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Appendix 1

Abbreviations

Abbreviations

$\theta(h)$	Soil moisture content as a function of the soil water potential head
α, n, m	Empirical constants for the van Genuchten equation
ρ_{H2O}	Density of water
θ_{fc}	Water content at field capacity
θ_a	Ambient water content
$\theta_r(h)$	Residual water content
$\theta_s(h)$	Saturated water content
b	Thickness of saturate formation
BOD_5	Five day biochemical oxygen demand
C_e	Measured concentration in the deionized water leachate solution
COA	City of Albuquerque
COD	Chemical oxygen demand
C_p	Concentration of the constituent in the soil pore water
EG01	Elena Gallegos monitoring well
ft/d	feet per day
g	grams
GPPAP	Groundwater Protection Policy and Action Plan
G_s	Specific gravity of soil
h	Soil water potential head
i	Infiltration rate
K	Saturated hydraulic conductivity
K(h)	Unsaturated hydraulic conductivity as a function of soil water potential head
K_f	Hydraulic conductivity across fault zone
kJ/mol	kilojoules per mole
K_s	Saturated hydraulic conductivity of soil
K_{unsat}	Unsaturated hydraulic conductivity
LUST	Leaking Underground Storage Tank
MBAS	Methylene Blue Active Substances
MOC	Method of Characteristics groundwater contaminant transport model
mg/L	milligrams per liter
M_s	mass of the soil sample used in the extraction
M_w	Mass of the deionized water used in the extraction procedure
NH_3	Ammonia
NH_4^+	Ammonium
NO_2^-	Nitrite
NO_3^-	Nitrate
OSE	Office of the State Engineer
PO_4^{3-}	Phosphate
PR01	Pinon Ridge monitoring well number 1
q	Volumetric flow rate per unit length
Q	Volumetric flow rate
SH01	Sandia Heights monitoring well number 1
SH02	Sandia Heights monitoring well number 2

SH03 Sandia Heights monitoring well number 3
SO_4^{2-} Sulfate
SP01 Sandia Park monitoring well number 1
SP02 Sandia Park monitoring well number 2
SWMS-2D Computer code for modeling flow through unsaturated soils
SV01 Sierra Vista monitoring well number 1
T_f Transmissivity across a fault zone
TKN Total Kjeldahl Nitrogen, an aggregate test of reduced nitrogen compounds that includes ammonia and organic compounds containing nitrogen
Total N Sum of all nitrogenous compounds except molecular nitrogen including: organic compounds containing nitrogen, ammonia and ammonium, nitrite, and nitrate.
Total P Sum of all compounds containing phosphorous
TRACR3D Computer code for contaminant transport through the vadose zone
V Volume of soil between the water table and the leach field
V_s Volume of solids in a soil sample
w Gravimetric water content
W_s Weight of solids in a soil sample

Appendix 2

Well Records for the Mhoon and Elena Gallegos Wells

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

Section 1. GENERAL INFORMATION

(A) Owner of well [illegible] Owner's Well No. [illegible]-73224
Street or Post Office Address [illegible]
City and State [illegible]

Well was drilled under Permit No. [illegible]-31,924 and is located in the:

a. ____ ¼ ____ ¼ ____ ¼ ____ ¼ of Section 14 Township 11N Range 4E N.M.P.M.

b. Tract No. 3 unit 2 of Map No. ____ of the Sandia Heights South

c. Lot No. ____ of Block No. ____ of the ____
Subdivision, recorded in Bernalillo County.

d. X= ____ feet, Y= ____ feet, N.M. Coordinate System ____ Zone in the ____ Grant.

(B) Drilling Contractor [illegible] License No. WD-477

Address South Route, Algonquin, N.Y. 12015

Drilling Began 3-[illegible]-79 Completed 3-[illegible]-79 Type tools rotary Size of hole 6¼ in.

Elevation of land surface or ____ at well is ____ ft. Total depth of well 520 ft.

Completed well is ☒ shallow ☐ artesian. Depth to water upon completion of well 455 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
444	450	16	Hard Frac. Granite	15

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet Top	Depth in Feet Bottom	Length (feet)	Type of Shoe	Perforations From	Perforations To
5 9/16	Steel		0	520	20		440	430
							420	420

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement

Section 5. PLUGGING RECORD

Plugging Contractor ____
Address ____
Plugging Method ____
Date Well Plugged ____
Plugging approved by:
State Engineer Representative

No.	Depth in Feet Top	Depth in Feet Bottom	Cubic Feet of Cement
1			
2			
3			
4			

19 MAR 13 P1:22

FOR USE OF STATE ENGINEER ONLY

Date Received March 13, 1979

Quad ____ FWL ____ FSL ____

File No. [illegible]-2174 Use Dom Location No. Tr. 3 Unit 2 SANDIA HEIGHTS SOUTH

Section 6. LOG OF HOLE

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	14	14	Gray Decom. Granite
14	46	32	Brown Gravel & boulders
46	97	51	Gray Decom. Granite
97	134	37	Brown Clay
134	166	32	Grey hard Granite
166	234	53	brown Sandy Clay
234	2[illegible]	[illegible]	brown Clay
2[illegible]4	312	13	White Sand
[illegible]	372	[illegible]	Brown Sandy Clay
372	4[illegible]6	2[illegible]	Grey Hard Granite
4[illegible]	432	31	Brown Clay
432	453	26	Gray Frac. Granite
453	474	11	Gray Hard Granite
474	506	32	Gray Frac. Granite
506	520	14	Brown Clay

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

W H. Atkinson
Driller

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

Section 1. GENERAL INFORMATION

(A) Owner of well: City of Albuquerque — Owner's Well No. _____
Street or Post Office Address: Parks & Recreation
City and State: Albuquerque, NM

Well was drilled under Permit No. RG-39434 and is located in the:

a. ____ ¼ ____ ¼ ____ ¼ ____ ¼ of Section ____ Township ____ Range ____ N.M.P.M.

b. Tract No. ____ of Map No. ____ of the ____

c. Lot No. ____ of Block No. ____ of the ____
Subdivision, recorded in ____ County.

d. X= ____ feet, Y= ____ feet, N.M. Coordinate System ____ Zone in the ____ Grant.

(B) Drilling Contractor: Rodgers & Company, Inc. — License No. WD-225

Address: 2615 Isleta Blvd., S.W. Albuquerque, NM

Drilling Began: 6/2/83 Completed: 6/3/83 Type tools ____ Size of hole ____ in.

Elevation of land surface or ____ at well is ____ ft. Total depth of well: 105' ft.

Completed well is: [XX] shallow [ ] artesian. Depth to water upon completion of well: 28' ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
20'	105'		Small gravel with clay, decomposed granite, coarse sand, sandstone, cemented gravel	6 g.p.m.

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet Top	Depth in Feet Bottom	Length (feet)	Type of Shoe	Perforations From	Perforations To
5 5/8"	O.D.		+1'	95'	96'	None	20'	95'

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement

83 JUN 27 AM 11:53
STATE ENGINEER OFFICE
DISTRICT II
ALBUQUERQUE, N. MEX.

Section 5. PLUGGING RECORD

Plugging Contractor ____
Address ____
Plugging Method ____
Date Well Plugged ____
Plugging approved by: ____
State Engineer Representative

No.	Depth in Feet Top	Depth in Feet Bottom	Cubic Feet of Cement
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received: 6/27/83

Quad ____ FWL ____ FSL ____

File No. RG-39434 Use: Dom Location No. Tr B Elena Gallegos Grant

Section 6. LOG OF HOLE

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0'	25'		Small gravel with clay
25'	60'		Decomposed granite with coarse sand
60'	80'		Cemented gravel with coarse sand
80'	90'		Sandstone
90'	105'		Cemented gravel with sand

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Arthur Silva
Driller

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1(a) and Section 5 need be completed.

Appendix 3

Drilling Logs for all Monitoring Wells

Cedar Hill Site (Sandia Heights)

Logged by: Grover T11N R4E 14.1313

Date: 18 Aug 1997 South east corner of Cedar Hill + Tennyson

Sample No. (~~HRP~~)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	0-5		5YR 7/6	0%	5%	95%	GW	50% K-spar 45% Plag	W M P G M P	A SA SR R A SA SR R	Fines may have been washed out 12mm
	5-10		2.5YR 5/3	40%	15%	35%	GM	50% K-spar 45% Plag	W M P G M P	A SA SR R A SA SR R	11mm
	10-15		2.5YR 6/1.5	<5%	30%	65%	GW sandy gravel	50% Kspar 45% Plag	W M P G M P	A SA SR R A SA SR R	12mm
	15-20		2.5YR 6/1.5	<5%	20%	75%	GW	45% Kspar & 45% plag 7% darks 3% quartz	W M P G M P	A SA SR R A SA SR R	11mm
	20-25		5YR 5/2	25%	20%	55%	GM	Plag, Kspar, quartz 7% darks	W M P G M P	A SA SR R A SA SR R	12mm
	25-30		5YR 5/1	5%	25%	70%	GW	Plag, Kspar, quartz darks	W M P G M P	A SA SR R A SA SR R	12mm
	30-35		10R 4/2	<5%	30%	65%	GW	Plag, Kspar, quartz darks	W M P G M P	A SA SR R A SA SR R	7mm
	35-40		10R 6/2	0%	60%	45%	SW	Plag, Kspar, quartz, darks	W M P G M P	A SA SR R A SA SR R	23mm
	40-45		10R 6/2	0%	10%	90%	GW sandy gravel	Plag, Kspar, quartz darks	W M P G M P	A SA SR R A SA SR R	5mm less size range in gravel Virtually no sand
	45-50		2.5YR 5/3	<5%	45%	50%	GW sandy gravel	Plag, quartz, Kspar darks	W M P G M P	A SA SR R A SA SR R	12mm

Cedar Hill (Sandia Hts)

Logged by: LISA VAN TASSELL & Gwinn Hall
Date: 8/18 1997

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	50-55		10R 6.5/3	20%	45%	35%	silty-gravelly GM sand	Kspar, Plag, quartz darks	W M P G M P	A SA SR R A SA SR R	12mm Break >fines
	55-60		10R 6/2	10%	30%	60%	GW	Plag, Kspar, quartz darks	W M P G M P	A SA SR R A SA SR R	10mm
	60-65		10R 5/3	<5%	40%	55%	GW	Plag, Kspar, quartz darks	W M P G M P	A SA SR R A SA SR R	5mm
	65-70		10R 5/2	<5%	35%	60%	GW	Plag, Kspar, quartz, darks	W M P G M P	A SA SR R A SA SR R	10mm Very little fines
	70-75		10R 5/3	<5%	40%	55%	GW	Kspar, Plag, quartz, darks	W M P G M P	A SA SR R A SA SR R	5mm
	75-80		10R 6/2	10%	40%	45%	GM	Plag, Kspar, darks quartz	W M P G M P	A SA SR R A SA SR R	5mm
	80-85		10R 5/2	15%	30%	65%	GW	Kspar, Plag, quartz darks	W M P G M P	A SA SR R A SA SR R	10mm
	85-90		10R 6/2	10%	60%	30%	SW	Kspar, Plag, quartz darks	W M P G M P	A SA SR R A SA SR R	11mm
	90-95		2.5YR 7/3	20%	60%	20%	SW	Kspar, Plag, quartz darks	W M P G M P	A SA SR R A SA SR R	13mm larger # of fines
	95-100		10R 6/2.5	5%	45%	50%	GW	Kspar, Plag, quartz	W M P G M P	A SA SR R A SA SR R	13mm

Cedar Hill (Sandia Heights)

Logged by: Lisa VanTassel, Guinn Hall, + Maya Clausche
Date: 8/19 1997

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	100-105	10YR 6/4		10	10	80	GP	Quartz, feldspar, dark	W (M) P (G) M P	A (SA) SR R A SA (SR) R	lgst clast = 8×5mm
	105-110	5YR 6/4		<5	30	65	GW	Quartz, feldspar, darks	(W) M P (G) M P	(A SA SR) R A (SA SR) R	Almost no fines lgst clast = 9×4mm
	110-115	5YR 6/3		<5	20	75	GW	Quartz, feldspar, darks, (micas)	(W) M P (G) M P	A (SA SR) R (A SA) SR R	lgst clast = 7×9mm
	115-120	5YR 6/3		<5	30	65	GW	Quartz, feldspar darks, (micas)	(W) M P (G) M P	A (SA SR) R (A SA) SR R	lgst clast = 8×11mm
	120-125	2.5YR 5/6		<5	75	20	SW	Quartz, feldspar, darks	W M (P) (G) M P	A (SA SR) R (A SA) SR R	Shifts to a more sand rich sediment lgst clast = 7×3mm
	125-130	5YR 6/4		<5	20	75	GW	Quartz, feldspar darks	W (M) P (G) M P	(A SA) SR R A (SA SR) R	back to predominantly gravel lgst clast = 5×12mm
	130-135	5YR 5/4		<5	20	75	GW	Quartz, feldspar, dark	(W) M P (G) M P	A (SA SR) R (A SA) SR R	lgst clast = 4×13mm
	135-140	7.5YR 6/4		10	30	60	GW	Quartz, feldspar, dark, (micas)	(W) M P (G) M P	A (SA SR) R (A SA) SR R	reappearance of fines lgst clast = 8×11mm
	140-145	7.5YR 5/3		<5	75	20	SW	Quartz, feldspar, dark, (micas)	W M (P) (G) M P	A (SA SR) R (A SA) SR R	Shift to sand predominance lgst clast = 4×8mm
	145-150	7.5YR 6/6		5	35	60	GW	Quartz, feldspar dark, micas	(W) (M) P (G) M P	A (SA SR) R (A SA) SR R	lgst clast = 3×6mm

Cedar Hill (Sandia Heights)

Logged by: Lisa Van Tassel & Maya Clauschee
Date: 8/19 1997

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	150-155	7.5YR5/4		<5	30	65	GW	Quartz, feldspars dark, micas	W M P G M P	A SA SR R A SA SR R	lgst clast = 6×11mm
	155-160	7.5YR6/4		<5	35	60	GW	Quartz, feldspars, darks	W M P G M P	A SA SR R A SA SR R	lgst clast = 5×12mm
	160-165	5YR5/6		<5	20	75	GW	Quartz, feldspar, dark, micas (pyrite)	W M P G M P	A SA SR R A SA SR R	lgst clast = 6×13mm
	165-170	5YR6/6		<5	60	35	SW	Quartz, kspar, plag. dark, micas	W M P G M P	A SA SR R A SA SR R	lgst clast = 5×9mm
	170-175	5YR6/6		<5	60	35	SW	Quartz, feldspars, darks, pyrite	W M P G M P	A SA SR R A SA SR R	lgst clast = 4×9mm
	175-180	5YR5/4		<5	30	65	GW	Quartz, feldspar, darks, micas, pyrite	W M P G M P	A SA SR R A SA SR R	lgst clast = 4×11mm
	180-185	10YR5/4		45	50	<5	SM	Quartz, feldspar, micas, darks	W M P G M P	A SA SR R A SA SR R	major shift to fine sediment. lrgst clast = 1×1.5mm
	185-190	10YR6/4		<5	45	50	SW	Quartz, feldspars, darks	W M P G M P	A SA SR R A SA SR R	lrgst clast = 3×5mm
	190-195	10YR6/4		5	40	55	GW	Quartz, feldspars, darks, micas	W M P G M P	A SA SR R A SA SR R	lrgst clast = 7×12mm
	195-200	7.5YR6/4		<5	15	80	GW	Quartz, feldspars darks	W M P G M P	A SA SR R A SA SR R	lrgst clast = 9×11mm

