1R - 2669

HYDRO-GEOLOGICAL REPORT

MARCH 2012

HYDROGEOLOGY OF
NEW MEXICO SALT WATER DISPOSAL COMPANY SPILL SITES
SECTIONS 15, 21 & 22, TOWNSHIP 10 SOUTH, RANGE 34 EAST
LEA COUNTY, NEW MEXICO

Prepared for: Whole Earth Environmental, Inc.
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Katy, Texas 77494

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Date: March 2012

Atkins
ENGINEERING ASSOCIATES

Background & Scope

New Mexico Salt Water Disposal Company operates several produced water (brine) transmission pipelines in Lea County, New Mexico. Three produced water spill/leakage sites associated with the operation of these pipelines are located in Sections 15, 21 and 22 of Township 10 South, Range 34 East, N.M.P.M. in Lea County, New Mexico, approximately 15 miles northwest of Tatum, New Mexico (study area). The spills sites are known as *Station 11*, *6-Inch Leak (aka Johnson Leak)*, and *New Spill*. The site locations are shown on attached Figures 1 and 2.

The scope of this report is to characterize the subsurface hydrogeology for the study area, specifically a layer of fat yellow clay, and analyze said clay layer's ability to prevent spilled produced water from impacting the regional water table.

Study Area Hydrogeology

Hydrogeologic data for the study area is limited. Hydrogeologic investigations varying in size and scope have occurred at each of the subject spill sites. Select documents from investigations at each of the sites are included as Appendices 1, 2 and 3.

Reports by Havenor (2009) and Barnhill (2007) describe the hydrogeology at the Station 11 site as evidenced by several soil borings drilled at the site. The geology is characterized by approximately 50 to 60 feet of Quatenary sand, silt and caliche and Tertiary Ogallala sand, underlain by Cretaceous age sediments. The upper layer of the Cretaceous age sediments consists of approximately 30 to 40 feet of fat yellow clay. Havenor (2009) also describes this fat clay layer as shale and an aquitard or aquiclude.

Five soil borings drilled at the 6-Inch Leak site and two soil borings at the New Spill site show similar geologic layers and depths as reported for the Station 11 site. These geologic layers appear to be connected across the study area. The location of the various soil borings and monitoring wells are shown on attached Figures 2 through 6. Copies of all soil boring/monitoring well logs are found in the appendices. Figure A below shows geologic cross-section A-B-C, which emphasizes the disposition of the upper Cretaceous yellow clay across the study area.

Three separate zones of groundwater appear in the study area: the regional shallow aquifer and two upper perched zones. Water level data for the regional shallow aquifer is available for the Station 11 and 6-Inch Leak sites. Three soil borings at Station 11 were completed as monitoring wells MW-1, M-2 and MW-3 so as to draw water from this aquifer. One unnamed monitoring well at the 6-Inch Leak site was completed in the regional shallow aquifer as well, but due to imprecise location information, the well is not shown on the attached figures. It is understood to be near or adjacent to the 6-Inch Leak site's MW-3. All other soil borings within the study area do not reach this aquifer. Figure 3 shows groundwater elevation contours for the regional aquifer using water level data presented in Barnhill (2007), which show groundwater to be relatively flat with a slight downward gradient towards the northeast at the Station 11 site. Upon completion the 6-Inch Leak site's regional water table monitoring well in September, 2011, the water level in said well was measured at 102.05 feet below top of casing; the water table elevation in the

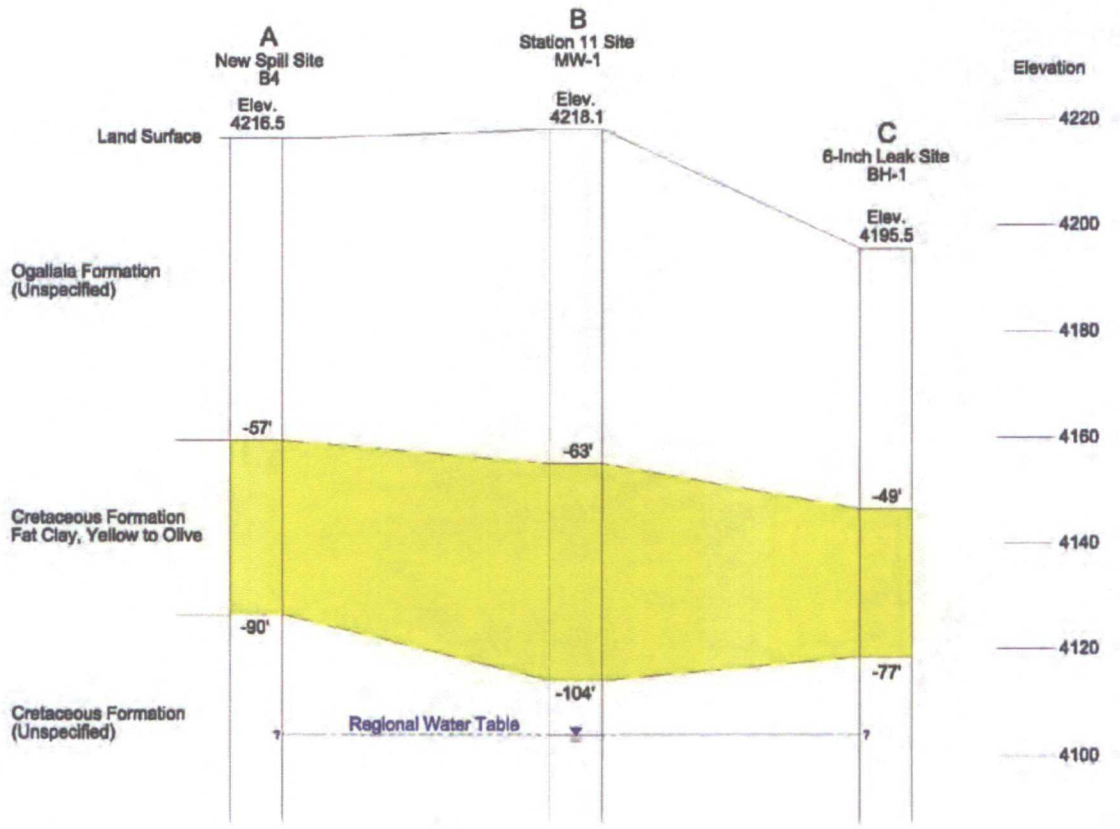


Figure A Geologic cross section A-B-C depicting upper Cretaceous fat yellow clay in relationship to the regional water table.

well at that time is estimated to have been 4,095 feet, which is similar to the elevations noted for Station 11 in 2007. Elevations of nearby lakes shown on USGS topographic maps (Figure 1) are also comparable to the regional water table elevations at Station 11 and 6-Inch Leak sites; it is likely that these lakes are occurring where the regional water table is exposed to land surface. Figure A below also gives an estimation of the regional water table elevation across the study area.

Evidence of the upper perched groundwater zone is found at two locations at the Station 11 site: monitoring well MW-5 and recovery well RW-1, which are completed to depths of 30 and 33 feet, respectively. According to Barnill (2007) recovery well RW-1 was drilled at nearly the same location as an earlier soil boring SB-4A and screened at depth where this upper perched water zone was noted in SB-4A. However, after drilling recovery well RW-1, very little water was found at the well on multiple occasions. Havenor (2007) reports the water thickness at MW-5 to be 0.9 of a foot. It should be noted that MW-2 was drilled between MW-5 and RW-1 and found no perched water above the regional groundwater table. Boring logs for MW-5 and SB-4A show the perched water to occur on top of brown clay. This is likely a localized clay lens within the Ogallala formation. Spilled produced water at the site appears to be the source of this groundwater zone.

Evidence of the lower perched groundwater zone is found across the study area. Numerous soil borings show a sandy layer at the bottom of the Ogallala formation varying from damp to wet (saturated) located directly on top of the fat yellow clay discussed above. In contrast to the clay lenses supporting the upper perched groundwater zone, the yellow clay layer supporting this lower perched groundwater zone appears to at least span across the study area. Boring logs at the Station 11 and New Spill sites show this lower perched groundwater zone to have a thickness of approximately 3 feet. At the Station 11 site the occurrence of the perched water appears limited to the area around monitoring wells MW-1, MW-6 and MW-4, as perched groundwater was not found during the drilling of MW-2 and MW-3. At the other sights it is not known how widespread this groundwater zone may be. Figures 4 and 5 show the estimated thickness of the lower perched groundwater zone at the Station 11 and New Spill sites.

Groundwater elevation data within the lower perched groundwater zone are available at the 6-Inch Leak site and shown as a contour map in Figure 6. The figure shows the groundwater zone to be mounded, with the highest point at monitoring well MW-2, which based on soil conductivity mapping appears to be at the center of the spill at this site. Coupling the measured water level data with boring log information, the thickness of the lower perched groundwater zone at this site appears to be from 6 to 14 feet. However, it should be noted that available boring logs for the 6-Inch Leak and New Spill sites were prepared by the well driller as opposed to the Station 11 site logs, which were prepared by a geologist. Well driller logs are likely not nearly as precise in establishing depths to varying geologic layers. The gradient of the lower perched groundwater at the 6-Inch Leak site indicates that the perched groundwater dissipates a short distance from the spill site.

Elsewhere in Lea County the Ogallala formation does carry water and in many places is the main shallow ground water aquifer. However, this does not appear to be the case in the study area. Tillery's (2008) Figure 2 depicts the saturated thickness of the High Plains (Ogallala) Aquifer across Lea County. The study area is located in a region described as having "variable or no saturation." Attached Figure 7 of this report shows the location of the study area within Tillery's Figure 2. The study area is also excluded from the domain of groundwater models of the Ogallala aquifer within Lea County by Musharrafieh and Chudnoff (1999) and McAda (1984). Very little recharge if any occurs in the study area. Annual recharge estimates for the Ogallala aquifer in Lea County range from 0.25 to 1 inch per year (Tillery, 2008, and Musharrafieh and Chudnoff, 1999). The New Mexico Office of the State Engineer's version of the model by Musharrafieh and Chudnoff (1999) used for water rights administration incorporates zero recharge in predicting future water level declines.

Groundwater analyses for chloride across the study area show samples from the perched groundwater zones to be of markedly poorer quality than those from the regional aquifer, as shown in Table 1.

The lower perched groundwater zones occurring at the three spill sites within the study area appear isolated from one another and sourced by the spilled produced water, with no connection to the regional aquifer. Some thin lenses of groundwater saturation may occur naturally in the area within the Ogallala formation, but would not be a significant water resource. Produced water contact with these lenses would be inconsequential.

Table 1 Groundwater chloride concentrations. *Assumed; insufficient data. ^Sampled during drilling.

Site	Sample Date	Well Name(s)	Groundwater Zone	Chloride (mg/L)
Station 11	June 13, 2007	MW-1^	Lower Perched	21,000
	July 9, 2007	MW-1	Regional Aquifer	550
		MW-2	Regional Aquifer	560
		MW-3	Regional Aquifer	620
	June 21, 2011	RW-1	Upper Perched	50,000
		MW-1	Regional Aquifer	230
		MW-2	Regional Aquifer	200
		MW-3	Regional Aquifer	200
		MW-4	Lower Perched	36,000
		MW-5	Upper Perched	18,800
		MW-6	Lower Perched	22,400
6-Inch Leak	May 20, 2011	MW-1, NW Background, West Background	Lower Perched	17,000
		MW-2, E. Leak Source, East 2"	Lower Perched	64,000
New Spill	November 18, 2011	B4	Lower Perched	19,200
Windmills	July 9, 2007	Sand Hill Windmill, NW Windmill	Regional Aquifer*	390
		Lucky Windmill, SW Windmill	Regional Aquifer*	460
	May 20, 2011	Sand Hill Windmill, NW Windmill	Regional Aquifer*	530
		Lucky Windmill, SW Windmill	Regional Aquifer*	530

Analysis of Produced Water Migration through Fat Yellow Clay

As discussed above, the occurrence of perched groundwater beneath each of the spill sites appears to be the result of produced water spills that appear to have been contained, at least in the present, by a layer of fat yellow clay at the top of the Cretaceous formation. Lab characterizations of this clay layer show it to be highly impermeable. Lab results presented by Barnhill (2007) for a soil sample collected at a depth interval of 65.6 to 66.1 feet during the drilling of monitoring well MW-1 at the Station 11 site show the saturated permeability, K_{sat}, to be 5.2×10^{-8} cm/sec. In anticipation of developing a numerical vadose zone model, a sample of the fat yellow clay was collected at a depth interval of 73 to 74 feet during the drilling of soil boring B4 at the New Spill site. The lab analyses report for this sample is found in Appendix 3. (B4 is referred to as Crossroads/Johnson Test Hole No. 2 in the laboratory report and Bore 2 on the attached boring long in Appendix 3.) The lab created three sub-samples, which were found to have K_{sat} values of 1.3×10^{-7}, 2.8×10^{-5}, and 1.4×10^{-6} cm/sec. In a telephone conversation with Joleen Hines, author of the laboratory analyses report, Ms. Hines indicated that the lab also analyzed a fourth sub-sample for K_{sat}, due to the variability in the results of the other three sub-samples, and found its value to be on the order of 10^{-9} cm/sec. She further indicated that the lower values are likely more reasonable, as the higher values could be the result of slight imperfections in the testing apparatus. The chart on Page 31 of the lab report shows the relative hydraulic conductivity as a fraction of K_{sat} for varying moisture contents. It can be seen that as the moisture content moves away from saturation the hydraulic conductivity decreases exponentially from the already very low saturated hydraulic conductivity value.

In order to determine the potential for spilled produced water to migrate through this clay layer where it could come in contact with the regional aquifer, a one-dimensional vadose zone numerical model was created and analyzed with HYDRUS-1D (Simunek and others, 2009), a

software package used for analysis of water flow and solute transport in variably saturated porous media. The software package incorporates the one-dimensional finite element model HYDRUS developed by the USDA-ARS U.S. Salinity Laboratory. A one-dimensional model was selected due to the limited information as to the horizontal extent of perched produced water. Among other things, the model computes flux and cumulative flux over time at the bottom of a soil profile, which can be used to predict the how long it will take for the perched produced water to migrate through the fat yellow clay layer.

The model represents the soil from ground surface to the bottom of the fat yellow clay layer in question. The stratigraphy is simplified into two materials – the upper mixture of sand, silts and clays of the Quaternary and Tertiary formations and the fat yellow clay layer. Representative thicknesses of 55 feet for the upper soil mixture and 30 feet for the fat yellow clay are used.

For the upper material, input parameters consistent with the soil properties of a typical sandy loam are provided by the HYDRUS software package. The input parameters for the clay were determined by lab analyses of a soil sample collected during the drilling of B4 at the New Spill site as discussed above. Table 2 below is a summary of the model input parameters selected for the model.

Table 2 Hydrus model input parameters

Parameter	HYDRUS "Sandy Loam"	Fat Yellow Clay
Residual soil water content, θ_r (%)	0.065	0.00
Saturated soil water content, θ_s (%)	0.40	0.41
α (cm^{-1})	0.075	0.00025
n (dimensionless)	1.89	1.30
Saturated permeability, K_{sat} (cm/sec)	0.0012272	$1.3x10^{-7}$

The upper boundary condition is atmospheric and the lower boundary condition is free drainage. The modeled initial soil moisture for the fat yellow clay is 33% for upper 10 feet, which is the average of the lab-reported moisture contents for the sample from B4, and 15% for the lower 20 feet. Boring logs in the study area show the fat yellow clay to be dry except where in contact with perched produced water. Two perched produced water thickness conditions were simulated. Simulation 1 is for a 5-foot perched produced water saturated thickness: for the upper soil mixture, the initial moisture content is 15% from surface down to 50 feet, and 41% (saturated) from 50 to 55 feet. Simulation 2 is for a 10-foot perched produced water saturated thickness: for the upper soil mixture, the initial moisture content is 15% from surface down to 45 feet, and 41% (saturated) from 45 to 55 feet. The model time is 10,000 years.

Figure B below gives the model-computed bottom flux over time and cumulative bottom flux over time, respectively, for Simulations 1 and 2. As the model is one-dimensional, flux has the dimensions of volume per unit area per unit time ($L^3/L^2/T$) and cumulative flux has the dimension of volume per unit area (L^3/L^2). Negative numbers indicate a downward flux out of the bottom of the fat yellow clay.

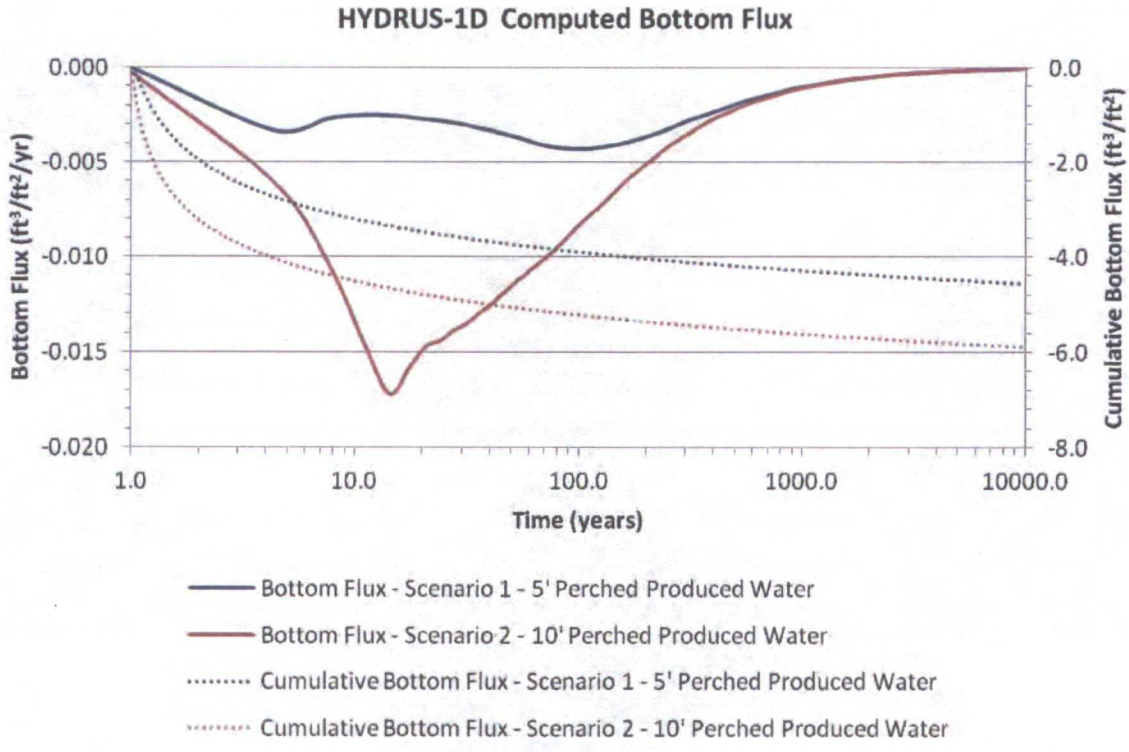


Figure C Model-computed flux and cumulative flux through the bottom of the fat yellow clay over time.

The bottom flux is the rate at which water is exiting the bottom of the fat yellow clay. In order to determine if the bottom flux includes any of the perched produced water, one must examine the cumulative bottom flux. The cumulative bottom flux can be described as the amount of water that would exit the fat yellow clay after a given period of time. These amounts can be divided by the moisture content to determine a thickness of the fat yellow clay layer through which moisture is displace by the perched produced water. Once the thickness of displaced moisture equals the thickness of the fat yellow clay, the bottom flux begins to be perched produced water. In other words, perched produced water begins passing through or exiting the fat yellow clay after displacing all moisture in that clay. The 10 feet of fat yellow clay with 33% moisture content would have an equivalent water amount of 3.3 ft^3/ft^2, while the 20 feet of fat yellow clay with 15% moisture content would have an equivalent water amount of 3 ft^3/ft^2, for a total of 6.3 ft^3/ft^2 of water that must be displaced before the perched produced water begins exiting the bottom of the fat yellow clay. Cumulative fluxes at Year 10,000 were computed as 4.57 and 5.88 ft^3/ft^2, respectively, in Simulations 1 and 2. In both cases, after 10,000 years, the model-predicted flux of perched produced water through the fat yellow clay layer is zero.

As with any model, the more the model differs from actual conditions, the less useful it becomes. A limitation of the one-dimensional model is that flow of the perched produced water is limited to the vertical direction. Due to the considerable difference in permeability of the sand, silt and clay mixture and the permeability of the fat yellow clay, there could be a significant amount of horizontal movement of the perched produced water, which would eventually dissipate into a saturated layer much thinner than the 5 and 10 feet thicknesses simulated. As shown by a comparison of the two different perched produced water thicknesses simulated, the less saturated

thickness of perched produced water, the less downward movement of moisture out of the clay. Any reduction in the produced water saturated thickness due to horizontal movement would reduce the potential for its passing through the fat yellow clay.

Summary

The study area consists of three produced water spill sites that have contributed to the presence of perched groundwater, separate from a regional aquifer. A layer of fat yellow clay is present across the study area that acts as an aquitard, preventing the migration of perched produced groundwater from reaching the regional aquifer. Chloride data from groundwater samples across the site show the perched groundwater to not be in communication with the regional aquifer. A one-dimensional vadose zone numerical model, created to simulate the migration of perched groundwater through the fat yellow clay, shows under simulations of 5 and 10 feet of perched produced water on a 30-foot layer of fat yellow clay that no perched produced water is predicted to pass through the clay layer after 10,000 years.

James Reese, PE

3/22/12
Date

List of Attachments

Figure 1 – Area Map & Spill Sites

Figure 2 – Detailed Area Map

Figure 3 – Regional Aquifer at Station 11 Site

Figure 4 – Perched Produced Water Thickness at New Spill Site

Figure 5 – Perched Produced Water Thickness at Station 11 Site

Figure 6 – Perched Produced Water Surface at 6-Inch Leak Site (aka Johnson Leak)

Figure 7 – Detailed Area Map (Figure 2) Location Overlay on USGS SIM 3044

Appendix 1 – Select documents related to the Station 11 site

Appendix 2 – Select documents related to the 6-Inch Leak (aka Johnson Leak) site

Appendix 3 – Select documents related to the New Spill site

References

Barnhill, Clayton, 2007, Abatement Plan / Monitor Well Installation Report for New Mexico Salt Water Disposal Company, Inc., unpublished report.

Havenor, Kay, 2009, Geological and Hydrgeological Evaluation of Borings and Monitor Wells at and around New Mexico Salt Water Disposal Co., Inc., Station 11, unpublished report.

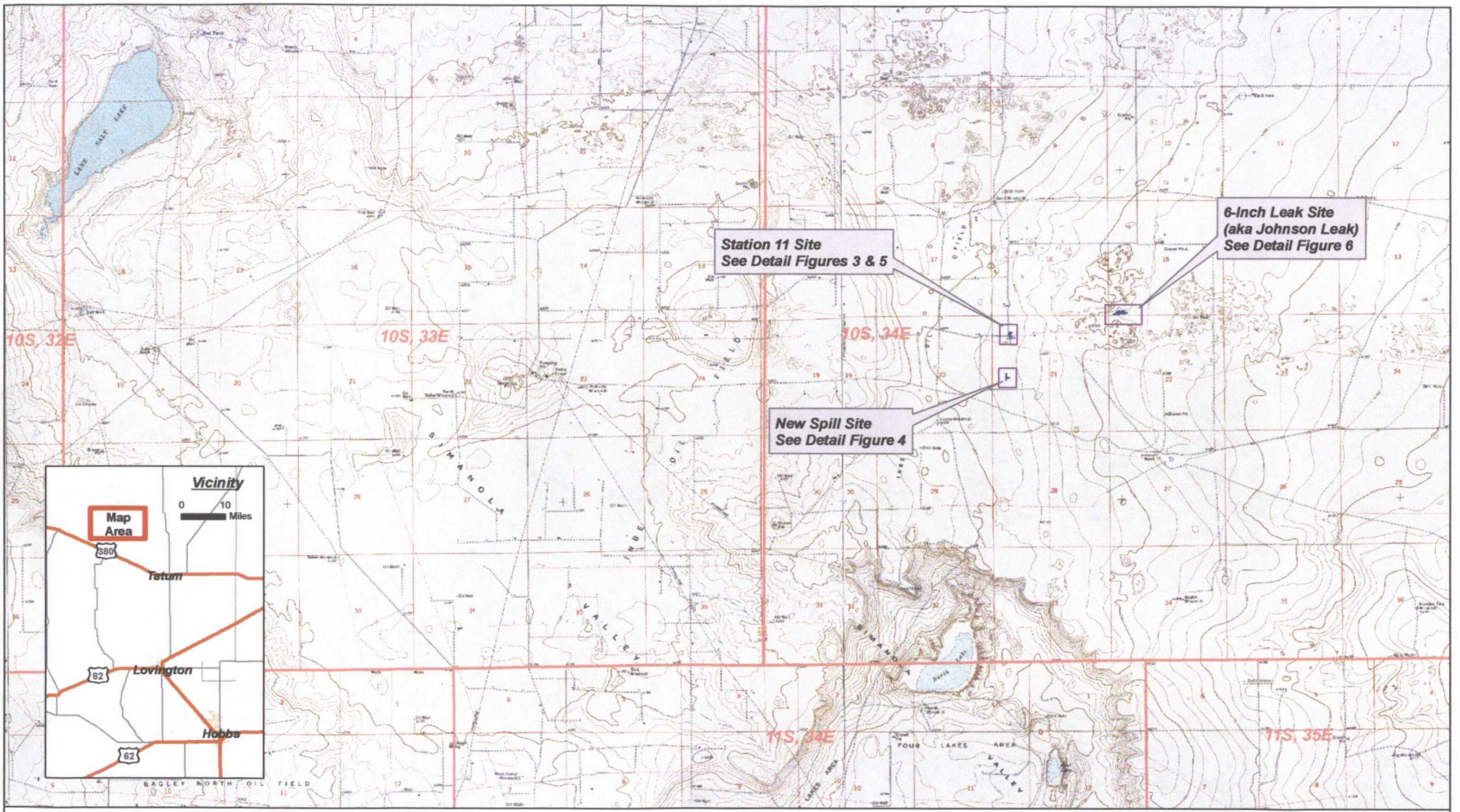
McAda, Douglas P., 1984, Projected water-level declines in the Ogallal aquifer in Lea County, New Mexico, U.S. Geological Survey Water-Resources Investigations Report 84-4062.

Musharrafieh, Ghassan and Mustafa Chudnoff, 1999, Numerical Simulation of Groundwater Flow for Water Rights Administration in the Lea County Underground Water Basin New Mexico, New Mexico Office of the State Engineer Technical Report 99-1.

Simunek, J., M. Sejna, H. Saito, M. Sakai, and M. Th. van Genuchten, 2009, The HYDRUS-1D Software Package for Simulating the One-Dimensional Movement of Water, Heat, and Multiple Solutes in Variably-Saturated Media.

Stephens, Daniel B., 1996, Vadose Zone Hydrology.

Tillery, Anne, 2008, Currenr (2004-07) Conditions and Changes in Ground-Water Levels from Predevelopment to 2007, Southern High Plains Aquifer, Southeast New Mexico – Lea County Underground Water Basin, U.S. Geological Survey Scientific Investigations Map 3044.



