U.S. Department of Energy
2597 B ¾ Road
Grand Junction, CO 81503

March 20, 2006

Mr. Myron Fliegel
U. S. Nuclear Regulatory Commission
Mail Stop T7J8
Two White Flint North
11545 Rockville Pike
Rockville, MD 20852-2747

Subject: Transmittal of Calculation Sets, Attachment 5 Field and Laboratory Results, Remedial Action Plan, Moab Uranium Mill Tailings Remedial Action (UMTRA) Project

Dear Mr. Fliegel:

Enclosed are three sets of the following calculation sets for the Moab UMTRA Project Remedial Action Plan (RAP):

1. Corehole Logs
2. Borehole Logs
3. Geophysical Logs
4. Test Pit Logs
5. Geotechnical Properties of Native Materials

This submittal supports the Attachment 2, Geology Report that was previously provided to your office on March 10, 2006.

We look forward to discussing this information at our planned April 4 and 5, 2006 meeting at your offices.

If you have any questions, please call me at (970) 248-7612 or Joel Berwick of my staff at (970) 248-6020.

Sincerely,

Donald R. Metzler
Moab Federal Project Director

cc w/enclosure:
Project File MOA 2.12 (R. Burrows)

cc w/o enclosure:
J. Berwick, DOE (e)
K. Karp, Stoller (e)

JDB\Moab\RAP\Calc Sets, Att 5 Field and Laboratory Results to NRC.doc

Office of Environmental Management – Grand Junction

UMTRA Project

Remedial Action Plan and Site Design for Stabilization of Moab Title I Uranium Mill Tailings at the Crescent Junction, Utah, Disposal Site

Attachment 5: Field and Laboratory Results

U.S. Department of Energy

Office of Environmental Management

Work Performed Under DOE Contract No. DE-AC01-02GJ79491
for the U.S. Department of Energy Office of Environmental Management.
Approved for public release; distribution is unlimited.

Contents

Appendix A Corehole Logs
Appendix B Borehole Logs
Appendix C Geophysical Logs
Appendix D Test Pit Logs
Appendix E Geotechnical Properties of Native Materials

U.S. Department of Energy—Grand Junction, Colorado

Calculation Cover Sheet

Calc. No.: MOA-02-02-2006-1-03-00 **Discipline:** Geologic and Geophysical Properties **No. of Sheets:** 4

Project: Moab UMTRA Project

Site: Crescent Junction, Utah

Feature: Corehole Logs

Sources of Data:

Corehole logs

Sources of Formulae and References:

DOE 2005. *Work Plan for Characterization of Crescent Junction Disposal Site,* Revision No. 0, August 12, 2005, DOE-EM/GJ912-2005.

Preliminary Calc. ☐ **Final Calc.** ☐ **Supersedes Calc. No.**

Author:	R. Hendenburg (K. Karp for)	3-15-06	**Checked by:**	[illegible]	3-10-06
	Name	Date		Name	Date
				[illegible]	3-15-06
				Name	Date
Approved by:	K. Karp	3-15-06		Craig Goodknight	3/15/06
	Name	Date		Name	Date
				Name	Date

Problem Statement:

Preliminary site selection performed jointly by the U.S. Department of Energy (DOE) and the Contractor has identified a 2,300 acre withdrawal area in the Crescent Flat area just northeast of Crescent Junction, Utah, as a possible site for a final disposal cell for the Moab uranium mill tailings. The proposed disposal cell would cover approximately 300 acres. Based on the preliminary site-selection process, the suitability of the Crescent Junction disposal site is being evaluated from several technical aspects, including geomorphic, geologic, hydrologic, seismic, geochemical, and geotechnical. The objective of this calculation set is to present the corehole logs generated during the drilling program to investigate subsurface geologic conditions at the Crescent Junction disposal site.

This calculation will be incorporated into Attachment 2 (Geology) of the Remedial Action Plan (RAP) and Site Design for Stabilization of Moab Title I Uranium Mill Tailings at the Crescent Junction, Utah, Disposal Site, and summarized in the appropriate sections of the Remedial Action Selection (RAS) report for the Moab site.

Method of Solution:

Ten coreholes (0201 through 0210) were drilled to depths of approximately 300 feet (ft) into the Mancos Shale as shown in Figure 1 and Table 1. These were drilled by Layne GeoConstruction using hollow-stem auger (HSA) and rotary coring. The auger bit size was 8.5 inches and core-bit size was HQ. Surface casing was set to selected depths (up to 40 ft) and cemented in each hole. Core samples were logged in the field using visual soil-classification procedures described in DOE (2005; p.4-6). Field logs were digitized and standardized using the gINT computer software program (gINT Software USA 2005). Appendix A contains the corehole logs for the Crescent Junction Site. These data are also available in the SEEPro database at the DOE Grand Junction office.

Three additional coreholes (0211 through 0213) were drilled to depths of approximately 40 ft, offsetting other selected boreholes, for running packer tests (Appendix B).

Assumptions:

N/A

Calculation:

N/A

Discussion:

Results and evaluation of the core drilling activities at the Crescent Junction disposal site during 2005 are discussed in detail in Attachment 2 (Geology) of the RAP and summarized in relevant sections of the RAS.

Conclusion and Recommendations:

N/A

Computer Source:

gINT computer software was used to digitize and standardize the corehole logs.

References:

DOE 2005. *Work Plan for Characterization of Crescent Junction Disposal Site,* Revision No. 0, August 12, 2005, DOE-EM/GJ912-2005

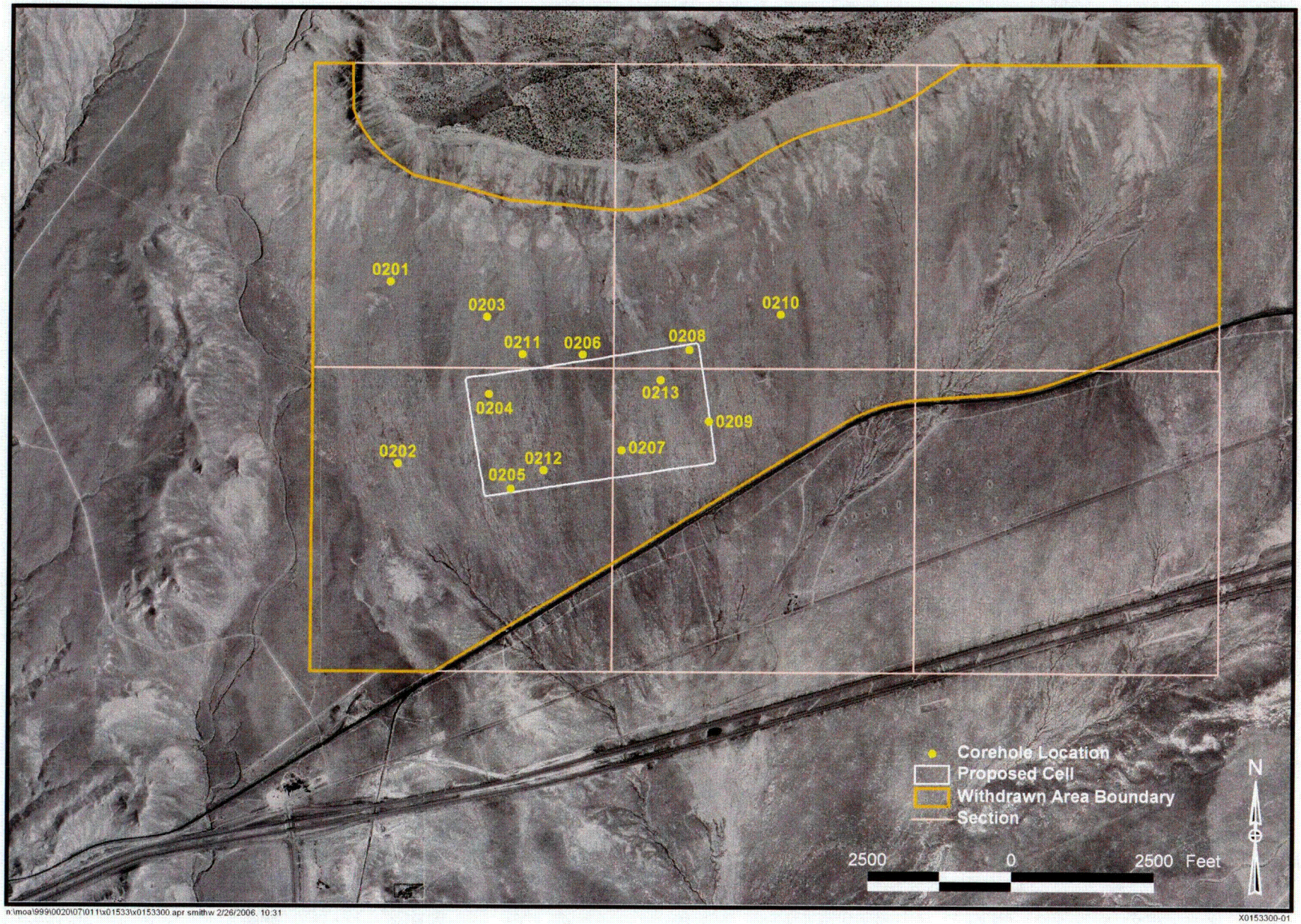

Figure 1. Location of Coreholes at the Crescent Junction Site

C01

Table 1. Corehole Specifications at the Crescent Junction Site

Corehole No.	N Coordinate[a]	E Coordinate[a]	Ground Elevation (ft ngvd)[b]	Total Depth (ft)	Date Completed	Geophysical Logs	Hole Size (in)	Casing (ft)	Sample Type	Drilling Method[c]
CRJ01-0201	6797583.56	2120851.13	5030.00	301.00	8-Nov-05	some	8.5	0-29	HQ core	HSA/rotary core
CRJ01-0202	6794422.62	2120996.12	4960.00	300.00	19-Nov-05	yes	8.5	0-29.5	HQ core	HSA/rotary core
CRJ01-0203	6796977.60	2122543.47	5015.00	301.00	7-Nov-05	yes	8.5	0-30	HQ core	HSA/rotary core
CRJ01-0204	6795633.72	2122583.61	4983.00	300.00	5-Nov-05	yes	8.5	0-25	HQ core	HSA/rotary core
CRJ01-0205	6793981.28	2122975.63	4945.90	300.00	2-Nov-05	yes	8.5	0-25	HQ core	HSA/rotary core
CRJ01-0206	6796324.67	2124232.60	4994.00	302.00	24-Oct-05	yes	8.5	0-26	HQ core	HSA/rotary core
CRJ01-0207	6794658.25	2124919.25	4950.20	300.00	20-Oct-05	yes	8.5	0-25	HQ core	HSA/rotary core
CRJ01-0208	6796412.91	2126089.65	4986.10	301.00	8-Oct-05	yes	8.5	0-40	HQ core	HSA/rotary core
CRJ01-0209	6795168.53	2126441.58	4955.70	300.00	27-Sep-05	yes	8.5	0-35	HQ core	HSA/rotary core
CRJ01-0210	6797035.78	2127690.14	4998.60	302.00	7-Oct-05	yes	8.5	0-23	HQ core	HSA/rotary core
CRJ01-0211	6796327.81	2123173.42	4998.00	40.00	22-Nov-05	no	4.0	no	HQ core	Casing advance
CRJ01-0212	6794311.80	2123552.99	4950.00	42.00	30-Nov-05	no	4.0	no	HQ core	Casing advance
CRJ01-0213	6795880.41	2125591.86	4975.00	40.50	2-Dec-05	no	4.0	no	HQ core	Casing advance

[a]Local coordinate system based on modified state plane coordinate system NAD 83 Utah Central Zone.
[b]ngvd = National Geodetic Vertical Datum
[c]HSA = hollow stem auger

Appendix A

Corehole Logs

BOREHOLE LOG CRJ01-0201

PROJECT MOAB
LOCATION Crescent Junction, UT.
SITE Crescent Junction
WELL NUMBER CRJ01-0201
NORTH COORD. (FT) 6797583.56
EAST COORD. (FT) 2120851.13
SURFACE ELEV. (FT NGVD) 5030.00
HOLE DEPTH (FT) 301.00

DATE DRILLED 08/24/2005 to 11/08/2005
DRILLING COMPANY Layne GeoConstruction
DRILLING METHOD H.S.A., Rotary Core
SAMPLING METHOD HQ CORE
DRILL OPERATOR Neaman, J. (CME 750, BB80), Hyleman, B. (BB80)
REMARKS 4-inch steel surface casing cemented to depth of 29.0 feet below land surface.

BIT SIZE(S) (IN) 8.5
CORE SIZE(S) (IN)
LOGGED BY Goodknight, C., Rupp, R.
WL (FT BGS)

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT.)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
							0-4.0 ft. SILT (ML); pale brown (10YR 6/3) with up to 10% siltstone and sandstone rock fragments. Mostly alluvial mud derived from sheet wash. Less than 10% very fine grained sand, highly calcareous.
5	5025	5 20 15 24	4.0-5.0 5.0-6.0				4.0-4.5 ft. SILTY SAND (SM); moderately calcareous, mottled, very pale brown (10YR 7/4) and yellow (10YR 7/8). 4.5-5.0 ft. SANDSTONE; very fine grained rock fragment, yellowish gray (5Y 6/1), slightly calcareous. 5.0-14.0 ft. WEATHERED MANCOS SHALE BEDROCK: 5.0-9.0 ft. highly weathered silty shale, soft, mottled, from light gray (N7) to dark yellowish orange (10YR 6/6), with ~5% white gypsum and calcite crystals and masses, moderately calcareous.
10	5020	13 33 30 37	9.0-10.0 10.0-11.0				9.0-12.0 ft. silty shale moderately weathered, layered, yellowish gray (5Y7/2), moderately calcareous, several % small white masses of gypsum. 10.5-11.0 ft. thin layer of siltstone that is highly calcareous and dark yellowish orange (10YR 6/6). 12.5-14.0 ft. shale becomes increasingly hard and less weathered.
		50/3"					14.0-14.5 ft. Blow refusal @ 14.3 ft. No Recovery.
15	5015		14.5-17.0				14.5-301.0 ft. MANCOS SHALE: 14.5-29.0 ft. mostly siltstone, light olive gray (5Y 5/2) wavy bedding, black surfaces on some bedding is framboidal pyrite, slightly weathered, mostly horizontal bedding plane fractures spaced 0.2 to 0.3 ft. apart. Inclined fracture (~45 degrees) @ 16.0 ft. with white gypsum and calcite. Thin clayey zone at ~16.5 ft.
20	5010		17.0-22.0				17.9-22.0 ft. layer of abundant burrows filled with limonitic-colored, dark yellowish orange (10YR 6/6) material, trace white calcite and gypsum. Horizontal fracturing more abundant at spacings of 0.1 ft or less.
25	5005		22.0-27.0		14.5-35.0 Very Poor		22.0-27.0 ft. slightly weathered, mostly siltstone, wavy bedded to bioturbated, abundant horizontal fractures spaced approximately 0.2 ft. apart filled with gypsum. Yellowish gray (5Y 7/2) to pale yellowish brown (10YR 6/2), moderately calcareous. Core much more competent, despite the horizontal fracturing.
			27.0-29.0				27.0-29.0 ft. slight to nonweathered, less horizontal fracturing filled with gypsum and more dark bedding, which is largely colored by framboidal pyrite. Bedding continues to be bioturbated and wavy. Mostly yellowish gray (5Y 7/2).
30	5000		29.0-35.0				29.0-35.0 ft. 4.0 ft. recovery - core loss spread over entire run - core severely parted on bedding with no angular fractures - core is moderately weathered, yellowish gray, some gypsum crystals, core is in fragments and pieces up to 0.05-0.1 ft. thick (long).

BOREHOLE LOG CRJ01-0201

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0201
SITE Crescent Junction Site **DATES DRILLED** 08/24/2005 to 11/08/2005

Continued from Previous Page

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
40	4990		35.0-45.0		35.0-45.0 Poor		35.0-45.0 ft. good recovery 9.6 ft. -still fractured and broken to about 42.0 ft. with gypsum infilling and limonitic stain, normal dark gray coloration and the usual +/-5 degree bedding angle - all lost core is at top of the run. No major high angle fractures in the run - broken core is generally on the nearly horizontal bedding planes. Below 42.0 ft., core becomes largely unweathered.
45	4985						45.0-55.0 ft. unweathered "fresh" core, moderate parting on bedding; some parting on fissile zones. Good Run.
50	4980		45.0-55.0		45.0-55.0 Fair		
55	4975						55.0-65.0 ft. very good run - relatively hard, moderately calcic claystone, dry interior of core, horizontal bedding, usual crenulations and hairline gypsum fillings.
60	4970		55.0-65.0				
65	4965				55.0-75.0 Good		65.0-75.0 ft. very good recovery, breaks and parting on bedding, no fractures, slightly fissile in spots - dry core interior- moderately to strongly calcic.
70	4960		65.0-75.0				

BOREHOLE LOG CRJ01-0201

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0201
SITE Crescent Junction Site **DATES DRILLED** 08/24/2005 to 11/08/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
75	4955						75.0-85.0 ft. very competent run - excellent recovery. Claystone, dry core interior, slightly fissile from 77.0-78.0 ft., hard, moderately calcic, no fractures, no secondary mineralization, no indication of water.
80	4950		75.0-85.0				
85	4945						85.0-95.0 ft. dark gray, horizontal bedding (at a 90 degree angle to core axis), thin bedding laminations, hard, dry core interior, minor mechanical breaks on bedding, short splinter from drilling stress at 92.7-93.0 ft.
90	4940		85.0-95.0				
95	4935				75.0-301.0 Excellent		95.0-105.0 ft. core splintered by mechanical stress from 97.0-98.5 ft., fissile break at 99.2 ft. Hard, calcic, dry core interior, no indication of formation water.
100	4930		95.0-105.0				
105	4925						105.0-115.0 ft. dark colored silty claystone (medium gray, N5) approximately 90%, and light colored (very light gray, N8), very fine grained sandstone, which represents bioturbated layers ~10%. Bioturbated layers are as much as 0.05 ft. thick. Core hard and competent, dry when broken open. Bioturbated beds are quite contorted in places. Trace fine carbonaceous and framboidal pyrite on bedding. No natural fractures, slightly to moderately calcareous.
110	4920		105.0-115.0				

BOREHOLE LOG CRJ01-0201

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0201
SITE Crescent Junction Site **DATES DRILLED** 08/24/2005 to 11/08/2005

Continued from Previous Page

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
115	4915						115.0-125.0 ft. core hard and competent, no natural fractures, dry when broken open. Bedding along some bioturbated layers is inclined as much as 25 degrees.
120	4910		115.0-125.0				
125	4905						125.0-135.0 ft. core is hard and competent, no natural fractures, dry when broken open. Carbonaceous mats (up to 0.05 ft. long) occur on some bedding surfaces. Trace fossil imprints on some bedding surfaces.
130	4900		125.0-135.0		75.0-301.0 Excellent		
135	4895						135.0-145.0 ft. bioturbated bedding increases to as much as 15-20% of layering. Carbonaceous mats are on some bedding planes and they break easily. Core hard and competent, no natural fractures, dry when broken open. Thin fissile layer at ~140.0 ft.
140	4890		135.0-145.0				
145	4885						145.0-155.0 ft. bioturbated bedding in as much as 30% of layering. Core is hard and competent, but breaks along finer grained, dark layers of silty claystone and carbonaceous material. Thin fissile layer at ~149 ft. and 155.3 ft.
150	4880		145.0-155.0				

BOREHOLE LOG CRJ01-0201

PROJECT MOAB
SITE Crescent Junction Site
BOREHOLE NUMBER CRJ01-0201
DATES DRILLED 08/24/2005 to 11/08/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
155	4875						155.0-165.0 ft. bioturbated layering is ~20% from 155.5-157.0 ft., then decreases rapidly to 2-3% at 159.0 ft., and remains so to bottom of interval. Some near vertical stress fractures from 157.0-159.0 ft. No natural fractures. Core hard and competent and dry when broken open. Coiled nautiloid fossil at 159.2 ft. coated in fine pyrite. Below 159.0 ft., core is much finer grained and more competent.
160	4870		155.0-165.0				
165	4865						165.0-175.0 ft. core placement is jumbled because core was extruded explosively from the barrel and scattered. Core through interval is mostly silty claystone with 2-3% bioturbated layering that is very fine grained sandstone. Several vertical stress fractures caused by drilling. Core from 174.5 to 175.5 ft. is placed correctly.
170	4860		165.0-175.0		75.0-301.0 Excellent		
175	4855						175.0-185.0 ft. silty claystone with 2-3% bioturbated (or storm) layering composed of very fine grained sandstone. Vertical stress fractures at top of interval at 175.5-176.0 ft. At 179.5-180.5 ft. and 181.0-181.5 ft. are vertical fractures that may be natural - no evidence of fluid movement along these tight fractures. At 180.5 and 181.8 ft. are thin fissile layers. Large flattened cephalopod at 177.3 ft.
180	4850		175.0-185.0				
185	4845						185.0-195.0 ft. increase in bioturbated layering to ~5%, some of it is chaotic, especially from 186.0-187.0 ft. Vertical fracture at 189.5- 190.5 ft., appears to be drilling related stress. Bioturbated layering decreases below ~190.0 ft., to about 2-3%. Core is hard and competent throughout, dry when broken apart.
190	4840		185.0-195.0				

BOREHOLE LOG CRJ01-0201

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0201
SITE Crescent Junction Site **DATES DRILLED** 08/24/2005 to 11/08/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
195	4835						195.0-205.0 ft. bioturbated layering increases below ~202.0 ft. to ~5-10%. Some bioturbated layering is inclined as much as 20 degrees from horizontal. Core is hard and competent throughout, dry when broken open. Some fine carbonaceous material along bedding surfaces.
200	4830		195.0-205.0				
205	4825						205.0-215.0 ft. bioturbated layering composes is nearly 10% of bedding from 206.0-211.0 ft., then decreases quickly to ~1% at 212.0 ft. and below. Core has fissile layers in many locations from 206.0 to 208.5 ft., below which the core is more competent and less broken. A couple of fissile layers from 211.0-212.0 ft. Core is dry when broken open. Fine carbonaceous material along many bedding surfaces.
210	4820		205.0-215.0		75.0-301.0 Excellent		
215	4815						215.0-225.0 ft. silty claystone with only ~10% bioturbated (or storm) layering consisting of lighter colored very fine grained sandstone. Some vertical fracturing at 218.0 and ~224.5-225.5 ft. is probably mechanical stress from drilling - no evidence of fluid movement along the tight fractures. Fissile, thin bedded layers at 221.7-221.9 ft., 222.3-222.5ft., 222.9 and 225.3 ft. Layering looks to dip 5-7 degrees. One or more of the fissile layers may be bentonite.
220	4810		215.0-225.0				
225	4805						225.0-235.0 ft. core splintered by mechanical stress from 225.0-226.3 ft. From 227.0-229.0 ft., core softer and fissile - washed out and rounded. From 229.0-232.0 ft., core generally parted on bedding every 0.3-0.7 ft. From 232.0-235.0 ft., more competent core with only parting on bedding.
230	4800		225.0-235.0				

BOREHOLE LOG CRJ01-0201

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0201
SITE Crescent Junction Site **DATES DRILLED** 08/24/2005 to 11/08/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
235	4795						235.0-245.0 ft. very dark gray when wet, mostly medium dark gray (4) when dry, minor parting, no fractures, slightly fissile @239.3 ft. No secondary mineralization.
240	4790		235.0-245.0				
245	4785						245.0-255.0 ft. very dark gray claystone. Splintered @245.8-246.4 ft., parted on bedding in a few places, otherwise unbroken. Very competent, horizontal bedding, dry core interior, no biocrenulations, no fractures, no formation water.
250	4780		245.0-255.0		75.0-301.0 Excellent		
255	4775						255.0-265.0 ft. splintered by mechanical stress @255.0-257.3 ft., and 259.0-261.0 ft., somewhat fissile @261.0,261.6, and 262.2 ft., otherwise moderately calcic, relatively hard, competent claystone.
260	4770		255.0-265.0				
265	4765						265.0-275.0 ft. splintered 265.3-266.0 ft., and 273.0-275.0 ft. Good competent run, no fractures other than stress related, consistent color and hardness, normal bedding and parting, no secondary mineralization.
	4760		265.0-275.0				

BOREHOLE LOG CRJ01-0201

PROJECT MOAB
SITE Crescent Junction Site
BOREHOLE NUMBER CRJ01-0201
DATES DRILLED 08/24/2005 to 11/08/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
275	4755						275.0-285.0 ft. splintered @ 275.0-276.0 ft., fissile (0.1 ft.) @284.0 ft., otherwise standard claystone with normal bedding, coloration, hardness, very competent and only slight parting on bedding planes, core interior is dry, no bioturbation.
280	4750		275.0-285.0				
285	4745				75.0-301.0 Excellent		285.0-295.0 ft. somewhat fissile overall, broken on fissile sections on bedding @ 285.6, 286.4, 287.0, and 287.3 ft., 288.4-289.0 ft., 291.2, 292.3,292.6, 293.3, and 294.5 ft.
290	4740		285.0-295.0				
295	4735						295.0-301.0 ft. fissile and parted @297.4, 297.7, 297.9, 298.1, 298.6, 299.6, 300.0, 300.4, and 300.8 ft. No secondary mineralization, no angular fractures, dry core interior, normal bedding angle.
			295.0-301.0				
300	4730						Total Depth 301.0 ft.
305	4725						

BOREHOLE LOG CRJ01-0202

PROJECT MOAB
LOCATION Crescent Junction, UT.
SITE Crescent Junction
WELL NUMBER CRJ01-0202
NORTH COORD. (FT) 6794422.62
EAST COORD. (FT) 2120996.12
SURFACE ELEV. (FT NGVD) 4960.00
HOLE DEPTH (FT) 300.00

DATE DRILLED 08/25/2005 to 11/19/2005
DRILLING COMPANY Layne GeoConstruction
DRILLING METHOD H.S.A., Rotary Core
SAMPLING METHOD HQ CORE
DRILL OPERATOR Neaman, J. (CME 750, BB80), Hyleman, B. (BB80)
REMARKS 4-inch steel surface casing cemented to depth of 29.5 feet below land surface. Water used during intial coring.

BIT SIZE(S) (IN) 8.5
CORE SIZE(S) (IN)
LOGGED BY Goodknight, C., Rupp, R.
WL (FT BGS)

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT.)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
		4 8 9 9	0-0.5 0.5-1.0 1.0-1.5 1.5-2.0				0-8.0 ft. CLAYEY SILT (ML); abundant roots and worm hole porosity, light brownish gray (10YR 6/2), highly calcareous, trace white mottling.
5	4955	5 6 8 8	4.0-4.5 4.5-5.0 5.0-5.5 5.5-6.0				4.0-8.0 ft. light yellowish brown (10YR 6/4) to yellowish red (5YR 5/6), compacted, mottled with white calcite and gypsum, slightly calcareous.
							8.0-9.0 ft. SANDY SILT (ML); light brown (7.5YR 6/4), highly calcareous, appears to be eolian-deposited material.
		50/5"					9.0-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: silty shale, moderately weathered but fairly hard (could not get drive samples), highly calcareous, yellowish gray (5Y 7/2) to dark yellowish orange (10YR 6/6).
10	4950						
		50/4"					
15	4945		14.5-19.5				15.0-300.0 ft. MANCOS SHALE: 15.0-17.5 ft. moderately to highly weathered, highly calcareous, soft, mostly clayey siltstone, light olive gray (5Y 5/2) to dark yellowish orange (10YR 6/6), with more of the yellowish orange beds from 15.0-16.0 ft. 17.5-19.5 ft. inclined bedding at ~20 degrees, mostly bedding plane fractures about every 0.1 ft., a few vertical fractures. Some black material (framboidal pyrite?) on bedding surfaces and trace white gypsum crystals, trace of yellow orange (10YR 6/6) beds.
20	4940		19.5-24.5				20.0-23.0 ft. moderate to slightly weathered. 23.0-24.0 ft. several bedding plane fractures filled with gypsum (up to 0.03 ft. thick). Several thin layers of limonitic-colored, dark yellowish orange (10YR 6/6) altered material from 24.0 to 24.5 ft.
25	4935		24.5-29.5		14.5-40.0 Very Poor		24.5-29.5 ft. slighty weathered. At 25.8-26.0 ft. is limonitic altered fracture, which is soft; color is dark yellowish brown (10YR 6/6) to light brown (5YR 5/6). A few vertical fractures (with no gypsum or calcite along them) but mostly bedding plane fractures. Highly calcareous. At 28.5 to 29.0 ft. fractures along bedding planes coated with gypsum, black film on bedding surfaces is mostly fine framboidal pyrite.
30	4930		29.5-35.0				29.5-35.0 ft. recovery of 4.5 ft. Top 1.0 ft. lost. Weathered, moderately to highly calcareous. Core is fractured mostly along bedding surfaces at spacings generally from 0.1-0.3 ft. Gypsum coats many fractures and one at 34.5 ft. is colored by limonite (dark yellowish orange, 10YR 6/6). Rock is mostly silty claystone and thin bedded with trace bioturbated layering.

BOREHOLE LOG CRJ01-0202

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SITE Crescent Junction Site **DATES DRILLED** 08/25/2005 to 11/19/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
40	4920		35.0-45.0				35.0-45.0 ft. bedding plane fracturing dominates and decreases in spacing frequency from 0.1-0.2 ft. to 0.5-1.0 ft. at 45.0 ft. Gypsum coatings are along many fractures. An inclined (45 degrees) fracture at ~43.5 ft. that is coated with gypsum but it cuts across bedding that contains limonitic coloration (which seems to follow bedding planes in the 3 or 4 occurrences in this core segment). Bedding is inclined at 15 -20 degrees. Bioturbated or storm bedding is trace to 1% of layering and it consists of very fine grained sandstone of very light gray (N8) color. Limonitic colored bands along bedding are as much as 0.07 ft. thick. Core becoming moderately hard and competent below 40.0 ft.
45	4915				40.0-50.0 Poor		45.0-55.0 ft. core hard and competent. Weathering effects are nearly absent. At 49.5 ft. is a 40 degree inclined fracture with limonite coloration along it, also a minor bedding plane fracture with limonite coating at 49.3 ft. A bedding plane fracture with limonite coating at 50.0 ft. that broke along a bioturbated/ storm bedding layer. No other natural fractures observed. Fine carbonaceous material along some bedding surfaces and trace of fossil imprints. Rock here is mainly claystone, medium gray (N5).
50	4910		45.0-55.0				
55	4905						55.0-65.0 ft. core hard and competent - no effects of weathering. Core is dry when broken open. Bedding plane fractures, probably drilling induced occur at thin fissile layers or along partings created by fossil imprints (such as at 56.0, 59.8, and 64.6 ft.). A fossil pelecypod imprint at 57.1 ft. Layering looks to be inclined ~10 degrees. Trace fossil resin at 57.4 ft. Claystone parts easily upon handling.
60	4900		55.0-65.0		50.0-75.0 Fair		
65	4895						65.0-75.0 ft. core loss from 65.0-66.4 ft. occured due to driller dropping the core barrel and breaking the bit. Footage lost in clearing the bit fragments from the hole. Competent core run with solid core and few breaks. Parting @73.6 ft. shows iron stain and deposit on bedding, possible fracture with water movement.
70	4890		65.0-75.0				

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
75	4885						75.0-85.0 ft. competent core, solid, few parts on bedding, fossiliferous in places (see 80.0 and 84.5 ft.). No secondary mineralization seen, no fissile locations.
80	4880		75.0-85.0				
85	4875						85.0-95.0 ft. somewhat fissile at 85.0-90.0 ft. and breaking on bedding (particularly 87.0-88.5 ft.). Solid sections are relatively hard and competent. Breaking may be due to mechanical problems as drillers are pulling rods to inspect the bit and lower rods. Inspection shows new bit is wrong style and broken. Bit changed.
90	4870		85.0-95.0				
95	4865						95.0-105.0 ft. shale broken into knobs and pieces; core loss of 1.5 ft. is spread over run, core appears slightly fissile but is obviously damaged by mechanical forces and how the new bit is cutting. Pieces are all broken on bedding planes. No evidence of angular fractures or secondary minerals.
100	4860		95.0-105.0		75.0-125.0 Good		
105	4855						105.0-115.0 ft. soft, fissile. No core loss, but overall condition is only fair. No secondary mineralization, core interior is dry, more of a calcic mudstone than claystone, weak rock integrity.
110	4850		105.0-115.0				

BOREHOLE LOG CRJ01-0202

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
115	4845						115.0-125.0 ft. core loss @ 115.0-116.0 ft. Fissile and broken at 116.0-117.5 ft. More competent @117.5-120.5 ft. Broken @120.5-121.0 ft. Very soft and fissile @122.5-123.4 ft. Generally a mudstone.
120	4840		115.0-125.0				
125	4835						125.0-135.0 ft. generally fissile as previous run with fewer partings. Core is soft but dry on interior surfaces, no secondary mineralization, no bioturbation, bedding angle +/- 5 degrees.
130	4830		125.0-135.0		125.0-300.0 Excellent		
135	4825						135.0-145.0 ft. mostly claystone, trace bioturbated or storm bedding layers. Fissile from 135.0-139.0 ft. and generally soft, but competent in rest of interval with several thin fissile layers. Core dry when broken open. No natural fractures seen. Bedding plane fractures common from 135.0-139.0 ft., but they are drilling induced. Core breaks easily along bedding when handled.
140	4820		135.0-145.0				
145	4815						145.0-155.0 ft. Bedding plane fractures common in 145.0-148.0 ft. interval and core less broken below. These fractures are drilling induced. Rock is fissile and soft throughout except for short interval at 148.3-148.5 ft., which is hard (better cemented). Core dry when broken open, breaks easily when handled.
150	4810		145.0-155.0				

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SITE Crescent Junction Site **DATES DRILLED** 08/25/2005 to 11/19/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
155	4805						155.0-165.0 ft. bedding plane fractures common in 155.0-157.0 ft. interval and core broken again only at ~161.0 ft. These are drilling induced fractures. Rock is fissile and soft throughout except for several short segments averaging about 0.2 ft. that are harder and more cemented. Bedding is slightly inclined at ~5 degrees. Core is dry when broken open and breaks easily when handled.
160	4800		155.0-165.0				
165	4795						165.0-175.0 ft. generally very fissile with minor core loss (probably top of the run), parting on bedding with some mechanical rounding, no identifiable fractures, no evident secondary mineralization, dry core interior, continued soft, essentially the same as previous 30.0 ft.
170	4790		165.0-175.0		125.0-300.0 Excellent		
175	4785						175.0-185.0 ft. slightly more competent but generally fissile and soft, easily parts on bedding. Bedding angle is ~10 degrees, no fractures evident, much like previous core run.
180	4780		175.0-185.0				
185	4775						185.0-195.0 ft. fissile with only about 2.0 ft. of competent rock, parting on bedding, no fractures, no secondary mineralization, dry core interior.
190	4770		185.0-195.0				

BOREHOLE LOG CRJ01-0202

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
195	4765						195.0-205.0 ft. soft fissile shale, easily parted on bedding,which is ~90 degrees to core axis. Not significantly different than the last 70.0 ft.
200	4760		195.0-205.0				
205	4755						205.0-215.0 ft. core loss spread over run, not much improvement in competency, fissile, easily parted.
210	4750		205.0-215.0		125.0-300.0 Excellent		
215	4745						215.0-225.0 ft. continued soft, fissile, very broken, core loss spread over length of run with no distinct loss location, but likely most loss @215.0-221.0 ft., some fossil imprints.
220	4740		215.0-225.0				
225	4735						225.0-235.0 ft. core loss from 233.0-234.0 ft. Normal bedding angle~90 degrees to core axis, in general the core is slightly less broken but still easily parted on bedding, no significant difference in competency.
230	4730		225.0-235.0				

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
235	4725						235.0-245.0 ft. core loss @ start of run. Overall the core is slightly more competent and not as broken as usual, but still very fissile and soft with the last 2.0 ft. (243.0-245.0 ft.) the hardest and most competent, fossil @ 239.7 ft.
240	4720		235.0-245.0				
245	4715						245.0-255.0 ft. core looking more competent now that the landing ring is back in the rods above the bit, minor core loss @248.0-249.0 ft. due to mechanical problems. Core still looks a little fissile and soft, still parting on bedding, borehole seems to be making water.
250	4710		245.0-255.0		125.0-300.0 Excellent		
255	4705						255.0-265.0 ft. parting on bedding and soft in places but the most competent run since about 75.0 ft. (far less mechanical damage). Bedding angle approximately 5 degrees, no fractures noted.
260	4700		255.0-265.0				
265	4695						265.0-275.0 ft. moderately fissile throughout, but best run of the day. Usual bedding parting, broken and crumbled where very fissile, no uncommon features, core interior dry where competent.
	4690		265.0-275.0				

BOREHOLE LOG CRJ01-0202

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
275	4685						275.0-285.0 ft. very fissile from 277.0-283.0 ft., easily parted on bedding, not crumbly from drilling, bedding angle ~ 5 degrees, some bioturbation crenulations.
280	4680		275.0-285.0				
285	4675				125.0-300.0 Excellent		285.0-295.0 ft. good competent rock, minor breaks on bedding at 285.0-286.0 ft., hard, very minor fissile locations and only 0.1 ft. long when fissile, dry core interior, no fractures, some biological or storm related crenulations but not of significant size.
290	4670		285.0-295.0				
295	4665		295.0-300.0				295.0-300.0 ft. minor core loss at end of run, probably due to drilling stress or dropped out of core barrel. Last foot of recovered core broken on bedding into 0.2 ft. and 0.1 ft. lengths.
300	4660						Total Depth 300.0 ft.
305	4655						

BOREHOLE LOG CRJ01-0203

PROJECT	MOAB	DATE DRILLED	08/25/2005 to 11/07/2005
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction
SITE	Crescent Junction	DRILLING METHOD	H.S.A., Rotary Core
WELL NUMBER	CRJ01-0203	SAMPLING METHOD	HQ CORE
NORTH COORD. (FT)	6796977.60	DRILL OPERATOR	Neaman, J. (CME 750, BB80), Hyleman, B. (BB80)
EAST COORD. (FT)	2122543.47	REMARKS	4-inch steel surface casing cemented to depth of 30.0 feet below land surface.
SURFACE ELEV. (FT NGVD)	5015.00		
HOLE DEPTH (FT)	301.00		

BIT SIZE(S) (IN) 8.5
CORE SIZE(S) (IN)
LOGGED BY Goodknight, C., Rupp, R.
WL (FT BGS)

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT.)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
							0-4.0 ft. CLAYEY SILT (ML); moderate root content, some white mottling, highly calcareous, light brownish gray (10YR 6/2), some worm-hole porosity.
		4, 3, 5, 11	2.0-2.5, 2.5-3.0, 3.0-3.5, 3.5-4.0				
5	5010	4, 8, 14, 17	4.5-5.0, 5.0-5.5, 5.5-6.0, 6.0-6.5				4.0-9.5 ft. SANDY SILT (ML); compacted, trace mottling, slightly calcareous, light brownish gray (2.5Y 6/2), ~2% dark shale fragments and trace limonitic siltstone fragments.
							8.5-9.5 ft. light brown (7.5YR 6/4), highly calcareous, appears to be eolian transported material.
10	5005	12, 16, 20, 24	9.5-10.0, 10.0-10.5, 10.5-11.0, 11.0-11.5				9.5-14.5 ft. WEATHERED MANCOS SHALE BEDROCK: highly weathered for first 2-3 ft., then moderately weathered down to 14.5 ft. Generally yellowish gray (5Y.7/2) to grayish orange (10YR 7/4), mostly highly calcareous. From 10.0-11.0 ft. is a thin layer of reddish yellow (7.5YR 6/8) siltstone that is non-slightly calcareous. White gypsum masses are 2-3% of material.
15	5000	50/4 0"					14.5-301.0 ft. MANCOS SHALE:
			15.0-17.5				14.5-22.0 ft. clayey siltstone, moderately weathered, light olive gray (5Y 5/2), wet color), horizontal bedding, gypsum coatings along some fractures, which are spaced about 0.1 ft. apart. Highly calcareous. Some bioturbated bedding and burrowing.
			17.5-19.0				18.0-19.0 ft. numerous horizontal fractures.
20	4995		19.0-22.0				@19.9 ft. is a 0.1 ft. thick bentonite bed, yellowish gray (5Y 7/2), moderately calcareous. Horizontal fracturing at least every 0.1 ft. still moderately weathered, some gypsum coatings on fractures. Bedding wavy and bioturbated.
							22.0-23.7 ft. moderately weathered, numerous bedding plane fractures spaced less than 0.1 ft. apart. Only trace gypsum along bedding fractures, Dark bedding surfaces are largely fine framboidal pyrite. Some contorted bedding and bioturbation. Mostly yellowish gray (5Y 7/2).
			22.0-27.0				
25	4990				15.0-35.0 Very Poor		
			27.0-30.0				28.0-30.0 ft. numerous horizontal bedding plane fractures. Trace gypsum along fractures.
30	4985						30.0-35.0 ft. moderately weathered , broken and fractured throughout run due to poor integrity of the rock. Core loss considerable (50%). A couple of fractures inclined 20 degrees to bedding with gypsum coatings.
			30.0-35.0				

BOREHOLE LOG CRJ01-0203

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0203
SITE Crescent Junction Site **DATES DRILLED** 08/25/2005 to 11/07/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
40	4975		35.0-45.0		35.0-50.0 Poor		35.0-45.0 ft. weathered, pale yellowish brown (10YR 6/2) to moderate yellowish brown (10YR 5/4), becoming medium gray (N5) at 44.0 ft. A tiger stripe appearance with abundant gypsum-healed fractures ranging from 0 degree to 50 degree angles inclined from bedding and 0.003 to 0.006 ft. thick. Associated iron stain and limonitic deposits especially from 43.0-45.0 ft. on fractures running parallel (vertical) to core axis. Interesting weathered top of bedrock sequence.
45	4970						45.0-55.0 ft. multiple fractures along bedding planes (up to 30 degree angles), continued gypsum and limonite mineralization to 50.0 ft., at which point the core becomes largely unaltered or unweathered with normal bedding angles of 5 degrees. Consistent dark gray coloration, becomes moderately calcic and relatively hard.
50	4965		45.0-55.0				
55	4960						55.0-65.0 ft. fairly competent with minor breaks on bedding planes, some limonitic alteration.
60	4955		55.0-65.0		50.0-75.0 Fair		
65	4950						65.0-75.0 ft. @68.0 ft. and 73.0 ft. are large fractures inclined 20 degrees to core axis with heavy limonite stain and mineralization. Possibly open water course on parallel fractures.
70	4945		65.0-75.0				

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PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0203
SITE Crescent Junction Site **DATES DRILLED** 08/25/2005 to 11/07/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
75	4940						75.0-85.0 ft. very competent, dark gray, dry core interior, calcic, hard.
80	4935		75.0-85.0				
85	4930						85.0-95.0 ft. very competent, with no parting, core is hard and in one piece, no indication of formation water.
90	4925		85.0-95.0				
95	4920						95.0-105.0 ft. very competent, normal bedding with few parts, no secondary mineralization.
100	4915		95.0-105.0		75.0-125.0 Good		
105	4910						105.0-115.0 ft. fissile partings and breaks at 106.2, 107.3, 110.5, 111.5, 111.7, 112.3, 112.5, 113.5 and 114.4 ft. Hard core, no secondary mineralization, no indication of water, dry core interior.
110	4905		105.0-115.0				

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PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0203
SITE Crescent Junction Site **DATES DRILLED** 08/25/2005 to 11/07/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
115	4900						115.0-125.0 ft. few partings on bedding, good solid core run.
120	4895		115.0-125.0				
125	4890						125.0-135.0 ft. excellent parting on bedding, no fissile sections , no fractures, no secondary mineralization, no indication of water.
130	4885		125.0-135.0		125.0-301.0 Excellent		
135	4880						135.0-145.0 ft. good competent shale. Normal bedding angle, nothing abnormal.
140	4875		135.0-145.0				
145	4870						145.0-155.0 ft. a few partings on bedding, no fractures.
150	4865		145.0-155.0				

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
155	4860						155.0-165.0 ft. a few fissile partings @ 157.0, 158.0, 159.9, 160.5, 161.2, and 162.0 ft. No secondary mineralization or indication of formation water, core interior is dry, normal bedding (+/- 5 degrees).
160	4855		155.0-165.0				
165	4850						165.0-175.0 ft. nice competent run, almost no partings, core is relatively hard with normal bedding angles.
170	4845		165.0-175.0		125.0-301.0 Excellent		
175	4840						175.0-185.0 ft. a couple of fissile spots at 176.6, 178.3, 178.6, and 179.6 ft. Good run overall.
180	4835		175.0-185.0				
185	4830						185.0-195.0 ft. fissile @185.7, 190.4, 192.0, 193.5, and 194.0 ft. Splintered from 192.5-193.3 ft. Hard claystone.
190	4825		185.0-195.0				

BOREHOLE LOG CRJ01-0203

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SITE Crescent Junction Site **DATES DRILLED** 08/25/2005 to 11/07/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
195	4820						195.0-205.0 ft. good run of competent shale, fossiliferous from 201.0-203.0 ft. Splintered by mechanical stress at 195.5-197.0 ft. No fractures, minor partings.
200	4815		195.0-205.0				
205	4810						205.0-215.0 ft. splintered by mechanical stress from 205.0-207.0 ft. Parted @ 205.7 ft. with rounding by bit. @205.7-215.0 ft., core was solid and unbroken, very nice core, bedding about 90 degrees to core axis (near-horizontal bedding).
210	4805		205.0-215.0		125.0-301.0 Excellent		
215	4800						215.0-225.0 ft. mostly silty claystone, moderately calcareous, medium gray (N5), trace bioturbated and/or storm bedding that is very fine grained sandstone, light gray (N7). Trace fossil imprints and shell (pelecypods) replacements (aragonite). Rock hard and competent through most of interval, more fissile 216.5-217.5 ft. Steeply inclined fracture (80-90 degrees)at 220.0-222.5 ft. that may be natural - it is tight with no gypsum or limonite coating.
220	4795		215.0-225.0				
225	4790						225.0-235.0 ft. hard core and competent throughout. A steeply inclined near-vertical fracture (possibly mechanical, drilling induced) at 225.0-227.0 ft. that is tight with no evidence of fluid movement. Core dry inside when broken apart. Bedding appears to be inclined ~5 degrees from horizontal.
230	4785		225.0-235.0				

