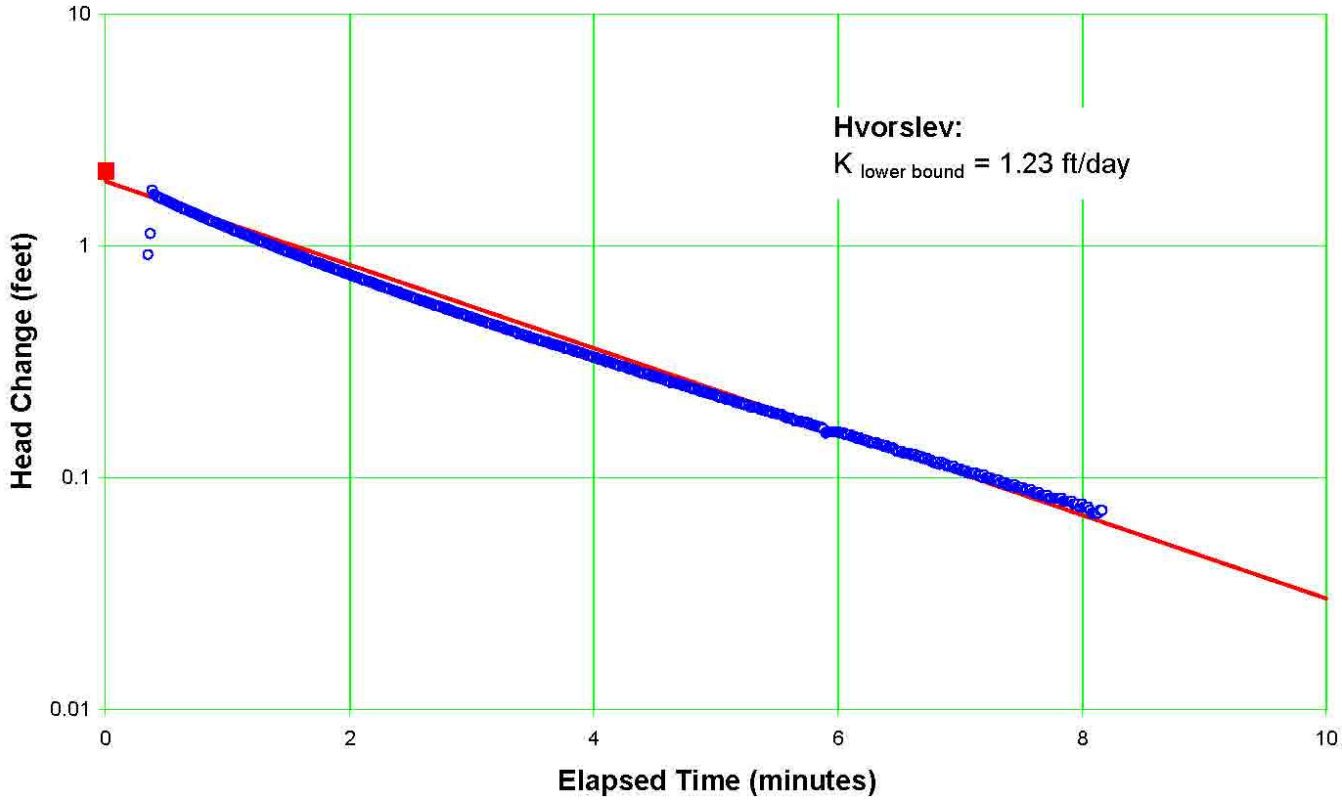
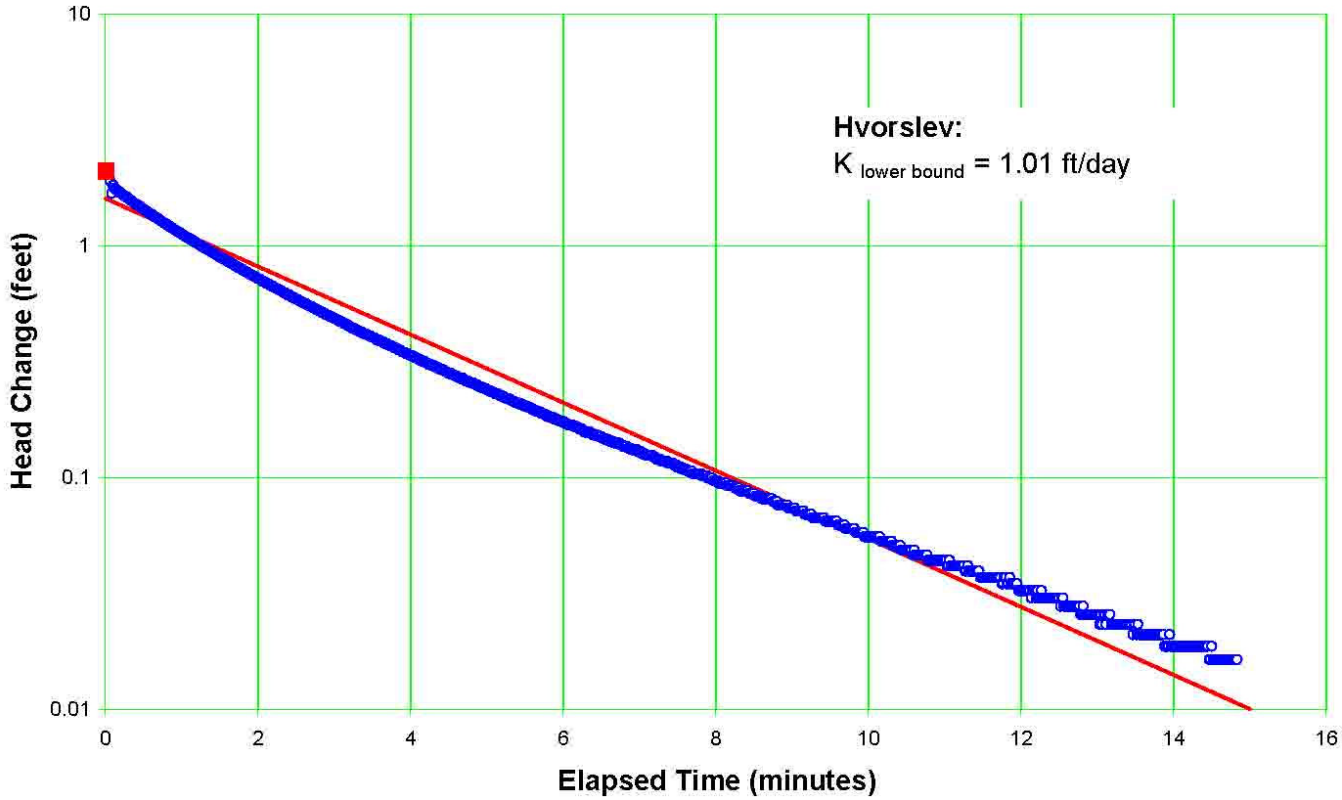


Figure 33. Well SCP-2B Slug In 5



SCI-1 Pump Test Analysis

SCI-1 PUMPING TEST ANALYSIS

INTRODUCTION

This section describes the analysis of pumping tests conducted in November 2006 on SCI-1, completed in an intermediate perched zone in Sandia Canyon. The primary objective of the analysis was to determine the hydraulic properties of the unconsolidated water-bearing sediments screened in SCI-1. A secondary objective was to try to infer from the data the approximate lateral extent of the saturated permeable zone penetrated by the well.

SCI-1 is completed with 4-inch PVC casing and well screen in a 10-inch borehole. The slotted portion of the well screen is 19.5 feet long, installed between the depths of 358.4 feet and 377.9 feet. The screen penetrates a portion of the Puye Formation, that extends to 390.5 feet below land surface and is underlain by the Cerros del Rio Basalt. The static water level measured at the time of testing was near the middle of the well screen at about 369.5 feet below land surface, thus falling within the Puye and suggesting locally unconfined conditions. At the time of testing, the water level was continuing to recover from several days of development pumping that had preceded the test pumping.

The geologic log for the well showed sandy conglomerate across the screened interval and extending down to 380 feet, about 2.1 feet beneath the well screen. Below 380 feet, the sediments were identified as siltstone, consisting of 95 percent silt and clay. In the hydraulic analysis, it was assumed that materials below 380 feet were impermeable because of the high silt and clay content. Thus, the well was considered to be mostly penetrating, screened from the upper limit of saturation (static water level) down to 2.1 beneath the screen.

Most pumping tests conducted on the Pajarito Plateau have implemented an inflatable packer to eliminate casing storage effects. In Well SCI-1, however, because the static water level fell within the well screen, it was not possible to accomplish this. Therefore, casing storage effects dominated much of the early data, as described later. (Even if the static water level had been above the top of the screen, it is doubtful that a down-hole packer would have been used, because of the danger of over-pressurizing and rupturing the limited-strength PVC well casing.)