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Topo Basemap: USGS 7.5' Quadsheets
Lane Salt Lake & Johnson Ranch

Figure 1 Area Map & Spill Sites
Salt Water Disposal Company
Secs. 15, 21 & 22, Township 10S, Range 34 E

March 2012

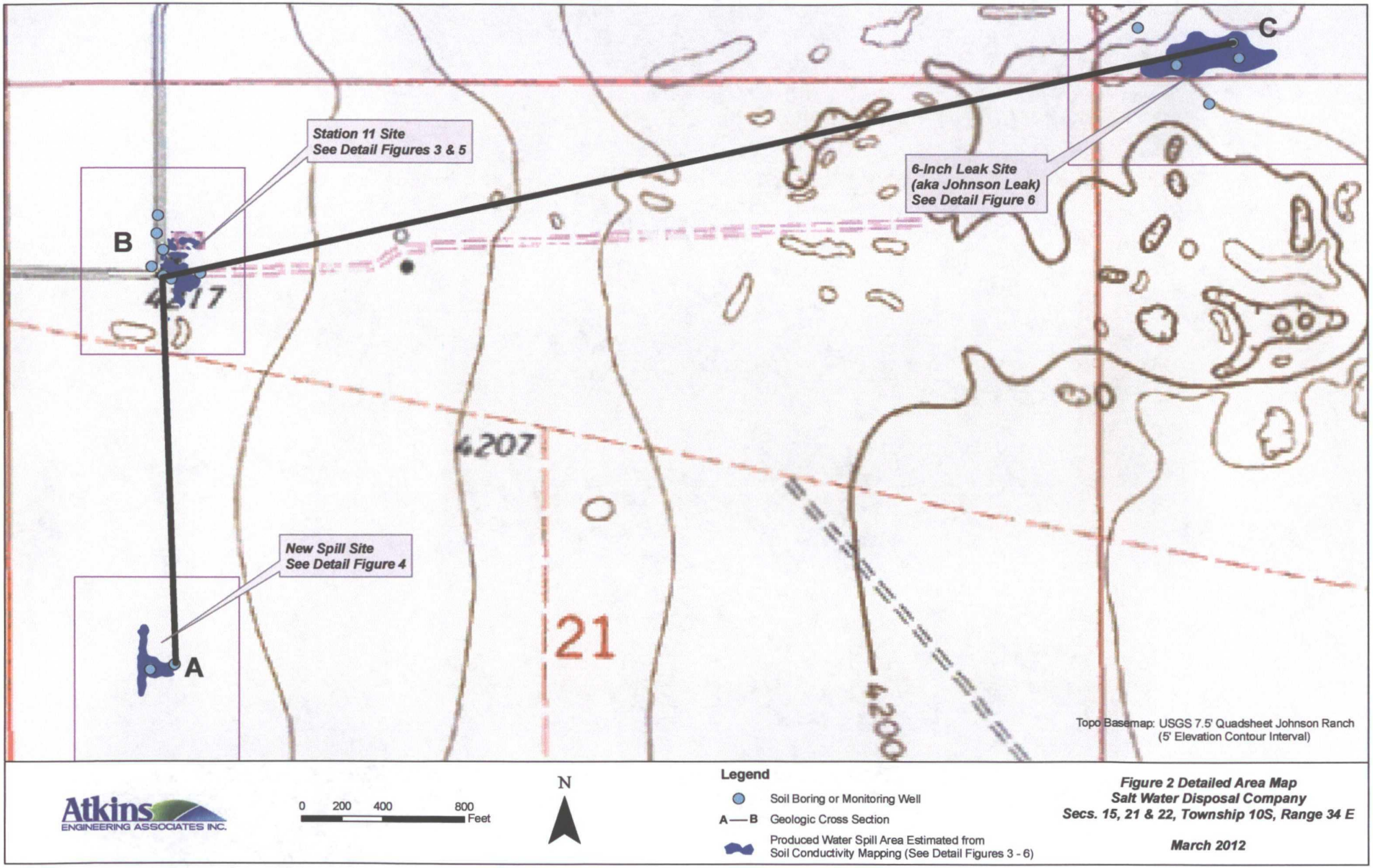
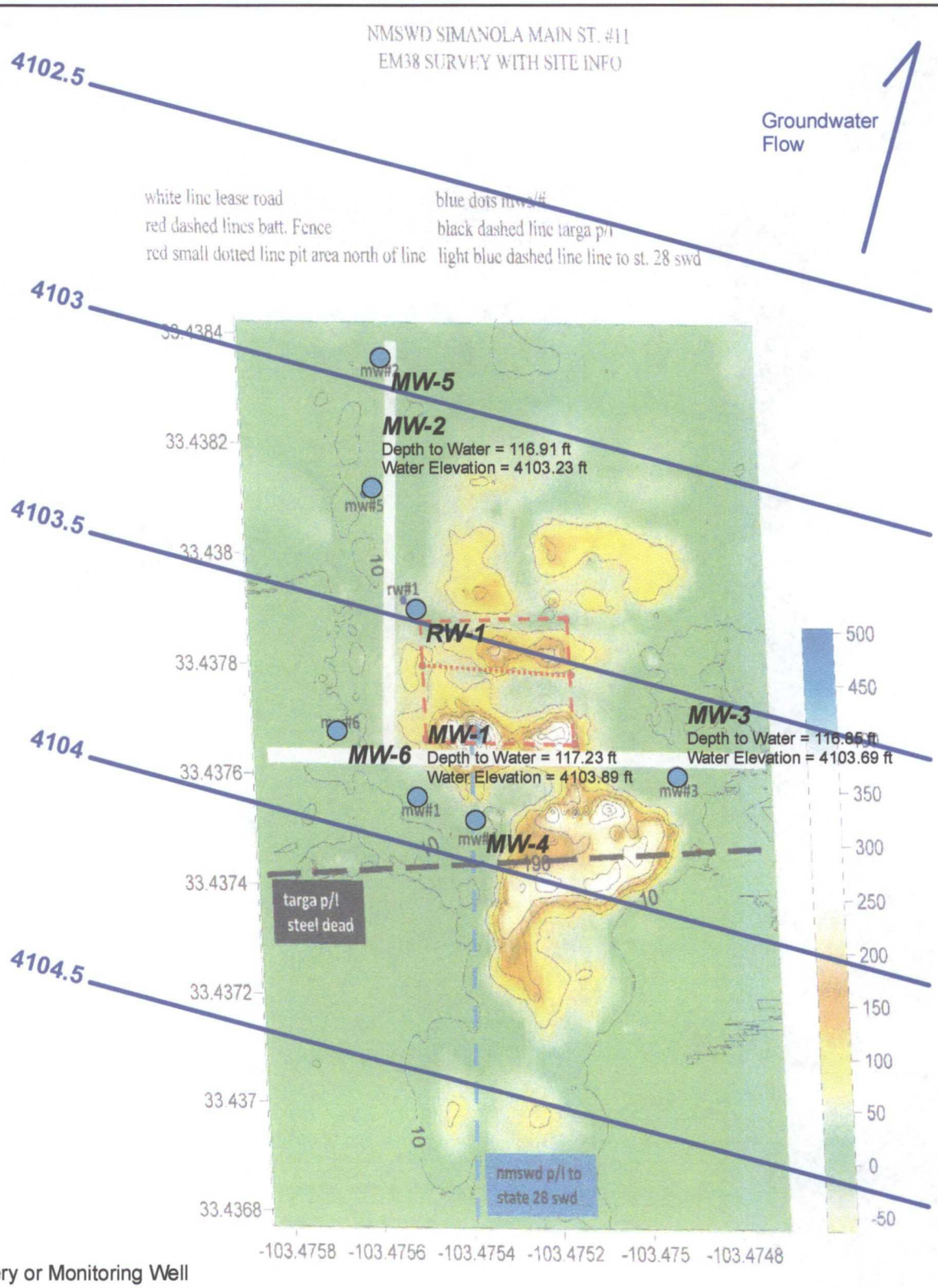


Figure 2 Detailed Area Map
Salt Water Disposal Company
Secs. 15, 21 & 22, Township 10S, Range 34 E

March 2012



Legend

- Recovery or Monitoring Well
- Regional Aquifer Water Table Elevation Contour - July 2007 (ft)

Basemap: Soil Conductivity provided by Whole Earth Environmental

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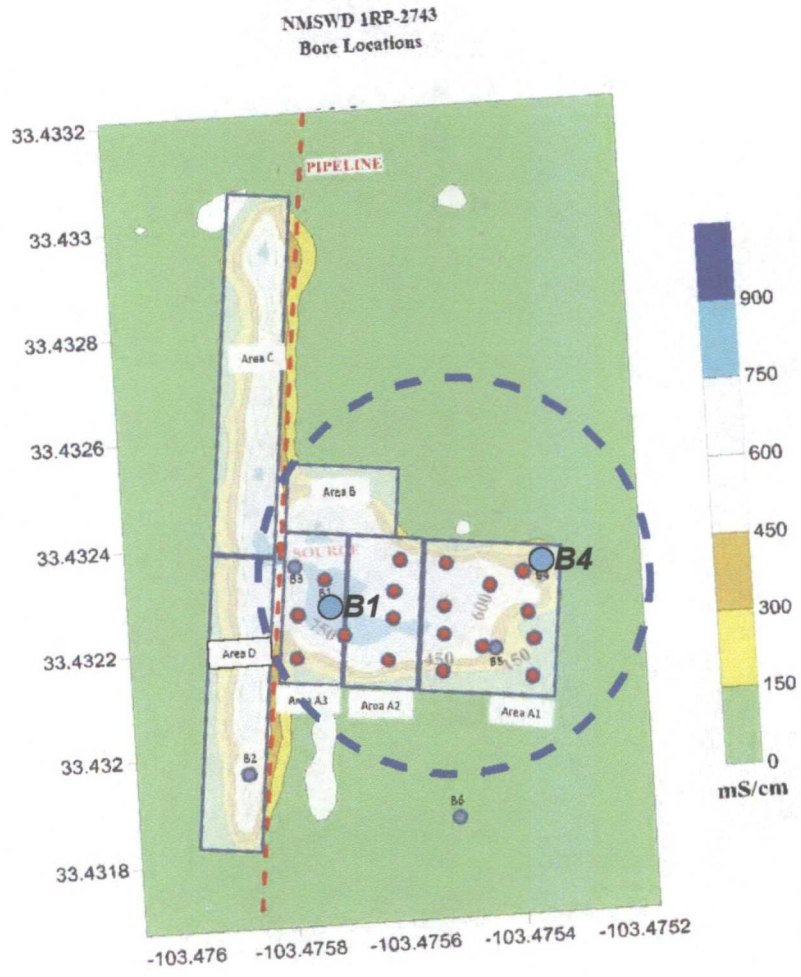
0 50 100 200 Feet

N

Figure 3 Regional Aquifer at Station 11 Site
Salt Water Disposal Company
Sec. 21, Township 10S, Range 34 E

March 2012



Legend

- Soil Boring
- Estimated 3-ft Perched Produced Water Thickness Contour

Basemap: Soil Conductivity provided by Whole Earth Environmental

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0 50 100 200 Feet

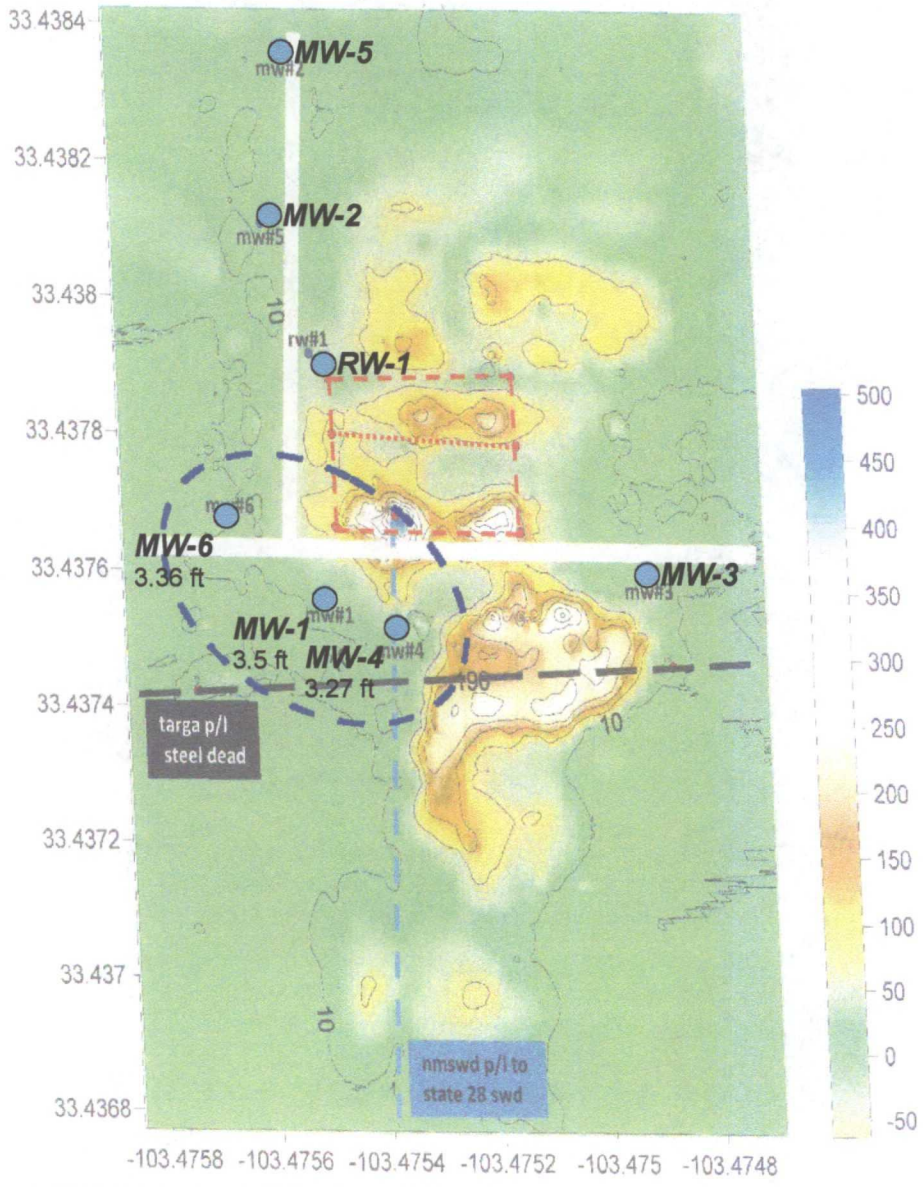
N

Figure 4 Perched Produced Water Thickness at New Spill Site - Salt Water Disposal Company Sec. 21, Township 10S, Range 34 E

March 2012

NMSWD SIMANOLA MAIN ST. #11
EM38 SURVEY WITH SITE INFO

white line lease road
red dashed lines batt. Fence
red small dotted line pit area north of line
blue dots mws/#
black dashed line targa p/l
light blue dashed line line to st. 28 swd



Legend

- Recovery Well or Monitoring Well (Appx. Perched Produced Water Thickness)
- Estimated 3-ft Perched Produced Water Thickness Contour

Basemap: Soil Conductivity provided by Whole Earth Environmental

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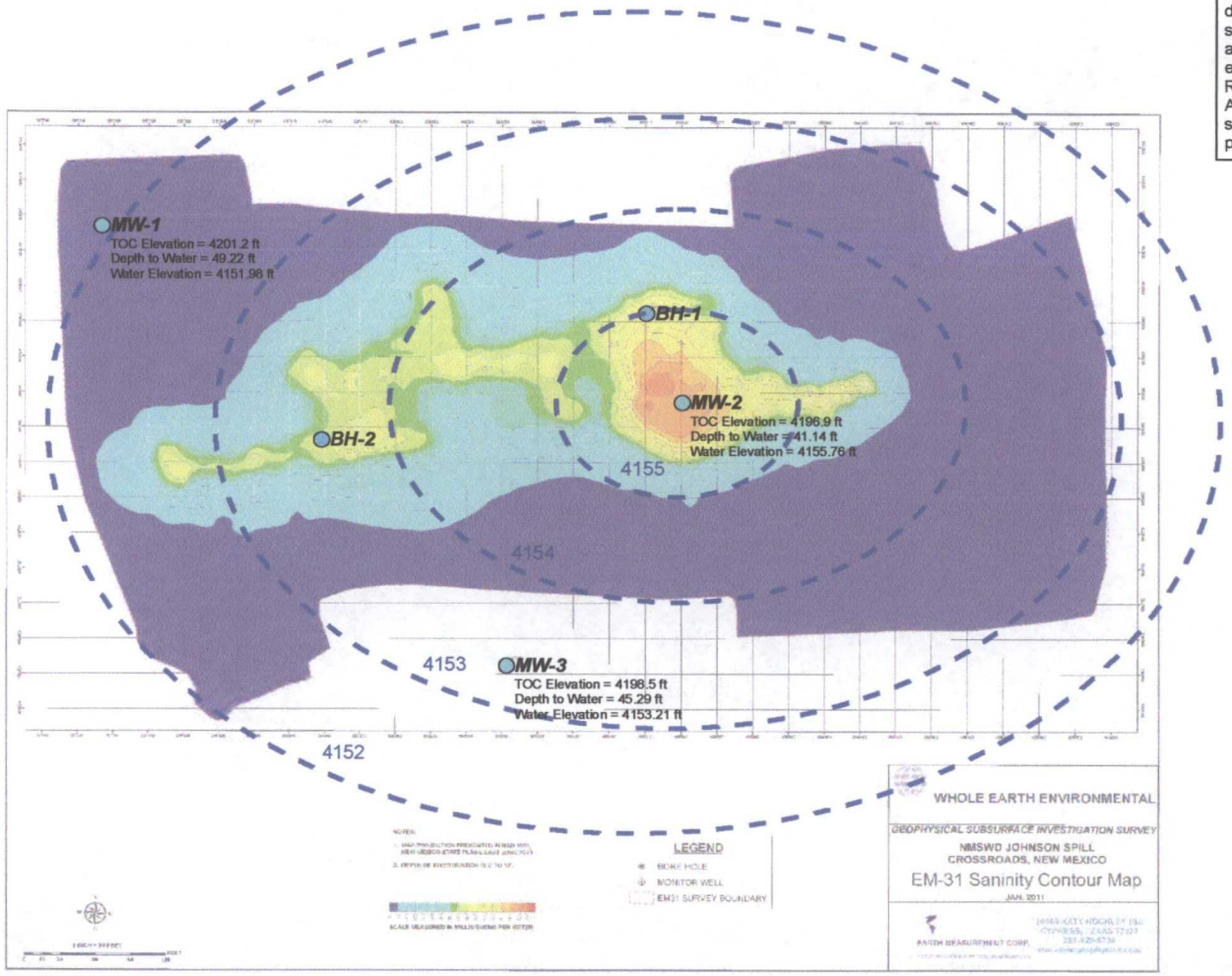
0 50 100 200 Feet

N

Figure 5 Perched Produced Water Thickness at Station 11 Site - Salt Water Disposal Company Sec. 21, Township 10S, Range 34 E

March 2012

Note: Perched ground water elevation contours determined from monitoring well and water level data shown on survey of January 2011 by Basin Surveys, adjusted to NVD27 using reported MW-3 ground elevation and USGS 7.5' quadsheet topo Johnson Ranch 4195' contour next to the MW-3 location.
A comparison of driller's logs for the monitoring well soil borings with water level data indicates the perched produced water thickness to vary from 6 to 14 feet.



Basemap: Soil Conductivity provided by Whole Earth Environmental

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0 50 100 200 Feet

N

Legend

- Soil Boring or Monitoring Well
- Perched Groundwater Elevation Contour - Jan. 2011 (ft)
- Section Line

Figure 6 Perched Produced Water Surface at 6-Inch Leak Site (aka Johnson Spill)
Salt Water Disposal Company
Secs. 15 & 22, Township 10S, Range 34 E
March 2012

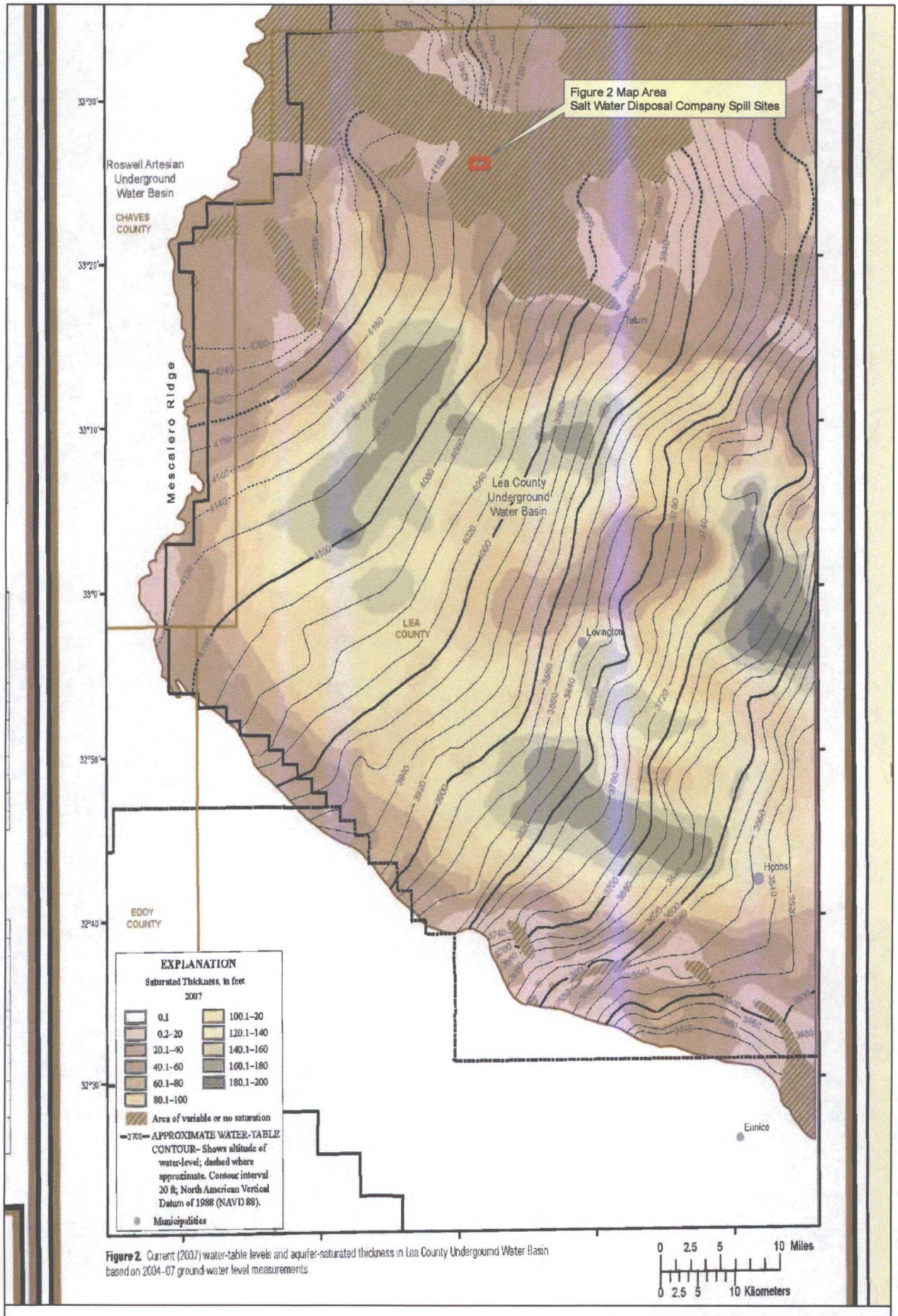

Figure 2. Current (2007) water-table levels and aquifer-saturated thickness in Lea County Undergound Water Basin based on 2004–07 ground-water level measurements.

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0 3 6 12 Miles

N

Figure 7 Detailed Area Map (Figure 2) Location Overlay on USGS SIM 3044 Salt Water Disposal Company

March 2012

Appendix 1

Select documents related to the Station 11 site

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

July 14, 2011

ROY R. RASCON

WHOLE EARTH ENVIRONMENTAL, INC.

2103 ARBOR COVE

KATY, TX 77494

RE: NMSWD STA. #11

Enclosed are the results of analyses for samples received by the laboratory on 06/23/11 9:47.

Cardinal Laboratories is accredited through Texas NELAP for:

Method SW-846 8021	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method SW-846 8260	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method TX 1005	Total Petroleum Hydorcarbons

Certificate number T104704398-08-TX. Accreditation applies to solid and chemical materials and non-potable water matrices.

Cardinal Laboratories is accreditated through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.4	Regulated VOCs (V2, V3)

Accreditation applies to public drinking water matrices.

This report meets NELAP requirements and is made up of a cover page, analytical results, and a copy of the original chain-of-custody. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Celey D. Keene

Celey D. Keene

Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

WHOLE EARTH ENVIRONMENTAL, INC.
ROY R. RASCON
2103 ARBOR COVE
KATY TX, 77494
Fax To: (281) 394-2051

Received:	06/23/2011	Sampling Date:	06/21/2011
Reported:	07/14/2011	Sampling Type:	Water
Project Name:	NMSWD STA. #11	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: RW #1 (H101296-01)

Bicarbonate 310.1M mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Alkalinity, Bicarbonate	**190**	5.00	06/28/2011	ND	976	97.6	1000	0.913	

Bromide, 4500 Br mg/kg **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Bromide	**118**	12.5	07/12/2011	ND	0.580	116	0.500		

BTEX 8260B mg/L **Analyzed By: CMS**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.001	0.001	06/24/2011	ND	0.021	107	0.0200	4.71	
Toluene*	<0.001	0.001	06/24/2011	ND	0.021	106	0.0200	4.46	
Ethylbenzene*	<0.001	0.001	06/24/2011	ND	0.021	103	0.0200	4.52	
Total Xylenes*	<0.003	0.003	06/24/2011	ND	0.062	103	0.0600	3.78	

Surrogate: Dibromofluoromethane	*131 %*	*80-120*
Surrogate: Toluene-d8	*90.8 %*	*80-120*
Surrogate: 4-Bromofluorobenzene	*77.6 %*	*80-120*

Calcium, 200.7 mg/L **Analyzed By: CK**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Calcium	**6090**	100	07/06/2011	ND	5.49	110	5.00	0.545	

Carbonate 310.1M mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Alkalinity, Carbonate	<0.00	0.00	06/28/2011	ND					

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

WHOLE EARTH ENVIRONMENTAL, INC.
ROY R. RASCON
2103 ARBOR COVE
KATY TX, 77494
Fax To: (281) 394-2051

Received:	06/23/2011	Sampling Date:	06/21/2011
Reported:	07/14/2011	Sampling Type:	Water
Project Name:	NMSWD STA. #11	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: RW #1 (H101296-01)

Chloride, SM4500Cl-B mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**50000**	4.00	06/28/2011	ND	112	112	100	0.00	

Conductivity 120.1 uS/cm **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Conductivity	**150000**	1.00	06/24/2011	ND	1430	101	1410	0.00	

Magnesium, 200.7 mg/L **Analyzed By: CK**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Magnesium	**786**	100	07/06/2011	ND	27.9	112	25.0	0.358	

pH pH Units **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
pH	**6.66**	0.100	06/24/2011		7.01	100	7.00	0.300	

Potassium, 200.7 mg/L **Analyzed By: CK**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Potassium	<100	100	07/06/2011	ND	10.8	108	10.0	7.14	

Sodium, 200.7 mg/L **Analyzed By: CK**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Sodium	**20600**	100	07/06/2011	ND	9.01	111	8.10	0.553	

Sulfate 375.4 mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Sulfate	**1140**	10.0	06/27/2011	ND	40.1	100	40.0	1.61	

TDS 160.1 mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier

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Received:	06/23/2011	Sampling Date:	06/21/2011
Reported:	07/14/2011	Sampling Type:	Water
Project Name:	NMSWD STA. #11	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: RW #1 (H101296-01)

TDS 160.1 mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
TDS	**75300**	5.00	06/27/2011	ND	229	95.4	240	6.45	

Total Alkalinity 310.1M mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Alkalinity, Total	**156**	4.00	06/28/2011	ND	800	97.6	820	1.12	

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Fax To: (281) 394-2051

Received:	06/23/2011	Sampling Date:	06/21/2011
Reported:	07/14/2011	Sampling Type:	Water
Project Name:	NMSWD STA. #11	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: MW #1 (H101296-02)

Bicarbonate 310.1M mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Alkalinity, Bicarbonate	**239**	5.00	06/28/2011	ND	976	97.6	1000	0.913	

Bromide, 4500 Br mg/kg **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Bromide	**2.76**	0.500	07/12/2011	ND	0.580	116	0.500		

BTEX 8260B mg/L **Analyzed By: CMS**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.001	0.001	06/24/2011	ND	0.021	107	0.0200	4.71	
Toluene*	<0.001	0.001	06/24/2011	ND	0.021	106	0.0200	4.46	
Ethylbenzene*	<0.001	0.001	06/24/2011	ND	0.021	103	0.0200	4.52	
Total Xylenes*	<0.003	0.003	06/24/2011	ND	0.062	103	0.0600	3.78	

Surrogate: Dibromofluoromethane	*146 %*	*80-120*
Surrogate: Toluene-d8	*93.4 %*	*80-120*
Surrogate: 4-Bromofluorobenzene	*81.0 %*	*80-120*

Calcium, 200.7 mg/L **Analyzed By: CK**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Calcium	**48.2**	5.00	07/06/2011	ND	5.49	110	5.00	0.545	

Carbonate 310.1M mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Alkalinity, Carbonate	<0.00	0.00	06/28/2011	ND					

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Reported:	07/14/2011	Sampling Type:	Water
Project Name:	NMSWD STA. #11	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: MW #1 (H101296-02)

Chloride, SM4500Cl-B mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**230**	4.00	06/28/2011	ND	112	112	100	0.00	

Conductivity 120.1 uS/cm **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Conductivity	**1650**	1.00	06/24/2011	ND	1430	101	1410	0.00	

Magnesium, 200.7 mg/L **Analyzed By: CK**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Magnesium	**11.8**	5.00	07/06/2011	ND	27.9	112	25.0	0.358	

pH pH Units **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
pH	**8.06**	0.100	06/24/2011		7.01	100	7.00	0.300	

Potassium, 200.7 mg/L **Analyzed By: CK**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Potassium	**5.43**	5.00	07/06/2011	ND	10.8	108	10.0	7.14	

Sodium, 200.7 mg/L **Analyzed By: CK**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Sodium	**299**	5.00	07/06/2011	ND	9.01	111	8.10	0.553	

Sulfate 375.4 mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Sulfate	**320**	10.0	06/27/2011	ND	40.1	100	40.0	1.61	

TDS 160.1 mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier

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Received:	06/23/2011	Sampling Date:	06/21/2011
Reported:	07/14/2011	Sampling Type:	Water
Project Name:	NMSWD STA. #11	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: MW #1 (H101296-02)

TDS 160.1 mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
TDS	**962**	5.00	06/27/2011	ND	229	95.4	240	6.45	

Total Alkalinity 310.1M mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Alkalinity, Total	**196**	4.00	06/28/2011	ND	800	97.6	820	1.12	

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Received:	06/23/2011	Sampling Date:	06/21/2011
Reported:	07/14/2011	Sampling Type:	Water
Project Name:	NMSWD STA. #11	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: MW #2 (H101296-03)

Bicarbonate 310.1M mg/L Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Alkalinity, Bicarbonate	**378**	5.00	06/28/2011	ND	976	97.6	1000	0.913	

Bromide, 4500 Br mg/kg Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Bromide	**3.27**	0.500	07/12/2011	ND	0.580	116	0.500		

BTEX 8260B mg/L Analyzed By: CMS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.001	0.001	06/24/2011	ND	0.021	107	0.0200	4.71	
Toluene*	<0.001	0.001	06/24/2011	ND	0.021	106	0.0200	4.46	
Ethylbenzene*	<0.001	0.001	06/24/2011	ND	0.021	103	0.0200	4.52	
Total Xylenes*	<0.003	0.003	06/24/2011	ND	0.062	103	0.0600	3.78	