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
235	4780						235.0-245.0 ft. hard and competent core, near vertical tight fracture, possibly mechanical at 237.0-239.0 ft. Mechanical induced fractures at 244.0-246.0 ft.
240	4775		235.0-245.0				
245	4770						245.0-254.0 ft. hard competent core throughout. More fissile interval (~0.1 ft.) at 246.0 ft. Possible natural vertical tight fracture at 247.5-249.0 ft. Thin fissile layer at 249.0 ft. and 249.7 ft. Trace pelecypod and cephalopod fossil imprints.
250	4765		245.0-254.0		125.0-301.0 Excellent		
255	4760		254.0-255.5				255.5-265.5 hard, competent core throughout. Fissile layer ~0.2 ft. thick at 257.5 ft. and one ~0.1 ft thick at 258.5 ft. Other fractures are mechanical and along bedding planes. Core is dry when broken open.
260	4755		255.5-265.5				
265	4750						265.5-275.5 ft. core hard and competent throughout and dry when broken open. Bioturbated or storm bedding forms increase to ~1-2% from 268.5-272.0 ft. At 271.0 ft., possible natural fracture ~20% from horizontal, tight, no evidence of water movement. Other scant fractures are horizontal and likely drilling induced.
	4745						

BOREHOLE LOG CRJ01-0203

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0203

SITE Crescent Junction Site **DATES DRILLED** 08/25/2005 to 11/07/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
			265.5-275.5				
275	4740						275.5-285.5 ft. mostly silty claystone. Bioturbated or storm bedding forms are ~1% with some of the layers as much as 0.05 ft. thick. No natural fractures present, bedding plane fractures seen are drilling induced. Core hard and competent. Dry when core was broken open.
280	4735		275.5-285.5				
285	4730				125.0-301.0 Excellent		285.5-295.5 ft. clayey siltstone, bioturbated and/or storm bedding is 1-2% of layering. Core is hard and competent, no natural fractures. Bedding plane fractures (infrequent) are drilling induced. At 290.0 and 295.5 ft., are thin (0.05-0.1 ft.) layers of porcelaneous, yellowish gray (5Y 8/1), very highly calcareous masses that are amorphous and not appearing to be fossils and have white small specks scattered through them. Core is dry when broken open. Trace fine carbonaceous material along bedding planes.
290	4725		285.5-295.5				
295	4720						295.5-301.0 ft. Core hard and competent, no natural fractures, bioturbation or storm bedding at 1-2% continues. Core dry when broken open. At 298.8 ft. is thin porcelaneous layer.
			295.5-301				
300	4715						Total Depth 301.0 ft.
305	4710						

BOREHOLE LOG CRJ01-0204

PROJECT	MOAB	DATE DRILLED	08/26/2005 to 11/05/2005
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction
SITE	Crescent Junction	DRILLING METHOD	H.S.A., Rotary Core
WELL NUMBER	CRJ01-0204	SAMPLING METHOD	HQ CORE
NORTH COORD. (FT)	6795633.72	DRILL OPERATOR	Neaman, J. (CME 750, BB80), Hyleman, B. (BB80)
EAST COORD. (FT)	2122583.61	REMARKS	4-inch steel surface casing cemented to depth of 25.0 feet below land surface.
SURFACE ELEV. (FT NGVD)	4983.00		
HOLE DEPTH (FT)	300.00		

BIT SIZE(S) (IN) 8.5
CORE SIZE(S) (IN)
LOGGED BY Goodknight, C., Rupp, R.
WL (FT BGS)

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT.)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
		3, 6, 7, 9	0-0.5, 0.5-1.0, 1.0-1.5, 1.5-2.0				0-3.0 ft. SILT (ML); pale brown (10YR 6/3), highly calcareous, highly mottled from 2.0-3.0 ft and light gray (10YR 7/2) overall color with white mottles being caliche masses, soft.
	4980						3.0-10.0 ft. WEATHERED MANCOS SHALE BEDROCK; soft from 3.0-5.5 ft. Highly weathered down to ~5.5 ft. Moderately weathered with less weathered being pale yellowish brown (10YR 6/2) and more weathered layers being grayish orange (10YR 7/4). Highly calcareous. Generally a silty sandstone, with some sand grains up to medium grain size. Dark bedding plane surfaces have some framboidal pyrite.
5		20, 47, 50/5"	5.0-5.5, 5.5-6.0, 6.0-6.5				
	4975						
10		50/4"					10.0-11.0 ft. No Recovery.
	4970		10.0-15.0				11.0-300.0 ft. MANCOS SHALE: 11.0-15.0 ft. moderately weathered, mainly light olive gray (5Y 5/2). Trace gypsum crystals along fracture surfaces. Mostly bedding plane fractures spaced 0.1-0.2 ft. apart; a few inclined (near vertical) fractures. Highly calcareous. Several fractures coated with limonite-colored (weathered) material-dark yellowish orange (10YR 6/6). Some arcuate fracturing.
15							15.0-16.8 ft. No recovery.
	4965		15.0-20.0				16.8-20.0 ft. moderately weathered, highly fractured 0.1 ft. spacing or more frequent. One inclined fracture with limonite coating at ~18.0 ft. Calcitic and gypsum fracture coatings especially at 19.0 -20 ft. Highly calcareous.
20			20.0-22.5				20.5-22.5 ft. moderate weathering. Well fractured down to ~21.25 ft. Some limonite-coated fractures at 21.5 ft. Bedding seems to be inclined ~10 degrees. Gypsum/calcite along fractures. Soft black material ~22.25-22.5 ft. All highly calcareous.
	4960		22.5-25.0		10.0-35.0 Very Poor		22.5-25.0 ft. slightly weathered, but highly fractured, some fractures are inclined like the 30 degree fracture at 24.0 ft., and a vertical fracture at 23.0 ft. Gypsum crystals coat several fractures. Highly calcareous shale is medium gray (N5), a damp color. No evidence of slickensides along fractures.
25							25.0-35.0 ft. poor recovery (~6.8 ft.) and overall broken and slightly to moderately weathered. Bedding angle appears normal (85 degrees to core axis). Much weak limonitic alteration and prevalent gypsum crystallization in voids on bedding planes. At 31.0-33.0 ft. are several fractures @ 30 degree angles. Core is moderately to strongly calcic and becomes slightly more competent with depth. Most core loss appears to be at the top of the run with some loss throughout.
	4955						
30			25.0-35.0				
	4950						

BOREHOLE LOG CRJ01-0204

PROJECT MOAB
SITE Crescent Junction Site
BOREHOLE NUMBER CRJ01-0204
DATES DRILLED 08/26/2005 to 11/05/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
	4945						35.0-45.0 ft. loss of 1.0 ft. over the run but appears to be in the top 5.0 ft. Core is generally parted on bedding @ 0.1-0.3 ft. lengths. Minor fracturing. Bedding appears normal. Some limonitic alteration throughout the run. Gypsum crystallization prevalent throughout. @39.0-40.0 ft. some low angle fracturing (possibility related to bioturbation, alteration markedly decreasing at end of run, @ 44.5 ft. transition to "fresh" rock begins.
40			30.0-45.0				
	4940				35.0-50.0 Poor		
45							45.0-55.0 ft. largely unweathered core "fresh." Parted on bedding in 0.2 ft. segments in intervals @45-46.4 ft. and 47.0-48.0 ft. Parted surfaces are coated with yellowish brown iron stain. @ 50.5, 51.0, 52.4, 53.8, 54.4 ft. are fractures on bedding that are significant and coated with iron alterations and trace gypsum mineralization. Bedding angle is normal.
	4935						
50			45.0-55.0				
	4930						
55							55.0-65.0 ft. fissile fracture at 55.3 ft and splintered to 57.0 ft. Core @57.0-65.0 ft. is very competent with only a couple of parting breaks @62.0-65.0 ft. Fossil shell @ 65.0 ft. Bedding angle < 3 degrees to almost perpendicular to core axis. Good fresh Mancos Shale, strongly calcic and relatively hard.
	4925				50.0-67.0 Fair		
60			55.0-65.0				
	4920						
65							65.0-75.0 ft. slightly fissile @ 65.0-67.0 ft. with break/fracture @67.0 ft. on bedding plane with limonite staining. Regular bedding. Remainder of core is very competent with few parts on bedding; interior of core is dry.
	4915						
70			65.0-75.0				
	4910						

BOREHOLE LOG CRJ01-0204

PROJECT MOAB
SITE Crescent Junction Site
BOREHOLE NUMBER CRJ01-0204
DATES DRILLED 08/26/2005 to 11/05/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
75							75.0-85.0 ft. @81.0 ft. parting on bedding with limonite stain. @81.8, 82.8, and 83.6 ft. are fissile breaks.
	4905						
80			75.0-85.0				
	4900						
85							85.0-95.0 ft. parted @ 88.2, 88.5, and 89.2 ft. with clean breaks on bedding. No stain, no mineralization. Core generally hard, no fractures and no water.
	4895						
90			85.0-95.0				
	4890						
95							95.0-105.0 ft. broken @ 96.3, 97.3, 98.2, 98.6, 100.3, 102.7, and 103.3-103.7 ft., which is fissile and has heavy limonitic coating, also limonite @ 98.2 ft. Breaks are potential water courses, but no indication of water presently exists. All breaks on bedding.
	4885						
100			95.0-105.0				
	4880						
105					67.0-145.0 Good		105.0-115.0 ft. broken @ 105.2, 105.5, 108.0, and 110.7 ft. and fissile @ 108.8-109.0 ft. Parted @113.8 ft. No iron stain or deposits in breaks or fissile locations, dry core interior, normal bedding.
	4875						
110			105.0-115.0				
	4870						

BOREHOLE LOG CRJ01-0204

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0204
SITE Crescent Junction Site **DATES DRILLED** 08/26/2005 to 11/05/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
115							115.0-125.0 ft. good run with no unusual characteristics, fissile @120.0,124.8 and 125.0 ft.
	4865						
120			115.0-125.0				
	4860						
125							125.0-135.0 ft. generally fissile @127.0-129.0 ft. with breaks on bedding, but no secondary mineralization or staining Also fissile @130.0-132.0 ft. with fossil replacement @131.0 ft. Bedding angle ~10 degrees.
	4855						
130			125.0-135.0		67.0-145.0 Good		
	4850						
135							135.0-145.0 ft. broken on bedding 2 to 3 places @2.0 ft. intervals. Normal bedding angle; hard core with no observed secondary mineralization, no indication of formation water, core interior is dry.
	4845						
140			135.0-145.0				
	4840						
145							145.0-155.0 ft. very competent run, no fissile sections, only minor parting on bedding, which dips approximately 5 degrees, minor mechanical breaks, no fractures.
	4835						
150			145.0-155.0				

BOREHOLE LOG CRJ01-0204

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0204
SITE Crescent Junction Site **DATES DRILLED** 08/26/2005 to 11/05/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
	4830						
155							155.0-165.0 ft. competent run with minor parting on bedding and mechanical breaks, no fractures, no secondary mineralization, no indication of formation water, dry.
	4825						
160			155.0-165.0				
	4820						
165							165.0-175.0 ft. competent run, minor parting and mechanical damage. Normal bedding angle, moderately calcic.
	4815						
170			165.0-175.0		145.0-300.0 Excellent		
	4810						
175							175.0-185.0 ft. moderately fissile @ 176.0-177.0 ft. and 180.6 ft., moderately broken on bedding. @184.5 ft. is a large bioturbation crenulation, which upsets the normal bedding angles. Slightly fossiliferous @185.0 ft.
	4805						
180			175.0-185.0				
	4800						
185							185.0-195.0 ft. broken at fissile locations @ 187.7 and 188.0 ft. Fissile but unbroken @189.0 ft. Two broken fissile locations in the 194.0-195.0 ft. interval. Consistent bedding, few biocrenulations. Good run.
	4795						
190			185.0-195.0				

BOREHOLE LOG CRJ01-0204

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0204
SITE Crescent Junction Site **DATES DRILLED** 08/26/2005 to 11/05/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
	4790						
195							195.0-205.0 ft. mechanical breaks on fissile locations @195.8, 196.4, 196.8,197.6,198.0, 202.5, and 203.3 ft. Normal bedding angle, no fractures, no secondary mineralization, no indication of water. Core interior is dry, good competent run.
	4785						
200			195.0-205.0				
	4780						
205							205.0-215.0 ft. core is splintering @205.0-210.0 ft. due to mechanical stress. @206.5, 209.8, 211.7, and 212.0 ft., are breaks on fissile bedding, normal bedding angle, no natural fractures, good competent run.
	4775						
210			205.0-215.0		145.0-300.0 Excellent		
	4770						
215							215.0-225.0 ft. very competent run with only a couple of partings on bedding, no breaks or fractures.
	4765						
220			215.0-225.0				
	4760						
225							225.0-235 ft. very competent run, mechanical breakage @226.0-227.0 ft.
	4755						
230			225.0-235.0				

BOREHOLE LOG CRJ01-0204

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0204
SITE Crescent Junction Site **DATES DRILLED** 08/26/2005 to 11/05/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
	4750						
235							235.0-245.0 ft. @236.2-236.3 ft is a fissile section. @240.4 and 241.0 ft. broken on bedding and fissile. @242.0 ft. is a fissile break and ones also @242.6, 244.7, and 245.0 ft. Normal bedding angle is approximately 5 to 10 degrees. Dry core interior, no secondary mineralization.
	4745						
240			235.0-245.0				
	4740						
245							245.0-255.0 ft. good competent run with few breaks on bedding, core is relatively hard, moderately calcic, and shows no sign of secondary mineralization or formation water.
	4735						
250			245.0-255.0		145.0-300.0 Excellent		
	4730						
255							255.0-265.0 ft. good run, moderately fissile, no fractures, parting on bedding @ 256.0, 258.7, 259.5, 260.0, and 263.5 ft. Fossiliferous @~260.0-265.0 ft.
	4725						
260			255.0-265.0				
	4720						
265							265.0-275.0 ft. very competent run with parting and mechanical breaks @ 266.0, 267.5, 271.5, and 272.8 ft. Normal bedding, no secondary mineralization, no indication of formation water.
	4715						
			265.0-275.0				

BOREHOLE LOG CRJ01-0204

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0204
SITE Crescent Junction Site **DATES DRILLED** 08/26/2005 to 11/05/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
	4710						
275							275.0-285.0 ft. competent run with no fractures (only breaks on bedding). No indication of water, fissile breaks @276.5, 280.8, 282.0, and 284.5 ft.
	4705						
280			275.0-285.0				
	4700						
285					145.0-300.0 Excellent		285.0-295.0 ft. extremely nice run with only very minor fissility @286.7 ft. Dry core interior, no secondary mineralization, almost no parting.
	4695						
290			285.0-295.0				
	4690						
295							295.0-300.0 ft. mechanical breakage due to drilling @296.6, 297.2, 297.8, 299.0, 299.6, and 299.8 ft. No indication of formation water.
	4685		295.0-300.0				
300							Total Depth 300.0 ft.
	4680						
305							
	4675						

BOREHOLE LOG CRJ01-0205

PROJECT	MOAB	DATE DRILLED	08/28/2005 to 11/02/2005
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction
SITE	Crescent Junction	DRILLING METHOD	H.S.A., Rotary Core
WELL NUMBER	CRJ01-0205	SAMPLING METHOD	HQ CORE
NORTH COORD. (FT)	6793981.28	DRILL OPERATOR	Neaman, J. (CME 750, BB80), Hyleman, B. (BB80)
EAST COORD. (FT)	2122975.63	REMARKS	4-inch steel surface casing cemented to depth of 25.0 feet below land surface.
SURFACE ELEV. (FT NGVD)	4945.90		
HOLE DEPTH (FT)	300.00		

BIT SIZE(S) (IN) 8.5
CORE SIZE(S) (IN)
LOGGED BY Goodknight, C., Rupp, R.
WL (FT BGS)

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT.)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
	4945	6, 5, 6, 7	0-0.5, 0.5-1.0, 1.0-1.5, 1.5-2.0				0-4.0 ft. CLAYEY SILT (ML); light brownish gray (10YR 6/2), highly calcareous, numerous roots, worm hole porosity, some mottling.
5	4940	17, 17, 23, 25	5.5-6.0, 6.0-6.5, 6.5-7.0				4.0-6.5 ft. SILT (ML); very pale brown (10YR 7/4), ~2% small fragments of shale, highly calcareous, some mottling.
							6.5-10.0 ft. SANDY SILT (ML); light brown (7.5YR 6/4), highly calcareous, some mottling (white), appears to be eolian transported material, ~1% dark mineral grains.
10	4935	38, 50/5"	10.0-10.5, 10.5-11.0				10.0-11.0 ft. WEATHERED MANCOS SHALE BEDROCK: highly weathered, yellowish gray (5Y 7/2) to dark yellowish orange (10YR 6/6), which reflects limonitic alteration, highly calcareous. Mostly claystone with some silt component.
			11.0-15.0				11.0-300.0 ft. MANCOS SHALE: 11.66-15.0 ft. yellowish gray (5Y 7/2) to grayish orange (10YR 7/4). Moderate to highly weathered with bedding plane fractures - some segments 0.2-0.3 ft. long are intact. Some dark fossil impressions on bedding (some framboidal pyrite). Highly calcareous. White gypsum masses @14.75-15.0 ft.
15	4930		15.0-20.0				15.0-20.0 ft. highly calcareous, much less fracturing - bedding plane fractures about every 0.3-0.4 ft. (main fractures @15.8, 16.75, 17.25, and 15.4 ft. and a steeply inclined fracture (~80 degrees) @18.0-18.5 ft., these fractures all filled with gypsum. Limonitic alteration @~17.8 ft., dark yellowish orange (10YR 6/6). Thin bentonite bed (<0.1 ft.) @ ~18.75 ft., pale yellowish brown (10YR 6/2). Several vertical fractures @~19.7-20.0 ft.
20	4925						20.0-21.5 ft. No Recovery.
			20.0-25.0				21.5-25.0 ft. bedding plane fractures generally ~0.1-0.2 ft. spacing, highly calcareous, slightly weathered, inclined bedding indicates dip ~5 degrees. Gypsum along bedding plane fracture @23.8 ft. Thin light brown (5YR 5/6) layer(0.05 ft) @~23.25 ft. along with some ~20 degree inclined bedding.
25	4920				11.0-40.0 Very Poor		25.0-35.0 ft. weathered and highly broken to ~32.0 ft., 80% recovery in upper part of run. Some surface slough ~1.0 ft. (hole was tagged @24.0 ft. below ground surface prior to drilling). Core is in generally poor condition to 32.0 ft., fragmented and broken by drilling action. Prolific rusty iron staining and evidence of surface water infiltration. Some calcic and gypsum deposition is distinguishable. Core becoming more competent @ 31.0-32.0 ft., but still shows clay interbedded in iron stained shale. @32.0-35.0 ft., core is regularly broken into 0.2-0.3 ft. long pieces showing the usual +/- 5 degree dip of bedding with gypsum crystallization along faces of breaks. @34.5 ft, thin iron stained band followed by gypsum filled fracture on bedding plane.
30	4915		25.0-35.0				

BOREHOLE LOG CRJ01-0205

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0205

SITE Crescent Junction Site **DATES DRILLED** 08/28/2005 to 11/02/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
	4910						35.0-45.0 ft. mildly weathered and moderately broken. 90% recovery, core loss in interval from 35.0-40.0 ft. Secondary gypsum deposits in fractures prevalent to 40.0 ft. and sporadically to 44.0 ft. Iron alteration considered characteristic of the run to 44.0 ft. @44.0 ft., the core becomes "fresh" in appearance, is largely unweathered, competent claystone, dark gray to medium gray with white turbidity crenulations along bedding planes, bedding angle throughout run is approximately 5 degrees. @38.2 ft., rather wide (0.05 ft) gypsum filled fracture with ~20 degree angle to core axis.
40			35.0-45.0				
	4905						
45					40.0-50.0 Poor		45.0-55.0 ft. good core run, some breakage to 49.7 ft. due to mechanical action. Breaks @46.2, 46.6, 47.1, 47.5-47.8, 48.6, and 49.7 ft. @48.0-48.2 ft., core is fissile with moderate iron stain. @51.5 and 52.3 ft., core has parted on bedding. @44.4 ft is a 0.1 ft. "storm" - sequence, which is light gray to tan and well cemented. Bedding throughout run is normal, approximately 5 degrees. Core coloration is normal dark to medium gray, and no high angle fracture or secondary mineralization observed.
	4900						
50			45.0-55.0				
	4895						
55							55.0-65.0 ft. unweathered with minor mechanical breaks and partings on bedding surfaces, no fractures of high angle or secondary mineralization noted. No indication of formation water, dry core interior.
	4890						
60			55.0-65.0				
	4885						
					50.0-75.0 Fair		
65							65.0-75.0 ft. minimal mechanical breaks. Fissile @66.7, 66.9, 69.4, and 69.9 ft. @75.0 ft., is rusty iron coating on a definite fracture surface along bedding.
	4880						
70			65.0-75.0				
	4875						

BOREHOLE LOG CRJ01-0205

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0205
SITE Crescent Junction Site **DATES DRILLED** 08/28/2005 to 11/02/2005

Continued from Previous Page

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
75	4870						75.0-85.0 ft. no fractures or breaks, only parting of core on bedding surfaces. Bedding at about a 5 degree angle. Competent unbroken core, no significant abnormalities. @81.0 ft. is a fossil crenulation.
80	4865		75.0-85.0				
85	4860				75.0-95.0 Good		85.0-95.0 ft. drilling breaks @85.4, 87.1-87.5 ft. Fissile @ 89.6 ft. Splintered along core axis @90.5 and 91.0 ft. Fissile @ 84.6 ft. No secondary mineralization evident. Core breakage probably due to driller down pressure. Core interior is dry - no evidence of formation water.
90	4855		85.0-95.0				
95	4850						95.0-105.0 ft. core splintered by drilling pressure @95.0-95.5 ft. Core broken across fissile bedding @100.0 ft. Good run, some parting on bedding, bedding angle ~0 degrees (horizontal) or perpendicular to core axis.
100	4845		95.0-105.0				
105	4840				95.0-300.0 Excellent		105.0-115.0 ft. drill breaks across bedding @107.7-108.7 ft., moderately fissile. 30 degree fractures, which appear mechanically induced @111.0-113.0 ft. Couple of parts on bedding planes @114.0-115.0 ft. No indication of water.
110	4835		105.0-115.0				

BOREHOLE LOG CRJ01-0205

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0205
SITE Crescent Junction Site **DATES DRILLED** 08/28/2005 to 11/02/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
115	4830						115.0-125.0 ft. Several fissile intervals(~0.1-0.2 ft.) with breakage on bedding planes from 119.0-121.0 ft. @123.0-125.0 ft., a few sections parted on bedding. No secondary mineralizations seen, no high angle fractures, no indication of formation water.
120	4825		115.0-125.0				
125	4820						125.0-135.0 ft. bedding angle 0 to 5 degrees, no fractures, some breakage along bedding @ 125.9-126.5, 127.8, 128.3, 128.7, 129.9, and 133.6 ft. Generally, fissile on breaks, but good competent core. No secondary mineralization, dry core interior.
130	4815		125.0-135.0		95.0-300.0 Excellent		
135	4810						135.0-145.0 ft. mechanical breaks @ 135.3, 135.5, 141.7, and 142.6 ft. Fissile also at these breaks @ 143.2-143.4 ft. is a calcic incrustation on core, with white to tan coloration. Usual approximately 5 degree bedding, no secondary mineralization.
140	4805		135.0-145.0				
145	4800						145.0-155.0 ft. fissile and broken on bedding @ 145.5, 151.0, and 151.6 ft. Excellent condition, normal bedding @ approximately 5 degrees, some parting on bedding planes, no high angle fractures, no indication of water, dry core interior.
150	4795		145.0-155.0				

BOREHOLE LOG CRJ01-0205

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0205
SITE Crescent Junction Site **DATES DRILLED** 08/28/2005 to 11/02/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
155	4790						155.0-165.0 ft. fissile breaks @ 155.4, 158.5-158.8, 159.1, 159.5, 159.8, 160.6, 160.9-161.2, 160.6, 162.9, 163.4-163.7, and 164.2 ft. All breaks along bedding planes. Approximately 5 degree bedding angles. No unusual characteristics, no evidence of formation water, dry core interiors.
160	4785		155.0-165.0				
165	4780						165.0-175.0 ft. fissile @ 168.2, 170.5, and 172.4 ft. No fractures, no breaks; only parting on bedding planes. Excellent run.
170	4775		165.0-175.0		95.0-300.0 Excellent		
175	4770						175.0-185.0 ft. fissile breaks @ 176.4-176.8, 177.1, 178.2-178.35, 179.4, 180.5-180.7, and 184.3-184.6 ft. All breaks on bedding which is @ 5 degree angle. No fractures, no secondary mineralizations, no indications of formation water. Core interior is dry, good consistent run.
180	4765		175.0-185.0				
185	4760						185.0-195.0 ft. In general the run is more fissile than usual, all breaks are on bedding planes @ 185.0, 185.6, 186-187.2, 188.2, 188.8-189.5, 190.1, 190.7-191.1, 192.2, 192.9, 193.5-193.7, and 194.2-194.4 ft. No secondary mineralization or staining in breaks. No water identified.
190	4755		185.0-195.0				

BOREHOLE LOG CRJ01-0205

PROJECT MOAB
SITE Crescent Junction Site
BOREHOLE NUMBER CRJ01-0205
DATES DRILLED 08/28/2005 to 11/02/2005

Continued from Previous Page

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
195	4750						195.0-205.0 ft. fissile breaks and splintered core from drill pressure throughout run @ 195.0-195.5, 197.6-197.8, 198.4-198.5, and 198.5-199.0 ft. @ 199.0 ft. is a 0.15 ft. break, generally washed out. No noticeable mineralization in partings or breaks, no iron staining. Most of these separations and breaks are mechanical.
200	4745		195.0-205.0				
205	4740						205.0-215.0 ft. good run. Very minor fissile sections and no fractures. Parting and mechanical breakage only on bedding at fissile intervals. Parted @ 205.2, 210.2, and 212.4 ft. Normal approximately 5 degree angle bedding. No more formation water.
210	4735		205.0-215.0		95.0-300.0 Excellent		
215	4730						215.0-225.0 ft. good competent run with minimal breakage on bedding @ 217.9, 222.4, 223.8, and 224.8-225.0 ft. Breakage @ fissile locations. No fractures, no indication of formation water. Bedding angle about 90 degrees to core axis (horizontal)..
220	4725		215.0-225.0				
225	4720						225.0-235.0 ft. 1.0 ft dropped on core retrieval but it was recovered next run. Characteristic run with a little more breakage than last run due to driller pushing to get 140.0 ft. for the day. Breaks along bedding in fissile areas @ 225.6, 226.3, 226.7, 229.0, 229.3, 230.2, 230.9, 231.1, 232.4, and 233.6 ft.
230			225.0-235.0				

BOREHOLE LOG CRJ01-0205

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0205
SITE Crescent Junction Site **DATES DRILLED** 08/28/2005 to 11/02/2005

Continued from Previous Page

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
235	4710						235.0-245.0 ft. run is generally fissile and broken in multiple places; splintered @240.0-241.0 ft. Becoming less fissile near bottom of run.
240	4705		235.0-245.0				
245	4700						245.0-255.0 ft. generally broken by mechanical action and splintered along core axis from 245.5-248.0, 250.0-251.0, and 253.5-255.0 ft. Remaining breaks on bedding, which is approximately 5 degrees, with no secondary mineralization or indication of water. Core interior is dry, no large bioturbation zones.
250	4695		245.0-255.0		95.0-300.0 Excellent		
255	4690						255.0-265.0 ft. continued breakage to 258.5 ft., then becoming fossiliferous and more calcic, more competent, and generally unbroken with minor separations on bedding surfaces.
260	4685		255.0-265.0				
265	4680						265.0-275.0 ft. another largely broken run of claystone. Bedding is normal angle (approximately 5 degrees), no fractures. Breakage is along bedding in fissile rock. Most prominent breaks @ 265.0-267.0, 269.0-271.0 and 272.5 ft.
			265.0-275.0				

BOREHOLE LOG CRJ01-0205

PROJECT MOAB
SITE Crescent Junction Site
BOREHOLE NUMBER CRJ01-0205
DATES DRILLED 08/28/2005 to 11/02/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
	4675						
275	4670						275.0-285.0 ft. moderately fissile and broken, normal bedding, no fractures. Parting only on bedding. @276.0-278.0 ft. ~50 % fissile breaks with some mechanical. @279.7 to 281.0 ft., fissile zone.
280	4665		275.0-285.0				
285	4660				95.0-300.0 Excellent		285.0-295.0 ft. white banding or bedding @284.0-290.0 ft. is strongly pronounced and closely spaced. Somewhat fissile @289.0-290.0 ft.
290	4655		285.0-295.0				
295	4650		295.0-300.0				295.0-300.0 ft. very competent core with minor parting on bedding. No fractures, no indication of formation water or identifiable secondary mineralization; no indication of explosive gases.
300	4645						Total Depth 300.0 ft.
305	4640						

BOREHOLE LOG CRJ01-0206

PROJECT	MOAB	DATE DRILLED	08/29/2005 to 10/24/2005
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction
SITE	Crescent Junction	DRILLING METHOD	H.S.A., Rotary Core
WELL NUMBER	CRJ01-0206	SAMPLING METHOD	HQ CORE
NORTH COORD. (FT)	6796324.67	DRILL OPERATOR	Neaman, J. (CME 750, BB80), Hyleman, B. (BB80)
EAST COORD. (FT)	2124232.60	REMARKS	4-inch steel surface casing cemented to depth of 26.0 feet below land surface.
SURFACE ELEV. (FT NGVD)	4994.00		
HOLE DEPTH (FT)	302.00		

BIT SIZE(S) (IN)	8.5
CORE SIZE(S) (IN)	
LOGGED BY	Goodknight, C., Rupp, R.
WL (FT BGS)	

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT.)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
		3, 6, 7, 9	0-0.5, 0.5-1.0, 1.0-1.5, 1.5-2.0				0-1.5 ft. SILT (ML); light brown (7.5YR 6/3), highly calcareous, abundant roots, wormhole porosity.
							1.5-4.0 ft. SANDY SILT (ML); light brownish gray (10YR 6/2), ~2% small pebbles, some mottling, highly calcareous.
	4990						4.0-6.5 ft. SILTY SAND (SM); light brownish gray (10YR 6/2), slightly calcareous, ~2% small rock fragments and some coarse sand particles.
5		8, 12, 16, 18	5.0-5.5, 5.5-6.0, 6.0-6.5, 6.5-7.0				6.5-9.0 ft. SILT (ML); ~10% very fine grained sand, mottled, slightly calcareous, very pale brown (10YR 7/3).
	4985						9.0-11.0 ft. WEATHERED MANCOS SHALE BEDROCK: highly weathered, slightly calcareous, soft to moderately hard, yellowish gray (5Y 7/2), some white gypsum crystals and masses along fracture/bedding surfaces.
10		22, 36, 50/4"	10.0-10.5, 10.5-11.0				11.0-12.6 ft. No Recovery.
			11.0-13.0				12.6-302.0 ft. MANCOS SHALE:
	4980						12.6-13.0 ft. moderately weathered, pale yellowish brown (10YR 6/2), mostly siltstone, wavy bedding with some fracturing along them.
15			13.0-18.0				13.0-13.5 ft. No Recovery. 13.5-18.0 ft. highly weathered down to 15.0 ft. (numerous bedding plane fractures) and moderate to slightly weathered down to 18.0 ft. with bedding plane fractures spaced 0.2-0.3 ft. apart. At 15.0-15.3 ft. is a 60 degree fracture. Thin coating of gypsum crystals along about half of the fractures.
	4975						Yellowish gray (5Y 7/2) to light olive gray (5Y 6/1), highly calcareous, bedding is wavy and bioturbated in places. Trace fine (framboidal) pyrite along bedding surfaces.
20			18.0-23.0				18.0-18.8 ft. No Recovery. 18.8-23.0 ft. abundant bedding plane fractures down to ~20.0 ft. Bedding plane fractures about 0.2-0.3 ft. apart down to 23.0 ft. Moderate to slightly weathered. Gypsum crystal coatings along many fractures. Some wavy and bioturbated bedding, pale yellowish brown (10YR 6/2) to olive gray (5Y 4/1) on some bedding surfaces, highly calcareous, no vertical or high angle fractures.
	4970				13.0-34.0 Very Poor		23.0-23.3 ft. No Recovery.
25			23.0-26.0				23.3-26.0 ft. abundant bedding plane fractures with spacing 0.1 ft. or less. Gypsum crystals along bedding plane fractures ~25.5 to 25.7 ft. Abundant worm burrows and bioturbated bedding, moderately calcareous.
	4965						26.0-35.0 ft. moderately weathered, prevalent fractures for length of run, but decreasing @34.0 ft. Core loss obvious at beginning of run (@26.0 ft.). Moderately calcic with prominent gypsum crystallization on faces of most fractures. Bedding angle approximately 5 degrees; ~90% of fractures are on bedding, no high angle fractures, some fractures are fissile, wavy bioturbation throughout, no evidence of formation water.
30			26.0-35.0				
	4960						

BOREHOLE LOG CRJ01-0206

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0206
SITE Crescent Junction Site **DATES DRILLED** 08/29/2005 to 10/24/2005

Continued from Previous Page

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
							35.0-45.0 ft. weathering decreases to unweathered "fresh" bedrock @39.5 ft. Moderately calcic. @36.0-37.7 ft., moderately fractured along bedding, moderately pyritized, with gypsum crystallization and minor iron staining on fractures to 39.4 ft.
40	4955		35.0-45.0		34.0-45.0 Poor		
45	4950						45.0-55.0 ft. "fresh" appearance to shale, clean mechanical fractures along bedding planes in several locations, no gypsum crystallization or iron staining along fracture faces. No evdience of formation water, core interior dry. Nice claystone.
50	4945		45.0-55.0				
55	4940				45.0-65.0 Fair		55.0-65.0 ft. fissile along fractures @56.0-58.0 ft. @57.0 ft. fractures occur @80 degree angle to core axis (~twice the bedding plane angle). No secondary mineralization on fractures faces.
60	4935		55.0-65.0				
65	4930						65.0-75.0 ft. bedding angle and bioturbation crenulations @80% to core axis. Core is solid overall with no fractures from 66.0-70.0 ft. and only minor mechanical fractures from 70.0-75.0 ft.
70	4925		65.0-75.0				
	4920						

BOREHOLE LOG CRJ01-0206

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0206
SITE Crescent Junction Site **DATES DRILLED** 08/29/2005 to 10/24/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
75					65.0-85.0 Good		75.0-85.0 ft. @79.8-80.0 ft. fossiliferous deposit, calcic, heavy encrustations on core, preceded by short splintery fractures along core axis for 0.5 ft.
	4915						
80			75.0-85.0				
	4910						
85							85.0-95.0 ft. good competent core, mechanical fractures on bedding planes with bioturbation crenulations, no secondary mineralization observed, no indication of formation water, interior of core dry.
	4905						
90			85.0-95.0				
	4900						
95							95.0-105.0 ft. @103.8 ft. approximately 0.2 ft. bioturbations and silt size cemented zone. Good claystone run with minor mechanical fractures and dry core interior, normal 5 degree angle of bedding, moderately calcic.
	4895						
100			95.0-105.0		85.0-302.0 Excellent		
	4890						
105							105.0-115.0 ft. excellent recovery with only 2 locations of mechanical fracturing on bedding, standard overall appearance.
	4885						
110			105.0-115.0				

BOREHOLE LOG CRJ01-0206

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0206
SITE Crescent Junction Site **DATES DRILLED** 08/29/2005 to 10/24/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
115	4880						115.0-125.0 ft. core generally hard and moderately calcic. @116.0-117.0 ft. core is splintered along axis (mechanically induced). No secondary mineral deposits noted.
120	4875		115.0-125.0				
125	4870						125.0-135.0 ft. minor mechanical fracturing along bedding planes.
130	4865		125.0-135.0		85.0-302.0 Excellent		
135	4860						135.0-145.0 ft. penetration rate slows, shale harder @140.0 ft. @140.0-140.6 ft. core fissile, biocrenulations, no secondary minerals. @141.0-143.0 ft. core fractured along axis. Drill pipe screened with LEL meter at end of run(0.0 ppm).
140	4855		135.0-145.0				
145	4850						145.0-155.0 ft. formation very hard. @151.0-153.0 ft. abundant fossils, large bivalves.
150	4845		145.0-155.0				

BOREHOLE LOG CRJ01-0206

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0206
SITE Crescent Junction Site **DATES DRILLED** 08/29/2005 to 10/24/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
	4840						
155							155.0-165.0 ft. core loss related to drilling, minor loss (~0.5 ft.). Continued hard core, causing mechanical fractures parallel with axis @ 157.0-158.0 ft. and 162.0-164.0 ft.
	4835						
160			155.0-165.0				
	4830						
165							165.0-175.0 ft. fissile along bedding @167.0-168.0 ft. Bedding plane angle =90 degrees to core axis. Core continues to drill slow, but formation doesn't appear any different.
	4825						
170			165.0-175.0		85.0-302.0 Excellent		
	4820						
175							175.0-185.0 ft. fissile @184.0-185.0 ft. No gas detected.
	4815						
180			175.0-185.0				
	4810						
185							185.0-195.0 ft. @185.0-186.0 ft. core is fissile. @189.5 ft. drilling compressor overheats; stopped drilling.
	4805						
190			185.0-195.0				

BOREHOLE LOG CRJ01-0206

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0206
SITE Crescent Junction Site **DATES DRILLED** 08/29/2005 to 10/24/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
195	4800						195.0-205.0 ft. @200.0-202.0 ft. heavy fracture zone, core is partly fissile and relatively weak, possible natural fracture zone, doesn't appear completely mechanically induced although the current compressor has minimal PSI to drill and clear cuttings. @200.0 ft. pyrite deposit.
200	4795		195.0-205.0				
205	4790						205.0-215.0 ft. good run, bedding angle is <5 degrees and is almost perpendicular to core axis, minimal bioturbidity crenulations. @214.8-215.0 ft. fissile break.
210	4785		205.0-215.0		85.0-302.0 Excellent		
215	4780						215.0-225.0 ft. @217.8 ft. is a 0.2 ft. fissile break, very broken. @220.7 and 220.9 ft. mechanical breaks. @223.5, and 223.7 ft. fissile with mechanical breaks. @ 224.2 ft mechanical break.
220	4775		215.0-225.0				
225	4770						225.0-235.0 ft. bedding +/- 5 degree angle, no formation water. @225.5, 225.8, 226.3, and 226.4 ft. mechanical breaks. @ 226.75 fractures on bedding. @227.35 mechanical breaks. @228.9, 229.6, 230.35, 230.55, and 230.75 ft. mechanical breaks, slightly fissile. @232.35, 232.95,233.2, 233.6, and 234.2 ft. fissile fractures on bedding.
230	4765		225.0-235.0				

BOREHOLE LOG CRJ01-0206

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0206
SITE Crescent Junction Site **DATES DRILLED** 08/29/2005 to 10/24/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
	4760						
235							235.0-245.0 ft. mechanical breaks @236.5, 238.2, 241.2, 242.0, 242.9, and 243.7 ft. Fissile fractures @ 238.65, 240.85-240.95, and 242.55 ft. Bedding angle +/- 5 degrees with bioturbidity crenulations, color, hardness, and general condition normal, no secondary mineralization, no indications of formation water.
	4755						
240			235.0-245.0				
	4750						
245							245.0-255.0 ft. mechanical breaks @246.3, 248.9, 250.3, 251.2, 252.5, 253.0, 253.9, 254.2, 254.5, and 255.0 ft. Core is generally hard, with dry interior, no indication of formation water.
	4745						
250			245.0-255.0		85.0-302.0 Excellent		
	4740						
255							255.0-265.0 ft. mechanical breaks @256.0, 256.5, 257.2, 257.9, 259.4, 259.9, 260.1, 260.5, 261.1, 261.8, and 264.2 ft. Slightly fissile @260.0-260.5 ft. on breaks. 5 degree angle bedding with bioturbation crenulations, moderately calcic.
	4735						
260			255.0-265.0				
	4730						
265							265.0-275.0 ft. no indication of formation water, no secondary mineralization identified on break faces. Mechanical breaks @ 266.3, 266.5, 269.9, 270.0, 270.4, 271.0, and 271.2 ft. @271.7 ft. on the face of bedding are several drops of resin (about 0.003 ft. diameter) or petroleum hydrocarbon deposits? Another is seen @ 268.3 on similar face of a break on bedding plane.
	4725						
			265.0-275.0				

BOREHOLE LOG CRJ01-0206

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0206
SITE Crescent Junction Site **DATES DRILLED** 08/29/2005 to 10/24/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
	4720						
275							275.0-285.0 ft. mechanical breaks @275.5, 276.0-276.7, 277.7, 278.2, 278.4, 279.0, 279.5, 283.3, 283.6, and 284.0 ft. Wavy biocrenulations (0.2 ft. thick) @ 281.0 ft. Normal bedding angle is 0-5 degrees. Moderately calcic.
	4715						
280			275.0-285.0				
	4710						
285					85.0-302.0 Excellent		285.0-295.0 ft. mechanical breaks @ 285.7-286.0 ft. 286.0-287.0 ft., 291.6, and 291.8 ft. @ 292.3 ft. "large" storm turbidity? section is light gray. This 10.0 ft. run doesn't appear to be as hard as the penetration rate would indicate.
	4705						
290			285.0-295.0				
	4700						
295							295.0-302.0 ft. mechanical breaks @ 396.0-396.6, 397.2, and 398.2 ft. Random bedding plane breaks, no fractures, core not extremely hard. Bedding angle normal, few scattered bioturbidity crenulations, no indication of formation water, core interior is dry.
	4695		295.0-302.0				
300							
							Total Depth 302.0 ft.
	4690						
305							
	4685						

BOREHOLE LOG CRJ01-0207

PROJECT MOAB
LOCATION Crescent Junction, UT.
SITE Crescent Junction
WELL NUMBER CRJ01-0207
NORTH COORD. (FT) 6794658.25
EAST COORD. (FT) 2124919.25
SURFACE ELEV. (FT NGVD) 4950.20
HOLE DEPTH (FT) 300.00

DATE DRILLED 09/10/2005 to 10/20/2005
DRILLING COMPANY Layne GeoConstruction
DRILLING METHOD H.S.A., Rotary Core
SAMPLING METHOD HQ CORE
DRILL OPERATOR Neaman, J. (Terramec 1000.), Hyleman, B. (BB80)
REMARKS 4-inch steel surface casing cemented to depth of 25.0 feet below land surface.