The limited saturated thickness in SCI-1 (about 9 feet) dictated placing the pump at the bottom of the well screen to provide sufficient available drawdown and to try to maintain submergence of the pressure transducer (positioned just above the pump). Also, the low yield capacity of the well resulted in low discharge rates – just fractional gallons per minutes (gpm). This combination of circumstances risked overheating the pump motor because of the low amount of water flow past the motor. Indeed, during the first test the amperage draw on the motor reached unacceptable levels, likely related to low discharge and overheating of the motor, and the test had to be aborted after just 5.5 hours. After collecting recovery data, the pump was raised just slightly, 0.88 feet, to provide better cooling of the pump motor and a second test was run for a period of 8 hours.

Test 1 was conducted on November 12 at a discharge rate of 0.46 gpm for 328 minutes from 8:11 am until 1:39 pm and was followed by 2961 minutes of recovery until 3:00 pm on

November 14. Test 2 was conducted on November 14 as a constant-drawdown test, rather than a constant-rate test, at rates ranging from 1.2 to 0.4 gpm for 480 minutes from 3:33 pm until 11:33 pm. Following shutdown, recovery was monitored for nearly 31 hours until 6:27 am on November 16. The extended recovery periods following the two tests were expected to provide background water level data as well.

Figure 1 shows water temperatures measured during the two pumping tests. It is evident that raising the pump slightly was effective in slowing the rate of temperature increase during the second pumping test. After 480 minutes of pumping during the second test, the temperature had not risen to levels reached in the previous test.

BACKGROUND DATA

The background water level data collected in conjunction with running the pumping tests allow the analyst to see what water level fluctuations occur naturally in the aquifer and help distinguish between water level changes caused by conducting the pumping test and changes associated with other causes.

Background water level fluctuations have several causes, among them barometric pressure changes, operation of other wells in the aquifer, earth tides and long-term trends related to weather patterns. The background data hydrograph from the SCI-1 testing was compared to barometric pressure data from the area to determine if a correlation existed.

Previous pumping tests have demonstrated a barometric efficiency for most wells of between 90 and 100 percent. Barometric efficiency is defined as the ratio of water level change divided by barometric pressure change, expressed as a percentage. In the initial pumping tests conducted as part of this project, down hole pressure was monitored using a *vented* transducer. This equipment measures the *difference* between the total pressure applied to the transducer and the barometric pressure, this difference being the true height of water above the transducer.

Subsequent pumping tests, including SCI-1, have utilized *non-vented* transducers. These devices simply record the total pressure on the transducer, that is, the sum of the water height plus the barometric pressure. This results in an attenuated "apparent" hydrograph in a barometrically efficient well. Take as an example a 90 percent barometrically efficient well. When monitored using a vented transducer, an *increase* in barometric pressure of 1 unit causes a *decrease* in recorded down-hole pressure of 0.9 units, because the water level is forced downward 0.9 units by the barometric pressure change. However, using a non-vented transducer, the total measured pressure *increases* by 0.1 units (the combination of the barometric pressure increase and the water level decrease). Thus, the resulting apparent hydrograph changes by a factor of 100 minus the barometric efficiency, and in the same direction as the barometric pressure change, rather than in the opposite direction.

Barometric pressure data were obtained from the Los Alamos National Laboratory TA-54 tower site from the Environmental Division-Meteorology and Air Quality (ENV-MAQ). The TA-54 measurement location is at an elevation of 6548 feet above mean sea level (amsl) whereas the wellhead elevation is about 6738 feet amsl. The static water level in SCI-1 was about 369 feet

below land surface, making the water table elevation approximately 6369 feet amsl. Therefore, the measured barometric pressure data from TA-54 had to be adjusted to reflect the pressure at the elevation of the water table within SCI-1.

The following formula was used to adjust the measured barometric pressure data:

$$P_{WT} = P_{TA54} \exp\left[-\frac{g}{3.281R} \left(\frac{E_{SCI1} - E_{TA54}}{T_{TA54}} + \frac{E_{WT} - E_{SCI1}}{T_{WELL}} \right) \right] \tag{1}$$

where,

P_{WT} = barometric pressure at the water table inside SCI-1
P_{TA54} = barometric pressure measured at TA-54
g = acceleration of gravity, in m/sec^2 (9.80665 m/sec^2)
R = gas constant, in J/Kg/degree Kelvin (287.04 J/Kg/degree Kelvin)
E_{SCI1} = land surface elevation at SCI-1, in feet (estimated at 6738 feet)
E_{TA54} = elevation of barometric pressure measuring point at TA-54, in feet (6548 feet)
E_{WT} = elevation of the water level in SCI-1, in feet (estimated at 6369 feet)
T_{TA54} = air temperature near TA-54, in degrees Kelvin (assigned a value of 37.2 degrees Fahrenheit, or 276.0 degrees Kelvin)
T_{WELL} = air temperature inside SCI-1, in degrees Kelvin (assigned a value of 51.6 degrees Fahrenheit, or 284.0 degrees Kelvin)

This formula is an adaptation of an equation provided by ENV-MAQ. It can be derived from the ideal gas law and standard physics principles. An inherent assumption in the derivation of the equation is that the air temperature between TA-54 and the well is temporally and spatially constant, and that the temperature of the air column in the well is similarly constant.

The corrected barometric pressure data reflecting pressure conditions at the water table were compared to the water level hydrograph to discern the correlation between the two.

IMPORTANCE OF EARLY DATA

In most pumping tests conducted without a packer seal above the pump, casing storage effects dominate the early-time data, both pumping and recovery. This renders the early data un-analyzable, hindering the interpretation of the pumping test. The duration of casing storage effects can be estimated using the following equation (Schafer, 1978).

$$t_c = \frac{0.6\left(D^2 - d^2\right)}{\frac{Q}{s}} \tag{2}$$

where,

t_c = duration of casing storage effect, in minutes
D = inside diameter of well casing, in inches
d = outside diameter of column pipe, in inches
Q = discharge rate, in gpm
s = drawdown observed in pumped well at time t_c, in feet

In wells screened across the water table, the equation must be modified to account for water stored in the filter pack, as follows:

$$t_c = \frac{0.6\left[\left(D^2 - d^2\right) + S_y\left(D_w^2 - D_O^2\right)\right]}{\frac{Q}{s}} \tag{3}$$

where,

S_y = short-term specific yield of filter pack (assumed to be about 0.2)
D_w = borehole diameter, in inches
D_O = outside diameter of well casing, in inches

Applying this formula suggested a casing storage effect duration of between one and two hours. Other evidence, described later, suggested that the limited areal extent of the perched zone resulted in boundary effects in the data in less than one hour. This made determination of the formation transmissivity challenging.

TIME-DRAWDOWN METHODS

Time-drawdown data can be analyzed using a variety of methods. Among them is the Cooper-Jacob method (1946), a simplification of the Theis equation (1935) that is mathematically equivalent to the Theis equation for pumped well data. The Cooper-Jacob equation describes drawdown around a pumping well as follows:

$$s = \frac{264Q}{T}\log\frac{0.3Tt}{r^2 S} \tag{4}$$

where,

s = drawdown, in feet
Q = discharge rate, in gpm
T = transmissivity, in gpd/ft
t = pumping time, in days
r = distance from center of pumpage, in feet
S = storage coefficient (dimensionless)

The Cooper-Jacob equation is a simplified approximation of the Theis equation and is valid whenever the u value is less than about 0.05, where u is defined as follows:

$$u = \frac{1.87 r^2 S}{Tt} \tag{5}$$

For small radius values (e.g., corresponding to borehole radii), u is less than 0.05 at very early pumping times and, therefore, is less than 0.05 for all measured drawdown values. Thus, for the pumped well, the Cooper-Jacob equation can be considered a valid approximation of the Theis equation.