Surrogate: Dibromofluoromethane	*146 %*	*80-120*
Surrogate: Toluene-d8	*93.9 %*	*80-120*
Surrogate: 4-Bromofluorobenzene	*80.2 %*	*80-120*

Calcium, 200.7 mg/L Analyzed By: CK

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Calcium	**47.0**	5.00	07/06/2011	ND	5.49	110	5.00	0.545	

Carbonate 310.1M mg/L Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Alkalinity, Carbonate	<0.00	0.00	06/28/2011	ND					

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Reported:	07/14/2011	Sampling Type:	Water
Project Name:	NMSWD STA. #11	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: MW #2 (H101296-03)

Chloride, SM4500Cl-B mg/L Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**200**	4.00	06/28/2011	ND	112	112	100	0.00	

Conductivity 120.1 uS/cm Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Conductivity	**1580**	1.00	06/24/2011	ND	1430	101	1410	0.00	

Magnesium, 200.7 mg/L Analyzed By: CK

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Magnesium	**10.6**	5.00	07/06/2011	ND	27.9	112	25.0	0.358	

pH pH Units Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
pH	**8.07**	0.100	06/24/2011		7.01	100	7.00	0.300	

Potassium, 200.7 mg/L Analyzed By: CK

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Potassium	**8.29**	5.00	07/06/2011	ND	10.8	108	10.0	7.14	

Sodium, 200.7 mg/L Analyzed By: CK

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Sodium	**294**	5.00	07/06/2011	ND	9.01	111	8.10	0.553	

Sulfate 375.4 mg/L Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Sulfate	**382**	10.0	06/27/2011	ND	40.1	100	40.0	1.61	

TDS 160.1 mg/L Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier

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Reported:	07/14/2011	Sampling Type:	Water
Project Name:	NMSWD STA. #11	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: MW #2 (H101296-03)

TDS 160.1 mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
TDS	**919**	5.00	06/27/2011	ND	229	95.4	240	6.45	

Total Alkalinity 310.1M mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Alkalinity, Total	**310**	4.00	06/28/2011	ND	800	97.6	820	1.12	

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Reported:	07/14/2011	Sampling Type:	Water
Project Name:	NMSWD STA. #11	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: MW #3 (H101296-04)

Bicarbonate 310.1M mg/L Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Alkalinity, Bicarbonate	**161**	5.00	06/28/2011	ND	976	97.6	1000	0.913	

Bromide, 4500 Br mg/kg Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Bromide	**4.10**	0.500	07/12/2011	ND	0.580	116	0.500		

BTEX 8260B mg/L Analyzed By: CMS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.001	0.001	06/24/2011	ND	0.021	107	0.0200	4.71	
Toluene*	<0.001	0.001	06/24/2011	ND	0.021	106	0.0200	4.46	
Ethylbenzene*	<0.001	0.001	06/24/2011	ND	0.021	103	0.0200	4.52	
Total Xylenes*	<0.003	0.003	06/24/2011	ND	0.062	103	0.0600	3.78	

Surrogate: Dibromofluoromethane	*140 %*	*80-120*
Surrogate: Toluene-d8	*92.5 %*	*80-120*
Surrogate: 4-Bromofluorobenzene	*77.3 %*	*80-120*

Calcium, 200.7 mg/L Analyzed By: CK

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Calcium	**65.0**	5.00	07/06/2011	ND	5.49	110	5.00	0.545	

Carbonate 310.1M mg/L Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Alkalinity, Carbonate	<0.00	0.00	06/28/2011	ND					

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Reported:	07/14/2011	Sampling Type:	Water
Project Name:	NMSWD STA. #11	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: MW #3 (H101296-04)

Chloride, SM4500Cl-B mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**200**	4.00	06/28/2011	ND	112	112	100	0.00	

Conductivity 120.1 uS/cm **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Conductivity	**1840**	1.00	06/24/2011	ND	1430	101	1410	0.00	

Magnesium, 200.7 mg/L **Analyzed By: CK**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Magnesium	**14.7**	5.00	07/06/2011	ND	27.9	112	25.0	0.358	

pH pH Units **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
pH	**7.92**	0.100	06/24/2011		7.01	100	7.00	0.300	

Potassium, 200.7 mg/L **Analyzed By: CK**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Potassium	<5.00	5.00	07/06/2011	ND	10.8	108	10.0	7.14	

Sodium, 200.7 mg/L **Analyzed By: CK**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Sodium	**341**	5.00	07/06/2011	ND	9.01	111	8.10	0.553	

Sulfate 375.4 mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Sulfate	**749**	10.0	06/27/2011	ND	40.1	100	40.0	1.61	

TDS 160.1 mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier

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Reported:	07/14/2011	Sampling Type:	Water
Project Name:	NMSWD STA. #11	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: MW #3 (H101296-04)

TDS 160.1 mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
TDS	**1110**	5.00	06/27/2011	ND	229	95.4	240	6.45	

Total Alkalinity 310.1M mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Alkalinity, Total	**132**	4.00	06/28/2011	ND	800	97.6	820	1.12	

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Received:	06/23/2011	Sampling Date:	06/21/2011
Reported:	07/14/2011	Sampling Type:	Water
Project Name:	NMSWD STA. #11	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: MW #4 (H101296-05)

Bicarbonate 310.1M mg/L Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Alkalinity, Bicarbonate	**83.0**	5.00	06/28/2011	ND	976	97.6	1000	0.913	

Bromide, 4500 Br mg/kg Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Bromide	**101**	12.5	07/12/2011	ND	0.580	116	0.500		

BTEX 8260B mg/L Analyzed By: CMS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.001	0.001	06/24/2011	ND	0.021	107	0.0200	4.71	
Toluene*	<0.001	0.001	06/24/2011	ND	0.021	106	0.0200	4.46	
Ethylbenzene*	<0.001	0.001	06/24/2011	ND	0.021	103	0.0200	4.52	
Total Xylenes*	<0.003	0.003	06/24/2011	ND	0.062	103	0.0600	3.78	

Surrogate: Dibromofluoromethane	*134 %*	*80-120*
Surrogate: Toluene-d8	*91.0 %*	*80-120*
Surrogate: 4-Bromofluorobenzene	*78.8 %*	*80-120*

Calcium, 200.7 mg/L Analyzed By: CK

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Calcium	**5310**	100	07/06/2011	ND	5.49	110	5.00	0.545	

Carbonate 310.1M mg/L Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Alkalinity, Carbonate	<0.00	0.00	06/28/2011	ND					

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Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

WHOLE EARTH ENVIRONMENTAL, INC.
ROY R. RASCON
2103 ARBOR COVE
KATY TX, 77494
Fax To: (281) 394-2051

Received:	06/23/2011	Sampling Date:	06/21/2011
Reported:	07/14/2011	Sampling Type:	Water
Project Name:	NMSWD STA. #11	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: MW #4 (H101296-05)

Chloride, SM4500Cl-B mg/L Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**36000**	4.00	06/28/2011	ND	112	112	100	0.00	

Conductivity 120.1 uS/cm Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Conductivity	**96200**	1.00	06/24/2011	ND	1430	101	1410	0.00	

Magnesium, 200.7 mg/L Analyzed By: CK

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Magnesium	**687**	100	07/06/2011	ND	27.9	112	25.0	0.358	

pH pH Units Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
pH	**6.63**	0.100	06/24/2011		7.01	100	7.00	0.300	

Potassium, 200.7 mg/L Analyzed By: CK

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Potassium	<100	100	07/06/2011	ND	10.8	108	10.0	7.14	

Sodium, 200.7 mg/L Analyzed By: CK

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Sodium	**13500**	100	07/06/2011	ND	9.01	111	8.10	0.553	

Sulfate 375.4 mg/L Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Sulfate	**466**	10.0	06/27/2011	ND	39.2	98.0	40.0	1.70	

TDS 160.1 mg/L Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier

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CARDINAL Laboratories

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Analytical Results For:

WHOLE EARTH ENVIRONMENTAL, INC.
ROY R. RASCON
2103 ARBOR COVE
KATY TX, 77494
Fax To: (281) 394-2051

Received:	06/23/2011	Sampling Date:	06/21/2011
Reported:	07/14/2011	Sampling Type:	Water
Project Name:	NMSWD STA. #11	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: MW #4 (H101296-05)

TDS 160.1 mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
TDS	**52500**	5.00	06/27/2011	ND	229	95.4	240	6.45	

Total Alkalinity 310.1M mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Alkalinity, Total	**68.0**	4.00	06/28/2011	ND	800	97.6	820	1.12	

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Analytical Results For:

WHOLE EARTH ENVIRONMENTAL, INC.
ROY R. RASCON
2103 ARBOR COVE
KATY TX, 77494
Fax To: (281) 394-2051

Received:	06/23/2011	Sampling Date:	06/21/2011
Reported:	07/14/2011	Sampling Type:	Water
Project Name:	NMSWD STA. #11	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: MW #5 (H101296-06)

Bicarbonate 310.1M mg/L Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Alkalinity, Bicarbonate	**102**	5.00	06/28/2011	ND	976	97.6	1000	0.913	

Bromide, 4500 Br mg/kg Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Bromide	**52.8**	10.0	07/12/2011	ND	0.580	116	0.500		

BTEX 8260B mg/L Analyzed By: CMS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.001	0.001	06/24/2011	ND	0.021	107	0.0200	4.71	
Toluene*	<0.001	0.001	06/24/2011	ND	0.021	106	0.0200	4.46	
Ethylbenzene*	<0.001	0.001	06/24/2011	ND	0.021	103	0.0200	4.52	
Total Xylenes*	<0.003	0.003	06/24/2011	ND	0.062	103	0.0600	3.78	

Surrogate: Dibromofluoromethane	*135 %*	*80-120*
Surrogate: Toluene-d8	*90.3 %*	*80-120*
Surrogate: 4-Bromofluorobenzene	*82.0 %*	*80-120*

Calcium, 200.7 mg/L Analyzed By: CK

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Calcium	**1820**	50.0	07/06/2011	ND	5.49	110	5.00	0.545	

Carbonate 310.1M mg/L Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Alkalinity, Carbonate	<0.00	0.00	06/28/2011	ND					

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Analytical Results For:

WHOLE EARTH ENVIRONMENTAL, INC.
ROY R. RASCON
2103 ARBOR COVE
KATY TX, 77494
Fax To: (281) 394-2051

Received:	06/23/2011	Sampling Date:	06/21/2011
Reported:	07/14/2011	Sampling Type:	Water
Project Name:	NMSWD STA. #11	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: MW #5 (H101296-06)

Chloride, SM4500Cl-B mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**18800**	4.00	06/28/2011	ND	112	112	100	0.00	

Conductivity 120.1 uS/cm **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Conductivity	**39800**	1.00	06/24/2011	ND	1430	101	1410	0.00	

Magnesium, 200.7 mg/L **Analyzed By: CK**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Magnesium	**198**	50.0	07/06/2011	ND	27.9	112	25.0	0.358	

pH pH Units **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
pH	**7.28**	0.100	06/24/2011		7.01	100	7.00	0.300	

Potassium, 200.7 mg/L **Analyzed By: CK**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Potassium	<50.0	50.0	07/06/2011	ND	10.8	108	10.0	7.14	

Sodium, 200.7 mg/L **Analyzed By: CK**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Sodium	**6540**	50.0	07/06/2011	ND	9.01	111	8.10	0.553	

Sulfate 375.4 mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Sulfate	**389**	10.0	06/27/2011	ND	39.2	98.0	40.0	1.70	

TDS 160.1 mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier

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Analytical Results For:

WHOLE EARTH ENVIRONMENTAL, INC.
ROY R. RASCON
2103 ARBOR COVE
KATY TX, 77494
Fax To: (281) 394-2051

Received:	06/23/2011	Sampling Date:	06/21/2011
Reported:	07/14/2011	Sampling Type:	Water
Project Name:	NMSWD STA. #11	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: MW #5 (H101296-06)

TDS 160.1 mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
TDS	**22000**	5.00	06/27/2011	ND	229	95.4	240	6.45	

Total Alkalinity 310.1M mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Alkalinity, Total	**84.0**	4.00	06/28/2011	ND	800	97.6	820	1.12	

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Analytical Results For:

WHOLE EARTH ENVIRONMENTAL, INC.
ROY R. RASCON
2103 ARBOR COVE
KATY TX, 77494
Fax To: (281) 394-2051

Received:	06/23/2011	Sampling Date:	06/21/2011
Reported:	07/14/2011	Sampling Type:	Water
Project Name:	NMSWD STA. #11	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: MW #6 (H101296-07)

Bicarbonate 310.1M mg/L Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Alkalinity, Bicarbonate	**24.4**	5.00	06/28/2011	ND	976	97.6	1000	0.913	

Bromide, 4500 Br mg/kg Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Bromide	**92.4**	12.5	07/12/2011	ND	0.580	116	0.500		

BTEX 8260B mg/L Analyzed By: CMS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.001	0.001	06/24/2011	ND	0.021	107	0.0200	4.71	
Toluene*	<0.001	0.001	06/24/2011	ND	0.021	106	0.0200	4.46	
Ethylbenzene*	<0.001	0.001	06/24/2011	ND	0.021	103	0.0200	4.52	
Total Xylenes*	<0.003	0.003	06/24/2011	ND	0.062	103	0.0600	3.78	

Surrogate: Dibromofluoromethane	*137 %*	*80-120*
Surrogate: Toluene-d8	*90.2 %*	*80-120*
Surrogate: 4-Bromofluorobenzene	*80.6 %*	*80-120*

Calcium, 200.7 mg/L Analyzed By: CK

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Calcium	**5260**	50.0	07/06/2011	ND	5.49	110	5.00	0.545	

Carbonate 310.1M mg/L Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Alkalinity, Carbonate	<0.00	0.00	06/28/2011	ND					

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CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

WHOLE EARTH ENVIRONMENTAL, INC.
ROY R. RASCON
2103 ARBOR COVE
KATY TX, 77494
Fax To: (281) 394-2051

Received:	06/23/2011	Sampling Date:	06/21/2011
Reported:	07/14/2011	Sampling Type:	Water
Project Name:	NMSWD STA. #11	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: MW #6 (H101296-07)

Chloride, SM4500Cl-B mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**22400**	4.00	06/28/2011	ND	112	112	100	0.00	

Conductivity 120.1 uS/cm **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Conductivity	**53300**	1.00	06/24/2011	ND	1430	101	1410	0.00	

Magnesium, 200.7 mg/L **Analyzed By: CK**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Magnesium	**539**	50.0	07/06/2011	ND	27.9	112	25.0	0.358	

pH pH Units **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
pH	**6.59**	0.100	06/24/2011		7.01	100	7.00	0.300	

Potassium, 200.7 mg/L **Analyzed By: CK**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Potassium	<50.0	50.0	07/06/2011	ND	10.8	108	10.0	7.14	

Sodium, 200.7 mg/L **Analyzed By: CK**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Sodium	**5610**	50.0	07/06/2011	ND	9.01	111	8.10	0.553	

Sulfate 375.4 mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Sulfate	**597**	10.0	06/27/2011	ND	39.2	98.0	40.0	1.70	

TDS 160.1 mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier

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Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

WHOLE EARTH ENVIRONMENTAL, INC.
ROY R. RASCON
2103 ARBOR COVE
KATY TX, 77494
Fax To: (281) 394-2051

Received:	06/23/2011	Sampling Date:	06/21/2011
Reported:	07/14/2011	Sampling Type:	Water
Project Name:	NMSWD STA. #11	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: MW #6 (H101296-07)

TDS 160.1 mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
TDS	**30400**	5.00	06/27/2011	ND	229	95.4	240	6.45	

Total Alkalinity 310.1M mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Alkalinity, Total	**20.0**	4.00	06/28/2011	ND	800	97.6	820	1.12	

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Notes and Definitions

A-01a	One surrogate, dibromofluoromethane, exhibited a high bias. No target compounds were detected so reanalysis was not required.
A-01	One surrogate, dibromofluoromethane, exhibited a high bias. No target compounds were detected so reanalysis was not required
ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference
**	Samples not received at proper temperature of 6°C or below.
***	Insufficient time to reach temperature.
-	Chloride by SM4500Cl-B does not require samples be received at or below 6°C
	Samples reported on an as received basis (wet) unless otherwise noted on report

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Celey D. Keene, Lab Director/Quality Manager

CARDINAL LABORATORIES

2111 Beechwood, Abilene, TX 79603   101 East Marland, Hobbs, NM 88240

(325) 673-7001 FAX (325)673-7020   (505) 393-2326 FAX (505) 393-2476

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Company Name:	WHOLE EARTH ENVIRONMENTAL INC.	**BILL TO**	
Project Manager:	ROY R. RASCON	P.O. #:	
Address:		Company:	
City: State: Zip:		Attn:	
Phone #: Fax #:		Address:	
Project Owner:		City:	
Project Name:	NMSWD STA. #11	State: Zip:	
Project Location:		Phone #:	
Sampler Name:	ROY R. RASCON	Fax #:	

FOR LAB USE ONLY LAB ID #	SAMPLE I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER:	PRESERV.: ACID/BASE:	ICE/COOL	OTHER:	SAMPLING: DATE	TIME	ANALYSIS REQUEST: CATS & ANS	PH	BTEX	CL / BROMIDE RATIO	EC							
H101796																										
1	RW #1	G	3	X						X	X		6/21/11	839	X	X	X	X	X							
2	MW #1	G	3	X						X	X		6/21/11	1108	X	X	X	X	X							
3	MW #2	G	3	X						X	X		6/22/11	1237	X	X	X	X	X							
4	MW #3	G	3	X						X	X		6/21/11	321	X	X	X	X	X							
5	MW #4	G	3	X						X	X		6/21/11	1105	X	X	X	X	X							
6	MW #5	G	3	X						X	X		6/22/11	235	X	X	X	X	X							
7	MW #6	G	3	X						X	X		6/22/11	341	X	X	X	X	X							

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising whether based in contract or tort, shall be limited to the amount paid by the client for the analyses. All claims including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within 30 days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequental damages, including without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

Relinquished By: ROY R. RASCON [signature] Date: Time: Received By: Jodi Henson

Relinquished By: Date: Time: Received By:

Phone Result: Yes No Add'l Phone #:
Fax Result: Yes No Add'l Fax #:

REMARKS: PLEASE E-MAIL TO: royr , mikeg, elliotw, & mcgriffin@vadose.us

Delivered By: (Circle One) Sampler - UPS - Bus - Other: 3°c

Sample Condition: Cool ✓Yes No; Intact ✓Yes No

CHECKED BY: (Initials) JH

† Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476

#26

CMB Environmental | NMSWDCO | Hall Environmental Analysis Lab

Monitor Well # 1

Soil Sample Analyltical Results

Monitor Well # 1	**TPH GRO**	**TPH DRO**	**BTEX**	**Chloride**	**TDS**
Soil Sample Depth					
0'-2.0'	ND	ND	ND	ND	
4.0'-5.0'	ND	ND	ND	150	
9.0'-9.3'	ND	ND	ND	130	
14.0'-14.5'	ND	ND	ND	210	
19.0'-20.0'	ND	ND	ND	620	
24.0'-25.0'	ND	ND	ND	1000	
29.0'-30.0'	ND	ND	ND	3300	
34.0'-35.5'	ND	ND	ND	2700	
39.0'-40.0'	ND	ND	ND	2300	
40.7-41.2'	ND	ND	ND	1500	
44.0'-45.3'	ND	ND	ND	3500	
49.0'-49.5'	ND	ND	ND	1800	
54.0'-54.3'	ND	ND	ND	720	
61.0'-63.5' (Aqueous)	ND	ND	ND	21000	51000
63.5'-64.0'	ND	ND	ND	460	
89.0'-90.8'	ND	ND	ND	ND	
104.4'-106.8'	ND	ND	ND	20	

All values are in PPM. Red Values indicate concentrations above WQCC standards.

New Mexico Salt Water Disposal Company
Groundwater Sampling July 09, 2007
By: CMB Environmental Geological Services Inc.

Well:	TPH DRO	TPH GRO	BTEX	Fluoride	Chloride	Bromide	Nitrate	Phosphorus	Sulfate	Calcium	Magnesium	Potassium	Sodium	S.C.	pH	TDS
MW-2	ND	ND	ND	1.6	560	2.6	ND	ND	260	120	22	8.8	350	2800	7.5	2600
MW-1	ND	ND	ND	1.6	550	1.3	1.3	ND	290	120	33	6.2	370	2500	7.31	1500
MW-3	ND	0.057	ND	1.6	620	2.7	ND	ND	360	210	42	11	350	3100	7.46	1800
NW Windmill				1.8	390	2.8	ND	ND	670	190	52	7.5	330	2900	7.5	2000
SW Windmill				0.66	460	1.8	26	ND	160	260	32	4.2	120	2300	7.8	1500
Tank Battery Fluid	35.1	55	20100	ND	83000	140	ND	ND	1600	3200	630	540	45000	280000	7.2	170000

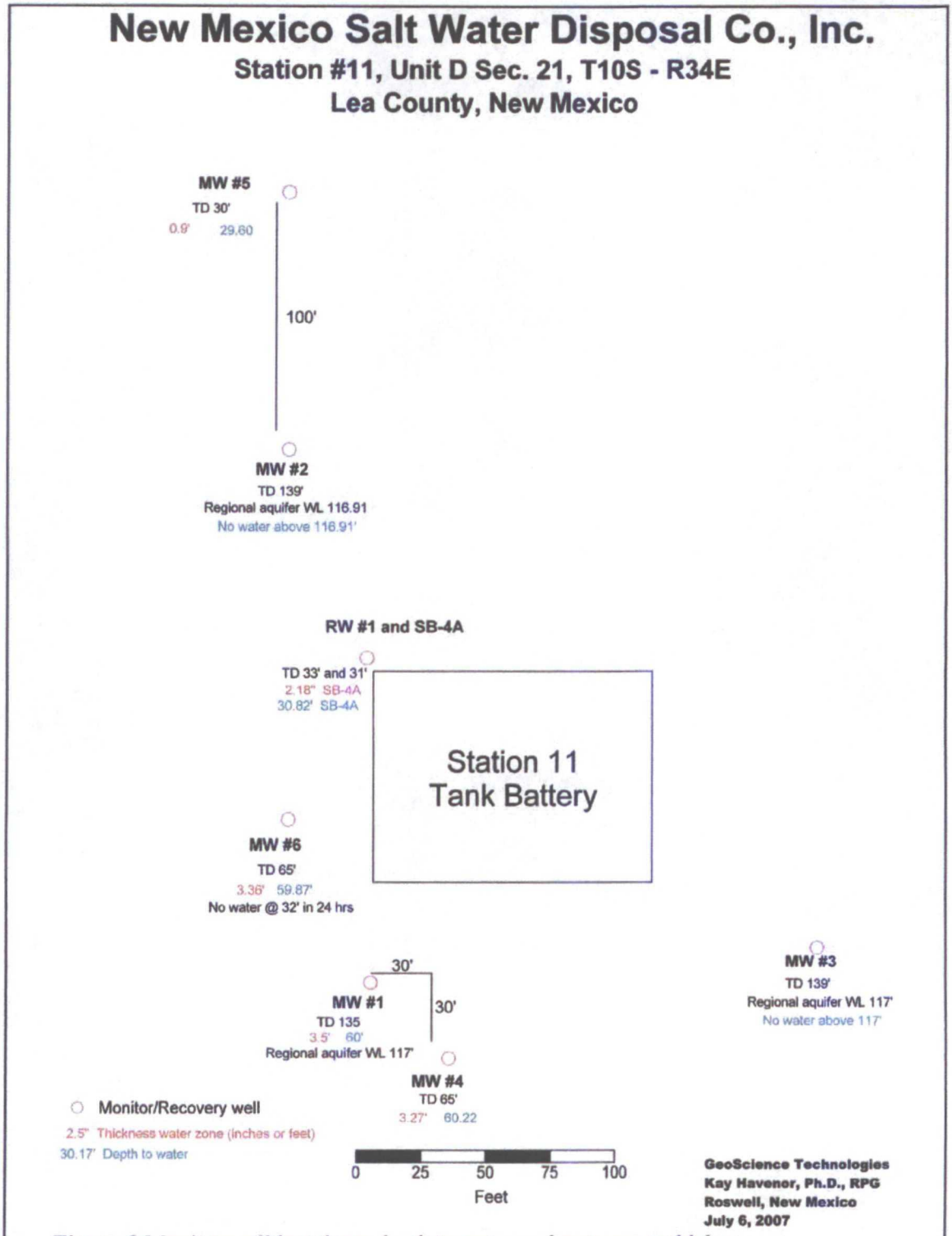
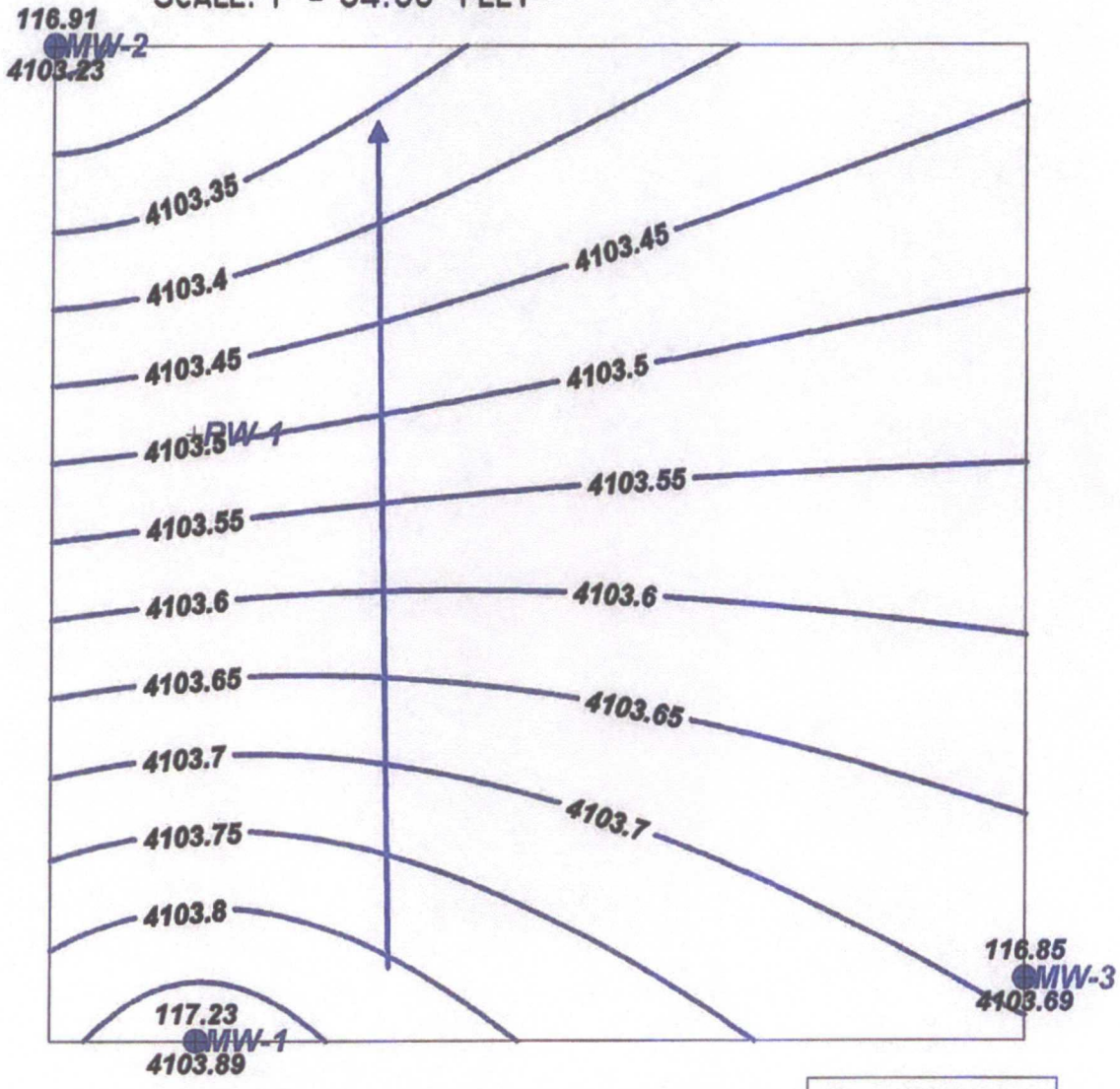


Figure 2 Monitor well locations, depth to water and water zone thickness

New Mexico Salt Water Disposal Company
Disposal Station # 11
Section 21, T.10S. R.34E.N.M.P.M.
Lea County, New Mexico

N

GROUNDWATER POTENTIOMETRIC SURFACE MAP
SCALE: 1" = 34.58' FEET



GROUNDWATER FLOW DIRECTION INDICATED BY BLUE FLOW LINES
CONTOUR INTERVAL IS 0.05' FOOT.