BIT SIZE(S) (IN) 8.5
CORE SIZE(S) (IN)
LOGGED BY Goodknight, C., Rupp, R.
WL (FT BGS)

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT.)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
	4950	2, 5, 10, 10	0-0.5, 0.5-1.0, 1.0-1.5, 1.5-2.0				0-1.25 ft. CLAYEY SILT (ML); grayish brown (10YR 5/2), highly calcareous, numerous roots, worm hole porosity.
		5, 11, 17, 19	2.5-3.0, 3.0-3.5, 3.5-4.0				1.25-3.5 ft. SANDY SILT (ML); ~90% silt, 10% very fine grained sand, light yellowish brown (10YR 6/4), trace roots, some mottling, highly calcareous, trace small rock fragments, trace gypsum crystals.
							3.5-5.0 ft. SILT (ML); very pale brown (10YR 7/4), highly calcareous, mottled, trace roots, trace gypsum crystals.
5	4945	3, 21, 27, 31	5.0-5.5, 5.5-6.0, 6.0-6.5, 6.5-7.0				5.0-5.75 ft. CLAYEY SILT (ML); ~5% small rock fragments, light brownish gray (10YR 6/2), highly calcareous.
							5.75-10.5 ft. WEATHERED MANCOS SHALE BEDROCK; yellowish gray (5Y 7/2) to dark yellowish orange (10YR 6/6), highly calcareous, mostly silty mudstone, soft, numerous bedding plane fractures (highly weathered). Trace gypsum along fractures and bedding surfaces, trace fine pyrite. Color becomes mostly pale yellowish brown (10YR 6/2) by 10.0 ft. depth, and rock becomes harder.
10	4940	50/5"	10.0-10.4				
			10.4-15.0				10.5-14.75 ft. No Recovery.
15	4935						14.75-300.0 ft. MANCOS SHALE: bedding plane fractures, mostly silty mudstone, pale yellowish brown (10YR 6/2) to yellowish gray (5Y 7/2), gypsum crystals along fractures.
			15.0-20.0				15-21.75 ft. No Recovery.
20	4930		20.0-22.0				
			22.0-25.0				21.75-22.0 ft. bedding plane fractures, mostly silty mudstone, gypsum crystals along fractures, trace fish plates and dark framboidal pyrite on bedding surfaces, medium gray (N5) to olive gray (5Y 4/1), moderately calcareous. 22.0-25.0 ft. rock seems to be more competent with horizontal bedding plane fractures spaced 0.1-0.2 ft. apart, medium light gray (N6) to medium gray (N5), fairly even bedded, moderately calcareous, hard, trace framboidal pryite, vertical fracture with gypsum crystal fill at 23.0 ft.
25	4925				10.5-40.0 Very Poor		25.0-35.0 ft. bedding plane fractures spaced 0.1 to 0.2 ft. apart or less. Rock is silty claystone overall, medium gray (N5), moderately calcareous. Mostly even bedding with only 5% or less bioturbated or storm bedding, which is coarser grained (up to very fine grained sandstone). Thin gypsum crystal coatings of bedding plane fractures. Inclined (45 degree) gypsum coated fractures at ~28.5, 30.0 and 31.5 ft. Bedding appears to be inclined 5-7 degrees. Several bedding surfaces had limonitic-colored, moderate yellowish brown (10YR 5/4) on them, indicating some water movement.
30	4920		25.0-35.0				

BOREHOLE LOG CRJ01-0207

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0207

SITE Crescent Junction Site **DATES DRILLED** 09/10/2005 to 10/20/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
	4915		35.0-38.0				35.0-38.0 ft. could not determine where 1.0 ft. core loss occurred. Bedding plane fractures as above, 30 degree fracture with thin gypsum coating at ~36.0 ft. Numerous horizontal bedding plane fractures 37.0-38.0 ft. and limonitic-coloration. Trace fine carbonaceous material on some bedding.
40	4910		38.0-45.0				38.0-45.0 ft bedding plane fractures decrease in number with depth from ~0.1-0.2 ft. spacing to 0.2-1.0 ft. spacing at 45 ft. Gypsum crystal coatings along some fractures. A 45 degree inclined fracture with gypsum coating at 42.2 ft. and a 30 degree inclined fracture with gypsum coating at 42.9 ft. Shale is even bedded with only trace of lighter-colored very fine grained sandstone layers representing storm layers or bioturbation. Core very fissile and fractures easily when handled.
45	4905		45.0-46.0		40.0-55.0 Poor		45.0-55.0 ft. Limonite and gypsum coated bedding plane fracture. at 45.5 ft. @ 46.0-55.0 ft. bedding plane fracturing generally decreases downward through interval. Thin gypsum crystal coatings on fracture surfaces along with limonitic coloration. A limonitic coating of vertical fracture at ~ 47.0 ft., and a 45 degree fracture with gypsum and limonite coating at 54.3-54.7 ft. Fissile, well fractured zone at ~51.0-51.5 ft. Rock is generally silty claystone and mostly even bedded. Trace bioturbation and storm layers, both of which are represented by very light gray (N8) very fine grained sandstone layers.
50	4900		46.0-55.0				
55	4895						55.0-65.0 ft. bedding plane fracturing frequency decreases to generally less than one per foot. Only trace of gypsum coatings on fractures. Core becoming more competent. Amount of bioturbated bedding and storm layers increases below ~60.0 ft to ~5%. Limonite colored material coats most fractures. A high angle (~60 degrees) fracture coated with limonite at 61.3-62.2 ft. and a fissile fractured layer at 62.5 ft. Trace pyritized fossil material.
60	4890		55.0-65.0				
65	4885				55.0-75.0 Fair		65.0-75.0 ft. ~65.0-65.5 ft. for a short core run. Bedding plane fracturing nearly absent, only 2 or 3 in this run. Possible 30 degree inclined fracture at ~73.5 ft. Trace limonitic coatings noted at 65.5 ft., and no limonitic or gypsum coatings on fractures noted for rest of run. Light-colored, storm or bioturbated beds are about 3% of layering. Core becoming more competent, most breaks are drilling-induced. Trace fine carbonaceous material and pyrite along some bedding.
70	4880		65.0-75.0				

BOREHOLE LOG CRJ01-0207

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0207
SITE Crescent Junction Site **DATES DRILLED** 09/10/2005 to 10/20/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
75	4875						75.0-85.0 ft. fossil @ 80.6 ft., 0.1 x 0.05 ft. Continued low angle bedding (5 degrees), core interior is dry, no indication of water from formation.
80	4870		75.0-85.0				
85	4865				75.0-95.0 Good		85.0-95.0 ft. dark gray (N3-N4) when wet, medium gray (N5) when dry, uniform, thin bedded, calcic, some gypsum, silty claystone. Bedding +/-5 degrees. Sporadic very fine grained sand to thinly bedded siltstone partings.
90	4860		85.0-95.0				
95	4855						95.0-105.0 ft. mechanical fracturing along bedding planes most common, no fracturing noted except partings along bedding planes, no significant iron alteration zones or infillings, calcite and gypsum predominantly along hairline bedding planes.
100	4850		95.0-105.0		95.0-300.0 Excellent		
105	4845						105.0-115.0 ft. no indication of formation water noted between 75.0-175.0 ft.
110	4840		105.0-115.0				

BOREHOLE LOG CRJ01-0207

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SITE Crescent Junction Site **DATES DRILLED** 09/10/2005 to 10/20/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
115	4835						115.0-165.0 ft. shale or claystone,medium dark gray (N4), as above.
120	4830		115.0-125.0				
125	4825						
130	4820		125.0-135.0		95.0-300.0 Excellent		
135	4815						
140	4810		135.0-145.0				
145	4805						
150	4800		145.0-155.0				

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PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0207
SITE Crescent Junction Site **DATES DRILLED** 09/10/2005 to 10/20/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
155	4795						
160	4790		155.0-165.0				
165	4785						165.0-175.0 ft. @167.5 ft. is a weak thinly bedded, silty layer about 0.4 ft. thick. @168.0-169.0 ft. couple of hard microcrystalline sand lenses (porcelaneous-appearing) up to 0.1 ft. thick. Sporadic silt and sand beds up to 0.05 ft. thick.
170	4780		165.0-175.0		95.0-300.0 Excellent		
175	4775						175.0-185.0 ft. @175.2-175.4, 175.7-176.3 ft., core is broken into 0.05 ft. pieces. @176.7-177.4 ft. core breaks to 3 pieces 0.2-0.3 ft. long. @179.5-180.5 core in 3 pieces. @182.0-182.5 several broken pieces.
180	4770		175.0-185.0				
185	4765						185.0-195.0 ft. competent with only bedding planes and hairline gaps, calcite filling. No breakage other than mechanical @ 185.0, 187.5, 191.0, and 193.5 ft. Bedding plane <~5 degrees, sporadic bioturbation zones about 0.1 ft. thick.
190	4760		185.0-195.0				

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SITE Crescent Junction Site **DATES DRILLED** 09/10/2005 to 10/20/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
195	4755						195.0-205.0 ft. mechanical breakage along bedding planes @ 198.0, 201.3, and 204.0-205.0 ft.
200	4750		195.0-205.0				
205	4745						205.0-215.0 ft. claystone. @205.0-207.5 ft. three 0.3 ft. sections showing strong mechanical fractures, no apparent lithologic cause, could be caused by vibration in drill string. Inner core is dry , no indication of water in the formation.
210	4740		205.0-215.0		95.0-300.0 Excellent		
215	4735						215.0-225.0 ft. three fractures @ 20 degrees to core axis from 216.5-217.0 ft. Clean hairline fractures, no secondary coatings or evidence of water, fractures spacing is approximately 0.1 ft.
220	4730		215.0-225.0				
225	4725						225.0-235.0 ft. From 226.0-226.5 ft. strong mechanical damage. Core is generally very consistent in appearance, random, thin (<0.025 ft.) storm and bioturbation layers.
230	4720		225.0-235.0				

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SITE Crescent Junction Site **DATES DRILLED** 09/10/2005 to 10/20/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
235	4715						235.0-245.0 ft. @240.2-240.8 ft. zone of silt size, coarser sediment interbedded with dark gray claystone, zone is mechanically fractured, otherwise the run is consistent with previous runs, no significant change in bedding, lithology, amount of mechanical fractures, no indication of formation water.
240	4710		235.0-245.0				
245	4705						245.0-255.0 ft. @ 251.5 ft. hairline clean fracture about 20 degrees to core axis is mechanical in origin. Run is competent with no other remarkable characteristics, usual bedding, coloration, fracturing, recovery, no indication of water in the formation.
250	4700		245.0-255.0		95.0-300.0 Excellent		
255	4695						255.0-265.0 ft. @256.0-259.0 ft. majority of mechanical fractures occur 0.15-0.4 ft. apart. Medium dark gray (N4) claystone with some bedding planes and no indication of water in the formation.
260	4690		255.0-265.0				
265	4685						265.0-275.0 ft. @266.0 ft. is a mechanical fracture that is filled with a lot of clay. This could be from cuttings or (unlikely but possible?) a large clay filled fracture? @268.7-269.4 ft. zone of fractures along bedding, some bioturbation-associated breakage, friable. Remainder of run is typical shale.
			265.0-275.0				

BOREHOLE LOG CRJ01-0207

PROJECT MOAB
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BOREHOLE NUMBER CRJ01-0207
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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
275	4675						275.0-285.0 ft. competent, unremarkable. Mechanical fractures prevalent @275.0-277.0 ft. with breaks every 0.2-0.4 ft. Only other break @279.5 ft. Nice consistent run, even bedding, minor bioturbation, no indication of water in the formation.
280	4670		275.0-285.0				
285	4665				95.0-300.0 Excellent		285.0-295.0 ft. @ 291.15-291.4, core is fractured and platy - this fracturing is mechanical, but a result of lower calcic content of core.
290	4660		285.0-295.0				
295	4655						295.0-300.0 ft. no evidence of water.
			295.0-300.0				
300	4650						Total Depth 300.0 ft.
305	4645						

BOREHOLE LOG CRJ01-0208

PROJECT MOAB
LOCATION Crescent Junction, UT.
SITE Crescent Junction
WELL NUMBER CRJ01-0208
NORTH COORD. (FT) 6796412.91
EAST COORD. (FT) 2126089.65
SURFACE ELEV. (FT NGVD) 4986.10
HOLE DEPTH (FT) 301.00

DATE DRILLED 09/09/2005 to 10/08/2005
DRILLING COMPANY Layne GeoConstruction
DRILLING METHOD H.S.A., Rotary Core
SAMPLING METHOD HQ CORE
DRILL OPERATOR Neaman, J. (Terra. 1000, BB80), Hyleman, B. (BB80)
REMARKS 4-inch steel surface casing cemented to depth of 40.0 feet below land surface.

BIT SIZE(S) (IN) 8.5
CORE SIZE(S) (IN)
LOGGED BY Goodknight, C., Reed, J.
WL (FT BGS)

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT.)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
	4985	3, 4, 6, 6	0-0.5, 0.5-1.0, 1.0-1.5, 1.5-2.0				0-1.5 ft. CLAYEY SILT (ML); gray (2.5Y 5/1), highly calcareous, moderate roots, worm hole porosity.
		10, 9, 16, 11	2.0-2.5, 2.5-3.0, 3.0-3.5, 3.5-4.0				1.5-3.5 ft. SANDY SILT (ML); light brownish gray (2.5Y 6/2), highly calcareous, mottled, compacted, some roots, trace rock fragments to 0.1 ft. in diameter. 3.5-4.5 ft. greater amount (~5%) of rock fragments to .05 ft. in diameter.
5	4980	8, 9, 12, 11	5.0-5.5, 5.5-6.0, 6.0-6.5, 6.5-7.0				4.5-6.0 ft. GRAVELLY SILT (ML); some very fine grained sand and ~20% rock fragments to 0.1 ft. in diameter, highly calcareous, light brownish gray (2.5Y 6/2). 6.0-9.0 ft. GRAVELLY SAND (SW); sand is very fine to coarse grain and ~70%; gravel consists of rock fragments up to 0.1 ft. in diameter; sand matrix is highly calcareous, light brownish gray (10YR 6/2), some mottling.
10	4975	22, 19, 16, 25	10.0-10.5, 10.5-11.0, 11.0-11.5, 11.5-12.0				9.0-15.75 ft. SILT (ML); trace of very fine grained sand , pale brown (10YR 6/3), highly calcareous, some mottling, compacted in some places, trace rock fragments.
15	4970	11, 11, 18, 21	15.0-15.5, 15.5-16.0, 16.0-16.5, 16.5-17.0				15.75-19.0 ft. GRAVELLY SAND (SP); sand is mostly fine to very fine grained and ~75%; gravel consists of rock fragments up to 0.2 ft. in diameter, trace gypsum crystals, highly calcareous, mottled.
20	4965	40, 42, 50/5"	20.0-25.5, 20.5-21.0, 21.0-21.5				19-20.5 ft. SILT (ML); light yellowish brown (10YR 6/4), highly calcareous, compacted. 20.5-22.0 ft. SILTY SAND (SM); silt 40%, very fine grained sand ~60%, light yellowish brown (2.5Y 6/3), trace mottling, highly calcareous, trace rusty colored siltstone fragments.
25	4960	50/4"	25.0-30.0				22.0-30.0 ft. WEATHERED MANCOS SHALE BEDROCK; Contact estimated at 22.0 ft. 25.0-30.0 ft. mostly silty mudstone, light olive gray (5Y 6/1) to medium gray (N5), highly calcareous, bedding plane fractures spaced mostly 0.1 ft. or less apart, wavy, contorted (bioturbated) bedding. Moderately weathered.
30	4955		30.0-35.0		25.0-35.0 Very Poor		30.0-31.5 ft. No Recovery. 31.5-301.0 ft. MANCOS SHALE: 31.5-35.0 ft. bedding plane fractures about 0.1 ft. apart down to ~33.0 ft., then about 0.2 ft. apart to 35.0 ft. Light olive gray (5Y 6/1) to medium gray (N5). @32.7 ft., a thin silty clay bed that is dark yellowish orange (10YR 6/6) with trace pyrite. Mostly clayey siltstone. Highly calcareous throughout, trace pyrite

BOREHOLE LOG CRJ01-0208

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SITE Crescent Junction Site **DATES DRILLED** 09/09/2005 to 10/08/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
	4950		35.0-40.0		35.0-40.0 Poor		crystals and fine framboidal pyrite along bedding surfaces along with trace carbonaceous material. Gypsum crystals along bedding plane fracture @34.5 ft. Bioturbated bedding in many places. 35.0-36.5 ft. No Recovery. 36.5-40.0 ft. moderately calcareous, mostly siltstone and ~20% very fine grained sandstone (mainly in lighter gray areas -very light gray, N8). Siltstone is mostly medium gray (N5). Bedding plane fractures are rare - only 0.4-0.5 ft. apart, indicating rock is very competent and only slight to non-weathered. Trace pyrite and carbonaceous material along bedding, which is wavy and bioturbated in most places. Some large burrows.
40	4945		40.0-45.0		40.0-55.0 Fair		40.0-45.0 ft. ~20% very fine grained sandstone, very light gray (N8) in wavy to bioturbated layers up to 0.03 ft. thick; remainder of rock is siltstone to clayey siltstone, medium gray (N5), weak to moderately calcareous. Trace fine pyrite and carbonaceous material along bedding. Core easily broken along bedding when handled. No natural fractures and limonitic coloration and no gypsum/calcite along bedding. Core dry when broken open.
45	4940						45.0-55.0 ft. 20-25% of rock that is very fine to fine grained sandstone occurs in layers up to 0.1 ft. thick. Most layers are wavy and bioturbated. More drilling-induced bedding plane fractures - no natural fractures present or indication of water movement (limonite, calcite, gypsum).
50	4935		45.0-55.0				
55	4930						55.0-65.0 ft. ~20% of rock that is very fine to fine grained sandstone occurs in layers up to ~0.07 ft. thick. No natural fractures present or indications of water movement. Trace pelecypod fossil imprints on some bedding surfaces.
60	4925		55.0-65.0				
65	4920				55.0-85.0 Good		65.0-75.0 ft. very fine to fine grained sandstone layers that compose ~20% of rock from 65.0 to 70.0 ft. decreases gradually through 70.0-75.0 ft to about 10%. Bedding plane fractures more frequent from 65.0-68.0 ft. than from 68.0-75.0 ft., but no evidence that they are anything more than drilling induced. Increase in carbonaceous material and associated framboidal pyrite (and trace amber-like material) along bedding planes in the medium gray (N5) silty claystone layers that comprise most of the rock.
70	4915		65.0-75.0				

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
75	4910						75.0-85.0 ft. most of the rock is medium gray (N5) and silty claystone to clayey siltstone (~90%). ~10% is very light gray (N8) very fine to fine grained sandstone in thin (<0.01 ft.) layers or as burrows and bioturbation segregations and irregular layers. Trace pelecypod and cephalopod fossil imprints on a few bedding surfaces. High angle (~80 degree) fractures at top and bottom of interval - top fracture at 75.0-75.8 ft. is smooth and may be natural and it is tight. Bottom fracture at 84.2-84.6 ft. is hackly and is probably drilling-induced.
80	4905		75.0-85.0				
85	4900						85.0-95.0 ft. most rock is silty claystone to clayey siltstone (95%). Only ~5% is very light gray (N8) very fine grained sandstone in a few thin layers (storm layers?) but mostly in round elongated forms that occur along bedding or cut down through bedding at various angles - these are likely burrows. Trace of various fossil imprints and less fine carbonaceous material along bedding. No natural fractures seen.
90	4895		85.0-95.0				
95	4890						95.0-105.0 ft. amount of very light gray (N8), very fine grained sandstone in wavey layers and as bioturbation (burrows) gradually increases from 5% to ~15% @105.0 ft. Increased amount of fine carbonaceous material along bedding surfaces of the main rock type - clayey siltstone. No natural fractures seen.
100	4885		95.0-105.0		85.0-301.0 Excellent		
105	4880						105.0-115.0 ft. amount of very light gray (N8), very fine grained sandstone in wavy layers and as bioturbation gradually decreases from ~15% at 108.0 ft. to 1-2% at 112.0 ft. At 115.0 ft., rock is mostly (~98%) medium gray (N5) silty claystone, weak-moderately calcareous. No natural fractures seen. Core dry when broken open.
110	4875		105.0-115.0				

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SITE Crescent Junction Site **DATES DRILLED** 09/09/2005 to 10/08/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
115	4870						115.0-125.0 ft. slight increase in amount of bioturbated layers (and very fine grained sandstone) from ~2% to ~5% from 117.0-122.0 ft. A hackly, near vertical fracture at 115.2-115.8 ft., probably drilling induced; a similar fracture at 124.6-125.0 ft. At 119.5 ft. is a pelecypod fossil imprint with fine pyrite. No natural fractures seen. Decrease in amount of bioturbated layers from 122.0-125.0 ft. down to ~2% or less.
120	4865		115.0-125.0				
125	4860						125.0-135.0 ft. amount of bioturbated and very fine grained sandstone layers decreases through interval from ~2% to a trace at 135.0 ft. Vertical fractures at 129.0-129.5 ft. and 132.8-134.5 ft. are somewhat wavy and arcuate and are thought to be drilling induced. No definite natural fractures seen. Pelecypod fossil imprint at 131.2 ft.
130	4855		125.0-135.0		85.0-301.0 Excellent		
135	4850						135.0-145.0 ft. Note: drilled to 145.0 ft. on 10/5/2005 but did not open core barrel till 10/6/2005. Although core appears intact and competent, it parts easily upon handling, revealing fossil imprints with fine pyrite coatings on many of them. Rock is homogeneous silty claystone, medium dark gray (N4), slightly calcareous, and only trace of bioturbated bedding. No natural fractures seen.
140	4845		135.0-145.0				
145	4840						145.0-155.0 ft. amount of bioturbated spots and layers increases slightly to 1-2%. Vertical fractures at ~148.5 and 152.5-153.4 ft. have smooth surfaces and are probably drilling induced - no evidence of water movement or natural fracturing on the surfaces. Thin, fissile bedding at ~145.0-145.5, 150.5-151.0, and 151.5-152.0 ft. are weaker and easily parted (softer).
150	4835		145.0-155.0				

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
155	4830						155.0-165.0 ft. amount of bioturbation decreases slightly to ~1%. High angle (~80 degrees) fractures at ~158.0-158.8 ft. and 159.0-159.7 ft. - no limonitic or other coatings along these tight fractures, therefore, they are probably drilling induced. Core hard and competent throughout. Trace fine carbonaceous material and fossil imprints.
160	4825		155.0-165.0				
165	4820						165.0-175.0 ft. bioturbated or storm layering (very fine grained sandstone) is only a trace. No fractures seen. From 165.5-169.4 ft., rock is fissile, softer, and parts easily. From 169.4-173.0 ft., core is more competent and breaks into 0.1-0.2 ft. segments. Core hard and competent from 173.0-175.0 ft.
170	4815		165.0-175.0		85.0-301.0 Excellent		
175	4810						175.0-185.0 ft. core hard and competent - no natural fractures seen. Drilling-induced fractures ~0.5 ft. long occur at top and bottom of core run. Trace fine carbonaceous material and fossil imprints. Lithology continues as silty claystone. Dry when core broken open.
180	4805		175.0-185.0				
185	4800						185.0-195.0 ft. possible natural fractures at 188.0-188.3 ft. - three fractures in this interval are inclined ~45 degrees and separated by ~0.1 ft. - no evidence of fluid movement along these tight fractures. From 189.0-191.0 ft., amount of bioturbation increases to 2-3%. Below 192.0 ft., bioturbated bedding amounts to only a trace. Core hard and competent throughout, and is generally a claystone, medium dark gray (N4).
190	4795		185.0-195.0				

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
195	4790						195.0-205.0 ft. hard and competent core throughout. Trace to ~1% bioturbated or storm bedding through interval. Inclined bedding is 5-7 degrees from horizontal, reflecting regional dip. No fractures present. Large pelecypod imprint at 204.5 ft.
200	4785		195.0-205.0				
205	4780						205.0-215.0 ft. rock is softer and more fissile from 207.5-208.5 ft. Fine carbonaceous material on some bedding planes. Trace to ~1% bioturbated or storm bedding up to 0.01 ft. thick, very light gray (N8), very fine grained sandstone. No fractures present. Dry when core broken open.
210	4775		205.0-215.0		85.0-301.0 Excellent		
215	4770						215.0-225.0 ft. core breaks into 0.05-0.3 ft. segments from 215.0-218.0 ft. - appears to be drilling induced. From 218.0-219.6 ft., core easily parts and appears to be somewhat more fissile (softer). From 219.6-225.0 ft., core is hard and competent. No natural fractures seen. Only trace of bioturbated bedding.
220	4765		215.0-225.0				
225	4760						225.0-235.0 ft. soft core, thinly bedded.
230			225.0-235.0				

BOREHOLE LOG CRJ01-0208

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SITE Crescent Junction Site **DATES DRILLED** 09/09/2005 to 10/08/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
235	4750						235.0-245.0 ft. competent core - no soft spots.
240	4745		235.0-245.0				
245	4740						245.0-255.0 ft. soft, thin bedded, easily parted @250.8-251.6 ft.; rest of core competent.
250	4735		245.0-255.0		85.0-301.0 Excellent		
255	4730						255.0-265.0 ft. light gray (N7) from 259.1-259.25 and 259.8-259.95 ft. - strong HCL, fine grained, dense, scattered small white fragments with strong HCL (calcite?). These are porcelaneous-appearing masses along bedding.
260	4725		255.0-265.0				
265	4720		265.0-275.0				265.0-275.0 ft. strong HCL, fine grained, dense, scattered small white fragments with strong HCL (calcite?) from 266.35-266.5 ft. - light gray (N7). These are additional porcelaneous masses.

BOREHOLE LOG CRJ01-0208

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SITE Crescent Junction Site **DATES DRILLED** 09/09/2005 to 10/08/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
	4715						
275	4710						275.0-285.0 ft. softer core, thin bedded, parts easily from 276.1-276.5, 278.3-279.5, and 280.1-280.7 ft.
280	4705		275.0-285.0				
285	4700				85.0-301.0 Excellent		
290	4695		285.0-295.0				
295	4690						
300	4685		295.0-301.0				Total Depth 301.0 ft.
305	4680						

BOREHOLE LOG CRJ01-0209

PROJECT MOAB
LOCATION Crescent Junction, UT.
SITE Crescent Junction
WELL NUMBER CRJ01-0209
NORTH COORD. (FT) 6795168.53
EAST COORD. (FT) 2126441.58
SURFACE ELEV. (FT NGVD) 4955.70
HOLE DEPTH (FT) 300.00

DATE DRILLED 09/07/2005 to 09/27/2005
DRILLING COMPANY Layne GeoConstruction
DRILLING METHOD H.S.A., Rotary Core
SAMPLING METHOD HQ CORE
DRILL OPERATOR Neaman, J. (Terra. 1000, BB80), Hyleman, B. (BB80)
REMARKS 4-inch steel surface casing cemented to depth of 35.0 feet below land surface.

BIT SIZE(S) (IN) 8.5
CORE SIZE(S) (IN)
LOGGED BY Goodknight, C.
WL (FT BGS)

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT.)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
	4955	3, 3, 4, 3	0-0.5, 0.5-1.0, 1.0-1.5, 1.5-2.0				0-2.0 ft. CLAYEY SILT (ML); light brownish gray (2.5Y 6/2), highly calcareous, moderate amount of roots, worm hole porosity, motted at 1.0-2.0 ft.
		3, 4, 6, 7	2.0-2.5, 2.5-3.0, 3.0-3.5, 3.5-4.0				2.0-5.25 ft. SILTY SAND (SM); pale brown (10 YR 6/3), highly calcareous, trace roots, noncohesive.
5	4950	7, 11, 12, 13	5.0-5.5, 5.5-6.0, 6.0-6.5, 6.5-7.0				5.25-6.75 ft. SAND (SW); light brownish gray (10YR 6/2), moderately calcareous, fine to coarse grained sand with ~2% rock fragments, probably a fluvial channel or sheetwash deposit.
							6.75-9.0 ft. CLAYEY SILT (ML); pale brown (10YR 6/3), highly calcareous, compacted, slightly mottled, dry.
10	4945	13, 13, 17, 20	10.0-10.5, 10.5-11.0, 11.0-11.5, 11.5-12.0				9.0-11.25 ft. SILT (ML); light brownish gray (2.5Y 6/2), highly calcareous, trace very fine grained sand, possibly an eolian deposit.
15	4940	35, 50/4"					11.25-16.0 ft. GRAVELLY SAND (SW); alluvial detritus, soft down to 14.0 ft. and increasingly harder 14.0-16.0 ft. Mostly light gray (2.5Y 7/2), highly calcareous, platy shale fragments, trace gypsum crystals that form plates, sandstone rock fragments up to 0.1 ft. long, some dolomitic ironstone fragments up to 0.05 ft. long.
							16.0-18.5 ft. No Recovery
20	4935		16.0-21.0				18.5-21.0 ft. GRAVELLY SAND (SW); alluvial detritus, soft to 19.5 ft, then hard and compacted to 21.0 ft. Soft material is mostly light yellowish brown (2.5Y 6/4) and more compacted material is mostly light brownish gray (2.5Y 6/2). Rock fragments of siltstone, fine grained sandstone, and ironstone are tabular to subrounded and up to 0.2 ft. long. Rock fragments seem to be calcareously cemented by groundmass in places.
			21.0-24.0				21.0-22.75 ft. No Recovery.
25	4930						22.75-35.0 ft. WEATHERED MANCOS SHALE BEDROCK: (contact estimated at 22.0 ft.) mostly silty mudstone, light gray (N7), highly calcareous, horizontal bedding plane fractures numerous, pelecypod impression @23.5 ft. A thin 0.05 ft. thick rusty, light brown (5YR 5/6) - colored siltstone bed at 23.0 ft. Soft, moderate to highly weathered. 24.0-27.25 ft. No Recovery.
			25.0-30.0				27.25-30.0 ft. core from 27.25 to 28.25 ft. was ground up in coring process and only rounded pieces are represented, moderately weathered. Horizontal bedding plane fractures spaced about 0.1-0.2 ft. apart from 28.25 ft. to 30.0 ft. Mostly clayey siltstone, gypsum crystal fracture coatings, highly calcareous, trace black fossil impressions in bedding planes with framboidal pyrite, pale yellowish brown (10YR 6/2), slightly weathered hard. Trace of dark carbonaceous material on bedding planes.
30	4925		30.0-35.0		16.0-45.0 Very Poor		30.0-33.0 ft. No Recovery.
							33.0-35.0 ft. horizontal bedding plane fractures spaced ~ 0.1 ft. apart predominate, a few vertical fractures with gypsum crystal coatings, mostly clayey siltstone, pale yellowish brown (10YR 6/2) to light olive gray (5Y 6/1).

BOREHOLE LOG CRJ01-0209

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0209
SITE Crescent Junction Site **DATES DRILLED** 09/07/2005 to 09/27/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
	4920						highly calcareous. Wavy to contorted (bioturbated) bedding, hard. 35.0-300.0 ft. MANCOS SHALE:
			35.0-40.5				35.0-40.5 ft. silty claystone, mainly horizontal fractures spaced every 0.1-0.2 ft. apart, some 0.01 ft. wide vertical fractures filled with crystalline gypsum at 38.0-39.8 ft. Slight to moderately calcareous, even bedded, light olive gray (5Y 6/1), hard, competent material, only slightly weathered especially in upper 2.0-3.0 ft. A 45 degree fracture at ~37.8 ft. that has very thin gypsum coating. Small crystal of amber-colored material at ~38.5 ft., ~0.01 ft. crystal.
40	4915						40.5-45.0 ft. mostly silty claystone and even, thinly bedded except for 42.3-42.6 ft., which is bioturbated - these small blotches are dark yellowish orange (10YR 6/6) and rest of rock is light olive gray (5Y 6/1). Mainly horizontal fractures, spaced 0.1-0.2 ft. apart, moderately calcareous, hard, competent rock with 0.01 ft. wide gypsum filled horizontal fracture at 41.2 ft. Vertical fracture at 42.8-43.2 ft.
			40.5-45.0				
45	4910						45.0-55.0 ft. mostly silty claystone and even, thinly bedded. Trace bioturbated bedding and framboidal pyrite replacing carbonaceous material along some bedding planes. Rock is olive gray (5Y 4/1) for the most part. Rock is more competent - bedding plane fractures are less frequent, spaced 0.3-0.4 ft. apart with limonite - colored (dark yellowish orange, 10YR 6/6) material on some fractures. 30 degree fracture at ~47.2 ft. Limonitic coated fracture at ~51.0 ft. A ~40 degree fracture at ~54.0 ft. with thin gypsum coating. Fossil ammonites and pelecypods noted at ~53.0 ft. A ~45 degree fracture with thin gypsum film at 49.0 ft.
50	4905		45.0-55.0		45.0-55.0 Poor		
55	4900						55.0-65.0 ft. thinly-evenly bedded silty claystone. Trace gypsum in vertical fracture at ~64.7 ft. Hard, competent rock, medium gray (N5), bedding plane fractures become rarer - only one or two per foot. Thin bed ~ 62.3-62.4 ft. that appears to be a coarser grained siltstone and burrowed with hackly fracture, moderate yellowish brown (10 YR 5/4), slightly calcareous.
60	4895		55.0-65.0		55.0-68.0 Fair		
65	4890						65.0-75.0 ft. mostly silty claystone except for a bioturbated section @67.7-68.0 ft. that has wavy bedding and is coarser grained up to very fine grain sand. Large fossil (cephalopod?) at base of this interval at ~68.0 ft. Moderately calcareous in coarser grain interval and slight to moderately calcareous elsewhere. From 65.0-66.0 ft. bedding plane fracturing is frequent (<0.1 ft.) and thick (0.01 ft.) gypsum coating at 65.2 ft., limonitic coating at 65.5 ft. and gypsum coating at 65.7 ft. Vertical fracture at 66.0-66.3 ft. and several at 63.7 ft. and 64.5 ft. Core much harder and more competent (few fractures) below 66.0 ft.
70	4885		65.0-75.0				

BOREHOLE LOG CRJ01-0209

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0209

SITE Crescent Junction Site **DATES DRILLED** 09/07/2005 to 09/27/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
75	4880						75.0-85.0 ft. trace bioturbation, mostly even, thin bedding, moderately calcareous, hard competent rock, bedding plane fractures less frequent than 0.5 ft. Vertical fracture(s) from 76.0-77.0 ft. and 84.0-84.5 ft. with limonite coatings. No gypsum seen. Limonitic coating also at 78.0 ft. Trace fine carbonaceous material and framboidal pyrite on bedding planes.
80	4875		75.0-85.0				
85	4870						85.0-95.0 ft. most bedding is parallel and even, trace-minor bioturbation scattered through interval and is expressed as flaser bedding. Light-colored bioturbated zones are calcareously cemented and coarser grained (very fine grain sand) than rest of core (silty claystone). Rock hard and competent, bedding plane fractures are rare, closed, and coated with limonite (dark yellowish orange, 10YR 6/6). Several fractures 85.0-86.0, 89.0, 91.9, and 94.2 ft. Slightly to moderately calcareous throughout.
90	4865		85.0-95.0				
95	4860				68.0-120.0 Good		95.0-105.0 ft. fractures infrequent and no limonitic or gypsum coatings observed, therefore fractures seen may be drilling induced. Fine carbonaceous fragments seen on some bedding surfaces.
100	4855		95.0-105.0				
105	4850						105.0-115.0 ft. fractures infrequent to absent - no gypsum or limonitic coatings observed, so fractures seen may be drilling induced. Color is mostly medium gray (N5). Some white fine calcite films on bedding surfaces and some dark fine grained carbonaceous material disseminated throughout.
110	4845		105.0-115.0				

BOREHOLE LOG CRJ01-0209

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0209
SITE Crescent Junction Site **DATES DRILLED** 09/07/2005 to 09/27/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
115	4840						115.0-125.0 ft. Increased bedding plane fractures especially from 118.0-120.0 ft. where spacing is generally <0.1 ft. Some closely spaced fractures also at ~117.2-117.5 ft. in softer shale, possibly related to thin bentonitic (?) layer that was lost. Silty claystone is moderately calcareous. Trace black carbonaceous material and framboidal pyrite associated with fine fossil fragments on bedding. Rock mostly hard and competent below 120.5 ft.
120	4835		115.0-125.0				
125	4830						125.0-135.0 ft. bedding plane fracturing is infrequent, non-fractured segments >1.0 ft. long are the rule. Bioturbated bedding imparting a flaser bedding structure is more frequent and some burrow in fillings are present. Burrow and bioturbation fillings are lighter colored, very light gray (N8), and are composed of very fine grain sand. Moderately calcareous and trace black carbonaceous material and framboidal pyrite associated with fine fossil fragments.
130	4825		125.0-135.0		120.0-300.0 Excellent		
135	4820						135.0-145.0 ft. bedding plane fracturing nearly nonexistent, very competent, hard silty claystone. Bioturbated bedding imparts a flaser and small-scale lenticular bedding. Trace black carbonaceous material and framboidal pyrite associated with fine fossil fragments. A 4.0 ft. and 3.5 ft. unbroken core segments indicate hardness of this interval. Trace calcareous (calcite) fossil shell replacement along some bedding surfaces.
140	4815		135.0-145.0				
145	4810						145.0-155.0 ft. bedding plane fracturing evident only from 146.0-147.0 ft. where they are ~0.1-0.2 ft. apart. Slight bioturbated bedding continues - bedding dips ~5-7 degrees from horizontal. Fresh shale is medium gray (N5) and slightly-moderately calcareous.
150	4805		145.0-155.0				

BOREHOLE LOG CRJ01-0209

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0209
SITE Crescent Junction Site **DATES DRILLED** 09/07/2005 to 09/27/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
155	4800						155.0-165.0 ft. bedding plane fractures nearly absent- none discernible from drilling induced breaks. Hard, competent core. Bioturbated bedding seems to be increasing, with individual flaser/lenticular bioturbated bed fillings of very fine grain sand up to 0.02 ft. thick. Rock type, overall, approximates siltstone when averaging between medium gray silty claystone and very light gray and very fine grained sandstone facies.
160	4795		155.0-165.0				
165	4790						165.0-175.0 ft. bedding plane fractures rare - not discernible from drilling-induced fractures. Hard competent rock. Bioturbation increasingly interrupts bedding and burrowed layers are up to 0.05 ft. thick.
170	4785		165.0-175.0		120.0-300.0 Excellent		
175	4780						175.0-185.0 ft. no discernible bedding plane fractures. Hard competent rock, mostly medium gray (N5). Bioturbation is ubiquitous and the very light gray (N8), very fine grained sandstone filling these burrowings composes ~20% of the rock. Small (<0.001 ft.) fragment of amber (?) colored material at 179.0 ft. Carbonaceous fragment ~0.15 ft. long at 179.7 ft.
180	4775		175.0-185.0				
185	4770						185.0-195.0 ft. few bedding plane fractures - some possibly between 192.0 and 194.0 ft. At 191.0-191.2 ft. is an abruptly lighter colored layer, yellowish gray (5Y 7/2) and almost a porcelaneous appearance from its very fine grained, dense character - highly calcareous and scattered very small white (calcite?) fragments are distributed in this layer and fine pyrite crystals are also associated with them. Bioturbated bedding also ubiquitous in this interval; and it is hard and competent. Finely divided carbonaceous fragments and pyrite along bedding.
190	4765		185.0-195.0				

BOREHOLE LOG CRJ01-0209

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0209
SITE Crescent Junction Site **DATES DRILLED** 09/07/2005 to 09/27/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
195	4760						195.0-205.0 ft. possibly a few bedding plane fractures in 196.0 ft. area and 199.0-200.0 ft. area although no limonitic or gypsum coatings observed. Below 199.0 ft. shale contains more fine black carbonaceous material on bedding surfaces. Also finely divided pyrite associated with this carbonaceous material. Rock only slightly calcareous. Core drilled slower from 200.0-205.0 ft. Moderately bioturbated throughout.
200	4755		195.0-205.0				
205	4750						205.0-215.0 ft. no bedding plane fractures observed - fractures in core are drilling induced. Overall rock color is medium gray (N5). Bedding shows lamination by very light gray (N8), thin bands that are composed of very fine grained sand - other very fine grained sand layers are formed from bioturbation and are lenticular or flaser shaped and up to 0.02 ft. thick. Slightly calcareous throughout. Finely divided black carbonaceous material on many bedding surfaces along with framboidal pyrite. Trace fossil impressions.
210	4745		205.0-215.0		120.0-300.0 Excellent		
215	4740						215.0-225.0 ft. bedding and fracture features are same as above. Several thin (up to 0.06 ft. thick) segregation of light-colored, very pale orange (10YR 8/2), densely calcareously cemented (almost porcelaneous) very fine grained material (silt size?). Scattered white pieces (<0.01 ft. in diameter) in segregations are highly calcareous and may be shell fragments and occur at 217.7, 218.0, 222.5, and 223.2 ft. Trace fossil shell fragments on bedding surfaces.
220	4735		215.0-225.0				
225	4730						225.0-235.0 ft. possible bedding plane fractures (6-8 of them) from 226.0-227.5 ft., but these may be drilling-induced because no indication of limonitic or calcitic/gypsum coatings. Laminated and bioturbated bedding forms continued. One dense calcareous segregation (as described above) at ~227.5-227.6 ft.
230	4725		225.0-235.0				

BOREHOLE LOG CRJ01-0209

PROJECT MOAB
SITE Crescent Junction Site
BOREHOLE NUMBER CRJ01-0209
DATES DRILLED 09/07/2005 to 09/27/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
235	4720						235.0-245.0 ft. possible bedding plane fractures from 240.0-241.0 ft., but they may be drilling induced because no indication of limonitic or calcitic/gypsum coatings. Laminated and bioturbated bedding forms continued. One dense calcareous segregation at 236.4-236.5 ft. has small scale vertical fractures (~0.02 ft. long) with calcite crystal infillings and masses of fine pyrite also associated with the calcite-filled fractures. These may be related to large cephalopod fossils(?).
240	4715		235.0-245.0				
245	4710						245.0-255.0 ft. no apparent bedding plane fractures. Laminated and bioturbated bedding forms continued. Dense calcareous segregation at 251.0 ft. and 252.3ft., which has white amorphous calcite fragments. Segregation at 252.3 ft. is a bulge that deforms later bedding above it. Imprint of a fine (framboidal) pyrite replaced fossil in core break at 250.8 ft., fossil is ~0.05 ft. long. Trace minute amber-colored particles in bedding plane at 255.0 ft.
250	4705		245.0-255.0		120.0-300.0 Excellent		
255	4700						255.0-265.0 ft. no apparent bedding plane fractures. Laminated and bioturbated bedding forms continued. No layers of dense calcareous segregations noted. Imprint at 265.3 ft. of long slender coiled (flattened and mostly stretched out) cephalopod. Coiled cephalopod ~0.1 ft. diameter at 261.8 ft.
260	4695		255.0-265.0				
265	4690						265.0-275.0 ft. no apparent bedding plane fractures. Laminated and bioturbated bedding forms continued. No layers of dense calcareous segregations noted. Slightly calcareous throughout. Fossil imprints in bedding at 271.6 and 273.5 ft.
			265.0-275.0				

BOREHOLE LOG CRJ01-0209

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0209

SITE Crescent Junction Site **DATES DRILLED** 09/07/2005 to 09/27/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
	4685						
275	4680						275.0-285.0 ft. bedding becomes more laminated with less bioturbated lenticular bedding. Slightly calcareous throughout. Rock is generally finer grained, medium dark gray (N4), generally a silty claystone, and the core fractures more easily when handling along bedding planes. At 282.5 ft. is a tight 20 degree inclined fracture with no coating on its surface. At~280.0 ft. is an imprint of a large cephalopod. Fossil imprints are moderately abundant in this section. Fine black carbonaceous material on bedding planes.
280	4675		275.0-285.0				
285	4670				120.0-300.0 Excellent		285.0-295.0 ft. bedding planes are mostly even and laminated, bioturbation is rare. No natural fractures observed. Core breaks readily along bedding. At ~287.0 ft. is imprint of a long, narrow, coiled cephalopod; at~295.0 ft. is an imprint of a pelecypod ~0.15 ft. diameter. Fine black carbonaceous material along bedding surfaces.
290	4665		285.0-295.0				
295	4660		295.0-300.0				295.0-300.0 ft. no natural fractures observed. Rock is hard and competent, but breaks readily along bedding surfaces. At 297.0 ft. is a large pyrite-plated mollusk imprint.
300	4655						Total Depth 300.0 ft.
305	4650						Note: When broken open, inside of core was dry throughout length of hole.