According to the Cooper-Jacob method, the time-drawdown data are plotted on a semilog graph, with time plotted on the logarithmic scale. Then a straight line of best fit is constructed through the data points and transmissivity is calculated using:

$$T = \frac{264Q}{\Delta s} \tag{6}$$

where,

T = transmissivity, in gpd/ft
Q = discharge rate, in gpm
Δs = change in head over one log cycle of the graph, in feet

The foregoing discussion applies to a well pumped at a constant discharge rate. Another way to implement a pumping test is to fix the drawdown at a constant level, rather than fixing the pumping rate. This approach offers the advantage that the water stored in the well casing or screen is pumped out rapidly, minimizing the duration of casing storage effects. During constant-drawdown testing, the discharge rate declines with time, as the cone of depression expands. The governing equation for drawdown (Jacob and Lohman, 1952), using units defined above, is as follows:

$$s_w = \frac{229Q}{TG(\alpha)} \tag{7}$$

where,

$$G(\alpha) = \frac{4\alpha}{\pi} \int_0^\infty x \exp\left(-\alpha x^2\right) \left[\frac{\pi}{2} + \tan^{-1}\left(\frac{Y_0(x)}{J_0(x)} \right) \right] dx \tag{8}$$

$$\alpha = \frac{Tt}{7.48 r_w^2 S} \tag{9}$$

and

s_w = drawdown in the pumped well, in feet
r_w = borehole radius, in feet
$J_0(x)$ = Bessel function of zero order of the first kind
$Y_0(x)$ = Bessel function of zero order of the second kind

For large pumping times, the following simplification can be used:

$$G(\alpha) = \frac{2}{\ln \frac{0.3Tt}{r_w^2 S}} \tag{10}$$

Applying this formula to equation (7) simplifies to equation (4) and, thus, it is possible to solve for transmissivity using semilog methods. This is done by plotting the ratio s_w/Q versus time and constructing a straight line of best fit through the data points. Transmissivity is computed from the slope of the line of fit, as follows:

$$T = \frac{264}{\Delta(s/Q)} \tag{11}$$

where,

$\Delta(s/Q)$ = change in head over one log cycle of the graph, in feet

DRAWDOWN CORRECTION FOR DEWATERING

All of the equations described above are valid for analyzing drawdown that is not affected by dewatering. Because most of the saturated screen length was dewatered during pumping, this effect could not be ignored. To compensate for dewatering, the drawdown values had to be corrected mathematically prior to analysis. An acceptable formula for doing this is as follows:

$$s_c = s - \frac{s^2}{2L} \tag{12}$$

where,

s_c = corrected drawdown
s = measured drawdown
L = initial saturated screen length

Theoretically, this mathematical adjustment is valid only for fully penetrating wells. In SCI-1, this criterion was not met exactly. Nevertheless, the well was nearly fully penetrating and the adjustment was deemed appropriate for the conditions and certainly better than not correcting the data.

RECOVERY METHODS

Recovery data were analyzed using the Theis Recovery Method. This is a semi-log analysis method similar to the Cooper-Jacob procedure.

In this method, residual drawdown is plotted on a semi-log graph versus the ratio *t/t'*, where *t* is the time since pumping began and *t'* is the time since pumping stopped. A straight line of best fit is constructed through the data points and *T* is calculated from the slope of the line as follows:

$$T = \frac{264Q}{\Delta s} \tag{13}$$

The recovery data are particularly useful compared to time-drawdown data. Because the pump is not running, spurious data responses associated with dynamic discharge rate fluctuations are eliminated. The result is that the data set is generally "smoother" and easier to analyze.

SPECIFIC CAPACITY METHOD

The specific capacity of the pumped well can be used to obtain a lower-bound estimate of hydraulic conductivity. The hydraulic conductivity is computed using formulas that are based on the assumption that the pumped well is 100 percent efficient. The resulting hydraulic conductivity is the value required to sustain the observed specific capacity. If the actual well is less than 100 percent efficient, it follows that the actual hydraulic conductivity would have to be greater than calculated to compensate for well inefficiency. Thus, because the efficiency is unknown, the computed hydraulic conductivity value represents a lower bound. The actual conductivity is known to be greater than or equal to the computed value.

For fully penetrating wells, the Cooper-Jacob equation can be iterated to solve for the lower-bound hydraulic conductivity. However, the Cooper-Jacob equation (assuming full penetration) ignores the contribution to well yield from permeable sediments above and below the screened interval. To account for this contribution, it is necessary to use a computation algorithm that

includes the effects of partial penetration. One such approach was introduced by Brons & Marting (1961) and augmented by Bradbury & Rothchild (1985).

Brons and Marting introduced a dimensionless drawdown correction factor, s_P, approximated by Bradbury and Rothschild as follows:

$$s_P = \frac{1-\frac{L}{b}}{\frac{L}{b}}\left[\ln\frac{b}{r_w} - 2.948 + 7.363\frac{L}{b} - 11.447\left(\frac{L}{b}\right)^2 + 4.675\left(\frac{L}{b}\right)^3\right] \tag{14}$$

In this equation, L is the well screen length, in feet. Incorporating the dimensionless drawdown parameter, the conductivity is obtained by iterating the following formula:

$$K = \frac{264Q}{sb}\left(\log\frac{0.3Tt}{r_w^2 S} + \frac{2s_P}{\ln 10}\right) \tag{15}$$

To apply this formula, a storage coefficient value must be assigned. Storage coefficient values for unconfined conditions, as expected in SCI-1, can range from about 0.01 to 0.25. Because the screened sediments in SCI-1 are heterogeneous and fine-grained, the storage coefficient would be expected to fall in the lower part of this range. The calculation result is not particularly sensitive to the choice of storage coefficient value, so a rough estimate of the storage coefficient is adequate to support the calculations. In the analysis of the SCI-1 pumping results, lower-bound hydraulic conductivity values were computed for storage coefficients ranging from 0.01 to 0.1.

The analysis also requires assigning a value for the saturated aquifer thickness, b. In SCI-1, silt and clay was encountered just 2.1 feet below the bottom of the well screen and, thus, b was assigned a value 2.1 feet greater than the saturated screen length, which varied during the testing period. For tests 1 and 2, the saturated screen lengths were 8.9 and 9.1 feet, respectively, making the corresponding assigned b values 11.0 and 11.2 feet

Computing the lower-bound estimate of hydraulic conductivity can provide a useful frame of reference for evaluating the other pumping test calculations.

SCI-1 DATA ANALYSIS

This section presents the data obtained from the SCI-1 pump testing and the results of the analytical interpretations. Analyses were applied to both the constant-rate test and the constant-drawdown test. There also is a discussion of the background data recorded before and after the pumping tests.

Background Data

Figure 2 shows the apparent water level hydrograph for SCI-1 and the barometric pressure data recorded before and after the pumping tests. The data were both surprising and inexplicable.

Overall, the water levels were recovering steadily whenever the well was not being pumped. Superimposed on this background trend was an obvious correlation with barometric pressure changes. However, the correlation was *inverse*, rather than direct as should be seen using a non-vented pressure transducer. This would require a given barometric pressure change to cause a greater change in the water level in the well.

The oscillation shown during the afternoon of November 13 illustrates this idea. From 2:15 pm to 6:15 pm, there was a barometric pressure increase of 0.05 feet of water. During this interval, the head recorded in the well declined 0.03 feet. Because that measured head incorporated the increase in barometric pressure, it means that the water level in the well would have had to drop by 0.08 feet to account for the overall decrease in observed pressure on the non-vented transducer. This is ostensibly an impossible response to the reported barometric pressure change. There was no explanation for the observed data. Perhaps it is possible that some sort of unusual elastic reaction is responsible for this observation, analogous to the Noordbergum effect (reverse water level fluctuations), or perhaps the pressure transducer malfunctioned in some way. Suffice it to say that the observed response could not be explained readily.

Constant-Rate Pumping Test

Test 1, the constant-rate pumping test, was started at 8:11 am on November 12 and continued for 328 minutes until 1:39 pm. At that time, the current draw on the pump became excessive because of inadequate cooling of the motor and a decision was made to shut the pump down. Recovery measurements were recorded for 2961 minutes until 3:00 pm on November 14.

After startup, it took 1.5 minutes before water was produced at the surface. This was an indication that the check valve on the pump had failed allowing a portion of the previously filled drop pipe to drain back into the well prior to the test. This meant that the discharge rate during the first 1.5 minutes would have been the maximum capacity of the pump – several gpm – while the pump was filling the empty pipe. Once water was produced at the surface, the initial measured rate was 1.2 gpm. The valve was adjusted over the subsequent 10 minutes to reduce the discharge rate to 0.46 gpm, which was maintained for the balance of the pumping period. (Note: when the pump was pulled at the conclusion of testing, the top half of the drop pipe was full of water, indicating that the check valve in the middle of the drop pipe string had held, but the lower half of the string was empty, confirming that the lower check valve had failed.)

Time-Drawdown Analysis

Figure 3 shows the time-drawdown data for the 328-minute pumping period. The drawdown data were corrected for dewatering effects. Note that the early data (first 10 minutes) showed that the water level had been drawn below the transducer, thus producing essentially a constant head reading. The excessive pumping rate during the 1.5 minutes that it took for the pump to

refill the drop pipe had dewatered the well casing to a level below the position of the pressure transducer. The discharge rate remained elevated for the next several minutes as the valve was slowly adjusted to the selected constant rate of 0.46 gpm. Reducing the flow rate allowed the water level in the casing to recover gradually, eventually rising above the transducer as shown on the graph.

As indicated on Figure 3, once the constant rate was achieved it took a long time for water levels to merge onto the expected downward trending drawdown curve. This was analogous to a casing storage effect, in that the rate of change of the water levels was sluggish because of the volume of screen and filter pack that had to be filled and drained.