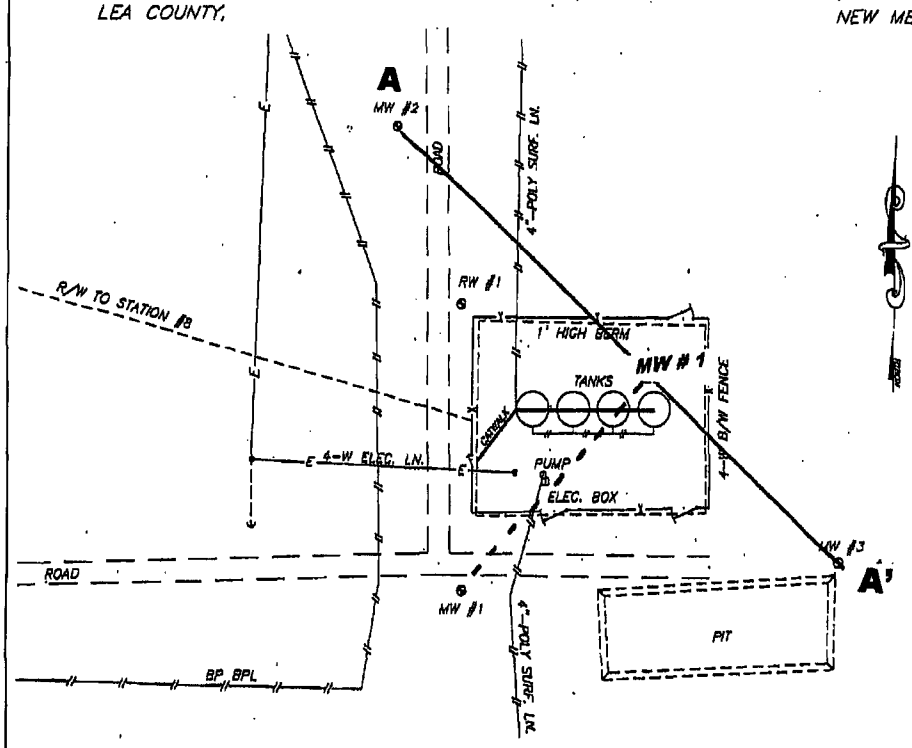
● 4103.23 to 4104

DEPTH TO WATER MEASURED FROM TOP OF MONITOR WELL CASING AND IS INDICATED BY BLACK NUMBERS ABOVE MONITOR WELL LOCATIONS. GROUNDWATER CONTOURS ARE DEVELOPED BY SUBTRACTING DEPTH TO GROUNDWATER FROM THE SURVEYED TOP OF MONITOR WELL CASING (ASL). GROUNDWATER ELEVATIONS (ASL) ARE POSTED BENEATH MONITOR WELL LOCATIONS.

PREPARED BY CLAYTON M. BARNHILL, PG, 08/01/07
FOR: NM SALT WATER DIISPOAL COMPANY
STAGE I ABATEMENT PLAN / MSA - MONITOR WELL INSTALLATION JUNE / JULY 2007.

New Mexico Salt Water Disposal Company
Station # 11
Section 21, Township 10 South, Range 34 East, N.M. P. M.
Lea County, New Mexico
Location of Cross Section A - A'

SECTION 21, TOWNSHIP 10 SOUTH, RANGE 34 EAST, N.M.P.M.,
LEA COUNTY, NEW MEXICO



WELL NO.	STATE PLANE COORDINATES	NORTH SIDE ELEVATIONS
MW #1	Y=887815.1 N X=803033.8 E	4218.10' GROUND 4216.51' TOP OF CONCRETE 4221.12' TOP OF 2" PVC PIPE
RW #1	Y=887941.7 N X=803032.8 E	4217.53' GROUND 4217.94' TOP OF CONCRETE 4220.13' TOP OF 4" PVC PIPE
MW #2	Y=888022.4 N X=803002.7 E	4217.09' GROUND 4217.39' TOP OF CONCRETE 4220.14' TOP OF 2" PVC PIPE
MW #3	Y=887828.2 N X=803210.2 E	4217.60' GROUND 4217.99' TOP OF CONCRETE 4220.54' TOP OF 2" PVC PIPE

LEGEND

- DENOTES FENCE GATE
- DENOTES FENCE LINE
- DENOTES GUY DOWN

NOTE: COORDINATES SHOWN HEREON ARE MERCATOR GRID AND CONFORM TO THE NEW MEXICO COORDINATE SYSTEM "NEW MEXICO EAST ZONE" NORTH AMERICAN DATUM 1983.

SCALE: 1" Inch = 75' Feet

I HEREBY CERTIFY THAT I DIRECTED AND AM RESPONSIBLE FOR THIS SURVEY, THAT THIS SURVEY IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF AND THAT THIS SURVEY AND PLAT MEET THE MINIMUM STANDARDS FOR SURVEYING IN NEW MEXICO.

RONALD J. EIDSON 3239 REGISTERED PROFESSIONAL SURVEYOR

7/17/07

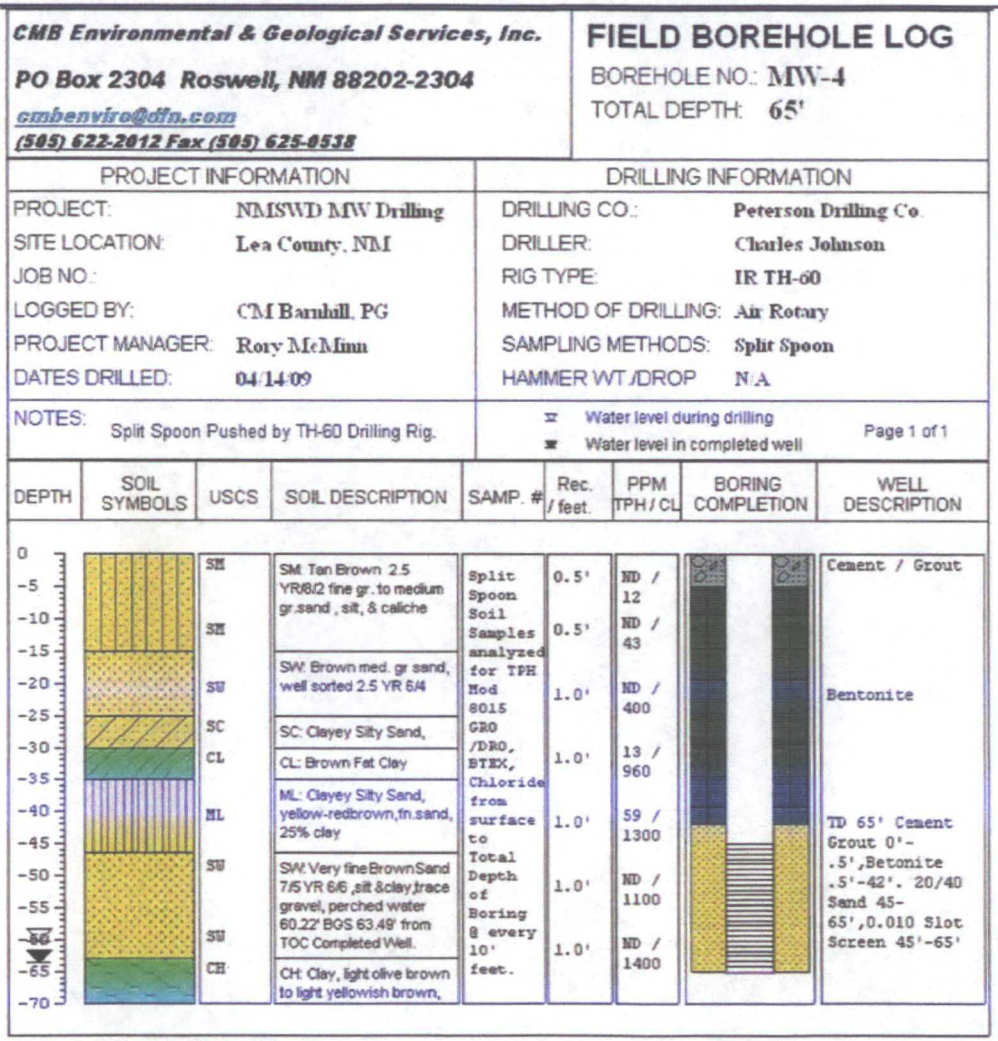
GARY G. EIDSON N.M. P.S. No. 12641
RONALD J. EIDSON N.M. P.S. No. 3239

PROVIDING SURVEYING SERVICES SINCE 1946
JOHN WEST SURVEYING COMPANY
412 N. DAL PASO
HOBBS, N.M. 88240
(505) 393-3117

NEW MEXICO SALT WATER DISPOSAL CO.

SURVEY OF DISPOSAL STATION #11 IN SECTION 21, TOWNSHIP 10 SOUTH, RANGE 34 EAST, N.M.P.M., LEA COUNTY, NEW MEXICO.

Survey Date: 07/02/07	Sheet 1 of 1 Sheets		
W.O. Number: 07.11.0830	Dr By: J.R.	Rev 1:	
Date: 07/16/07	Disk: CD#7	07110830	1" = 75'



CMB Environmental & Geological Services, Inc.
PO Box 2304 Roswell, NM 88202-2304
cmbenviro@dfn.com
(505) 622-2012 Fax (505) 625-0538

FIELD BOREHOLE LOG
BOREHOLE NO.: MW-4
TOTAL DEPTH: 65'

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	NMSWD MW Drilling	DRILLING CO.:	Peterson Drilling Co.
SITE LOCATION:	Lea County, NM	DRILLER:	Charles Johnson
JOB NO.:		RIG TYPE:	IR TH-60
LOGGED BY:	CM Barnhill, PG	METHOD OF DRILLING:	Air Rotary
PROJECT MANAGER:	Rory McMinn	SAMPLING METHODS:	Split Spoon
DATES DRILLED:	04/14/09	HAMMER WT./DROP	N/A

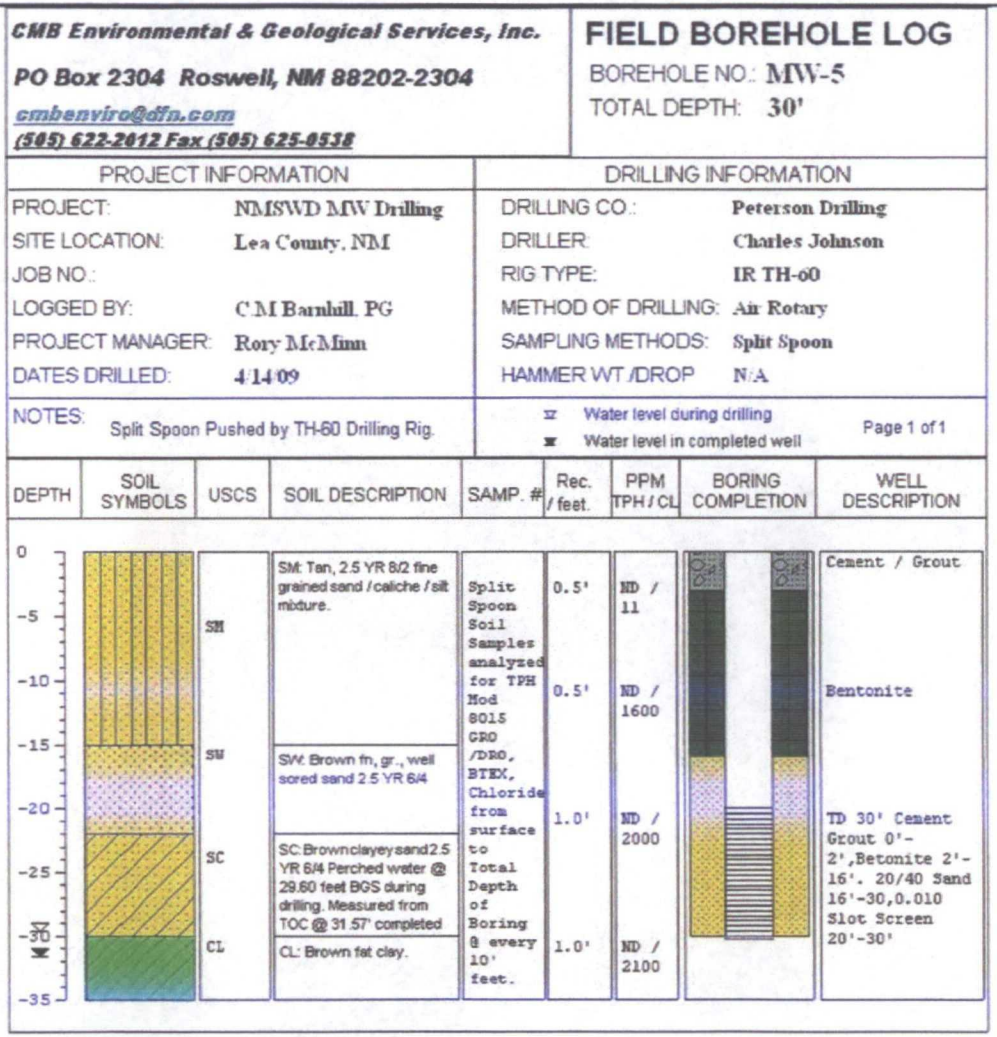
NOTES: Split Spoon Pushed by TH-60 Drilling Rig.

⧖ Water level during drilling
⧗ Water level in completed well

Page 1 of 1

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMP. #	Rec. / feet.	PPM TPH / CL	BORING COMPLETION	WELL DESCRIPTION
0 -5 -10 -15 -20 -25 -30 -35 -40 -45 -50 -55 -60 -65 -70		SM SM SW SC CL ML SW SW CH	SM: Tan Brown 2.5 YR/6/2 fine gr. to medium gr.sand , silt, & caliche SW: Brown med. gr sand, well sorted 2.5 YR 6/4 SC: Clayey Silty Sand, CL: Brown Fat Clay ML: Clayey Silty Sand, yellow-redbrown,fn.sand, 25% clay SW: Very fine Brown Sand 7/5 YR 6/6 ,silt &clay,trace gravel, perched water 60.22' BGS 63.49' from TOC Completed Well. CH: Clay, light olive brown to light yellowish brown,	Split Spoon Soil Samples analyzed for TPH Mod 8015 GRO /DRO, BTEX, Chloride from surface to Total Depth of Boring @ every 10' feet.	0.5' 0.5' 1.0' 1.0' 1.0' 1.0' 1.0'	ND / 12 ND / 43 ND / 400 13 / 960 59 / 1300 ND / 1100 ND / 1400		Cement / Grout Bentonite TD 65' Cement Grout 0'-.5',Betonite .5'-42'. 20/40 Sand 45-65',0.010 Slot Screen 45'-65'

Figure 4 Borehole log MW-4 (Barnhill, 2009)



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FIELD BOREHOLE LOG

BOREHOLE NO.: MW-5
TOTAL DEPTH: 30'

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	NMSWD MW Drilling	DRILLING CO.:	Peterson Drilling
SITE LOCATION:	Lea County, NM	DRILLER:	Charles Johnson
JOB NO.:		RIG TYPE:	IR TH-60
LOGGED BY:	CM Barnhill, PG	METHOD OF DRILLING:	Air Rotary
PROJECT MANAGER:	Rory McMinn	SAMPLING METHODS:	Split Spoon
DATES DRILLED:	4/14/09	HAMMER WT /DROP	N/A

NOTES: Split Spoon Pushed by TH-60 Drilling Rig.

Water level during drilling
Water level in completed well

Page 1 of 1

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMP. #	Rec. / feet.	PPM TPH / CL	BORING COMPLETION	WELL DESCRIPTION
0		SM	SM: Tan, 2.5 YR 8/2 fine grained sand / caliche / silt mixture.	Split Spoon Soil Samples analyzed for TPH Mod 8015 GRO /DRO, BTEX, Chloride from surface to Total Depth of Boring @ every 10' feet.	0.5'	ND / 11		Cement / Grout
-5								
-10					0.5'	ND / 1600		Bentonite
-15		SW	SW: Brown fn, gr., well sored sand 2.5 YR 6/4					
-20					1.0'	ND / 2000		TD 30' Cement Grout 0'-2',Betonite 2'-16'. 20/40 Sand 16'-30,0.010 Slot Screen 20'-30'
-25		SC	SC: Brown clayey sand 2.5 YR 6/4 Perched water @ 29.60 feet BGS during drilling. Measured from TOC @ 31.57' completed					
-30		CL	CL: Brown fat clay.		1.0'	ND / 2100		
-35								

Figure 5 Borehole log MW-5 (Barnhill, 2009)

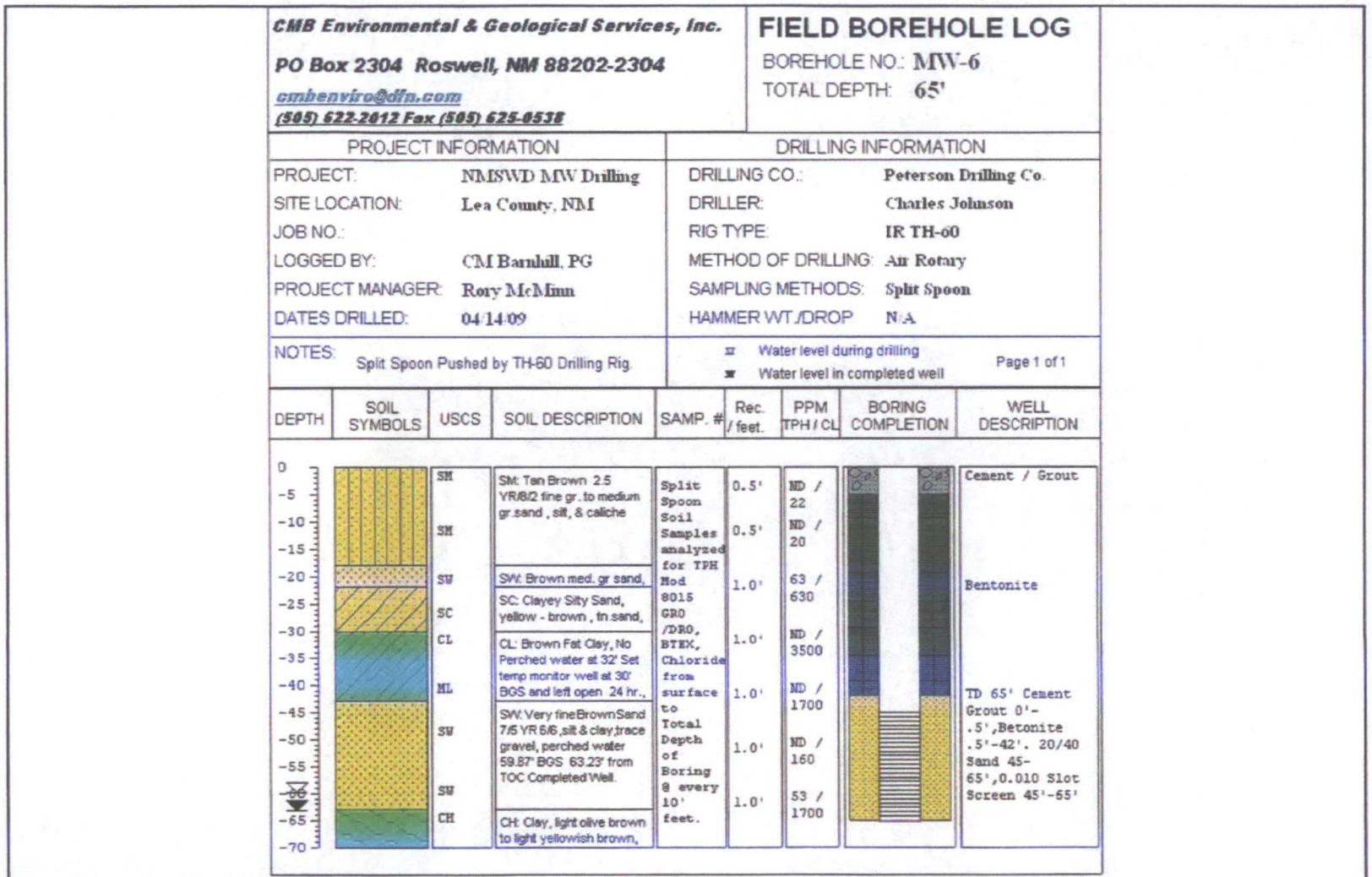

Figure 6 Monitor well MW-6 (Barnhill, 2009)

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cmbenviro@dfn.com
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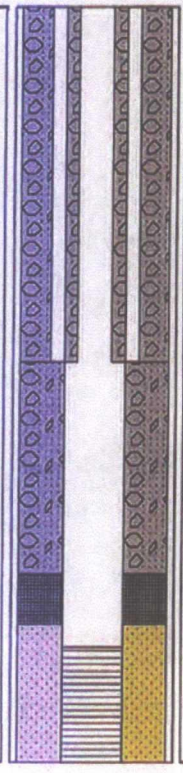
FIELD BOREHOLE LOG

BOREHOLE NO.: **MW-1**
TOTAL DEPTH: **135'**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	NMSWDCO ESA 06/07	DRILLING CO.:	GeoProjects International
SITE LOCATION:	Lea County, NM	DRILLER:	Jose Landeros
JOB NO.:		RIG TYPE:	CME-75
LOGGED BY:	Luana Rought, PhD	METHOD OF DRILLING:	Hollow Stem Auger 4 1/4"
PROJECT MANAGER:	CM Barnhill, PG	SAMPLING METHODS:	Split Spoon
DATES DRILLED:	06/12/07 - 06/29/07	HAMMER WT./DROP	140 lb., 30 in.

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMP. #	Rec. / inches	PID ppm	BORING COMPLETION	WELL DESCRIPTION
0		SM	SM: Brown fine gr. to medium gr.sand , silt, & caliche	Split Spoon Soil Samples analyzed for TPH Mod 8015 GRO /DRO, BTEX, Chloride Every 5' unless there was no sample recovery	24"	0.3		Cement / Grout
-5					12"	0.3		
-10		SM			3"	NS		
-15					5"	0.2		
-20		ML	ML: Clayey Silty Sand, yellow - red brown, fn.sand, 10% caliche, 25% clay , 34.8'- Ksat 8.8E-08 Eff. Por.= -16.4%,40.2" Ksat = 3.6E-05 Eff. Por.= 13.6%		12"	0.1		
-25					12"	0.1		
-30		ML			12"	0.4		
-35					12"	0.2		
-40		ML			12"	0.2		
-45					13"	0.2		
-50		SW	SW: Very fine Brown Sand ,silt &clay,trace gravel, perched water 61'-63'		6"	NS		Cement Grout Set 6" Sch 40 PVC surface casing surface to 65'
-55					2"	0 PPM		
-60		SW			6"	0 PPM		
-65		CH	CH: Clay, light olive brown to light yellowish brown, very tight fat clay, 10-15% very fine sand and silt. high plasticity.65.6'-66.1' Ksat 5.2E-08 Eff. Porosity 9.3%		17"	0 PPM		
-70					NS	0 PPM		
-75					12"	0 PPM		
-80		CH			NS	0 PPM		
-85					NS	0 PPM		
-90					20"	0 PPM		
-95		CH			NS	0 PPM		
-100					NS	0 PPM		
-105		SS	SANDSTONE: Dark gray to very dark gray, very fine grained sand. 25% silt and 25% clay. Saturated at 117' bgs. Water @ 117.23' TOC		4"	0 PPM		
-110					NS			
-115					NS			
-120		SS						
-125								
-130								
-135								TD 135' Cement Grout 0'-100.5',Betonite 100.5'-109.8'. 16/30 Sand 109.8'-135',0.010 Slot Screen 114'-135'

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FIELD BOREHOLE LOG

BOREHOLE NO.: **MW-2**

TOTAL DEPTH: **135'**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	NMSWDCO ESA 06/07	DRILLING CO.:	GeoProjects International
SITE LOCATION:	Lea County, NM	DRILLER:	Jose Landeros
JOB NO.:		RIG TYPE:	CME-75
LOGGED BY:	Luana Rought, PhD	METHOD OF DRILLING:	Hollow Stem Auger 4 1/4"
PROJECT MANAGER:	CM Barnhill, PG	SAMPLING METHODS:	Split Spoon
DATES DRILLED:	06/06/07 - 06/13/07	HAMMER WT./DROP	140 lb., 30 in.

NOTES:

▽ Water level during drilling

▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMP. #	Rec. / Inches	PID ppm	BORING COMPLETION	WELL DESCRIPTION
0		SM	SM: Brown fine gr. to medium gr.sand , silt, & caliche	Split Spoon Soil Samples analyzed for TPH Mod 8015 GRO /DRO, BTEX, Chloride	24"	4.8		Cement / Grout
-5					24"	0.1		
-10		SM			24"	0.4		
-15					24"	0.3		
-20			ML: Clayey Silty Sand, yellow - red brown, fn.sand,		23"	0		
-25		ML			24"	0.3		
-30			CH: Brown clay,31.5' Eff. Por. -23.7 Ksat 2.4E-07		18"	0.3		
-35		CH			24"	0		
-40					24"	0		
-45			SW: Sand , fine gr.red-yellowish brown		8/10'	0.3		Cement Grout
-50		SW			18"	0.4		
-55		SM	SM: Yellow silty sand		12"	0.3		
-60		CH	CH: Fat Clay, lt olive brown. fat clay, harder drilling at 75' Mudstone?	Every 5' unless there was no sample recovery	18"	0.3		
-65		CH			18"	0		
-70					18"	0.5		
-75		CH			4/10'	0		
-80		SS	SANDSTONE: Brown		2/10'	NS		TD 135' Cement Grout 0'-106.3',Betonite 106.3'-111'. 16/30 Sand 111'-135',0.010 Slot Screen 114.5'-135'
-85		CH	CH: Clay, silt, sand, yellow brown with carbon?		18"	0		
-90					19"	3.0		
-95		CH			9/10'	NS		
-100					NS	NS		
-105		SS	SANDSTONE: Dark gray to very dark gray, very fine grained sand. 25% silt and 25% clay. Saturated at 117' bgs. Water @ 116.91' TOC		2/10'	NS		
-110					NS			
-115					3/10'	NS		
-120		SS			3/10'			
-125					1/10'			
-130					1/10'			
-135								

CMB Environmental & Geological Services, Inc.

PO Box 2304 Roswell, NM 88202-2304

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FIELD BOREHOLE LOG

BOREHOLE NO.: **MW-3**

TOTAL DEPTH: **135'**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	NMSWDCO ESA 06/07	DRILLING CO.:	GeoProjects International
SITE LOCATION:	Lea County, NM	DRILLER:	Jose Landeros
JOB NO.:		RIG TYPE:	CME-75
LOGGED BY:	Luana Rought, PhD	METHOD OF DRILLING:	Hollow Stem Auger 4 1/4"
PROJECT MANAGER:	CM Barnhill, PG	SAMPLING METHODS:	Split Spoon
DATES DRILLED:	06/22/07 - 06/26/07	HAMMER WT./DROP	140 lb., 30 in.

NOTES:

▽ Water level during drilling

▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMP. #	Rec. / inches	PID ppm	BORING COMPLETION	WELL DESCRIPTION
0 -5 -10 -15 -20 -25 -30 -35 -40 -45 -50 -55 -60 -65 -70 -75 -80 -85 -90 -95 -100 -105 -110 -115 -120 -125 -130 -135		SM SM ML CH SW CH CH CH CH CH SS SS	SM: Brown fine gr. to medium gr.sand , silt, & caliche ML: Clayey Silty Sand, yellow - red brown, fn.sand, 10% caliche, 25% clay , CH: Brown clay,31.5' Eff. Por. -23.7 Ksat 2.4E-07 SW: Sand , fine gr.red-yellowish brown CH: Clay, lt olive brown. fat clay, harder drilling at 71' Mudstone? Carbon like Clay @ 89' SANDSTONE: Dark gray to very dark gray, very fine grained sand. 25% silt and 25% clay. Saturated at 113' bgs. Water @ 116.85' TOC. Ksat @ 109' Capillary Fringe 1.6E-03 Effective Porosity 25.1%	Split Spoon Soil Samples analyzed for TPH Mod 8015 GRO /DRO, BTEX, Chloride Every 5' unless there was no sample recovery	24" 12' 6" 18" 18" 12" 12" 12" NS 12" 12" 12" 1/10' 12" 12" 12" 1/10' 6" 12" 6" 12" 6" 1.5" 0.3" 12"	0.4 0.5 NS 0.4 0.3 0.1 0.2 NS NS NS 0.1 NS NS 0.2 0.2 0.3 NS 0.3 0.2 NS 0.3 0.2 NS NS		Cement / Grout Cement Grout TD 135' Cement Grout 0'-106.3',Betonite 90-96'. 96,109.5' Slough Sand, 16/30 Sand 109.5'-135',0.010 Slot Screen 114.5'-135'

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FIELD BOREHOLE LOG

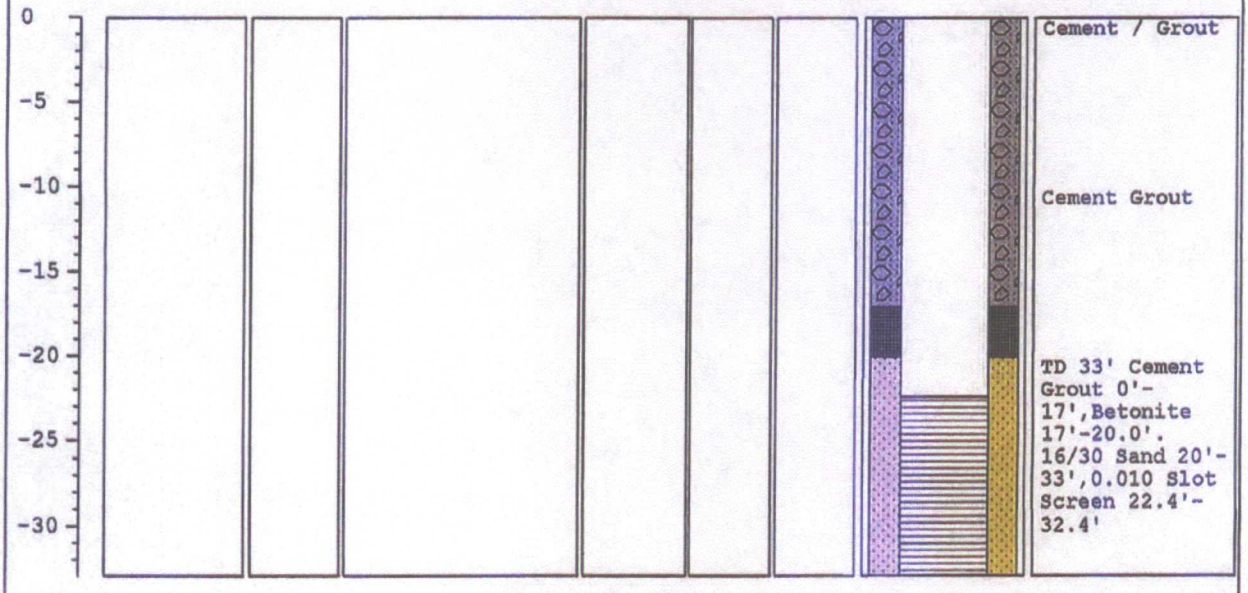
BOREHOLE NO.: **RW-1**
TOTAL DEPTH: **33'**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	NMSWDCO ESA 06/07	DRILLING CO.:	GeoProjects International
SITE LOCATION:	Lea County, NM	DRILLER:	Jose Landeros
JOB NO.:		RIG TYPE:	CME-75
LOGGED BY:	Luana Rought, PhD	METHOD OF DRILLING:	Hollow Stem Auger 6 5/8
PROJECT MANAGER:	CM Barnhill, PG	SAMPLING METHODS:	Split Spoon
DATES DRILLED:	06/12/07	HAMMER WT./DROP	140 lb., 30 in.