UNM Monitor Well
SH03
Logged by: Gwinn Hall
Date: 26 Aug 1997

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Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	200-205	—	10R 7/2	<1	40	60	GP	Qtz, Kspar, Plag darks	W (M) P (G) M P	A (SA) SR) R A (SA) SR R	10 mm largest
	205-210		10R 7/2	<1	60	40	GP	Qtz, Kspar, Plag darks	W (M) P (G) M P	A (SA) SR) R A (SA) SR R	12 mm largest
	210-215		10R 7/2	<3	75	25	SW	a.a.	(W) (M) P (G) M P	A (SA) SR) R A (SA) SR R	11 mm largest
	215-220		10R 7/2	<1	80	20	SW	a.a.	W (M) P (G) M P	A (SA) SR) R A (SA) SR R	6 mm largest
	220-225		10R 7/2	<1	90	10	SW	a.a.	(W) M P (G) M P	A (SA) SR) R A (SA) SR R	4 mm largest
	225-230		10R 7/3	<1	90	10	SW	a.a.	(W) M P (G) M P	A (SA) SR R A (SA) SR R	9 mm largest
	230-235		10R 7/2	<3	90	7	SW	a.a.	(W) M P (G) M P	A (SA) SR R A (SA) SR R	4 mm largest
	235-240		10R 7/2	<1	98	<1	SW	a.a.	W (M) P (G) M P	A (SA) SR) R A (SA) SR R	—
	240-245		10R 7/2	<1	95	3	SW	a.a.	W (M) P (G) M P	A (SA) SR R A (SA) SR R	4 mm largest
	245-250	—	10R 6/3	<1	96	3	SW	a.a.	(W) M P (G) M P	A (SA) SR) R A (SA) SR R	7 mm largest

UNM Monitoring Well
SH03

Logged by: Gwinn Hall + Maya Clauschee
Date: 8/26 1997

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	250-255		10R 6/3	<1	96	3	SW	Quartz, K-spar, Plag, darks	W M P G M P	A SA SR R A SA SR R	6mm largest
	255-260		10R 7/3	<1	96	3	SW	Quartz, K-spar, plag, darks	W M P G M P	A SA SR R A SA SR R	4mm largest
	260-265		10R 6/2	<1	98	<1	SW	Qtz, K-spar, plag, darks	W M P G M P	A SA SR R A SA SR R	4mm largest
	265-270		10R 6/2	<1	96	3	SW	a.a	W M P G M P	A SA SR R A SA SR R	5mm largest
	270-275		10R 6/2	<1	96	<3	SW	a.a	W M P G M P	A SA SR R A SA SR R	5mm largest
	275-280		10R 7/2	<1	98	1	SW	a.a.	W M P G M P	A SA SR R A SA SR R	2mm largest
	280-285		10R 6/2	<1	59	40	SP	a.a	W M P G M P	A SA SR R A SA SR R	7mm largest
	285-290		10R 6/3	<5	75	20	SW	a.a	W M P G M P	A SA SR R A SA SR R	6mm lgst
	290-295		10R 6/2	<1	89	10	SW	a.a	W M P G M P	A SA SR R A SA SR R	5mm largest
	295-300		10R 6/2	<1	95	5	SW	a.a	W M P G M P	A SA SR R A SA SR R	4mm largest

CWM Monitoring Well
SH03
Logged by: Marge Clouchek + Karen Hall
Date: 26 Aug 1997

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	300-305		10R 7/2	<1	98	<1	SW	Quartz, Plag, K-Spar, darks	W (M) P (G) M P	A (SA SR) R A (SA) SR R	
	305-310		10R 6/2	<1	94	5	SW	Quartz, Plag, K-spar, darks	(W) M P (G) M P	A (SA SR) R (A SA) SR R	4mm largest
	310-315		10R 6/2	<1	94	5	SW	a.a.	(W) M P (G) M P	A (SA SR) R (A SA) SR R	5mm largest
	315-320		10R 6/2	<1	95	5	SW	Kspar, Plag, Quartz, darks	(W) M P (G) M P	A (SA) SR R A (SA) SR R	6mm largest
	320-325		10R 7/3	<1	90	10	SW	a.a	(W) M P (G) M P	(A SA) SR R (A SA) SR R	10mm largest
	325-330		10R 6/2	<1	25	75	GW	a.a	(W) M P (G) M P	A (SA SR) R (A SA) SR R	10mm largest some limestone
	330-335		10R 6/2	<1	20	80	GW	a.a.	W M (P) (G) M P	A (SA SR) R (A SA) SR R	8mm largest
	335-340		10R 6/3	<1	<1	98	GW	Quartz, K spar, SS, LS, Granite	W M (P) (G) M P	(A SA) SR R (A SA) SR R	14mm largest
	340-345		10R 6/3	<3	85	12	SW	Kspar, Quartz Plag, darks	(W) M P (G) M P	A SA SR R A SA SR R	7mm largest
	345-350		10R 6/3	<1	98	1	SW	Quartz, Plag, K-spar, darks	(W) M P (G) M P	A (SA SR) R A (SA SR) R	5mm largest

UNM Monitoring Well
SH03

Logged by: Gwinn Hall & Maya Clauschee
Date: Aug 26 1997

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Remarks
	350-355		10R5/2	<1	98	1	SW	Quartz, Kspar, Plag, darks	W M P G M P	A SA SR R A SA SR R	4mm largest
	355-360		10R7/2	<1	98	1	SW	a.a	W M P G M P	A SA SR R A SA SR R	5mm largest
	360-365		10R6/2	<1	98	1	SW	Plag, Quartz, Kspar, dark	W M P G M P	A SA SR R A SA SR R	4mm largest
	365-370		10R 6/2	<1	96	3	SW	a.a.	W M P G M P	A SA SR R A SA SR R	4mm largest
	370-375		10R6/2	<3	87	10	SW	Plag, Quartz, Kspar, dark	W M P G M P	A SA SR R A SA SR R	9mm largest
	375-380		10R5/2	<1	89	10	SW	Plag, Kspar, quartz, dark	W M P G M P	A SA SR R A SA SR R	largest 8mm
	380-385		10R5/2	<1	84	15	SW	Plag, quartz, Kspar, dark	W M P G M P	A SA SR R A SA SR R	largest 12mm
	385-390		10R5/2	<1	94	5	SW	Quartz, Plag, Kspar, dark	W M P G M P	A SA SR R A SA SR R	largest 5mm
	390-395		10R6/2	<1	92	7	SW	Plag, Kspar, quartz, dark	W M P G M P	A SA SR R A SA SR R	largest 8mm
	395-400		10R5/2	<1	94	5	SW	Kspar, quartz, Plag, dark	W M P G M P	A SA SR R A SA SR R	largest 10mm

Logged by: LISA VAN TASSELL
Date: 8/27 1997

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	400-405		10R 5/2	<1	96	3	SW	Quartz, Plag, Kspar, dark	W M P G M P	A SA SR R A SA SR R	largest 6mm
	405-410		10R 6/2	<1	97	2	SW	Quartz, Plag, Kspar, dark	W M P G M P	A SA SR R A SA SR R	largest 7mm
	410-415		10R 5/2	<1	98	1	SW	Plag, Quartz, Kspar, dark	W M P G M P	A SA SR R A SA SR R	largest 7mm
	415-420		10R 5/2	<1	94	5	SW	Kspar, Plag, quartz, dark	W M P G M P	A SA SR R A SA SR R	largest 8mm
	420-425		10R 6/2	<1	94	5	SW	Kspar, plag, quartz, dark	W M P G M P	A SA SR R A SA SR R	largest 6mm
	425-430		10R 6/2	<1	97	2	SW	quartz, plag, kspar, darks	W M P G M P	A SA SR R A SA SR R	largest 10mm
	430-435		10R 5/2	<1	98	1	SW	quartz, plag, kspar, darks	W M P G M P	A SA SR R A SA SR R	largest 4mm
	435-440		10R 6/3	<1	96	3	SW	Plag, Kspar, quartz, darks	W M P G M P	A SA SR R A SA SR R	largest 10mm
	440-445		10R 5/2	<1	94	5	SW	Plag, Kspar, quartz, darks	W M P G M P	A SA SR R A SA SR R	largest 12mm
	445-450		10R 5/3	<1	94	5	SW	Kspar, Plag, quartz, darks	W M P G M P	A SA SR R A SA SR R	largest 6mm

Logged by: LISA VAN TASSELL
Date: 8/27 1997

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8/27/97)

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	450-455		10R5/2	<1	96	3	SW	Plag, Kspar, quartz darks	W M P G M P	A SA SR R A SA SR R	largest 4mm
	455-460		5YR6/4	<3	96	1	SW	quartz, plag, kspar, darks	W M P G M P	A SA SR R A SA SR R	largest 3mm
	460-465		5YR6/3	<1	98	1	SW	Plag, Kspar, quartz, darks	W M P G M P	A SA SR R A SA SR R	largest 4mm
	465-470		10R6/3	<1	94	5	SW	quartz, plag, kspar, dark	W M P G M P	A SA SR R A SA SR R	largest 9mm
	470-475		10R6/2	<5	94	1	SW	Kspar, plag, quartz darks	W M P G M P	A SA SR R A SA SR R	largest 3mm
	475-480		10R5/3	<1	92	7	SW	Kspar, plag, quartz dark	W M P G M P	A SA SR R A SA SR R	largest 6mm
	480-485		10R5/4	<1	92	7	SW	Kspar, plag, quartz, dark	W M P G M P	A SA SR R A SA SR R	largest 7mm
	485-490		10R5/3	<1	96	3	SW	Kspar, plag quartz, dark	W M P G M P	A SA SR R A SA SR R	largest 6mm
	490-495		10R5/2	5	94	1	SW	Kspar, plag quartz, dark	W M P G M P	A SA SR R A SA SR R	largest 2mm
									W M P G M P	A SA SR R A SA SR R	

PR01 (Piñon Ridge)

Logged by: Gwinn Hall & Lisa VanTassell
Date: 9/9 1997

(Page 1 of ——
9/9/97)

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	0-25		2.5Y 4/2 4.5/6	100%	0	0	Clay		W M P G M P	A SA SR R A SA SR R	
	25-30		2.5Y 4/4	100%	0	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	Marcos - siltstone mod. ind. w/ calcite strong rx to HCL
	30-35		2.5Y 4/4	99%	1%	0	f. to v. f.		W M P G M P	A SA SR R A SA SR R	Marcos sandy siltstone weak to moderate rx to HCL (v.o.)
	35-40		2.5Y 5/3	99%	1%	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	fine grained sandy siltstone
	40-45		2.5Y 5/3	99%	1%	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	sandy siltstone
	45-50		2.5Y 4/2	99%	1%	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	sandy siltstone
	50-55		2.5Y 4/1	99%	1%	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	sandy siltstone
	55-60		2.5Y 4/1	99%	1%	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	sandy siltstone
	60-65		2.5Y 4/1	99%	1%	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	cavings present sandy siltstone mod. rx w/ HCL
	65-70		2.5Y 4/2	99%	1%	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	sandy siltstone

PR01

Logged by: Quinn Hall & Lisa VanTassell
Date: 9/9 1997

(Page 2 of —— 9/9/97)

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks	
	70-75		2.5Y3/1	99%	1%	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	Mancos slightly harder, darker strong rx w/ HCL	
	75-80		2.5Y3/1	99%	1%	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	Mancos slightly harder, darker strong rx w/ HCL	
	80-85		2.5Y4/1	99%	1%	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	Sandy siltstone Not as hard slight rx w/ HCL	
	85-90		2.5Y4/2	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	No rx w/ HCL coarser material	
	90-95		2.5Y5/2	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	quartz, sandstone break siltstone to sandstone	*break in lithology
	95-100		2.5Y5/2	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	Cuvings - siltstone sandstone	
	100-105		2.5Y4/1	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	mod. rx w/ HCL No sandstone harder	*loss of circulation cuttings 100-120 combined
	105-110		2.5Y4/1	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	No sandstone Not as hard, flakes easier, strong rx w/ HCL	
	110-115		2.5Y4/1	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	softer, easier to break slight rx w/ HCL	
	115-120		2.5Y4/1	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	* lost circulation 10-15 min	

PR01

Logged by: Gwinn Hall & Lisa Van Tassell
Date: 9/9 1997

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	120-125		2.5Y 3/1	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	very dark almost black in color
	125-130		2.5Y 3/2	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	dark, slightly coarser
	130-135		2.5Y 3/2	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	black in color
	135-140		2.5Y 3/2	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	still black in color
	140-145		2.5Y 2.5/1	99	1	0	very fine		W M P G M P	A SA SR R A SA SR R	* break completely black in color small pieces / slight rxn w/ HCL
	145-150		2.5Y 2.5/1	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	Rx w/ HCL black in color
	150-155		2.5Y 2.5/1	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	Harder to break slight rx w/ HCL
	155-160		2.5Y 2.5/1	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	Harder to break streak on paper - black
	160-165		2.5Y 2.5/1	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	organic rich siltstone
	165-170		2.5Y 2.5/1	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	organic rich siltstone

PR01

Logged by: Gwinn Hall, Lisa VanTassell, Maya C.
Date: 9/9 1997

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	170-175		2.5Y 2.5/1	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	~~No reaction~~ w/ HCL slight
	175-180		2.5Y 2.5/1	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	~~No reaction~~ w/ HCL slight
	180-185		2.5Y 2.5/1	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	Slight rx w/ HCL → carbonate present
	185-190		2.5Y 2.5/1	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	Black in color - layers are lighter in color
	190-195		2.5Y 2.5/1	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	Slight rx w/ HCL layered more calcite, limestone
	195-200		2.5Y 2.5/1	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	Slight rx w/ HCL calcite, limestone
	200-205		2.5Y 2.5/1	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	Calcite, dark in color layered
	205-210		2.5Y 2.5/1	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	calcite layered
	210-215		2.5Y 2.5/1	99	1	0	fine to very fine		W M P G M P	A SA SR R A SA SR R	calcite layered
	215-220								W M P G M P	A SA SR R A SA SR R	

Sandia Park Well 1 (SPC1)
Triangle

Logged by: Gwinn Hall
Date: 22 Sep. 1997

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	0-5	10R 4/6	2.5YR 8/1				clays + v.f.-f.sand	?	W M P G M P	A SA SR R A SA SR R	Gray v.f.-fine grained silty s.s. w/ red siltstone
	5-10	10R 4/6					clays + silts		W M P G M P	A SA SR R A SA SR R	dark red siltstone
	10-15	a.a.					a.a.		W M P G M P	A SA SR R A SA SR R	a.a.
	15-20	10R 4/8					v.f. sand clays, silts		W M P G M P	A SA SR R A SA SR R	v.f. grained red brown sandstone
	20-25	10R 4/8					a.a.		W M P G M P	A SA SR R A SA SR R	silty s.s. or sandy siltstone red brown
	25-30	10R 4/4					a.a.		W M P G M P	A SA SR R A SA SR R	a.a.
	30-35	10R 5/4					clays, silts v.f. sandy		W M P G M P	A SA SR R A SA SR R	sandy siltstone
	35-40	10R 4/6					a.a.		W M P G M P	A SA SR R A SA SR R	a.a.
	40-45	a.a.					a.a.		W M P G M P	A SA SR R A SA SR R	a.a.
	45-50	10R 3/8					v.f. sandy clay, silt		W M P G M P	A SA SR R A SA SR R	silty sandstone v. finely laminated w/ clays on bedding