The transmissivity computed from the data following the "refilling and draining" event was 156 gpd/ft. This value agreed with the results of test 2 (described below) which was believed to provide the best estimate of tranmsisivity. The good agreement might represent corroboration of the transmissivty, but also might be a fortuitous result of analyzing the intermediate transition data between the flat portion of the graph and the steeper, boundary-affected portion between 100 and 200 minutes.

After 215 minutes, the curve flattened, indicating that the pumping water level had fallen below the pressure transducer.

Recovery Analysis

After pump shutoff, recovery data were recorded from 1:39 pm on November 12 until 3:00 pm on November 14. Figure 4 shows the resulting Theis recovery analysis. The effect of the leaky check valve can be seen by the steep water level rise and decline, which persisted for about and hour after pump shut off. This effect made it impossible to analyze data within this period, although even without the leaky check valve, this portion of the data set likely would have been affected by casing and filter pack storage anyway.

The subsequent data produced a transmissivity of 81 gpd/ft. This result was believed to be lower than the actual transmissivity (as identified by test 2, below) and likely indicates that the data were affected by boundary conditions. It is apparent that the curve continued to steepen throughout the recovery period, suggesting a laterally limited perched zone.

Following the recovery period, the pump was raised slightly to provide better cooling of the motor for the repeat test. The scattered data points on the left side of the graph reflect the movement of the pump during this task.

Constant-Drawdown Pumping Test

Test 2, the constant-drawdown pumping test, was started at 3:33 pm on November 14 and continued for 480 minutes until 11:33 pm. Following pump shutoff, recovery data were collected for 1854 minutes until 6:27 am on November 16.

The constant-drawdown test was conducted by allowing the pump to operate at its maximum capacity, rather than against a partially closed valve. This meant that the pumping water level was pulled down to the pump intake almost immediately and held there throughout the test. This offered the advantage of virtually eliminating casing and filter pack storage effects, making analysis of the early response data possible.

Time-Drawdown Analysis

Time drawdown data were analyzed by calculating the specific drawdown, s/Q, and plotting it against the pumping time. This required making many discharge rate measurements continually throughout the pumping period.

Figure 5 shows a semilog plot of the specific drawdown versus pumping time for test 2. The early data (less than one hour) suggested a transmssivity of 158 gpd/ft. The saturated thickness at the time of test 2 was 11.2 feet, making the hydraulic conductivity 14.1 gpd/ft^2, or 1.9 feet per day.

After about 45 minutes, the curve steepened significantly, consistent with a negative boundary, i.e., laterally limited perched zone.

Recovery Analysis

After pump shutoff, recovery data were recorded from 11:33 pm on November 14 until 6:27 am on November 16. Figure 6 shows the resulting Theis recovery analysis. As occurred in test 1, the effect of the leaky check valve can be seen by the steep water level rise and decline, which persisted for about and hour after pump shut off. This effect made it impossible to analyze data within this period, although even without the leaky check valve, this portion of the data set likely would have been affected by casing and filter pack storage.

The subsequent data produced a transmissivity of 74 gpd/ft, using the average discharge rate of 0.51 gpm. The low transmissivity value was due to negative boundary effects which are shown to occur within the first hour of pumping (and, therefore, recovery) on the specific drawdown graph on Figure 5. At late recovery time, the curve continued to steepen suggesting a laterally limited perched zone.

Specific Capacity Data

Specific capacity data were used to estimate lower bound conductivity values for the aquifer sediments. Calculations were performed for early pumping times to minimize the effect of negative boundaries on the results. A borehole radius of 0.42 feet was used in the analysis and calculations were performed for a range of storage coefficient values from 0.01 to 0.1.

During test 1, SCI-1 produced 0.46 gpm with 4.33 feet of drawdown after 60 minutes of pumping. The corresponding corrected drawdown (for dewatering effects) was 3.27 feet. At the time of testing the saturated screen length was 8.9 feet and the total saturated thickness (down to the silt and clay zone) was 11.0 feet.

During test 2, SCI-1 produced 0.72 gpm with 6.27 feet of drawdown after 40 minutes of pumping. The corresponding corrected drawdown (for dewatering effects) was 5.36 feet. At the time of testing the saturated screen length was 9.1 feet and the total saturated thickness was 11.2 feet.

Using these inputs, lower-bound transmissivity values were computed and plotted on Figure 7. As indicated, the results suggested lower-bound values ranging from about 60 to 120 gpd/ft, consistent with the estimated actual transmissivity of 158 gpd/ft.

Lateral Extent of Perched Zone

The pumping test data suggested negative boundaries and lateral limits for the tested perched zone. Consistent with this, episodes of test pumping, and well development pumping prior to testing, appeared to leave the static water level at an elevation lower than the starting level that existed before each pumping event. The observed apparent reductions in static water level were used to estimate the areal extent of the permeable perched zone.

If the perched area is visualized as a square of length dimension, L, the following equation can be derived to estimate this dimension:

$$L = \sqrt{\frac{V}{sS_y}} \tag{16}$$

where,

L = length dimension along one side of square area, in feet
V = volume pumped, in cubic feet
s = decline in water level, in feet
S_y = storage coefficient of the unconfined formation

Note that this equation is based on the assumption that the perched zone head declined by a magnitude, s, everywhere. For areally extensive perched zones, this assumption will be violated and the equation will underestimate the size of the perched area.

Two events were used to support estimates of the dimension of an equivalent square perched area. The first was based on development pumping from November 3 through November 9. During this period, 919 gallons of water (122.8 cubic feet) was pumped. As a result, the static water level dropped from 368.23 feet below land surface to 369.54 feet – a decline of 1.31 feet.

The second event used to estimate L was test 2. After the recovery from test 2 pumping, the static water level was measured at 31.72 feet above the pressure transducer 1854 minutes after pumping stopped. This was compared to the measured head 1854 minutes following the conclusion of the test 1 pumping – 32.00 feet. Thus, during test 2, the removal of 245.5 gallons of water (32.8 cubic feet) was associated with a water level decline of 0.28 feet.

Equation (16) was used to compute L for a range of storage coefficients. It was expected that the storage coefficient would range from 0.01 to 0.1, but this range was expanded to 0.001 to 0.10 for calculation purposes to see what the effect would be of the assumption of minimal gravity drainage of the sediments.

Figure 8 shows the results of the computations. It suggests a perched zone of severely limited areal extent. For example, for the most likely storage coefficient range (0.01 to 0.1), the lateral area of the perched zone is estimated to be equivalent to a square having a lineal dimension of just tens of feet. For much smaller storage coefficient values, the lineal dimension would not exceed few hundred feet.

The dimensions summarized on Figure 8 are only approximate. The actual specific yield of the pumped sediments is not known. Likewise, the perched system was never in hydraulic equilibrium because water levels continued to recover at all times. Nevertheless, the calculations suggest that the perched interval is very small.

SUMMARY

The following information summarizes the results of the pumping and recovery tests on SCI-1:

1. The hydrograph data produced ostensibly impossible results in which a given barometric pressure change caused an even greater change in the groundwater level. It was not known if this observation was a result of a defective transducer or perhaps related to an unusual elastic effect in the subsurface sediments. There was no apparent explanation for the unusual observed response.
2. Limited saturated thickness of the perched zone dictated placing the pump at the bottom of the screen. This prevented proper cooling of the pump motor, resulting in premature shutdown of the initial pumping test due to overheating of the motor. As a result, a second test was conducted.
3. Casing and filter pack storage effects were dominant and could not have been eliminated by the standard application of an inflatable packer. This difficulty was overcome by running the second test as a constant-drawdown test which successfully minimized storage effects.
4. The constant-drawdown test supported calculation of a transmissivity of 158 gpd/ft and a hydraulic conductivity of 14.1 gpd/ft^2, or 1.9 feet per day.
5. A leaky check valve allowed water standing in the drop pipe to drain back into the well during recovery, precluding the use of the recovery data for computing formation parameters. However, even if this had not occurred, it is probable that casing storage effects would have rendered the recovery data sets un-analyzable.
6. Specific capacity data suggested a lower-bound transmissivity of 60 to 120 gpd/ft, reasonably consistent with the results of the analysis of the constant-drawdown data.
7. The test data suggested negative boundary conditions.

8. Also, water levels did not recover completely following test pumping and preceding episodes of development pumping. The amount of lowering of the static water level by pumping suggested a severely limited perched zone having an area equivalent to a square with a lineal dimension on the order of just tens of feet.