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMP. #	Rec. / inches	PID ppm	BORING COMPLETION	WELL DESCRIPTION



CMB Environmental & Geological Services, Inc.
PO Box 2304
1208 Highland Road
Roswell, NM 88202-2304

FIELD BOREHOLE LOG

BOREHOLE NO.: **SB-4A**
TOTAL DEPTH: **31'**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	NM SW Disposal Co.	DRILLING CO.:	Atkins Engineering
SITE LOCATION:	Sec. 21 T10S R34E	DRILLER:	Mort Bates
JOB NO.:	NMSWDCO2003-02	RIG TYPE:	Mobile Drill B-58
LOGGED BY:	CM Barnhill, PG	METHOD OF DRILLING:	Hollow Stem Auger
PROJECT MANAGER:	John Maxey, Jr.	SAMPLING METHODS:	Split Spoon
DATES DRILLED:	11/20/03	HAMMER WT./DROP	140 lb., 30" inch

NOTES:

⧖ Water level during drilling
⧖ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMP. #	Blows / ft.	CL ppm	BORING COMPLETION	WELL DESCRIPTION
5		SW	SW: Tan Brown Sand, No Hydrocarbon Odor or Staining', Medium grained, well sorted sand, caliche nodules @ 4'-19', Non Detect TPH @ 0'-2', Non Detect BTEX, Non Detect TPH @ 4'-11' & Non Detect BTEX	0'-2'	50/24"	160 PPM		Drill Cuttings / backfill from surface to 10' BGS
10		SW		4'-6'	50/12"	800 PPM		
15		SW		9'-11'	52/6"	2100 PPM		
20		SC	SC: Tan Brown Clayey Sand , No Hydrocarbon Odor or staining. Water Sample from 30.82' BGS Cl = 45000 PPM, 26 PPM Acetone, all other VOC's Non-Detect, PAH's = ND, Mecury = ND RCRA8=ND	14'-16'	50/12"	3400 PPM		Bentonite @ TD to 10' BGS
25		SC		19'-21'	44/24"	4500 PPM		
30		CH	CH: Brown Tight Fat Clay, silty 29'-31', Perched Water @ 30.82' BGS Sampled for PAH's, VOC's, RCRA 8 Metals, TDS, Chloride	24'-26'	62/24"	5300 PPM		
35		CH		29'-31'	63/12"	3900 PPM		T.D. 31'
				34'-36'				

Appendix 2

Select documents related to the 6-Inch Leak (aka Johnson Leak) site

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

May 26, 2011

ROY R. RASCON

WHOLE EARTH ENVIRONMENTAL, INC.

2103 ARBOR COVE

KATY, TX 77494

RE: NMSWD 6" LINE LEAK

Enclosed are the results of analyses for samples received by the laboratory on 05/23/11 10:00.

Cardinal Laboratories is accredited through Texas NELAP for:

Method SW-846 8021	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method SW-846 8260	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method TX 1005	Total Petroleum Hydorcarbons

Certificate number T104704398-08-TX. Accreditation applies to solid and chemical materials and non-potable water matrices.

Cardinal Laboratories is accreditated through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.4	Regulated VOCs (V2, V3)

Accreditation applies to public drinking water matrices.

This report meets NELAP requirements and is made up of a cover page, analytical results, and a copy of the original chain-of-custody. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Celey D. Keene

Celey D. Keene

Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

WHOLE EARTH ENVIRONMENTAL, INC.
ROY R. RASCON
2103 ARBOR COVE
KATY TX, 77494
Fax To: (281) 394-2051

Received:	05/23/2011	Sampling Date:	05/20/2011
Reported:	05/26/2011	Sampling Type:	Water
Project Name:	NMSWD 6" LINE LEAK	Sampling Condition:	** (See Notes)
Project Number:	NONE GIVEN	Sample Received By:	Celey D. Keene
Project Location:	CROSSROADS, NM		

Sample ID: NW BCKGRD MW (H101039-01)

Bromide, 4500 Br mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Bromide	<0.100	0.100	05/25/2011	ND	0.580	96.7	0.600	0.00	

Chloride, SM4500Cl-B mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**17000**	4.00	05/25/2011	ND	108	108	100	3.77	

Sample ID: S. LEAK SOURCE MW (H101039-02)

Bromide, 4500 Br mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Bromide	**130**	10.0	05/25/2011	ND	0.580	96.7	0.600	0.00	

Chloride, SM4500Cl-B mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**64000**	4.00	05/25/2011	ND	108	108	100	0.00	

Sample ID: SAND HILL WINDMILL (H101039-03)

Bromide, 4500 Br mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Bromide	**3.25**	0.500	05/25/2011	ND	0.580	96.7	0.600	0.00	

Chloride, SM4500Cl-B mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**530**	4.00	05/25/2011	ND	108	108	100	0.00	

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

WHOLE EARTH ENVIRONMENTAL, INC.
ROY R. RASCON
2103 ARBOR COVE
KATY TX, 77494
Fax To: (281) 394-2051

Received:	05/23/2011	Sampling Date:	05/20/2011
Reported:	05/26/2011	Sampling Type:	Water
Project Name:	NMSWD 6" LINE LEAK	Sampling Condition:	** (See Notes)
Project Number:	NONE GIVEN	Sample Received By:	Celey D. Keene
Project Location:	CROSSROADS, NM		

Sample ID: LUCKY WINDMILL (H101039-04)

Bromide, 4500 Br mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Bromide	**2.12**	0.200	05/25/2011	ND	0.580	96.7	0.600	0.00	

Chloride, SM4500Cl-B mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**530**	4.00	05/25/2011	ND	108	108	100	0.00	

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Notes and Definitions

ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference
**	Samples not received at proper temperature of 6°C or below.
***	Insufficient time to reach temperature.
-	Chloride by SM4500Cl-B does not require samples be received at or below 6°C
	Samples reported on an as received basis (wet) unless otherwise noted on report

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

101 East Marland, Hobbs, NM 88240
(575) 393-2326 FAX (575) 393-2476

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

		BILL TO	
Company Name:	W.E.E. Inc	P.O. #:	
Project Manager:	Roy R. Rascon	Company:	
Address:		Attn:	
City: State: Zip:		Address:	
Phone #: Fax #:		City:	
Project #: Project Owner:		State: Zip:	
Project Name:	NMSWD 6" Line Leak	Phone #:	
Project Location:		Fax #:	
Sampler Name:	Roy R. Rascon		

ANALYSIS REQUEST: CL- / Bromide Ratio

Lab I.D. (FOR LAB USE ONLY)	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER	PRESERV.: ACID/BASE	ICE / COOL	OTHER	SAMPLING: DATE	TIME	CL- / Bromide Ratio
H01039-														7:31	
01	NW BCKGRD Mill	C	1	X								X	5-20-11	~~8:49~~P	X
02	E Leak Source Mill	C	1	X								X	5-20-11	7:19P	X
03	Sand Hill Windmill	C	1	X								X	5-20-11	8:49P	X
04	Lucky Windmill	C	1	X								X	5-23-11	7:56A	X

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising whether based in contract or tort, shall be limited to the amount paid by the client for the analyses. All claims including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within 30 days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

Relinquished By:	Date:	Received By:
Roy R. Rascon	Date: 5-20-11 Time: 10:20	[signature]
Relinquished By:	Date: Time:	Received By:

Delivered By: (Circle One) Sampler - UPS - Bus - Other: 25.5C

Sample Condition: Cool ☐ Yes ☒ No; Intact ☒ Yes ☐ No

CHECKED BY: (Initials) CDH

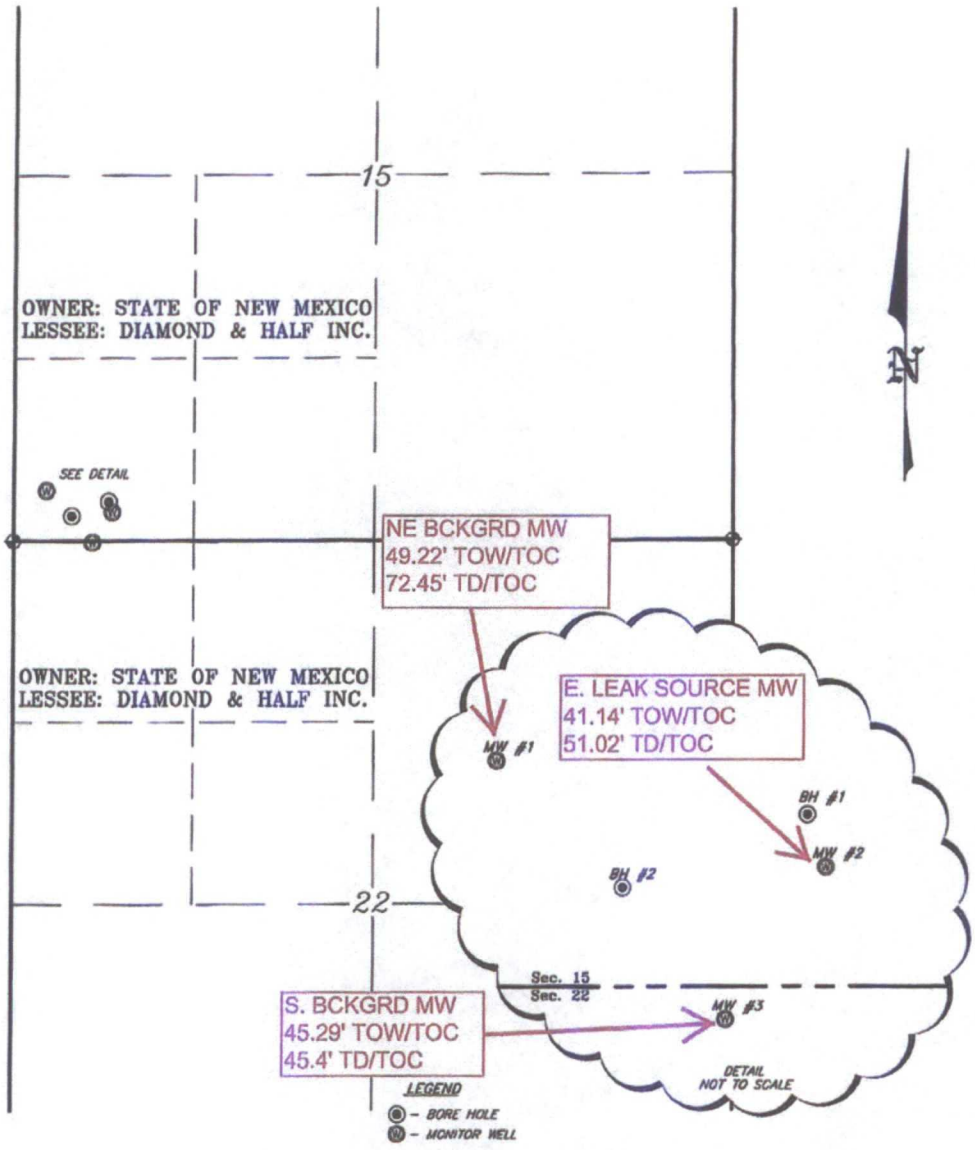
Phone Result: ☐ Yes ☐ No Add'l Phone #:
Fax Result: ☐ Yes ☐ No Add'l Fax #:

REMARKS: Rush Please Email To All
Need By Wednesday

† Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476

#26

SECTIONS 15&22, TOWNSHIP 10 SOUTH, RANGE 34 EAST, N.M.P.M.,
LEA COUNTY, NEW MEXICO.



ALL COORDINATES ARE BASED ON NMSPCE (NAD83)

NAME	NORTHING	EASTING	LATITUDE	LONGITUDE	ELEVATION NO. SIDE PVC	ELEVATION CONCRETE	ELEVATION GROUND
MW #1	N888031.293	E807750.318	N33°26'26.84"	W103°27'35.95"	4212.2'	4210.0'	4209.5'
MW #2	N888881.297	E808241.098	N33°26'25.31"	W103°27'30.17"	4207.9'	4205.9'	4205.4'
MW #3	N888657.823	E808094.439	N33°26'23.11"	W103°27'31.92"	4209.5'	4207.1'	4206.6'
BH #1	N888957.647	E808211.471	N33°26'26.07"	W103°27'30.51"			4206.5'
BH #2	N888849.976	E807937.402	N33°26'25.03"	W103°27'33.76"			4207.5'

I HEREBY CERTIFY THAT THIS PLAT WAS PREPARED FROM FIELD NOTES OF AN ACTUAL SURVEY AND MEETS OR EXCEEDS ALL REQUIREMENTS FOR LAND SURVEYS AS SPECIFIED BY THIS STATE.

100 0 100 100

GARY L. JONES N.M. P.S. No. 7977
TEXAS P.L.S. No. 5074

BASIN SURVEYS P.O. BOX 1786 – HOBBS, NEW MEXICO

WHOLE EARTH ENVIROMENTAL, INC.

REF: MONITOR WELLS & BORE HOLES

MONITOR WELLS LOCATED IN
SECTIONS 15&22, TOWNSHIP 10 SOUTH, RANGE 34 EAST,
N.M.P.M., LEA COUNTY, NEW MEXICO.

W.O. Number: 23995	Drawn By: K. GOAD		
Date: 01-17-2011	Disk: KJG – 23995MW.DWG	Survey Date: 01-10-2011	Sheet 1 of 1 Sheets

EAST LEAK SOURCE WELL

Atkins ENGINEERING ASSOCIATES

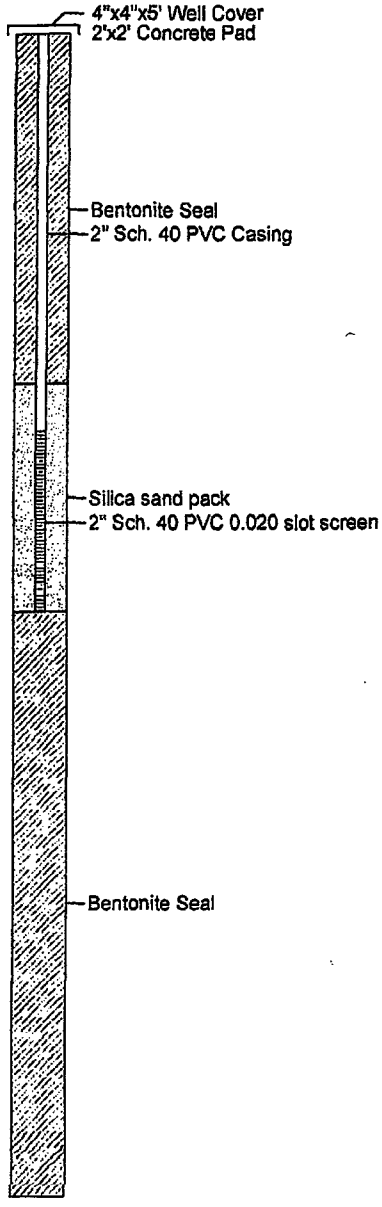
Log of Boring East 2" Monitor Well

Whole Earth Environmental, Inc.
2103 Arbor Cove
Katy TX 77494
Contact: Mike Griffin
Job#: CROSSRD.DRL.10

Drill Start	: 12/08/10 (07:00)	Logged By	: Mort Bates
Drill End	: 12/08/10 (13:30)		
Boring Location	: East side of spill		
Site Location	: NMSWD, Crossroads		
Auger Type	: 3¼ Hollow		

Depth in Feet	GRAPHIC	USCS	Sample	DESCRIPTION
0		SP		Oily sand, loose, tan, damp
5				Caliche, firm, tan, reddish tan, damp
10				Caliche, hard, grayish white, dry
15				
20				Caliche, firm, tan, dry
25				
30				
35		SP		Sand, loose, tan, dry
40		CL		Sandy clay, loose, reddish tan, damp
		GW		Sandy gravel, loose, tan, wet
45		SS		Sandstone, firm, tan, wet
50		CL		Clay, stiff, tan, damp
55				
60		CL		Clay, stiff, yellowish tan, damp
65				
70				
75		CL		Clay, stiff, gray, damp
80				
85				
90				Free phase oil at 92'
95				
100				Total Depth 97'

East 2" MW



12-21-2010 C:\Users\Paddy\Documents\Whole Earth\Crossroads\East.bor

NORTHWEST BACKGROUND WELL

Atkins ENGINEERING ASSOCIATES

Log of Boring West Background Well

Whole Earth Environmental, Inc.
2103 Arbor Cove
Katy TX 77494

Contact: Mike Griffin

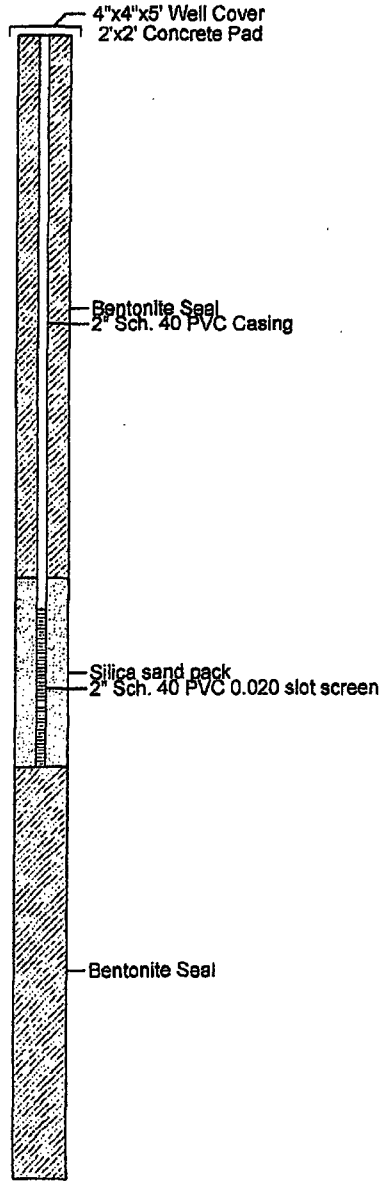
Job#: CROSSRD.DRL.10

Drill Start	: 12/08/10 (14:00)	Logged By	: Mort Bates
Drill End	: 12/09/10 (16:30)		
Boring Location	: NW of spill 200'±		
Site Location	: NMSWD, Crossroads		
Auger Type	: 3¼ Hollow		

Depth in Feet	GRAPHIC	USCS	Sample	DESCRIPTION
0–5		SP		Sand, loose, tan, dry
5–35		SP		Caliche, firm, white, dry
35–45		SS		Sandstone, firm, reddish tan, dry
45–50		SS		Sandstone, firm, yellow, dry
50–55		SS		Sandstone, hard, yellowish tan, dry
55–60		SS		Sandstone, firm, yellowish tan, wet
60–80		CL		Clay, stiff, yellowish brown, moist
80–110		SC		Clayey sand, stiff, grayish black, damp

Total Depth 110'

West Background Well



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NORTHEAST BACKGROUND BORING

Atkins ENGINEERING ASSOCIATES

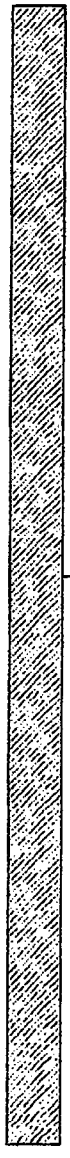
Log of Boring East Background Well

Whole Earth Environmental, Inc.
2103 Arbor Cove
Katy TX 77494
Contact: Mike Griffin
Job#: CROSSRD.DRL.10

Drill Start	: 12/11/10 (10:30)	Logged By	: Mort Bates
Drill End	: 12/14/10 (16:30)		
Boring Location	: NE of spill 200'±		
Site Location	: NMSWD, Crossroads		
Auger Type	: 3¼ Hollow		

Depth in Feet	GRAPHIC	USCS	Sample	DESCRIPTION
0–5		SP		Sand, loose, tan, dry
5–35				Caliche, hard, tan and white, dry
35–40		SS		Sandstone, firm, tan, dry
40–45		SS		Sandstone, firm, damp
45–75		CL		Clay, stiff, yellow, damp
75–90		CL		Clay, stiff, gray, damp
90–100		CL		Clay, stiff, dark gray, damp
100				Total Depth 100'

East Background Well



12-21-2010 C:\Users\Paddy\Documents\Whole Earth\Crossroads\EastBG.bor

WEST LEAK SOURCE BORING

Atkins ENGINEERING ASSOCIATES

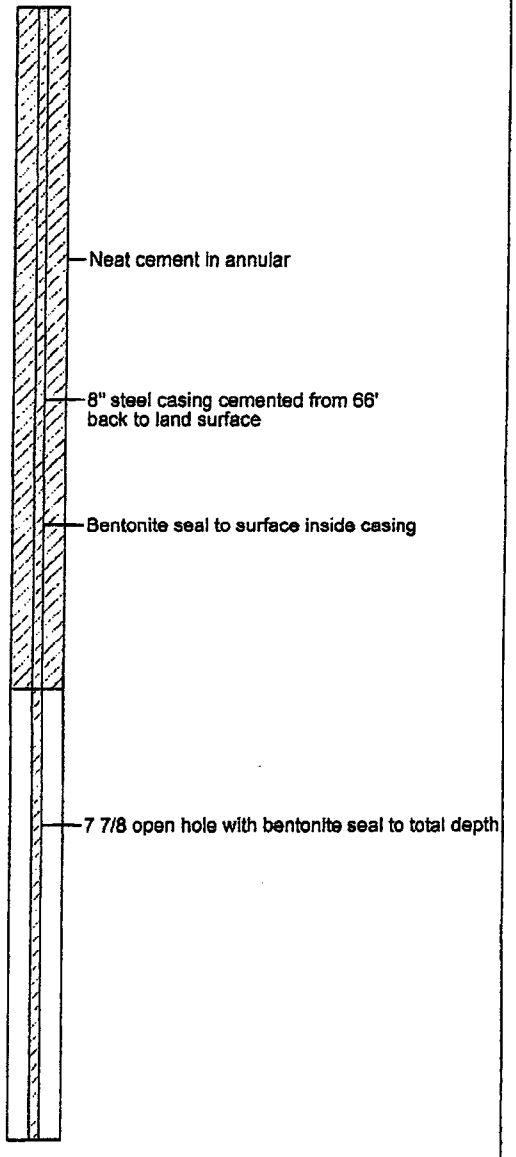
Log of Boring West Side Leak Test Hole

Whole Earth Environmental, Inc.
2103 Arbor Cove
Katy TX 77494
Contact: Mike Griffin
Job#: CROSSRD.DRL.10

Drill Start	: 12/12/10 (11:30)	Logged By	: Mort Bates
Drill End	: 12/30/10 (15:00)		
Boring Location	: West side of leak area		
Site Location	: NMSWD, Crossroads		
Auger Type	: Air rotary		

Depth in Feet	GRAPHIC	USCS	Sample	DESCRIPTION
0		SP		Poorly graded sand, loose, tan and black, damp
5				Caliche, firm, tan, dry
10				
15				
20				
25				
30				
35		SP		Poorly graded sand, loose, tan, damp
40				
45		SS		Sandstone, firm, tan, damp
50		SS		Sandstone, firm, yellowish tan, wet
55		GW		Sand and gravel, loose, yellow, wet
60		CL		Sandy clay, soft, yellowish tan, wet
65		CL		Clay, stiff, yellow, moist
70		CL		Clay, stiff, yellowish brown, dry
75				
80		LS		Limestone with clay, firm, gray, dry
85		LS		Limestone, hard, gray, dry
90				
95		CL		Clay, firm, gray, dry
100				
105				
110				Total Depth 110'
115				

West Side Leak Test Hole



01-06-2011 C:\Users\Paddy\Documents\Whole Earth\Crossroads\WestLeak.bor

SOUTH BACKGROUND WELL

Atkins ENGINEERING ASSOCIATES

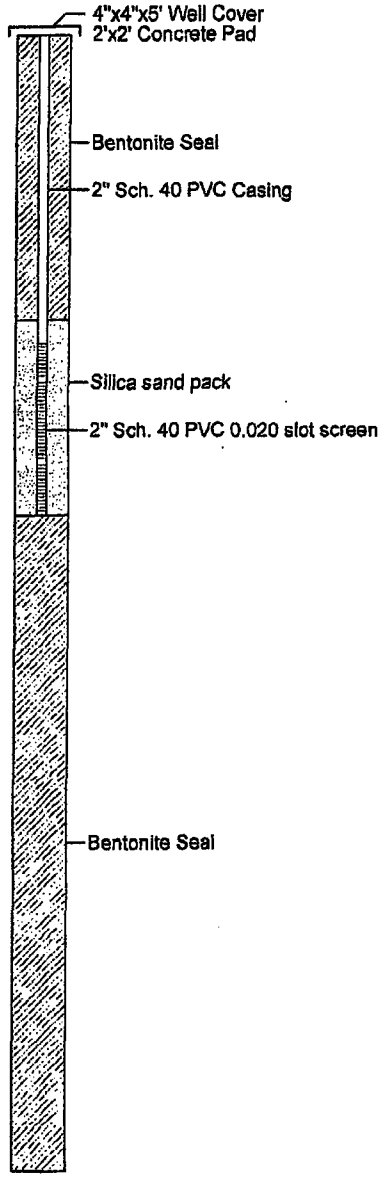
Log of Boring Down Gradient Well

Whole Earth Environmental, Inc.
2103 Arbor Cove
Katy TX 77494
Contact: Mike Griffin
Job#: CROSSRD.DRL.10

Drill Start	: 12/15/10 (07:30)	Logged By	: Mort Bates
Drill End	: 12/16/10 (12:00)		
Boring Location	: South of spill 200'±		
Site Location	: NMSWD, Crossroads		
Auger Type	: 3¼ Hollow		

Depth in Feet	GRAPHIC	USCS	Sample	DESCRIPTION
0		SP		Sand, loose, tan, dry
5				Caliche, firm, white, dry
10				Caliche, *hard, white, dry*
15				
20				
25				
30		SC		Clayey sand, loose, tan to yellow, dry
35				
40				
45		SC		Clayey sand, loose, tan to yellow, moist
50		SC		Clayey sand, firm, yellow, wet
55				
60				
65				
70				
75				
80				
85		CL		Clay, stiff, grayish black, damp
90				
95				
100				Total Depth 100'
105				

Down Gradient Well



12-21-2010 C:\Users\Paddy\Documents\Whole Earth\Crossroads\Down.bor

Appendix 3

Select documents related to the New Spill site

Laboratory Report for

Atkins Engineering Associates Inc.

Crossroads/Johnson Test Hole No. 2

January 31, 2012

Daniel B. Stephens & Associates, Inc.

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January 31, 2012

Jack Atkins
Atkins Engineering Associates Inc.
P.O. Box 3156
Roswell, NM 88202-3156
(575) 624-2420

Re: DBS&A Laboratory Report for Atkins Engineering Associates Inc. Crossroads/Johnson Test Hole No. 2

Dear Mr. Atkins:

Enclosed is the final report for the Atkins Engineering Associates Inc. Crossroads/Johnson Test Hole No. 2 sample. Please review this report and provide any comments as samples will be held for a maximum of 30 days. After 30 days samples will be returned or disposed of in an appropriate manner.
All testing results were evaluated subjectively for consistency and reasonableness, and the results appear to be reasonably representative of the material tested. However, DBS&A does not assume any responsibility for interpretations or analyses based on the data enclosed, nor can we guarantee that these data are fully representative of the undisturbed materials at the field site. We recommend that careful evaluation of these laboratory results be made for your particular application.

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

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

Sincerely,

DANIEL B. STEPHENS & ASSOCIATES, INC.
SOIL TESTING & RESEARCH LABORATORY

Joleen Hines

Joleen Hines
Laboratory Supervising Manager

Enclosure

Daniel B. Stephens & Associates, Inc.
Soil Testing & Research Laboratory
5840 Osuna Rd. NE
Albuquerque, NM 87109
505-889-7752
FAX 505-889-0258

Summaries

Summary of Tests Performed

Sample ID / Boring / Well	Moisture Content[1]			Grain Size Distribution[2]			Consolidation[3]								Permeability[4]			Atterberg Limits[5]		Percent Passing No. 200 Sieve	Proctor Density

[1] Laboratory testing performed in accordance with the latest applicable ASTM standards.

[2] Soil classification based on visual observation and laboratory testing in accordance with the Unified Soil Classification System.

[3] Consolidation tests performed on relatively undisturbed samples collected with a split-barrel sampler.

[4] Permeability tests performed on relatively undisturbed samples collected with a split-barrel sampler.