Sandia Park SP01 UNM well in triangle

Logged by: Gwinn Hall
Date: 22 Sept 1997

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	50-55	10R 5/4					silts, clays v.f. sandy		W M P G M P	A SA SR R A SA SR R	red siltstone
	55-60	10R 5/3					v.f. sands		W M P G M P	A SA SR R A SA SR R	v.f. sandstone / red siltstone feldspathic
	60-65	10R 4.5/8					clays, silts		W M P G M P	A SA SR R A SA SR R	red mudstone
	65-70	10R 5/8					clays/silts		W M P G M P	A SA SR R A SA SR R	red mudstone
	70-75	a.a.					a.a.		W M P G M P	A SA SR R A SA SR R	a.a.
	75-80	10R 5/6 and	10R 8/1				silts clays		W M P G M P	A SA SR R A SA SR R	gray, red mudstone } increased clays gray color
	80-85	10R 4/8					clays, silts		W M P G M P	A SA SR R A SA SR R	red silty mudstone
	85-90	10R 3/6					clay silt		W M P G M P	A SA SR R A SA SR R	red (w/ minor gray clays) mudstone
	90-95	10R 3/6					silts, clays		W M P G M P	A SA SR R A SA SR R	red mudstone
	95-100	10R 5/4					v.f. sand + silts		W M P G M P	A SA SR R A SA SR R	red v.f. sand s.s. moderately indurated

water here

Sandia Park Triangle SP01
Logged by: Gerim Hall
Date: 22 Sep 1997
MW well

(Page 3 of 13)
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Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
wet	100-105	10R 5/6					v.f. sand		W M (P) / (G) M P	A SA SR R / A SA SR R	red sand stone (v.f. grained) well indurated (hard)
wet	105-110	10R 4/6					clay, silt & sands (v.f.)		W M (P) / (G) M P	A SA SR R / A SA SR R	~~v. well sorted~~ red mudstone w/ s.s. coverings
									W M P / G M P	A SA SR R / A SA SR R	
									W M P / G M P	A SA SR R / A SA SR R	
									W M P / G M P	A SA SR R / A SA SR R	
									W M P / G M P	A SA SR R / A SA SR R	
									W M P / G M P	A SA SR R / A SA SR R	
									W M P / G M P	A SA SR R / A SA SR R	
									W M P / G M P	A SA SR R / A SA SR R	
									W M P / G M P	A SA SR R / A SA SR R	

Logged by: Gwinn Hall
Date: 12 Oct 1998

SP02
Sandia Park
Elev 6935
LOC 11.5.24.2313

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
10:30 am	dry 0-5	2.5YR 6/3		60	25	15	SW	arkose, limestone, darks	W M P G M P	A SA SR R A SA SR R	Qal
	dry 5-10	2.5YR 6/4		85	10	5	SP	same	W M P G M P	A SA SR R A SA SR R	Qal
	dry 10-15	—		—	5	95	GP	Qtz SS, limestone, arkose	W M P G M P	A SA SR R A SA SR R	Qacuc
	dry 15-20	—		—	10	90	GP	arkose mudstone, limestone, arkose	W M P G M P	A SA SR R A SA SR R	Qacuc, First appearance of Qbo? (Qbo)
	dry 20-25	10R 3/6		30	70	—	SM	Feldspars, Qtz,	W M P G M P	A SA SR R A SA SR R	Fine grained arkose
12:00 pm	dry 25-30	2.5YR 5/8		20	80	—	SP	—	W M P G M P	A SA SR R A SA SR R	Fine sands well sorted, Qtz, arkose
	~~25-30~~ 30-35	10R 5/8		30	65	5	SP	arkose, Qtz, darks	W M P G M P	A SA SR R A SA SR R	10mm round pellets of clay w/ sand content
	dry 35-40	2.5YR 7.5/8		10	90	—	SP	—	W M P G M P	A SA SR R A SA SR R	well sorted Qtz, arkose, fine sand
	dry 40-45	5YR 8.5/2		5	95			Qtz,	W M P G M P	A SA SR R A SA SR R	well sorted, fine grained Qtz sand
	45-50	"		"	"			Qtz	W M P G M P	A SA SR R A SA SR R	"

Glorieta

Glorieta

Logged by: Gwinn Hall
Date: Oct 12 1998

Sandia Park
5902
69351
11.5.24.2313

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	dry 50-55	5YR 8.5/2	—	5	95			Qtz, feldspars darks	W M (P) / (G) M P	A SA (SR) R / A SA SR R	Glorieta
	dry 55-60	10YR 7/8		5	95			"	W M (P) / (G) M P	A SA (SR) R / A SA SR R	Glorieta
	dry 60-65	5YR 7/6		5	95			Feldspars, Qtz	W M (P) / G (M) P	A SA (SR) R / A SA SR R	Glorieta but a little finer
	dry 65-70	10R 5.5/6	/	20	80			Feldspars, Qtz, darks	W M (P) / G (M) P	A SA (SR) R / A SA SR R	Yeso - a little filling w/HCl
	70-75	"		20	80			"	W M (P) / G (M) P	A SA (SR) R / A SA SR R	dirtier Sandstone fizzes Yeso
	75-80	10R 7/3		20	80	—		Qtz,	W M P / G M P	A SA (SR) R / A SA SR R	fine grained calcified sandstone Yeso
	80-85	10R 4.5/6		10	90			Feldspars, ~~Arkose~~, Qtz	W M (P) / G (M) P	A SA (SR) R / A SA SR R	Arkosic, medstone friable ss. - slight fizz Yeso
	85-90	10R 3/6		50	50			~~Arkose~~, Qtz Feldspars	W M (P) / G (M) P	A SA (SR) R / A SA SR R	Arkosic medstone friable ss. - no fizz Yeso
	90-95	~~10R~~		80	20			Feldspars, Qtz, Limestone	W M (P) / (G) M P	A SA (SR) R / A SA SR R	Arkosic Mudstone - Fizzes moderately Yeso
	95-100	2.5YR 4/8		20	80			"	W (M) P / (G) M P	A SA (SR) R / A SA SR R	Fine grained ~~Sandst~~ Arkose / Fizzes Yeso

Logged by: Gavin Hall
Date: 12 Oct 1998

Sandia Park
SP02
elev 6935
Loc 11.5.24.2513

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks	Cavings of calcareous sandstone above
	100-105	2.5YR 6.5/8		40	60	–		Feldspars, Qtz, Rocks	W M P G M P	A SA SR R A SA SR R	Silty Sand Stone/Mudstone Fizzes	Yes0
	105-110	10.R 5.5/6		20	80	–		"	W M P G M P	A SA SR R A SA SR R	silty Fine grained Arkose Yes0 Fizzes	
	110-115	2.5YR 5/8		10	90			"	W M P G M P	A SA SR R A SA SR R	U. fine grained - slight well sorted Fizz Arkosic S.S.	Yes0
	115-120	"		"	"			"	W M P G M P	A SA SR R A SA SR R	" No Fizz	Yes0
	120-125	"		"	"			"	W M P G M P	A SA SR R A SA SR R	U. well sorted fine grained Arkose w/ Gravity Cob Fizz	Yes0
	125-130	"		"	"			"	W M P G M P	A SA SR R A SA SR R	"	Yes0
	130-135	"		"	"			"	W M P G M P	A SA SR R A SA SR R	"	Yes0
	135-140	"		"	"			"	W M P G M P	A SA SR R A SA SR R	"	Yes0
	140-145 moist	~~2.5YR~~ 10R 3/6		30	70			Feldspars, Qtz, clays	W M P G M P	A SA SR R A SA SR R	well sorted silty Arkose, slight Fizz	Yes0
	145-150 moist	10R 4/6		30	70			"	W M P G M P	A SA SR R A SA SR R	moderately well sorted Arkose, Fizz	Yes0

Logged by: Gwinn Hall
Date: 13 Oct 1998

Sandia Park
SP02
elev 6935
loc 11.5.24.2313

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	moist 150-155	10R 3/6		40	60			Feld, Qtz	W M P G M P	A SA SR R A SA SR R	silty, well sorted Arkose v. fine gravel Fizz loso
	moist 155-160	10R 5/6		10	80	10			W M P G M P	A SA SR R A SA SR R	silty, sandy, gravelly, Arkose, Fizz
	wet 160-165			<5	60	35			W M P G M P	A SA SR R A SA SR R	unconsolidated precam arkosic gravel; arkose water
TD	wet 165-170			<5	90	5		Feldspars, Qtz, limestone	W M P G M P	A SA SR R A SA SR R	medium-uncosolidated precam sand Arkose, Qtz gravel, Limestone Fizz
									W M P G M P	A SA SR R A SA SR R	
									W M P G M P	A SA SR R A SA SR R	
									W M P G M P	A SA SR R A SA SR R	
									W M P G M P	A SA SR R A SA SR R	
									W M P G M P	A SA SR R A SA SR R	
									W M P G M P	A SA SR R A SA SR R	

SV01 15 Sep 97 4:20pm

Location: End of Alamo Hueco Ln in Sierra Vista Subdivision T10N R5E Sect 1. 2342

Logged by: Quinn Hall

Date: _____ 199

(Page 1 of 7 / 19)

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	0-5	5Y 2.5/1		30	70		Fine - v. Fine	Qtz, darks, clays	W M P G M P	A SA SR R A SA SR R	whitish gray s.s.
	5-10	10YR 2.5/2		"	"		a.a.	a.a.	W M P G M P	A SA SR R A SA SR R	a.a.
	10-15	a.a		"	"		a.a.	a.a.	W M P G M P	A SA SR R A SA SR R	a.a.
	15-20	a.a.		"	"		a.a.	a.a.	W M P G M P	A SA SR R A SA SR R	grayish s.s. w/ some reddish tan v. fine s.s.
	20-25	2.5YR 3.5/8		100			clay	—	W M P G M P	A SA SR R A SA SR R	clayey silt, silty clay (wet clay)
	25-30	7.5YR 4/4		90	10		sandy siltstone	—	W M P G M P	A SA SR R A SA SR R	silty, sandy (v. fine) siltstone
	30-35	2.5Y 8/2		90	10		sandy siltstone	—	W M P G M P	A SA SR R A SA SR R	a.a.
	35-40	2.5YR 8/2		95	5		silty mudstone	—	W M P G M P	A SA SR R A SA SR R	silty mudstone w/ minor v. fine sand
	40-45	5Y 8/3		40	60		—	—	W M P G M P	A SA SR R A SA SR R	v. fine silty friable s.s.
	45-50	2.5YR 4/8		90	10			—	W M P G M P	A SA SR R A SA SR R	reddish brown finely bedded shale

SU01

Logged by: Gwinn Hall
Date: 15 Sep 1997

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	50-55	10R 5/1		95	1				W M P G M P	A SA SR R A SA SR R	greyish brown finely bedded shale
	55-60	10YR 6/3		20	80				W M P G M P	A SA SR R A SA SR R	U. fine grained silty S.S.
	60-65	10YR 3/2		90	10				W M P G M P	A SA SR R A SA SR R	silty mudstone
	65-70	2.5Y 3/1		100					W M P G M P	A SA SR R A SA SR R	finely, weakly laminated shale
	70-75	2.5Y 3/1		100					W M P G M P	A SA SR R A SA SR R	mudstone
	75-80	5YR 6/2.5		95	5				W M P G M P	A SA SR R A SA SR R	sandy, siltstone
	80-85	10R 4/2		95	5				W M P G M P	A SA SR R A SA SR R	silty mudstone
	85-90	5YR 6/2		100					W M P G M P	A SA SR R A SA SR R	silty mudstone
	90-95	a.a.		a.a.					W M P G M P	A SA SR R A SA SR R	a.a.
	95-100	10R 4/2		100					W M P G M P	A SA SR R A SA SR R	silty mudstone

Logged by: Geiner Hall
Date: Sept 16 1997

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	100-105	Chart 2 GLEY 7/5PB		90	10				W M P / G M P	A SA SR R / A SA SR R	Light grey siltstone
	105-110	Chart 2 GLEY 6/10B		20	80			Qtz, clays, darks	W M P / G M P	A SA SR R / A SA SR R	Bluish grey f-v.fine sandstone (wet)
	110-115	a.a.		a.a			a.a	~~Qtz, clays, organics(?)~~	W M P / G M P	A SA SR R / A SA SR R	a.a. (wet)
	115-120	Chart 2 GLEY 2.5/5B						Qtz, clays organics (?)	W M P / G M P	A SA SR R / A SA SR R	v. fine organic sandy siltstone (wet)
	120-125	GLEY Chart 2 7.5/5B		100				Qtz, darks, clays	W M P / G M P	A SA SR R / A SA SR R	siltstone light bluish gray
	125-130	a.a.		a.a.				a.a.	W M P / G M P	A SA SR R / A SA SR R	a.a.
	130-135	a.a		a.a.				a.a.	W M P / G M P	A SA SR R / A SA SR R	a.a.
	135-140	GLEY Chart 2 5/10B		100				Qtz, darks, clays	W M P / G M P	A SA SR R / A SA SR R	bluish gray siltstone *
	140-145	GLEY Chart 2 7.5/10B		100				Qtz, clays, darks	W M P / G M P	A SA SR R / A SA SR R	light bluish gray siltstone
	145-150	GLEY Chart 2 7.5/10P		100				Qtz, clays, darks	W M P / G M P	A SA SR R / A SA SR R	a.a.

* Poor circulation for 3-5' (~~[illegible]~~ like cuttings at)

SU01

Logged by: Gaiven Hall
Date: Sept 16 1997

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09/15/97)

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	150-155	GLEY chart 7.5/10B		100				Qtz, clays, clades	W M P G M P	A SA SR R A SA SR R	light bluish grey silt/stone
	155-160	a.a.		100				a.a.	W M P G M P	A SA SR R A SA SR R	a.a
	160-165								W M P G M P	A SA SR R A SA SR R	
	165-170								W M P G M P	A SA SR R A SA SR R	
	170-175								W M P G M P	A SA SR R A SA SR R	
	175-180								W M P G M P	A SA SR R A SA SR R	
	180-185	GLEY chart 6/5PB		100					W M P G M P	A SA SR R A SA SR R	
	185-190	GLEY chart 6/5PB		100					W M P G M P	A SA SR R A SA SR R	
	190-195	GLEY chart 7/5PB		100					W M P G M P	A SA SR R A SA SR R	
	195-200	GLEY chart 7/5PB		100					W M P G M P	A SA SR R A SA SR R	

SUC1

Logged by: Lisa VanTassell

Date: 9/16 1997

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Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	200-205		7/N	100					W M P G M P	A SA SR R A SA SR R	fine very fine, silty sand
	205-210		7/N						W M P G M P	A SA SR R A SA SR R	aa
	210-215								W M P G M P	A SA SR R A SA SR R	
	215-220								W M P G M P	A SA SR R A SA SR R	
	220-225								W M P G M P	A SA SR R A SA SR R	
	225-230								W M P G M P	A SA SR R A SA SR R	
	230-235								W M P G M P	A SA SR R A SA SR R	
	235-240		7/N						W M P G M P	A SA SR R A SA SR R	
	240-245		7/N						W M P G M P	A SA SR R A SA SR R	
	245-250		7/N						W M P G M P	A SA SR R A SA SR R	

SU01

Logged by: _____

Date: _____ 199

(Page 6 of 7 / 19)

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	250-255		5/N	100					W M P G M P	A SA SR R A SA SR R	
	255-260		5/N						W M P G M P	A SA SR R A SA SR R	
	260-265		4/10						W M P G M P	A SA SR R A SA SR R	
	265-270		6/N						W M P G M P	A SA SR R A SA SR R	
	270-275		4/N						W M P G M P	A SA SR R A SA SR R	color change
	275-280		5/N						W M P G M P	A SA SR R A SA SR R	
	280-285		5/10Y						W M P G M P	A SA SR R A SA SR R	
	285-290		5/10Y						W M P G M P	A SA SR R A SA SR R	
	290-295		6/N						W M P G M P	A SA SR R A SA SR R	
	295-300		5/10Y						W M P G M P	A SA SR R A SA SR R	