BOREHOLE LOG CRJ01-0210

PROJECT	MOAB	DATE DRILLED	08/30/2005 to 10/07/2005
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction
SITE	Crescent Junction	DRILLING METHOD	H.S.A., Rotary Core
WELL NUMBER	CRJ01-0210	SAMPLING METHOD	HQ CORE
NORTH COORD. (FT)	6797035.78	DRILL OPERATOR	Neaman, J. (CME 750), Hyleman, B. (CS1000)
EAST COORD. (FT)	2127690.41	REMARKS	4-inch steel surface casing cemented to depth of 23.0 feet below land surface.
SURFACE ELEV. (FT NGVD)	4998.60		
HOLE DEPTH (FT)	302.00		

BIT SIZE(S) (IN) 8.5
CORE SIZE(S) (IN)
LOGGED BY Goodknight, C.
WL (FT BGS)

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT.)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
		2, 2, 4, 5	0-0.5, 0.5-1.0, 1.0-1.5, 1.5-2.0				0-3.0 ft. SILT (ML); grayish brown (10YR 5/2), highly calcareous, moderate roots, wormhole porosity, ~1-2% small rock fragments.
	4995						3.0-5.0 ft. CLAYEY SILT (ML); light brownish gray (10YR 6/2), highly calcareous, some mottling, ~2% small rock fragments.
5		9, 50/5"	5.0-5.5, 5.5-6.0				5.0-10.0 ft. WEATHERED MANCOS SHALE BEDROCK; soft, highly weathered to 5.5 ft., grayish orange (10YR 7/4), highly calcareous, mostly siltstone. At 5.5-6.0 ft., is hard, very fine grained sandy dolomite, slightly calcareous, pale yellowish brown (10YR 6/2). Through sandy dolomite layer by ~7.0 ft. and into softer weathered Mancos Shale consisting mainly of siltstone, highly calcareous. @6.0 FIRST REFUSAL
	4990						
10		50/5"	10.0-10.5				10.0-302.0 ft. MANCOS SHALE: 10.0-10.5 ft. mostly siltstone, moderately weathered, grayish orange (10YR 7/4) to pale yellowish brown (10YR 6/2), highly calcareous. 10.5-11.5 ft. No Recovery.
			10.5-15.0				11.5-15.0 ft. moderately weathered (more abundant bedding plane fractures) to ~13.5 ft. Slightly weathered below to 15.0 ft. with bedding plane fractures spaced ~0.1-0.2 ft. apart. Wavy bedding and some bioturbation. Some carbonaceous material and fine framboidal pyrite on bedding surfaces. Highly calcareous, mostly siltstone, mostly yellowish gray (5Y 7/2), gypsum crystals on some fractures.
	4985						
15							15.0-16.8 ft. No Recovery.
			15.0-20.0				16.8-20.0 ft. moderately weathered as indicated by bedding plane fractures spaced generally <0.1 ft. apart, gypsum crystals along bedding fractures, wavy bedding and some bioturbation, yellowish gray (5Y 7/2) to medium light gray (N6), highly calcareous.
	4980						
20							20.0-21.5 ft. much softer dark shale/mudstone , dark yellowish brown (10YR 4/2 - a damp color), highly calcareous.
			20.0-23.0				21.5-23.0 ft. mainly siltstone, highly calcareous, pale yellowish brown (10YR 6/2) to dark yellowish brown (10YR 4/2), with bioturbated bedding. @22.5 ft. ~0.1. ft. thin light brown (5YR 5/6) bed, soft, highly calcareous, mostly silty claystone. From 22.6-23.0 ft. harder siltstone, bioturbated, gypsum fracture coatings, and pale yellowish brown (10YR 6/2) to dark yellowish brown (10YR 4/2), highly calcareous.
	4975				11.0-35.0 Very Poor		
25			23.0-26.0				23.0-26.0 ft. moderately to highly weathered, abundant bedding plane fractures spaced about 0.02 ft. apart, bedding is bioturbated, mostly very fine grained sandstone with some siltstone, highly calcareous, trace limonitic coatings along a few bedding plane fractures, trace black carbonaceous material, fine sandstone is yellowish gray (5Y 7/2) and darker silty layers are medium gray (N5).
	4970						
30			26.0-36.0				26.0-36.0 ft. bedding plane fractures decrease with depth to about every 0.5 ft. at 36.0 ft. Fractures at 32.6, 34.2, and 35.0 ft. have gypsum crystal fillings up to 0.01 ft. thick. A 40 degree inclined fracture at 35.3 ft. has thin white gypsum coating. Moderately calcareous throughout. Less very fine grained sandstone with depth - below ~29.0 ft. is mostly a silty claystone, medium gray (N5) with minor very light gray (N8) very fine grained sandstone filling bioturbated layers. From 26.0-29.0 ft., lithology is the same as from 23.0-26.0 ft above. At 34.1-34.2 ft. is a thin layer of light brown (5YR 5/6) clayey siltstone with trace of black carbonaceous material; this layer is noncalcareous.
	4965						

BOREHOLE LOG CRJ01-0210

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0210
SITE Crescent Junction Site **DATES DRILLED** 08/30/2005 to 10/07/2005

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DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
40	4960		36.0-46.0		35.0-43.0 Poor		36.0-45.0 ft. fracture zone with limonitic coloration @36.7-36.9 ft. and a similar layer @38.1 ft. From ~37.0-45.0 ft. mostly siltstone, medium dark gray (N4), slightly calcareous. Fractures with thin limonitic coating at 41.3 and 42.5 ft. - no natural fractures noted below that point. Trace bioturbation and carbonaceous material. Siltstone is mostly competent, hard, and brittle. Possible vertical fracture from 41.0-41.8 ft. with no coating and is tight.
45	4955						45.0-56.0 ft. From 45.0-46.0 ft. very fine grained sandstone, medium dark gray (N4), slightly calcareous, hard, competent, trace carbonaceous material.very fine grained sandstone and about 20% siltstone. Moderately bioturbated throughout. Slightly calcareous overall, moderately calcareous in coarser (very fine grained) sandstone fills of bioturbation layers. No natural fractures noted and no limonitic coloration or films of calcite or gypsum. Rock hard and competent throughout. At ~53.6-53.7 ft. is a rounded mass ~0.15 ft. in diameter and 0.1 ft. high of moderately to highly calcareous, dense, very fine grained sandstone that is lighter colored, medium light gray (N6), than rest of rock. Trace carbonaceous material fragments.
50	4950		46.0-56.0		43.0-55.0 Fair		
55	4945						56.0-66.0 ft. mostly sandy siltstone - siltstone ~60% and very fine grained sandstone ~40.0%. Most sandstone is in coarser grained bioturbation fills. Moderately bioturbated throughout. Trace black carbonaceous material on bedding planes. Rock is hard and competent, no natural fractures detected, moderately calcareous. Cephalopod imprint at 61.2 ft.
60	4940		56.0-66.0				
65	4935						66.0-76.0 ft. moderately bioturbated throughout. Fine carbonaceous material along bedding throughout. Rock hard and competent - no natural fractures detected. Moderately calcareous in coarser grained material and slightly calcareous in finer siltstone material. Fossil impressions on some bedding surfaces.
70	4930		66.0-76.0		55.0-85.0 Good		
	4925						

BOREHOLE LOG CRJ01-0210

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0210
SITE Crescent Junction Site **DATES DRILLED** 08/30/2005 to 10/07/2005

Continued from Previous Page

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
75							76.0-86.0 ft. moderately to highly bioturbated throughout. Fine carbonaceous material along bedding, vertical fractures ~76.0 to 76.6 ft. and 82.0-82.8 ft., no fracture coatings and both are tight. Fossil impressions on some bedding planes.
	4920						
80			76.0-86.0				
	4915						
85							86.0-96.0 ft. lithology gradually has changed to more siltstone - rock is now generally a sandy siltstone - probably ~40% very fine grained sandstone. Core is less competent and more prone to breakage along siltstone bedding planes. Bioturbated throughout. No natural fractures noticed. Dry inside core when broken. @93.0-94.0 ft. is a silty interval that breaks easily.
	4910						
90			86.0-96.0				
	4905						
95							96.0-107.0 ft. about equal amounts of very fine grained sandstone and siltstone. Moderately bioturbated . Core slightly more competent but still prone to break along siltstone bedding planes. No natural fractures observed. Dry inside core when broken. Trace fossil imprints, finely divided carbonaceous material along bedding, and fine framboidal pyrite.
	4900						
100			96.0-107.0		85.0-302.0 Excellent		
	4895						
105							107.0-117.0 ft. moderately to highly bioturbated throughout. Approximately equal amounts of very fine grained sandstone, very light gray (N8) and siltstone, medium dark gray (N4). Core mostly hard and competent. Prone to break along siltstone bedding planes. No natural fractures observed. Dry inside core when broken. Finely divided carbonaceous material along bedding.
	4890						
110			107.0-117.0				

BOREHOLE LOG CRJ01-0210

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0210
SITE Crescent Junction Site **DATES DRILLED** 08/30/2005 to 10/07/2005

Continued from Previous Page

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
115	4885						
							117.0-127.0 ft. same as above interval.
120	4880						
			117.0-127.0				
125	4875						
							127.0-137.0 ft. light colored, very fine grained sand in bioturbated layers can be as much as 0.1 ft. thick. Slightly calcareous throughout. Dry inside when broken.
130	4870				85.0-302.0 Excellent		
			127.0-137.0				
135	4865						
							137.0-147.0 ft. fossil impression at 137.0 ft. Below about 140.0 ft., finer grained overall - generally siltstone, with only about 10-20% very fine grained sandstone that depicts bioturbated layers. Slightly calcareous throughout. More fine carbonaceous material along bedding. Bedding more laminated and less bioturbated. Calcareous material layer as a fossil impression at ~139.5 ft.
140	4860						
			137.0-147.0				
145	4855						
							147.0-157.0 ft. bioturbated layers become increasingly rare. Rock is hard and competent, no natural fractures observed. Rock is generally medium dark gray (N4), slightly calcareous, and is a clayey siltstone. Flattened cephalopods and pelecypods occur in a few bedding planes. Finely divided carbonaceous material seen in shallower parts of hole is nearly absent here.
150	4850						
			147.0-157.0				

BOREHOLE LOG CRJ01-0210

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0210
SITE Crescent Junction Site **DATES DRILLED** 08/30/2005 to 10/07/2005

Continued from Previous Page

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
155	4845						
							157.0-167.0 ft. @160.0-164.0 ft., thin laminated (fissile) bedding in Mancos becomes less competent allowing it to fracture along bedding easily. Light-colored very fine grained sandstone to siltstone that defines the bioturbated layers composes only ~5% of the rock in this interval.
160	4840						
			157.0-167.0				
165	4835						
							167.0-177.0 ft. competent, hard rock throughout. Most bedding is laminated (parallel) and only <5% bioturbated bedding. Slightly calcareous throughout. Mostly medium dark gray (N4) clayey siltstone to silty claystone. Parts of flattened cephalopods along a few bedding planes.
170	4830				85.0-302.0 Excellent		
			167.0-177.0				
175	4825						
							177.0-187.0 ft. core is mostly intact initially throughout, but breaks readily due to its fissile character upon handling and drying. Rock is mostly silty claystone with moderately abundant imprints of fossils on bedding planes. Dry inside core when broken.
180	4820						
			177.0-187.0				
185	4815						
							187.0-197.0 ft. essentially same as last interval. Rare bioturbated layers.
190	4810						

BOREHOLE LOG CRJ01-0210

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0210
SITE Crescent Junction Site **DATES DRILLED** 08/30/2005 to 10/07/2005

Continued from Previous Page

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
			187.0-197.0				
	4805						
195							
							197.0-207.0 ft. rock comewhat coarser grained and is mostly clayey siltstone. Core much less prone to break upon handling - much more competent and hard. Fossil imprints moderately common along bedding. Only trace bioturbated bedding; most bedding is parallel.
	4800						
200							
			197.0-207.0				
	4795						
205							
							207.0-217.0 ft. unchanged from 197.0-207.0 ft. interval. Large cephalopod imprint at ~210.0 ft.
	4790						
210					85.0-302.0 Excellent		
			207.0-217.0				
	4785						
215							
							217.0-227.0 ft. unchanged from 197.0-207.0 ft. above. Core more prone to fracturing from ~218.0-220.0 ft. indicating greater fissility and possibly more claystone facies.
	4780						
220							
			217.0-227.0				
	4775						
225							
							227.0-237.0 ft. mostly silty claystone. Core is competent when first out in core barrel, but soon fractures along fissile bedding planes. Slightly calcareous throughout. Trace fine carbonaceous material on bedding planes. Trace amber in some bedding planes. Bioturbation present but <5% of bedding planes. Core dry inside when broken.
	4770						
230							

BOREHOLE LOG CRJ01-0210

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0210
SITE Crescent Junction Site **DATES DRILLED** 08/30/2005 to 10/07/2005

Continued from Previous Page

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
			227.0-237.0				
	4765						
235							
							237.0-247.0 ft. same as above interval.
	4760						
240							
			237.0-247.0				
	4755						
245							
							247.0-257.0 ft. unchanged from above interval (227.0-237.0 ft.). Bedding appears to dip ~5-7 degrees from horizontal throughout.
	4750						
250					85.0-302.0 Excellent		
			247.0-257.0				
	4745						
255							
							257.0-267.0 ft. unchanged from above interval (227.0-237.0 ft.). Core nearly unbroken initially. Fissile interval ~0.2 ft. thick at ~264.0 ft. that breaks easily. Bioturbation layers expressed as very light gray (N8) color and are ~1-2% of layering.
	4740						
260							
			257.0-267.0				
	4735						
265							
							267.0-279.0 ft. essentially unchanged from 227.0-237.0 ft. interval. Bioturbation ~1% or less of bedding - some of the coarser grained layering may be due to storm events rather than bioturbation. Thin fissile interval at ~271.0 ft. Weakly calcareous throughout. Trace fossil imprints - one large flattened cephalopod at ~ 270.7 ft. Trace very fine (framboidal) pyrite and amber.
	4730						

BOREHOLE LOG CRJ01-0210

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0210

SITE Crescent Junction Site **DATES DRILLED** 08/30/2005 to 10/07/2005

Continued from Previous Page

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE INTERVAL (FT)	EXTENT	RQD Description from core (FT)	GRAPHIC LOG	
			267.0-277.0				
	4725						
275							
	4720						
280							279.0-289.0 ft. unchanged from 227.0-237.0 ft. interval. Thin fissile interval at ~282.5 ft. (~0.2 ft. thick). Trace of fossil imprints throughout.
	4715		279.0-289.0				
285					85.0-302.0 Excellent		
	4710						
290							289.0-299.0 ft. unchanged from 227.0-237.0 ft. interval. Bioturbated/storm event layers of very fine grained sandstone are ~1% of layers, which may be up to 0.02 ft. thick.
	4705		289.0-299.0				
295							
	4700						
300			299.0-302.0				299.0-302.0 ft. unchanged from 227.0-237.0 ft. interval. Small flattened cephalopod fossil imprint at 301.0 ft.
	4695						Total Depth 302.0 ft. Note: Core is dry throughout length of hole when broken open.
305							
	4690						

Appendix B

Borehole Logs for Packer Testing

BOREHOLE LOG CRJ01-0211

PROJECT	MOAB	DATE DRILLED	11/20/2005 to 11/22/2005
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction
SITE	Crescent Junction	DRILLING METHOD	Casing Advance/HQ Core
WELL NUMBER	CRJ01-0211	SAMPLING METHOD	HQ CORE
NORTH COORD. (FT)	6796327.81	DRILL OPERATOR	Hyleman, B.
EAST COORD. (FT)	2123173.42	REMARKS	Packer test location approximately 10 ft. west of borehole 0026.
SURFACE ELEV. (FT NGVD)	4998.00		Log for borehole 0026 used for 0-16.0 ft.
HOLE DEPTH (FT)	40.00		

BIT SIZE(S) (IN) 4.0
CORE SIZE(S) (IN) 3.0
LOGGED BY Rupp, R.
WL (FT BGS)

DEPTH (FT BGL)	ELEV. (FT NGVD)	SAMPLE INTERVAL (FT.)	EXTENT	Downhole Packer Test	RQD Description from core (FT)	GRAPHIC LOG	
							0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, very fine grained sand, roots, mottled, trace rock fragments.
							2.0-4.0 ft. medium dense.
	4995						
							4.0-5.0 ft. Not Sampled.
5							5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, very fine grained sand, roots, mottled, trace rock fragments. @6.5 fine to medium grained sand.
							7.0-10.0 ft. Not Sampled.
	4990				Drill Pipe		
10							10.0-11.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), weak HCL, dry, medium dense to very dense, very fine grained sand, mottled.
							11.0-15.0 ft. Not Sampled.
	4985						13.0-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: No drilling change, but inferred to occur midway in the range of 11.0 to 15.0 ft.
15							15.0-16.0 ft. WEATHERED MANCOS SHALE: Highly weathered.
		16.0-18.0			16.0-40.0 ft. Very Poor		16.0-18.0 ft. SANDY SILT (ML); unconsolidated alluvial material containing broken, subrounded fragments and pebbles of sandstone mixed with sandy silt.
	4980				Packer Bit		18.0-27.0 ft. WEATHERED MANCOS SHALE BEDROCK: sandy shale, first occurrence of bedrock in this hole, highly weathered and broken. Poor core recovery - difficult to determine specific depths of core loss. No competent rock recovered - largest fragment is 0.15 ft. long and coated in pale yellowish brown (10YR 6/2) mud. Pebbly at

BOREHOLE LOG CRJ01-0211

PROJECT MOAB
SITE CRJ01-0211
BOREHOLE NUMBER CRJ01-0211
DATES DRILLED 11/20/2005 to 11/22/2005

Continued from Previous Page

DEPTH (FT BGL)	ELEV. (FT NGVD)	SAMPLE INTERVAL (FT)	EXTENT	Downhole Packer Test	RQD Description from core (FT)	GRAPHIC LOG	
							bottom of run.
	4975	18.0-27.0					
25					Test Zone #1 20-30'		
	4970	27.0-30.0			16.0-40.0 ft. Very Poor		27.0-40.0 ft. MANCOS SHALE: 27.0-30.0 ft. Sandy, silty shale, soft, thinly bedded, limonite-stained, very fine grained subrounded to rounded quartz sand, moderate yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/2).
30							30.0-36.0 ft. Sandy shale, very broken and highly weathered (as above) with 60% silty sandy clay mud - few shale fragments of any size - usually angular fragments (up to 0.15 ft. wide), moderate yellowish brown (10YR 5/4).
	4965	30.0-36.0					
35					Test Zone #2 30-40'		
	4960	36.0-40.0					36.0-40.0 ft. very broken and moderately weathered shale, sandy, fractured on bedding with longest piece of competent rock about 0.15 ft., moderate yellowish brown (10YR 5/4), dip of bedding is about 5 degrees, some iron staining but no gypsum crystallization as it was probably washed out.
40							Total Depth 40.0 ft.

BOREHOLE LOG CRJ01-0212

PROJECT	MOAB	DATE DRILLED	11/22/2005 to 11/30/2005
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction
SITE	Crescent Junction	DRILLING METHOD	Casing Advance/HQ Core
WELL NUMBER	CRJ01-0212	SAMPLING METHOD	HQ CORE
NORTH COORD. (FT)	6794311.80	DRILL OPERATOR	Hyleman, B.
EAST COORD. (FT)	2123552.99	REMARKS	Packer test location approximately 6.0 ft. east of borehole 0041.
SURFACE ELEV. (FT NGVD)	4950.00		Log for borehole 0041 used for 0-12.0 ft.
HOLE DEPTH (FT)	42.00		

BIT SIZE(S) (IN) 4.0
CORE SIZE(S) (IN) 3.0
LOGGED BY Rupp, R.
WL (FT BGS)

DEPTH (FT BGL)	ELEV. (FT NGVD)	SAMPLE INTERVAL (FT.)	EXTENT	Downhole Packer Test	RQD Description from core (FT)	GRAPHIC LOG	
							0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, very fine grained sand, roots, trace rock fragments.
							2.0-4.0 ft. medium dense.
							4.0-5.0 ft. Not Sampled.
5	4945						5.0-7.0 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong HCL, dry, medium dense, very fine grained sand (more than above), mottled.
							7.0-10.0 ft. Not Sampled.
					Drill Pipe		
10	4940						10.0-10.5 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong HCL, dry, medium dense, very fine grained sand, mottled.
							10.5-12.0 ft. WEATHERED MANCOS SHALE BEDROCK:
							12.0-14.0 ft. SILTY CLAY (CL): clay with trace very fine grained sand, very dense, yellowish brown (10YR 5/4-5/6), clay can be split along axis of core with moderate hand pressure and a chisel.
15	4935	12.0-21.0			12.0-40.0 ft. Very Poor		14.0-21.0 ft. WEATHERED MANCOS SHALE BEDROCK: highly weathered and altered, only remnant rock structure or bedding, moderately calcic, abundant gypsum crystallization, damp inside core, moderate, yellowish brown (10YR 5/4), first occurrence of bedrock in this hole.
20	4930				Packer Bit		
							21.0-42.0 ft. MANCOS SHALE: 21.0-26.0 ft. weathered silty claystone; minor rock fragments and weak remnant rock structure.

BOREHOLE LOG CRJ01-0212

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0212
SITE CRJ01-0212 **DATES DRILLED** 11/22/2005 to 11/30/2005

Continued from Previous Page

DEPTH (FT BGL)	ELEV. (FT NGVD)	SAMPLE INTERVAL (FT)	EXTENT	Downhole Packer Test	RQD Description from core (FT)	GRAPHIC LOG	
		21.0-31.0			12.0-40.0 ft. Very Poor		26.0-31.0 ft. gray decrepit shale, poor rock structure and bedding, parts easily on bedding and has significant gypsum mineralization and crystals on bedding fractures, usually filling the openings. Damp to dry and friable, core is stuck to liner and crumbles during removal and placement into core box.
					Test Zone #1 22-30'		
30	4920						
							31.0-36.0 ft. very weathered and broken shale, calcic, yellowish brown (10YR 5/4) to olive gray (5Y 4/1). Core loss from 31.0 to 32.0 ft., which is extremely fragmented and broken rock. Clayey from 34.0-35.0 ft. From 35.0-35.5 ft. gypsum infilling on bedding fracture, some limonitic alteration throughout.
		31.0-36.0					
35	4915						
							36.0-42.0 ft. very weathered and broken. Clay alteration at 36.0 to 38.5 ft. Slightly more competent, but fissile at 38.5 to 40.8 ft. Most competent weathered rock at 40.8 to 42.0 ft., but has heavy iron alteration and gypsum crystallization on bedding.
					Test Zone #2 32-42'		
		36.0-42.0					
40	4910						
					40.0-42.0 ft. Poor		
							Total Depth 42.0 ft.
45	4905						
50	4900						

BOREHOLE LOG CRJ01-0213

PROJECT	MOAB	DATE DRILLED	12/01/2005 to 12/02/2005
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction
SITE	Crescent Junction	DRILLING METHOD	Casing Advance/HQ Core
WELL NUMBER	CRJ01-0213	SAMPLING METHOD	HQ CORE
NORTH COORD. (FT)	6795880.41	DRILL OPERATOR	Hyleman, B.
EAST COORD. (FT)	2125591.86	REMARKS	Packer test location approximately 6.0 ft. east of borehole 0079.
SURFACE ELEV. (FT NGVD)	4975.00		Log for borehole 0079 used for 0-10.5 ft.
HOLE DEPTH (FT)	40.50		

BIT SIZE(S) (IN) 4.0
CORE SIZE(S) (IN) 3.0
LOGGED BY Rupp, R.
WL (FT BGS)

DEPTH (FT BGL)	ELEV. (FT NGVD)	SAMPLE INTERVAL (FT.)	EXTENT	Downhole Packer Test	RQD Description from core (FT)	GRAPHIC LOG	
							0-2.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand, trace rock fragments.
							2.0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, roots, very fine grained sand, rock fragments (more than above).
							4.0-5.0 ft. Not Sampled.
5	4970						5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand, rock fragments.
							7.0-10.0 ft. Not Sampled.
					Drill Pipe		8.5-10.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
10	4965						10.0-10.5 ft. WEATHERED MANCOS SHALE:
							10.5-40.5 ft. MANCOS SHALE: 10.5-13.5 ft. clayey shale, moderately to highly weathered, pale yellowish brown (10YR 6/2) to dark yellowish brown (10YR 4/2).
							13.5-14.5 ft. silty claystone with trace of sand, becoming competent weathered rock.
15	4960	10.5-20.5			10.5-38.0 ft. Very Poor		@15.0 ft. core soft and easily parted on bedding, core interior is damp, moderately calcic, trace sand, gypsum crystallization prominent on bedding along with iron staining.
					Packer Bit		

BOREHOLE LOG CRJ01-0213

PROJECT MOAB **BOREHOLE NUMBER** CRJ01-0213
SITE CRJ01-0213 **DATES DRILLED** 12/01/2005 to 12/02/2005

Continued from Previous Page

DEPTH (FT BGL)	ELEV. (FT NGVD)	SAMPLE INTERVAL (FT)	EXTENT	Downhole Packer Test	RQD Description from core (FT)	GRAPHIC LOG	
							20.5-30.5 ft. clayey shale, weathered, fissile, bedded, damp, most of run is stuck to the core barrel liner and must be pried off, thus crumbling into soil-like particles and clumps and losing all rock integrity and structure. Limonite and gyspum mineralization is well developed. Strongly calcic in places.
25	4950	20.5-30.5			10.5-38.0 ft. Very Poor		
					Test Zone #1 20-30'		
30	4945						30.5-40.5 ft. silty claystone with trace of very fine grained sand, moderately weathered, rock becoming more competent. Limonitic and gypsum mineratlization on bedding planes. At 36.0 ft., fracture 40 degrees inclined to core axis that is gypsum filled. Other fractures are about 80 degrees inclined to core axis throughout run. Core easily parted, fissile sections are crumbly.
35	4940	30.5-38.5			Test Zone #2 30-40'		
40	4935	38.5-40.5			38.0-40.5 ft. Poor		
							Total Depth 40.5 ft.

U.S. Department of Energy—Grand Junction, Colorado

Calculation Cover Sheet

Calc. No.: MOA-02-02-2006-1-11-00 **Discipline:** Geologic and Geophysical Properties **No. of Sheets:** 7

Project: Moab UMTRA Project

Site: Crescent Junction, Utah

Feature: Borehole Logs

Sources of Data:

Borehole logs

Sources of Formulae and References:

DOE 2005. *Work Plan for Characterization of Crescent Junction Disposal Site,* Revision No. 0, August 12, 2005, DOE-EM/GJ912-2005.

Preliminary Calc. ☐ **Final Calc.** ☐ **Supersedes Calc. No.**

Author: K. Karp for R. Herolenburg 3-15-06 (Name / Date)

Checked by: G. Gray Frank 3-10-06 (Name / Date); Neal Kerley 3-15-06 (Name / Date); Craig Hardlight 3/15/06 (Name / Date); Name / Date

Approved by: Frank A. Karp 3-15-06 (Name / Date)

Problem Statement:

Preliminary site selection performed jointly by the U.S. Department of Energy (DOE) and the Contractor has identified a 2,300 acre withdrawal area in the Crescent Flat area just northeast of Crescent Junction, Utah, as a possible site for a final disposal cell for the Moab uranium mill tailings. The proposed disposal cell would cover approximately 300 acres. Based on the preliminary site-selection process, the suitability of the Crescent Junction disposal site is being evaluated from several technical aspects, including geomorphic, geologic, hydrologic, seismic, geochemical, and geotechnical. The objective of this calculation set is to present the geotechnical borehole logs generated during the drilling program to investigate subsurface geologic conditions at the Crescent Junction disposal site.

This calculation will be incorporated into Attachment 2 (Geology) of the Remedial Action Plan (RAP) and Site Design for Stabilization of Moab Title I Uranium Mill Tailings at the Crescent Junction, Utah, Disposal Site, and summarized in the appropriate sections of the Remedial Action Selection (RAS) report for the Moab site.

Method of Solution:

One-hundred geotechnical boreholes were drilled to depths of up to 25.75 ft through the surficial unconsolidated material into the shallow weathered Mancos Shale as shown in Figure 1 and Table 1. These were drilled by Layne GeoConstruction using hollow-stem auger (HSA) with split-barrel sampling. The bit size was 8 inches with sample diameter at 2.5 inches. Borehole termination was at depth of blow count refusal in the weathered Mancos Shale. Samples were logged in the field using visual soil-classification procedures described in DOE (2005; p.4-6). Field logs were digitized and standardized using the gINT computer software program (gINT Software USA 2005). Appendix A contains the borehole logs for the Crescent Junction site. These data are also available in the SEEPro database at the DOE Grand Junction office.

Assumptions:

N/A

Calculation:

N/A

Discussion:

Results and evaluation of the borehole drilling activities at the Crescent Junction disposal site during 2005 are discussed in detail in Attachment 2 (Geology) of the RAP and summarized in relevant sections of the RAS.

Conclusion and Recommendations:

N/A

Computer Source:

gINT computer software was used to digitize and standardize all field generated drill logs.

References:

DOE 2005. Work Plan for Characterization of Crescent Junction Disposal Site, Revision No. 0, August 12, 2005, DOE-EM/GJ912-2005.

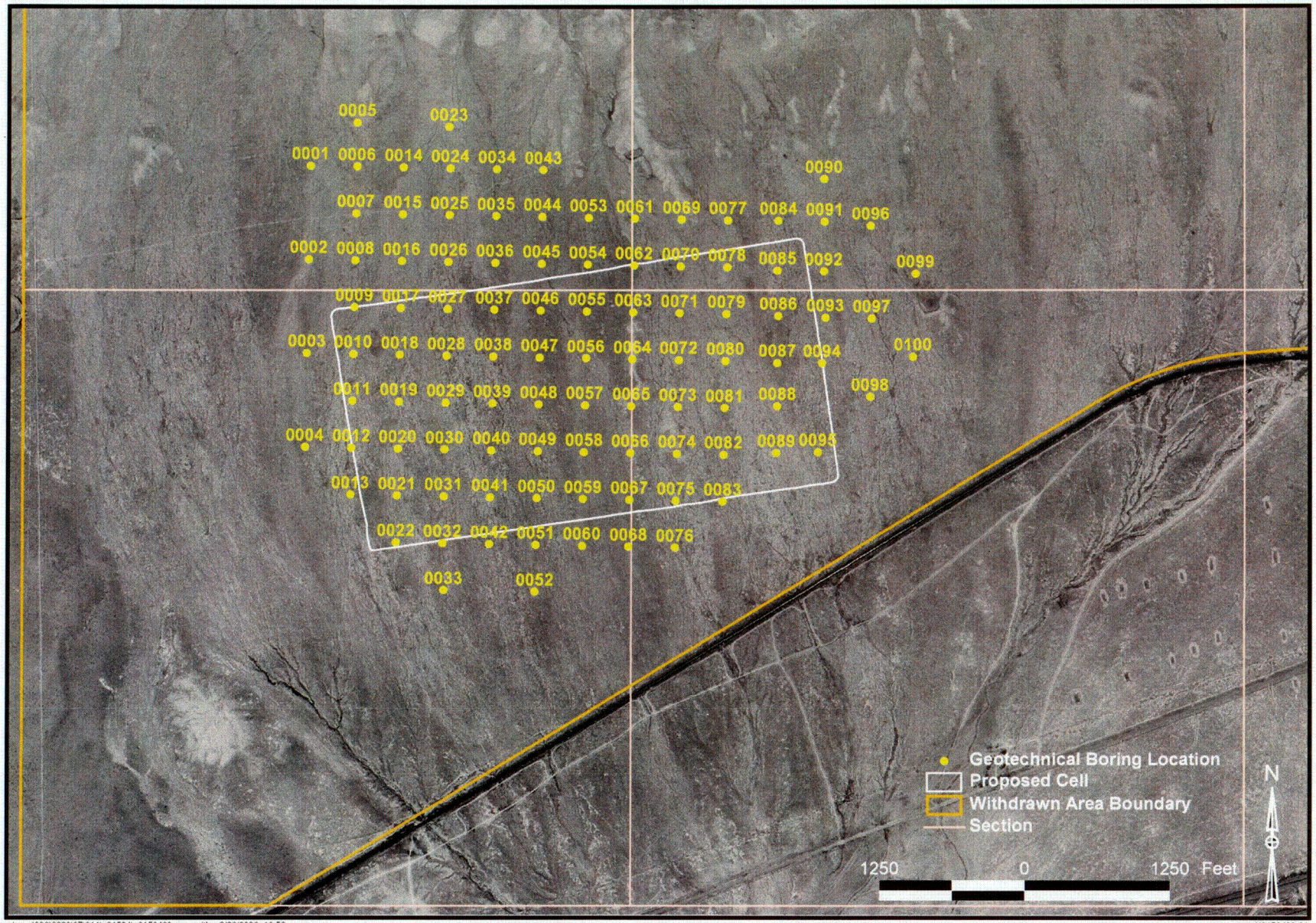

Figure 1. Location of Boreholes at the Crescent Junction Site

C02

Table 1. Borehole Specifications at the Crescent Junction Site

Borehole No.	N Coordinate[a]	E Coordinate[a]	Ground Elevation (ft ngvd)[b]	Total Depth (ft)	Date Completed	Geophysical Logs	Hole Size (in)	Casing (ft)	Sample Type	Drilling Method[c]
CRJ01-0001	6797154.03	2121993.62	5019.50	20.00	4-Nov-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0002	6796350.68	2121978.38	4996.90	20.75	4-Nov-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0003	6795547.32	2121963.14	4977.70	15.80	4-Nov-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0004	6794743.96	2121947.90	4962.50	15.80	3-Nov-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0005	6797522.39	2122396.60	5030.60	10.80	3-Nov-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0006	6797146.41	2122395.30	5019.30	15.60	3-Nov-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0007	6796744.73	2122387.68	5008.40	15.75	3-Nov-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0008	6796343.05	2122380.06	4997.50	15.80	3-Nov-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0009	6795941.38	2122372.44	4988.30	10.40	3-Nov-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0010	6795539.70	2122364.82	4978.90	10.80	3-Nov-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0011	6795138.02	2122357.20	4969.50	15.80	3-Nov-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0012	6794736.34	2122349.58	4961.40	11.00	3-Nov-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0013	6794334.66	2122341.96	4954.10	11.00	2-Nov-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0014	6797138.79	2122796.98	5021.00	25.50	2-Nov-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0015	6796737.11	2122789.36	5009.20	20.75	2-Nov-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0016	6796335.43	2122781.74	4997.60	20.40	2-Nov-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0017	6795933.76	2122774.12	4987.70	15.90	2-Nov-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0018	6795532.08	2122766.50	4978.50	15.30	2-Nov-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0019	6795130.40	2122758.88	4969.70	11.00	2-Nov-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0020	6794728.72	2122751.26	4960.90	10.50	1-Nov-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0021	6794327.04	2122743.63	4952.80	10.75	27-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0022	6793925.37	2122736.02	4945.40	10.50	27-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0023	6797485.70	2123187.03	5035.50	11.40	27-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0024	6797131.17	2123198.66	5023.30	20.30	26-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0025	6796729.49	2123191.04	5010.10	25.75	26-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0026	6796327.81	2123183.42	4997.90	16.00	26-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0027	6795926.14	2123175.80	4987.60	20.50	26-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0028	6795524.46	2123168.17	4977.30	21.00	26-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0029	6795122.78	2123160.56	4967.80	30.40	26-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0030	6794721.10	2123152.93	4959.00	20.75	25-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0031	6794319.42	2123145.31	4951.60	15.75	25-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0032	6793917.75	2123137.69	4944.10	11.00	25-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0033	6793515.74	2123147.56	4936.80	10.75	25-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0034	6797123.55	2123600.34	5021.80	15.50	25-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0035	6796721.87	2123592.71	5009.00	15.25	25-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0036	6796320.19	2123585.09	4997.40	20.40	25-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0037	6795918.52	2123577.47	4985.90	20.40	25-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0038	6795516.84	2123569.85	4975.30	15.75	24-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0039	6795115.16	2123562.23	4966.90	20.75	24-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0040	6794713.48	2123554.61	4957.60	20.50	24-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0041	6794311.80	2123546.99	4949.80	12.00	23-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0042	6793910.12	2123539.37	4941.90	16.00	23-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0043	6797115.93	2124002.01	5018.70	11.00	23-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0044	6796714.25	2123994.39	5006.40	11.00	23-Oct-05	no	8.5	n/a	SS 2.5"	HSA

Table 1 (continued). Borehole Specifications at the Crescent Junction Site

Borehole No.	N Coordinate[a]	E Coordinate[a]	Ground Elevation (ft ngvd)[b]	Total Depth (ft)	Date Completed	Geophysical Logs	Hole Size (in)	Casing (ft)	Sample Type	Drilling Method[c]
CRJ01-0045	6796312.57	2123986.77	4993.60	11.00	23-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0046	6795910.90	2123979.15	4985.00	15.60	23-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0047	6795509.22	2123971.53	4974.40	15.50	23-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0048	6795107.54	2123963.91	4964.40	16.50	23-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0049	6794705.86	2123956.29	4955.80	17.00	23-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0050	6794304.18	2123948.67	4948.00	20.50	22-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0051	6793902.50	2123941.05	4940.30	11.00	22-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0052	6793500.83	2123933.43	4933.50	15.75	22-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0053	6796706.63	2124396.07	5007.70	10.40	22-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0054	6796304.95	2124388.45	4993.10	11.25	22-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0055	6795903.27	2124380.83	4982.10	11.75	22-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0056	6795501.60	2124373.21	4972.60	11.80	21-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0057	6795099.92	2124365.59	4962.90	15.75	21-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0058	6794698.24	2124357.97	4954.10	15.50	21-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0059	6794296.56	2124350.35	4946.20	20.50	21-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0060	6793894.88	2124342.73	4938.10	12.00	21-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0061	6796699.01	2124797.75	5002.00	10.70	21-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0062	6796297.33	2124790.13	4989.10	10.50	21-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0063	6795895.65	2124782.51	4979.80	7.00	21-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0064	6795493.98	2124774.89	4973.80	6.00	20-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0065	6795092.30	2124767.27	4960.90	5.80	20-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0066	6794690.62	2124759.65	4952.60	10.80	20-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0067	6794288.94	2124752.02	4944.70	10.20	20-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0068	6793887.26	2124744.40	4936.60	10.50	20-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0069	6796691.39	2125199.43	4996.80	7.00	20-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0070	6796289.71	2125191.81	4986.90	21.00	20-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0071	6795888.03	2125184.19	4976.90	11.00	20-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0072	6795486.36	2125176.56	4967.30	11.50	20-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0073	6795084.68	2125168.94	4959.50	11.00	19-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0074	6794683.00	2125161.32	4950.90	6.50	19-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0075	6794281.32	2125153.70	4941.70	10.75	19-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0076	6793879.64	2125146.08	4933.90	10.50	19-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0077	6796683.77	2125601.10	4997.10	10.75	19-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0078	6796282.09	2125593.48	4985.50	15.50	19-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0079	6795880.41	2125585.86	4974.86	10.70	19-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0080	6795478.74	2125578.24	4966.70	15.70	19-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0081	6795077.06	2125570.62	4958.00	16.00	18-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0082	6794675.38	2125563.00	4949.10	16.75	18-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0083	6794273.70	2125555.38	4941.00	10.70	13-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0084	6796681.41	2126032.90	4993.00	11.00	12-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0085	6796253.92	2126024.79	4982.60	16.50	12-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0086	6795863.61	2126033.25	4972.90	16.00	12-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0087	6795461.93	2126025.63	4963.00	11.50	12-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0088	6795092.63	2126024.46	4954.90	16.50	12-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0089	6794690.96	2126016.84	4947.00	20.70	12-Oct-05	no	8.5	n/a	SS 2.5"	HSA

Table 1 (continued). Borehole Specifications at the Crescent Junction Site

Borehole No.	N Coordinate[a]	E Coordinate[a]	Ground Elevation (ft ngvd)[b]	Total Depth (ft)	Date Completed	Geophysical Logs	Hole Size (in)	Casing (ft)	Sample Type	Drilling Method[c]
CRJ01-0090	6797038.22	2126429.83	4999.40	15.50	11-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0091	6796673.79	2126434.58	4990.20	10.80	11-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0092	6796246.30	2126426.47	4980.40	15.50	11-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0093	6795850.05	2126440.65	4971.00	20.70	11-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0094	6795460.44	2126411.56	4961.80	21.50	10-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0095	6794697.78	2126376.72	4945.50	15.75	10-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0096	6796636.02	2126834.80	4988.50	20.50	10-Oct-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0097	6795842.42	2126842.33	4969.40	19.70	27-Sep-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0098	6795171.16	2126829.42	4954.30	20.00	27-Sep-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0099	6796226.49	2127221.52	4977.40	9.75	26-Sep-05	no	8.5	n/a	SS 2.5"	HSA
CRJ01-0100	6795514.03	2127198.93	4961.20	12.50	26-Sep-05	no	8.5	n/a	SS 2.5"	HSA

[a]Local coordinate system based on modified state plane coordinate system NAD 83 Utah Central Zone.
[b]ngvd = National Geodetic Vertical Datum
[c]HSA = hollow stem auger

Appendix A

Geotechnical Borehole Logs

BOREHOLE LOG CRJ01-0001

PROJECT	MOAB	DATE DRILLED	11/04/2005 to 10/19/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0001	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6797154.03	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2121993.62	REMARKS			
SURFACE ELEV. (FT NGVD)	5019.50				
HOLE DEPTH (FT)	20.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 4, 6, 8	1.9			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, very fine grained sand, roots, mottled, rock fragments.
		8, 8, 9, 16	1.95			2.0-4.0 ft. medium dense.
	5015					4.0-5.0 ft. Not Sampled.
5		5, 10, 14, 13	2.0			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong to weak HCL, dry, medium dense, very fine grained sand (more than above), mottled, rock fragments.
						7.0-10.0 ft. Not Sampled.
	5010					
10		6, 10, 18, 20	2.0			10.0-12.0 ft. SANDY SILT (ML-SP); pale brown (10YR 6/3), strong to weak HCL, dry, medium dense, very fine grained sand, mottled, rock fragments.
						12.0-15.0 ft. Not Sampled.
	5005					14.0-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: inferred from drilling change.
15		50/4"	0.45			15.0-15.5 ft. WEATHERED MANCOS SHALE:
						@15.5 ft. first refusal in bedrock.
						Total Depth 15.5 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	5000					

BOREHOLE LOG CRJ01-0002

PROJECT	MOAB	DATE DRILLED	11/04/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0002	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796350.68	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2121978.38	REMARKS			
SURFACE ELEV. (FT NGVD)	4996.90				
HOLE DEPTH (FT)	20.75				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 3, 5, 7	2.0			0-4.0 ft. SANDY SILT (ML); strong HCL, dry to very slightly moist, loose to medium dense, very fine grained sand, roots, mottled.
	4995	8, 9, 10, 12	1.9			2.0-4.0 ft. medium dense, dry.
						4.0-5.0 ft. Not Sampled.
5		5, 11, 12, 12	1.75			5.0-7.0 ft. SANDY SILT (ML); strong HCL, dry, loose to medium dense, very fine grained sand, mottled.
	4990					7.0-10.0 ft. Not Sampled.
10		7, 10, 12, 16	2.0			10.0-12.0 ft. SANDY SILT (ML); strong HCL, dry, loose to medium dense, very fine grained sand, mottled.
	4985					12.0-15.0 ft. Not Sampled.
15		23, 34, 50	1.4			15.0-16.5 ft. SANDY SILT (ML); strong HCL, dry, very dense, very fine grained sand, mottled. @16.5 ft. rock fragment (sandstone) in shoe.
	4980					16.5-20.0 ft. Not Sampled.
						17.0-20.0 ft. WEATHERED MANCOS SHALE BEDROCK: inferred from drilling change.
20		47, 50/3"	0.55			20.0-20.75 ft. WEATHERED MANCOS SHALE: Sandstone;
	4975					@20.75 ft. first refusal in bedrock. Total Depth 20.75 ft. Borehole terminated at depth of blow count refusal weathered Mancos Shale.

BOREHOLE LOG CRJ01-0003

PROJECT	MOAB	DATE DRILLED	11/04/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0003	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795547.32	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2121963.14	REMARKS			
SURFACE ELEV. (FT NGVD)	4977.70				
HOLE DEPTH (FT)	15.80				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 3, 4, 7	2.0			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry to very slightly moist, loose to medium dense, very fine grained sand, roots, mottled.
	4975	6, 6, 9, 16	1.75			2.0-4.0 ft dry, medium dense. @4.0 ft. highly weathered sandstone rock fragments in shoe.
						4.0-5.0 ft. Not Sampled.
5		6, 8, 12, 15	1.9			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, very fine grained sand, mottled.
	4970					7.0-10.0 ft. Not Sampled.
10		13, 16, 16, 19	1.8			10.0-12.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, medium dense to dense, very fine grained sand, mottled.
						12.0-15.0 ft. Not Sampled.
	4965					12.5-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
15		50, 50/4"	0.5			15.0-15.8 ft. WEATHERED MANCOS SHALE :
	4960					15.8 ft. first refusal in bedrock. Total Depth 15.8 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

Stoller

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GRAND JUNCTION, COLORADO

BOREHOLE LOG CRJ01-0004

PROJECT	MOAB	DATE DRILLED	11/03/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0004	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6794743.96	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2121947.90	REMARKS			
SURFACE ELEV. (FT NGVD)	4962.50				
HOLE DEPTH (FT)	15.80				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 5, 7, 6	1.95			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry to very slightly moist, loose to medium dense, very fine grained sand, roots, mottled.
	4960	6, 9, 9, 11	1.65			2.0-4.0 ft medium dense, trace rock fragments, dry.
						4.0-5.0 ft. Not Sampled.
5		7, 13, 14, 15	1.85			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, medium dense, trace rock fragments, dry, very fine grained sand, mottled.
	4955					7.0-10.0 ft. Not Sampled.
10		15, 17, 22, 29	1.9			10.0-12.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), weak HCL, dry, dense to very dense, very fine grained sand, mottled.
	4950					12.0-15.0 ft. Not Sampled.
						13.5-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
15		35, 50/4"	0.75			15.0-15.8 FT. WEATHERED MANCOS SHALE :
						15.8 ft. first refusal in bedrock.
	4945					Total Depth 15.8 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

Stoller

U.S. DEPARTMENT OF ENERGY
GRAND JUNCTION, COLORADO

BOREHOLE LOG CRJ01-0005

PROJECT	MOAB	DATE DRILLED	11/03/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0005	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6797522.39	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2122396.60	REMARKS			
SURFACE ELEV. (FT NGVD)	5030.60				
HOLE DEPTH (FT)	10.80				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	5030	2, 5, 7, 6	1.8			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry to very slightly moist, loose to medium dense, very fine grained sand, roots, mottled. Rock fragments.
		7, 7, 11, 15	1.7			2.0-4.0 ft medium dense, rock fragments, dry.
						4.0-5.0 ft. Not Sampled.
5	5025	12, 24, 27, 31	1.55			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), weak HCL, dense to very dense, rock fragments, dry, very fine grained sand.
						7.0-10.0 ft. Not Sampled.
						8.0-10.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
10	5020	30, 50/4"	0.8			10.0-10.8 ft. WEATHERED MANCOS SHALE:
						@10.8 ft. first refusal in bedrock.

Total Depth 10.8 ft.

Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0006

PROJECT	MOAB	DATE DRILLED	11/03/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0006	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6797146.41	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2122395.30	REMARKS			
SURFACE ELEV. (FT NGVD)	5019.30				
HOLE DEPTH (FT)	15.60				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 4, 6, 7	2.0			0-4.0 ft. SANDY SILT (ML); brown (10YR 5/3), strong HCL, dry, loose to medium dense, very fine grained sand, roots, mottled.
		8, 9, 10, 10	1.6			2.0-4.0 ft medium dense.
	5015					4.0-5.0 ft. Not Sampled.
5		4, 5, 10, 9	1.6			5.0-7.0 ft. SILTY GRAVELLY SAND (SM); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, well graded sand, rounded to sub-angular.
	5010					7.0-10.0 ft. Not Sampled.
10		26, 45, 50/4 5"	1.25			10.0-11.5 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, very dense, very fine grained sand, mottled, rock fragments.
						11.5-15.0 ft. Not Sampled.
	5005					13.0-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: No drilling change, but inferred to occur midway in the range of 11.5 to 15.0 ft.
15		50-50/1"	0.45			15.0-15.6 ft. WEATHERED MANCOS SHALE:
	5000					@15.6 ft. first refusal in bedrock. Total Depth 15.6 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0007

PROJECT	MOAB	DATE DRILLED	11/03/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0007	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796744.73	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2122387.68	REMARKS			
SURFACE ELEV. (FT NGVD)	5008.40				
HOLE DEPTH (FT)	15.75				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 3, 4, 6	1.8			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose very fine grained sand, roots.
		5, 3, 6, 6	1.65			2.0-4.0 ft loose to medium dense, mottled.
	5005					4.0-5.0 ft. Not sampled.
5		4, 6, 6, 5	1.75			5.0-7.0 ft. SANDY SILT (ML); light yellowish brown (10YR 6/4), strong HCL, dry, loose to medium dense, very fine grained sand (more than above), mottled.
	5000					7.0-10.0 ft. Not sampled.
10		7, 7, 10, 15	2.0			10.0-12.0 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong HCL, dry, medium dense, very fine grained sand, rock fragments, mottled.
						12.0-15.0 ft. Not sampled.
	4995					13.0-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: inferred from drilling change.
15		50-50/3"	0.6			15.0-15.75 ft. WEATHERED MANCOS SHALE;
						@15.75 ft. first refusal in bedrock.
						Total Depth 15.75 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4990					

BOREHOLE LOG CRJ01-0008

PROJECT	MOAB	DATE DRILLED	11/03/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0008	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796343.05	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2122380.06	REMARKS			
SURFACE ELEV. (FT NGVD)	4997.50				
HOLE DEPTH (FT)	15.80				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 4, 4, 5	1.9			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose very fine grained sand, roots, mottled, rock fragments.
	4995	7, 7, 8, 10	2.0			2.0-4.0 ft. medium dense.
						4.0-5.0 ft. Not Sampled.
5		7, 10, 11, 14	1.9			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, medium dense, very fine grained sand (increase in sand), mottled, rock fragments.
	4990					7.0-10.0 ft. Not Sampled.
10		6, 7, 9, 10	2.0			10.0-12.0 ft. SANDY SILT (ML); yellow (10YR 7/6), strong HCL, dry, medium dense, very fine grained sand, trace rock fragments.
	4985					12.0-15.0 ft. Not Sampled.
						14.0-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
15		46, 50/0.5"	0.6			15.0-15.8 ft. WEATHERED MANCOS SHALE:
	4980					@15.8 ft. first refusal in bedrock. Total Depth 15.8 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

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BOREHOLE LOG CRJ01-0009

PROJECT	MOAB	DATE DRILLED	11/03/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0009	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795941.38	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2122372.44	REMARKS			
SURFACE ELEV. (FT NGVD)	4988.30				
HOLE DEPTH (FT)	10.40				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		4, 7, 5, 6	1.8			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, medium dense, very fine grained sand, roots, mottled.
		8, 6, 10, 12	1.9			
	4985					3.5-4.0 ft. color changes to white (10YR 8/1), strong HCL, dry, medium dense, very fine grained sand, trace rock fragments.
						4.0-5.0 ft. Not Sampled.
5		12, 22, 24, 22	1.65			5.0-5.5 ft. SANDY SILT (ML); white (10YR 8/1), strong HCL, dry, medium dense, very fine grained sand, trace rock fragments.
						5.5-7.0 ft. WEATHERED MANCOS SHALE BEDROCK:
						7.0-10.0 ft. Not Sampled.
	4980					
10		50/5"	0.5			10.0-10.4 ft. WEATHERED MANCOS SHALE :
						@10.4 ft. first refusal in bedrock.
						Total Depth 10.4 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4975					

BOREHOLE LOG CRJ01-0010

PROJECT	MOAB	DATE DRILLED	11/03/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0010	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795539.70	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2122364.82	REMARKS			
SURFACE ELEV. (FT NGVD)	4978.90				
HOLE DEPTH (FT)	10.80				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		1, 3, 4, 5	2.0			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, very fine grained sand, roots, mottled.
		9, 8, 11, 11	1.65			2.0-4.0 ft. medium dense.
	4975					4.0-5.0 ft. Not Sampled.
5		9, 13, 18, 23	1.75			5.0-7.0 ft. SANDY SILT (ML); very pale brown (10YR 8/4), strong HCL, dry, medium dense to dense, very fine grained sand, trace roots and rock fragments,
	4970					7.0-10.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change. Not Sampled.
10		37, 50/3.5"	0.6			10.0-10.8 ft. WEATHERED MANCOS SHALE:
	4965					@10.8 ft. first refusal in bedrock. Total Depth 10.8 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

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BOREHOLE LOG CRJ01-0011

PROJECT	MOAB	DATE DRILLED	11/03/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0011	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795138.02	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2122357.20	REMARKS			
SURFACE ELEV. (FT NGVD)	4969.50				
HOLE DEPTH (FT)	15.80				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 5, 7, 8	1.95			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, very fine grained sand, roots, mottled.
		8, 8, 10, 11	2.0			2.0-4.0 ft. medium dense.
	4965					4.0-5.0 ft. Not Sampled.
5		5, 11, 14, 16	1.75			5.0-7.0 ft. SANDY SILT (ML); brownish yellow (10YR 6/6), strong HCL, dry, medium dense, very fine grained sand, mottled, rock fragments.
						7.0-10.0 ft. Not Sampled.
	4960					
10		17, 32, 35, 37	1.8			10.0-12.0 ft. SANDY, SILTY GRAVEL (GM); pale brown (10YR 6/3), strong HCL, dry, dense to very dense, gravel is sub-rounded, well graded, fine, mottled, mostly sandstone fragments.
						12.0-15.0 ft. Not Sampled.
	4955					13.5-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
15		29, 50/4"	0.6			15.0-15.8 ft. WEATHERED MANCOS SHALE:
						@15.8 ft. first refusal in bedrock.
	4950					Total Depth 15.8 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0012

PROJECT	MOAB	DATE DRILLED	11/03/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0012	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6794736.34	DRILL OPERATOR	Nearman, J.		
EAST COORD. (FT)	2122349.58	REMARKS			
SURFACE ELEV. (FT NGVD)	4961.40				
HOLE DEPTH (FT)	11.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	4960	2, 3, 4, 6	2.0			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, very fine grained sand, roots.
		5, 5, 8, 11	1.75			2.0-4.0 ft. medium dense, mottled.
						4.0-5.0 ft. Not Sampled.
5	4955	7, 14, 17, 17	1.8			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, medium dense to dense, very fine grained sand, mottled, rock fragments, trace roots.
						7.0-10.0 ft. Not Sampled.
						8.5-10 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
10		23, 50/5.5"				10.0-11.0 ft. WEATHERED MANCOS SHALE: parts of rabbit in bottom samples - discarded samples.
	4950					@11.0 ft. first refusal in bedrock. Total Depth 11.0 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0013

PROJECT	MOAB	DATE DRILLED	11/02/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0013	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6794334.66	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2122341.96	REMARKS			
SURFACE ELEV. (FT NGVD)	4954.10				
HOLE DEPTH (FT)	11.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 3, 6, 7	1.95			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, very fine grained sand, roots.
		5, 6, 7, 8	1.95			2.0-4.0 ft. medium dense.
	4950					4.0-5.0 ft. Not Sampled.
5		4, 6, 7, 7	1.75			5.0-7.0 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong HCL, very slightly moist to dry, medium dense, very fine grained sand, mottled, rock fragments.
						7.0-10.0 ft. Not Sampled.
	4945					9.0-10.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
10		25, 50/5"	0.75			10.0-11.0 ft. WEATHERED MANCOS SHALE:
						@11.0 ft. first refusal in bedrock. Total Depth 11.0 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4940					

BOREHOLE LOG CRJ01-0014

PROJECT	MOAB	DATE DRILLED	11/02/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0014	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6797138.79	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2122796.98	REMARKS			
SURFACE ELEV. (FT NGVD)	5021.00				
HOLE DEPTH (FT)	25.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	5020	4 7 5 7	1.95	X		0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, very slightly moist to dry, medium dense, very fine grained sand, roots, trace rock fragments, mottled.
		7 7 13 14	1.55	X		2.0-4.0 ft. dry
						4.0-5.0 ft. Not Sampled.
5	5015	9 14 10 11	1.75	X		5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, medium dense, very fine grained sand, roots, trace rock fragments, mottled.
						7.0-10.0 ft. Not Sampled.
10	5010	9 11 13 16	1.85	X		10.0-12.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, medium dense, very fine grained sand, trace rock fragments, mottled.
						12.0-15.0 ft. Not Sampled.
15	5005	28 32 46 50/5"	1.65	X		15.0-17.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), weak HCL, dry, very dense, very fine grained sand, mottled.
						17.0-20.0 ft. Not Sampled.
20	5000	27 50/4"	0.8	X		20.0-21.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, very dense, very fine grained sand, mottled.
						21.0-25.0 ft. Not Sampled.
						23.0-25.0 ft. WEATHERED MANCOS SHALE BEDROCK: no drilling change, but inferred to occur midway in the range of 21.0-25.0 ft.
25	4995	50/5"	0.5	X		25-25.5 ft. WEATHERED MANCOS SHALE: @25.5 ft. first refusal in bedrock. Total Depth 25.5 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

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BOREHOLE LOG CRJ01-0015

PROJECT	MOAB	DATE DRILLED	11/02/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0015	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796737.11	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2122789.36	REMARKS			
SURFACE ELEV. (FT NGVD)	5009.20				
HOLE DEPTH (FT)	20.75				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		1, 4, 3, 5	1.85			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, very slightly moist to dry, loose, very fine grained sand, roots, mottled.
		6, 6, 8, 7	1.8			2.0-4.0 ft. medium dense.
	5005					4.0-5.0 ft. Not Sampled.
5		7, 8, 8, 7	1.8			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, moist to dry, medium dense, very fine grained sand, trace roots, mottled.
						7.0-10.0 ft. Not Sampled.
	5000					
10		8, 12, 10, 15	1.95			10.0-12.0 ft. SANDY SILT (ML); very pale brown (10YR 7/3), strong HCL, dry, medium dense, very fine grained sand, trace rock fragments, mottled.
						12.0-15.0 ft. Not Sampled.
	4995					
15		20, 35, 39, 50/5"	1.6			15.0-17.0 ft. SANDY SILT (ML); very pale brown (10YR 7/3), weak HCL, dry, dense to very dense, very fine grained sand, mottled, rock fragments.
						17.0-20.0 ft. Not Sampled.
	4990					
20		43-50/3"	0.6			20.0-20.5 ft. SANDY SILT (ML); very pale brown (10YR 7/3), weak HCL, dry, dense to very dense, very fine grained sand, mottled, rock fragments.
						20.5-20.75 ft. WEATHERED MANCOS SHALE BEDROCK:
						@25.75 ft. first refusal in bedrock.
						Total Depth 20.75 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4985					

BOREHOLE LOG CRJ01-0016

PROJECT	MOAB	DATE DRILLED	11/02/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0016	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796335.43	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2122781.74	REMARKS			
SURFACE ELEV. (FT NGVD)	4997.60				
HOLE DEPTH (FT)	20.40				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		4, 6, 6, 8	2.0			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, very slightly moist to dry, medium dense, very fine grained sand, roots.
	4995	9, 10, 10, 12	1.6			2.0-4.0 ft. dry, mottled.
						4.0-5.0 ft. Not Sampled.
5		12, 37, 44, 34	0.9			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, mottled, medium dense to very dense, very fine grained sand, trace roots, sandstone rock fragment @7.0 ft.
	4990					7.0-10.0 ft. Not Sampled.
10		8, 6, 7, 9	1.8			10.0-12.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong to weak HCL, dry, medium dense, increase in very fine grained sand.
	4985					12.0-15.0 ft. Not Sampled.
15		21, 38, 50/4"	1.4			15.0-16.5 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong to weak HCL, dry, dense to very dense, very fine grained sand, mottled, trace rock fragments.
						16.5-20.0 ft. Not Sampled.
	4980					17.0-20.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
20		50/4.5"	0.4			20.0-20.4 ft. WEATHERED MANCOS SHALE:
						@20.4 ft. first refusal in bedrock.
	4975					Total Depth 20.4 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0017

PROJECT	MOAB	DATE DRILLED	11/02/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0017	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795933.76	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2122774.12	REMARKS			
SURFACE ELEV. (FT NGVD)	4987.70				
HOLE DEPTH (FT)	15.90				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 5, 6, 7	1.9			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, very fine grained sand, roots, mottled, rock fragments.
	4985	6, 6, 8, 10	1.75			2.0-4.0 ft. medium dense, no roots or rock fragments.
						4.0-5.0 ft. Not Sampled.
5		9, 11, 14, 17	2.0			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, medium dense to dense, very fine grained sand, mottled.
	4980					7.0-10.0 ft. Not Sampled.
10		13, 19, 27, 42	1.75			10.0-12.0 ft. SANDY SILT (ML); very pale brown (10YR 8/3), weak HCL, dry, dense to very dense, very fine grained sand, rock fragments, mottled.
	4975					12.0-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change. Not Sampled.
15		19, 50/4 5"	0.9			15.0-15.9 ft. WEATHERED MANCOS SHALE:
	4970					@15.9 ft. first refusal in bedrock. Total Depth 15.9 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0018

PROJECT	MOAB	DATE DRILLED	11/02/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0018	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795532.08	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2122766.50	REMARKS			
SURFACE ELEV. (FT NGVD)	4978.50				
HOLE DEPTH (FT)	15.30				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		9, 5, 7, 9	2.0			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, very slightly moist to dry, loose to medium dense, very fine grained sand, roots.
		6, 8, 8, 9	1.75			2.0-4.0 ft. medium dense, dry, more sand, rock fragments in shoe.
	4975					4.0-5.0 ft. Not Sampled.
5		9, 10, 12, 12	1.55			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, medium dense, very fine grained sand, rock fragments. Rock fragments in shoe.
						7.0-10.0 ft. Not Sampled.
	4970					
10		19, 29, 32, 40	2.0			10.0-12.0 ft. SANDY SILT (ML); very pale brown (10YR 7/3), strong HCL, dry, dense to very dense, very fine grained sand, mottled.
						12.0-15.0 ft. Not Sampled.
	4965					13.0-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
15		50/4"	0.3			15.0-15.3 ft. WEATHERED MANCOS SHALE:
						@15.3 ft. first refusal in bedrock.
						Total Depth 15.3 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4960					

BOREHOLE LOG CRJ01-0019

PROJECT	MOAB	DATE DRILLED	11/02/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0019	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795130.40	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2122758.88	REMARKS			
SURFACE ELEV. (FT NGVD)	4969.70				
HOLE DEPTH (FT)	11.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 4, 6, 7	2.0			0-4.0 ft. SANDY SILT (ML); brown (10YR 5/3), strong HCL, slightly moist to dry, loose to medium dense, very fine grained sand, roots, mottled.
		7, 8, 9, 12	1.9			2.0-4.0 ft. dry.
						4.0-5.0 ft. Not Sampled.
	4965					
5		2, 9, 11, 11	1.75			5.0-7.0 ft. SANDY SILT (ML); brown (10YR 5/3), strong HCL, dry, medium dense, very fine grained sand, mottled. No roots.
						7.0-10.0 ft. Not Sampled. No drilling Change.
	4960					
10		35, 50/5"	0.85			10.0-11.0 ft. WEATHERED MANCOS SHALE BEDROCK:
						@11.0 ft. first refusal in bedrock. Total Depth 11.0 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4955					

BOREHOLE LOG CRJ01-0020

PROJECT	MOAB	DATE DRILLED	11/01/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0020	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6794728.72	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2122751.26	REMARKS			
SURFACE ELEV. (FT NGVD)	4960.90				
HOLE DEPTH (FT)	10.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	4960	3, 3, 6, 7	1.1			0-4.0 ft. SANDY SILT (ML); brownish yellow (10YR 6/6), strong HCL, moist to dry, loose to medium dense, very fine sand, roots, mottled, rock fragments, rock fragments in shoe.
		6, 6, 6, 9	1.7			
						4.0-5.0 ft. Not Sampled.
						4.5-5.0 ft. WEATHERED MANCOS SHALE BEDROCK: No drilling change, but inferred to occur midway in the range of 4.0-5.0 ft.
5		18, 39, 50/5"	1.4			5.0-6.4 ft. WEATHERED MANCOS SHALE :
	4955					6.4-10.0 ft. Not Sampled. @6.4 ft. first refusal in bedrock.
10		50/5 5"	0.4			10.0-10.5 ft. MANCOS SHALE :
	4950					Total Depth 10.5 ft. Borehole terminated at depth of (second) blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0021

PROJECT	MOAB	DATE DRILLED	10/27/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0021	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6794327.04	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2122743.63	REMARKS			
SURFACE ELEV. (FT NGVD)	4952.80				
HOLE DEPTH (FT)	10.75				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		4, 5, 7, 9	1.95			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, very fine grained sand, roots.
	4950	6, 7, 14, 13	1.75			2.0-4.0 ft. medium dense, mottled.
						4.0-5.0 ft. Not Sampled.
5		8, 15, 18, 25	1.95			5.0-7.0 ft. SANDY SILT (ML); vary pale brown (10YR 8/2), strong HCL, dry, medium dense, very fine grained sand, mottled.
						7.0-10.0 ft. Not Sampled.
	4945					8.0-10.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
10		29, 50/3"	0.75			10.0-10.75 ft. WEATHERED MANCOS SHALE:
	4940					@10.75 ft. first refusal in bedrock. Total Depth 10.75 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

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BOREHOLE LOG CRJ01-0022

PROJECT	MOAB	DATE DRILLED	10/27/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0022	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6793925.37	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2122736.02	REMARKS			
SURFACE ELEV. (FT NGVD)	4945.40				
HOLE DEPTH (FT)	10.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	4945	3, 3, 5, 11	1.9			0-4.0 ft. SANDY SILT (ML); brown (10YR 5/3), strong HCL, dry, loose to medium dense, very fine grained sand, rock fragments, mottled.
		8, 11, 17, 15	1.5			2.0-4.0 ft. very pale brown (10YR 7/3), medium dense to dense.
						4.0-5.0 ft. Not Sampled.
5	4940	4, 7, 17, 34	1.85			5.0-6.5 ft. SANDY SILT (ML); very pale brown (10YR 7/3), strong HCL, dry, medium dense to dense, very fine grained sand, mottled, rock fragments.
						6.5-7.0 ft. WEATHERED MANCOS SHALE BEDROCK:
						7.0-10.0 ft. Not Sampled.
10	4935	50/5.5"	0.5			10.0-10.5 ft. WEATHERED MANCOS SHALE:
						@10.5 ft. first refusal in bedrock.
						Total Depth 10.5 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0023

PROJECT	MOAB	DATE DRILLED	10/27/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0023	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6797485.70	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123187.03	REMARKS			
SURFACE ELEV. (FT NGVD)	5035.50				
HOLE DEPTH (FT)	11.40				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	5035	3, 8, 13, 13	1.95			0-4.0 ft. SANDY SILT (ML); grayish brown (10YR 5/2), weak HCL, dry, medium dense, very fine grained sand, roots, rock fragments, mottled.
		7, 9, 9, 14	1.6			2.0-4.0 ft. pale brown (10YR 6/3), strong HCL, more rock fragments, no roots.
						4.0-5.0 ft. Not Sampled.
5	5030	12, 18, 17, 19	1.95			5.0-7.0 ft. SANDY SILT (ML); light gray (10YR 7/2), strong HCL, dry, medium dense, very fine grained sand, mottled, rock fragments include both shale and sandstone.
						7.0-10.0 ft. Not Sampled.
						7.5-10.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
10	5025	19, 33, 50/4.5"	1.25			10.0-11.4 ft. WEATHERED MANCOS SHALE:
						@11.4 ft. first refusal in bedrock. Total Depth 11.4 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0024

PROJECT	MOAB	DATE DRILLED	10/26/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0024	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6797131.17	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123198.66	REMARKS			
SURFACE ELEV. (FT NGVD)	5023.30				
HOLE DEPTH (FT)	20.30				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 3, 5, 5	1.75			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, very fine grained sand, roots, mottled, rock fragments.
	5020	6, 9, 8, 10	1.8			2.0-4.0 ft. medium dense.
						4.0-5.0 ft. Not Sampled.
5		7, 8, 12, 12	1.8			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong to weak HCL, dry, medium dense, very fine grained sand, mottled.
	5015					7.0-10.0 ft. Not Sampled.
10		14, 23, 22, 18	1.95			10.0-12.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), weak HCL, dry, dense, very fine to fine grained sand, mottled.
	5010					12.0-15.0 ft. Not Sampled.
15		23, 46, 50/3"	1.35			15.0-16.5 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, very dense, very fine grained sand, mottled.
	5005					16.5-20.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
20		50/4"	0.3			20.0-20.3 ft. WEATHERED MANCOS SHALE:
						@20.3 ft. first refusal in bedrock.
						Total Depth 20.3 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	5000					

BOREHOLE LOG CRJ01-0025

PROJECT	MOAB	DATE DRILLED	10/26/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0025	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796729.49	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123191.04	REMARKS			
SURFACE ELEV. (FT NGVD)	5010.10				
HOLE DEPTH (FT)	25.75				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		4, 4, 6, 8	1.95			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, very fine grained sand, roots, mottled.
		6, 7, 12, 14	1.75			2.0-4.0 ft. medium dense.
						4.0-5.0 ft. Not Sampled.
5	5005	15, 19, 10, 16	1.5			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong to weak HCL, dry, medium dense to dense, very fine grained sand, mottled, rock fragments.
						7.0-10.0 ft. Not Sampled.
10	5000	12, 24, 35, 40	1.75			10.0-12.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, dense to very dense, very fine to fine grained sand, mottled, rock fragments.
						12.0-15.0 ft. Not Sampled.
15	4995	23, 40, 50/4 5"	1.25			15.0-16.5 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, very dense, very fine grained sand, mottled. No rock fragments.
						16.5-20.0 ft. Not Sampled.
20	4990	36, 50/4 5"	0.75			20.0-21.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, very dense, very fine grained sand, mottled. Rock fragments.
						21.0-25.0 ft. Not Sampled.
						23.0-25.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
25	4985	37, 50/3"	0.75			25.0-25.75 ft. WEATHERED MANCOS SHALE:
						@25.75 ft. first refusal in bedrock.
						Total Depth 25.75 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0026

PROJECT	MOAB	DATE DRILLED	10/26/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0026	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796327.81	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123183.42	REMARKS			
SURFACE ELEV. (FT NGVD)	4997.90				
HOLE DEPTH (FT)	16.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 3, 5, 6	2.0			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, very fine grained sand, roots, mottled, trace rock fragments.
	4995	8, 7, 7, 13	1.9			2.0-4.0 ft. medium dense.
						4.0-5.0 ft. Not Sampled.
5		5, 9, 9, 10	1.9			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, very fine grained sand, roots, mottled, trace rock fragments. @6.5 fine to medium grained sand.
	4990					7.0-10.0 ft. Not Sampled.
10		18, 50/5"	1.0			10.0-11.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), weak HCL, dry, medium dense to very dense, very fine grained sand, mottled.
						11.0-15.0 ft. Not Sampled.
	4985					13.0-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: No drilling change, but inferred to occur midway in the range of 11.0 to 15.0 ft.
15		25, 50/5"	0.8			15.0-16.0 ft. WEATHERED MANCOS SHALE: Highly weathered.
	4980					@16.0 ft first refusal in bedrock. Total Depth 16.0 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0027

PROJECT	MOAB	DATE DRILLED	10/26/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0027	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795926.14	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123175.80	REMARKS			
SURFACE ELEV. (FT NGVD)	4987.60				
HOLE DEPTH (FT)	20.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 3, 3, 13	1.55			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, very fine grained sand, roots, rock fragment in shoe.
	4985	6, 7, 8, 12	1.6			2.0-4.0 ft. medium dense with rock fragments.
						4.0-5.0 ft. Not Sampled.
5		9, 13, 15, 11	1.75			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, medium dense with rock fragments, mottled.
	4980					7.0-10.0 ft. Not Sampled.
10		12, 17, 9, 12	1.8			10.0-12.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), weak HCL, dry, medium dense, very fine grained sand, mottled.
	4975					12.0-15.0 ft. Not Sampled.
15		28, 40, 50/5"	1.25			15.0-16.5 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong to weak HCL, dry, dense to very dense, very fine grained sand, mottled.
	4970					16.5-20.0 ft. Not Sampled.
						18.0-20.0 ft. WEATHERED MANCOS SHALE BEDROCK: No drilling change, but inferred to occur midway in the range of 16.5 to 20.0 ft.
20		50/5"	0.5			20.0-20.5 ft. WEATHERED MANCOS SHALE:
						@20.5 ft. first refusal in bedrock.
						Total Depth 20.5 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4965					

BOREHOLE LOG CRJ01-0028

PROJECT	MOAB	DATE DRILLED	10/26/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0028	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795524.46	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123168.17	REMARKS			
SURFACE ELEV. (FT NGVD)	4977.30				
HOLE DEPTH (FT)	21.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		4, 3, 6, 8	1.75			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, very fine grained sand, roots, mottled.
	4975	8, 10, 10, 15	1.75			2.0-4.0 ft. medium dense.
						4.0-5.0 ft. Not Sampled.
5		9, 12, 18, 19	2.0			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, medium dense to dense, very fine grained sand, mottled, trace rock fragments.
	4970					7.0-10.0 ft. Not Sampled.
10		17, 22, 25, 35	1.85			10.0-12.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, dense to very dense, very fine grained sand, mottled, trace rock fragments.
	4965					12.0-15.0 ft. Not Sampled.
15		21, 30, 50, 50/4"	1.75			15.0-16.5 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong to weak HCL, dry, dense to very dense, very fine grained sand.
	4960					17.0-20.0 ft. Not Sampled.
20		42, 50/3.5"	0.75			20.0-20.5 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong to weak HCL, dry, dense to very dense, very fine grained sand.
						20.5-21.0 ft. WEATHERED MANCOS SHALE BEDROCK:
	4955					@21.0 ft. first refusal in bedrock.
						Total Depth 21.0 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0029

PROJECT	MOAB	DATE DRILLED	10/26/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT,	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0029	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795122.78	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123160.56	REMARKS			
SURFACE ELEV. (FT NGVD)	4967.80				
HOLE DEPTH (FT)	30.40				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2 2 4 7	1.95			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, loose to medium dense, very fine grained sand, roots, mottled.
	4965	7 6 7 8	1.9			2.0-4.0 ft. trace rock fragments.
						4.0-5.0 ft. Not Sampled.
5		6 5 7 9	1.75			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong to weak HCL, medium dense, very fine grained sand, mottled.
	4960					7.0-10.0 ft. Not Sampled.
10		12 16 19 21	1.9			10.0-12.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong to weak HCL, medium dense to dense, very fine grained sand, mottled.
	4955					12.0-15.0 ft. Not Sampled.
15		22 22 23 50	1.95			15.0-17.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, medium dense to dense, very fine grained sand, trace rock fragments, mottled.
	4950					17.0-20.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change. Not Sampled.
20		50/5"				20.0-20.5 ft. WEATHERED MANCOS SHALE: No recovery.
						20.5-25.0 ft. Not Sampled. @20.5 ft. first refusal in bedrock.
	4945					
25		21 26 25 34	1.6			25.0-27.0 ft. MANCOS SHALE:
	4940					27.0-30.0 ft. Not sampled.
30		50/4.5"	0.4			30.0-30.4 ft. MANCOS SHALE:
						Total Depth 30.4 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4935					

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BOREHOLE LOG CRJ01-0030

PROJECT	MOAB	DATE DRILLED	10/25/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0030	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6794721.10	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123152.93	REMARKS			
SURFACE ELEV. (FT NGVD)	4959.00				
HOLE DEPTH (FT)	20.75				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 4, 7, 8	1.9			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, very fine grained sand, roots, mottled.
		8, 10, 13, 13	1.9			2.0-4.0 ft. medium dense.
	4955					4.0-5.0 ft. Not Sampled.
5		7, 8, 12, 11	1.95			5.0-7.0 ft. SANDY SILT (ML); very pale brown (10YR 7/3), strong to weak HCL, dry, medium dense, very fine grained sand.
						7.0-10.0 ft. Not Sampled.
	4950					
10		6, 7, 11, 11	1.8			10.0-12.0 ft. SANDY SILT (ML); very pale brown (10YR 7/3), strong to weak HCL, dry, medium dense, very fine grained sand, trace rock fragments, trace roots.
						12.0-15.0 ft. Not Sampled.
	4945					
15		18, 22, 28, 42	2.0			15.0-16.5 ft. SANDY SILT (ML); very pale brown (10YR 7/3), strong to weak HCL, dry, medium dense, very fine grained sand, trace rock fragments.
						16.5-17.0 ft. WEATHERED MANCOS SHALE BEDROCK:
						17.0-20.0 ft. Not Sampled.
	4940					
20		44, 50/3"	0.55			20.0-20.75 ft. WEATHERED MANCOS SHALE:
						@20.75 ft. first refusal in bedrock.
						Total Depth 20.75 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4935					

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BOREHOLE LOG CRJ01-0031

PROJECT	MOAB	DATE DRILLED	10/25/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0031	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6794319.42	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123145.31	REMARKS			
SURFACE ELEV. (FT NGVD)	4951.60				
HOLE DEPTH (FT)	15.75				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	4950	2, 5, 7, 9	1.95			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, loose to medium dense, very fine grained sand, roots, mottled.
		7, 8, 10, 12	1.95			
						4.0-5.0 ft. Not Sampled.
5	4945	8, 11, 13, 15	1.9			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong to weak HCL, dry, medium dense, very fine grained sand.
						7.0-10.0 ft. Not Sampled.
10	4940	16, 19, 35, 32	1.95			10.0-12.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong to weak HCL, dry, dense to very dense, very fine grained sand.
						12.0-15.0 ft. Not Sampled.
						13.5-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
15		46, 50/3"	0.75			15.0-15.75 ft. WEATHERED MANCOS SHALE:
	4935					@15.75 ft. first refusal in bedrock. Total Depth 15.75 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0032

PROJECT	MOAB	DATE DRILLED	10/25/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0032	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6793917.75	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123137.69	REMARKS			
SURFACE ELEV. (FT NGVD)	4944.10				
HOLE DEPTH (FT)	11.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 3, 5, 7	2.0			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, very fine grained sand, roots, mottled.
		5, 8, 9, 11	1.8			2.0-4.0 ft. medium dense.
	4940					4.0-5.0 ft. Not Sampled.
5		7, 12, 15, 17	1.9			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, very fine grained sand, roots, mottled.
						7.0-10.0 ft. Not Sampled.
	4935					8.0-10.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
10		28, 50/5"	0.9			10.0-11.0 ft. WEATHERED MANCOS SHALE:
	4930					@11.0 ft. first refusal in bedrock. Total Depth 11.0 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0033

PROJECT	MOAB	DATE DRILLED	10/25/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0033	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6793515.74	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123147.56	REMARKS			
SURFACE ELEV. (FT NGVD)	4936.80				
HOLE DEPTH (FT)	10.75				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 4, 6, 6	1.95			0-4.0 ft. SANDY SILT (ML): very pale brown (10YR 7/4), strong HCL, dry, loose to medium dense, very fine grained sand, roots, rock fragments, mottled.
	4935	5, 8, 13, 19	1.6			@4.0 ft. highly weathered Mancos Shale bedrock in shoe.
						4.0-5.0 ft. WEATHERED MANCOS SHALE BEDROCK: Not sampled.
5		13, 23, 42, 50/4 5"	1.5			5.0-7.0 ft. WEATHERED MANCOS SHALE:
	4930					7.0-10.0 ft. Not Sampled. @7.0 ft. first refusal in bedrock.
10		48, 50/3"	0.5			10.0-10.75 ft. MANCOS SHALE:
	4925					Total Depth 10.75 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0034

PROJECT	MOAB	DATE DRILLED	10/25/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT,	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0034	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6797123.55	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123600.34	REMARKS			
SURFACE ELEV. (FT NGVD)	5021.80				
HOLE DEPTH (FT)	15.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 4, 9, 12	1.95			0-4.0 ft. SANDY SILT (ML); brown (10YR 5/3), strong HCL, dry, loose to medium dense, very fine grained sand, roots, rock fragments, mottled.
	5020	6, 12, 17, 22	1.8			2.0-4.0 ft. medium dense to dense.
						4.0-5.0 ft. Not Sampled.
5		7, 10, 13, 20	2.0			5.0-7.0 ft. SANDY SILT (ML); brown (10YR 5/3), weak HCL, dry, loose to medium dense, very fine grained sand, rock fragments at 7.0 ft.
	5015					7.0-9.5 ft. Not Sampled.
10		7, 9, 12, 17	1.95			9.5-11.5 ft. SANDY SILT (ML); pale brown (10YR 6/3), weak HCL, dry, medium dense, very fine to fine grained sand, rock fragment (mostly at 11.5 ft.).
	5010					11.5-15.0 ft. Not Sampled.
						13.5-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
15		50/5"	0.3			15.0-15.50 ft. WEATHERED MANCOS SHALE:
	5005					@15.5 ft. first refusal in bedrock. Total Depth 15.50 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0035

PROJECT	MOAB	DATE DRILLED	10/25/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0035	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796721.87	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123592.71	REMARKS			
SURFACE ELEV. (FT NGVD)	5009.00				
HOLE DEPTH (FT)	15.25				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 3, 6, 9	1.85			0-2.0 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong HCL, dry, loose to medium dense, very fine grained sand, roots, rock fragments.
		7, 12, 10, 12	1.65			2.0-4.0 ft. color change to brown (10YR 5/3), weak HCL, dry, medium dense, very fine grained sand, mottled, trace rock fragments.
	5005					4.0-5.0 ft. Not Sampled.
5		7, 9, 14, 20	1.90			5.0-7.0 ft. SANDY SILT (ML); brown (10YR 5/3), weak HCL, dry, medium dense to dense, very fine grained sand, mottled, trace rock fragments.
	5000					7.0-10.0 ft. Not Sampled.
10		8, 14, 22, 33	1.9			10.0-12.0 ft. SANDY SILT (ML); brown (10YR 5/3), weak HCL, dry, medium dense to very dense, very fine grained sand, mottled, trace rock fragments. @12.0 ft., highly weathered Mancos Shale bedrock in shoe.
	4995					12.0-14.5 ft. WEATHERED MANCOS SHALE BEDROCK: Not sampled.
15		43, 50/3"	0.5			14.5-15.25 ft. WEATHERED MANCOS SHALE: 15.25 ft. first refusal in bedrock.
	4990					Total Depth 15.25 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

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BOREHOLE LOG CRJ01-0036

PROJECT	MOAB	DATE DRILLED	10/25/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT,	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0036	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796320.19	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123585.09	REMARKS			
SURFACE ELEV. (FT NGVD)	4997.40				
HOLE DEPTH (FT)	20.40				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 3, 3, 5	1.65			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry to very slightly moist, very fine grained sand, roots, slightly cohesive, rock fragments, mottled.
	4995	4, 5, 6, 7	1.75			
						4.0-5.0 ft. Not Sampled.
5		4, 4, 6, 6	1.5			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry to very slightly moist, very fine grained sand, roots, slightly cohesive, rock fragments, mottled.
	4990					7.0-10.0 ft. Not Sampled.
10		5, 7, 8, 10	1.55			10.0-12.0 ft. SANDY CLAYEY SILT (ML); light yellowish brown (10YR 6/4), weak HCL, dry to very slightly moist, medium dense, very fine grained sand, very slightly cohesive, mottled, trace rock fragments.
	4985					12.0-15.0 ft. Not Sampled.
15		8, 16, 26, 32	1.55			15.0-17.0 ft. SANDY CLAYEY SILT (ML); lightly yellowish brown (10YR 6/4), strong to weak HCL, dry to very slightly moist, medium dense to very dense, very fine grained sand, trace rock fragments, mottled, very slightly cohesive. @17.0 ft., highly weathered Mancos Shale bedrock in shoe.
	4980					17.0-20.0 ft. WEATHERED MANCOS SHALE BEDROCK: Not sampled.
20		50/4.5"	0.3			20.0-20.4 ft. WEATHERED MANCOS SHALE: highly weathered. @20.4 ft. first refusal in bedrock.
	4975					Total Depth 20.4 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0037

PROJECT	MOAB	DATE DRILLED	10/25/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0037	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795918.52	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123577.47	REMARKS			
SURFACE ELEV. (FT NGVD)	4985.90				
HOLE DEPTH (FT)	20.40				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	4985	3, 6, 9, 8	2.0			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, very fine grained sand, roots, shale rock fragments, mottled.
		3, 8, 12, 14	1.75			2.0-4.0 ft. medium dense, rock fragments (more than above).
						4.0-5.0 ft. Not Sampled.
5	4980	10, 17, 19, 22	2.0			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong to weak HCL, dry, medium dense to dense, very fine grained sand, rock fragments, mottled.
						7.0-10.0 ft. Not Sampled.
10	4975	10, 20, 22, 27	2.0			10.0-12.0 ft. SANDY SILT (ML); brownish yellow (10YR 6/6), weak HCL, dry, medium dense to dense, very fine grained sand, trace rock fragments.
						12.0-15.0 ft. Not Sampled.
15	4970	35, 50/4"	0.75			15.0-16.0 ft. SANDY SILT (ML); very pale brown (10YR 7/3), strong HCL, dry, dense to very dense, very fine grained sand, rock fragments, mottled.
						16.0-20.0 ft. Not Sampled.
						18.0-20.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
20	4965	50/4"	0.45			20.0-20.4 ft. WEATHERED MANCOS SHALE: @20.4 ft. first refusal in bedrock.

Total Depth 20.4 ft.

Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0038

PROJECT	MOAB	DATE DRILLED	10/24/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0038	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795516.84	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123569.85	REMARKS			
SURFACE ELEV. (FT NGVD)	4975.30				
HOLE DEPTH (FT)	15.75				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	4975	4, 4, 6, 6	1.95			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, very fine grained sand, roots, trace rock fragments, mottled.
		6, 10, 10, 10	1.6			
						4.0-5.0 ft. Not Sampled.
5	4970	6, 7, 9, 10	2.0			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong to weak HCL, dry, medium dense, very fine grained sand, mottled.
						7.0-10.0 ft. Not Sampled.
10	4965	16, 34, 41, 50/4.5"	1.8			10.0-12.0 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong HCL, dry, dense to very dense, very fine grained sand, rock fragments (mostly in shoe).
						12.0-15.0 ft. Not Sampled.
15	4960	41, 50/3"	0.75			15.0-15.5 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong HCL, dry, dense to very dense, very fine grained sand, rock fragments (mostly in shoe).
						15.5-15.75 ft. WEATHERED MANCOS SHALE BEDROCK:
						@15.75 ft. first refusal in bedrock.
						Total Depth 15.75 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0039

PROJECT	MOAB	DATE DRILLED	10/24/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0039	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795115.16	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123562.23	REMARKS			
SURFACE ELEV. (FT NGVD)	4966.90				
HOLE DEPTH (FT)	20.75				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 4, 7, 7	1.9			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, very fine grained sand, roots, trace rock fragments.
	4965	5, 8, 8, 8	1.65			2.0-4.0 ft. medium dense, mottled.
						4.0-5.0 ft. Not Sampled.
5		4, 5, 5, 8	1.85			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong to weak HCL, dry, loose to medium dense, very fine to fine grained sand (more than above), slightly cohesive.
	4960					7.0-10.0 ft. Not Sampled.
10		11, 15, 26, 35	1.9			10.0-12.0 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong HCL, dry, medium dense to very dense, very fine grained sand, rock fragments.
	4955					12.0-15.0 ft. Not Sampled.
15		20, 38, 50/5"	1.5			15.0-16.5 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong to weak HCL, dry, very dense, very fine grained sand, rock fragments, mottled.
	4950					16.5-20.0 ft. Not Sampled.
20		48, 50/3"	0.75			20.0-20.5 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong to weak HCL, dry, very dense, very fine grained sand, rock fragments, mottled.
	4945					20.5-20.75 ft. WEATHERED MANCOS SHALE BEDROCK:
						@20.75 ft. first refusal in bedrock.
						Total Depth 20.75 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0040

PROJECT	MOAB	DATE DRILLED	10/24/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0040	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6794713.48	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123554.61	REMARKS			
SURFACE ELEV. (FT NGVD)	4957.60				
HOLE DEPTH (FT)	20.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		4, 7, 6, 10	1.8			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, medium dense, very fine grained sand, roots.
	4955	8, 10, 13, 14	1.8			2.0-4.0 ft. rock fragments, trace roots, mottled.
						4.0-5.0 ft. Not Sampled.
5		9, 22, 50/5"	1.4			5.0-6.5 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, dense to very dense, very fine grained sand, rock fragments, trace roots, mottled.
	4950					6.5-10.0 ft. Not Sampled.
10		5, 10, 10, 10	2.0			10.0-12.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, medium dense, very fine grained sand, mottled.
	4945					12.0-15.0 ft. Not Sampled.
15		22, 50, 50/5"				15.0-16.5 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, dense to very dense, very fine grained sand, mottled. Parts of prairie dog on center bit - discard samples.
	4940					17.0-20.0 ft. Not Sampled.
						18.5-20.0 ft. WEATHERED MANCOS SHALE BEDROCK: no drilling change, but inferred to occur midway in the range of 17.0 to 20.0 ft.
20		50/5"	0.5			20.0-20.5 ft. WEATHERED MANCOS SHALE:
	4935					@20.5 ft. first refusal in bedrock. Total Depth 20.5 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0041

PROJECT	MOAB	DATE DRILLED	10/23/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0041	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6794311.80	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123546.99	REMARKS			
SURFACE ELEV. (FT NGVD)	4949.80				
HOLE DEPTH (FT)	12.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 2, 4, 4	2.0			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, very fine grained sand, roots, trace rock fragments.
		5, 6, 6, 7	1.65			2.0-4.0 ft. medium dense.
						4.0-5.0 ft. Not Sampled.
5	4945	4, 8, 13, 12	1.9			5.0-7.0 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong HCL, dry, medium dense, very fine grained sand (more than above), mottled.
						7.0-10.0 ft. Not Sampled.
10	4940	30, 36, 41, 50/5"	1.75			10.0-10.5 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong HCL, dry, medium dense, very fine grained sand, mottled.
						10.5-12.0 ft. WEATHERED MANCOS SHALE BEDROCK:
						@12.0 ft. first refusal in bedrock.
	4935					Total Depth 12.0 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0042

PROJECT	MOAB	DATE DRILLED	10/23/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0042	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6793910.12	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123539.37	REMARKS			
SURFACE ELEV. (FT NGVD)	4941.90				
HOLE DEPTH (FT)	16.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		4, 5, 5, 5	1.9			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, loose, roots, mottled.
	4940	5, 5, 8, 8	1.5			2.0-4.0 ft. loose to medium dense.
						4.0-5.0 ft. Not Sampled.
5		10, 8, 11, 12	1.9			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, medium dense, mottled.
	4935					7.0-10.0 ft. Not Sampled.
10		30, 22, 27, 31	1.9			10.0-12.0 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong HCL, dry, dense to very dense, very fine grained sand (more than above).
	4930					12.0-15.0 ft. Not Sampled.
						13.0-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
15		30, 50/4.5"	0.9			15.0-16.0 ft. WEATHERED MANCOS SHALE:
	4925					@16.0 ft. first refusal in bedrock. Total Depth 16.0 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

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BOREHOLE LOG CRJ01-0043

PROJECT	MOAB	DATE DRILLED	10/23/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0043	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6797115.93	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2124002.01	REMARKS			
SURFACE ELEV. (FT NGVD)	5018.70				
HOLE DEPTH (FT)	11.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		4, 7, 9, 8	1.45			0-2.0 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong HCL, dry, medium dense, roots, very fine grained sand, rock fragments.
	5015	5, 8, 9, 10	1.6			2.0-4.0 ft. pale brown (10YR 6/3) strong HCL, dry, medium dense, very fine grained sand (less than above), trace rock fragments, mottled.
						4.0-5.0 ft. Not Sampled.
5		31, 47, 49, 50/5"	1.9			5.0-5.5 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, medium dense, mottled, very fine grained sand, trace rock fragments, mottled. 5.5-7.0 ft. WEATHERED MANCOS SHALE BEDROCK:
	5010					7.0-10.0 ft. Not Sampled. @7.0 ft. first refusal in bedrock.
10		35, 50/3"	0.65			10.0-11.0 ft. MANCOS SHALE: Sandy shale.
	5005					Total Depth 11.0 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0044

PROJECT	MOAB	DATE DRILLED	10/23/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0044	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796714.25	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123994.39	REMARKS			
SURFACE ELEV. (FT NGVD)	5006.40				
HOLE DEPTH (FT)	11.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	5005	3, 2, 5, 7	1.95			0-4.0 ft. SANDY SILT (ML); brown (10YR 5/3), strong HCL, dry, loose, roots, very fine grained sand, rock fragments, mottled.
		8, 10, 14, 15	2.0			2.0-4.0 ft. strong to weak HCL.
						4.0-5.0 ft. Not Sampled.
5	5000	6, 12, 17, 26	1.8			5.0-7.0 ft. SANDY SILT (ML); brown (10YR 5/3), strong HCL, dry, loose, roots, very fine grained sand, rock fragments, mottled.
						7.0-10.0 ft. Not Sampled.
10		49, 50/2"	0.8			10.0-10.5 ft. SANDY SILT (ML); brown (10YR 5/3), strong HCL, dry, loose, roots, very fine grained sand, rock fragments, mottled.
						10.5-11.0 ft. WEATHERED MANCOS SHALE BEDROCK:
	4995					@11.0 ft. first refusal in bedrock.

Total Depth 11.0 ft.

Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0045

PROJECT	MOAB	DATE DRILLED	10/23/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0045	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796312.57	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123986.77	REMARKS			
SURFACE ELEV. (FT NGVD)	4993.60				
HOLE DEPTH (FT)	11.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 3, 6, 9	2.0			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, roots, very fine grained sand, trace rock fragments.
		7, 10, 15, 14	1.7			2.0-4.0 ft. mottled.
	4990					4.0-5.0 ft. Not Sampled.
5		7, 14, 33, 50/5.5"	1.6			5.0-6.5 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, roots, very fine grained sand, trace rock fragments.
						6.5-7.0 ft. SANDY SILT (ML) pale brown (10YR 6/3), weak HCL, dry, medium dense to very dense, very fine grained sand
						7.0-10.0 ft. Not Sampled.
	4985					
10		25, 50/3.5"	0.7			10.0-10.5 ft. SANDY SILT (ML) pale brown (10YR 6/3), strong HCL, dry, medium dense to very dense, very fine grained sand.
						10.5-11.0 ft. WEATHERED MANCOS SHALE BEDROCK:
						@11.0 ft. first refusal in bedrock.
						Total Depth 11.0 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4980					

BOREHOLE LOG CRJ01-0046

PROJECT	MOAB	DATE DRILLED	10/23/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0046	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795910.90	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123979.15	REMARKS			
SURFACE ELEV. (FT NGVD)	4985.00				
HOLE DEPTH (FT)	15.60				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 3, 6, 7	1.95			0-4.0 ft. SANDY SILT (ML); brown (10YR 5/3), strong HCL, dry, loose to medium dense, roots, very fine grained sand, trace rock fragments.
		5, 7, 13, 23	1.55			3.0-4.0 ft. rock fragments
						4.0-5.0 ft. Not Sampled.
5	4980	8, 18, 22, 24	1.8			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), weak HCL, dry, medium dense to dense, very fine grained sand, rock fragments.
						7.0-10.0 ft. Not Sampled.
10	4975	27, 32, 41, 45	1.95			10.0-12.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), weak HCL, dry, very dense, very fine grained sand.
						12.0-15.0 ft. Not Sampled.
						13.0-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
15	4970	39, 50/1.5"	0.60			15.0-15.6 ft. WEATHERED MANCOS SHALE: @15.6 ft. first refusal in bedrock.

Total Depth 15.6 ft.

Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0047

PROJECT	MOAB	DATE DRILLED	10/23/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0047	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795509.22	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123971.53	REMARKS			
SURFACE ELEV. (FT NGVD)	4974.40				
HOLE DEPTH (FT)	15.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 5, 7, 9	1.95			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, roots, very fine grained sand, rock fragments, mottled.
		9, 9, 12, 20	1.75			2.0-4.0 ft. medium dense to dense.
	4970					4.0-5.0 ft. Not Sampled.
5		7, 14, 18, 14	1.75			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), weak HCL, dry, medium dense to dense, very fine grained sand.
	4965					7.0-10.0 ft. Not Sampled.
10		19, 18, 27, 30	1.75			10.0-12.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, dense to very dense, very fine grained sand, rock fragments at 12.0 ft.
						12.0-15.0 ft. Not Sampled.
	4960					14.0-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
15		50/5"	0.45			15.0-15.5 ft. WEATHERED MANCOS SHALE:
						@15.5 ft. first refusal in bedrock.
						Total Depth 15.5 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4955					

BOREHOLE LOG CRJ01-0048

PROJECT	MOAB	DATE DRILLED	10/23/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0048	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795107.54	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123963.91	REMARKS			
SURFACE ELEV. (FT NGVD)	4964.40				
HOLE DEPTH (FT)	16.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 4, 7, 7	1.90			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, roots, very fine grained sand, trace rock fragments, mottled.
		5, 8, 13, 14	1.70			
	4960					4.0-5.0 ft. Not Sampled.
5		6, 15, 23, 22	1.95			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, medium dense to dense, very fine grained sand, mottled.
						7.0-10.0 ft. Not Sampled.
	4955					
10		24, 38, 40, 43	1.95			10.0-12.0 ft. SANDY SILT (ML); light yellowish brown (10YR 6/4), strong to weak HCL, dry, dense to very dense, very fine grained sand (more sand than above).
						12.0-15.0 ft. Not Sampled.
	4950					
15		23, 39, 50/4.5"	1.3			15.0-15.5 ft. SANDY SILT (ML); light yellowish brown (10YR 6/4), strong to weak HCL, dry, dense to very dense, rock fragments, very fine grained sand.
						15.5-16.5 ft. WEATHERED MANCOS SHALE BEDROCK:
						@16.5 ft. first refusal in bedrock.
						Total Depth 16.5 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4945					

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BOREHOLE LOG CRJ01-0049

PROJECT	MOAB	DATE DRILLED	10/23/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0049	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6794705.86	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123956.29	REMARKS			
SURFACE ELEV. (FT NGVD)	4955.80				
HOLE DEPTH (FT)	17.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	4955	2, 5, 7, 9	1.95			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, roots, very fine grained sand.
		9, 10, 12, 13	1.75			2.0-4.0 ft. medium dense.
						4.0-5.0 ft. Not Sampled.
5	4950	6, 9, 15, 15	1.9			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), weak HCL, dry, medium dense, very fine grained sand (more than above).
						7.0-10.0 ft. Not Sampled.
10	4945	20, 19, 24, 26	2.0			10.0-12.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, dense, very fine grained sand, trace rock fragments.
						12.0-15.0 ft. Not Sampled.
15	4940	18, 24, 39, 50/4"	1.8			15.0-15.5 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, dense, very fine grained sand, trace rock fragments.
						15.5-17.0 ft. WEATHERED MANCOS SHALE BEDROCK:
						@17.0 ft. first refusal in bedrock.

Total Depth 17.0 ft.
Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0050

PROJECT	MOAB	DATE DRILLED	10/22/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0050	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6794304.18	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123948.67	REMARKS			
SURFACE ELEV. (FT NGVD)	4948.00				
HOLE DEPTH (FT)	20.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 3, 5, 6	2.0			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, roots, very fine grained sand, mottled.
	4945	6, 10, 17, 18	1.9			2.0-4.0 ft. medium dense to dense.
						4.0-5.0 ft. Not Sampled.
5		10, 18, 17, 23	2.0			5.0-7.0 ft. SANDY SILT (ML); light brownish gray (10YR 6/2), weak HCL, dry, medium dense to dense, very fine grained sand, (more than above).
	4940					7.0-10.0 ft. Not Sampled.
10		20, 27, 40, 50	2.0			10.0-12.0 ft. SANDY SILT (ML); very pale brown (10YR 7/3), weak HCL, dry, dense to very dense, very fine grained sand, rock fragments, trace Fe stain.
	4935					12.0-15.0 ft. Not Sampled.
15		24, 50/4.5"	0.85			15.0-16.0 ft. SANDY SILT (ML); very pale brown (10YR 7/3), weak HCL, dry, dense to very dense, very fine grained sand.
						16.0-20.0 ft. Not Sampled.
	4930					18.0-20.0 ft. WEATHERED MANCOS SHALE BEDROCK: No drilling change, but inferred to occur midway in the range of 16.0 to 20.0 ft.
20		50/5"	0.45			20.0-20.5 ft. WEATHERED MANCOS SHALE:
						@20.5 ft. first refusal in bedrock.
						Total Depth 20.5 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4925					

BOREHOLE LOG CRJ01-0051

PROJECT	MOAB	DATE DRILLED	10/22/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0051	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6793902.50	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123941.05	REMARKS			
SURFACE ELEV. (FT NGVD)	4940.30				
HOLE DEPTH (FT)	11.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	4940	3, 6, 9, 11	2.0			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, roots, very fine grained sand, mottled.
		8, 12, 11, 14	1.65			2.0-3.0 ft. medium dense. 3.0-4.0 ft. sand increases
						4.0-5.0 ft. Not Sampled.
5	4935	9, 15, 14, 31	2.0			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, medium dense to dense, very fine grained sand, trace roots.
						7.0-10.0 ft. Not Sampled.
10	4930	36, 50/5"	0.8			10.0-10.5 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, medium dense to dense, very fine grained sand, trace roots. 10.5-11.0 ft. WEATHERED MANCOS SHALE BEDROCK: highly weathered. @11.0 ft. first refusal in bedrock. Total Depth 11.0 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

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BOREHOLE LOG CRJ01-0052

PROJECT	MOAB	DATE DRILLED	10/22/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0052	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6793500.83	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2123933.43	REMARKS			
SURFACE ELEV. (FT NGVD)	4933.50				
HOLE DEPTH (FT)	15.75				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 3, 7, 9	2.0			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, roots, very fine grained sand, mottled.
	4930	4, 10, 14, 16	1.4			
						4.0-5.0 ft. Not Sampled.
5		7, 15, 16, 19	1.8			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, medium dense to dense, roots, very fine grained sand, mottled.
						7.0-10.0 ft. Not Sampled.
	4925					
10		24, 40, 50/5"	1.3			10.0-11.5 ft. SANDY SILT (ML); very pale brown (10YR 7/3), strong HCL, dry, very dense, very fine grained sand, mottled.
						11.5-15.0 ft. Not Sampled.
	4920					
15		38, 50/3"	0.7			15.0-15.5 ft. SANDY SILT (ML); very pale brown (10YR 7/3), strong HCL, dry, very dense, very fine grained sand, mottled.
						15.5-15.75 ft. WEATHERED MANCOS SHALE BEDROCK: Fe stained.
						@15.75 ft. first refusal in bedrock.
						Total Depth 15.75 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4915					

BOREHOLE LOG CRJ01-0053

PROJECT	MOAB	DATE DRILLED	10/22/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0053	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796706.63	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2124396.07	REMARKS			
SURFACE ELEV. (FT NGVD)	5007.70				
HOLE DEPTH (FT)	10.40				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 6, 10, 8	1.65			0-4.0 ft. SANDY SILT (ML); brown (10YR 5/3), strong HCL, dry, loose to medium dense, roots, very fine grained sand, mottled.
	5005	6, 8, 9, 17	1.85			
						4.0-5.0 ft. Not Sampled.
5		10, 12, 15, 24	2.0			5.0-6.5 ft. SANDY SILT (ML); brown (10YR 5/3), strong HCL, dry, loose to medium dense, roots, very fine grained sand, mottled.
						6.5-7.0 ft. WEATHERED MANCOS SHALE BEDROCK:
	5000					7.0-10.0 ft. Not Sampled.
10		50/4"				10.0-10.4 ft. WEATHERED MANCOS SHALE:
						@10.4 ft. first refusal in bedrock.
						Total Depth 10.4 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0054

PROJECT	MOAB	DATE DRILLED	10/22/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0054	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796304.95	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2124388.45	REMARKS			
SURFACE ELEV. (FT NGVD)	4993.10				
HOLE DEPTH (FT)	11.25				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 2, 5, 7	1.8			0-4.0 ft. SANDY SILT (ML); light brownish gray (10YR 6/2), strong HCL, dry, loose to medium dense, roots, very fine grained sand.
	4990	5, 5, 9, 12	1.65			
						4.0-5.0 ft. Not Sampled.
5		4, 6, 9, 8	2.0			5.0-7.0 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong HCL, dry, loose to medium dense, very fine grained sand (more than above).
	4985					7.0-10.0 ft. Not Sampled.
10		19, 48, 50/3"	1.3			10.0-10.5 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong HCL, dry, loose to medium dense, very fine grained sand.
						10.5-11.25 ft. WEATHERED MANCOS SHALE BEDROCK:
						@11.25 ft. first refusal in bedrock. Total Depth 11.25 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0055

PROJECT	MOAB	DATE DRILLED	10/22/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0055	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795903.27	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2124380.83	REMARKS			
SURFACE ELEV. (FT NGVD)	4982.10				
HOLE DEPTH (FT)	11.75				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 4, 5, 7	2.0			0-4.0 ft. SANDY SILT (ML); brown (10YR 5/3), strong HCL, dry, loose to medium dense, roots, very fine grained sand.
	4980	5, 5, 9, 12	1.6			
						4.0-5.0 ft. Not Sampled.
5		8, 11, 14, 17	1.9			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong to weak HCL, dry, medium dense to dense, very fine grained sand, rock fragments and subrounded gravel, more sand than above.
	4975					7.0-10.0 ft. Not Sampled.
10		14, 26, 49, 50/3"	2.0			10.0-11.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong to weak HCL, dry, medium dense to dense, very fine grained sand, rock fragments and subrounded gravel.
						11.0-11.75 ft. WEATHERED MANCOS SHALE BEDROCK:
	4970					@11.75 ft. first refusal in bedrock. Total Depth 11.75 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0056

PROJECT	MOAB	DATE DRILLED	10/21/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0056	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795501.60	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2124373.21	REMARKS			
SURFACE ELEV. (FT NGVD)	4972.60				
HOLE DEPTH (FT)	11.80				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 2, 4, 7	2.0			0-4.0 ft. SANDY SILT (ML); light yellowish brown (10YR 6/4), strong HCL, dry, loose, roots, very fine grained sand.
	4970	5, 7, 10, 15	1.6			2.0-4.0 ft. loose to medium dense, trace roots.
						4.0-5.0 ft. Not Sampled.
5		10, 13, 14, 16	1.95			5.0-7.0 ft. SANDY SILT (ML); light yellowish brown (10YR 6/4), strong HCL, dry, loose to medium dense, trace roots, very fine grained sand.
	4965					7.0-10.0 ft. Not Sampled.
10		13, 27, 50, 50/4"	1.7			10.0-11.0 ft. SANDY SILT (ML); light yellowish brown (10YR 6/4), strong HCL, dry, loose dense, roots, very fine grained sand.
						11.0-11.8 ft. WEATHERED MANCOS SHALE BEDROCK:
	4960					@11.8 ft. first refusal in bedrock. Total Depth 11.8 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0057

PROJECT	MOAB	DATE DRILLED	10/21/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0057	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795099.92	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2124365.59	REMARKS			
SURFACE ELEV. (FT NGVD)	4962.90				
HOLE DEPTH (FT)	15.75				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 4, 8, 8	1.95			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand.
	4960	8, 14, 17, 21	1.8			
						4.0-5.0 ft. Not Sampled.
5		5, 6, 6, 8	1.9			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand.
						7.0-10.0 ft. Not Sampled.
	4955					
10		7, 8, 10, 11	2.0			10.0-12.0 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong HCL, dry, loose to medium dense, trace roots, very fine grained sand (more sand than above).
						12.0-15.0 ft. Not Sampled.
	4950					
						13.5-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
15		50 • 50/3"	0.75			15.0-15.75 ft. WEATHERED MANCOS SHALE:
						@15.75 ft. first refusal in bedrock.
						Total Depth 15.75 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4945					

BOREHOLE LOG CRJ01-0058

PROJECT	MOAB	DATE DRILLED	10/21/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0058	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6794698.24	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2124357.97	REMARKS			
SURFACE ELEV. (FT NGVD)	4954.10				
HOLE DEPTH (FT)	15.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 5, 8, 9	2.0			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand.
		5, 7, 10, 10	1.6			
	4950					4.0-5.0 ft. Not Sampled.
5		5, 8, 12, 17	1.95			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, very fine grained sand.
						7.0-10.0 ft. Not Sampled.
	4945					
10		28, 50/4"	0.8			10.0-11.0 ft. SANDY SILT (ML); very pale brown (10YR 7/4), weak HCL, dry, medium dense to dense.
						11.0-15.0 ft. Not Sampled.
						12.0-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
	4940					
15		50/5"	0.4			15.0-15.5 ft. WEATHERED MANCOS SHALE:
						@15.5 ft. first refusal in bedrock.
						Total Depth 15.5 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4935					

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BOREHOLE LOG CRJ01-0059

PROJECT	MOAB	DATE DRILLED	10/21/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0059	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6794296.56	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2124350.35	REMARKS			
SURFACE ELEV. (FT NGVD)	4946.20				
HOLE DEPTH (FT)	20.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	4945	3, 5, 5, 6	2.0			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand.
		3, 6, 9, 13	1.4			
						4.0-5.0 ft. Not Sampled.
5	4940	5, 7, 10, 10	1.95			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand.
						7.0-10.0 ft. Not Sampled.
10	4935	9, 10, 12, 13	2.0			10.0-12.0 ft. SANDY SILT (ML); light yellowish brown (10YR 6/4), weak to no HCL, dry, loose, very fine grained sand.
						12.0-15.0 ft. Not Sampled.
15	4930	8, 9, 12, 14	2.0			15.0-17.0 ft. SANDY SILT (ML); light yellowish brown (10YR 6/4), weak to no HCL, dry, loose, very fine grained sand.
						17.0-20.0 ft. Not Sampled.
						18.0-20.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
20	4925	50/5"	0.45			20.0-20.5 ft. WEATHERED MANCOS SHALE: @20.5 ft. first refusal in bedrock. Total Depth 20.5 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0060

PROJECT	MOAB	DATE DRILLED	10/21/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0060	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6793894.88	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2124342.73	REMARKS			
SURFACE ELEV. (FT NGVD)	4938.10				
HOLE DEPTH (FT)	12.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 3, 7, 10	2.0			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 7/4), strong HCL, dry, loose, roots, very fine grained sand.
	4935	6, 11, 14, 15	1.8			
						4.0-5.0 ft. Not Sampled.
5		3, 3, 3, 5	1.8			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 7/4), strong HCL, dry, loose, roots, very fine grained sand.
						7.0-10.0 ft. Not Sampled.
	4930					7.5-10.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
10		21, 34, 40, 50/5"	1.55			10.0-12.0 ft. WEATHERED MANCOS SHALE:
	4925					@12.0 ft. first refusal in bedrock. Total Depth 12.0 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0061

PROJECT	MOAB	DATE DRILLED	10/21/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0061	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796699.01	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2124797.75	REMARKS			
SURFACE ELEV. (FT NGVD)	5002.00				
HOLE DEPTH (FT)	10.70				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		5, 7, 8, 10	1.8			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand, few rock fragments (sandstone and shale).
	5000	6, 7, 9, 17	1.75			2.0-4.0 ft. only trace of rock fragments.
						4.0-5.0 ft. Not Sampled.
5		8, 8, 7, 9	1.9			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand, few rock fragments (sandstone and shale).
	4995					7.0-10.0 ft. Not Sampled.
						8.0-10.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
10		43, 50/2	0.75			10.0-10.7 ft. WEATHERED MANCOS SHALE: sandy shale.
	4990					@10.7 ft. first refusal in bedrock. Total Depth 10.7 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0062

PROJECT	MOAB	DATE DRILLED	10/21/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0062	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796297.33	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2124790.13	REMARKS			
SURFACE ELEV. (FT NGVD)	4989.10				
HOLE DEPTH (FT)	10.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 2, 5, 6	1.85			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand, rock fragments.
		5, 6, 9, 9	1.85			
	4985					4.0-5.0 ft. Not Sampled.
5		4, 7, 12, 14	1.7			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand, rock fragments. @7.0 ft. weathered bedrock on shoe.
	4980					7.0-10.0 ft. WEATHERED MANCOS SHALE BEDROCK: Not sampled.
10		50/5"				10.0-10.5 ft. WEATHERED MANCOS SHALE: @10.5 ft. first refusal in bedrock. Total Depth 10.5 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

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BOREHOLE LOG CRJ01-0063

PROJECT	MOAB	DATE DRILLED	10/21/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0063	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795895.65	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2124782.51	REMARKS			
SURFACE ELEV. (FT NGVD)	4979.80				
HOLE DEPTH (FT)	7.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 1, 2, 2	1.75			0-3.0 ft. SANDY SILT (ML); light yellowish brown (10YR 6/4), strong HCL, dry, loose, roots, very fine grained sand.
		2, 3, 4, 9	1.8			3.0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, trace roots, very fine grained sand (less than above), mottled.
						4.0-5.5 ft. Not Sampled.
5	4975	8, 31, 45, 50/4"	1.5			5.5-7.0 ft. WEATHERED MANCOS SHALE BEDROCK:
						@7.0 ft. first refusal in bedrock. Total Depth 7.0 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
10	4970					

BOREHOLE LOG CRJ01-0064

PROJECT	MOAB	DATE DRILLED	10/20/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0064	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795493.98	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2124774.89	REMARKS			
SURFACE ELEV. (FT NGVD)	4973.80				
HOLE DEPTH (FT)	6.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 3, 5, 6	1.95			0-3.5 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong HCL, dry, loose, roots, very fine grained sand, rock fragments..
		8, 9, 12, 20	1.75			
	4970					3.5-4.0 ft. WEATHERED MANCOS SHALE BEDROCK:
						4.0-5.0 ft. Not Sampled.
5		22, 50/5"	1.0			5.0-6.0 ft. WEATHERED MANCOS SHALE:
						@6.0 ft. first refusal in bedrock. Total Depth 6.0 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4965					
10						

BOREHOLE LOG CRJ01-0065

PROJECT	MOAB	DATE DRILLED	10/20/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0065	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795092.30	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2124767.27	REMARKS			
SURFACE ELEV. (FT NGVD)	4960.90				
HOLE DEPTH (FT)	5.80				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	4960	3, 5, 6, 8	2.0			0-3.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand, trace rock fragments.
		7, 13, 18, 22	1.5			3.0-4.0 ft. WEATHERED MANCOS SHALE BEDROCK:
						4.0-5.0 ft. Not Sampled.
5		24, 50/4"	1.0			5.0-5.8 ft. WEATHERED MANCOS SHALE:
	4955					@5.8 ft. first refusal in bedrock. Total Depth 5.8 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
10	4950					

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BOREHOLE LOG CRJ01-0066

PROJECT	MOAB	DATE DRILLED	10/20/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0066	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6794690.62	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2124759.65	REMARKS			
SURFACE ELEV. (FT NGVD)	4952.60				
HOLE DEPTH (FT)	10.80				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 8, 11, 14	1.75			0-4.0 ft. SANDY SILT (ML); light brownish gray (10YR 6/2), strong HCL, dry, loose to medium dense, roots, very fine grained sand.
	4950	9, 10, 15, 17	1.7			
						4.0-5.0 ft. Not Sampled.
5		10, 14, 19, 33	1.85			5.0-5.5 ft. SANDY SILT (ML); light brownish gray (10YR 6/2), strong HCL, dry, loose to medium dense, roots, very fine grained sand.
						5.5-7.0 ft. WEATHERED MANCOS SHALE BEDROCK:
	4945					7.0-10.0 ft. Not Sampled.
10		31, 50/4"	1.0			10.0-10.8 ft. WEATHERED MANCOS SHALE:
						@10.8 ft. first refusal in bedrock. Total Depth 10.8 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0067

PROJECT	MOAB	DATE DRILLED	10/20/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0067	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6794288.94	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2124752.02	REMARKS			
SURFACE ELEV. (FT NGVD)	4944.70				
HOLE DEPTH (FT)	10.20				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		5, 5, 7, 7	1.95			0-3.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand.
		11, 12, 12, 17	1.55			3.0-4.0 ft. WEATHERED MANCOS SHALE BEDROCK:
						4.0-5.0 ft. Not Sampled.
	4940					
5		21, 42, 33, 41	1.9			5.0-7.0 ft. WEATHERED MANCOS SHALE:
						7.0-10.0 ft. Not Sampled.
	4935					
10		50/2	0.55			10.0-10.2 ft. WEATHERED MANCOS SHALE:
						@10.2 ft. first refusal in bedrock.
						Total Depth 10.2 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

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BOREHOLE LOG CRJ01-0068

PROJECT	MOAB	DATE DRILLED	10/20/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0068	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6793887.26	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2124744.40	REMARKS			
SURFACE ELEV. (FT NGVD)	4936.60				
HOLE DEPTH (FT)	10.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	4935	3, 5, 7, 6	1.85			0-4.0 ft. SANDY SILT (ML); very pale brown (10YR 7/3), strong HCL, dry, loose, roots, very fine grained sand, rock fragments.
		5, 10, 14, 17	1.75			
						4.0-5.0 ft. Not Sampled.
5	4930	12, 15, 26, 36	1.9			5.0-10.0 ft. WEATHERED MANCOS SHALE BEDROCK:
						7.0-10.0 ft. Not Sampled.
10		50/5"	0.4			10.0-10.5 ft. WEATHERED MANCOS SHALE:
	4925					@10.5 ft. first refusal in bedrock. Total Depth 10.5 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

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BOREHOLE LOG CRJ01-0069

PROJECT	MOAB	DATE DRILLED	10/20/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0069	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796691.39	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2125199.43	REMARKS			
SURFACE ELEV. (FT NGVD)	4996.80				
HOLE DEPTH (FT)	7.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 3, 4, 6	2.0			0-4.0 ft. SANDY SILT (ML); grayish brown (10YR 5/2), strong HCL, dry, loose, roots, very fine grained sand, rock fragments.
	4995	5, 8, 9, 7	1.8			
						4.0-5.0 ft. Not Sampled.
5		7, 9, 22, 50/5"	1.5			5.0-6.0 ft. SANDY SILT (ML); grayish brown (10YR 5/2), strong HCL, dry, loose, roots, very fine grained sand, rock fragments.
	4990					6.0-7.0 ft. WEATHERED MANCOS SHALE BEDROCK:
						@7.0 ft. first refusal in bedrock. Total Depth 7.0 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
10						
	4985					

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BOREHOLE LOG CRJ01-0070

PROJECT	MOAB	DATE DRILLED	10/20/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0070	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796289.71	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2125191.81	REMARKS			
SURFACE ELEV. (FT NGVD)	4986.90				
HOLE DEPTH (FT)	21.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 5, 8, 10	2.0			0-4.0 ft. SANDY SILT (ML); brown (10YR 5/3), strong HCL, dry, loose, roots, very fine grained sand.
	4985	7, 10, 12, 14	1.75			2.0-4.0 ft. loose to medium dense.
						4.0-5.0 ft. Not Sampled.
5		6, 9, 9, 11	1.9			5.0-7.0 ft. SANDY SILT (ML); brown (10YR 5/3), strong HCL, dry, loose to medium dense, roots, very fine grained sand.
	4980					@7.0 ft. sandstone rock fragment in shoe.
						7.0-10.0 ft. Not Sampled.
10		7, 12, 13, 16	2.0			10.0-12.0 ft. SANDY SILT (ML); brown (10YR 5/3), strong HCL, dry, loose to medium dense, roots, very fine grained sand.
	4975					12.0-20.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change. Not Sampled.
15		50/4"				@15.0-15.4 ft. No Recovery.
						@15.4 ft. first refusal in bedrock.
	4970					
20		50, 50/3"	0.85			20.0-21.0 ft. MANCOS SHALE:
	4965					Total Depth 21.0 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0071

PROJECT	MOAB	DATE DRILLED	10/20/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0071	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795888.03	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2125184.19	REMARKS			
SURFACE ELEV. (FT NGVD)	4976.90				
HOLE DEPTH (FT)	11.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	4975	3, 3, 4, 7	1.95	X		0-4.0 ft. SANDY SILT (ML); light brownish gray (10YR 6/2), strong HCL, dry, loose, roots, very fine grained sand.
		5, 7, 9, 9	1.55	X		
						4.0-5.0 ft. Not Sampled.
5	4970	4, 13, 15, 15	1.85	X		5.0-7.0 ft. SANDY SILT (ML); light brownish gray (10YR 6/2), strong HCL, dry, loose, roots, very fine grained sand.
						7.0-10.0 ft. Not Sampled.
						9.0-10.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
10		27, 50/5"	1.0	X		10.0-11.0 ft. WEATHERED MANCOS SHALE:
	4965					@11.0 ft. first refusal in bedrock. Total Depth 11.0 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0072

PROJECT	MOAB	DATE DRILLED	10/20/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0072	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795486.36	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2125176.56	REMARKS			
SURFACE ELEV. (FT NGVD)	4967.30				
HOLE DEPTH (FT)	11.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 2, 3, 4	1.75			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand.
	4965	3, 4, 4, 6	1.6			
						4.0-5.0 ft. Not Sampled.
5		8, 10, 13, 15	1.5			5.0-7.0 ft. SANDY SILT (ML); light gray (10YR 7/2), strong HCL, dry, loose to medium dense, trace roots, very fine grained sand.
	4960					7.0-10.0 ft. Not Sampled.
10		16, 39, 50/4.5"	1.25			10.0-11.5 ft. WEATHERED MANCOS SHALE BEDROCK:
	4955					@11.5 ft. first refusal in bedrock. Total Depth 11.5 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

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BOREHOLE LOG CRJ01-0073

PROJECT	MOAB	DATE DRILLED	10/19/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0073	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795084.68	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2125168.94	REMARKS			
SURFACE ELEV. (FT NGVD)	4959.50				
HOLE DEPTH (FT)	11.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 3, 4, 6	1.95			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand.
		3, 4, 5, 5	1.75			
	4955					4.0-5.0 ft. Not Sampled.
5		4, 12, 21, 20	1.70			5.0-6.5 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand.
						6.5-7.0 ft. WEATHERED MANCOS SHALE BEDROCK:
						7.0-10.0 ft. Not Sampled.
	4950					
10		14, 50/5"	0.9			10.0-11.0 ft. WEATHERED MANCOS SHALE:
						@11.0 ft. first refusal in bedrock.

Total Depth 11.0 ft.
Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0074

PROJECT	MOAB	DATE DRILLED	10/19/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT,	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0074	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6794683.00	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2125161.32	REMARKS			
SURFACE ELEV. (FT NGVD)	4950.90				
HOLE DEPTH (FT)	6.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	4950	2, 5, 8, 11	1.95			0-2.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, roots, very fine grained sand. @2.0 ft. weathered bedrock in shoe.
		9, 14, 23, 36	1.5			2.0-4.0 ft. WEATHERED MANCOS SHALE BEDROCK:
						4.0-5.0 ft. Not Sampled.
5	4945	17, 42, 50/5"	1.05			5.0-6.5 ft. WEATHERED MANCOS SHALE:
						@6.5 ft. first refusal in bedrock. Total Depth 6.5 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
10	4940					

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BOREHOLE LOG CRJ01-0075

PROJECT	MOAB	DATE DRILLED	10/19/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0075	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6794281.32	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2125153.70	REMARKS			
SURFACE ELEV. (FT NGVD)	4941.70				
HOLE DEPTH (FT)	10.75				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 4, 4, 8	2.0			0-4.0 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong HCL, dry, loose, roots, very fine grained sand.
	4940	8, 6, 6, 11	1.55			
						4.0-5.0 ft. Not Sampled.
5		6, 12, 16, 35	1.9			5.0-5.5 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong HCL, dry, loose, roots, very fine grained sand.
	4935					5.5-7.0 ft. WEATHERED MANCOS SHALE BEDROCK:
						7.0-10.0 ft. Not Sampled.
10		39, 50/3"	0.9			10.0-10.75 ft. WEATHERED MANCOS SHALE:
	4930					@10.75 ft. first refusal in bedrock. Total Depth 10.75 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0076

PROJECT	MOAB	DATE DRILLED	10/19/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0076	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6793879.64	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2125146.08	REMARKS			
SURFACE ELEV. (FT NGVD)	4933.90				
HOLE DEPTH (FT)	10.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 4, 8, 11	1.95			0-2.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, roots, very fine grained sand.
		5, 8, 14, 22	1.5			2.0-4.0 ft. SANDY SILT (ML); brownish yellow (10YR 6/6), strong HCL, dry , loose to medium dense, roots, very fine grained sand (more sand than above), rock fragments.
	4930					4.0-5.0 ft. Not Sampled.
5		16, 28, 45, 50/5"	1.95			5.0-6.0 ft. SANDY SILT (ML); brownish yellow (10YR 6/6), strong HCL, dry , loose to medium dense, roots, very fine grained sand, rock fragments.
						6.0-7.0 ft. WEATHERED MANCOS SHALE BEDROCK: drilling change @6.0 ft.
						@6.9 ft. first refusal in bedrock.
						7.0-10.0 ft. Not Sampled.
	4925					
10		50/5 5"	0.4			10.0-10.5 ft. MANCOS SHALE: weathered.
						Total Depth 10.5 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0077

PROJECT	MOAB	DATE DRILLED	10/19/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0077	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796683.77	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2125601.10	REMARKS			
SURFACE ELEV. (FT NGVD)	4997.10				
HOLE DEPTH (FT)	10.75				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		4, 4, 4, 4	1.75			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand.
	4995	3, 3, 3, 4	1.85			
						4.0-5.0 ft. Not Sampled.
5		4, 7, 8, 8	1.9			5.0-6.5 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand.
						6.5-7.0 ft. WEATHERED MANCOS SHALE BEDROCK:
	4990					7.0-10.0 ft. Not Sampled.
10		30, 50/3"	0.80			10.0-10.75 ft. WEATHERED MANCOS SHALE:
						@10.75 ft. first refusal in bedrock. Total Depth 10.75 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4985					

BOREHOLE LOG CRJ01-0078

PROJECT	MOAB	DATE DRILLED	10/19/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0078	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796282.09	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2125593.48	REMARKS			
SURFACE ELEV. (FT NGVD)	4985.50				
HOLE DEPTH (FT)	15.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	4985	3, 4, 5, 6	1.8			0-4.0 ft. SANDY SILT (ML); light brownish gray (10YR 6/2), strong HCL, dry, loose, roots, very fine grained sand.
		6, 8, 7, 8	1.8			
						4.0-5.0 ft. Not Sampled.
5	4980	6, 8, 8, 9	1.85			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, trace roots, very fine grained sand, rock fragments (more than above)
						7.0-10.0 ft. Not Sampled.
10	4975	9, 11, 13, 21	1.8			10.0-12.0 ft. SANDY SILT (ML); very pale brown (10YR 7/3), strong HCL, dry, loose to medium dense, very fine grained sand. @12.0 ft. Weathered bedrock in shoe.
						12.0-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: Not Sampled.
15	4970	50/4"	0.35			15.0-15.5 ft. WEATHERED MANCOS SHALE: @15.5 ft. first refusal in bedrock. Total Depth 15.5 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0079

PROJECT	MOAB	DATE DRILLED	10/19/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0079	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795880.41	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2125585.86	REMARKS			
SURFACE ELEV. (FT NGVD)	4974.90				
HOLE DEPTH (FT)	10.70				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 2, 7, 9	1.8			0-2.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand, trace rock fragments.
		6, 11, 15, 16	1.55			2.0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry , loose to medium dense, roots, very fine grained sand, rock fragments (more than above).
						4.0-5.0 ft. Not Sampled.
5	4970	5, 8, 8, 9	1.9			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry , loose, roots, very fine grained sand, rock fragments.
						7.0-10.0 ft. Not Sampled.
						8.5-10.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
10	4965	40, 50/2	0.8			10.0-10.7 ft. WEATHERED MANCOS SHALE:
						@10.7 ft. first refusal in bedrock. Total Depth 10.7 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0080

PROJECT	MOAB	DATE DRILLED	10/19/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0080	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795478.74	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2125578.24	REMARKS			
SURFACE ELEV. (FT NGVD)	4966.70				
HOLE DEPTH (FT)	15.70				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	4965	3, 4, 4, 5	1.55			0-4.0 ft. SANDY SILT (ML); light brownish gray (10YR 6/2), strong HCL, dry, loose, roots, very fine grained sand.
		6, 9, 12, 13	1.95			
						4.0-5.0 ft. Not Sampled.
5	4960	3, 5, 6, 8	1.75			5.0-7.0 ft. SANDY SILT (ML); light brownish gray (10YR 6/2), strong HCL, dry, loose, trace roots, very fine grained sand.
						7.0-10.0 ft. Not Sampled.
10	4955	5, 12, 22, 34	1.95			10.0-11.0 ft. SANDY SILT (ML); light brownish gray (10YR 6/2), strong HCL, dry, loose, trace roots, very fine grained sand.
						11.0-12.0 ft. WEATHERED MANCOS SHALE BEDROCK:
						12.0-15.0 ft. Not Sampled.
15	4950	50, 50/2	0.6			15.0-15.7 ft. WEATHERED MANCOS SHALE:
						@15.7 ft. first refusal in bedrock.
						Total Depth 15.7 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0081

PROJECT	MOAB	DATE DRILLED	10/18/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0081	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795077.06	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2125570.62	REMARKS			
SURFACE ELEV. (FT NGVD)	4958.00				
HOLE DEPTH (FT)	16.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		1, 3, 4, 3	1.8			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand.
	4955	3, 4, 4, 6	1.55			
						4.0-5.0 ft. Not Sampled.
5		6, 13, 14, 17	1.95			5-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand.
						7.0-10.0 ft. Not Sampled.
	4950					
10		10, 15, 26, 35	1.95			10-11.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand.
						11.0-12.0 ft. WEATHERED MANCOS SHALE BEDROCK:
						12.0-15.0 ft. Not Sampled.
	4945					
15		22, 50/5"	0.9			15.0-16.0 ft. WEATHERED MANCOS SHALE:
						@16.0 ft. first refusal in bedrock.
						Total Depth 16.0 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4940					

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BOREHOLE LOG CRJ01-0082

PROJECT	MOAB	DATE DRILLED	10/18/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0082	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6794675.38	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2125563.00	REMARKS			
SURFACE ELEV. (FT NGVD)	4949.10				
HOLE DEPTH (FT)	16.75				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		4, 3, 5, 6	1.8			0-4.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand.
		7, 7, 9, 11	1.8			
	4945					4.0-5.0 ft. Not Sampled.
5		6, 7, 9, 11	1.85			5-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, trace roots, very fine grained sand.
						7.0-10.0 ft. Not Sampled.
	4940					
10		6, 10, 9, 11	2.0			10-12.0 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong HCL, dry, loose to medium dense, trace roots, trace rock fragments, very fine grained sand (more sand than above).
						12.0-15.0 ft. Not Sampled.
	4935					
15		10, 24, 50, 50/3"	1.85			15-15.5 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong HCL, dry, loose to medium dense, trace roots, trace rock fragments, very fine grained sand.
						15.0-16.75 ft. WEATHERED MANCOS SHALE BEDROCK:
						@16.75 ft. first refusal in bedrock.
						Total Depth 16.75 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4930					

BOREHOLE LOG CRJ01-0083

PROJECT	MOAB	DATE DRILLED	10/13/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0083	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6794273.70	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2125555.38	REMARKS			
SURFACE ELEV. (FT NGVD)	4941.00				
HOLE DEPTH (FT)	10.70				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	4940	4, 9, 8, 9	1.8			0-4.0 ft. SILT (ML); light brownish gray (10YR 6/4), strong HCL, dry, loose. roots, trace rock fragments.
		7, 8, 13, 20	1.75			@4.0 ft. some white gypsum (no HCL reaction).
						4.0-5.0 ft. Not Sampled.
5		50/5"	0.25			5.0-5.5 ft. SILT (ML); light brownish gray (10YR 6/2), strong HCL, dry, loose. roots, trace rock fragments.
						@5.5 ft. weathered bedrock in shoe.
	4935					5.5-10.0 ft. WEATHERED MANCOS SHALE BEDROCK: Not sampled.
10		39, 50/2	0.5			10.0-10.7 ft. WEATHERED MANCOS SHALE:
	4930					@10.7 ft. first refusal in bedrock.

Total Depth 10.7 ft.
Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0084

PROJECT	MOAB	DATE DRILLED	10/12/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0084	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796681.41	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2126032.90	REMARKS			
SURFACE ELEV. (FT NGVD)	4993.00				
HOLE DEPTH (FT)	11.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		1, 3, 4, 4	2.0			0-3.5 ft. SILT (ML); brown (10YR 5/3), strong HCL, dry, loose. roots, trace rock fragments.
	4990	2, 3, 3, 4	1.7			3.5-4.0 ft. CLAYEY SILT (ML); pale brown (10YR 6/3), strong HCL, dry-slightly moist, loose, slightly cohesive, trace rock fragments
						4.0-5.0 ft. Not Sampled.
5		2, 4, 5, 5	1.5			5.0-7.0 ft. CLAYEY SILT (ML); pale brown (10YR 6/3), strong HCL, dry-slightly moist, loose, slightly cohesive, trace rock fragments.
	4985					7.0-10.0 ft. Not sampled.
						9.0-10.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
10		16, 50/5"	0.85			10.0-11.0 ft. WEATHERED MANCOS SHALE:
						@11.0 ft. first refusal in bedrock. Total Depth 11.0 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0085

PROJECT	MOAB	DATE DRILLED	10/12/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0085	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796253.92	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2126024.79	REMARKS			
SURFACE ELEV. (FT NGVD)	4982.60				
HOLE DEPTH (FT)	16.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		4, 5, 4, 6	1.8	X		0-4.0 ft. SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, trace fine grained sand.
	4980	5, 5, 6, 5	1.75	X		
						4.0-5.0 ft. Not Sampled.
5		5, 8, 11, 10	1.85	X		5-7.0 ft. SANDY GRAVELLY SILT/SILTY SANDY GRAVEL (SM-GM); light brownish gray (10YR 6/2), dry, loose to medium dense, trace roots, fine grained sand, rock fragments.
	4975					7.0-10.0 ft. Not Sampled.
10		12, 19, 29, 46	1.85	X		10-11.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), weak HCL, dry, medium dense.
						11.0-12.0 ft. WEATHERED MANCOS SHALE BEDROCK:
	4970					12.0-15.0 ft. Not Sampled.
15		21, 28, 50/5"	1.3	X		15.0-16.50 ft. WEATHERED MANCOS SHALE: Sandstone, white (10YR 8/1), weak to no HCL.
	4965					16.5 ft. first refusal in bedrock. Total Depth 16.5 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0086

PROJECT	MOAB	DATE DRILLED	10/12/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0086	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795863.61	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2126033.25	REMARKS			
SURFACE ELEV. (FT NGVD)	4972.90				
HOLE DEPTH (FT)	16.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		4, 4, 5, 5	2.0			0-4.0 ft. SILT (ML); light brownish gray (10YR 6/2), strong HCL, dry, loose, roots, trace rock fragments.
	4970	3, 3, 4, 5	1.65			
						4.0-5.0 ft. Not Sampled.
5		8, 13, 13, 15	2.0			5-7.0 ft. SANDY GRAVELLY SILT/SILTY SANDY GRAVEL (SM-GM); light brownish gray (10YR 6/2), dry, medium dense, trace roots, fine grained sand, rock fragments.
	4965					7.0-10.0 ft. Not Sampled.
10		19, 23, 27, 34	1.9			10-12.0 ft. No lithologic description. Assume soil/alluvial material.
	4960					12.0-15.0 ft. Not Sampled.
						14.0-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: No drilling change but inferred to occur midway in the range of 12.0 to 15.0 ft.
15		32, 50/5"	0.7			15.0-16.0 ft. WEATHERED MANCOS SHALE:
	4955					@16.0 ft. first refusal in bedrock. Total Depth 16.0 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

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BOREHOLE LOG CRJ01-0087

PROJECT	MOAB	DATE DRILLED	10/12/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0087	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795461.93	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2126025.63	REMARKS			
SURFACE ELEV. (FT NGVD)	4963.00				
HOLE DEPTH (FT)	11.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 6, 7, 5	2.0			0-4.0 ft. SANDY SILT (ML); light gray (10YR 7/2), strong HCL, dry, loose, roots, very fine grained sand, trace rock fragments.
	4960	5, 7, 10, 13	1.8			
						4.0-5.0 ft. Not Sampled.
5		9, 10, 9, 9	1.8			5-7.0 ft. SANDY SILT (ML); yellowish brown (10YR 5/4), strong HCL, dry, loose, trace roots, very fine grained sand, some rock fragments (sandstone and shale).
						7.0-10.0 ft. Not Sampled.
	4955					8.5-10.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
10		12, 45, 50/5"	1.4			10.0-11.5 ft. WEATHERED MANCOS SHALE: fine grained sandstone.
						@11.5 ft. first refusal in bedrock. Total Depth 11.5 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0088

PROJECT	MOAB	DATE DRILLED	10/12/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0088	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795092.63	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2126024.46	REMARKS			
SURFACE ELEV. (FT NGVD)	4954.90				
HOLE DEPTH (FT)	16.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 3, 2, 3	1.5			0-2.0 ft. CLAYEY SILT (ML); yellowish brown (10YR 5/4), strong HCL, slightly moist to dry, loose, roots, trace rock fragments.
		3, 3, 6, 10	1.75			2.0-4.0 ft. SANDY SILT (ML); grayish brown (10YR 5/2), stong HCL, dry, loose, roots.
						4.0-5.0 ft. Not Sampled.
5	4950	3, 5, 11, 13	1.8			5.0-7.0 ft. SANDY SILT (ML); grayish brown (10YR 5/2), stong HCL, dry, loose, roots.
						7.0-10.0 ft. Not Sampled.
10	4945	50/5"	0.4			10.0-10.5 ft. SANDY SILT (ML); grayish brown (10YR 5/2), stong HCL, dry, loose, roots.
						10.5-15.0 ft. Not Sampled.
						12.0-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: No drilling change but inferred to occur midway in the range of 10.5 to 15.0 ft.
15	4940	18, 49, 50/4"	1.3			15.0-16.5 ft. WEATHERED MANCOS SHALE:
						16.5 ft. first refusal in bedrock.

Total Depth 16.5 ft.
Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0089

PROJECT	MOAB	DATE DRILLED	10/12/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0089	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6794690.96	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2126016.84	REMARKS			
SURFACE ELEV. (FT NGVD)	4947.00				
HOLE DEPTH (FT)	20.70				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 2, 2, 6	1.7	X		0-2.0 ft. CLAYEY SILT (ML); brown (10YR 5/3), strong HCL, slightly moist to dry, loose, slightly cohesive, roots.
	4945	8, 7, 7, 11	1.75	X		2.0-4.0 ft. SILT (ML); grayish brown (10YR 5/2), strong HCL, dry, loose to medium dense, trace roots.
						4.0-5.0 ft. Not Sampled.
5		5, 6, 5, 6	1.5	X		5.0-7.0 ft. SANDY SILT (ML); grayish brown (10YR 5/2), strong HCL, dry, loose, trace roots, very fine grained sand.
	4940					7.0-10.0 ft. Not Sampled.
10		4, 9, 14, 13	1.0	X		10.0-12.0 ft. SANDY SILT (ML) light gray (10YR 7/2), strong HCL, dry, medium dense, very fine grained sand. @11.0 ft parts of prairie dog or rabbit.
	4935					12.0-15.0 ft. Not Sampled.
15		19, 27, 38, 50	1.9	X		15.0-17.0 ft. SANDY SILT (ML) light yellowish brown (10YR 6/4), weak HCL, dry, medium dense, very fine grained sand rock fragments at 16.0 ft..
	4930					@17.0 ft. weathered bedrock in shoe.
						17.0-20.0 ft. Not Sampled. WEATHERED MANCOS SHALE BEDROCK:
20		41, 50/2	0.65	X		20.0-20.7 ft. WEATHERED MANCOS SHALE:
	4925					@20.7 ft. first refusal in bedrock. Total Depth 20.7 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

Stoller

U.S. DEPARTMENT OF ENERGY
GRAND JUNCTION, COLORADO

BOREHOLE LOG CRJ01-0090

PROJECT	MOAB	DATE DRILLED	10/11/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0090	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6797038.22	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2126429.83	REMARKS			
SURFACE ELEV. (FT NGVD)	4999.40				
HOLE DEPTH (FT)	15.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 4, 5, 6	2.0			0-4.0 ft. SILT (ML); light yellowish brown (10YR 6/4), strong HCL, dry, loose, roots, trace rock fragments.
		5, 10, 12, 17	1.55			
	4995					4.0-5.0 ft. Not Sampled.
5		3, 6, 9, 10	1.65			5.0-7.0 ft. SANDY SILT (ML); light yellowish brown (10YR 6/4), strong HCL, dry, loose, trace roots, very fine grained sand.
						7.0-10.0 ft. Not Sampled.
	4990					
10		7, 16, 34, 30	1.9			10.0-11.0 ft. SANDY SILT (ML); light yellowish brown (10YR 6/4), strong HCL, dry, loose, trace roots, very fine grained sand.
						11.0-12.0 ft. WEATHERED MANCOS SHALE BEDROCK:
						12.0-15.0 ft. Not Sampled.
	4985					
15		50/4.5"	0.5			15.0-15.5 ft. WEATHERED MANCOS SHALE:
						@15.5 ft.first refusal in bedrock.
						Total Depth 15.5 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4980					

BOREHOLE LOG CRJ01-0091

PROJECT	MOAB	DATE DRILLED	10/11/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0091	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796673.79	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2126434.58	REMARKS			
SURFACE ELEV. (FT NGVD)	4990.20				
HOLE DEPTH (FT)	10.80				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	4990	1, 1, 4, 7	2.0			0-4.0 ft. SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, very fine grained sand.
		4, 8, 15, 18	1.8			
						4.0-5.0 ft. Not Sampled.
5	4985	7, 18, 22, 22	1.8			5.0-7.0 ft. SILT (ML); very pale brown (10YR 7/3), strong HCL, dry, loose to medium dense, trace very fine grained sand, rock fragments in shoe.
						7.0-10.0 ft. Not Sampled.
						8.0-10.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
10	4980	25, 50/.5"	0.75			10.0-10.8 ft. WEATHERED MANCOS SHALE:
						@10.8 ft. first refusal in bedrock.. Total Depth 10.8 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

Stoller

U.S. DEPARTMENT OF ENERGY
GRAND JUNCTION, COLORADO

BOREHOLE LOG CRJ01-0092

PROJECT	MOAB	DATE DRILLED	10/11/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT,	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0092	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796246.30	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2126426.47	REMARKS			
SURFACE ELEV. (FT NGVD)	4980.40				
HOLE DEPTH (FT)	15.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	4980	2, 5, 5, 4	1.85			0-4.0 ft. SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, trace rock fragments, trace fine grained sand.
		3, 3, 3, 4	1.65			@2.0 silty sand with rock fragment in shoe.
						4.0-5.0 ft. Not Sampled.
5	4975	3, 5, 6, 7	1.5			5.0-7.0 ft. SILT (ML); brown (10YR 5/3), strong HCL, dry, loose, trace roots.
						7.0-10.0 ft. Not Sampled.
						8.0-10.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
10	4970	8, 9, 10, 13	1.65			10.0-12.0 ft. WEATHERED MANCOS SHALE:
						12.0-15.0 ft. Not Sampled.
15	4965	50/5"	0.5			15.0-15.5 ft. WEATHERED MANCOS SHALE:
						15.5 ft. first refusal in bedrock.