[5] Atterberg limits tests performed on soil passing the No. 40 sieve.

Notes

Sample Receipt and Preparation:

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

General Notes:

[illegible]

[illegible]

[illegible]

Summary of Sample Preparation/Volume Changes

	Initial Sample Data[1]		Volume Change Post Saturation[2]			Volume Change Post Drying Curve[3]		
	Volume Change	Dry Bulk Density	Dry Bulk Density	Volume Change	% of Initial	Dry Bulk Density	Volume Change	% of Initial
Sample Name	(%)	(g/cm^3)	(g/cm^3)	(%)	(%)	(g/cm^3)	(%)	(%)
Crossroads/Johnson Test Hole No. 2 #1	16.8	1.79	1.65	+ 8.0%	92.6%	NA	NA	NA
Crossroads/Johnson Test Hole No. 2 #2	21.6	1.57	1.57	---	100%	1.57	---	100%
Crossroads/Johnson Test Hole No. 2 #3	20.8	1.69	1.69	---	100%	1.69	---	100%

[1]Initial Sample Data: The 'as received' dry bulk density and moisture content.

[2]Volume Change Post Saturation: Volume change measurements were obtained after saturated hydraulic conductivity testing.

[3]Volume Change Post Drying Curve: Volume change measurements were obtained throughout hanging column and pressure plate testing. The 'Volume Change Post Drying Curve' values represent the final sample dimensions after the last pressure plate point.

Notes:

"+" indicates sample swelling, "-" indicates sample settling, and "---" indicates no volume change occurred.

NA = Not Applicable.

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

Sample Number	Moisture Content				Dry Bulk Density (g/cm^3)	Wet Bulk Density (g/cm^3)	Calculated Porosity (%)
	As Received		Remolded				
	Gravimetric (%, g/g)	Volumetric (%, cm^3/cm^3)	Gravimetric (%, g/g)	Volumetric (%, cm^3/cm^3)			
Crossroads/Johnson Test Hole No. 2 #1	16.8	30.0	---	---	1.79	2.09	33.3
Crossroads/Johnson Test Hole No. 2 #2	21.6	30.0	---	---	1.57	1.91	32.2
Crossroads/Johnson Test Hole No. 2 #3	20.8	35.1	---	---	1.69	2.04	38.0

NA = Not analyzed

--- = This sample was not remolded

Summary of Saturated Hydraulic Conductivity Tests

Sample Number	K_{sat} (cm/sec)	□versi□e Corrected K_{sat} (cm/sec)	□ethod of Analysis	
			□alling Head □e□ible □ all	□alling Head □igid □ all
Crossroads/Johnson Test Hole No. 2 #1	1.3□-07	NA	□	
Crossroads/Johnson Test Hole No. 2 #2	2.8□-05	NA		□
Crossroads/Johnson Test Hole No. 2 #3	1.□□-06	NA		□

--- = □versi□e correction is unnecessary since coarse fraction □ 5% of composite mass
N□ = Not re□uested
NA = Not applicable

Summary of Moisture Characteristics of the Initial Drainage Curve

Sample Number	Pressure Head (-cm water)	□oisture Content (%, cm^3/cm^3)
Crossroads/Johnson Test Hole No. 2 #2	0	□1.□
	17	□0.7
	52	39.2
	130	38.1
	337	37.7
	1275	36.7
	1□□81	25.3
	3□877	19.3
	197229	11.7
	8□9860	7.6
Crossroads/Johnson Test Hole No. 2 #3	0	□0.9
	22	□1.1
	73	□0.9
	158	39.6
	337	39.□
	1275	38.6
	22□36	2□.0
	73120	17.1
	391195	9.□
	8□9860	8.2

□□ Volume ad□ustments are applicable at this matric potential (see data sheet for this sample).

Summary of Calculated Unsaturated Hydraulic Properties

Sample Number	α (cm^{-1})	N (dimensionless)	θ_r (% vol)	θ_s (% vol)	□versi□e Corrected θ_r (% vol)	□versi□e Corrected θ_s (% vol)
Crossroads/Johnson Test Hole No. 2 #2	0.0003	1.2893	0.00	39.52	NA	NA
Crossroads/Johnson Test Hole No. 2 #3	0.0002	1.3125	0.00	□0.□5	NA	NA

-- = □versi□e correction is unnecessary since coarse fraction □5% of composite mass

N□ = Not re□uested

NA = Not applicable

Summary of Atterberg Tests

Sample Number	□i□uid □imit	Plastic □imit	Plasticity Inde□	Classification
Crossroads/Johnson Test Hole No. 2	56	29	27	CH

--- = Soil re□uires visual-manual classification due to non-plasticity

Summary of Specific Gravity Tests

	□□75mm □aterial		□□75mm □aterial		□ulk Sample
Sample Number	Specific □ravity	Percent of □ulk Sample	Specific □ravity	Percent of □ulk Sample	Specific □ravity
Crossroads/Johnson Test Hole No. 2	2.73	100	---	0	2.73

--- = □nnecessary since specified fraction □5% of composite mass

□= □ased on specific gravity of material □ □75 mm

Initial Properties

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

Sample Number	Moisture Content				Dry Bulk Density (g/cm^3)	Wet Bulk Density (g/cm^3)	Calculated Porosity (%)
	As Received		Remolded				
	Gravimetric (%, g/g)	Volumetric (%, cm^3/cm^3)	Gravimetric (%, g/g)	Volumetric (%, cm^3/cm^3)			
Crossroads/Johnson Test Hole No. 2 #1	16.8	30.0	---	---	1.79	2.09	33
Crossroads/Johnson Test Hole No. 2 #2	21.6	30.0	---	---	1.57	1.91	32.2
Crossroads/Johnson Test Hole No. 2 #3	20.8	35.1	---	---	1.69	2.00	38.0

NA = Not analyzed

--- = This sample was not remolded

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

Job Name: Atkins □ngineering
Job Number: □□11.02□□00
Sample Number: Crossroads/Johnson Test Hole No. 2 #1
Ring Number: NA
Depth: 72'-7□

	As □eceived	□emolded
Test Date:	2-Dec-11	---
Field weight of sample* (g):	19□5□	
Tare weight, ring (g):	0.00	
Tare weight, pan/plate (g):	0.00	
Tare weight, other (g):	0.00	
Dry weight of sample (g):	166.53	
Sample volume (cm^3):	93.21	
Measured particle density (g/cm^3):	2.72	

Gravimetric Moisture Content (% g/g):	16.8
Volumetric Moisture Content (% vol):	30.0
Dry bulk density (g/cm^3):	1.79
Wet bulk density (g/cm^3):	2.09
Calculated Porosity (% vol):	3□3
Percent Saturation:	87.6

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

Comments:

□□ eight including tares
NA = Not analy□ed
--- = This sample was not remolded

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

Job Name: Atkins Engineering
Job Number: LB11.0244.00
Sample Number: Crossroads/Johnson Test Hole No. 2 #2
Ring Number: NA
Depth: 72'-74'

	As Received	Remolded
Test Date:	2-Dec-11	---
Field weight of sample* (g):	175.35	
Tare weight, ring (g):	39.58	
Tare weight, pan/plate (g):	0.00	
Tare weight, other (g):	0.00	
Dry weight of sample (g):	111.67	
Sample volume (cm^3):	70.97	
Measured particle density (g/cm^3):	2.72	
Gravimetric Moisture Content (% g/g):	21.6	
Volumetric Moisture Content (% vol):	34.0	
Dry bulk density (g/cm^3):	1.57	
Wet bulk density (g/cm^3):	1.91	
Calculated Porosity (% vol):	42.2	
Percent Saturation:	80.5	

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

Comments:

* Weight including tares
NA = Not analyzed
--- = This sample was not remolded

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

Job Name: Atkins Engineering
Job Number: LB11.0244.00
Sample Number: Crossroads/Johnson Test Hole No. 2 #3
Ring Number: NA
Depth: 72'-74'

	As Received	Remolded
Test Date:	6-Dec-11	---
Field weight of sample* (g):	320.06	
Tare weight, ring (g):	126.71	
Tare weight, pan/plate (g):	0.00	
Tare weight, other (g):	0.00	
Dry weight of sample (g):	160.05	
Sample volume (cm^3):	94.97	
Measured particle density (g/cm^3):	2.72	
Gravimetric Moisture Content (% g/g):	20.8	
Volumetric Moisture Content (% vol):	35.1	
Dry bulk density (g/cm^3):	1.69	
Wet bulk density (g/cm^3):	2.04	
Calculated Porosity (% vol):	38.0	
Percent Saturation:	92.2	

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

Comments:

* Weight including tares
NA = Not analyzed
--- = This sample was not remolded

Saturated Hydraulic Conductivity

Summary of Saturated Hydraulic Conductivity Tests

Sample Number	K_{sat} (cm/sec)	Oversize Corrected K_{sat} (cm/sec)	Method of Analysis: Falling Head Flexible Wall	Method of Analysis: Falling Head Rigid Wall
Crossroads/Johnson Test Hole No. 2 #1	1.3E-07	NA	X	
Crossroads/Johnson Test Hole No. 2 #2	2.8E-05	NA		X
Crossroads/Johnson Test Hole No. 2 #3	1.4E-06	NA		X

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

Saturated Hydraulic Conductivity
Flexible Wall Falling Head-Rising Tail Method

Job name: Atkins Engineering
Job number: LB11.0244.00
Sample number: Crossroads/Johnson Test Hole No. 2 #1
Ring Number NA
Depth: 72'-74'

Remolded or Initial Sample Properties	
Initial Mass (g):	194.54
Diameter (cm):	4.930
Length (cm):	4.883
Area (cm^2):	19.09
Volume (cm^3):	93.21
Dry Density (g/cm^3):	1.79
Dry Density (pcf):	111.53
Water Content (%, g/g):	16.8
Water Content (%, vol):	30.0
Void Ratio (e):	0.52
Porosity (%, vol):	34.3
Saturation (%):	87.6

Post Permeation Sample Properties	
Saturated Mass (g):	207.53
Dry Mass (g):	166.53
Diameter (cm):	5.086
Length (cm):	4.954
*Deformation (%)**:*	1.44
Area (cm^2):	20.32
Volume (cm^3):	100.65
Dry Density (g/cm^3):	1.65
Dry Density (pcf):	103.29
Water Content (%, g/g):	24.6
Water Content (%, vol):	40.7
Void Ratio(e):	0.64
Porosity (%, vol):	39.2
Saturation (%):*	104.0

Test and Sample Conditions		
Permeant liquid used:	Tap Water	
Sample Preparation:	☑ In situ sample, extruded	
	☐ Remolded Sample	
Number of Lifts:	NA	
Split:	NA	
Percent Coarse Material (%):	NA	
Particle Density(g/cm^3):	2.72	☐ Assumed ☑ Measured
Cell pressure (PSI):	82.0	
Influent pressure (PSI):	81.0	
Effluent pressure (PSI):	80.0	
Panel Used:	☑ D ☐ E ☐ F	
Reading:	☐ Annulus ☑ Pipette	
		Date/Time
B-Value (% saturation) prior to test*:	0.95	12/8/11 945
B-Value (% saturation) post to test:	0.98	12/8/11 1630

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

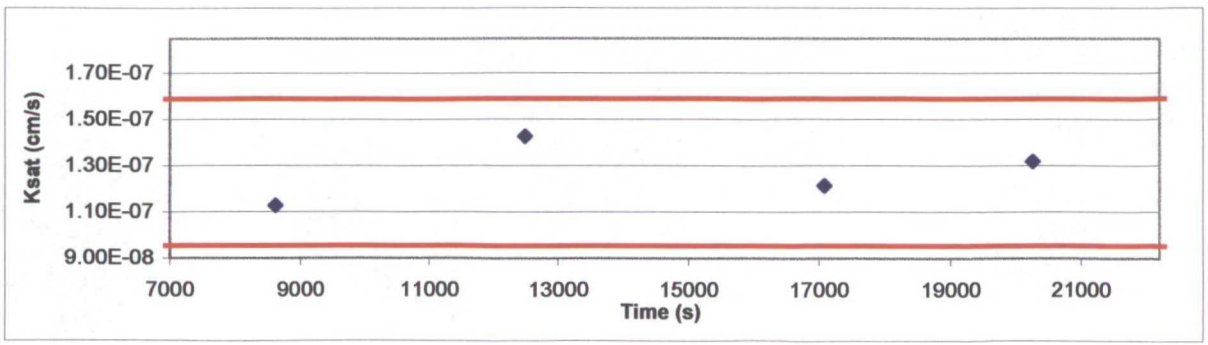
Laboratory analysis by: D. O'Dowd
Data entered by: D. O'Dowd
Checked by: J. Hines

Saturated Hydraulic Conductivity
Flexible Wall Falling Head-Rising Tail Method

Job name: Atkins Engineering
Job number: LB11.0244.00
Sample number: Crossroads/Johnson Test Hole No. 2 #1
Ring Number NA
Depth: 72'-74'

Date	Time	Temp (°C)	Influent Pipette Reading	Effluent Pipette Reading	Gradient (ΔH/ΔL)	Average Flow (cm^3)	Elapsed Time (s)	Ratio (outflow to inflow)	Change in Head (Not to exceed 25%)	k_{sat} T°C (cm/s)	k_{sat} Corrected (cm/s)
Test # 1:											
08-Dec-11	10:51:50	20.1	4.65	20.10	17.80	0.30	8605	1.00	1%	1.13E-07	1.13E-07
08-Dec-11	13:15:15	20.4	5.00	19.75	17.64						
Test # 2:											
08-Dec-11	13:15:15	20.4	5.00	19.75	17.64	0.17	3895	1.00	1%	1.44E-07	1.42E-07
08-Dec-11	14:20:10	20.6	5.20	19.55	17.54						
Test # 3:											
08-Dec-11	14:20:10	20.6	5.20	19.55	17.54	0.17	4580	1.00	1%	1.23E-07	1.21E-07
08-Dec-11	15:36:30	20.7	5.40	19.35	17.45						
Test # 4:											
08-Dec-11	15:36:30	20.7	5.40	19.35	17.45	0.13	3175	1.00	0%	1.34E-07	1.32E-07
08-Dec-11	16:29:25	20.7	5.55	19.20	17.38						

***Average Ksat* (cm/sec):** **1.27E-07**
Calculated Gravel Corrected Average Ksat (cm/sec): ---



ASTM Required Range (+/- 25%)

Ksat (-25%) (cm/s): 9.53E-08

Ksat (+25%) (cm/s): 1.59E-07

Saturated Hydraulic Conductivity
Falling Head Method

Job name: Atkins Engineering
Job number: LB11.0244.00
Sample number: Crossroads/Johnson Test Hole No. 2 #2
Ring Number: NA
Depth: 72'-74'

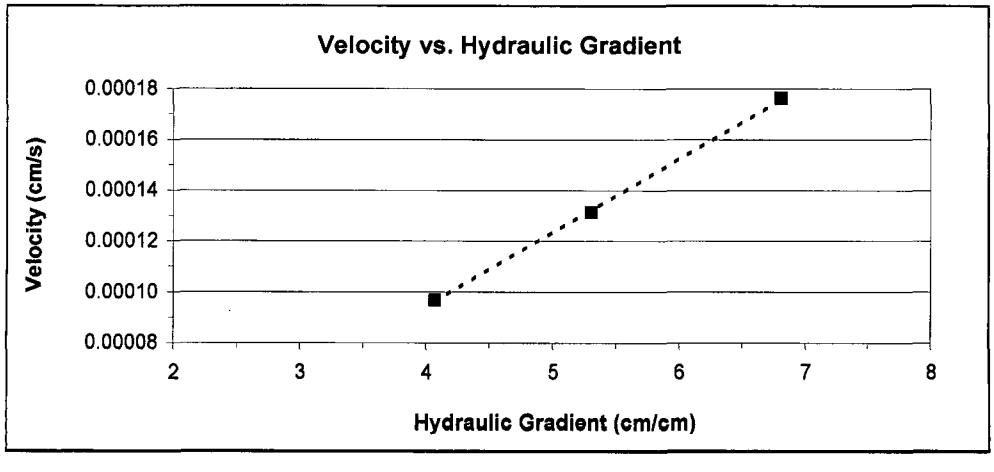
Type of water used: TAP
Backpressure (psi): 0.0
Offset (cm): 3.5
Sample length (cm): 3.70
Sample x-sectional area (cm^2): 19.20
Reservoir x-sectional area (cm^2): 0.70

Date	Time	Temp (°C)	Reservoir head (cm)	Corrected head (cm)	Elapsed time (sec)	Ksat (cm/sec)	Ksat @ 20°C (cm/sec)
Test # 1:							
12-Dec-11	12:21:14	20.0	29.2	25.7	981	2.8E-05	2.8E-05
12-Dec-11	12:37:35	20.0	24.45	21.0			
Test # 2:							
12-Dec-11	12:37:35	20.0	24.45	21.0	1762	2.8E-05	2.8E-05
12-Dec-11	13:06:57	20.0	18.1	14.6			
Test # 3:							
12-Dec-11	13:06:57	20.0	18.1	14.6	1053	2.7E-05	2.7E-05
12-Dec-11	13:24:30	20.0	15.3	11.8			

***Average Ksat* (cm/sec):** **2.8E-05**
***Oversize Corrected Ksat* (cm/sec):** **NA**

Comments:

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



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

Saturated Hydraulic Conductivity
Falling Head Method

Job name: Atkins Engineering
Job number: LB11.0244.00
Sample number: Crossroads/Johnson Test Hole No. 2 #3
Ring Number: NA
Depth: 72'-74'

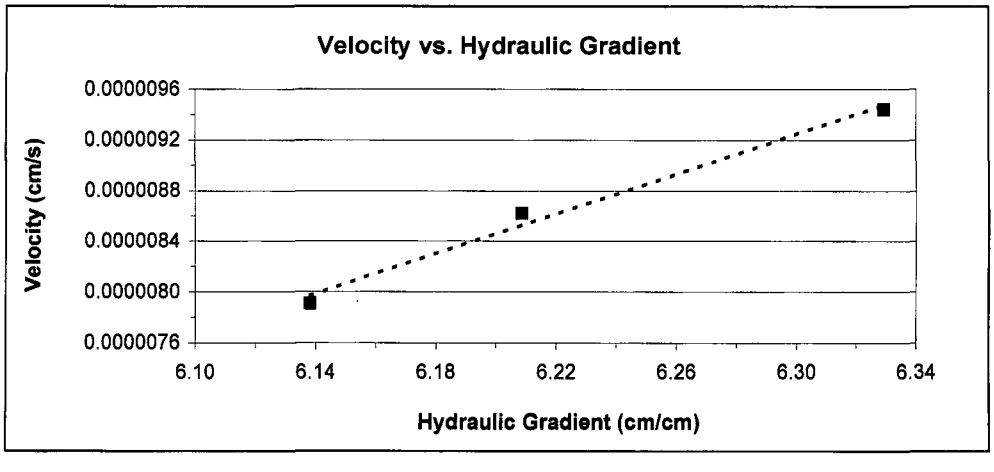
Type of water used: TAP
Backpressure (psi): 0.0
Offset (cm): 0.7
Sample length (cm): 4.97
Sample x-sectional area (cm^2): 19.10
Reservoir x-sectional area (cm^2): 0.70

Date	Time	Temp (°C)	Reservoir head (cm)	Corrected head (cm)	Elapsed time (sec)	Ksat (cm/sec)	Ksat @ 20°C (cm/sec)
Test # 1:							
12-Dec-11	12:21:40	20.0	32.3	31.6	970	1.5E-06	1.5E-06
12-Dec-11	12:37:50	20.0	32.05	31.4			
Test # 2:							
12-Dec-11	13:07:17	20.0	31.7	31.0	1063	1.4E-06	1.4E-06
12-Dec-11	13:25:00	20.0	31.45	30.8			
Test # 3:							
12-Dec-11	13:25:00	20.0	31.45	30.8	2085	1.3E-06	1.3E-06
12-Dec-11	13:59:45	20.0	31	30.3			

***Average Ksat* (cm/sec):** **1.4E-06**
***Oversize Corrected Ksat* (cm/sec):** **NA**

Comments:

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



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

Moisture Retention Characteristics

Summary of Moisture Characteristics of the Initial Drainage Curve

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
Crossroads/Johnson Test Hole No. 2 #2	0	41.4
	17	40.7
	52	39.2
	130	38.1
	337	37.7
	1275	36.7
	14481	25.3
	34877	19.3
	197229	11.7
	849860	7.6
Crossroads/Johnson Test Hole No. 2 #3	0	40.9
	22	41.1
	73	40.9
	158	39.6
	337	39.4
	1275	38.6
	22436	24.0
	73120	17.1
	391195	9.4
	849860	8.2

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

Summary of Calculated Unsaturated Hydraulic Properties

Sample Number	α (cm^{-1})	N (dimensionless)	θ_r (% vol)	θ_s (% vol)	Oversize Corrected θ_r (% vol)	Oversize Corrected θ_s (% vol)
Crossroads/Johnson Test Hole No. 2 #2	0.0003	1.2893	0.00	39.52	NA	NA
Crossroads/Johnson Test Hole No. 2 #3	0.0002	1.3125	0.00	40.45	NA	NA

— = Oversize correction is unnecessary since coarse fraction < 5% of composite mass
NR = Not requested
NA = Not applicable

Moisture Retention Data

Hanging Column / Pressure Plate

(Soil-Water Characteristic Curve)

Job Name: Atkins Engineering
Job Number: LB11.0244.00
Sample Number: Crossroads/Johnson Test Hole No. 2 #2
Ring Number: NA
Depth: 72'-74'

Dry wt. of sample (g): 111.67
Tare wt., ring (g): 39.58
Tare wt., screen & clamp (g): 27.24
Initial sample volume (cm^3): 70.97
Initial dry bulk density (g/cm^3): 1.57
Measured particle density (g/cm^3): 2.72
Initial calculated total porosity (%): 42.16

	Date	Time	Weight* (g)	Matric Potential (-cm water)	Moisture Content† (% vol)
Hanging column:	12-Dec-11	15:15	207.85	0	41.37
	19-Dec-11	8:40	207.41	17.0	40.75
	27-Dec-11	9:30	206.29	52.0	39.17
	3-Jan-12	11:55	205.52	130.0	38.08
Pressure plate:	13-Jan-12	12:30	205.28	337	37.75
	22-Jan-12	13:15	204.51	1275	36.66

Volume Adjusted Data[1]

	Matric Potential (-cm water)	Adjusted Volume (cm^3)	% Volume Change[2] (%)	Adjusted Density (g/cm^3)	Adjusted Calculated Porosity (%)
Hanging column:	0.0	---	---	---	---
	17.0	---	---	---	---
	52.0	---	---	---	---
	130.0	---	---	---	---
Pressure plate:	337	---	---	---	---
	1275	---	---	---	---

Comments:

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

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

* Weight including tares

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

‡‡ Volume adjustments are applicable at this matric potential (see comment #1). Changes in volume, if applicable, are estimated based on obtainable measurements of changes in sample length and diameter.

Technician Notes:

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

Moisture Retention Data

Dew Point Potentiometer / Relative Humidity Box

(Soil-Water Characteristic Curve)

Sample Number: Crossroads/Johnson Test Hole No. 2 #2

Initial sample bulk density (g/cm^3): 1.57

Fraction of bulk sample used (<2.00mm fraction) (%): 99.77

Dry weight of dew point potentiometer sample* (g): 155.14

Tare weight, jar (g): 117.74

	Date	Time	Weight* (g)	Water Potential (-cm water)	Moisture Content† (% vol)
Dew point potentiometer:	7-Dec-11	12:00	161.16	14481	25.27
	7-Dec-11	8:30	159.75	34877	19.35
	6-Dec-11	12:30	157.93	197229	11.71

Volume Adjusted Data[1]

	Water Potential (-cm water)	Adjusted Volume (cm^3)	% Volume Change[2] (%)	Adjusted Density (g/cm^3)	Adjusted Calc. Porosity (%)
Dew point potentiometer:	14481	---	---	---	---
	34877	---	---	---	---
	197229	---	---	---	---

Dry weight of relative humidity box sample* (g): 80.89

Tare weight (g): 44.10

	Date	Time	Weight* (g)	Water Potential (-cm water)	Moisture Content† (% vol)
Relative humidity box:	9-Dec-11	9:20	82.68	849860	7.64

Volume Adjusted Data[1]

	Water Potential (-cm water)	Adjusted Volume (cm^3)	% Volume Change[2] (%)	Adjusted Density (g/cm^3)	Adjusted Calc. Porosity (%)
Relative humidity box:	849860	---	---	---	---

Comments:

[1] Applicable if the sample experienced volume changes during testing. 'Volume Adjusted' values represent the volume change measurements obtained after the last hanging column or pressure plate point. "---" indicates no volume changes occurred.

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

* Weight including tares

† Adjusted for >2.00mm (#10 sieve) material not used in DPP/RH testing. Assumed moisture content of material >2.00mm is zero, and assumed density of water is 1.0 g/cm^3.

‡‡ Volume adjustments are applicable at this matric potential (see comment #1). Changes in volume, if applicable, are estimated based on obtainable measurements of changes in sample length and diameter.