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Figure 1. SCI-1 Water Temperature During Tests 1 and 2

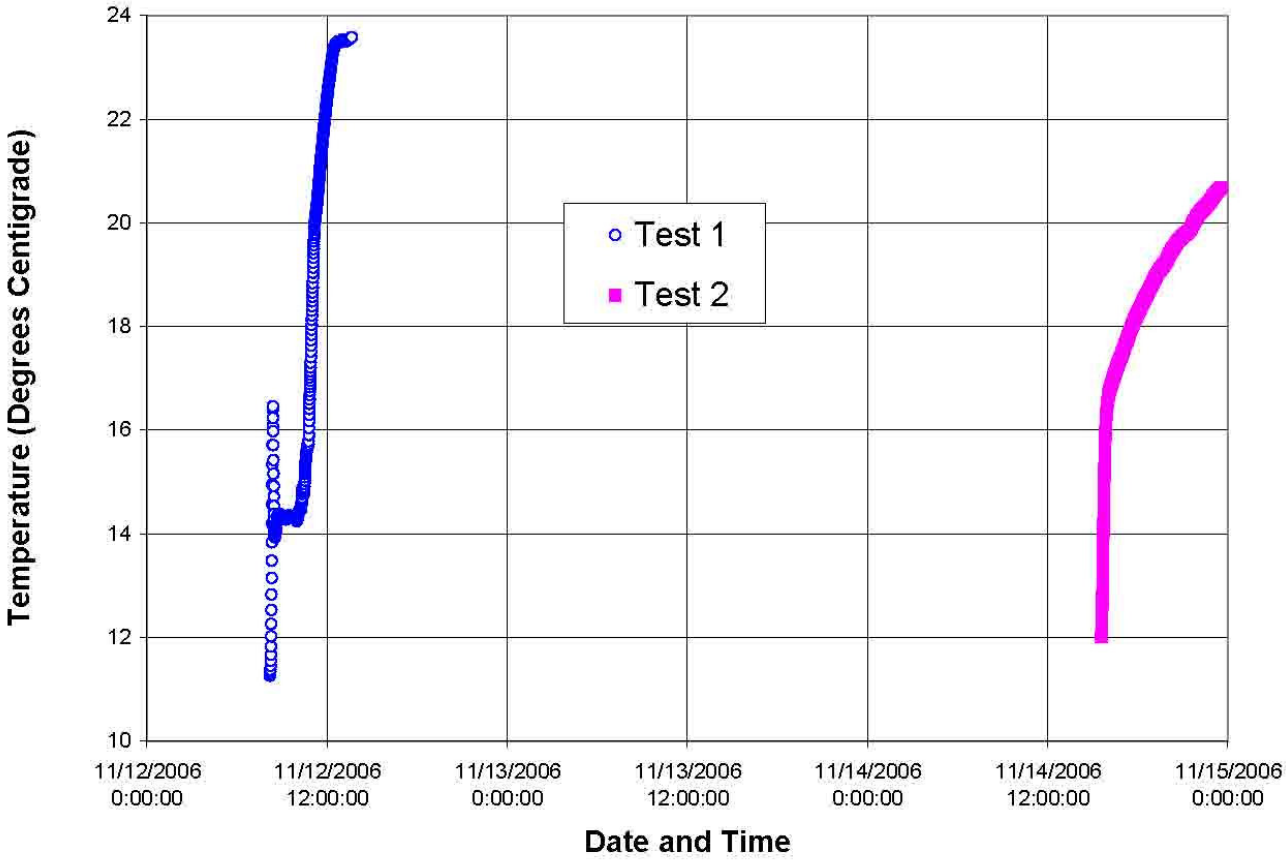


Figure 2. Comparison of SCI-1 Apparent Hydrograph and Adjusted TA-54 Barometric Pressure