Total Depth 15.5 ft.

Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0093

PROJECT	MOAB	DATE DRILLED	10/11/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0093	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795850.05	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2126440.65	REMARKS			
SURFACE ELEV. (FT NGVD)	4971.00				
HOLE DEPTH (FT)	20.70				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	4970	1, 1, 3, 6	1.65			0-1.0 ft. CLAYEY SILT (ML); brown (10YR 5/3), strong HCL, dry, loose, slightly cohesive, roots.
						1.0-4.0 ft. SILT (ML); brown (10YR 5/3), strong HCL, dry, loose, roots.
		7, 9, 6, 7	1.5			@2.0 ft. trace roots.
						4.0-5.0 ft. Not Sampled.
5	4965	4, 7, 10, 15	1.7			5.0-7.0 ft. SANDY SILT (ML); yellowish brown (10YR 5/4), strong HCL, dry, loose to medium dense, very fine grained sand.
						7.0-10.0 ft. Not Sampled.
10	4960	6, 11, 14, 16	2.0			10.0-12.0 ft. SANDY SILT (ML); light brownish gray (10YR 6/2), strong HCL, dry, loose to medium dense, very fine grained sand (more than above), rock fragments in shoe.
						12.0-15.0 ft. Not Sampled.
15	4955	12, 20, 21, 26	2.0			15.0-17.0 ft. SANDY SILT WITH GRAVEL (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, very fine grained sand, rock fragments.
						17.0-20 ft. Not Sampled.
						17.5-20.0 ft. WEATHERED MANCOS SHALE BEDROCK: Inferred from drilling change.
20	4950	49, 50/2	0.75			20.0-20.7 ft. WEATHERED MANCOS SHALE:
						@20.7 ft. first refusal in bedrock.
						Total Depth 20.7 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0094

PROJECT	MOAB	DATE DRILLED	10/10/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT,	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0094	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795460.44	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2126411.56	REMARKS			
SURFACE ELEV. (FT NGVD)	4961.80				
HOLE DEPTH (FT)	21.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 3, 4, 4	1.9			0-0.5 ft. CLAYEY SILT (ML); brown (10YR 4/3), strong HCL, dry, loose, slightly cohesive, roots.
	4960	5, 6, 9, 11	1.75			0.5-4.0 ft. SILT (ML); yellowish brown (10YR 5/4), strong HCL, dry, loose to medium dense, trace roots.
						4.0-5.0 ft. Not Sampled.
5		4, 3, 3, 4	1.65			5.0-7.0 ft. SILT (ML); brown (10YR 4/3), strong HCL, dry, loose, trace roots.
	4955					7.0-10.0 ft. Not Sampled.
10		14, 18, 19, 18	1.75			10.0-12.0 ft. SILT (ML); brown (10YR 4/3), strong HCL, dry, loose, trace roots.
	4950					12.0-15.0 ft. Not Sampled.
15		21, 28, 20, 30	2.0			15.0-17.0 ft. SANDY SILT WITH GRAVEL (ML); very pale brown (10YR 7/3), dry, dense, none to weak HCL.
	4945					17.0-20 ft. Not Sampled. No drilling change, top of bedrock estimated @ 20.0 ft.
20		32, 44, 50/5"	1.4			20.0-21.5 ft. WEATHERED MANCOS SHALE BEDROCK:
	4940					@21.5 ft. first refusal in bedrock.

Total Depth 21.5 ft.

Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0095

PROJECT	MOAB	DATE DRILLED	10/10/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0095	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6794697.78	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2126376.72	REMARKS			
SURFACE ELEV. (FT NGVD)	4945.50				
HOLE DEPTH (FT)	15.75				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	4945	2, 4, 6, 9	1.9			0-2.0 ft. SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, roots, trace very fine grained sand.
		8, 9, 12, 13	1.8			2.0-4.0 ft. SILT (ML); brownish yellow (10YR 6/8), strong HCL, dry, loose to medium dense, trace roots.
						4.0-5.0 ft. Not Sampled.
5	4940	4, 7, 8, 11	1.7			5.0-7.0 ft. SANDY SILT (ML); pale brown (10YR 6/3), weak HCL, dry, loose to medium dense, very fine grained sand.
						7.0-10.0 ft. Not Sampled.
						9.5-10.0 ft. WEATHERED MANCOS SHALE BEDROCK: inferred from drilling change.
10	4935	20, 45, 50/3"	1.0			10.0-11.25 ft. WEATHERED MANCOS SHALE:
						11.25-15.0 ft. Not Sampled. @11.25 ft. first refusal in bedrock.
15	4930	35, 50/3"	0.5			15.0-15.75 ft. MANCOS SHALE:
						Total Depth 15.75 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

BOREHOLE LOG CRJ01-0096

PROJECT	MOAB	DATE DRILLED	10/10/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0096	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796636.02	DRILL OPERATOR	Neaman, J.		
EAST COORD. (FT)	2126834.80	REMARKS			
SURFACE ELEV. (FT NGVD)	4988.50				
HOLE DEPTH (FT)	20.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		2, 3, 8, 9	1.75			0-1.0 ft. CLAYEY SILT (ML); dark yellowish brown (10YR 4/4), strong HCL, slightly moist, loose, slightly cohesive, roots, trace of fine grained sand.
						1.0-2.0 ft. SILT (ML); brown (10YR 5/3), strong HCL, dry, loose, few roots.
		6, 8, 13, 14	1.75			2.0-2.5 ft. SANDY SILT (ML); brownish yellow (10YR 6/6), some rock fragments, strong HCL, dry, loose, trace roots.
	4985					2.5-4.0 ft. SANDY SILT (ML); dark yellowish brown (10YR 4/6), weak HCL, dry, loose to medium dense, some rock fragments.
						4.0-5.0 ft. Not Sampled.
5		9, 16, 18, 24	1.70			5.0-7.0 ft. SILTY SANDY GRAVEL(GM); weak HCL, dry, loose to medium dense, angular gravel (rock fragments), fine to coarse grained sand.
						7.0-10.0 ft. Not Sampled.
	4980					
10		28, 50/5"	0.65			10.0-11.0 ft. SANDY SILT (ML); very pale brown (10YR 7/4), strong HCL, dry, medium dense, very fine grained sand, rock fragment in shoe.
						11.0-20.0 ft. Not Sampled.
	4975					13.0-15.0 ft. WEATHERED MANCOS SHALE BEDROCK: No drilling change but inferred to occur midway in the range of 11.0 to 15.0 ft.
15		50/3"				15.0-15.25 ft. No recovery. Inferred WEATHERED MANCOS SHALE: @15.25 ft. first refusal in bedrock.
	4970					
20		50/5"				20.0-20.5 ft. MANCOS SHALE: No recovery.
						Total Depth 20.5 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4965					

BOREHOLE LOG CRJ01-0097

PROJECT	MOAB	DATE DRILLED	09/27/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0097	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795842.42	DRILL OPERATOR	Mott, S.		
EAST COORD. (FT)	2126842.33	REMARKS			
SURFACE ELEV. (FT NGVD)	4969.40				
HOLE DEPTH (FT)	19.70				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		1, 3, 8, 9	1.75			0-1.0 ft. CLAYEY SILT (ML); brown (10YR 4/3), strong HCL, slightly moist, loose, slightly cohesive, some roots.
						1.0-2.0 ft. SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose, few roots.
		3, 7, 13, 13	0.9			2.0-4.0 ft. SILT (ML); pale brown (10YR 6/3), strong HCL, dry, loose to medium dense, trace roots.
	4965					4.0-4.5 ft. Not Sampled.
5		3, 11, 15, 20	1.75			4.5-6.5 ft. SILT (ML); pale brown (10YR 6/3), strong HCL (4.5-5.5 ft), dry, loose, to medium dense, trace roots. No HCL reaction from 5.5-6.5 ft.
						6.5-9.0 ft. Not Sampled.
10	4960	10, 13, 18, 17	0.9			9.0-11.0 ft. SILT (ML); very pale brown (10YR 7/3), weak to strong HCL, dry, medium dense, trace roots, some rock fragments (shale).
						11.0-14.0 ft. Not Sampled.
15	4955	10, 14, 20, 38	1.8			14.0-15.5 ft. SILT (ML); yellowish brown (10YR 5/4), strong HCL, dry, loose to medium dense.
						15.5-16.0 ft. WEATHERED MANCOS SHALE BEDROCK: weak HCL, brown (10YR 5/3), medium dense.
						16.0-19.0 ft. Not Sampled.
	4950	30, 50/2	0.55			19.0-19.7 ft. WEATHERED MANCOS SHALE:
20						@19.7 ft. first refusal in bedrock.
						Total Depth 19.7 ft.
						Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4945					

BOREHOLE LOG CRJ01-0098

PROJECT	MOAB	DATE DRILLED	09/27/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0098	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795171.16	DRILL OPERATOR	Mott, S.		
EAST COORD. (FT)	2126829.42	REMARKS			
SURFACE ELEV. (FT NGVD)	4954.30				
HOLE DEPTH (FT)	20.00				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 6, 7, 8	2.0	X		0-2.0 ft. CLAYEY SILT (ML); brown (10YR 5/3), strong HCL, dry, loose, slightly cohesive, some roots.
		6, 6, 6, 8	1.75	X		2.0-4.0 ft. SILT (ML); pale brown (10YR 6/3), and light gray (10YR 7/2), strong HCL, dry, loose, mottled, trace roots, rock fragments at 3.5 ft., mottling decrease with at depth.
	4950					4.0-4.5 ft. Not Sampled.
5		11, 11, 12, 10	1.5	X		4.5-6.5 ft. SILT (ML); pale brown (10YR 6/3), strong HCL, dry, medium dense, trace roots.
						6.5-9.0 ft. Not Sampled.
	4945	7, 15, 24, 22	1.85	X		9.0-11.0 ft. SILT (ML); light yellowish brown, (10YR 6/4), strong HCL, dry, loose to medium dense, trace roots.
10						11.0-14.0 ft. Not Sampled.
						13.0-14.0 ft. WEATHERED MANCOS SHALE BEDROCK: No drilling change but inferred to occur midway in the range of 11.0-14.0 ft.
	4940	39, 50/5"	0.75	X		14.0-14.9 ft. WEATHERED MANCOS SHALE); very pale brown (10YR 8/2), strong HCL, dry, dense, some shale fragments (shale).
15						14.9-19.0 ft. Not Sampled. @14.9 first refusal in bedrock.
	4935	35, 50/4"	1.0	X		19.0-20.0 ft. MANCOS SHALE:
20						Total Depth 20.0 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4930					

BOREHOLE LOG CRJ01-0099

PROJECT	MOAB	DATE DRILLED	09/26/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0099	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6796226.49	DRILL OPERATOR	Mott, S.		
EAST COORD. (FT)	2127221.52	REMARKS			
SURFACE ELEV. (FT NGVD)	4977.40				
HOLE DEPTH (FT)	9.75				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
		3, 6, 8, 8	1.4			0-2.0 ft. CLAYEY SILT (ML); brown (10YR 4/3), highly calcareous, dry, loose, slightly cohesive, roots.
	4975	5, 6, 12, 11	2.0			2.0-4.0 ft. SILT (ML); very pale brown (10YR 7/4), highly calcareous, some rock fragments, some fine grained sand, mottled, dry, loose.
						4.0-4.5 ft. Not Sampled.
5		12, 11, 18, 17	1.5			4.5-6.5 ft. SILT (ML); very pale brown (10YR 7/3), highly calcareous, occasional roots, mottled, dry, medium dense.
	4970					6.5-9.0 ft. WEATHERED MANCOS SHALE BEDROCK: Not Sampled. @6.5 ft. weathered bedrock in shoe.
		40, ~~50/2.5"~~	0.5			9.0-9.75 ft. WEATHERED MANCOS SHALE: light brownish gray (10YR 6/2), highly calcareous, dense to very dense.
10						@9.75 ft. first refusal in bedrock. Total Depth 9.75 ft. Borehole terminated at depth of blow count refusal in weathered Mancos Shale.
	4965					

BOREHOLE LOG CRJ01-0100

PROJECT	MOAB	DATE DRILLED	09/26/2005	BIT SIZE(S) (IN)	8.0
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Layne GeoConstruction	CORE SIZE(S) (IN)	2.5
SITE	Crescent Junction	DRILLING METHOD	Hollow Stem Auger	LOGGED BY	Reed, J.
WELL NUMBER	CRJ01-0100	SAMPLING METHOD	SPLIT SPOON	WL (FT BGS)	
NORTH COORD. (FT)	6795514.03	DRILL OPERATOR	Mott, S.		
EAST COORD. (FT)	2127198.93	REMARKS			
SURFACE ELEV. (FT NGVD)	4961.20				
HOLE DEPTH (FT)	12.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	4960	4, 4, 4, 4	1.5	X		0-2.0 ft. CLAYEY SILT (ML); brown (10YR 4/3), highly calcareous, dry, loose, slightly cohesive, roots.
		4, 6, 5, 6	2.0	X		2.0-4.0 ft. SILT (ML); brown (10YR 5/3), highly calcareous, trace roots, mottled, dry, loose, slightly cohesive.
						4.0-4.5 ft. Not Sampled.
5	4955	6, 7, 7, 8	0.5	X		4.5-6.5 ft. CLAYEY SILT (ML); light brownish gray (10YR 6/2), highly calcareous, dry, loose. Poor recovery.
						6.5-9.5 ft. Not Sampled.
10	4950	9, 9, 12, 18	1.95	X		9.5-10.5 ft. SANDY SILT (ML); very pale brown (10YR 7/4); highly calcareous, very fine grained sand, dry, loose.
						10.5-11.5 ft. WEATHERED MANCOS SHALE BEDROCK; pale brown, (10YR 6/3), highly calcareous, medium dense, dry.
		24, 50/5"	0.6	X		11.5-12.5 ft. WEATHERED MANCOS SHALE: light brownish gray (10YR 6/2), highly calcareous, dry.
						@12.5 ft. first refusal in bedrock.

Total Depth 12.5 ft.
Borehole terminated at depth of blow count refusal in weathered Mancos Shale.

U.S. Department of Energy—Grand Junction, Colorado

Calculation Cover Sheet

Calc. No.: MOA-02-02-2006-1-04-00 **Discipline:** Geologic and Geophysical Properties **No. of Sheets:** 4

Project: Moab UMTRA Project

Site: Crescent Junction, Utah

Feature: Geophysical Logs

Sources of Data:

Geophysical logs

Sources of Formulae and References:

COLOG 2006. *Borehole Geophysical Logging Results – Crescent Junction Disposal Site – Crescent Junction, Utah.*

Preliminary Calc. ☐ **Final Calc.** ☐ **Supersedes Calc. No.**

	Name	Date
Author:	R. Heydenburg	3-13-06
Approved by:	Frank King	3-15-06
Checked by:	G. Gray Jones	3-10-06
	Mark Kautsky	3-15-06
	Craig Goodlett	3/15/06
	Carl Koizumi	3/15/06

Problem Statement:

Preliminary site selection performed jointly by the U.S. Department of Energy (DOE) and the Contractor has identified a 2,300 acre withdrawal area in the Crescent Flat area just northeast of Crescent Junction, Utah, as a possible site for a final disposal cell for the Moab uranium mill tailings. The proposed disposal cell would cover approximately 300 acres. Based on the preliminary site-selection process, the suitability of the Crescent Junction disposal site is being evaluated from several technical aspects, including geomorphic, geologic, hydrologic, seismic, geochemical, and geotechnical. The objective of this calculation set is to present the geophysical logging information generated during the drilling program to investigate subsurface geologic conditions at the Crescent Junction disposal site.

This calculation will be incorporated into Attachment 2 (Geology) of the Remedial Action Plan (RAP) and Site Design for Stabilization of Moab Title I Uranium Mill Tailings at the Crescent Junction, Utah, Disposal Site, and summarized in the appropriate sections of the Remedial Action Selection (RAS) report for the Moab site.

Method of Solution:

Geophysical logging was performed by COLOG in the 10 coreholes drilled at the Crescent Junction site as shown in Figure 1 and Table 1. Methodology included the following on coreholes 0202 through 0210 (logging of 0201 was incomplete due to equipment issues): (1) optical and acoustic televiewer, (2) caliper measurements, (3) compensated density, (4) neutron logs, (5) induction resistivity, (6) natural gamma, and (7) rock quality designation. Data are included in the COLOG report (Appendix A).

Assumptions:

N/A

Calculation:

N/A

Discussion:

Results and evaluation of the geophysical logging in coreholes at the Crescent Junction disposal site during 2005 are discussed in detail in Attachment 2 (Geology) of the RAP and summarized in relevant sections of the RAS.

Conclusion and Recommendations:

N/A

Computer Source:

N/A

References:

COLOG 2006. *Borehole Geophysical Logging Results – Crescent Junction Disposal Site – Crescent Junction, Utah.* (See Appendix A)

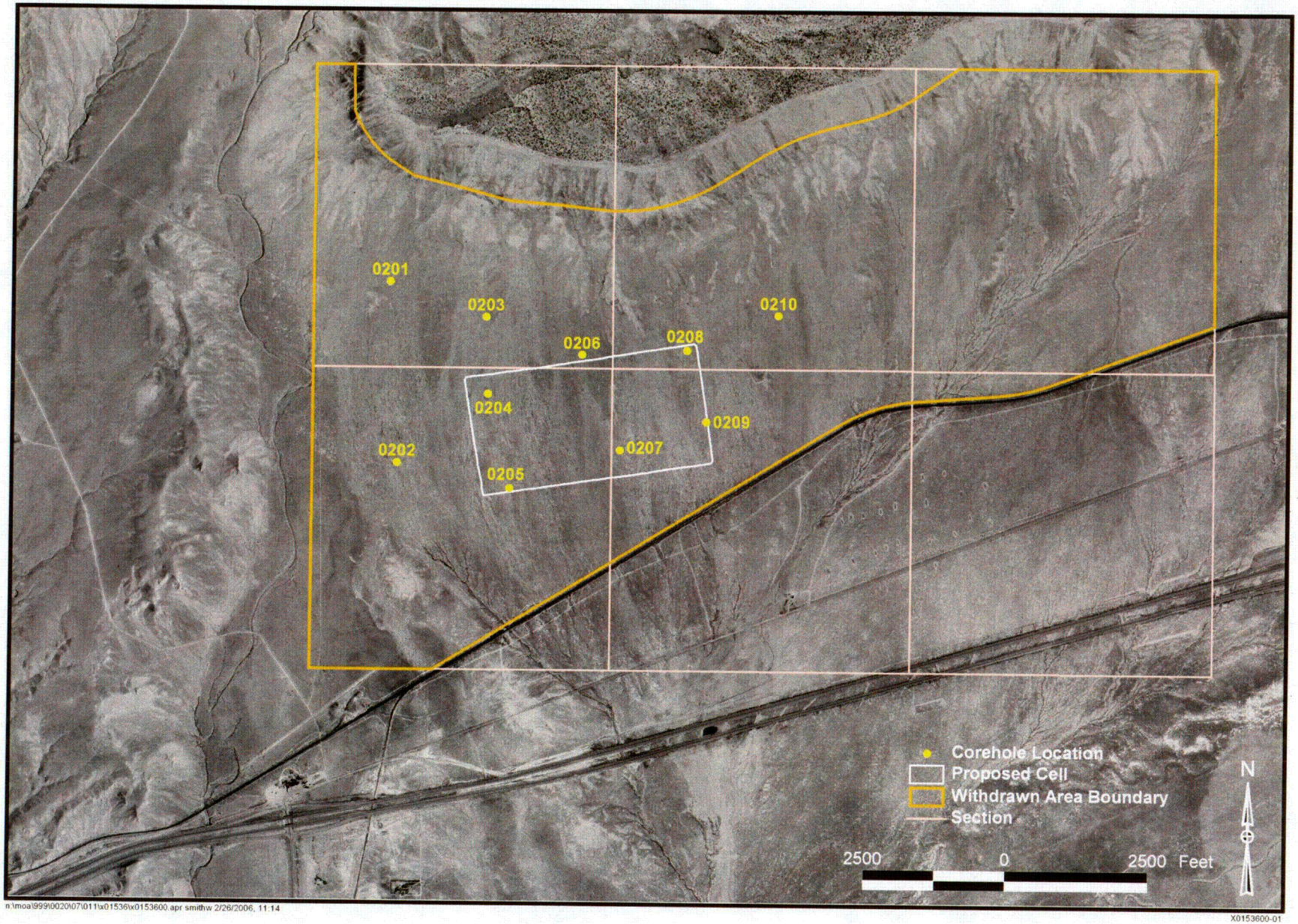

Figure 1. Location of Coreholes at the Crescent Junction Site

C03

Table 1. Corehole Specifications at the Crescent Junction Site

Corehole No.	N Coordinate[a]	E Coordinate[a]	Ground Elevation (ft ngvd)[b]	Total Depth (ft)	Date Completed	Geophysical Logs	Hole Size (in)	Casing (ft)	Sample Type	Drilling Method[c]
CRJ01-0201	6797583.56	2120851.13	5030.00	301.00	8-Nov-05	some	8.5	0-29	HQ core	HSA/rotary core
CRJ01-0202	6794422.62	2120996.12	4960.00	300.00	19-Nov-05	yes	8.5	0-29.5	HQ core	HSA/rotary core
CRJ01-0203	6796977.60	2122543.47	5015.00	301.00	7-Nov-05	yes	8.5	0-30	HQ core	HSA/rotary core
CRJ01-0204	6795633.72	2122583.61	4983.00	300.00	5-Nov-05	yes	8.5	0-25	HQ core	HSA/rotary core
CRJ01-0205	6793981.28	2122975.63	4945.90	300.00	2-Nov-05	yes	8.5	0-25	HQ core	HSA/rotary core
CRJ01-0206	6796324.67	2124232.60	4994.00	302.00	24-Oct-05	yes	8.5	0-26	HQ core	HSA/rotary core
CRJ01-0207	6794658.25	2124919.25	4950.20	300.00	20-Oct-05	yes	8.5	0-25	HQ core	HSA/rotary core
CRJ01-0208	6796412.91	2126089.65	4986.10	301.00	8-Oct-05	yes	8.5	0-40	HQ core	HSA/rotary core
CRJ01-0209	6795168.53	2126441.58	4955.70	300.00	27-Sep-05	yes	8.5	0-35	HQ core	HSA/rotary core
CRJ01-0210	6797035.78	2127690.14	4998.60	302.00	7-Oct-05	yes	8.5	0-23	HQ core	HSA/rotary core

[a]Local coordinate system based on modified state plane coordinate system NAD 83 Utah Central Zone.
[b]ngvd = National Geodetic Vertical Datum
[c]HSA = hollow stem auger

Appendix A

COLOG, 2006. *Borehole Geophysical Logging Results – Crescent Junction Disposal Site – Crescent Junction, Utah*

Attached as a CD

U.S. Department of Energy—Grand Junction, Colorado

Calculation Cover Sheet

Calc. No.: MOA-02-02-2006-1-10-00 **Discipline:** Geologic and Geophysical Properties **No. of Sheets:** 4

Project: Moab UMTRA Project

Site: Crescent Junction, Utah

Feature: Test Pit Logs

Sources of Data:

Test pit logs

Sources of Formulae and References:

DOE 2005. *Work Plan for Characterization of Crescent Junction Disposal Site,* Revision No. 0, August 12, 2005, DOE-EM/GJ912-2005.

Preliminary Calc. ☐ **Final Calc.** ☐ **Supersedes Calc. No.**

Author:	K. Kamp for R. Heydenburg 3-15-06 (Name / Date)	**Checked by:**	S. Gray Fuller 3-10-06 (Name / Date)
			Ted Lafferty 3-15-06 (Name / Date)
Approved by:	Kurt Kamp 3-15-06 (Name / Date)		Craig Goodknight 3/15/06 (Name / Date)
			Name / Date

Problem Statement:

Preliminary site selection performed jointly by the U.S. Department of Energy (DOE) and the Contractor has identified a 2,300 acre withdrawal area in the Crescent Flat area just northeast of Crescent Junction, Utah, as a possible site for a final disposal cell for the Moab uranium mill tailings. The proposed disposal cell would cover approximately 300 acres. Based on the preliminary site-selection process, the suitability of the Crescent Junction disposal site is being evaluated from several technical aspects, including geomorphic, geologic, hydrologic, seismic, geochemical, and geotechnical. The objective of this calculation set is to present the test pit logs generated during the program to investigate subsurface geologic conditions at the Crescent Junction disposal site.

This calculation will be incorporated into Attachment 2 (Geology) of the Remedial Action Plan (RAP) and Site Design for Stabilization of Moab Title I Uranium Mill Tailings at the Crescent Junction, Utah, Disposal Site, and summarized in the appropriate sections of the Remedial Action Selection (RAS) report for the Moab site.

Method of Solution:

Five test pits were dug at the site to investigate subsurface conditions to depths ranging from 15 to 23 feet (ft)as shown in Figure 1 and Table 1. The pits were dug by trackhoe. Pit walls and samples were observed and logged in the field using visual soil-classification procedures described in DOE (2005; p.4-6). Field test pit logs were digitized and standardized using the gINT computer software program (gINT Software USA 2005). Appendix A contains the test pit logs for the Crescent Junction site. These data are also available in the SEEPro database at the DOE Grand Junction office.

Assumptions:

N/A

Calculation:

N/A

Discussion:

Results and evaluation of the test pit activities at the Crescent Junction disposal site during 2005 are discussed in detail in Attachment 2 (Geology) of the RAP and summarized in relevant sections of the RAS.

Conclusion and Recommendations:

N/A

Computer Source:

gINT computer software was used to digitize and standardize the test pit logs.

References:

DOE 2005. *Work Plan for Characterization of Crescent Junction Disposal Site*, Revision No. 0, August 12, 2005, DOE-EM/GJ912-2005.

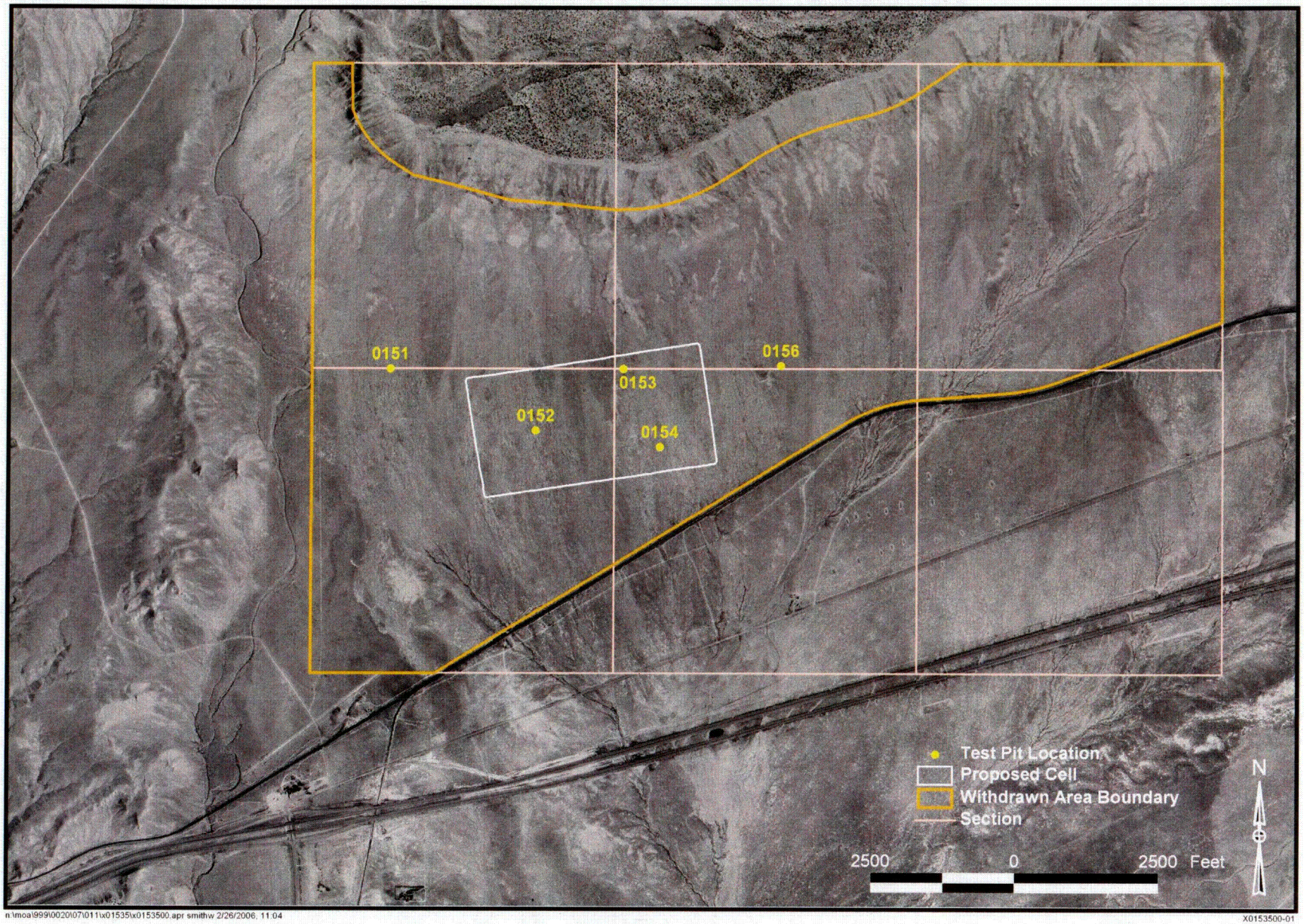

Figure 1. Location of Test Pits at the Crescent Junction Site

C04

Table 1. Test Pit Specifications at the Crescent Junction Site

Test Pit No.	N Coordinate[a]	E Coordinate[a]	Ground Elevation (ft ngvd)[b]	Total Depth (ft)	Date Completed	Geophysical Logs	Hole Size (in)	Casing (ft)	Sample Type	Drilling Method[c]
CRJ01-0151	6796084.42	2120861.99	4991.20	15.90	16-Aug-05	no	n/a	n/a	Bucket	Trackhoe
CRJ01-0152	6795018.03	2123400.06	4965.00	23.40	1-Nov-05	no	n/a	n/a	Bucket	Trackhoe
CRJ01-0153	6796083.25	2124922.48	4983.50	15.75	10-Nov-05	no	n/a	n/a	Bucket	Trackhoe
CRJ01-0154	6794730.87	2125565.10	4950.00	21.50	31-Oct-05	no	n/a	n/a	Bucket	Trackhoe
CRJ01-0156	6796137.16	2127679.48	4974.00	22.50	28-Oct-05	no	n/a	n/a	Bucket	Trackhoe

[a]Local coordinate system based on modified state plane coordinate system NAD 83 Utah Central Zone.
[b]ngvd = National Geodetic Vertical Datum
[c]HSA = hollow stem auger

Appendix A

Test Pit Logs

TEST PIT LOG CRJ01-0151

PROJECT	MOAB	DATE DRILLED	08/16/2005	BIT SIZE(S) (IN)	
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Ksue Corporation	CORE SIZE(S) (IN)	
SITE	Crescent Junction	DRILLING METHOD	Trackhoe	LOGGED BY	Goodknight, C.
WELL NUMBER	CRJ01-0151	SAMPLING METHOD		WL (FT BGS)	
NORTH COORD. (FT)	6796084.42	DRILL OPERATOR	Carter, C.		
EAST COORD. (FT)	2120861.99	REMARKS	Samples collected in 5.0 gallon buckets.		
SURFACE ELEV. (FT NGVD)	4991.20				
HOLE DEPTH (FT)	15.90				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE Depth/Interval (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	4990					0-2.5 SILTY CLAY LOAM (ML/CL); some mottling, abundant roots, especially top 1.0 ft., highly calcareous, porous from worm burrowing, looks like adobe brick, brown (10YR 5/3).
			4.25-4.50			2.25-7.9 ft. SILTY SAND (SM); moderately calcareous, mottled throughout, mostly grayish brown (10YR 5/2), mixture of silt (~20%) and sand (80%) up to medium-coarse grained. Some rooting down to ~4.0 ft. Several layers of sheet wash material consisting of sandstone slabs and fragments up to 0.4-0.5 ft. in diameter. Two obvious sheet wash layers are at ~2.25-2.5 ft., and 3.5-4.0 ft. These sandstone fragments are generally very pale brown (10YR 7/4).
5	4985					
			7.5			
10	4980					7.9-12.9 ft. WEATHERED MANCOS SHALE BEDROCK; highly weathered, soft, porous, shale and siltstone fragments, moderately calcareous, clear and white gypsum and calcite crystals fill small cavities. Mostly light brownish gray (2.5Y 6/2). Fluvial channel approximately 6.0-8.0 ft., wide cuts down into weathered Mancos Shale to depth of ~9.75 ft (1.8 ft., or nearly 2.0 ft.). Fluvial fill material consists of medium to coarse grained sand (SW) and trace small limonitic siltstone and shale rock fragments up to 0.025 ft. diameter and mottled, porous, silt (ML). Sand material is grayish brown (10YR 5/2) and silt is light brownish gray (10YR 6/2); all are highly calcareous.
						12.9-14.0 ft. Mancos Shale is moderately weathered down to ~14.0 ft. and becomes increasingly competent.
						14.0-15.0 ft. Mancos Shale is slightly weathered, fractured, hard, layered.
15	4975					15.0-15.9 ft. MANCOS SHALE: slightly weathered to nonweathered sandy siltstone, hard, mostly planar bedding, highly calcareous, light gray (N7) to yellowish gray (5Y 7/2), trace fine black material which is framboidal pyrite replacing fossil fragments. Trace grayish orange (10YR 7/4) color along fractures and bedding planes. Rare flattened cephalopod fossil impression colored (light brown, 5YR 5/6) after limonite. Stopped test pit at 15.9 ft., unable to excavate further with trackhoe.
						Total Depth 15.9 ft.

TEST PIT LOG CRJ01-0152

PROJECT	MOAB	DATE DRILLED	10/31/2005 to 11/01/2005	BIT SIZE(S) (IN)	
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Ksue Corporation	CORE SIZE(S) (IN)	
SITE	Crescent Junction	DRILLING METHOD	Trackhoe	LOGGED BY	Smith, G.
WELL NUMBER	CRJ01-0152	SAMPLING METHOD		WL (FT BGS)	
NORTH COORD. (FT)	6795018.03	DRILL OPERATOR	Carter, C.		
EAST COORD. (FT)	2123400.06	REMARKS	Samples collected in 5.0 gallon buckets.		
SURFACE ELEV. (FT NGVD)	4965.00				
HOLE DEPTH (FT)	23.40				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE Depth/Interval (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
						0-0.75 ft. SILTY CLAY (CL-ML); abundant roots, calcic (stage I carbonate development), some fine grained sand, blocky structure, sticky, moderately plastic, grayish brown (10YR 5/2). Represents A horizon.
						0.75-8.5 ft. CLAY/SILTY CLAY WITH SAND (CL-ML); low to medium plasticity, sticky, fine grained sand, grayish brown (2.5Y 5/2), interbedded with channel deposits, sandstone fragments to cobble size, sub-rounded to sub-angular, medium to coarse grained sand, interbeds to 2.0 ft. thick. Represents sheet wash deposits.
5	4960					
			7.5			
						8.5-19.5 ft. SILTY SANDY CLAY (CL); low plasticity, slightly sticky (75-100%); fine grained sand (0-25%); fine to medium grained sand, angular, calcareous (10%). Some channel deposits (2.0-3.0 ft deep), imbricated shale and sandstone fragments to 0.25 ft. in diameter, platy. Represents eolian and fluvial deposits.
10	4955					
15	4950		15.0			
20	4945					19.5-23.0 ft. WEATHERED MANCOS SHALE BEDROCK: moderately plastic, platy, calcareous, some sandstone fragments, gypsum crystals, light brownish gray (2.5Y 6/2). Note: A fluvial channel deposit that is 2.0 ft. deep and 3.0 ft. wide is in east side wall that contains medium to coarse grained sand, shale fragments, and silt, and is calcareous, light yellowish brown (10YR 6/4).
			23.0			23.0-23.4 ft. MANCOS SHALE: Stopped test pit at 23.4 ft., unable to excavate further with trackhoe.
						Total Depth 23.4 ft
25	4940					

TEST PIT LOG CRJ01-0153

PROJECT	MOAB	DATE DRILLED	11/10/2005
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Ksue Corporation
SITE	Crescent Junction	DRILLING METHOD	Trackhoe
WELL NUMBER	CRJ01-0153	SAMPLING METHOD	
NORTH COORD. (FT)	6796083.25	DRILL OPERATOR	Carter, C.
EAST COORD. (FT)	2124922.48	REMARKS	Samples collected in 5.0 gallon buckets.
SURFACE ELEV. (FT NGVD)	4983.50		
HOLE DEPTH (FT)	15.75		

BIT SIZE(S) (IN)	
CORE SIZE(S) (IN)	
LOGGED BY	Goodknight, C.
WL (FT BGS)	

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE Depth/Interval (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
						0-1.3 ft. SILT/CLAY LOAM (CL-ML); some mottling, abundant roots especially top 0.75 ft., moderately calcareous, gray (2.5Y 6/1) to light brownish gray (2.5Y 6/2), looks like adobe brick, some small rock fragments (up to 0.1 ft. in diameter).
	4980		2.5-3.5			1.3-5.4 ft. SILT (SM); trace very fine grained sand, highly mottled (white), with abundant root filaments, moderately to highly calcareous, mostly light brownish gray (10YR 6/2). Several thin layers of sandstone rock fragments up to 0.3 ft. in diameter and some yellowish brown/orange limonitic siltstone fragments.
5						4.25-4.75 ft. slightly darker colored layer, light brownish gray (10YR 6/2), than the other 1.3 to 5.4 ft. layer, possibly because of higher moisture content (this interval seemed slightly damp during excavation).
						5.4-8.0 ft. SILT (ML); trace very fine grained sand, light brownish gray (10YR 6/2), soft, crumbly, moderately to highly calcareous, some mottling, trace roots in upper part. Several thin fluvial layers of up to coarse grained sand size.
	4975		8.5			8.0-9.25 ft. SANDY SILT (ML); silt and very fine grained sand, light yellowish brown (10YR 6/4), highly calcareous, powdery, trace mottling, probable eolian origin. @9.25 ft., thin layer of limonitic siltstone fragments that appear to have been emplaced by sheet wash.
10						9.25-15.0 ft. WEATHERED MANCOS SHALE BEDROCK; highly weathered, soft, moderately calcareous, crumbly, porous, some platy shale and siltstone fragments, mottled (white) is calcareous material and gypsum. Mostly light brownish gray (2.5Y 6/2) and minor light yellowish brown (10YR 6/4), limonitic - colored fragments.
						11.75-14.0 ft. moderately weathered, fractured, soft to moderately hard, layered.
	4970					14.0-15.0 ft. slightly weathered, fractured, hard, layered.
15			15.0-15.75			15.0-15.75 MANCOS SHALE; slightly weathered to non weathered siltstone, hard, planar to slightly wavy bedding, moderately to highly calcareous, light gray (N7) to yellowish gray (5Y 7/2), trace fine black material that is framboidal pyrite replacing fine fossil fragments. Some grayish orange (10YR 7/4) color along fractures and some bedding planes. Stopped test pit at 15.75 ft; unable to excavate further with trackhoe.
	4965					Total Depth 15.75 ft.

TEST PIT LOG CRJ01-0154

PROJECT	MOAB	DATE DRILLED	10/28/2005 to 10/31/2005	BIT SIZE(S) (IN)	
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Ksue Corporation	CORE SIZE(S) (IN)	
SITE	Crescent Junction	DRILLING METHOD	Trackhoe	LOGGED BY	Smith, G.
WELL NUMBER	CRJ01-0154	SAMPLING METHOD		WL (FT BGS)	
NORTH COORD. (FT)	6794730.87	DRILL OPERATOR	Carter, C.		
EAST COORD. (FT)	2125565.10	REMARKS	Samples collected in 5.0 gallon buckets.		
SURFACE ELEV. (FT NGVD)	4950.00				
HOLE DEPTH (FT)	21.50				

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE Depth/Interval (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
						0-1.5 ft. SILTY CLAY (CL-ML); abundant roots, calcic, some fine grained sand, blocky structure, sticky, low to medium plasticity, grayish brown (10YR 5/2). Represents A horizon.
						1.5-8.0 ft. SILTY CLAY (CL-ML); with some sand, sub-angular, moderately plastic, sticky, calcic, (Stage I carbonate development), grainy to blocky structure, medium to fine grained sand, light brownish gray (2.5Y 6/2). Represents sheet wash deposits.
			4.0			
5	4945					
						8.0-17.0 ft. SILTY CLAY (CL); some fine grained sand, sub-angular, low plasticity, slightly sticky, yellowish brown (10YR 5/4), calcareous. Some fluvial channel intermixing, medium to coarse grained sands, silty, yellowish. Represents eolian deposits.
10	4940					
			12.0			
15	4935					
						17.0-21.0 ft. WEATHERED MANCOS SHALE BEDROCK: beds of silty claystone (about 0.05 ft. thick), calcareous, weak, pale yellowish brown (10YR 6/2). Some sandstone fragments, abundant gypsum crystals, some limonitic coloration, dark yellowish orange (10YR 6/6).
			18.0-20.0			
20	4930					
						21.0-21.5 ft. MANCOS SHALE: becoming hard and competent. Stopped test pit at 21.5 ft; unable to excavate further with trackhoe.
						Total Depth 21.5 ft
25	4925					

TEST PIT LOG CRJ01-0156

PROJECT	MOAB	DATE DRILLED	10/27/2005 to 10/28/2005
LOCATION	Crescent Junction, UT.	DRILLING COMPANY	Ksue Corporation
SITE	Crescent Junction	DRILLING METHOD	Trackhoe
WELL NUMBER	CRJ01-0156	SAMPLING METHOD	
NORTH COORD. (FT)	6796137.16	DRILL OPERATOR	Carter, C.
EAST COORD. (FT)	2127679.48	REMARKS	Samples collected in 5.0 gallon buckets.
SURFACE ELEV. (FT NGVD)	4974.00		
HOLE DEPTH (FT)	22.50		

BIT SIZE(S) (IN)			
CORE SIZE(S) (IN)			
LOGGED BY	Smith, G., Goodknight, C.		
WL (FT BGS)			

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE Depth/Interval (FT.)	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
						0-1.5 ft. SILTY CLAY (CL-ML); abundant roots, some grained sand, angular blocky, low plasticity, grayish brown (10YR 5/2), highly calcareous. Represents A horizon.
						1.5-8.5 ft. SILTY CLAY WITH SAND (CL-ML); fine grained sand (10-20%) subangular, moderate plasticity, sticky, calcic (stage I carbonate development), blocky structure, light brownish gray (2.5Y 6/2). Represents sheet wash deposits.
	4970		4.0-5.0			
5						
			8.0-9.0			
	4965					8.5-15.0 ft. CLAY/SILTY SAND CLAY; fine grained sand (30%), silty clay (70%), low plasticity, slightly sticky, diffuse calcium carbonate, yellowish brown (10YR 5/4). Pit sidewalls have salt coating, and the east sidewall is white. Represents eolian deposits.
10						
			12.0			
	4960					
15						15.0-20.0 ft. SILTY CLAYEY SAND AND GRAVEL (SM-GM); silty, clayey, sand and gravel. Sandstone boulders up to 2.0 ft. in diameter. Sub-rounded, platy sandstone fragments (up to 0.3-0.4 ft. long), medium to coarse grained sand. 10% boulders, 20-30% sands/gravels, and 50-60% sands/silts/clays. Represents a channel-fill deposit.
	4955					
20						20.0-22.0 ft. WEATHERED MANCOS SHALE BEDROCK: Beds of silty claystone, light olive gray (5Y 6/1) and siltstone, yellowish gray (5Y 7/2) that are 0.05 to 0.3 ft. thick, moderately calcareous, break along bedding planes easily, trace carbonaceous material, gypsum, and pelecypod impressions along bedding.
			22.0			22.0-22.5 ft. MANCOS SHALE: Becoming hard and competent. Stopped test pit at 22.5 ft; unable to excavate further with trackhoe.
	4950					Total Depth 22.5 ft.
25						
	4945					

U.S. Department of Energy—Grand Junction, Colorado

Calculation Cover Sheet

Calc. No.: MOA-02-03-2006-4-01-00 **Discipline:** i.e., Geotechnical **No. of Sheets:** 5

Project: Moab UMTRA Project

Site: Crescent Junction Disposal Site

Feature:
Geotechnical Properties of Native Materials

Sources of Data:

Lab-Test Results from Geotechnical Engineering Group, Inc.

Sources of Formulae and References:

Geotechnical Engineering Group, Inc. December 22, 2005. *Geotechnical Testing Services* Letter Report to S.M. Stoller Corporation, GEG Job Number 2165.

Geotechnical Engineering Group, Inc. February 23, 2006. *Geotechnical Testing Services* Letter Report to S.M. Stoller Corporation, GEG Job Number 2165.

Preliminary Calc. ☐ **Final Calc.** ☐ **Supersedes Calc. No.**

	Name	Date		Name	Date
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				J. Burnett	3/16/06
Approved by:	K. Kemp	3-16-06		K. Kemp	
				R. Heydenburg	3-16-06

Problem Statement:

Preliminary site selection performed jointly by the U.S. Department of Energy (DOE) and the Contractor has identified a 2,300 acre withdrawal area in the Crescent Flat area just northeast of Crescent Junction, Utah, as a possible site for a final disposal cell for the Moab uranium mill tailings. The proposed disposal cell would cover approximately 300 acres. Based on the preliminary site-selection process, the suitability of the Crescent Junction disposal site is being evaluated from several technical aspects, including geomorphic, geologic, hydrologic, seismic, geochemical, and geotechnical. The objective of this calculation is to bring to light the geotechnical properties of native materials that were sampled from boreholes and test pits samples collected at the Crescent Junction site.