5U01

Logged by: ~~Lou~~ Van Tassel + Maya Clauschee

Date : _____ 199

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	300-305		5/10Y	100					W M P G M P	A SA SR R A SA SR R	
	305-310		4/10Y	100					W M P G M P	A SA SR R A SA SR R	
	310-315		5/10Y	100					W M P G M P	A SA SR R A SA SR R	
	315-320		4/10Y	75%	0	25%			W M P G M P	A SA SR R A SA SR R	gravel present
	320-325		4/10Y	65%	25%	10%			W M P G M P	A SA SR R A SA SR R	
	325-330		4/10Y	100					W M P G M P	A SA SR R A SA SR R	
	330-335		4/10Y	100					W M P G M P	A SA SR R A SA SR R	
	335-340		4/10Y						W M P G M P	A SA SR R A SA SR R	
									W M P G M P	A SA SR R A SA SR R	
									W M P G M P	A SA SR R A SA SR R	

Logged by: Gwinn Hall
Date: 6 Oct 1998

Loc. 11.6.30.2443 westview Pl
elev. 6650' (from topo)
Sandia Knolls SKØ1

(Page 01 of 6)
10/06/98

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel ~~(≥2 mm)~~	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks	
	0-5	dry 2.5YR 6.5/8	dry 2.5YR 7/4	45	20	35	SM	sandstone,	W (M) P G M P	A (SA) SR R A (SA, SR) R	unconsolidated	
	5-10	~~[illegible]~~ dry 2.5YR 6.5/8	2.5YR 5½/1	40	20	40	SM	Limestone	W (M) P G M P	A (SA) SR R A (SA, SR) R	(¼-½)" Ø moist clay clods	QFY
	10-15	dry 5YR 6½/8	light Grey	15	20	65	SW	Various: Limestone Quartzite, Organic	W (M) P G M P	A (SA) SR R A (SA) SR R	unconsolidated	QFY
	15-20	7.5YR 5/8	dry —	95	5	—	CL	CO_3, Quartz, micas	W M (P) G M P	A SA SR R A SA SR R	moist clods w/possible Fe staining	QFY
	20-25	5YR 6½/4	dry —	100	—	—	MH	Clays & Silts	W M (P) G M P	A SA SR R A SA SR R	yellowish, dark (inside)	Qacf
	25-30	5YR 6½/4	~~dry~~	100	—	—	MH	Clays & Silts	W (M) P G M P	A SA SR R A SA SR R	reddish when clods are broken;	Qacf
	30-35	7.5YR 6/8	dry —	95	5	—	CL	Clays & Silts Limestone	W M (P) G M P	A SA SR R A SA SR R	Too fine to see angularity, poorly consol. Broken clods show darker, moist mat'l; Too fine for angularity, poorly consol.	
	35-40	7.5 dry 7/6	dry —	100	—	—	CL	Clays & Silts Limestone	W (M) P G M P	A SA SR R A SA SR R	Too fine to tell moist clods	
	40-45	dry		100			CL		W M (P) G M P	A SA SR R A SA SR R	moist clods, dark inside, Too fine to tell angularity	
	45-50	dry		100			CL		W M (P) G M P	A SA SR R A SA SR R	mudstone,	TRZ?
									W M P G M P	A SA SR R A SA SR R	mudstone	

Q

Oct

Logged by: Gwinn Hall
Date: 7 Oct 1995

Sandia Knolls
Loc 11.6.30.2443
Westview Pl
Elev 6650
SKØ1

(Page 02 of 6
07/10/98)

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	50-55	dry 10R 3/6	—	100			CL	—	W M (P) (G) M P	A SA SR R A SA SR R	Dark red siltstone
	55-60	dry 10YR 5/6	varied	~~90~~95	2	3	CL	sandstone, ~~qz~~ limestone	W M P G M P	A SA SR R A SA SR R	Granular (Clods) some gravel (caving?)
	60-65	dry 7.5YR 5/3	—	98	1	1	CL	sandstone, Limestone	W M (P) G (M) P	A (SA) SR R A (SA) SR R	Sandy siltstone some cavings
	65-70	dry chart 2.5Gley 3/5PB	—	99	1	—	CL	—	W M (P) (G) M P	A (SA) SR R A SA SR R	Non-calcareous black silty shale w/ minor Qtz grains
	70-75	"	—	99	1	—	CL	—	W M (P) (G) M P	A SA SR R A SA SR R	silty mudstone Black - Non calcareous
	75-80	"	—	100	—	—	ML	—	W M (P) (G) M P	A SA SR R A SA SR R	Black Silt - Non calcareous
	80-85	10YR dry 6/8		20	80	—	SM		W M (P) (G) M P	A (SA) (SR) R A SA SR R	Silty sandstone Calcareous cement
	85-90	dry Black	—	100	—	—	CL		W M (P) (G) M P	A SA SR R A SA SR R	Black silty shale Non-calcareous
	90-95	Black		100					W M P G M P	A SA SR R A SA SR R	Calcareous Black siltstone (shale?)
	95-100	"		—			CL		W M (P) G (M) P	A SA SR R A SA SR R	Non-calcareous Black siltstone (shale?)

Logged by: Gwinn Hall
Date: 20 Oct 1998

Sandia Knolls
Westview Pl
Loc 116.30.2443
elev 6650
SKØ1

(Page 03 of 6
07/10/98)

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	100-105	dry Black	—	100	—	—	shale		W M P G M P	A SA SR R A SA SR R	Dark gray to black shale (Calcareous)
	105-110	"		"			Shale		W M P G M P	A SA SR R A SA SR R	"
	110-115	"		"			shale		W M P G M P	A SA SR R A SA SR R	"
	115-120	"		"			shale		W M P G M P	A SA SR R A SA SR R	"
	wet 120-125	"		"			shale		W M P G M P	A SA SR R A SA SR R	"
	wet 125-130	"		"			Shale		W M P G M P	A SA SR R A SA SR R	"
	wet 130-135	"		"			shale		W M P G M P	A SA SR R A SA SR R	"
	wet 135-140	"		"			shale		W M P G M P	A SA SR R A SA SR R	"
	wet 140-145	Black (?)		50?	10?	40?		Qtz	W M P G M P	A SA SR R A SA SR R	Gravelly silt/clay/shale mixed of fines from above?
	145-150			10?	50	~~50~~ 40		Qtz, darks,	W M P G M P	A SA SR R A SA SR R	Slight pyrite, chalcopyrite mineralization. Fault gouge?

Logged by: [illegible]
Date: 7 Oct 1998

Sandia Knolls
Westview Pl
Loc 11.6.30.2443
elev 6650
SK01

(Page 04 of 6
10/7/98)

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	wet 150-155				60	40	gravelly sand	Dacites, Qtz, slight granite	W (M) P / G M P	A (SA) SR R / A SA (SR) R	More Fault gouge? (same as above)
	wet 155-160	Chart 2Gley 8.5/5PB	reddish brown black, white	20	40	40	clayey, silty gravel	to fine grained some Qtz	W M P / G (M) P	A (SA) SR R / A (SA) SR R	Lighter grey ~~clay~~ fines some sand/gravel as above
2/8	wet 160-165	Chart 2Gley 4/10B	grey, brn, blk	80	0-5	15-20	gravels, clays	fine grained	W (M) P / G (M) P	A (SA) SR R / A (SA) SR R	Volcanics, Limestone Other sandstones
	wet 165-170	same	as above	→	→	→	→	→	W M P / G M P	A SA SR R / A SA SR R	→
	wet 170-175	same	as above	→	→	→	→	→	W M P / G M P	A SA SR R / A SA SR R	→
	wet 175-180	same	as above	90	0	10	→	→	W M P / G M P	A SA SR R / A SA SR R	→
	wet 180-185	"	"	"	"	"	→	→	W M P / G M P	A SA SR R / A SA SR R	Breccia? (fault wack)
	wet 185-190	"	"	"	"	"	→	→	W M P / G M P	A SA SR R / A SA SR R	→
	190-195	"	"	80		20		silty-clay	W M P / G M P	A SA SR R / A SA SR R	fault breccia
	195-200	varied grey blk	"			10			W M P / G M P	A SA SR R / A SA SR R	fault breccia (cuttings) some gravel

SK01

(Page 5 of 6)

Logged by: _____

Date : _____ 199

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	200-205	varied some							W M P G M P	A SA SR R A SA SR R	cuttings, fault breccia, qtz, limestone, ss
	205-210	wet				Cuttings	Limestone	some calcite veins	W M P G M P	A SA SR R A SA SR R	
	210-215	wet							W M P G M P	A SA SR R A SA SR R	
	215-220	wet							W M P G M P	A SA SR R A SA SR R	
	220-225 225-230								W M P G M P	A SA SR R A SA SR R	
	230-235								W M P G M P	A SA SR R A SA SR R	
	235-240								W M P G M P	A SA SR R A SA SR R	
	240-245								W M P G M P	A SA SR R A SA SR R	Possibly some dolerite
	245-250								W M P G M P	A SA SR R A SA SR R	
									W M P G M P	A SA SR R A SA SR R	

SK01

(Page 6 of 6)

Logged by: _____

Date : _____ 199

Sample No. (HRP)	Depth Interval (ft)	Color (moist) Fines (<2 mm)	Color (moist) Coarse (≥2 mm)	Texture Silt-Clay	Texture Sand	Texture Gravel (≥2 mm)	Texture Bulk Texture	Mineralogy gravel, in decreasing order of abundance	Other Grading Recovery	Other Angularity of sand/gravel	Other Remarks
	250-255	Dark							W M P G M P	A SA SR R A SA SR R	Cuttings: Qtz., Some calcite veins
	255-260	grey in color							W M P G M P	A SA SR R A SA SR R	Limestone, Calcite
	260-265 ~~265-271~~								W M P G M P	A SA SR R A SA SR R	
	265-270								W M P G M P	A SA SR R A SA SR R	
	270-275								W M P G M P	A SA SR R A SA SR R	
	275-280								W M P G M P	A SA SR R A SA SR R	
									W M P G M P	A SA SR R A SA SR R	
									W M P G M P	A SA SR R A SA SR R	
									W M P G M P	A SA SR R A SA SR R	
									W M P G M P	A SA SR R A SA SR R	

Appendix 4

Laboratory Results of Monitoring Well Sample Analyses

December Results		**Mhoon**	**Elena Gallegos**	**Cedar Hill**	**San Rafael**	**Sandia Park**	**Pinon Ridge**	**Sierra Vista**
Well Number		SH01	EG01	SH02	SH03	SP01	PR01	SV01
Sample Date		12/8/1997	12/8/1997	12/9/1997	12/9/1997	11/18/1997	11/19/1997	12/1/1997
DTW	ft	478.41		442.56	444.48	55.56	173.81	242.76
T	(C)	16.5		17	14	13.1	13.1	13.1
Field pH						7.19	6.82	7.86
Field Cond								
D.O.								
Alkalinity	mg/L	158.9	249.1	184.7	144.7	188.4	483.4	604.1
Conductivity	USiemens	386	553	436	432	1319	1402	1121
TDS	mg/L	276	352	260	268	876	324	20136
Br	mg/L	< 0.5	< 0.5	< 0.5	< 0.5	1.07	0.71	< 0.5
Cl	mg/L	6.44	6.05	5.77	14	218	77.5	29.4
CO3	mg/L	1.58	1.54	< 1	< 1	< 1.0	< 1.000	11.4
HCO3	mg/L	157.3	247.5	183.8	144.1	188	483	592.6
F	mg/L	2.21	1.97	1.84	1.62	0.42	0.32	1.11
SO4	mg/L	26.9	44.1	32.8	43.9	93.2	246	< 7.0
NO2	mg/L N	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.0500	< 0.05
NO3	mg/L N	1.36	0.12	1.64	3.17	3.7	< 0.0500	< 0.05
NO3+NO2	mg/L N	1.361	0.121	1.641	3.171	3.701	0.002	0.002
TKN	mg/L N	< 1.0	< 1	< 1.0	< 1	< 1.0	2.59	1.81
Amonia	mg/L N	< 0.01	< .01	< 0.01	< 0.01	< 0.01	0.1	0.31
OrPO4	mg/L P	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5000	< 0.5
MBAS	mg/L	0	0	0	0	0.01	0.3	0
TOC	mg/L	< 1.0	< 1	< 1.0	< 1	2.56	6.88	4.32
ECOLI	1=PRESNT	0	0	0	0	0	1	0
StdPlate	CT/ML	1390	2	74	74	336	0	980000
TCOLI	1=PRESNT	1	0	0	0	1	1	1
Ca	mg/L	50	76.7	61.9	52.1	138	177	3.95
Fe (Total)	ug/L	965	7.23	15.9	29	< 5.0	1000	1000
K	mg/L	1.5	2.09	1.59	1.57	1.39	5.02	1.91
Mg	mg/L	5.07	12.3	7.47	7.64	38.7	55.5	1.43
Mn	ug/L	23.2	< 1.0	6.04	3.53	1.33	179	26.4
Na	mg/L	21.5	21.4	13.6	21.7	49.6	28	263
Zn	ug/L	< 5.0	111	< 5.0	< 5.0	< 5.0	91.9	31.9

March Results

		Mhoon	**Elena Gallegos**	**Cedar Hill**	**San Rafael**	**Sandia Park**	**Pinon Ridge**	**Sierra Vista**
Well Number		SH01	EG01	SH02	SH03	SP01	PR01	SV01
Sample Date		3/17/1998	3/17/1998	3/16/1998	3/17/1998	3/25/1998	3/25/1998	3/30/1998
DTW	ft	476.06		440.48	444.45	44.86	180.92	238.46
T	(C)	18.2	16.1	17.5	15.2	14.5	16.0	12.5
Field pH		7.79	7.38	7.47	7.51	7.55	6.97	7.97
Field Cond	USiemens					990.0	1160.0	1110.0
DO	mg/L					5.31	0.5	0.7
Alkalinity	mg/L	157.8	261	157.6	194	197.8	135.5	591
Conductivity	UMHOS/CM	443	683	477	475	1109	1333	1100
TDS	mg/L	244	358	304	276	688	816	1024
Br	mg/L	< 0.5	< 0.5	< 0.5	< 0.5	0.92	0.72	< 0.5
Cl	mg/L	6.75	7.52	19.5	4.7	140	70.5	30.7
CO3	mg/L	1.72	1.54	< 1	1.54	< 1.0	< 1.0	13.9
HCO3	mg/L	156	259.4	156.8	192.4	197.3	134.5	577
F	mg/L	2.42	2.22	1.6	1.94	0.45	0.32	1.72
SO4	mg/L	28	47.6	49	31.4	92.5	107	< 7.0
NO2	mg/L N	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
NO3	mg/L N	1.34	< .05	3.22	1.33	3.88	0.66	< 0.05
NO3+NO2	mg/L N	1.341	0.002	3.221	1.331	3.881	0.661	0.002
TKN	mg/L N	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Amonia	mg/L N	< 0.01	< .01	< 0.01	< 0.01	< 0.01	0.0122	0.32
OrPO4	mg/L P	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
MBAS	mg/L	0	0	0.2	0	0	0	0
TOC	mg/L	1.08	2.17	1.57	1.62	5.281	5.643	2.255
ECOLI	1=PRESNT	0	0	0	0	0	1	0
StdPlate	CT/ML	246	<1	N	50	100	12000	130
TCOLI	1=PRESNT	1	0	0	0	1	1	1
Ca	mg/L	55.4	83.6	47.1	65.8	114	166.5	5.48
Fe (Total)	ug/L	4000	8.35	385	11.2	9.42	37.9	2185
K	mg/L	2.71	2.27	5.41	1.58	2.04	4.85	1.75
Mg	mg/L	7.24	13.6	8.58	7.99	32.4	52.5	1.84
Mn	ug/L	270	< 1.0	73.9	2.83	< 1	153	58
Na	mg/L	22.6	23.5	39.6	13.6	41	26.6	265
Zn	ug/L	43.8	159	82	13	30.4	142	< 5