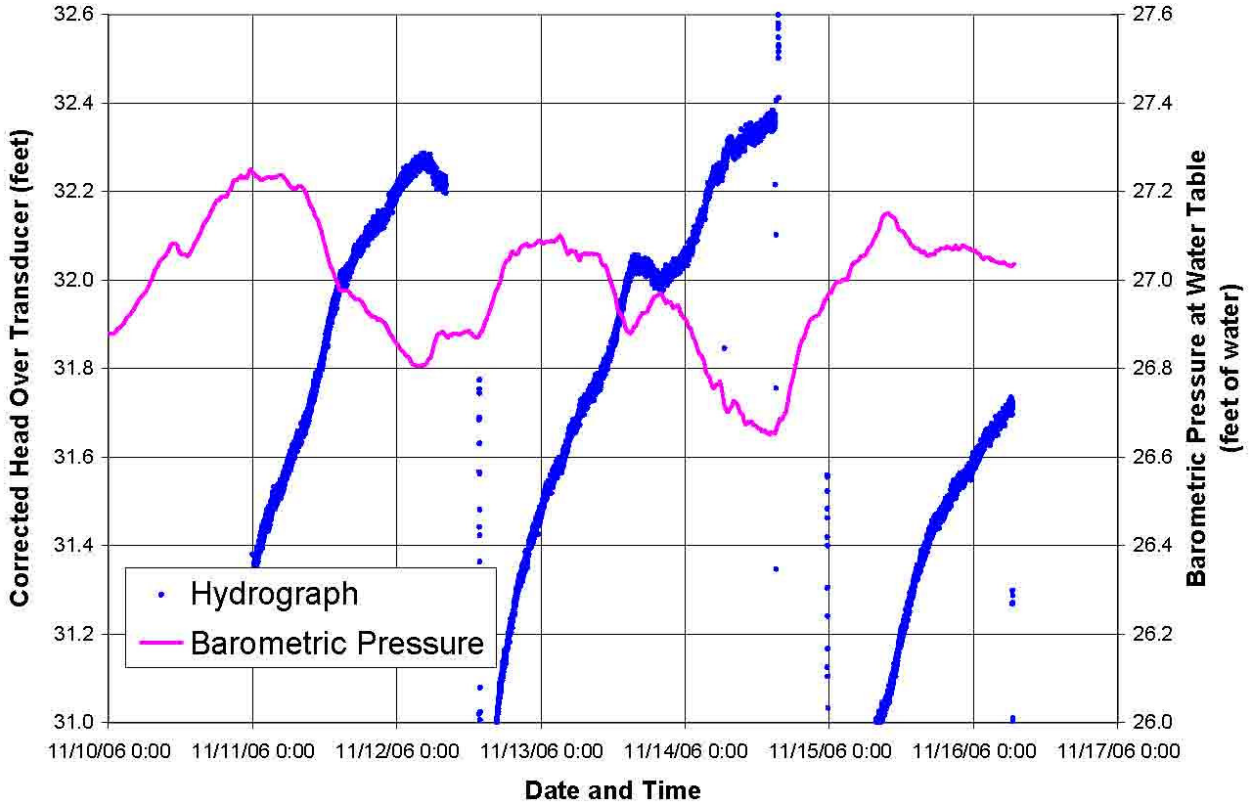


Figure 3. Well SCI-1 Test 1 Drawdown

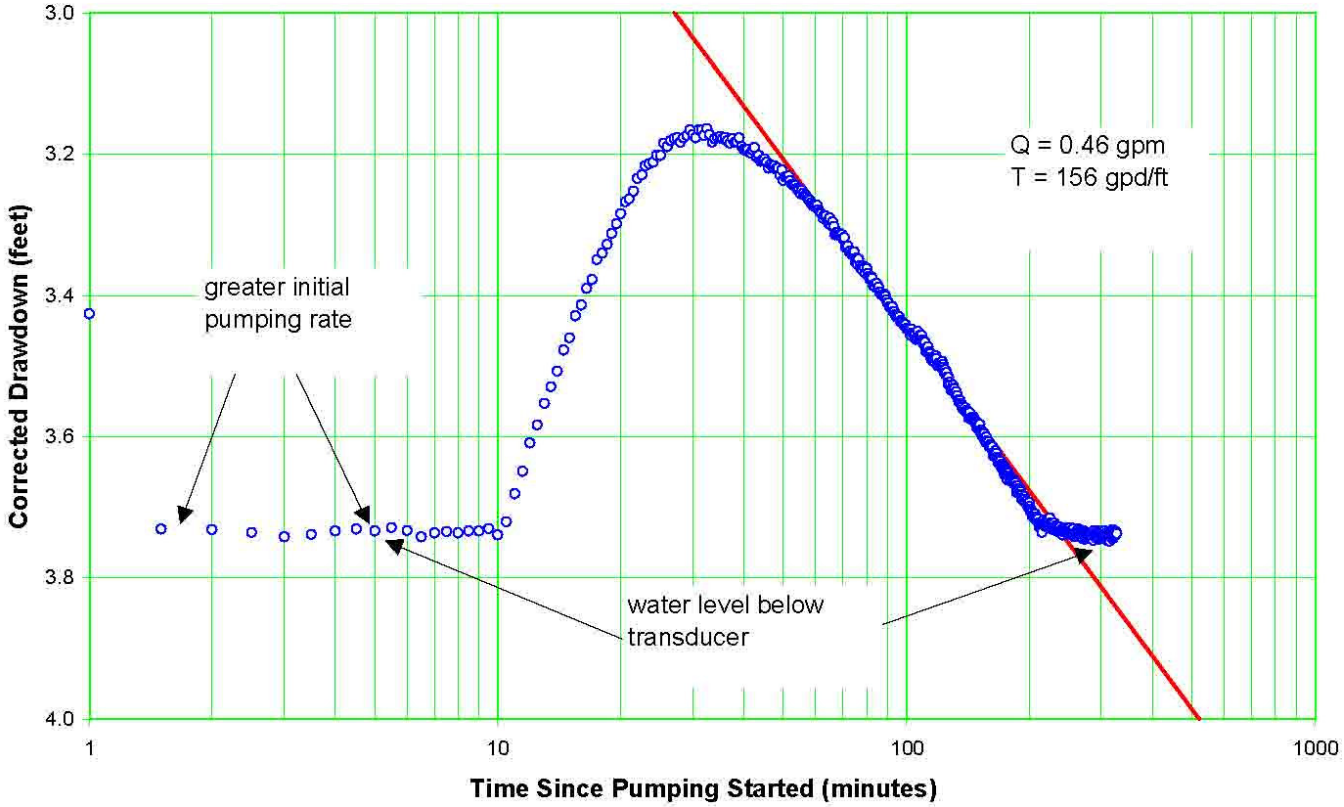


Figure 4. Well SCI-1 Test 1 Residual Drawdown

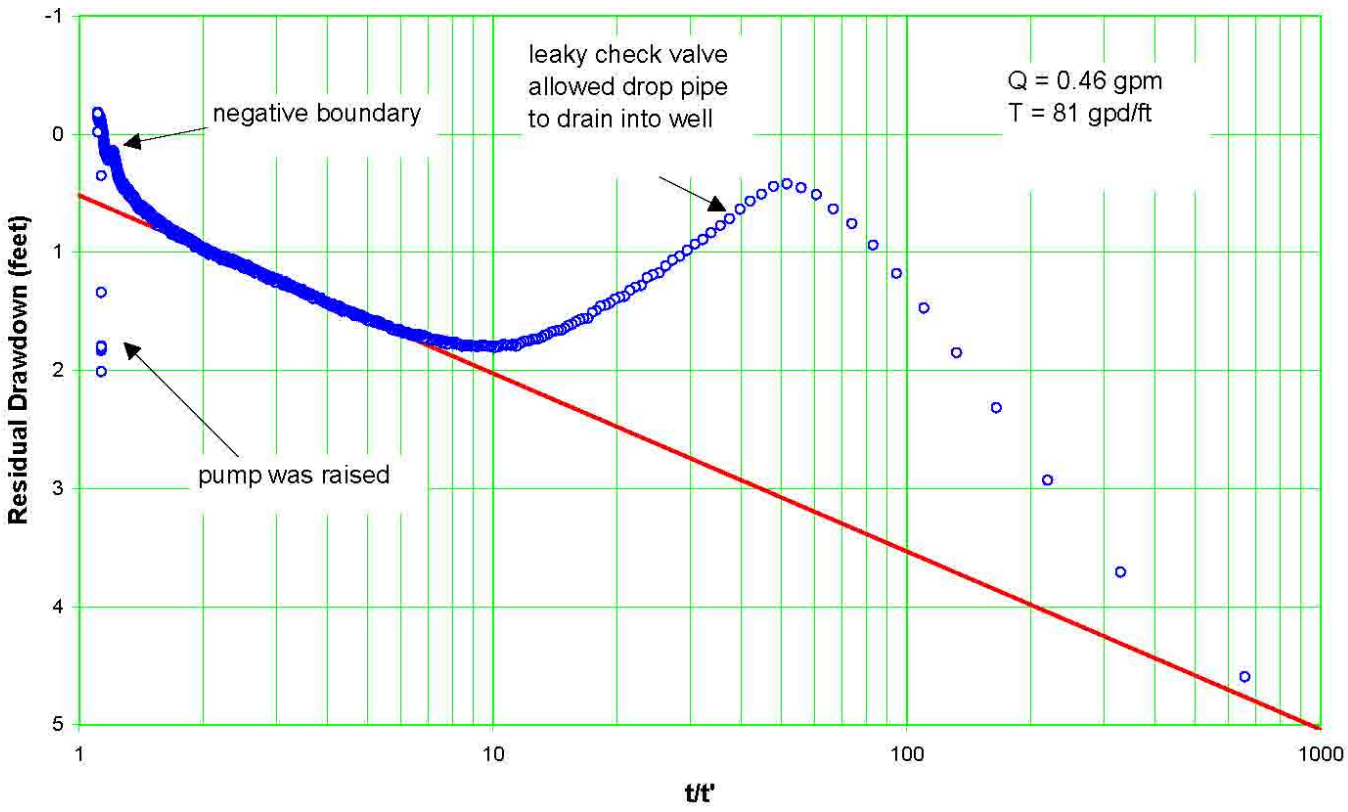


Figure 5. Well SCI-1 Test 2 Specific Drawdown