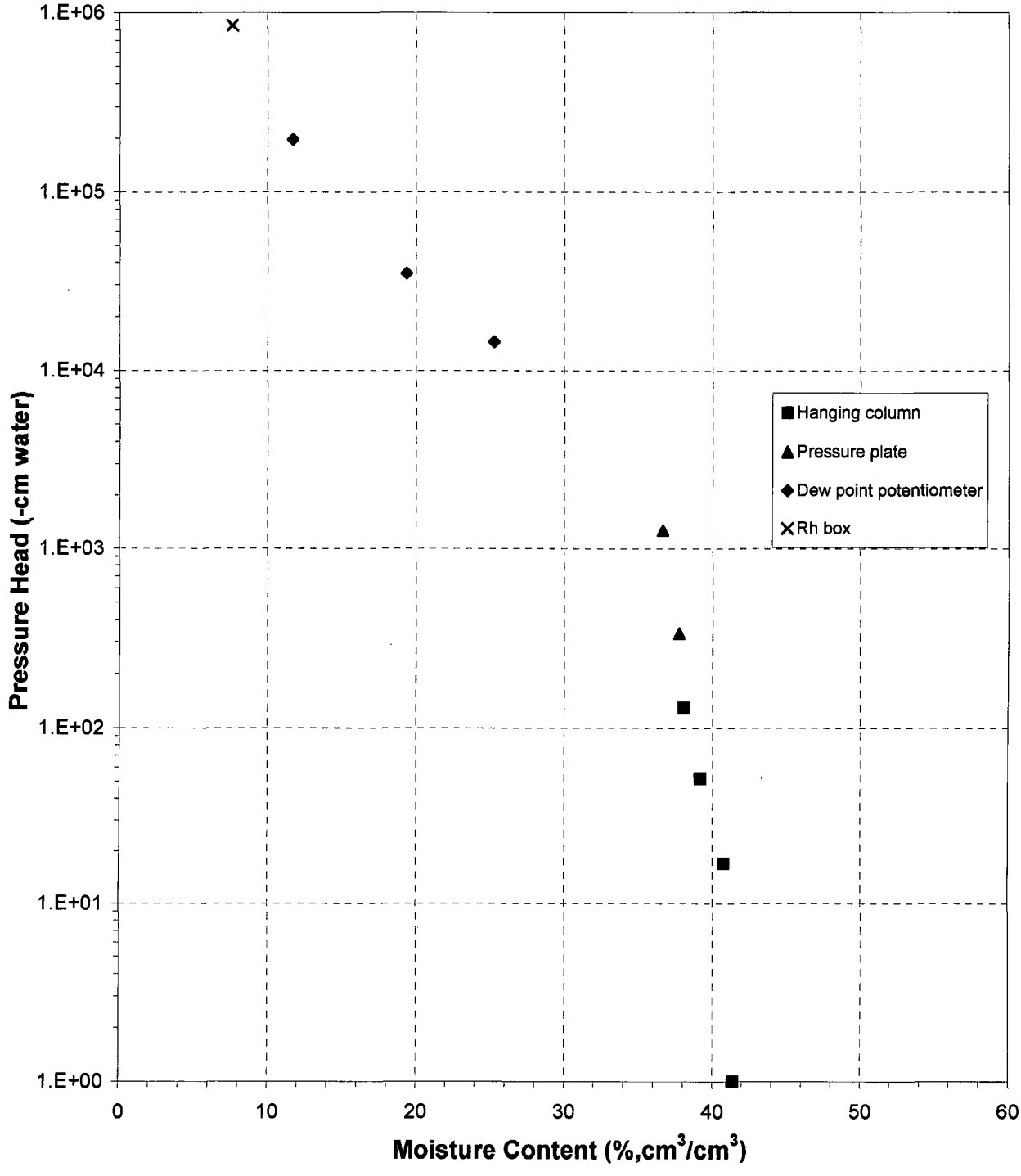
Laboratory analysis by: D. O'Dowd

Data entered by: C. Krous

Checked by: J. Hines

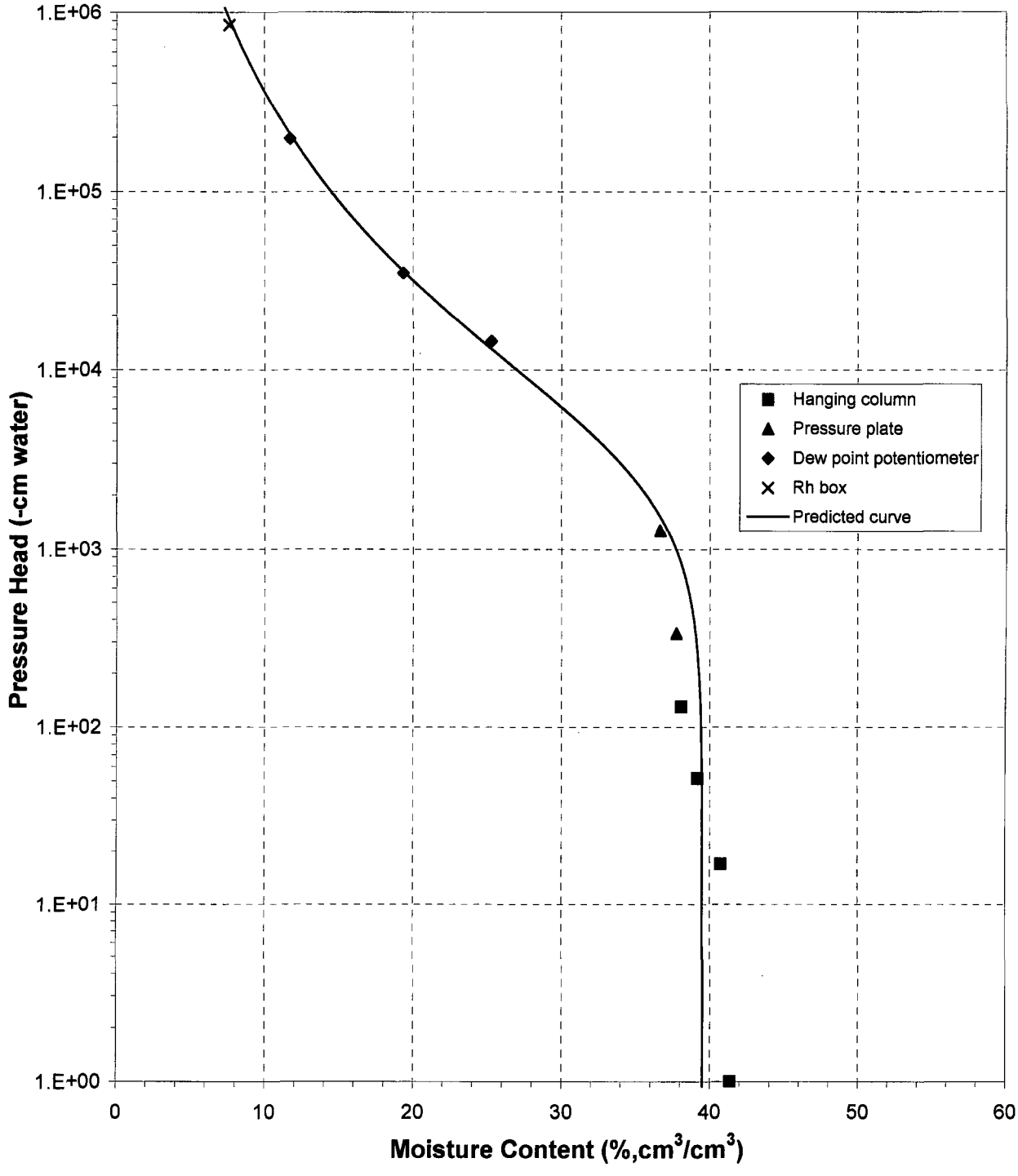
Water Retention Data Points

Sample Number: Crossroads/Johnson Test Hole No. 2 #2



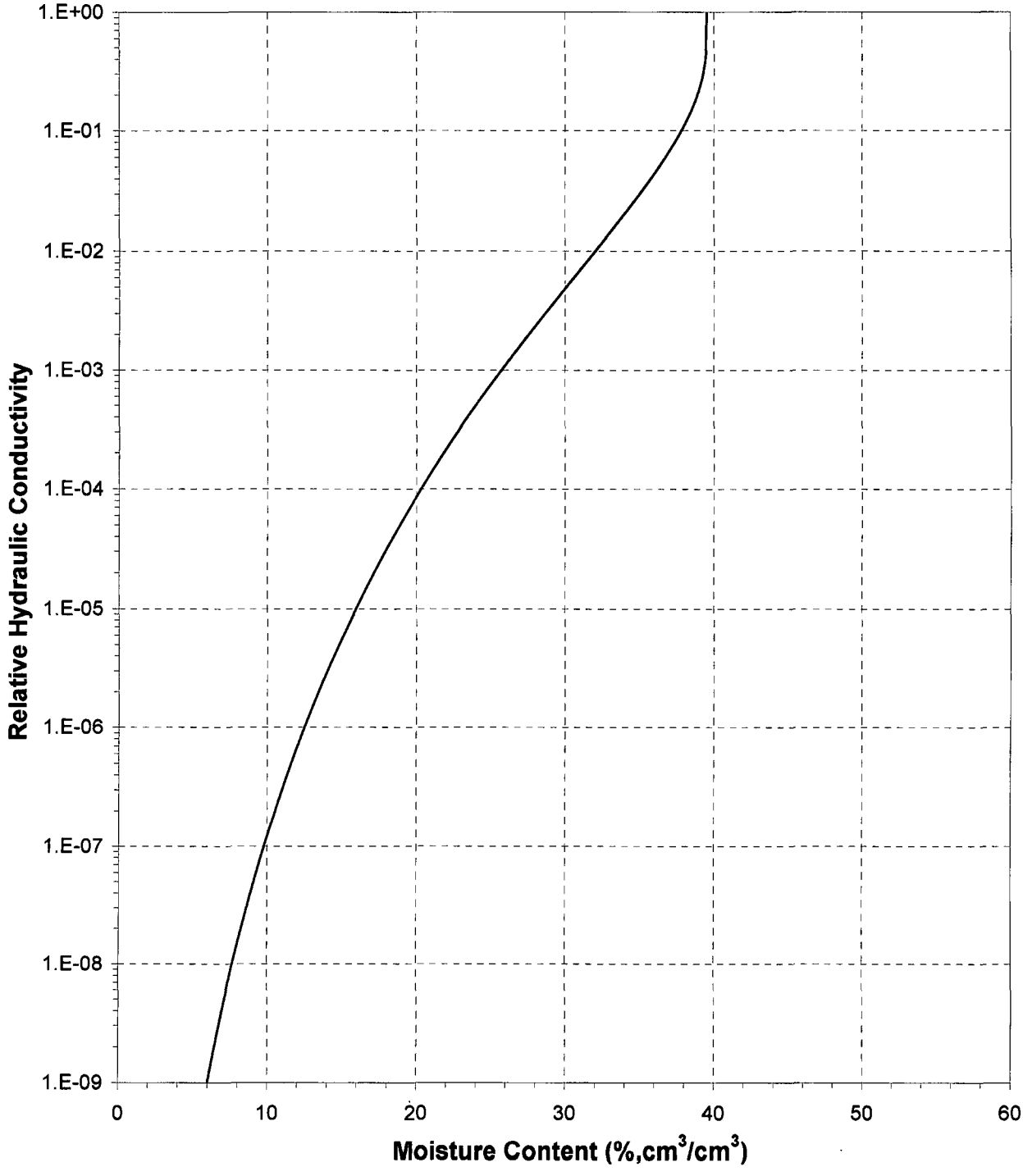
Predicted Water Retention Curve and Data Points

Sample Number: Crossroads/Johnson Test Hole No. 2 #2



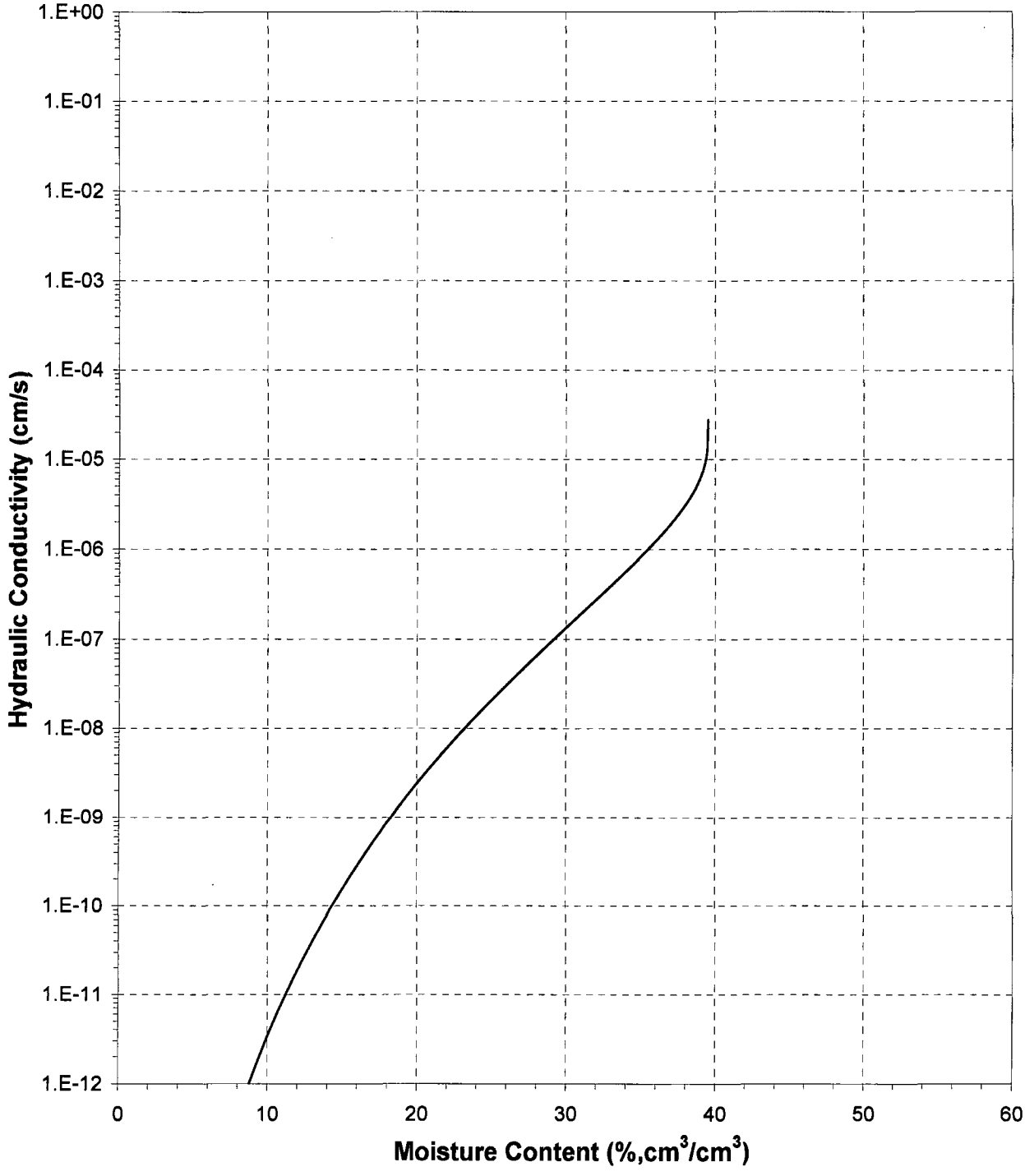
Plot of Relative Hydraulic Conductivity vs Moisture Content

Sample Number: Crossroads/Johnson Test Hole No. 2 #2



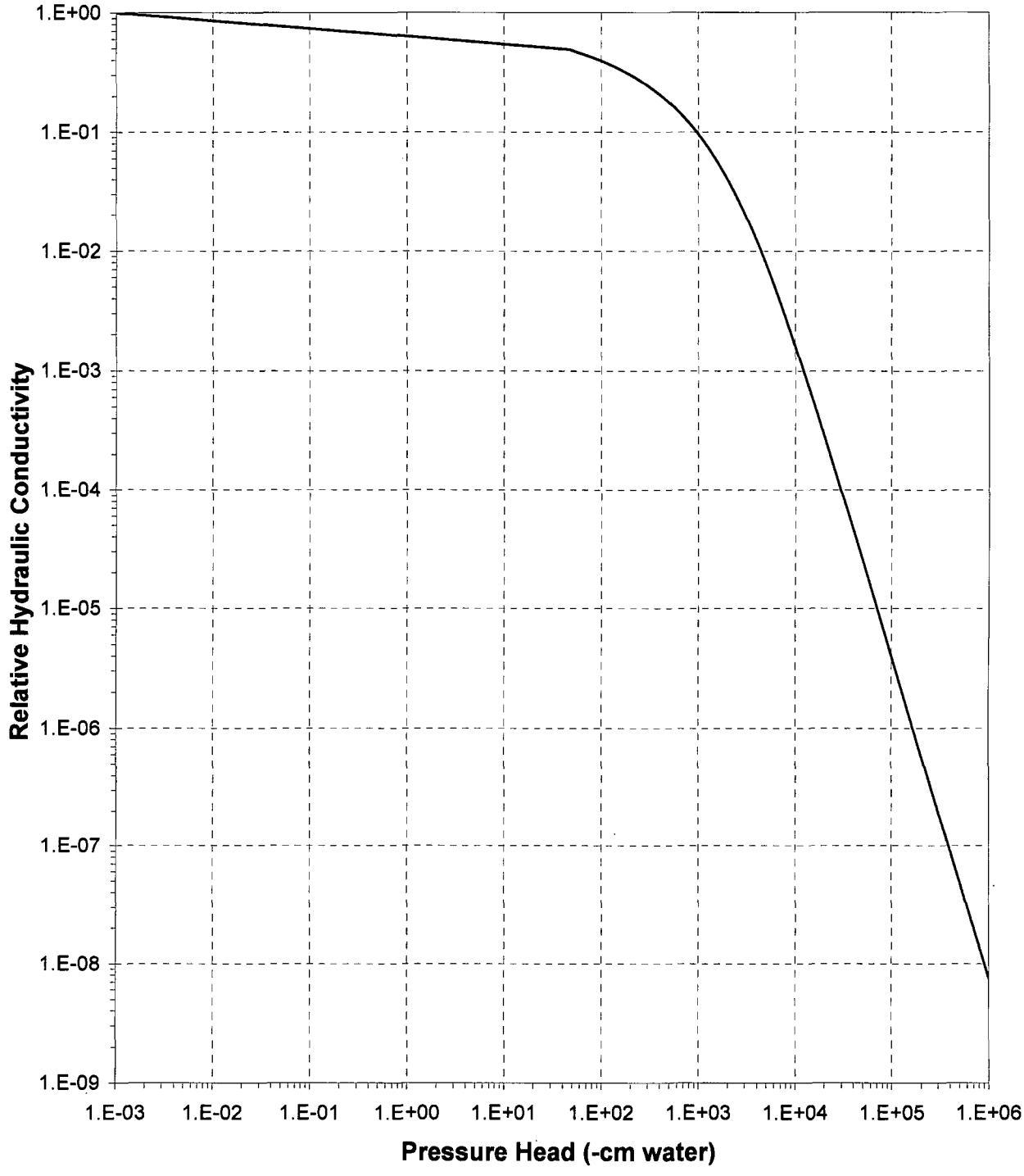
Plot of Hydraulic Conductivity vs Moisture Content

Sample Number: Crossroads/Johnson Test Hole No. 2 #2



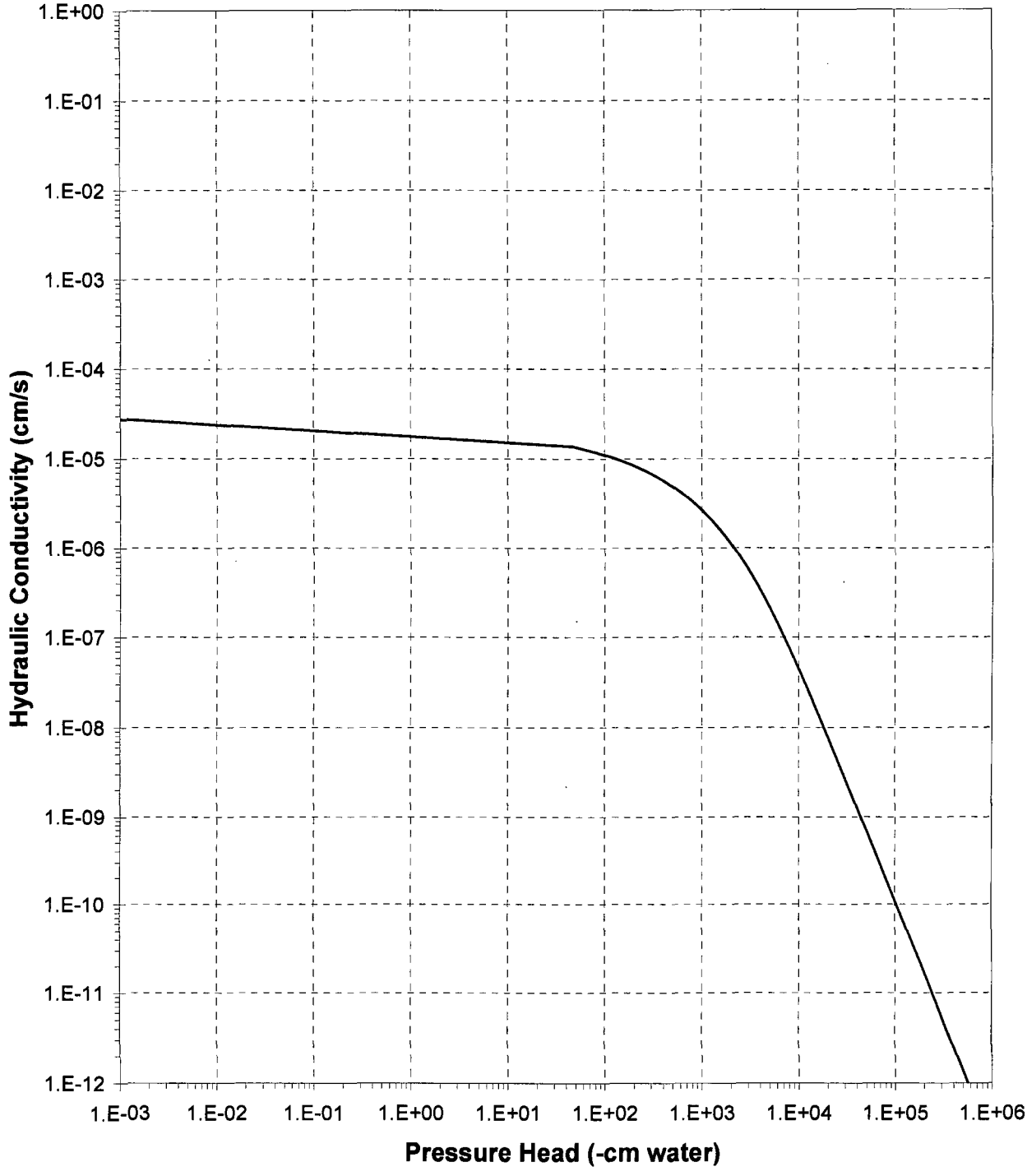
Plot of Relative Hydraulic Conductivity vs Pressure Head

Sample Number: Crossroads/Johnson Test Hole No. 2 #2



Plot of Hydraulic Conductivity vs Pressure Head

Sample Number: Crossroads/Johnson Test Hole No. 2 #2



Moisture Retention Data

Hanging Column / Pressure Plate

(Soil-Water Characteristic Curve)

Job Name: Atkins Engineering
Job Number: LB11.0244.00
Sample Number: Crossroads/Johnson Test Hole No. 2 #3
Ring Number: NA
Depth: 72'-74'

Dry wt. of sample (g): 160.05
Tare wt., ring (g): 126.71
Tare wt., screen & clamp (g): 27.96
Initial sample volume (cm^3): 94.97
Initial dry bulk density (g/cm^3): 1.69
Measured particle density (g/cm^3): 2.72
Initial calculated total porosity (%): 38.04

	Date	Time	Weight* (g)	Matric Potential (-cm water)	Moisture Content† (% vol)
Hanging column:	12-Dec-11	13:20	353.60	0	40.94
	19-Dec-11	8:45	353.75	22.0	41.10
	26-Dec-11	12:00	353.57	73.0	40.91
	3-Jan-12	12:15	352.29	158.0	39.56
Pressure plate:	13-Jan-12	12:35	352.16	337	39.42
	27-Jan-12	13:10	351.35	1275	38.57

Volume Adjusted Data [1]

	Matric Potential (-cm water)	Adjusted Volume (cm^3)	% Volume Change [2] (%)	Adjusted Density (g/cm^3)	Adjusted Calculated Porosity (%)
Hanging column:	0.0	---	---	---	---
	22.0	---	---	---	---
	73.0	---	---	---	---
	158.0	---	---	---	---
Pressure plate:	337	---	---	---	---
	1275	---	---	---	---

Comments:

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

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

* Weight including tares

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

‡‡ Volume adjustments are applicable at this matric potential (see comment #1). Changes in volume, if applicable, are estimated based on obtainable measurements of changes in sample length and diameter.

Technician Notes:

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

Moisture Retention Data

Dew Point Potentiometer / Relative Humidity Box

(Soil-Water Characteristic Curve)

Sample Number: Crossroads/Johnson Test Hole No. 2 #3

Initial sample bulk density (g/cm^3): 1.69
Fraction of bulk sample used (<2.00mm fraction) (%): 99.77

Dry weight of dew point potentiometer sample* (g): 155.14
Tare weight, jar (g): 117.74

	Date	Time	Weight* (g)	Water Potential (-cm water)	Moisture Content† (% vol)
Dew point potentiometer:	7-Dec-11	11:00	160.48	22436	24.01
	6-Dec-11	16:05	158.95	73120	17.13
	6-Dec-11	10:20	157.23	391195	9.40

Volume Adjusted Data [1]

	Water Potential (-cm water)	Adjusted Volume (cm^3)	% Volume Change [2] (%)	Adjusted Density (g/cm^3)	Adjusted Calc. Porosity (%)
Dew point potentiometer:	22436	---	---	---	---
	73120	---	---	---	---
	391195	---	---	---	---

Dry weight of relative humidity box sample* (g): 80.89
Tare weight (g): 44.10

	Date	Time	Weight* (g)	Water Potential (-cm water)	Moisture Content† (% vol)
Relative humidity box:	9-Dec-11	9:20	82.68	849860	8.19

Volume Adjusted Data [1]

	Water Potential (-cm water)	Adjusted Volume (cm^3)	% Volume Change [2] (%)	Adjusted Density (g/cm^3)	Adjusted Calc. Porosity (%)
Relative humidity box:	849860	---	---	---	---

Comments:

[1] Applicable if the sample experienced volume changes during testing. 'Volume Adjusted' values represent the volume change measurements obtained after the last hanging column or pressure plate point. "---" indicates no volume changes occurred.

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

* Weight including tares

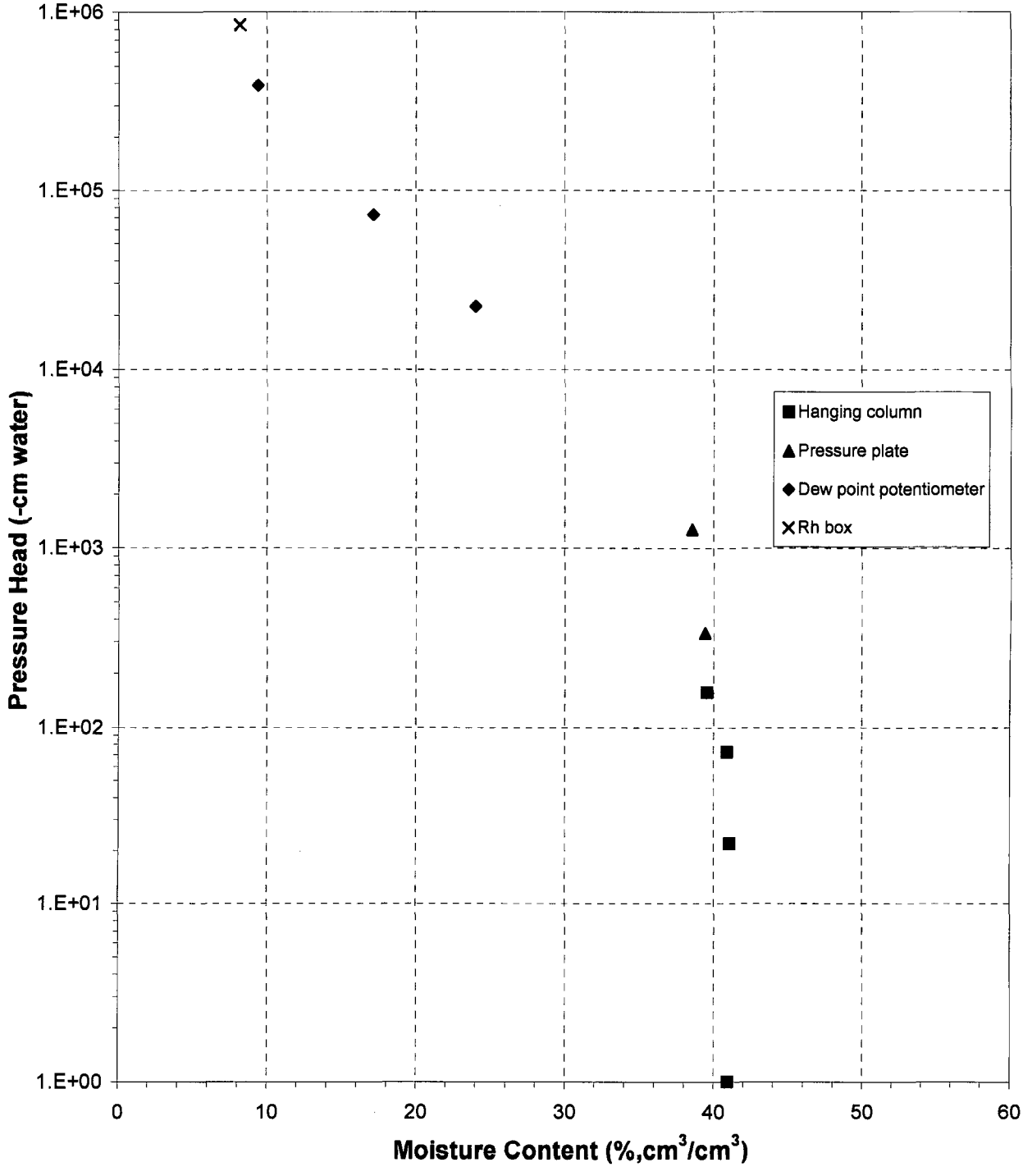
† Adjusted for >2.00mm (#10 sieve) material not used in DPP/RH testing. Assumed moisture content of material >2.00mm is zero, and assumed density of water is 1.0 g/cm^3.

‡‡ Volume adjustments are applicable at this matric potential (see comment #1). Changes in volume, if applicable, are estimated based on obtainable measurements of changes in sample length and diameter.