June Results

		Mhoon		Elena Gallegos		Cedar Hill		San Rafael		Sandia Park
Well Number		SH01	SHF1	EG01	EGF1	SH02	SHF2	SH03	SHF3	SP01
Sample Date		6/15/1998	6/15/1998	7/1/1998	7/1/1998	6/16/1998	6/16/1998	7/1/1998	7/1/1998	6/18/1998
DTW	ft	478.57				442.86		442.77		46.15
T	(C)	20.1		17		24.2		19.8		15.5
Field pH		8.36		8.05		7.79		7.87		7.57
Field Cond	Usiemens	370		550				430		
DO	mg/L	7.2				5.5				
Alkalinity	mg/L	146	142.6	236.4	236.1	156	148	180	179.3	181.7
Conductivity	UMHOS/CM	383	382	569	566	437	440	443	441	1402
TDS	mg/L	264	252	360	340	292	300	284	264	1036
Br	mg/L	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	0.99
Cl	mg/L	6.63	6.85	7.17	6.33	19.1	18.8	4.44	4.74	294
CO3	mg/L	1.39	<1	<1	<1	1.59	1.65	<1	<1	<1
HCO3	mg/L	144	141.6	235.7	235.4	154	146	179.1	178.3	181.3
F	mg/L	2.34	2.3	2.13	2.16	1.63	1.67	1.94	1.83	0.4
SO4	mg/L	25.9	26.2	46.9	46.5	42.8	42.6	29.2	28.5	109
NO2	mg/L N	<.05	<.05	<.05	<.05	<.05	<.05	<.05	<.05	<.05
NO3	mg/L N	1.28	1.3	0.23	0.23	3.54	3.39	1.3	1.26	3.41
NO3+NO2	mg/L N	1.281	1.301	0.231	0.231	3.541	3.391	1.301	1.261	3.411
TKN	mg/L N	<5	<5	<5	<5	<5	<5	<5	<5	<5
Amonia	mg/L N	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
OrPO4	mg/L P	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5
MBAS	mg/L	0	0	0	0	0	0	0	0	0
TOC	mg/L	<1	<1	1.224	1.456	<1	1.154	<1	<1	3.519
ECOLI	1=PRESNT	0	0	0	0	0	0	0	0	0
StdPlate	CT/ML	494	2	0	6	N	38	2	0	3
TCOLI	1=PRESNT	0	0	0	1	0	0	0	0	0
Ca	mg/L	52.8	50.7	81.8	79.9	44.1	39.9	67.9	67.7	155
Fe (Total)	ug/L	5550	69.2	12.5	<5	4420	39.7	5.45	<5	5.9
K	mg/L	4.71	3.74	2.03	2.05	4.3	2.97	1.58	1.56	1.43
Mg	mg/L	6.78	5.1	12.9	12.6	8.07	6.65	8.29	8.26	44.1
Mn	ug/L	208	4.53	<1	<1	191	4.3	<1	<1	<1
Na	mg/L	21.3	21.9	20.8	20.1	44.2	43.6	13.5	13.4	51.1
Zn	ug/L	<5	<5	49.8	27.2	299	<5	<5	<5	<5

September Results

		Mhoon		Elena Gallegos		Cedar Hill		San Rafael		Sandia Park
Well Number		SH01	SHF1	EG01	EGF1	SH02	SHF2	SH03	SHF3	SP01
Sample Date		9/15/1998	9/15/1998	9/23/1998	7/1/1998	9/17/1998	9/17/1998	9/15/1998	9/15/1998	9/24/1998
DTW	ft	479.29				443.71		445.04		54.77
T	(C)	20		18		22		18		15.8
Field pH		7.84		7.49		7.62		7.7		7.16
Field Cond	Usiemens	180		590		420		450		1490
DO	mg/L	-				5.5				-
Alkalinity	mg/L	156.9	156	253.1	253.1	133.1	139.2	184.3	181	186
Conductivity	UMHOS/CM	388	392	590	600	404	410	433	435	1580
TDS	mg/L	268	264	400	400	268	272	288	288	1204
Br	mg/L	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	1.16
Cl	mg/L	7.52	6.78	8.97	8.65	15.6	15.6	4.92	5.07	339
CO3	mg/L	1.3	1.83	1.24	1.19	1.33	1.25	1.76	1	2.03
HCO3	mg/L	155.6	154.6	251.8	235.4	131.7	137.9	182.5	180	184
F	mg/L	2.11	2.11	1.9	2	1.76	1.76	1.68	1.8	0.39
SO4	mg/L	29.2	26.2	54.8	55.9	38.1	39.2	31.4	31.4	106
NO2	mg/L N	<.05	<.05	<.05	<.05	<.05	<.05	<.05	<.05	<.05
NO3	mg/L N	1.48	1.4	<.05	<.05	3.85	3.74	1.45	1.46	3.08
NO3+NO2	mg/L N	1.481	1.401	0.002	0.002	3.851	3.741	1.451	1.461	3.081
TKN	mg/L N	<5	<5	<5	<5	<5	<5	<5	<5	<5
Amonia	mg/L N	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
OrPO4	mg/L P	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5
MBAS	mg/L	0	0	0	0	0	0	0	0	0
TOC	mg/L	<1	1.05	1.811	1.824	<1	<1	1.48	1.5	4.006
ECOLI	1=PRESNT	0	0	0	0	0	0	0	0	0
StdPlate	CT/ML	495	<1	0	1	N	<1	<1	181	<1
TCOLI	1=PRESNT	1	0	0	0	1	0	0	0	1
Ca	mg/L	53.4	53.6	86	85.7	43.4	44.7	73.9	68.8	180
Fe (Total)	ug/L	824	13.3	14.7	5.48	2180	<5	16.7	7.6	7.46
K	mg/L	1.52	1.37	2.11	2.14	3.07	2.37	1.56	1.54	1.55
Mg	mg/L	5.18	5.01	13.7	13.6	7.27	6.95	8.29	8.21	49.5
Mn	ug/L	27.9	<1	<1	<1	109	<1	<1	<1	<1
Na	mg/L	20.7	20.7	21.3	20.9	32.7	29.3	13.2	13	56.8
Zn	ug/L	<5	147	118	86	114	<5	<5	<5	91.8

Sandia Park Well #2

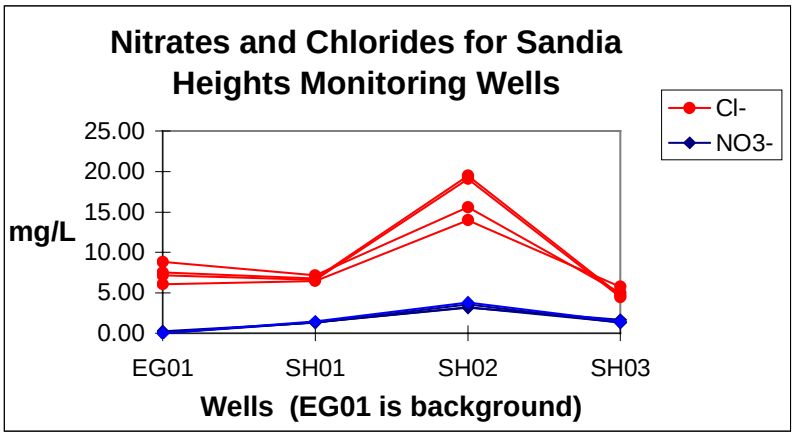
Well Number		SP02
Sample Date		12/3/1998
DTW	ft	
T	(C)	12.0
Field Cond	USiemens	440.0
DO	mg/L	
Field pH		7.41
Alkalinity	mg/L	272.5
Conductivity	UMHOS/CM	<1
TDS	mg/L	340
Br	mg/L	<.5
Cl	mg/L	45.2
CO3	mg/L	<1
HCO3	mg/L	271.9
F	mg/L	0.32
SO4	mg/L	27.4
NO2	mg/L N	<0.05
NO3	mg/L N	0.6
NO3+NO2	mg/L N	0.601
TKN	mg/L N	< 5
Amonia	mg/L N	< 0.01
OrPO4	mg/L P	< 0.5
MBAS	mg/L	0
TOC	mg/L	1.849
ECOLI	1=PRESNT	0
StdPlate	CT/ML	660
TCOLI	1=PRESNT	1
Ca	mg/L	108
Fe (Total)	ug/L	<5
K	mg/L	<1
Mg	mg/L	10.6
Mn	ug/L	<1
Na	mg/L	15.9
Zn	ug/L	<5

Averages of four sampling rounds

		Mhoon	**Elena Gallegos**	**Cedar Hill**	**San Rafael**	**Sandia Park**	**Pinon Ridge**	**Sierra Vista**
Well Number		SH01	EG01	SH02	SH03	SP01	PR01	SV01
DTW	ft	478.08		442.40	444.19	50.34	173.64	239.46
T	(C)	18.7	17.0	20.2	16.8	14.7	15.2	15.0
Field pH		8.00	7.64	7.63	7.69	7.37	6.93	7.88
Field Cond	Usiemens	275	570	420	440	1240	1030	1070
D.O.	mg/L	7.2	4.7	5.5		5.3	0.8	1.3
Alkalinity	mg/L	153	248	146	184	185	388	588
Conductivity	USiemens	396	594	433	444	1396	1383	1103
TDS	mg/L	261	368	284	277	1004	823	4253
Br	mg/L	<.5	<.5	<.5	<.5	1.08	0.50	<.5
Cl	mg/L	6.83	7.45	17.1	4.94	268	83.2	31.7
CO3	mg/L	1.30	0.92	0.97	0.72	0.34	<1	12.3
HCO3	mg/L	152	244	145	183	184	387	576
F	mg/L	2.25	2.06	1.67	1.84	0.41	0.32	1.65
SO4	mg/L	27.1	49.3	42.6	30.8	103	209	<7
NO2	mg/L N	<.05	<.05	<.05	<.05	<.05	<.05	<.05
NO3	mg/L N	1.36	0.097	3.49	1.41	3.48	0.37	<.05
NO3+NO2	mg/L N	1.36	0.098	3.49	1.41	3.48	0.375	0.002
TKN	mg/L N	<5	<5	<5	<5	<5	0.43	0.30
Amonia	mg/L N	<.01	<.01	<.01	<.01	<.01	0.02	0.105
OrPO4	mg/L P	<.5	<.5	<.5	<.5	<.5	5.02	<.5
MBAS	mg/L	0	0	0.033	0	0	0.05	0
TOC	mg/L	0.355	1.41	0.454	0.77	3.77	4.57	2.63
ECOLI	1=PRESNT	0	0	0	0	0	0.33	0
StdPlate	CT/ML	438	1.67	N	51.2	73.2	2285	164208
TCOLI	1=PRESNT	0.5	0.17	0.17	0	0.5	0.67	0.67
Ca	mg/L	52.7	82.3	45.2	67.7	150	170	4.71
Fe (Total)	ug/L	1904	8.04	1176	8.21	3.80	295	604
K	mg/L	2.59	2.12	3.28	1.57	1.54	5.08	1.68
Mg	mg/L	5.73	13.1	7.53	8.09	42.2	57.8	1.35
Mn	ug/L	88.9	0	63.6	1.48	0.222	123	51.1
Na	mg/L	21.5	21.3	35.2	13.4	50.0	27.3	261
Zn	ug/L	31.8	91.8	82.5	2.17	20.4	40.7	1.33

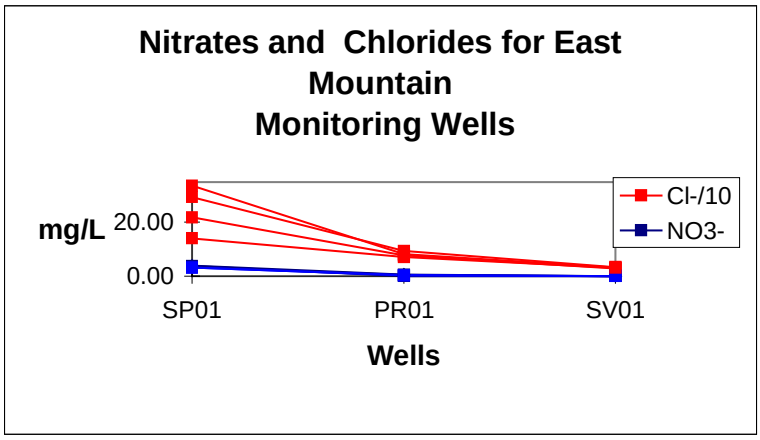
Sandia Heights Results (With SH02 and SH03 swapped for first round)

	Dec '97		Mar '98		Jun '98		Sep '98	
	NO3-	Cl-	NO3-	Cl-	NO3-	Cl-	NO3-	Cl-
EG01	0.12	6.05	0.00	7.52	0.23	7.17	0.00	8.81
SH01	1.36	6.44	1.34	6.75	1.28	6.63	1.44	7.15
SH02	3.17	14.00	3.22	19.50	3.54	19.10	3.80	15.60
SH03	1.64	5.77	1.33	4.70	1.30	4.44	1.46	5.00



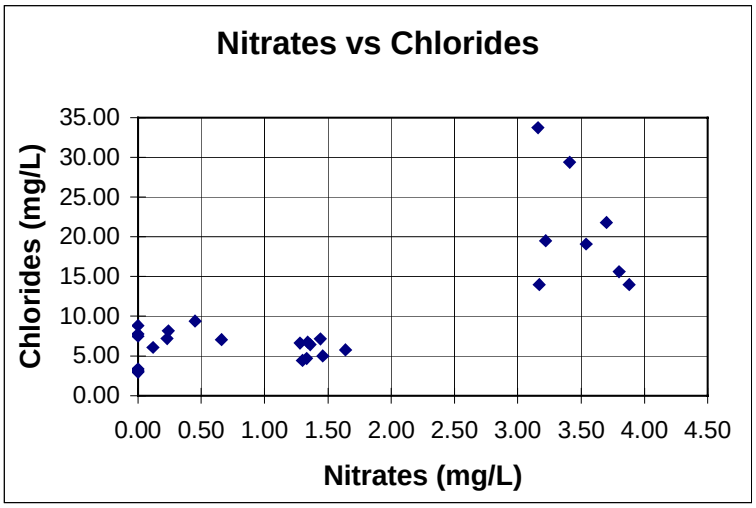
East Mountain NO3- vs. Cl-(/10)

	Dec '97		Mar '98		Jun '98		Sep '98	
	NO3-	Cl-/10	NO3-	Cl-/10	NO3-	Cl-/10	NO3-	Cl-/10
SP01	3.70	21.80	3.88	14.00	3.41	29.40	3.16	33.70
PR01	0.00	7.75	0.66	7.05	0.45	9.38	0.24	8.14
SV01	0.00	2.94	0.00	3.07	0.00	3.35	0.00	3.21