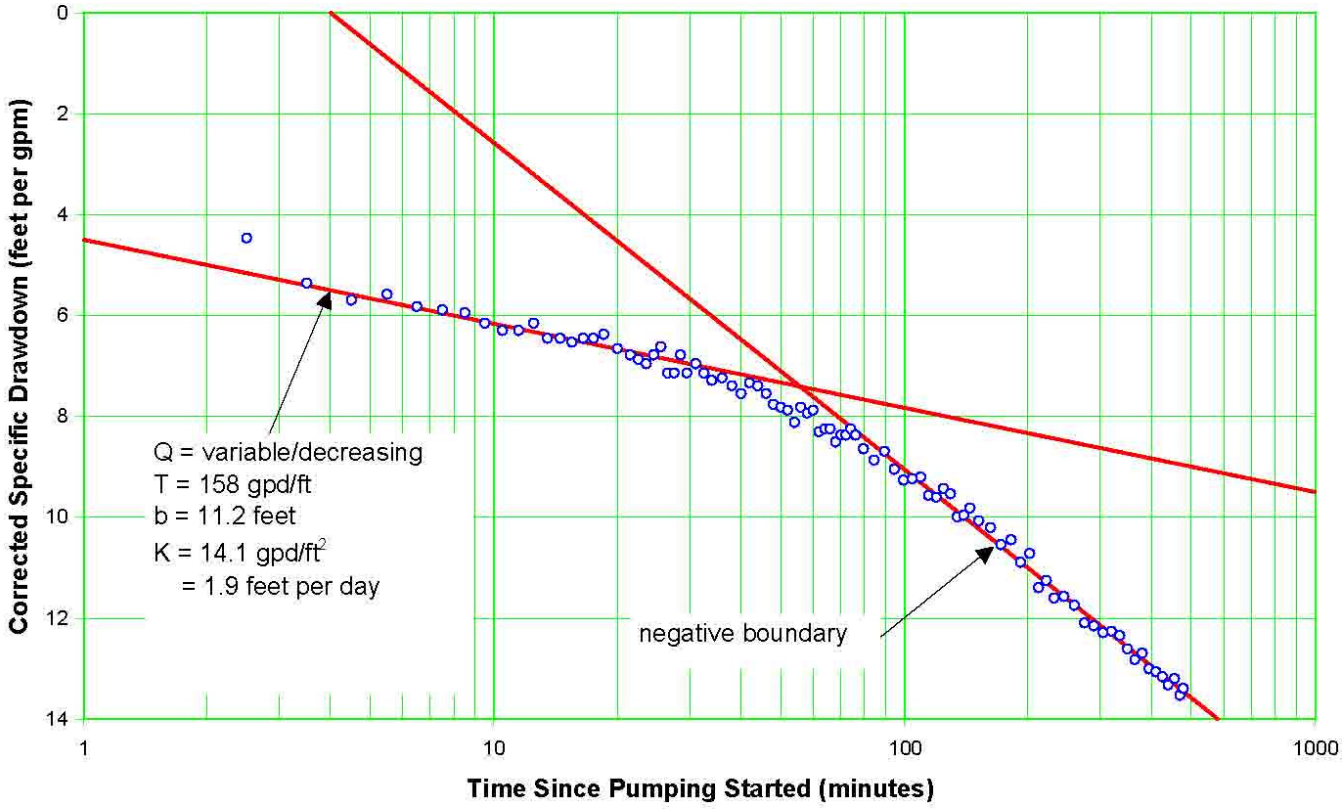


Figure 6. Well SCI-1 Test 2 Residual Drawdown

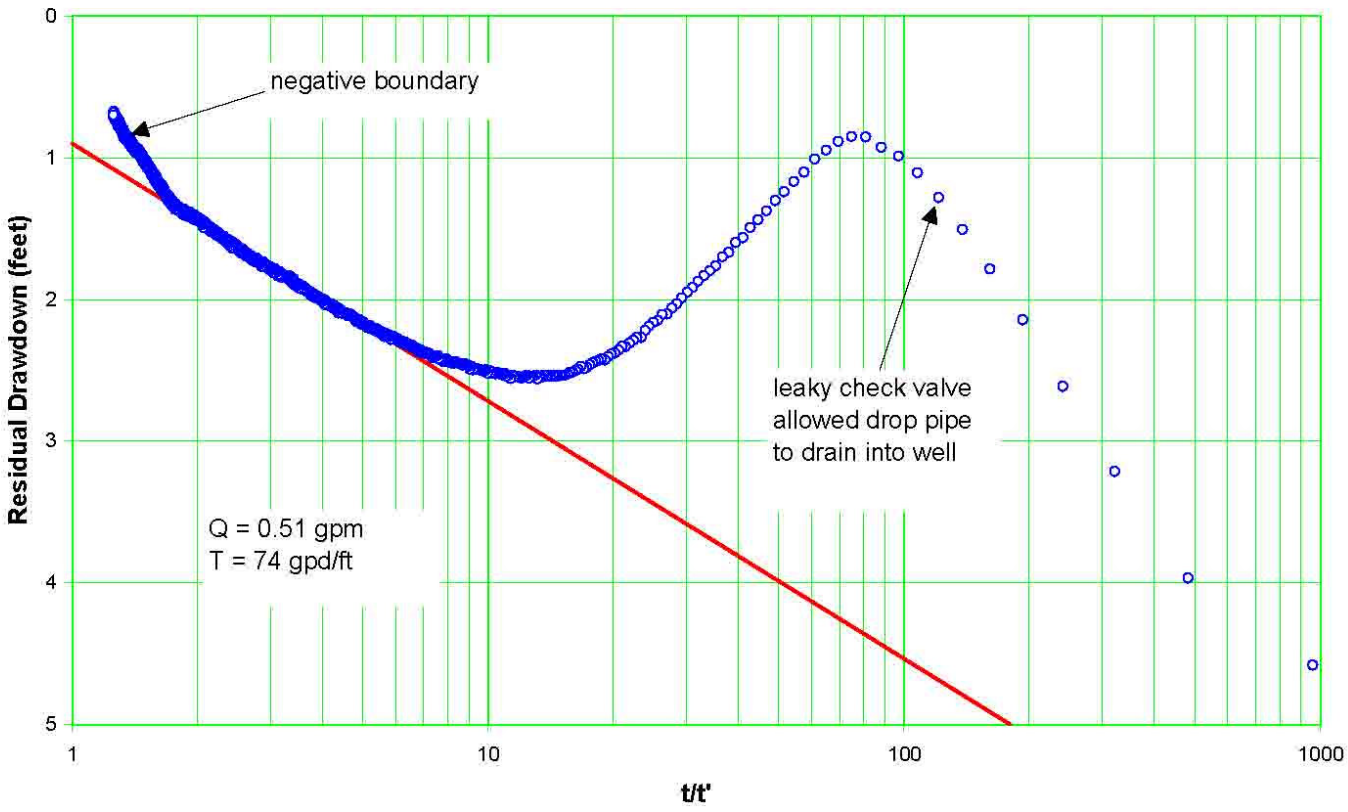


Figure 7. SCI-1 Lower-Bound Transmissivities

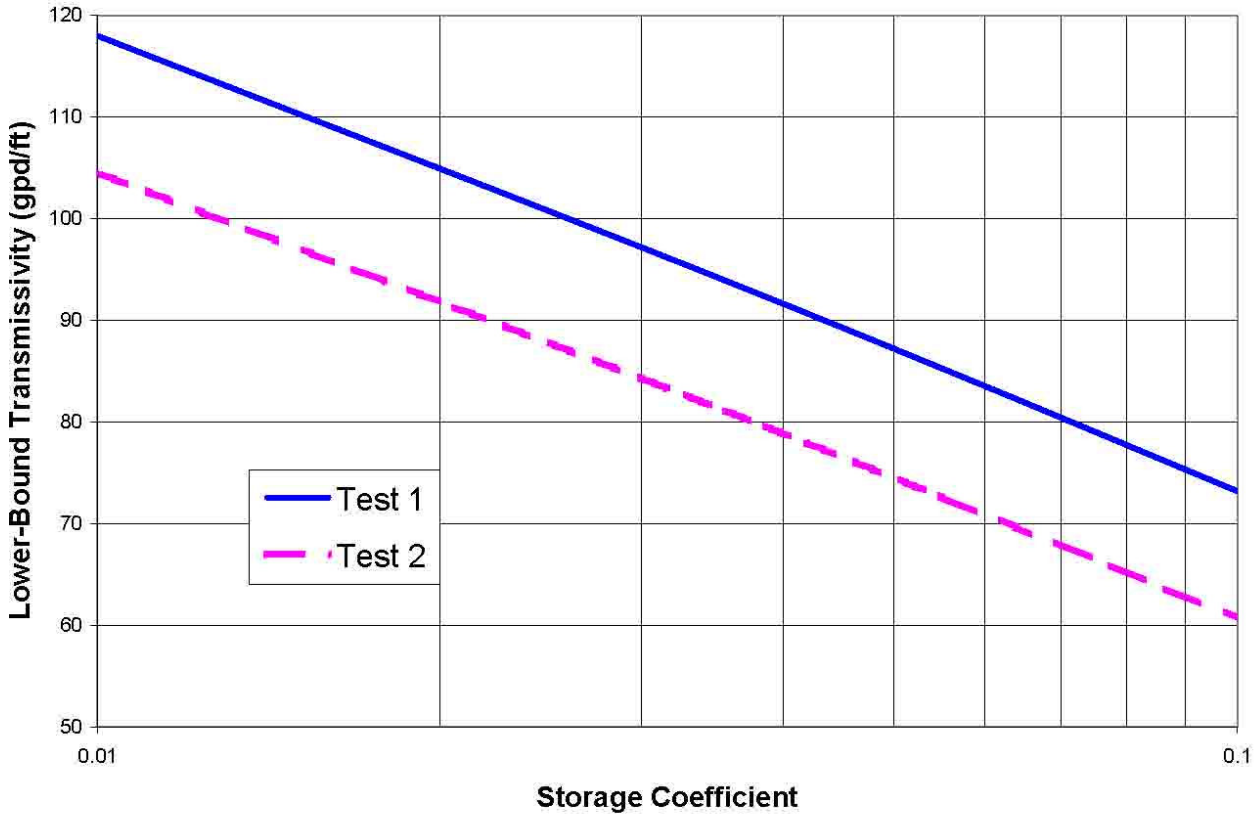
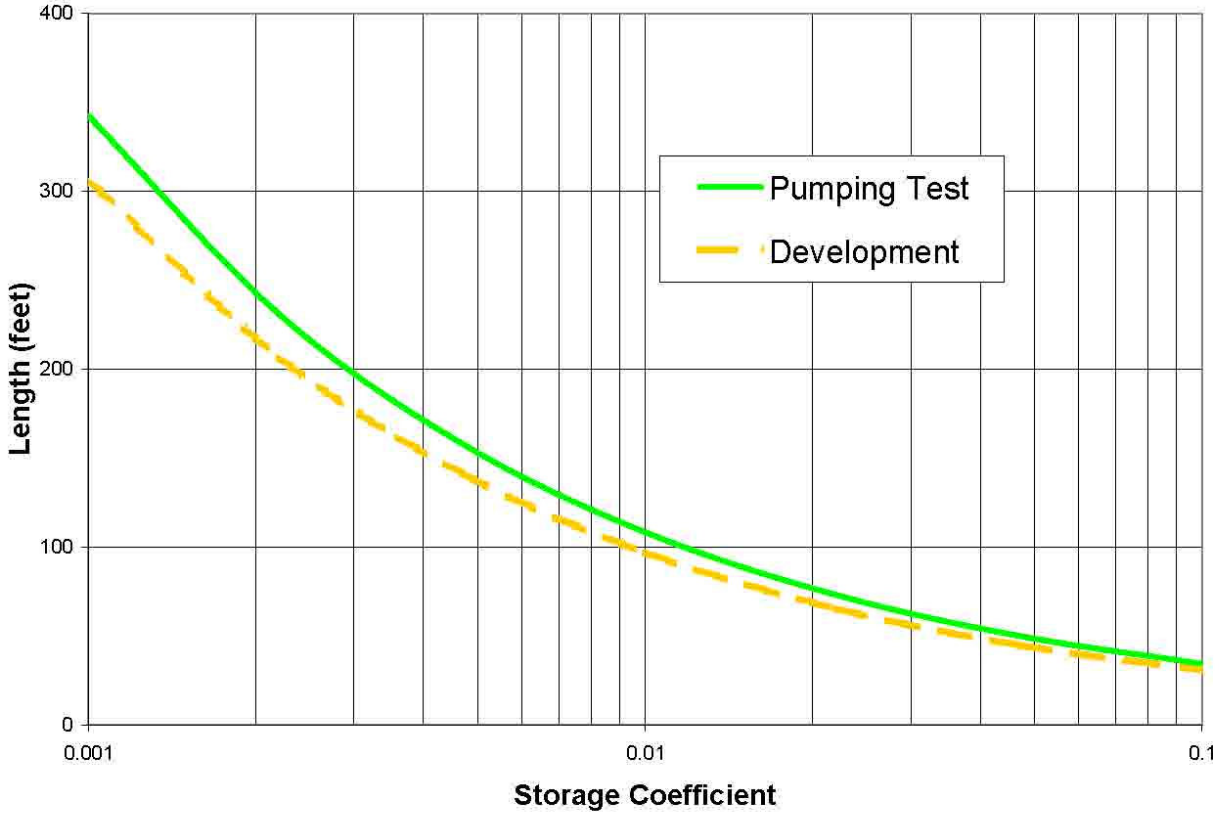