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

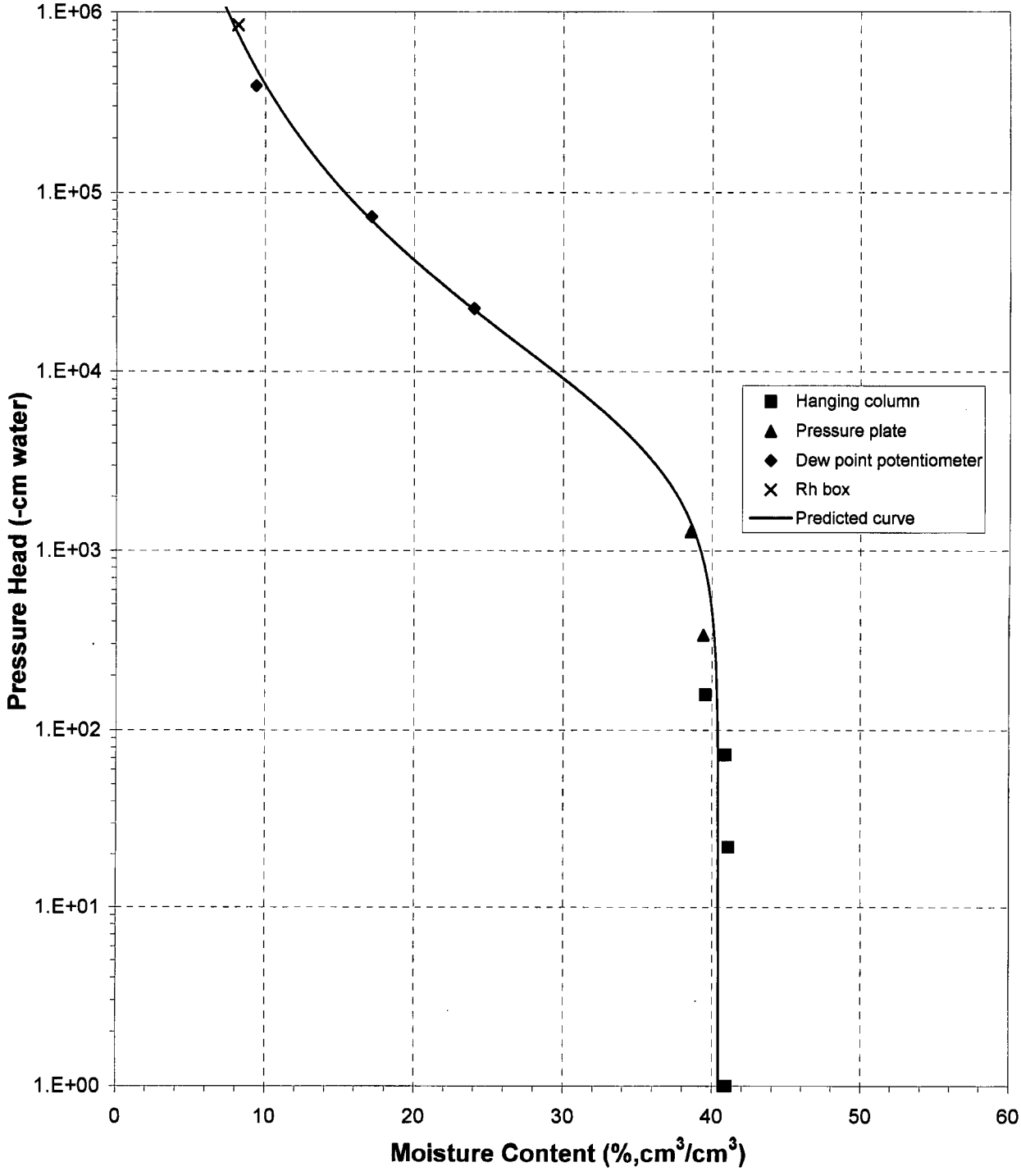
Water Retention Data Points

Sample Number: Crossroads/Johnson Test Hole No. 2 #3



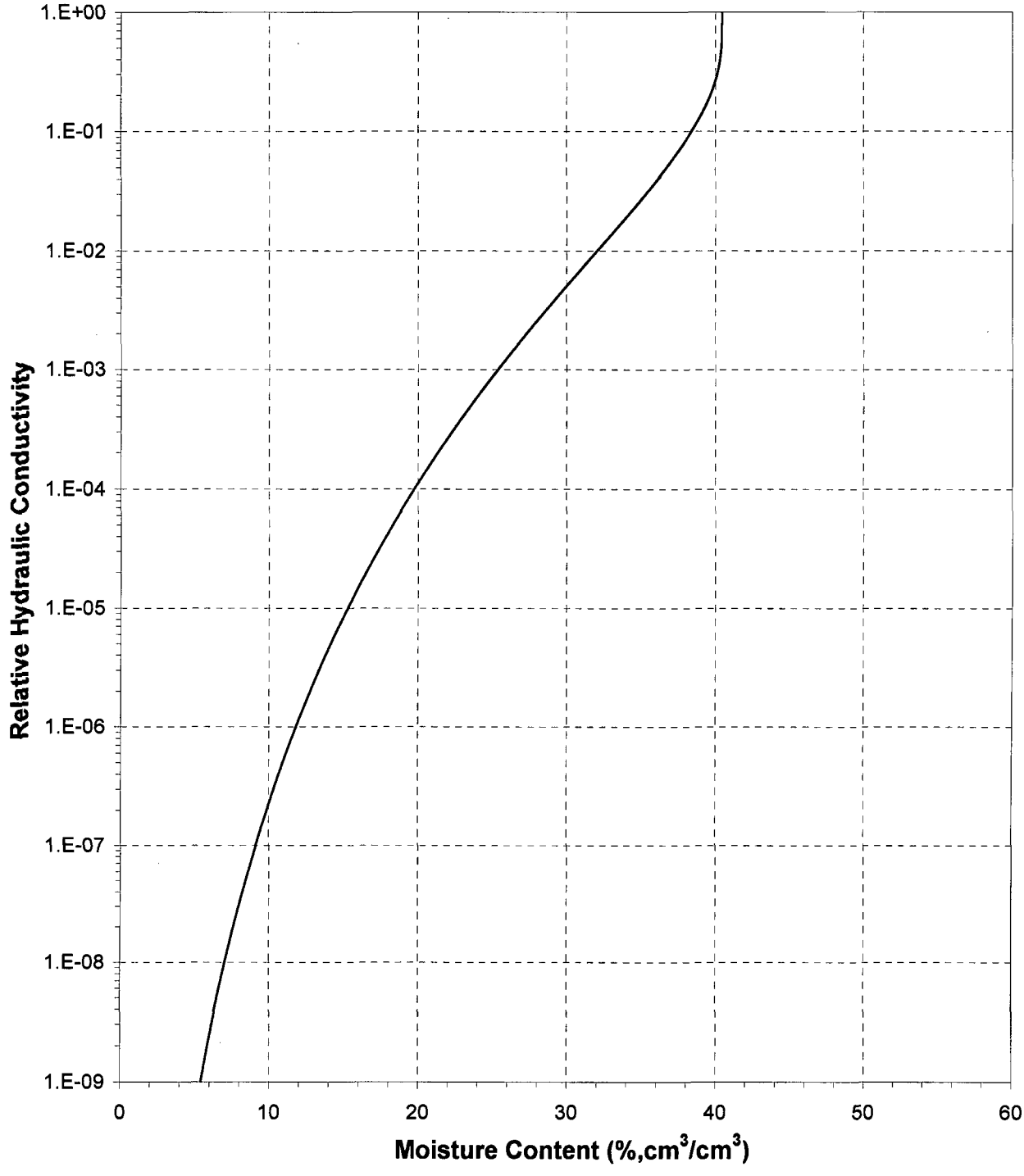
Predicted Water Retention Curve and Data Points

Sample Number: Crossroads/Johnson Test Hole No. 2 #3



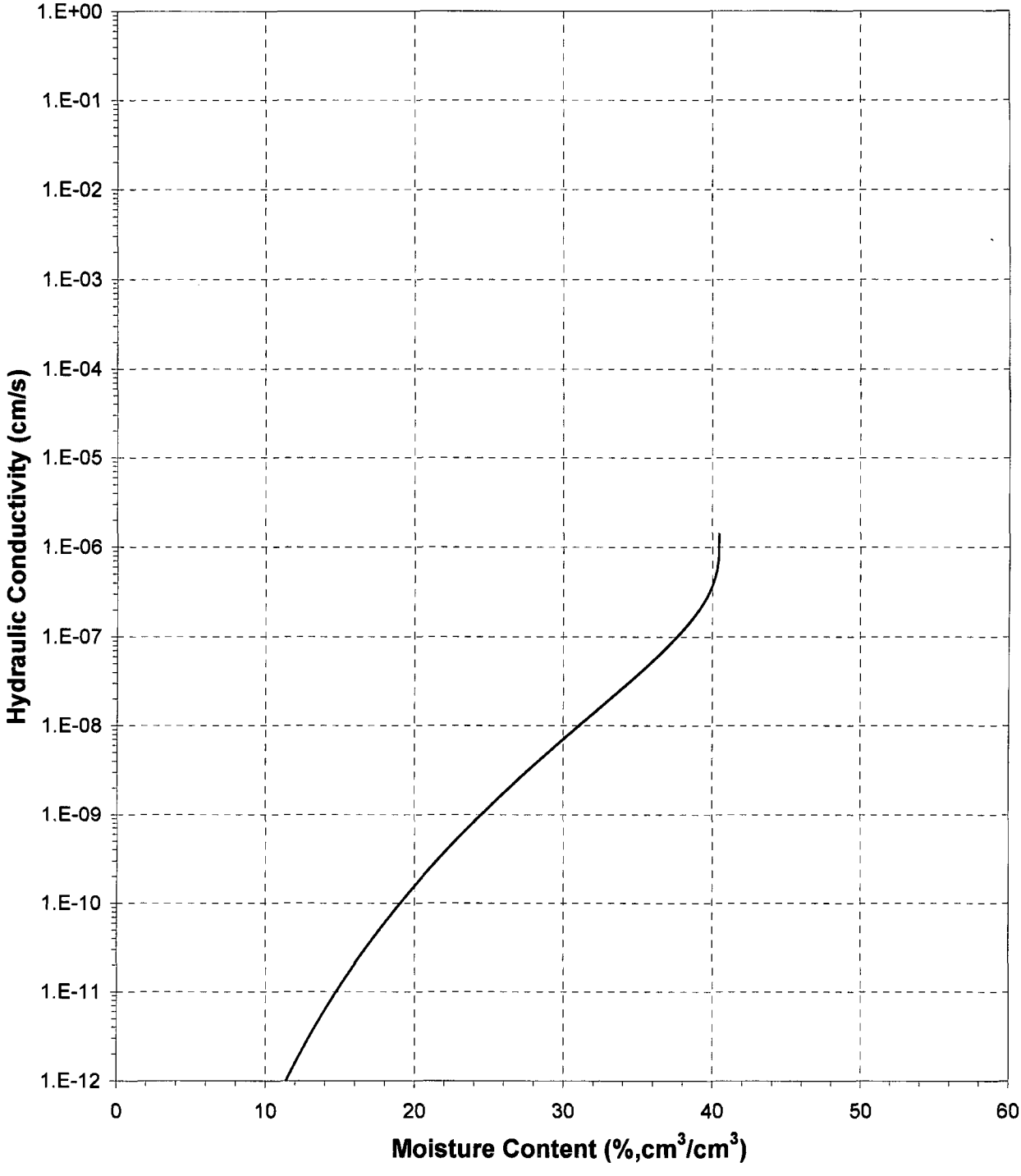
Plot of Relative Hydraulic Conductivity vs Moisture Content

Sample Number: Crossroads/Johnson Test Hole No. 2 #3



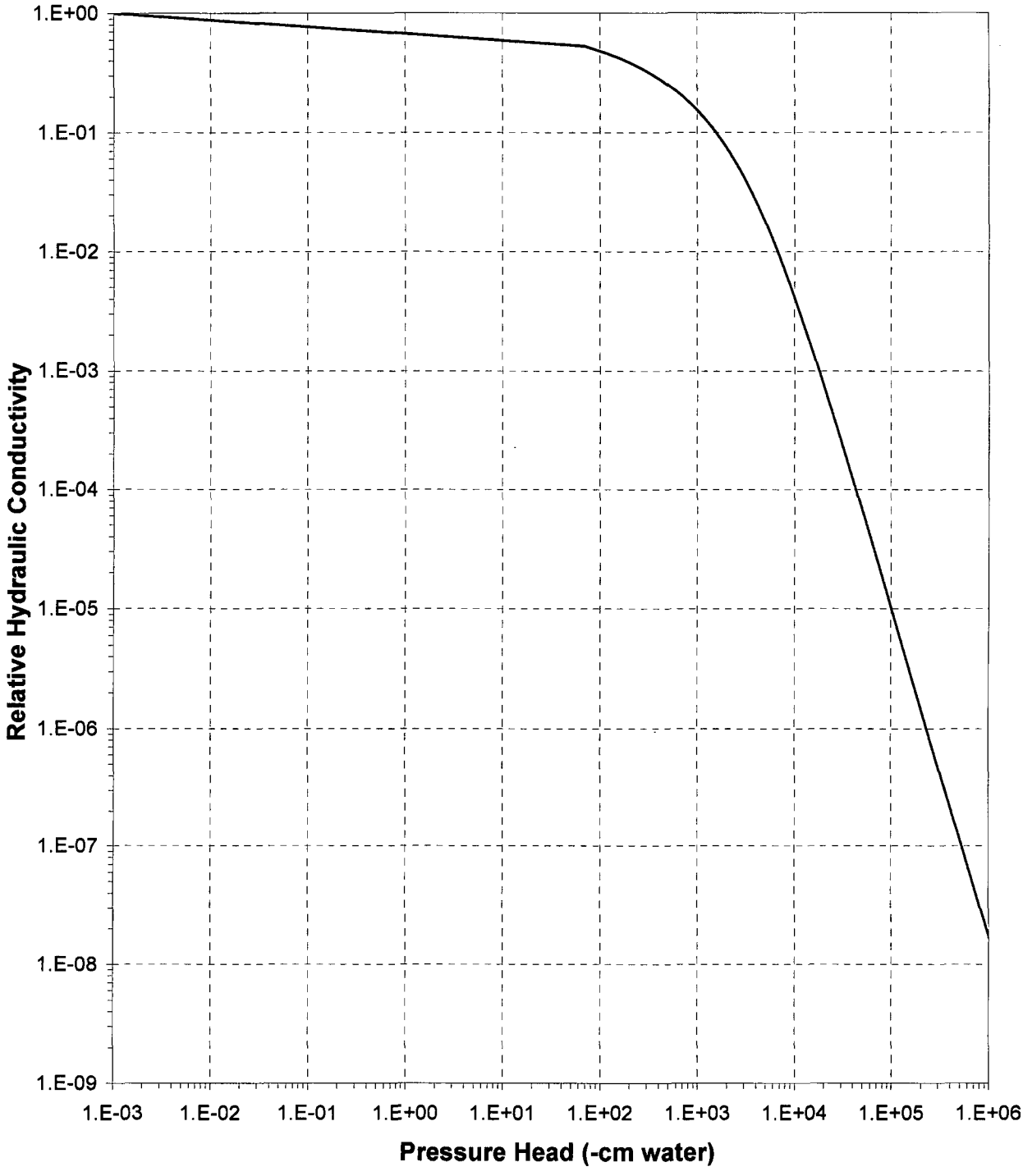
Plot of Hydraulic Conductivity vs Moisture Content

Sample Number: Crossroads/Johnson Test Hole No. 2 #3



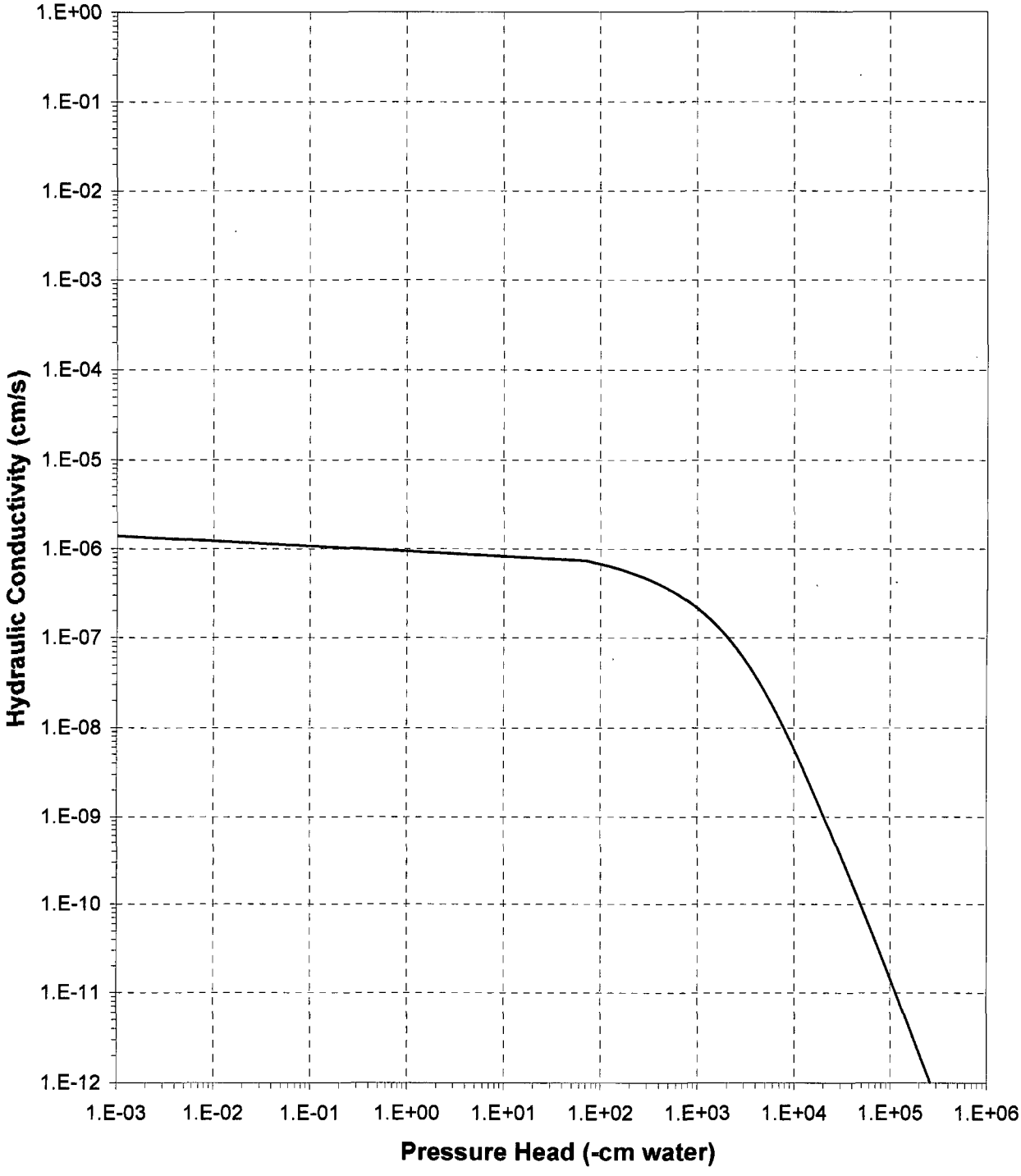
Plot of Relative Hydraulic Conductivity vs Pressure Head

Sample Number: Crossroads/Johnson Test Hole No. 2 #3



Plot of Hydraulic Conductivity vs Pressure Head

Sample Number: Crossroads/Johnson Test Hole No. 2 #3



Atterberg Limits/ Identification of Fines

Summary of Atterberg Tests

Sample Number	Liquid Limit	Plastic Limit	Plasticity Index	Classification
Crossroads/Johnson Test Hole No. 2	56	29	27	CH

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

Atterberg Limits

Job Name: Atkins Engineering
Job Number: LB11.0244.00
Sample Number: Crossroads/Johnson Test Hole No. 2
Ring Number: NA
Depth: 72'-74'

Test Date: 5-Dec-11

Liquid Limit

	Trial 1	Trial 2	Trial 3
Number of drops:	35	26	17
Pan number:	LL1	LL2	LL3
Weight of pan plus moist soil (g):	125.29	127.93	129.68
Weight of pan plus dry soil (g)	121.08	123.46	124.99
Weight of pan (g):	113.31	115.37	116.95
Gravimetric moisture content (% g/g):	54.18	55.25	58.33
Liquid Limit:	56		

Plastic Limit

	Trial 1	Trial 2
Pan number:	PL1	PL2
Weight of pan plus moist soil (g):	123.66	124.42
Weight of pan plus dry soil (g)	121.89	122.93
Weight of pan (g):	115.72	117.70
Gravimetric moisture content (% g/g):	28.69	28.49
Plastic Limit:	29	

Results

Percent of Sample Retained on #40 Sieve: NA

Liquid Limit: 56
Plastic Limit: 29
Plasticity Index: 27

Classification: CH

Comments:

--- = Soil requires visual-manual classification due to non-plasticity
* = 1-point method requested by client

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

Specific Gravity

Summary of Specific Gravity Tests

	<4.75mm Material		>4.75mm Material		Bulk Sample
Sample Number	Specific Gravity	Percent of Bulk Sample	Specific Gravity	Percent of Bulk Sample	Specific Gravity
Crossroads/Johnson Test Hole No. 2	2.73	100	---	0	2.73

--- = Unnecessary since specified fraction <5% of composite mass

* = Based on specific gravity of material < 4.75 mm

Data for Specific Gravity for Sample: Crossroads/Johnson Test Hole No. 2

Job Name: Atkins Engineering
Job Number: LB11.0244.00
Sample Number: Crossroads/Johnson Test Hole No. 2
Ring Number: NA
Depth: 72'-74'

ASTM D854 (<4.75mm Fraction)

Test Date:	19-Dec-11	
Percent of Test Sample (% g/g):	100.00	
Percent of Bulk Sample (% g/g):	100.00	
	Trial 1	*Trial 2*
Weight of pycnometer filled w/air (g):	95.80	93.69
Weight of pycnometer filled w/soil (g):	147.79	144.60
Weight of pycnometer filled w/soil & water (g):	377.95	375.30
Weight of pycnometer filled w/water (g):	345.06	343.05
Observed temperature (°C):	20.50	20.50
Density of water at observed temperature (g/cm^3):	0.9981	0.9981
Specific Gravity (g/g):	2.72	2.73
Correction factor, K:	0.9999	0.9999
Specific Gravity at 20°C (g/g):	2.72	2.73
Average Specific Gravity at 20°C (g/g):	2.73	
Average Particle Density at 20°C (g/cm^3):	2.72	

ASTM C127 (>4.75mm Fraction)

Test Date:	---	
Percent of Test Sample (% g/g):	0.00	
Percent of Bulk Sample (% g/g):	0.00	
Tare Weight (g):	---	--- = Test unnecessary since specified fraction <5% of composite mass.
Saturated Surface Dry (SSD) mass in Air & Tare (g):	---	
Saturated Apparent mass in Water & Tare (g):	---	
Oven Dry (OD) mass in Air & Tare (g):	---	
Observed Temperature (°C):	---	
Density of water at observed temperature (g/m^3):	---	
SSD Specific Gravity (g/g):	---	
Apparent Specific Gravity (g/g):	---	
OD Specific Gravity (g/g):	---	
Percent Absorption (%):	---	
Correction Factor, K:	---	
Average Specific Gravity (Apparent) at 20°C:*	---	
Average Particle Density (Apparent) at 20°C (g/cm^3)*:	---	
Specific Gravity (Apparent) at 20°C*:	**2.73**	** Weighted harmonic average, if more than one fraction used.*
Particle Density (Apparent) at 20°C (g/cm^3)* :	2.72	

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

Laboratory Tests and Methods

Tests and Methods

Dry Bulk Density:	ASTM D7263
Moisture Content:	ASTM D7263
Calculated Porosity:	ASTM D7263
Saturated Hydraulic Conductivity:	
Falling Head: (Rigid Wall)	Klute, A. and C. Dirkson. 1986. Hydraulic Conductivity and Diffusivity: Laboratory Methods.Chp. 28, pp. 700-703, in A. Klute (ed.), Methods of Soil Analysis, Part 1, American Society of Agronomy, Madison, WI
Falling Head Rising Tail: (Flexible Wall)	ASTM D5084
Hanging Column Method:	ASTM D6836 (modified apparatus)
Pressure Plate Method:	ASTM D6836 (modified apparatus)
Water Potential (Dewpoint Potentiometer) Method:	ASTM D6836
Relative Humidity (Box) Method:	Campbell, G. and G. Gee. 1986. Water Potential: Miscellaneous Methods. Chp. 25, pp. 631-632, in A. Klute (ed.), Methods of Soil Analysis. Part 1. American Society of Agronomy, Madison, WI; Karathanasis & Hajek. 1982. Quantitative Evaluation of Water Adsorption on Soil Clays. SSA Journal 46:1321-1325
Moisture Retention Characteristics & Calculated Unsaturated Hydraulic Conductivity:	ASTM D6836; van Genuchten, M.T. 1980. A closed-form equation for predicting the hydraulic conductivity of unsaturated soils. SSSAJ 44:892-898; van Genuchten, M.T., F.J. Leij, and S.R. Yates. 1991. The RETC code for quantifying the hydraulic functions of unsaturated soils. Robert S. Kerr Environmental Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Ada, Oklahoma. EPA/600/2091/065. December 1991
Specific Gravity Fine	ASTM D854
Atterberg Limits:	ASTM D4318

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

November 18, 2011

ROY R. RASCON

WHOLE EARTH ENVIRONMENTAL, INC.

2103 ARBOR COVE

KATY, TX 77494

RE: NMSWD 1RP-2743

Enclosed are the results of analyses for samples received by the laboratory on 11/18/11 13:07.

Cardinal Laboratories is accredited through Texas NELAP for:

Method SW-846 8021	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method SW-846 8260	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method TX 1005	Total Petroleum Hydorcarbons

Certificate number T104704398-08-TX. Accreditation applies to solid and chemical materials and non-potable water matrices.

Cardinal Laboratories is accreditated through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.4	Regulated VOCs (V2, V3)

Accreditation applies to public drinking water matrices.

This report meets NELAP requirements and is made up of a cover page, analytical results, and a copy of the original chain-of-custody. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Celey D. Keene

Celey D. Keene

Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

WHOLE EARTH ENVIRONMENTAL, INC.
ROY R. RASCON
2103 ARBOR COVE
KATY TX, 77494
Fax To: (281) 394-2051

Received:	11/18/2011	Sampling Date:	11/18/2011
Reported:	11/18/2011	Sampling Type:	Water
Project Name:	NMSWD 1RP-2743	Sampling Condition:	** (See Notes)
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: B4 @ 55.35' (H102520-01)

Chloride, SM4500Cl-B **mg/L** **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**19200**	4.00	11/18/2011	ND	108	108	100	0.00	

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Notes and Definitions

ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference
**	Samples not received at proper temperature of 6°C or below.
***	Insufficient time to reach temperature.
-	Chloride by SM4500Cl-B does not require samples be received at or below 6°C
	Samples reported on an as received basis (wet) unless otherwise noted on report

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

101 East Marland, Hobbs, NM 88240
(575) 393-2326 FAX (575) 393-2476

Company Name:	WEE Inc
Project Manager:	Roy R. RASCON
Address:	
City:	State: Zip:
Phone #:	Fax #:
Project #:	Project Owner:
Project Name:	NMSWD IRP-2743
Project Location:	
Sampler Name:	Roy R. RASCON

BILL TO

P.O. #:	
Company:	
Attn:	
Address:	
City:	
State: Zip:	
Phone #:	
Fax #:	

ANALYSIS REQUEST

FOR LAB USE ONLY Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER:	PRESERV: ACID/BASE:	ICE / COOL	OTHER:	SAMPLING: DATE	TIME	Cl-
H102516 A,B 1	B4@55.35'	G	2	X									11-18-11	0813	X

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising whether based in contract or tort, shall be limited to the amount paid by the client for the analyses. All claims, including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within 30 days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

Relinquished By: Roy R. Rascon	Date: 11-18-11 Time: 107	Received By: Jodi Henson	
Relinquished By:	Date: Time:	Received By:	
Delivered By: (Circle One) Sampler - UPS - Bus - Other:	20°	Sample Condition: Cool ☐ Yes ☐ No; Intact ☐ Yes ☐ No	CHECKED BY: (Initials)

Phone Result: ☐ Yes ☐ No Add'l Phone #:
Fax Result: ☐ Yes ☐ No Add'l Fax #:
REMARKS: Please E Mail to All

Rush !!!

† Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476

#26

Log of Boring Bore 1

Atkins ENGINEERING ASSOCIATES

Whole Earth Environmental 2103 Arbor Cove Katy, TX 77494	Date	: 11/16/11	Auger Type	: 3¼ Hollow Stem
	Drill Start	: 9:00	Logged By	: K. Bates
	Drill End	: 15:00		
Contact: Mike Griffin	Boring Location	: 33°17'46"N, 103°24'31"W		
Job # WENMIRP.MWD.11	Site Location	: 33°17'46"N, 103°24'31"W		

Depth in Feet	GRAPHIC	USCS	Sample	DESCRIPTION
0		CL	1	Clay with caliche, tan, loose, dry
5				
10			2	
15			3	
20		CL	4	Clay with caliche and sand, loose, dry
25			5	
30		CL	6	Clay with caliche, small gravel, firm, stiff
35			7	
40			8	
45			9	
50			10	
55			11	
60		CH	12	Clay with sand, tan-yellow, sticky, damp
65		CH	13	Clay, tan-yellow, moist to saturated
70		CH	14	Clay, brown-tan-yellow, saturated.
75		CH	15	Clay, yellow, stiff to firm, damp to dry
80				Total Depth 75'

Baroid well grout

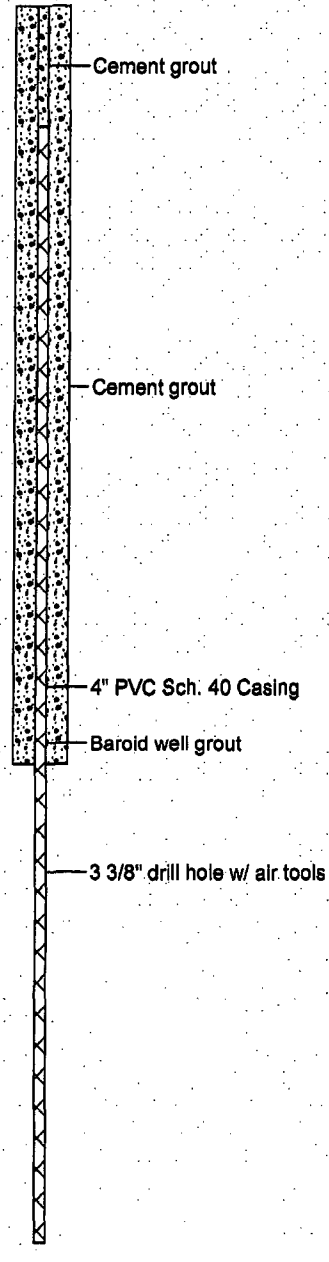
02-24-2012 C:\Users\Paddy\Documents\Whole Earth\NMSWD Leak IRP-27431.bor

Log of Boring Bore 2

Atkins ENGINEERING ASSOCIATES

Whole Earth Environmental 2103 Arbor Cove Katy, TX 77494	Drill Start	: 11/17/11 (10:20)	Logged By : K. Bates
	Drill End	: 12/13/11	
	Boring Location	: 90' NE of Bore 1	
Contact: Mike Griffin	Site Location	: 33°17'46"N, 103°24'31"W	
Job # WENMIRP.MWD.11	Auger Type	: 3¼ Hollow Stem, 6¼ Air Rods	

Depth in Feet	GRAPHIC	USCS	Sample	DESCRIPTION
0				
5		CL	1	Clay with small gravel, tan, loose, dry
10			2	
15			3	
20			4	
25		CL	5	Clay, brown, stiff, loose, dry
30			6	
35			7	
40		CL	8	clay, brownish red, firm, damp
45			9	
50		CL	10	Clay with sand and caliche, brown-tan, moist
55			11	
60		CL	12	Clay with slight amount of caliche, tan-yellow, stiff
65		CL		Clay with small amount of caliche, tan-yellow, sticky, stiff
70				
75		CH	13	Clay, yellow, stiff to firm, damp to dry Shelby tube sample 73-74'
80		LS		Limestone, light tan, hard, dry
85		CH		Clay, yellow, firm, dry
90				Mudstone, gray, firm, dry
95		CL		
100				Void. No returns. Stiff. Plugged bit (gray and dry on bit).
105				Total depth 103'



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