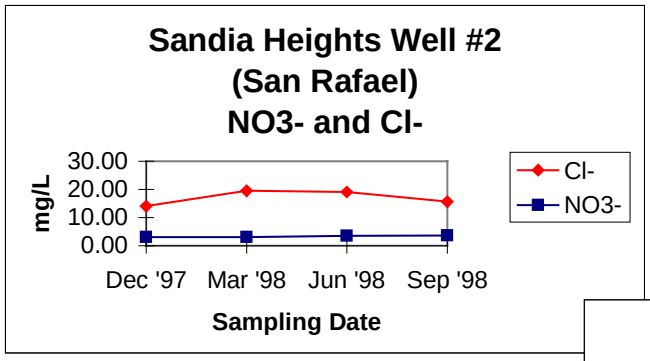


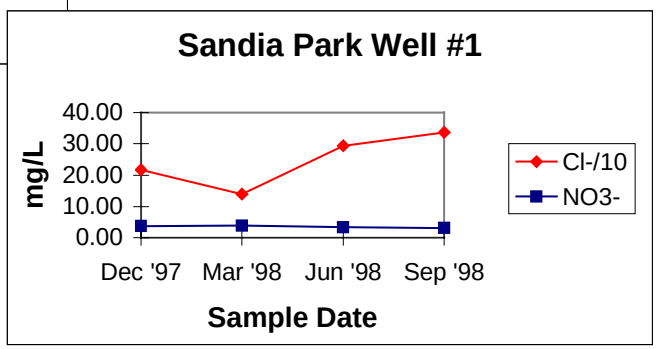
Nitrates vs. Chlorides

	Dec '97		Mar '98		Jun '98		Sep '98	
	NO3-	Cl-	NO3-	Cl-	NO3-	Cl-	NO3-	Cl-
EG01	0.12	6.05	0.00	7.52	0.23	7.17		
SH01	1.36	6.44	1.34	6.75	1.28	6.63		
SH02	3.17	14.00	3.22	19.50	3.54	19.10		
SH03	1.64	5.77	1.33	4.70	1.30	4.44		
SP01	3.70	21.80	3.88	14.00	3.41	29.40		
PR01	0.00	7.75	0.66	7.05	0.45	9.38		
SV01	0.00	2.94	0.00	3.07	0.00	3.35		
	0.00	7.52						
	1.34	6.75						
	3.22	19.50						
	1.33	4.70						
	3.88	14.00						
	0.66	7.05						
	0.00	3.07						
	0.23	7.17						
	1.28	6.63						
	3.54	19.10						
	1.30	4.44						
	3.41	29.40						
	0.45	9.38						
	0.00	3.35						
	3.16	33.70						
	0.24	8.14						
	0.00	3.21						
	0.00	8.81						
	1.44	7.15						
	3.80	15.60						
	1.46	5.00						



	SH02			SP01	
Date	**Cl-**	**NO3-**	**Date**	**Cl-/10**	**NO3-**
Dec '97	14.00	3.17	Dec '97	21.80	3.70
Mar '98	19.50	3.22	Mar '98	14.00	3.88
Jun '98	19.10	3.54	Jun '98	29.40	3.41
Sep '98	15.60	3.74	Sep '98	33.70	3.16





Appendix 5

Results of USGS Analyses for Organic Contaminants

USGS Laboratory Waste Water Method, lab code 8033

Recovery: Average of seven spikes @ 0.5 ug/L

RSD: Relative standard deviation for the seven spikes

MRL: Method reporting limit (ug/L) calculated according to 40 CFR, vol 49, using seven spikes at 0.1 ug/L,

unless the limit was raised (*) for cited problems.

See attached comments.

Compound Name	Recovery %	RSD (%)	MRL	Report Comments	Use
tetrachloroethylene	40.8	11.3	0.03		Solvent, degreaser
tribromomethane	77.1	9.4	0.04		Trihalomethane
benzaldehyde	119.3	5.7	0.1	Found frequently in lab blanks below the MRL	Flavor
phenol	82.4	16.1	0.08 *	Found frequently in lab blanks below the MRL	General disinfectant
1,2,4-trimethylbenzene	53.1	9.4	0.08 *	Found frequently in lab blanks below the MRL	Common in gasoline
1,3-dichlorobenzene	63.9	7.4	0.03		Fumigant
1,4-dichlorobenzene	61.1	8.3	0.03		Fumigant
D-limone	15.8	18.2	0.05	Poor recovery, value always estimated	Fragrance
1,2-dichlorobenzene	65.1	7.8	0.03		Fumigant
acetophenone	98.7	10.9	0.1 *		Fragrance
para-cresol	78.4	8.3	0.03		Wood preservative
ethanol, 2-(2-butoxyethoxy-)	112.9	7.5	0.2 *	Common interference, raised reporting limit	Solvent for nitrocellulose resins
naphthalene	66.2	5.0	0.03		Polynuclear aromatic hydrocarbon (PAH), fumigant

naphthalene, 2-methyl	77.2	6.7	0.04		PAH
naphthalene, 1-methyl	63.5	4.7	0.04		PAH
phthalic anhydride	71.9	26.2	0.1 *	Found occasionally in lab blanks below the MRL	Used to manufacture plastics
2(2-btxyethxy) ethyl acetate	89.6	7.6	0.06		Solvent for nitrocellulose resins
2,6-di-tert-butylphenol	15.1	36.4	0.09	Poor recovery, value always estimated	Antioxidant
acenaphthylene	63.0	9.4	0.03		PAH
2,6-di-tert-para-benzoquinone	117.7	10.3	0.07		Antioxidant
Butylated hydroxyanisole (BHA)	16.4	44.5	0.12	Poor recovery, value always estimated	Antioxidant
acenaphthene	61.7	4.5	0.04		PAH
Butylated hydroxytoluene (BHT)	15.4	33.7	0.08	Poor recovery, value always estimated	Antioxidant
fluorene	70.0	3.6	0.08		PAH
tributyl phosphate	76.9	10.3	0.04		Plasticizer
nonylphenol-total	70.0	14.5	0.5	Occasionally in lab blanks, estimated - standard is a Technical Mix	Nonionic detergent metabolite
simazine	88.9	15.7	0.04		Pesticide
atrazine	96.4	14.5	0.03		Pesticide
tri (2-chloroethyl) phosphate	93.7	16.7	0.04		Fire retardant
lindane	73.5	7.1	0.05		Pesticide
phenanthrene	73.3	8.2	0.06		PAH
diazinon	70.7	10.5	0.03		Pesticide
anthracene	66.0	5.9	0.05		PAH
caffeine	73.9	17.2	0.08	Found frequently in lab blanks below the MRL	Stimulant
methyl parathion	89.9	8.7	0.06		Pesticide
carbaryl	142.4	10.6	0.06	Variable performance & recovery, value always estimated	Pesticide

Nonylphenol ethoxylate 1 (NPEO1) (total)	74.2	12.4	1	Estimated - standard is a technical mix	Nonionic detergent metabolite
metolachlor	94.9	14.0	0.03		Pesticide
chlorpyrifos	85.5	12.7	0.02		Pesticide
DCPA	92.2	9.8	0.04		Pesticide
fluoranthene	91.8	11.7	0.03		PAH
trans-chlordane	81.1	11.1	0.04		Pesticide
pyrene	94.5	11.3	0.03		PAH
cis-chlordane	79.3	10.0	0.04		Pesticide
bisphenol A	92.7	12.8	0.09	Has been detected below MRL in some field blanks	Used to manufacture polymers
p,p' -DDE	84.1	13.0	0.04		Pesticide
dieldrin	85.0	11.0	0.08		Pesticide
NPEO2-total	63.0	10.0	1.1	Estimated - standard is a technical mix	Nonionic detergent metabolite
tri (dichloroisopropyl) phosphate	66.7	11.3	0.1		Fire retardant
bis (2-ethyl hexyl) adipate	62.5	13.9	1.5 *	Found frequently in lab blanks below the MRL	Plasticizer
ethanol, 2-butoxy-, phosphate	85.3	13.0	0.07		Plasticizer
trephenyl phosphate	79.7	17.6	0.1		Plasticizer
benzo (a) anthracene	85.2	13.3	0.06		PAH
chrysene	93.2	12.5	0.06		PAH
bis (2-ethyl hexyl) phthalate	68.4	13.6	2.0 *	Found frequently in lab blanks below the MRL	Plasticizer
17beta-estradiol	35.0	33.4	0.5 *	Variable performance & recovery, value always estimated	Major estrogen metabolite
benzo (b) fluoranthene	83.9	15.4	0.05		PAH
benzo (k) fluoranthene	85.3	15.1	0.05		PAH
benzo (a) pyrene	67.1	13.2	0.05		PAH

methyl-di-(tert-butyl-d9) phenol-SURROGATE (BHT-d9)	20.8	35.8	NA	Poor recovery, is an antioxidant (BHT-d9)	Monitor method performance
nonylbenzene - SURROGATE	95.9	8.2	NA		Monitor method performance
bisphenol A,-d6 SURROGATE	87.3	17.8	NA		Monitor method performance

USGS Waste water results from each well sampled. All results in ug/L.

(*) - Compound demonstrates poor or variable method performance, therefore, any detected values are always ESTIMATED (E).

NOTE - All results reported below the MRL are also ESTIMATED (E).

Compound Name	**MRL**	**EG02**	**SH03**	**PR01**	**SV01**	**SP01**	**SP02**
Date sampled		1-Jul-98	1-Jul-98	18-Jun-98	17-Jun-98	18-Jun-98	3-Dec-98
tetrachloroethylene	0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
tribromomethane	0.04	**7.6**	< 0.04	**E0.030**	< 0.04	**0.64**	< 0.04
benzaldehyde	0.1	< 0.10	< 0.1	< 0.10	< 0.1	< 0.10	< 0.1
phenol	0.08 *	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08
1,2,4-trimethylbenzene	0.08 *	< 0.08	< 0.08	< 0.08	**0.22**	< 0.08	< 0.08
1,3-dichlorobenzene	0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
1,4-dichlorobenzene	0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
D-limone	0.05	< 0.05	< 0.05	< 0.05	**E0.066**	**E0.22**	< 0.05
1,2-dichlorobenzene	0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
acetophenone	0.1 *	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
para-cresol	0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
ethanol, 2-(2-butoxyethoxy-)	0.2 *	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
naphthalene	0.03	< 0.03	< 0.03	< 0.03	**0.43**	< 0.03	< 0.03
naphthalene, 2-methyl	0.04	< 0.04	< 0.04	< 0.04	**0.54**	**0.081**	< 0.04
naphthalene, 1-methyl	0.04	< 0.04	< 0.04	< 0.04	**0.38**	< 0.04	< 0.04
phthalic anhydride	0.1 *	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2(2-btxyethxy) ethyl acetate	0.06	< 0.06	< 0.06	< 0.06	**0.16**	**0.16**	< 0.06
2,6-di-tert-butylphenol	0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
acenaphthylene	0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
2,6-di-tert-para-benzoquinone	0.07	< 0.07	< 0.07	**0.37**	**0.13**	< 0.07	< 0.07

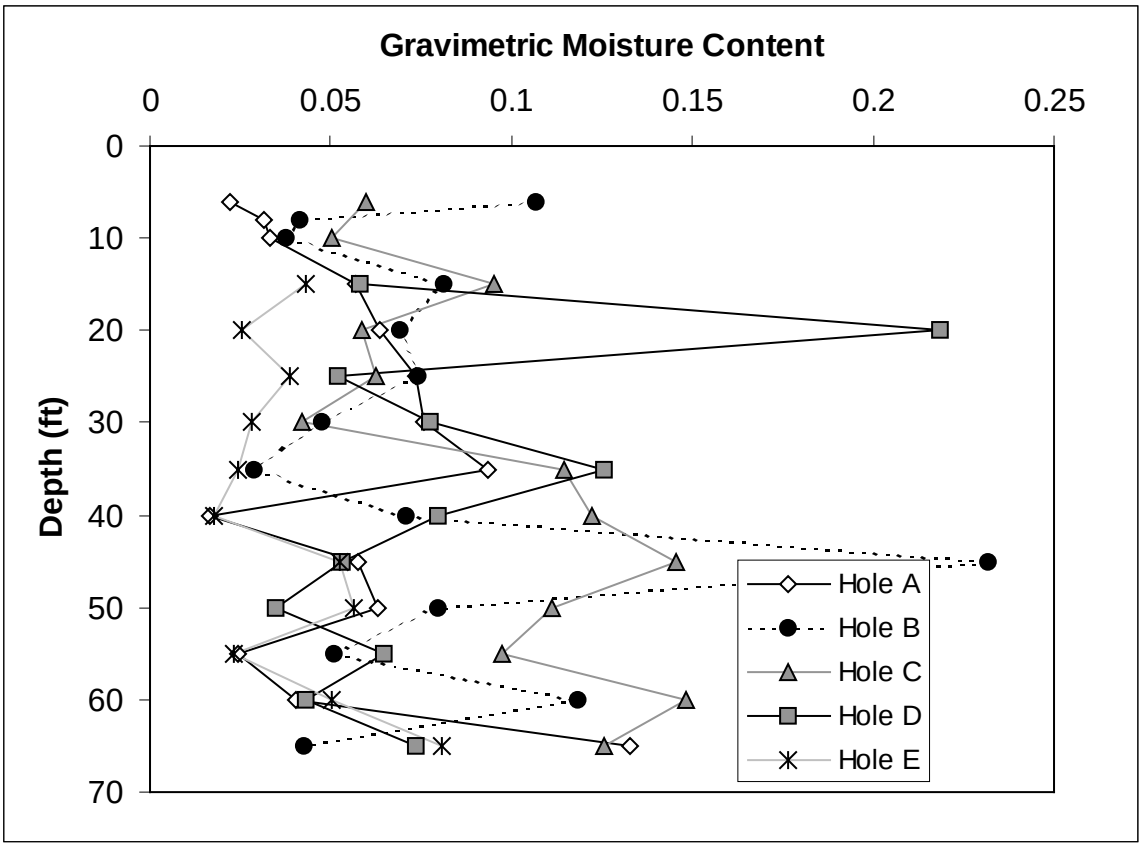
Compound Name	MRL	EG02	SH03	PR01	SV01	SP01	SP02
Butylated hydroxyanisole (BHA)	0.12	< 0.12	< 0.12	< 0.12	< 0.12	< 0.12	< 0.12
acenaphthene	0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Butylated hydroxytoluene (BHT)	0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08
fluorene	0.08	< 0.08	< 0.08	< 0.08	**E0.066**	< 0.08	< 0.08
tributyl phosphate	0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
nonylphenol-total	0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
simazine	0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
atrazine	0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
tri (2-chloroethyl) phosphate	0.04	< 0.04	< 0.04	**0.073**	< 0.04	< 0.04	**E0.026**
lindane	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
phenanthrene	0.06	< 0.06	< 0.06	**E0.036**	**E0.038**	< 0.06	< 0.06
diazinon	0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
anthracene	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
caffeine	0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08
methyl parathion	0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
carbaryl	0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Nonylphenol ethoxylate 1 (NPEO1) (total)	1.0	< 1.0	< 1.0	**E1.3**	< 1.0	< 1.0	< 1.0
metolachlor	0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
chlorpyrifos	0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
DCPA	0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
fluoranthene	0.03	< 0.03	< 0.03	**E0.029**	< 0.03	< 0.03	< 0.03
trans-chlordane	0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
pyrene	0.03	< 0.03	< 0.03	**0.072**	< 0.03	< 0.03	< 0.03
cis-chlordane	0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04