Figure 8. Length of Equivalent Square Perched Zone Area



Appendix C

Survey Data

Description	Northing	Easting	Elev
ALLUVIAL WELLS			
SCA-1 GRND	1773264.59	1622482.45	7211.22
SCA-1 CASING	1773264.37	1622482.87	7215.12
SCA-2 GRND	1770284.39	1636113.87	6748.56
SCA-2 BRASS CAP	1770283.36	1636114.63	6749.08
SCA-2 CASING	1770282.78	1636115.02	6751.65
SCA-2 MONUMENT	1770282.86	1636115.05	6752.17
SCA-3 GRND	1769920.09	1,637,200.35	6722.72
SCA-3 BRASS CAP	1769918.81	1,637,200.62	6723.22
SCA-3 MONUMENT	1769917.96	1,637,200.79	6725.69
SCA-3 CASING	1769917.84	1,637,200.75	6725.36
SCA-4 GRND	1769568.19	1,638,259.70	6703.20
SCA-4 BRASS CAP	1769567.21	1,638,260.55	6703.58
SCA-4 MONUMENT	1769566.67	1,638,261.15	6706.34
SCA-4 CASING	1769566.62	1,638,261.23	6706.13
SCA-5 GRND	1769727.42	1639878.36	6668.66
SCA-5 BRASS CAP	1769726.40	1639878.16	6669.02
SCA-5 MONUMENT	1769725.52	1639878.31	6671.56
SCA-5 CASING	1769725.47	1639878.28	6671.48
SCP-1 GRND	1769568.78	1,638,254.01	6703.24
SCP-1 BRASS CAP	1769567.80	1,638,254.68	6703.65
SCP-1 MONUMENT	1769567.23	1,638,255.42	6706.38
SCP-1A CASING	1769566.97	1,638,255.34	6706.23
SCP-1B CASING	1769567.12	1,638,255.31	6706.24
SCP-1C CASING	1769567.17	1,638,255.43	6706.25
SCP-2A GRND	1769913.99	1,637,209.35	6722.45
SCP-2A BRASS CAP	1769912.57	1,637,209.46	6722.95
SCP-2A MONUMENT	1769911.52	1,637,209.67	6725.65
SCP-2A CASING	1769911.26	1,637,209.65	6725.48
SCP-2B GRND	1769916.74	1,637,204.82	6722.57
SCP-2B BRASS CAP	1769915.56	1,637,204.82	6723.11
SCP-2B MONUMENT	1769914.58	1,637,205.11	6725.59
SCP-2B CASING	1769914.53	1,637,205.05	6725.31
COREHOLES			
SCC-1 GRND	1770300.26	1636821.97	6737.84
SCC-1 BRASS CAP	1770298.16	1636822.89	6738.27
SCC-1 MONUMENT	1770297.23	1636823.35	6740.97
SCC-1 CASING	1770297.05	1636823.65	6740.60
SCC-2 BRASS CAP	1769868.04	1637145.53	6723.74
SCC-2 GRND	1769867.81	1637145.92	6723.25

Description	Northing	Easting	Elev
SCC-3 BRASS CAP	1769575.70	1,637,740.85	6712.99
SCC-3 GRND	1769583.81	1,637,743.51	6712.64
SCC-4 BRASS CAP	1769635.60	1,637,906.51	6709.16
SCC-4 GRND	1769636.67	1,637,905.68	6708.95
SCC-5 BRASS CAP	1769450.89	1639331.58	6683.61
SCC-5 GRND	1769450.37	1639331.29	6683.11
SCC-6 BRASS CAP	1769505.80	1642266.73	6619.29
SCC-6 GRND	1769505.28	1642266.21	6618.96

Appendix D

Deviation Table

	ALLUVIAL WELLS	PIEZOMETERS	COREHOLES
NUMBER TO BE DRILLED			
Work Plan	5	2 nested (each with 3 screens)	6 (one possibly converted to a well)
Drilling Plan	5	2 nested (each with 3 screens)	6 (two possibly converted to wells)
Actual	5	1 nested (with 3 screens) and 2 separate piezometers[1]	6 (SCC-1 was converted to a well called SCI-1)
DEPTH			
Work Plan	5 through alluvium	2 through alluvium	20 ft into Cerros del Rio basalt
Drilling Plan	3 through alluvium	2 through alluvium	10-20 ft into Cerros del Rio basalt
Actual	2 (SCA-4, SCA-5) through alluvium[2]	SCP-1abc through alluvium[3]	SCC-1, 2, 3, 5, and 6 drilled 9.5-16 ft into basalt; SCC-4: drilled 1 ft into basalt[4]
HYDROLOGIC TESTING			
Work Plan	slug tests	slug tests	NA
Drilling Plan	slug tests	slug tests	Option for testing if well installed
Actual	4 tested; 1 lacks water	5 slug tests conducted	1 specific capacity test conducted at SCI-1; further hydrologic testing planned
GROUNDWATER SAMPLES			
Work Plan	None	None	Suballuvial groundwater sampled if sufficient volume present
Drilling Plan	None	None	As possible
Actual	None	None	1 shallow perched water sample collected at SCC-2; 3 intermediate perched water samples collected at SCC-1, SCC-2 and SCC-3
CORE SAMPLES			
Work Plan	None	None	Every 20 ft to Total Depth
Drilling Plan	None	None	Every 20 ft to Total Depth
Actual	None	None	Collected as specified.
CORE ANALYSES			
Work Plan	None	None	TAL[5] metals, anions, total organic carbon, moisture content
Drilling Plan	None	None	Every 20 ft:TAL metals, anions, total organic carbon, nitrogen isotopes, moisture content. Every 40 ft: tritium, rad screening
Actual	None	None	Collected as specified in Drilling Plan

[1] SCP-2a and 2b were installed near from SCA-3, which functions as the third piezometer.

[2] Flowing sands in SCA-3 prevented drilling to bedrock.

[3] Depths for SCP-2a and 2b were modified based on information gained from nearby SCA-3.

[4] Due to mechanical problems with the core barrel.

[5] TAL - Target analyte list.

Appendix E

Waste Characterization Sampling

Appendix E – Waste Characterization Sampling

Investigation-Derived Waste

The following waste streams were generated in the Sandia Canyon drilling program:

1 - Borehole Cuttings
2 - Drilling Fluids
3 - Decontamination Water
4 - Development and Hydrologic Testing Water
5 - Spent Personal Protective Equipment and sampling supplies (contact waste)
6 - Municipal Solid Waste (MSW)
7 - Petroleum-Contaminated Soil (PCS)
8 - Filters from the dust hog

The waste streams are being managed in five accumulation areas pending the receipt of analytical results as outlined in the Waste Characterization Strategy Form (WCSF) and Amendment [Appendix B of the Final Sandia Canyon Drilling Plan (Kleinfelder 2006)]. The accumulation areas are located at SCC-1, SCC-2, SCC-3/SCC-4, SCC5 and SCC-6. Each area has straw bale berms covered and lined with Visqueen plastic.

Borehole cuttings from the coreholes are stored in roll-ff bins and cuttings from the wells and piezometers are stored in 55-gallon (gal.) drums. Drilling fluids and decontamination water are stored in 55-gal. drums; development and hydrologic testing water is stored in 55-gal. drums and one 3,000-gal. poly tank. Contact waste and Dust Hog filters are also stored in 55-gal. drums. One 55-gal. drum of PCS was generated during the drilling program.

The various waste streams have been sampled in accordance with the WCSF and Amendment presented in Appendix B of the Final Sandia Canyon Drilling Plan (Kleinfelder 2006). Waste disposal will commence once the analytical results for the waste streams are received.

If waste is identified as hazardous, it will be disposed of at an approved LANL hazardous waste landfill. If waste is identified as low-level radioactive waste, disposal will be at TA-54, Area G. Should the analysis reveal that the wastes are non-regulated, Kleinfelder personnel will coordinate with the DOE project representative to manage the non-regulated waste. The wastes will be thin-spread on site after DOE approval is received.