Compound Name	MRL	EG02	SH03	PR01	SV01	SP01	SP02
bisphenol A	0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
p,p' -DDE	0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
dieldrin	0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08
NPEO2-total	1.1	< 1.1	< 1.1	**E0.87**	< 1.1	< 1.1	< 1.1
tri (dichloroisopropyl) phosphate	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
bis (2-ethyl hexyl) adipate	1.5 *	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
ethanol, 2-butoxy-, phosphate	0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07
trephenyl phosphate	0.1	< 0.1	< 0.1	**E0.039**	< 0.1	< 0.1	< 0.1
benzo (a) anthracene	0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
chrysene	0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
bis (2-ethyl hexyl) phthalate	2.0 *	< 2.0	< 2.0	**4.2**	< 2.0	< 2.0	< 2.0
17beta-estradiol	0.5 *	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
benzo (b) fluoranthene	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
benzo (k) fluoranthene	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
benzo (a) pyrene	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
3 beta-coprostanol	0.8 *	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
cholesterol	1.5 *	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
indeno (1,2,3-c,d) pyrene	0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
dibenzo (a,h) anthracene	0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
benzo (g,h,I) perylene	0.2	< 0.2	< 0.2	**E0.036**	< 0.2	< 0.2	< 0.2
methyl-di-(tert-butyl-d9) phenol-SURROGATE (BHT-d9) (%-rec)	NA	34.2	44.1	100.00	95.00	105.00	54.00
nonylbenzene - SURROGATE (%-rec)	NA	72.9	53.9	96.67	103.03	115.15	94.00
bisphenol A,-d6 SURROGATE (%-rec)	NA	44.8	58.4	90.00	63.75	87.50	NA

Appendix 6

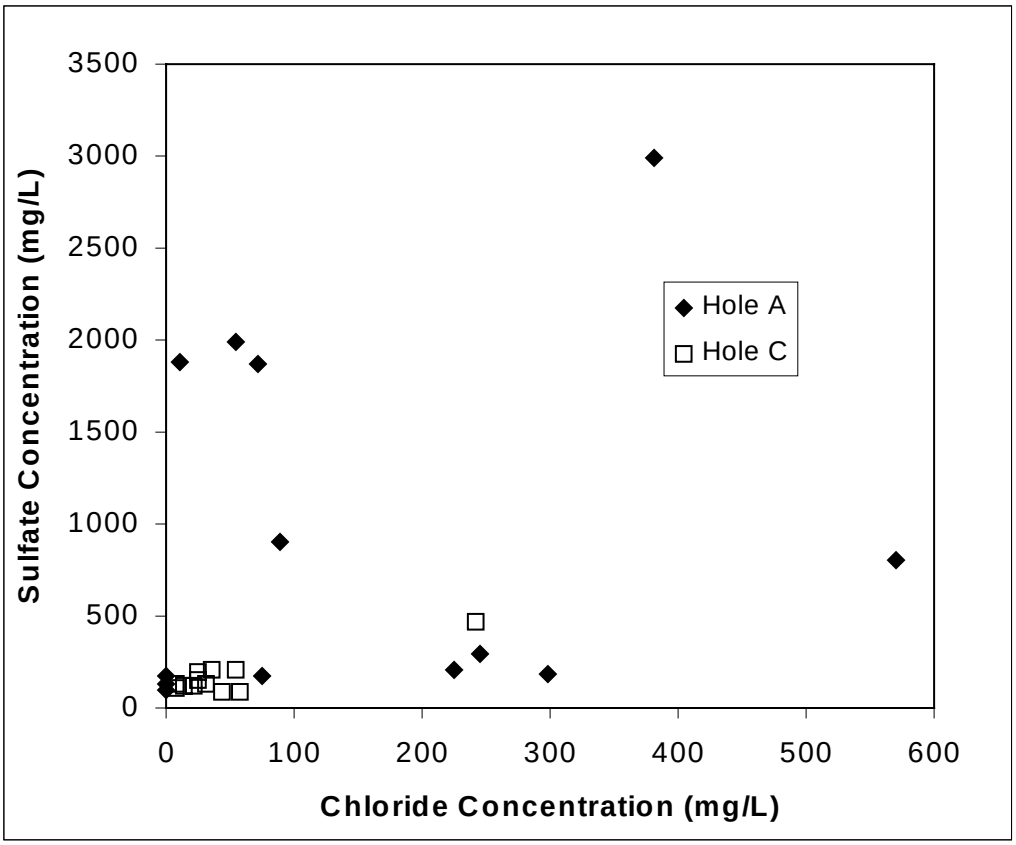
Laboratory Results of Vadose Zone Soil Analyses

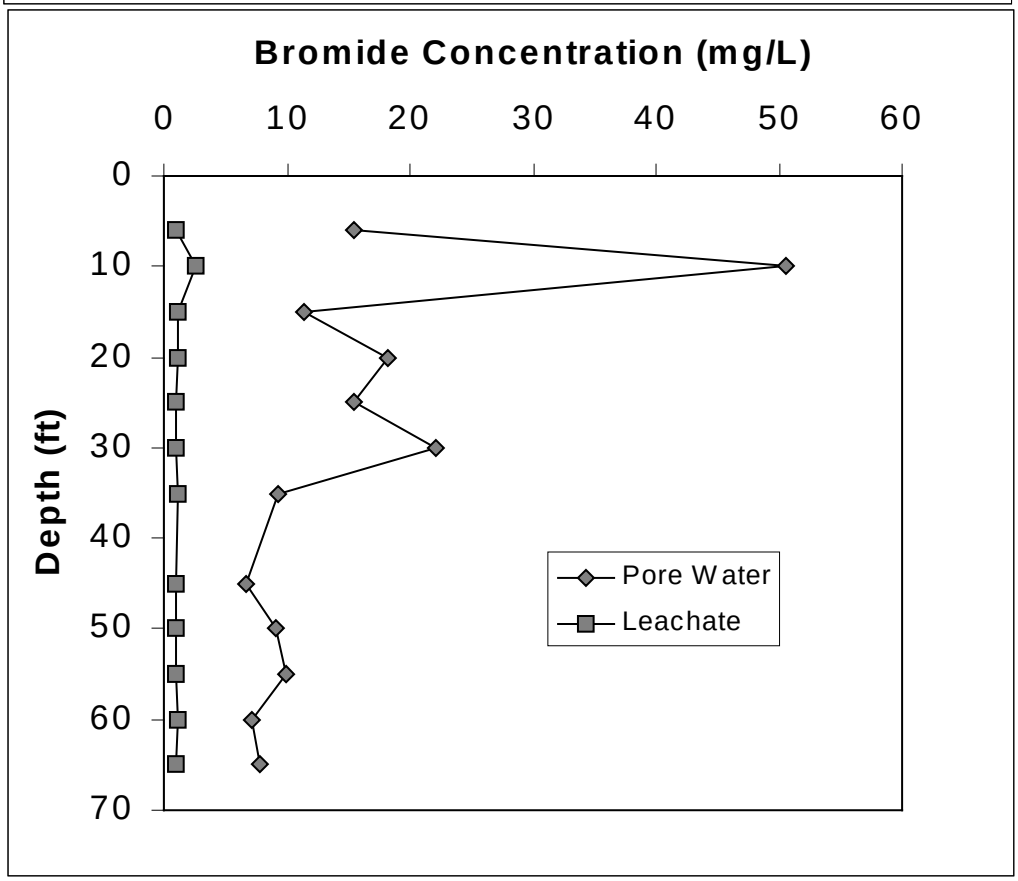
Gravimetric Moisture Content						
Depth (ft)	A	B	C	D	E	
6	0.02232	0.106545	0.059821			6
8	0.031255	0.041419	0.050106			10
10	0.032947	0.037791	0.09538	0.058018	0.042925	15
15	0.05681	0.081143	0.058815	0.218405	0.025714	20
20	0.063877	0.06891	0.062568	0.051988	0.038758	25
25	0.073647	0.07414	0.042035	0.077684	0.027964	30
30	0.075866	0.047408	0.114449	0.125291	0.024445	35
35	0.093685	0.028829	0.122163	0.079496	0.017839	40
40	0.016495	0.070712	0.145546	0.05333	0.052737	45
45	0.057675	0.231911	0.11129	0.0348	0.056315	50
50	0.063259	0.079745	0.097266	0.064946	0.023065	55
55	0.024536	0.050939	0.148331	0.043327	0.050509	60
60	0.040188	0.118439	0.125776	0.073335	0.080577	65
65	0.132747	0.042652				

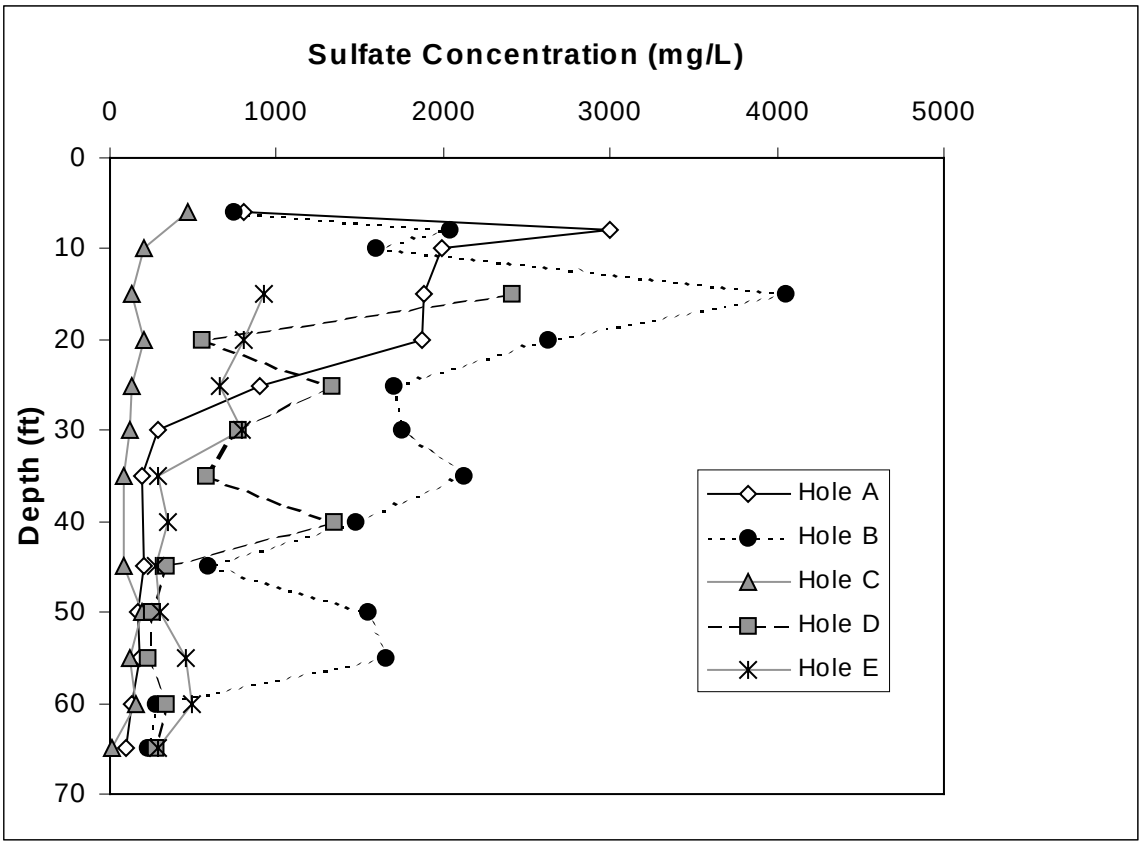


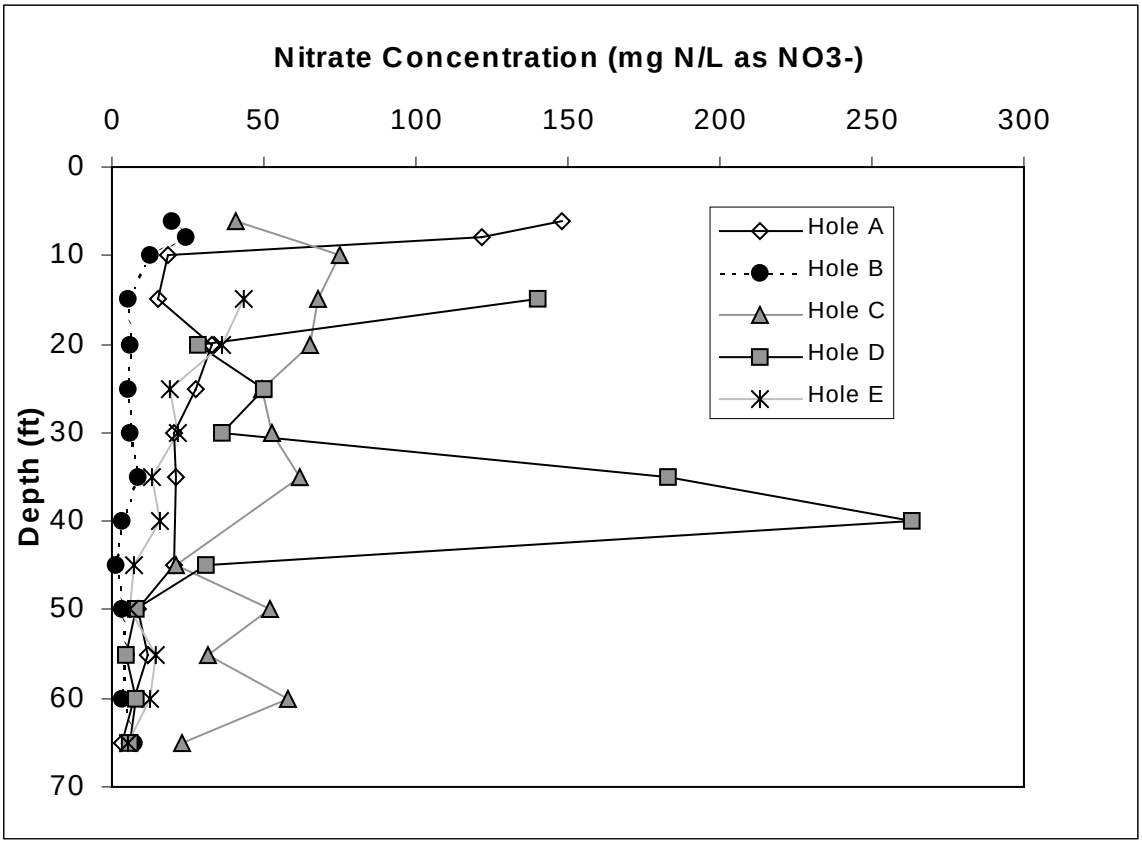
Pore Water Concentrations			NO3-					
Sample	Cl-	SO4(2-)	mg NO3/L	mg N/L	Depth (ft)			
A1	570.09	800.20	655.71	148.06	6			
A2	381.73	2993.47	540.24	121.99	8			
A3	54.09	1984.76	81.25	18.35	10			
A4	10.45	1884.05	66.14	14.93	15			
A5	71.71	1868.66	146.16	33.00	20			
A6	89.54	903.72	123.04	27.78	25			
A7	244.67	289.27	89.47	20.20	30			
A8	298.90	187.87	94.12	21.25	35			
A10	225.63	206.12	89.43	20.19	45			
A11	74.93	169.24	37.04	8.36	50			
A12	0.00	175.47	50.99	11.51	55			
A13	0.00	127.23	33.00	7.45	60			
A14	0.00	95.02	14.96	3.38	65			
Pore Water Concentrations			NO3-					
Sample	Cl-	SO4(2-)	mg NO3/L	mg N/L	Depth (ft)			
B1	205.45	745.84	87.71	19.81	6			
B2	110.15	2034.59	108.88	24.58	8			
B3	59.15	1598.88	54.53	12.31	10			
B4	623.79	4056.22	23.34	5.27	15			
B5	773.37	2626.17	25.22	5.69	20			
B6	1145.87	1699.16	23.08	5.21	25			
B7	1244.51	1744.62	25.30	5.71	30			
B8	1531.85	2118.44	38.75	8.75	35			
B9	366.06	1469.54	15.43	3.48	40			
B10	170.32	590.38	5.75	1.30	45			
B11	433.69	1543.82	15.12	3.41	50			
B12	335.89	1653.25	19.98	4.51	55			
B13	293.32	274.03	13.29	3.00	60			
B14	558.76	222.68	31.29	7.07	65			
Pore Water Concentrations			NO3-			Br- (mg/L)		
Sample	Cl-	SO4(2-)	mg NO3/L	mg N/L	Depth (ft)	Pore Wate	Leachate	Leachate
C1	241.73	464.35	180.20	40.69	6	15.51	0.93	6
C3	55.05	207.36	333.56	75.32	10	50.54	2.53	10
C4	30.97	131.85	301.24	68.02	15	11.44	1.09	15
C5	36.69	201.26	287.50	64.92	20	18.21	1.07	20
C6	7.71	133.71	217.26	49.06	25	15.52	0.97	25
C7	21.16	122.78	232.60	52.52	30	22.07	0.93	30
C8	57.55	88.27	275.24	62.15	35	9.35	1.07	35
C10	44.46	81.98	93.92	21.21	45	6.61	0.96	45
C11	24.40	193.44	228.84	51.67	50	9.07	1.01	50
C12	13.48	118.43	139.53	31.51	55	9.96	0.97	55
C13	25.36	156.55	256.77	57.98	60	7.14	1.06	60
C14	8.58	113.33	101.74	22.97	65	7.73	0.97	65

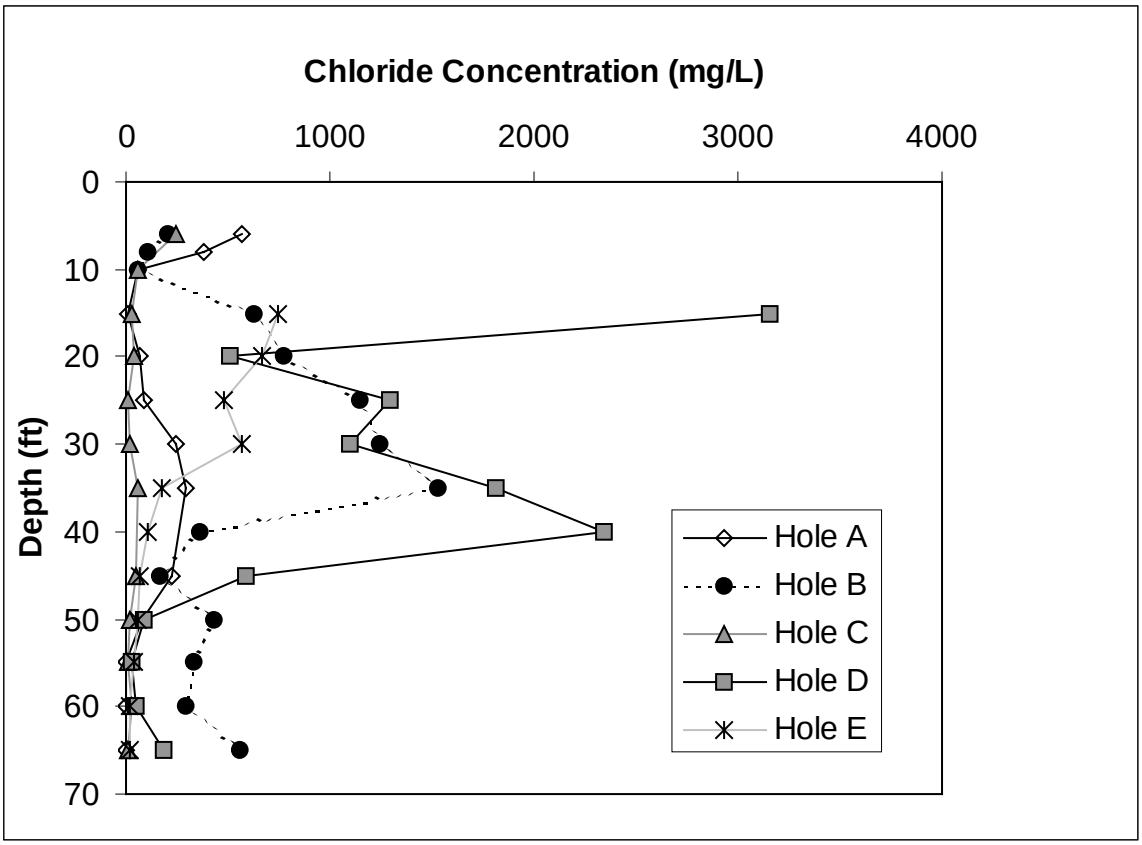
Pore Water Concentrations			NO3-					
Sample	Cl-	SO4(2-)	mg NO3/L	mg N/L	Depth (ft)			
D4	3161.18	2408.75	620.43	140.09	15			
D5	509.39	552.81	125.84	28.41	20			
D6	1295.48	1325.90	220.48	49.79	25			
D7	1101.57	763.18	158.89	35.88	30			
D8	1813.72	576.84	811.36	183.20	35			
D9	2343.73	1344.32	1165.72	263.22	40			
D10	584.86	340.90	135.81	30.67	45			
D11	86.66	253.25	34.87	7.87	50			
D12	33.81	231.88	21.44	4.84	55			
D13	45.19	339.31	33.57	7.58	60			
D14	190.79	280.38	25.51	5.76	65			
Pore Water Concentrations			NO3-					
Sample	Cl-	SO4(2-)	mg NO3/L	mg N/L	Depth (ft)			
E4	741.82	917.81	192.60	43.49	15			
E5	667.22	798.17	159.82	36.09	20			
E6	482.70	664.17	84.59	19.10	25			
E7	568.49	792.23	97.05	21.91	30			
E8	178.19	292.34	59.29	13.39	35			
E9	108.15	342.57	70.60	15.94	40			
E10	66.56	279.52	33.09	7.47	45			
E11	61.61	305.22	25.34	5.72	50			
E12	38.72	459.93	63.79	14.40	55			
E13	21.45	493.53	54.75	12.36	60			
E14	21.89	284.42	24.23	5.47	65			


Sulfate Concentration (mg/L)
3500
3000
2500
2000
1500
1000
500
0
0
100
200
300
400
500
600
Chloride Concentration (mg/L)
Hole A
Hole C


Bromide Concentration (mg/L)
0
10
20
30
40
50
60
Depth (ft)
0
10
20
30
40
50
60
70
Pore Water
Leachate


Sulfate Concentration (mg/L)
0
1000
2000
3000
4000
5000
Depth (ft)
0
10
20
30
40
50
60
70
Hole A
Hole B
Hole C
Hole D
Hole E


Nitrate Concentration (mg N/L as NO3-)
0
50
100
150
200
250
300
Depth (ft)
0
10
20
30
40
50
60
70
Hole A
Hole B
Hole C
Hole D
Hole E


Chloride Concentration (mg/L)
0
1000
2000
3000
4000
Depth (ft)
0
10
20
30
40
50
60
70
Hole A
Hole B
Hole C
Hole D
Hole E

Appendix 7

Mancos Shale Microcosm Study

Mancos Shale Microcosm Study

NITRATE TESTING

Materials

6 Erlenmeyer flasks w/ rubber stoppers

100 g Silica sand

75 g Mancos shale

1 Liter of 50 mg/L nitrate solution (made with tap water)

2 Liters of 10% hydrochloric acid solution (made with DI water)

6 ml of septic wastewater effluent

Compressed nitrogen-gas tank w/ low range regulator and hose

Procedure

To begin the Mancos shale nitrate evaluation, approximately 100 g of silica sand was soaked in a 10% hydrochloric acid bath for 24 hours. The sand was then rinsed repeatedly in de-ionized water until the pH of the rinse water rose above 6.00. The Erlenmeyer flasks and stoppers were also soaked and rinsed in the same method.

After the sand was dried over-night in a 100 degree Celsius oven, 25 grams of sand was weighed and placed into each of the first three flasks. Then, 25 grams of Mancos shale was weighed and placed into each one of the last three flasks. 100 ml of the 50 mg/L nitrate solution was placed into each of the 6 flasks. Next, 1 ml of wastewater was placed into each of the six flasks. Each flask was then swirled gently and then placed into the incubator to be kept at 20 degrees Celsius.

Sampling

Approximately 4 ml of fluid from each flask was extracted each sampling day for use in the ion chromatograph to analyze nitrate concentrations. The extracted sample was placed in a 3-dram glass vial and taken to the biology annex for analysis. Approximately 4 ml of each nitrate standard solution was also extracted into glass sample vials. In order to keep oxygen from entering the microcosm environment, nitrogen gas was blown into the flask whenever the rubber stopper was removed. The nitrogen concentration results received so far can be seen below.

Ion Chromatography - Nitrate Concentration Results (+/- 5 mg/L)

Sample ID	**Sample Days from Start**					
	1	**2**	**3**	**4**	**5**	**10**
50 mg/L Nitrate Standard	63.7	50.9	50.0	50.4	50.4	50.4
30 mg/L Nitrate Standard	--	--	28.8	28.9	28.8	29.1
25 mg/L Nitrate Standard	43.4	38.5	--	--	--	--
12.5 mg/L Nitrate Standard	32.8	61.1	--	--	--	--
10 mg/L Nitrate Standard	--	--	8.6	8.5	8.5	8.5
Control 1	80.5	61.1	54.9	55.8	55.3	55.8
Control 2	64.2	62.4	54.4	55.8	55.3	55.8
Control 3	62.4	73.5	54.4	55.8	55.8	56.2
Mancos Shale 1	55.3	54.9	54.4	55.3	55.3	55.8
Mancos Shale 2	77.0	62.8	54.4	55.3	55.8	55.8
Mancos Shale 3	71.7	67.7	54.4	55.3	56.2	56.2

TOTAL NITROGEN TESTING

A leachate solution from the Mancos shale was prepared by mixing 50 mg of the Mancos Shale with 250 ml of de-ionized water. The mixture was shaken vigorously for 1 minute. A syringe was used to draw 10 ml of leachate form the container. Then a filter was used to remove particulate matter form the leachate solution. This leachate solution was then stored in the refrigerator to be used for nitrogen, chemical oxygen demand, and ammonia testing.

HACH procedure followed:

One powder pillow of nitrogen persulfate reagent was added to a total nitrogen hydroxide reagent vial. Then, 2 ml of the Mancos leachate was placed into the same total nitrogen hydroxide reagent vial. The vial was then shaken vigorously for 30 seconds and placed into the 105 degree Celsius COD reactor for exactly 30 minutes. The vial was then removed and allowed to cool to room temperature. One Reagent A powder pillow was then added to the digested vial, which was then shaken for 15 seconds and allowed a 3 minute reaction period. One Reagent B powder pillow was then added to the same digested vial, which was shaken again for 15 seconds and allowed a 2 minute reaction period. Next, 2 ml of the digested, treated sample was transferred to a total nitrogen Reagent C vial. The Reagent C vial was then inverted slowly 10 times and then allowed a 5 minute reaction period. This process of adding reagents, adding leachate, shaking and reacting was repeated for each sample and standard. After the final 5 minute reaction period, each vial was placed the spectrophotometer. The absorbance of each vial at 410-nm wavelength was recorded. The absorbance data from the standards was used to generate a standard curve and linear equation. The equation that was provided from the standard curve was used to calculate the Total Nitrogen present in the Mancos Leachate. This equation is:

Nitrogen = 47.499 * (Absorption) - 2.3898

Description	**Absorption @ 410 nm**	**Total Nitrogen (mg/L)**
DI + reagents	0.039	--
1 mg/L Nitrogen std	0.084	--
5 mg/L Nitrogen std	0.148	--
10 mg/L Nitrogen std	0.270	--
30 mg/L Nitrogen std	0.679	--
Mancos Leachate 1	0.200	7.110
Mancos Leachate 2	0.198	7.015
Mancos Leachate 3	0.059	0.413
		AVE = 4.846 mg/L

CHEMICAL OXYGEN DEMAND

HACH procedure followed:

2 ml of the Mancos leachate was placed into a low range COD reagent vial. The vial was then inverted several times and then placed in the 150 degree Celsius COD Reactor. This process was repeated for each vial. The vials were digested for 2 hours, then allowed to cool to 120 degrees Celsius in the COD reactor. After the vials cooled to 120 degrees Celsius, they were inverted several times and placed in a cooling rack. Once the vials reached room temperature, they were placed one-at-a-time into the spectrophotometer. The absorbance of each vial at 420-nm wavelength was recorded. The absorbance data from the standards was used to generate a standard curve and linear equation. The equation that was provided from the standard curve was used to calculate the Oxygen present in the Mancos Leachate. This equation is:

$$(\text{Oxygen}) = -317.57 * (\text{Absorption}) + 236.22$$

Vial Description	Absorption @ 420 nm	Oxygen (mg/L)
DI only	0.041	--
DI and Reagents	0.741	--
10 mg/L Oxygen std.	0.711	--
50 mg/L Oxygen std.	0.587	--
100 mg/L Oxygen std.	0.439	--
150 mg/L Oxygen std.	0.265	--
Mancos Leachate 1	0.498	78.07
Mancos Leachate 2	0.490	80.61
Mancos Leachate 3	0.482	83.15
		AVE = 80.61 mg/L

AMMONIA TESTING

HACH procedure followed:

0.1 ml of the Mancos leachate was placed into an ammonia reagent vial. The ammonia salicylate powder pillow was then added to the vial. Then the ammonia cyanurate powder pillow was added to the vial. The vial was then shaken vigorously for 30 seconds and then allowed a 20-minute reaction period. This procedure of adding leachate, reagent powders, shaking, and reacting was repeated for each standard and sample. At the end of the 20-minute reaction period, each vial was placed in the spectrophotometer. The absorbance of each vial at 655-nm wavelength was recorded. The absorbance data from the standards was used to generate a standard curve and linear equation. The equation that was provided from the standard curve was used to calculate the Ammonia present in the Mancos Leachate. This equation is:

Ammonia = 21.725 * (Absorption) - 2.5419

Description	**Absorbance @ 655 nm**	**Ammonia (mg/L)**
DI water	0.080	--
0.122 mg/L Ammonia std	0.107	--
1.22 mg/L Ammonia std	0.180	--
12.2 mg/L Ammonia std	0.755	--
36.6 mg/L Ammonia std	1.771	--
61 mg/L Ammonia std	> 2.000	--
Mancos Leachate	**0.111**	**0 mg/L**

LOSS UPON IGNITION - VOLITALE MATERIALS

Standard Methods 2-57 procedure followed:

To begin the testing for volatile materials, approximately 10 grams of Mancos shale was dried in a 100 degree Celsius oven overnight. This was done to rid the sample of any moisture. Three porcelain dishes were then washed, dried and weighed. Next, 200 mg of the dried Mancos shale was placed in each porcelain dish. The dishes were placed in a 500-degree Celsius furnace for 20 minutes. The samples were allowed to cool in the normal atmosphere for 10 minutes; then they were placed in a desiccator for another 10 minutes of cooling. The samples were then weighed. This process of heating, cooling, and weighing was repeated until the weight loss was minute.

	Sample 1 **(mg)**	**Sample 2** **(mg)**	**Sample 3** **(mg)**
Dish Weight	71.3389	68.5405	70.2066
Initial Dish + Sample Weight	71.8730	69.0460	70.7912
Sample Weight	0.5341	0.5055	0.5846
First Heating	71.8636	69.0358	70.7754
Second Heating	71.8596	69.0343	70.7729
Third Heating	71.8538	69.0314	70.7723
Total Change in Weight	0.0192	0.0146	0.0189
Percent Loss Upon Ignition	3.59%	2.89%	3.23%
Average Percent Loss Upon Ignition	**3.24%**		