This calculation will be incorporated into Attachment 2 (Geology) of the Remedial Action Plan (RAP), and Site Design for Stabilization of Moab Title I Uranium Mill Tailings at the Crescent Junction, Utah, Disposal Site, and summarized in the appropriate sections of the Remedial Action Selection (RAS) report for the Moab site.

Method of Solution:

The geotechnical characterization of the Crescent Junction site was undertaken by drilling one hundred geotechnical boreholes with truck-mounted hollow-stem auger equipment and excavating five test pits with trackhoe equipment. Undisturbed drive samples were collected using the *Modified California* sampler with brass sleeves that were capped and labeled in the field. The boreholes were advanced to top of bedrock (refusal). Two samples were collected from the upper 5 feet and every 5 feet thereafter. Representative bulk samples from the soil and weathered-bedrock horizons were collected from test pits that were excavated to the top of bedrock.

The samples were stored temporarily in a *Connex* shipping container at the Crescent Junction site and transported twice weekly to Geotechnical Engineering Group (GEG) laboratory in Grand Junction, Colorado. GEG analyzed the geotechnical samples in accordance with the Statement of Work (S.M. Stoller 2005; Document X0114900). The Statement of Work required the subcontracted laboratory to follow ASTM procedures in carrying out the laboratory testing. In addition, S.M. Stoller Corporation completed a Quality Assurance (QA) audit of the testing laboratory and no findings were issued as a result of the surveillance. A copy of the QA Surveillance Report is attached in Appendix A.

Assumptions:

N/A

Calculation:

Laboratory results from the testing are contained in Appendices B and C. A summary of the index properties of the natural materials from the Crescent Junction site are contained in Table 1.

Discussion:

N/A

Conclusion and Recommendations:

N/A

Table 1. Summary of Geotechnical Index Properties for Natural Soil Materials at the Crescent Junction Site

Sample	Field Description	Tested Depth (ft)	Natural Moisture (%)	Dry Density (pcf)	Liquid Limit (%)	Plasticity Index (%)	Passing No. 200 (%)	Specific Gravity	□max (Modified Proctor) (pcf)	Wopt (Modified Proctor) (%)	Sieve			Hydrometer		
											% Gravel	% Sand	% Fines	% silt	% clay	Double Hydrometer
Boreholes	sandy silt															
	Max	17	13.4	113.4	34	19	94									
	Min	1.5	2.8	77	18	3	36									
	Avg.	6.3	6.7	92.4	23.6	7.3	64.8									
	Count	37	37	31	36	36	36									
Test Pits	fluvial/eolian															
	Max	15			21	3	84	2.65	127.5	12	49	35	67	52	27	83
	Min	8.5			19	2	63	2.63	118	10	0	22	29	15	14	62
	Avg.	11.9			20.0	2.7	69.5	2.6	123.0	11.0	12.5	30.5	57.0	36.5	20.5	72.5
	Count	4			3	3	4	4	4	4	4	4	4	4	4	2
	sheet wash															
	Max	7.5			26	9	83	2.82	123	13	4	30	84	62	22	79
	Min	3.5			22	4	66	2.64	118.5	11.5	0	16	66	54	13	61
	Avg.	4.9			23.8	6.0	72.8	2.7	120.5	12.4	1.0	25.4	73.6	58.8	16.8	70.0
	Count	5			5	5	5	3	5	5	5	5	5	4	4	2
Boreholes	weathered shale															
	Max	27	12.3	118	34	19	93									
	Min	3.5	2.6	71	21	4	19									
	Avg.	12.7	7.3	104.4	27.5	9.9	70.3									
	Count	11	11	10	11	11	11									
Test Pits	weathered shale															
	Max	23			38	20	97	2.73	127.5	13	2	14	97	55	42	86
	Min	20			25	7	84	2.56	120.5	11	0	3	84	53	31	62
	Avg.	21.7			32	13	92	2.6	123.0	12.0	0.7	7.3	92.0	54.3	37.7	74.0
	Count	3			3	3	3	2	3	3	3	3	3	3	3	2

C05

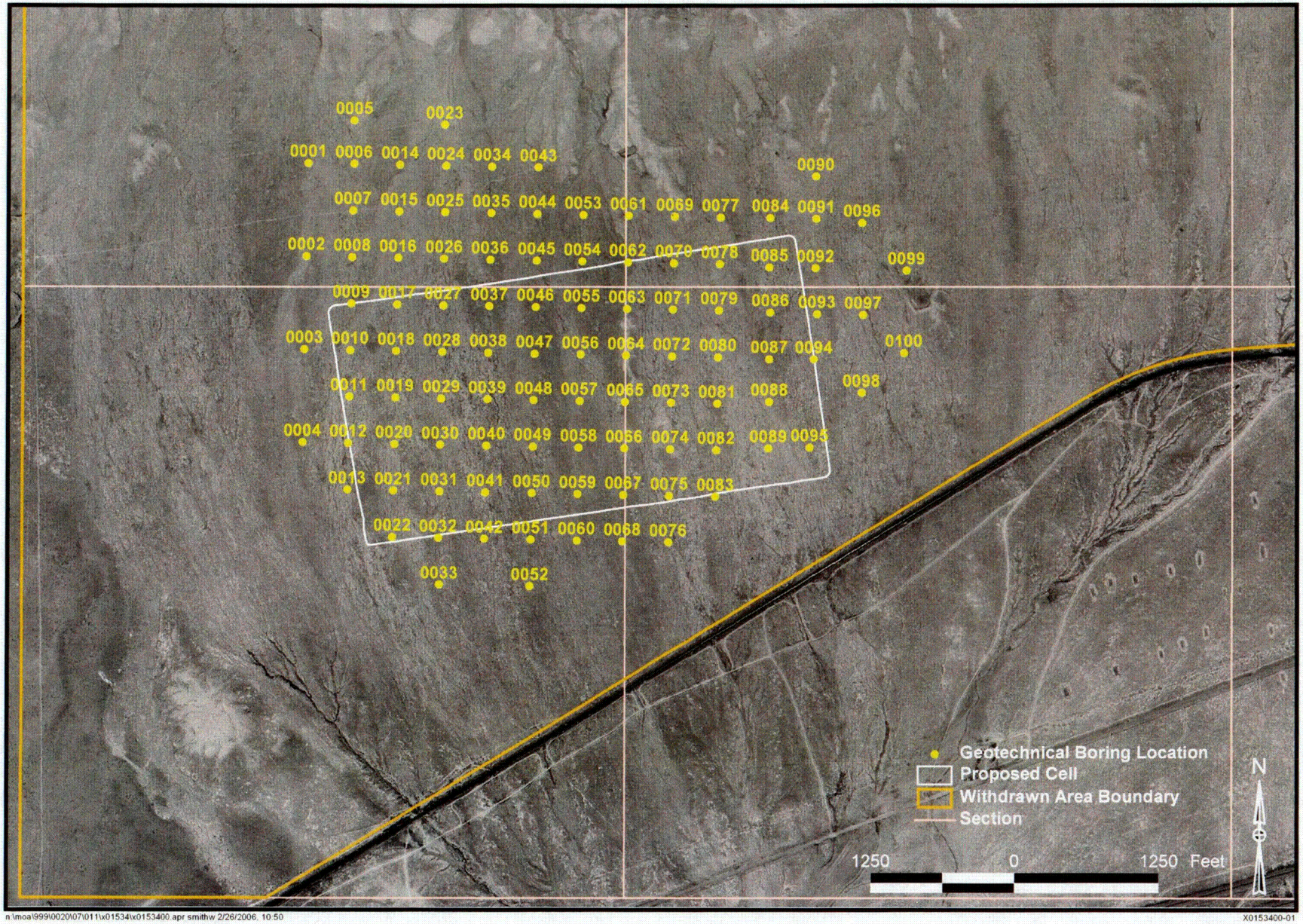


Figure 1. Map Depicting the Locations of the 100 Geotechnical Boreholes at the Crescent Junction Site

C06

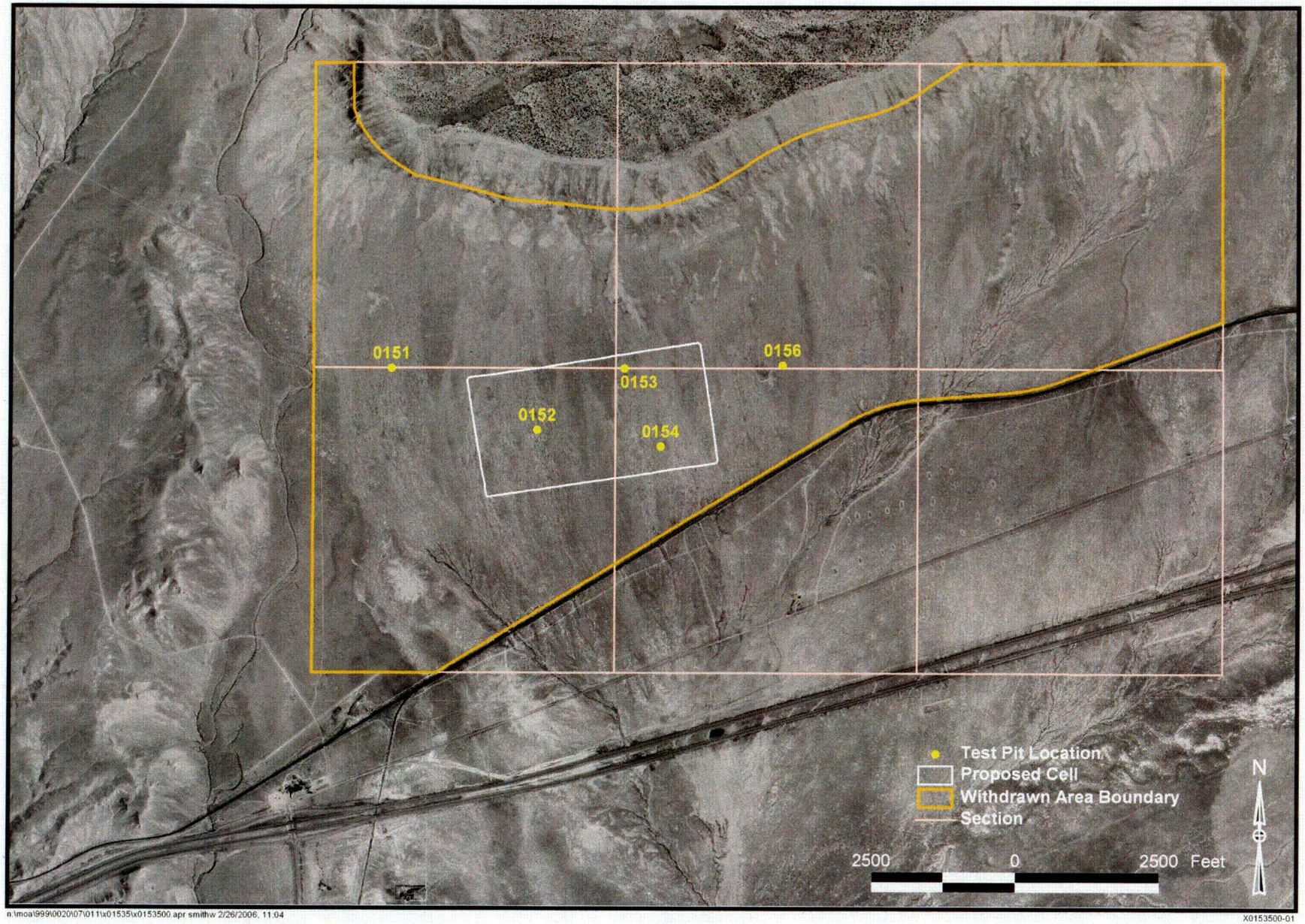


Figure 2. Map Depicting the Location of the Five Test Pits at the Crescent Junction Site

C07

Appendix A

Quality Assurance Surveillance Report

Stoller

established 1959

QA Surveillance Report

To: Mr. John Withers
Geotechnical Engineering Group, Inc.

Surveillance No. and Title: S-05-09, Geotechnical Engineering Group, Inc. laboratory

Project and Task: Moab Project, Crescent Junction Site
Analysis of soil samples obtained during geotechnical drilling.

Date(s) Performed: November 21 through 30, 2005 – review of procurement data
November 28, 2005 and December 15, 2005 – laboratory visit

Purpose and Scope: Evaluate subcontractor adherence to site-specific Statement of Work (SOW) for geotechnical testing of Crescent Junction soil samples.

Results: Sample transfer, receipt, and storage were being performed as directed in the SOW. Required personnel qualifications stipulated in American Society for Testing and Materials (ASTM) D 3740-01 were met. Discrepancies in samples, such as inadequate soil matrix or no sample at the specified depth, were resolved by discussion and mutual agreement between the laboratory and Stoller representatives. No findings are being issued as a result of this surveillance. One observation concerning documentation of instrument calibration is being submitted for your consideration.

Activities Observed: The contractor SOW was reviewed and subcontractor documents compared to the requirements specified in the SOW. Quality Assurance (QA) made an on-site visit November 28, 2005 at the Geotechnical Engineering Group, Inc. laboratory. During this visit QA interviewed you with regard to employee training, certification, laboratory procedures, accreditation, and performance of sample receipt, storage, and analysis, and instrument calibration.

Qualification requirements for this subcontract are equivalent to those stipulated in ASTM D 3740-01 *Standard Proactive for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil sand Rock as Used in Engineering Design and Construction* which requires that the supervising laboratory technician shall have at least 5 years experience performing tests on soil and rock and possess a current, valid NICET Level III Certification in Construction Materials Testing– Subfield Soils or Geotechnical Engineering Technology or Transportation Engineering, or equivalent. Submitted certification documentation for the laboratory technician has an expiration date of September 2004. When this was brought to your attention you assured me that you could provide Stoller with a current certificate for this employee. A copy of the current certification was received and is valid until September 1, 2007. Other personnel qualifications submitted for this SOW are compliant with ASTM D 3740-01.

It was my understanding from our discussion, subcontractor employees receive training provided in-house from experienced personnel, and they also participate in vendor provided certification training opportunities. The analytical procedures followed in the laboratory consist of a combination of in-house, process- or regional-specific procedures, as well as recognized industry

standard published procedures (i.e., ASTM and American Association of State Highway and Transportation Officials (AASHTO) Standards). Copies of industry standards were available in the laboratory for employee reference. The Geotechnical Engineering Group, Inc. is accredited to AASHTO R18 specifications although none of the analysis provided for this SOW is applicable to this accreditation. Soil testing is being performed to ASTM industry standards in accordance with this SOW.

I observed the designated sample receiving area where shipment accountability and condition are reviewed, and samples are entered into the laboratory tracking system maintaining customer-issued identification numbers. Stoller samples were shipped, received, and tracked by hole/box number on the Chain-of-Custody documentation. Example: Hole 30, box 1 of 2 and 2 of 2. Each box contained differing amounts of sample tubes filled at various depths during drilling. Neither the Stoller representative offering the samples for analysis, or the laboratory, verified the samples by individual sample tubes/depths. Stoller samples were segregated and stored in an area that was removed from other customer samples. Stoller representatives directed the laboratory on which samples to analyze. Analytical requests are documented on analysis sheets and processed in order received. You explained to me there is a designated area where requests are staged and if any analysis is requested that is not a normal routine procedure, internal procedures dictate that an engineer is required to review and approve the request before analysis is performed. When there was a discrepancy in the sample, such as inadequate soil matrix or no sample at the specified depth, the laboratory informed Stoller and worked to resolve the issue.

During our tour of the laboratory, although Stoller samples were not being analyzed at the time, I was able to observe work practices of subcontractor employees performing analysis and view instrument calibration documentation posted on equipment. You explained that the laboratory instrument calibration program consists of procedures performed by trained employees as well as vendor-performed on-site equipment calibrations. From my observation, there appears to be two types of calibration stickers placed on equipment, in-house calibrations and vendor-performed calibrations. I noticed a mixture of current and out-of-date calibration stickers on laboratory equipment. The particular piece of equipment we discussed as out-of-calibration was for concrete measurements, not soils, however it would be advisable that the laboratory review all instrument calibration stickers and correct as applicable.

A second on-site visit was conducted on December 15, 2005. Rex Sellers, Contract Administrator and Greg Lord, S.M. Stoller Engineer accompanied QA on this visit. A Geotechnical Engineering Group representative conducted a tour of the laboratory and explained the processes and equipment used for performing geotechnical analysis. The employee conducting the tour was informative and knowledgeable of the type of work that was of interest to the contractor.

Findings: None

Observations: There is a mixture of current and out-of-date calibration stickers on laboratory equipment. It is advisable that the laboratory reviews all instrument calibration stickers and correct as applicable.

Surveillance of Compliance With: Geotechnical Testing Laboratory Statement of Work; Doc. No. X0114900, September 2005.

Persons Contacted: QA would like to thank the following individuals for their time and information provided during the performance of this surveillance: John Withers, Geotechnical Engineering Group Engineer, Terry Brown, Geotechnical Engineering Group Laboratory Manger, Robert Anderson, Geotechnical Engineering Group Laboratory Technician, Greg Lord, S.M. Stoller Engineer, Rex Sellers, Stoller Contract Administrator, Mark Kautsky, Stoller Technical Monitor

Action Required: None

Reviewed By: signature on file copy **Date:** 12/21/2005
Donna Riddle, RAB EMS-LA E051671
Stoller QA Manager

Issued By: signature on file copy **Date:** 12/21/2005
Linda Tegelman, ASQ CQA 28173
Stoller Lead Auditor

cc: QA File S-05-09

Email: K. E. Karp
M. Kautsky
G. G. Lord
J. O. Neff
R. D. Sellers

Appendix B

Geotechnical Testing Results

December 22, 2005

Geotechnical Engineering Group, Inc.

December 22, 2005

S.M Stoller Corporation
2597 B ¾ Road
Grand Junction, CO 81503

Attention: Mr. Rex Sellers
Senior Contract Adviser

Subject: Geotechnical Testing Services
Cresent Junction
Utah Disposal Site
GEG Job No. 2,165

Dear Mr. Sellers,

As requested, Geotechnical Engineering Group, Inc. (GEG) has performed laboratory testing for the subject project. The laboratory tests were performed on samples obtained by others. Laboratory tests performed were determined by S.M Stoller Corporation and include: moisture content tests, dry density tests, sieve analysis tests, percent passing No. 200 sieve tests, hydrometer tests, double hydrometer tests, Atterberg limits tests, moisture content-dry density relationship (Proctor) test and specific gravity tests.

Moisture Content and Dry Density

Moisture content and dry density were determined for each sample tested. The moisture content was determined according to ASTM Test Method D2216. The dry density of the sample was determined by using the wet weight of the entire sample tested. The results of the moisture and dry density determinations are presented on Table 1, Pages 1 through 4.

Geotechnical, Environmental and Materials Testing Consultants
Grand Junction - Montrose - Moab - Crested Butte
(970) 245-4078 • fax (970) 245-7115 • geotechnicalgroup com
2308 Interstate Avenue, Grand Junction, Colorado 81505

Sieve Analysis Tests and Hydrometer Tests

Sieve analysis tests and hydrometer tests were conducted on selected samples. The sieve analysis tests were conducted in general accordance with ASTM Test Method D422. The results of the sieve analysis tests are presented on Gradation Test Results (Figs. 1 through 6).

Percent Passing No. 200 Sieve

Percent passing No. 200 sieve was determined on select samples in general accordance with ASTM Test Method C117. Percent passing No. 200 sieve are presented in Table 1, Pages 1 through 4.

Double Hydrometer Tests

Double hydrometer tests were performed on select samples in general accordance with ASTM Test Method D4221. Double hydrometer tests results are presented in Table I, Pages 1 through 4.

Atterberg Limits Tests

Atterberg limits tests were conducted on select samples. Atterberg limits tests were conducted in general accordance with ASTM Test Method D4318. The results of the Atterberg limits tests are presented in Table 1, Pages 1 through 4.

Moisture Content-Dry Density Relationship Tests

Moisture content-dry density relationship (Proctor) tests were conducted on select samples. The moisture-density relationship tests were conducted in accordance with ASTM Test Method D1557. The results of the moisture-density relationship tests are presented on Figs. 1 through 12.

Specific Gravity Tests

Specific gravity tests were conducted on select samples. The specific gravity tests were conducted in general accordance with ASTM Test Method D854. The results of the specific gravity tests are presented on Table 1

We believe the laboratory study was performed and this letter was prepared in a manner consistent with that level of care and skill ordinarily used by geotechnical engineers practicing in this area at this time. No other warranty, either express or implied, is made. When we may be of further service or answer any questions from a geotechnical or construction materials point of view, please call.

Sincerely,
GEOTECHNICAL ENGINEERING GROUP, INC.

Robert W. Anderson
Laboratory Supervisor

RWA:cb
(3 copies sent)

TABLE I

JOB NO. 2,165

Geotechnical Engineering Group, Inc.

TABLE I

SUMMARY OF LABORATORY TEST RESULTS

HOLE	DEPTH (FEET)	NATURAL MOISTURE (%)	DRY DENSITY (PCF)	Atterberg Limits LIQUID LIMIT (%)	Atterberg Limits PLASTICITY INDEX (%)	Double Hydrometer DISPERSION AT 5 MICRON (%)	PASSING NO. 200 SIEVE (%)	SPECIFIC GRAVITY	SOIL TYPE
TH-5	2	4.2	91	21	4	--	69	--	Clay, silty, sandy (CL)
	11	6	118	25	10	--	79	--	Shale
TH-7	10.5	4.5	100	21	9	--	62	--	Clay, silty, sandy (CL)
TH-9	4	6.6	83	24	9	--	74	--	Clay, silty, sandy (CL)
	6.5	6.6	107.2	28	9	--	84	--	Shale
TH-11	2	6.1	83	22	9	--	78	--	Clay, silty, sandy (CL)
	16	7.9	119.4	37	20	--	96	--	Shale
TH-13	7	8.3	113.4	NL*	NP*	--	43	--	Sand, clayey, silty (SC/SM)
TH-25	16.5	7.3	106	21	6	--	66	--	Clay, silty, sandy (CL)
TH-27	16.5	8.4	108	24	11	--	87	--	Clay, silty, sandy (CL)
TH-29	7	13.4	77	23	6	--	77	--	Clay, silty, sandy (CL)
	27	6.4	81	29	10	--	81	--	Shale
TH-31	12	8.2	96	24	4	--	50	--	Clay, sand, silty (CL/SC)

* NL – Indicates sample did not exhibit liquid characteristics.

* NP – Indicates sample did not exhibit plastic characteristics.

** Assumed 2.65 for specific gravity, program sheet didn't indicate specific gravity tests.

Geotechnical Engineering Group, Inc.

TABLE I

SUMMARY OF LABORATORY TEST RESULTS

HOLE	DEPTH (FEET)	NATURAL MOISTURE (%)	DRY DENSITY (PCF)	Atterberg Limits LIQUID LIMIT (%)	Atterberg Limits PLASTICITY INDEX (%)	Double Hydrometer DISPERSION AT 5 MICRON (%)	PASSING NO. 200 SIEVE (%)	SPECIFIC GRAVITY	SOIL TYPE
TH-33	10.75	6.7	117	34	18	--	82	--	Shale
TH-43	3.5	6.1	90	25	8	--	53	--	Clay, silty, sandy (CL)
TH-45	1.5	4.6	84	19	7	--	57	--	Clay, silty, sandy (CL)
TH-49	6.5	6	83	20	6	--	62	--	Clay, silty, sandy (CL)
	12	5.4	102	19	5	--	80	--	Clay, silty, sandy (CL)
TH-51	3.5	3.8	85	20	6	--	57	--	Clay, silty, sandy (CL)
TH-64	2	12.4	95	34	5	--	74	--	Clay, silty, sandy (CL)
TH-66	3.5	4.7	90	21	5	--	53	--	Clay, silty, sandy (CL)
	7	12.3	112	31	10	--	90	--	Shale
TH-68	2	4.2	94	21	6	--	36	--	Clay, silty, sandy (CL)
TH-78	7	5.7	85	23	7	--	70	--	Clay, silty, sandy (CL)
TH-80	3	2.8	95	19	5	--	53	--	Clay, silty, sandy (CL)

* NL – Indicates sample did not exhibit liquid characteristics.

* NP – Indicates sample did not exhibit plastic characteristics.

** Assumed 2.65 for specific gravity, program sheet didn't indicate specific gravity tests.

Geotechnical Engineering Group, Inc.

TABLE I

SUMMARY OF LABORATORY TEST RESULTS

HOLE	DEPTH (FEET)	NATURAL MOISTURE (%)	DRY DENSITY (PCF)	Atterberg Limits LIQUID LIMIT (%)	Atterberg Limits PLASTICITY INDEX (%)	Double Hydrometer DISPERSION AT 5 MICRON (%)	PASSING NO. 200 SIEVE (%)	SPECIFIC GRAVITY	SOIL TYPE
TH-80	7	6	89	24	7	--	65	--	Clay, silty, sandy (CL)
TH-82	12	4.7	91	21	8	--	79	--	Clay, silty, sandy (CL)
	17	7.1	118	34	14	--	93	--	Shale
TH-90	12	8.2	99	22	5	--	55	--	Clay, silty, sandy (CL)
TH-92	2	5.7	87	22	9	--	63	--	Clay, silty, sandy (CL)
	12	7.7	71	26	6	--	71	--	Clay, silty, sandy (CL)
TH-94	4	12.2	89	31	10	--	61	--	Clay, silty, sandy (CL)
	17	7.1	102	20	5	--	37	--	Clay, silty, sandy (CL)
	21.5	6.8	112	21	4	--	33	--	Shale
TH-95	7	6.5	85	23	7	--	46	--	Clay, silty, sandy (CL)
TH-99	2.5	4.8	87	18	3	--	47	--	Sand, clayey, silty (SC/SM)
TP-151	4'3"-4'6"	5.6	--	24	5	--	66	**	Clay, silty, sandy (CL)
TP-152	7.5	4.3	--	26	9		74	2.64	Clay, silty, sandy (CL)

* NL – Indicates sample did not exhibit liquid characteristics.

* NP – Indicates sample did not exhibit plastic characteristics.

** Assumed 2.65 for specific gravity, program sheet didn't indicate specific gravity tests.

Geotechnical Engineering Group, Inc.

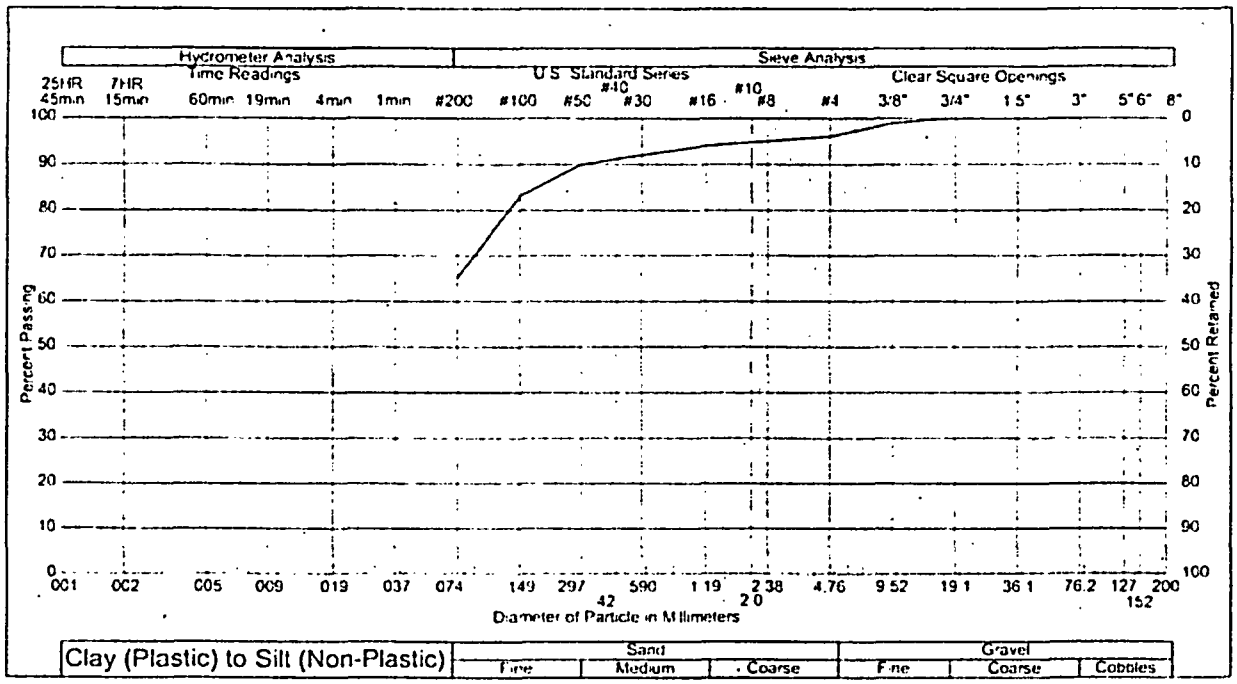
TABLE I

SUMMARY OF LABORATORY TEST RESULTS

HOLE	DEPTH (FEET)	NATURAL MOISTURE (%)	DRY DENSITY (PCF)	Atterberg Limits LIQUID LIMIT (%)	Atterberg Limits PLASTICITY INDEX (%)	Double Hydrometer DISPERSION AT 5 MICRON (%)	PASSING NO. 200 SIEVE (%)	SPECIFIC GRAVITY	SOIL TYPE
TP-152	15	2.9	--	21	3		84	2.63	Clay, silty, sandy (CL)
	23	5.5	--	33	12	--	97	**	Clay, silty, sandy (CL)
TP-153	2.5-3.5	5.7	--	23	5	--	72	2.68	Clay, silty, sandy (CL)
	8.5	4.4	--	NL*	NP*	--	67	2.65	Silt, sandy, clayey (ML)
TP-154	4	7.6	--	22	4	79	83	**	Clay, silty, sandy (CL)
	12	2.7	--	20	3	62	63	2.65	Clay, silty, sandy (CL)
	18-20	5.5	--	38	20	62	95	2.73	Shale
TP-155	4-5	7.2	--	24	7	61	69	2.82	Clay, silty, sandy (CL)
TP-156	12	2.7	--	19	2	83	64	2.64	Clay, silty, sandy (CL)
	22	5.5	--	25	7	86	84	2.56	Clay, silty, sandy (CL)

* NL – Indicates sample did not exhibit liquid characteristics.
* NP – Indicates sample did not exhibit plastic characteristics.
** Assumed 2.65 for specific gravity, program sheet didn't indicate specific gravity tests.

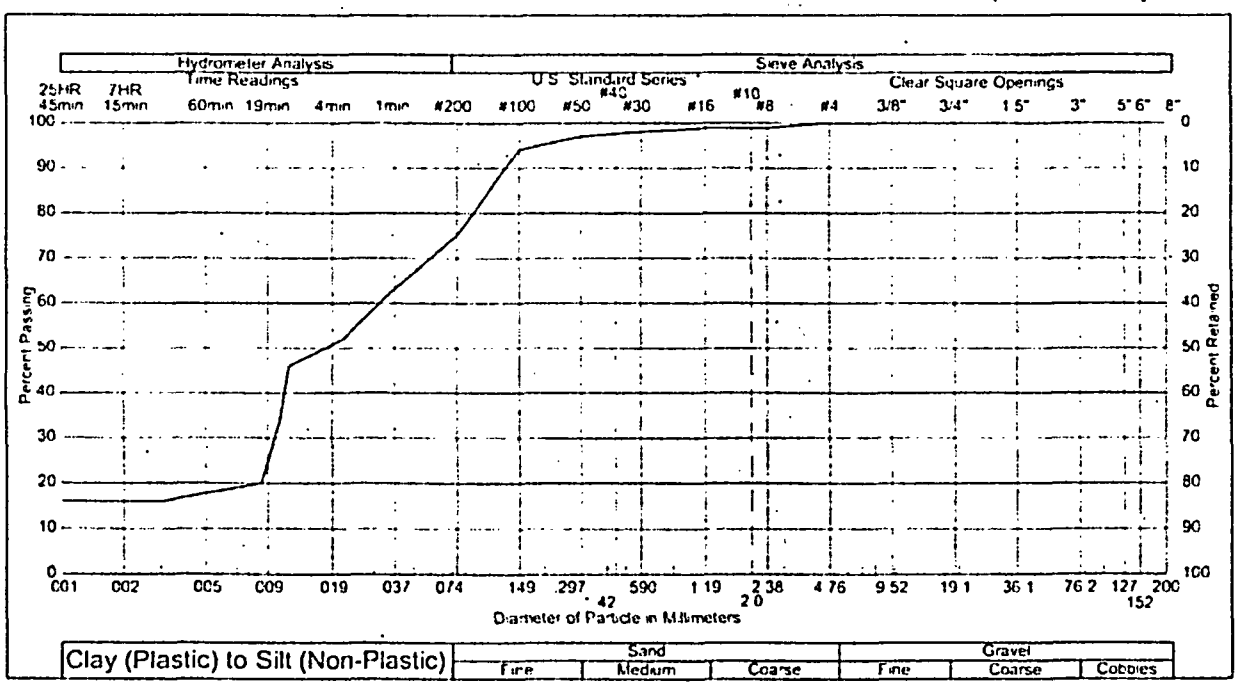
GRADATION TEST RESULTS



Sample of: 05-197
From: TH-0151 @ 4'3" - 4'6" foot depth
Moisture Content: 5.6 %

Gravel: 4 %
Sand: 30 %
Silt & Clay: 66 %

Liquid Limit: 24
Plastic Limit: 19
Plasticity Index: 5
Specific Gravity:

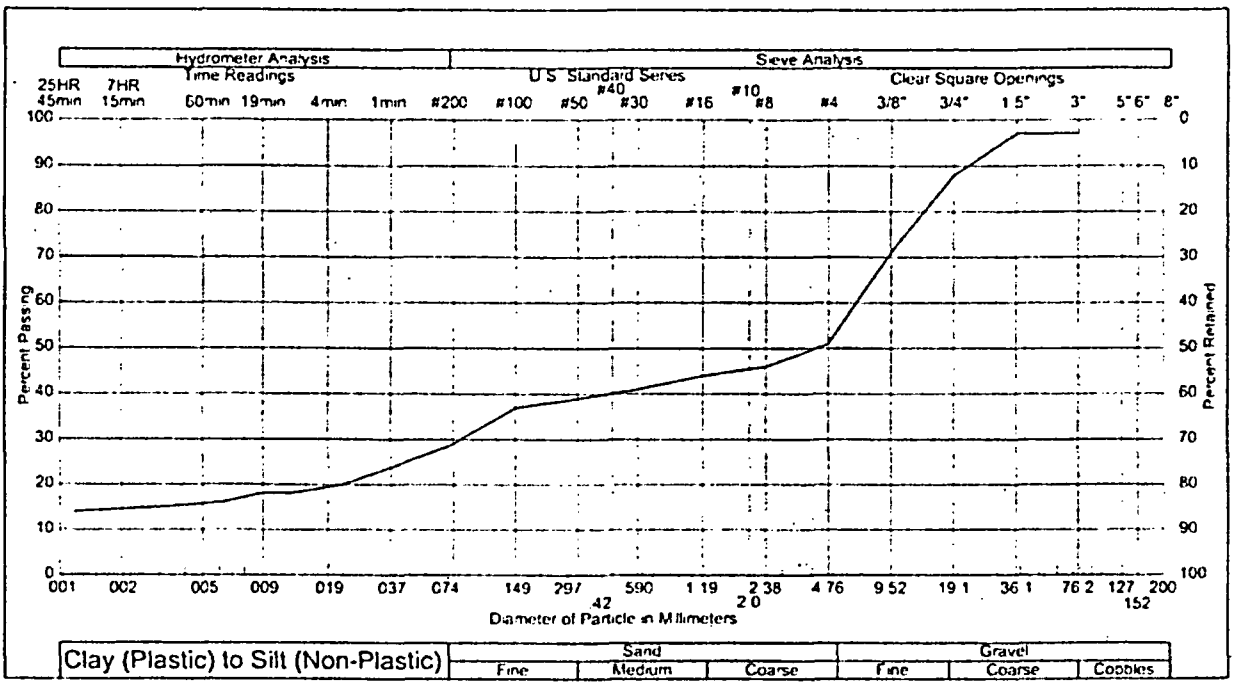


Sample of: Claly, silty, sandy, moist 05-186
From: TP-152 @ 7.5 foot depth
Moisture Content: 4.3 %

Gravel: 0 %
Sand: 25 %
Silt & Clay: 75 %

Liquid Limit: 26
Plastic Limit: 17
Plasticity Index: 9
Specific Gravity: 2.64

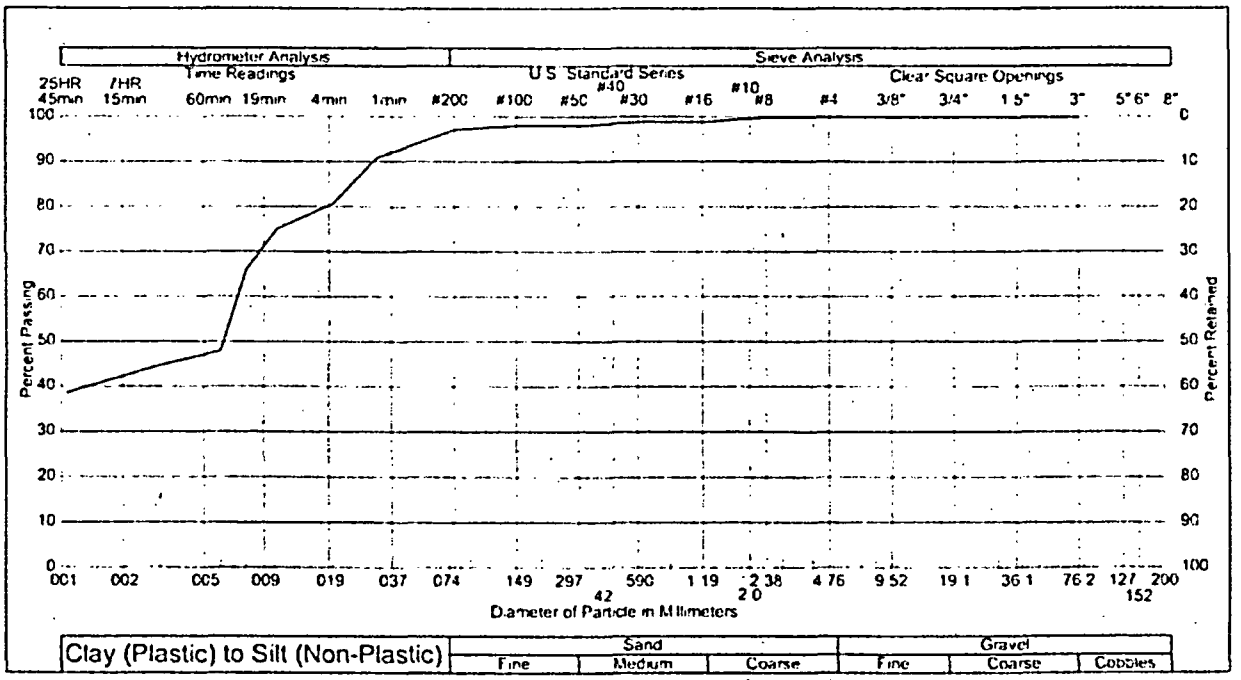
# Gradation Test Results	Job No. 2,165
Geotechnical Engineering Group, Inc.	Date: December, 2005
	Fig. 1



Sample of: Clay, silty, sandy, sandstone 05-188
From: TH-152 @ 15 foot depth
Moisture Content: 2.9 %

Gravel: 49 %
Sand: 22 %
Silt & Clay: 29 %

Liquid Limit: 21
Plastic Limit: 18
Plasticity Index: 3
Specific Gravity: 2.63

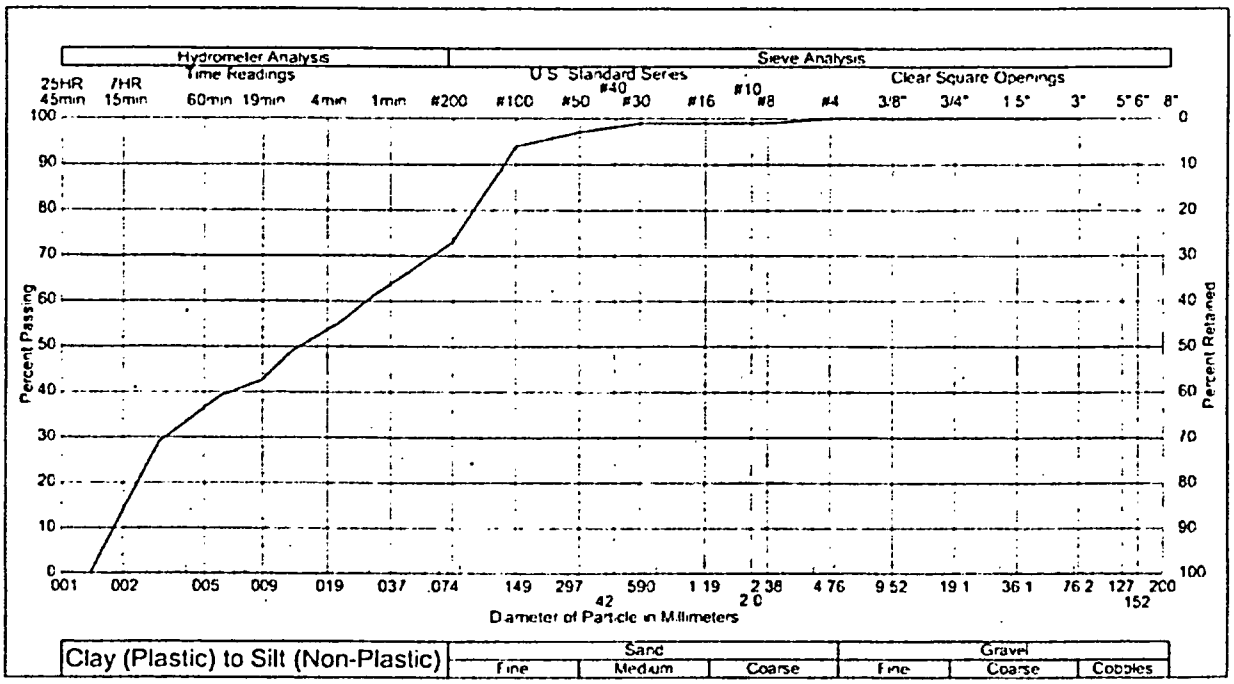


Sample of: 05-198
From: TH-152 @ 23 foot depth
Moisture Content: 5.5 %

Gravel: 0 %
Sand: 3 %
Silt & Clay: 97 %

Liquid Limit: 33
Plastic Limit: 21
Plasticity Index: 12
Assumed Specific Gravity: 2.65

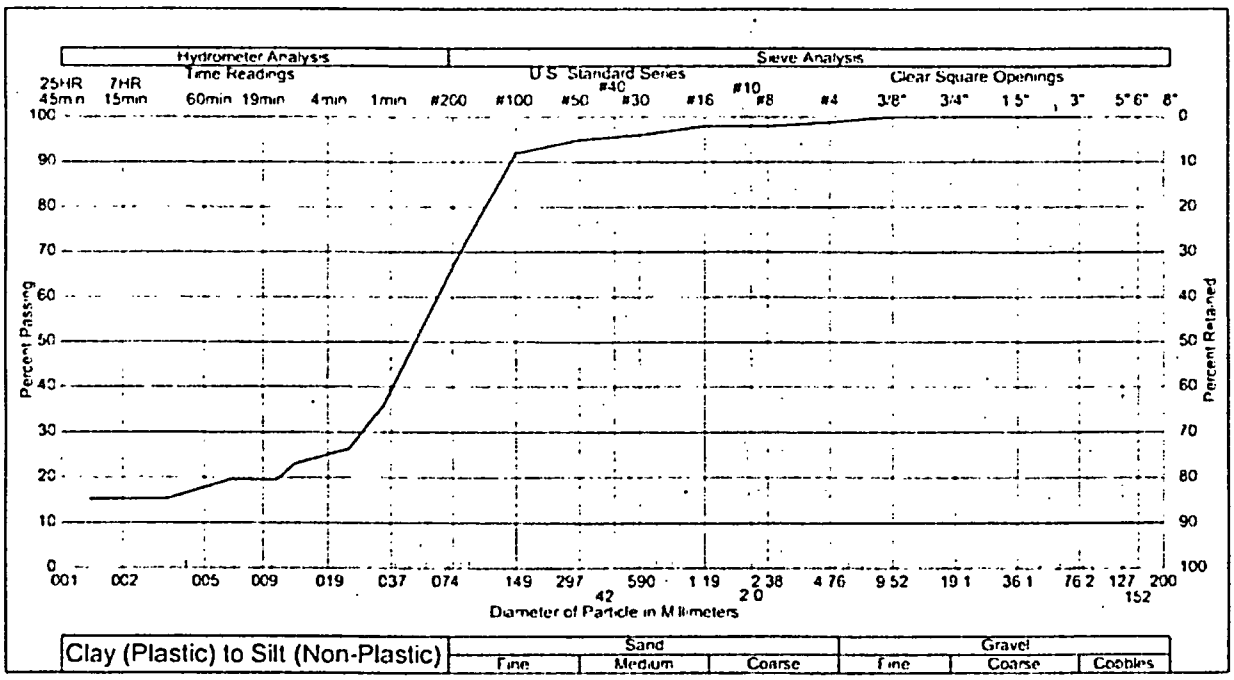
# Gradation Test Results	Job No. 2,165
Geotechnical Engineering Group, Inc.	Date: December, 2005
	Fig. 2



Sample of: Silty, clay, sandy, moist, brown 05-189
From: TH-153 @ 2.5 to 3.5 foot depth
Moisture Content: 5.7 %

Gravel: 0 %
Sand: 27 %
Silt & Clay: 73 %

Liquid Limit: 23
Plastic Limit: 18
Plasticity Index: 5
Specific Gravity: 2.68



Sample of: Clay, sandy, dry, moist, brown 05-190
From: TH-153 @ 8.5 foot depth
Moisture Content: 4.4 %

Gravel: 1 %
Sand: 32 %
Silt & Clay: 67 %

Liquid Limit: NL
Plastic Limit:
Plasticity Index: NP
Specific Gravity: 2.65

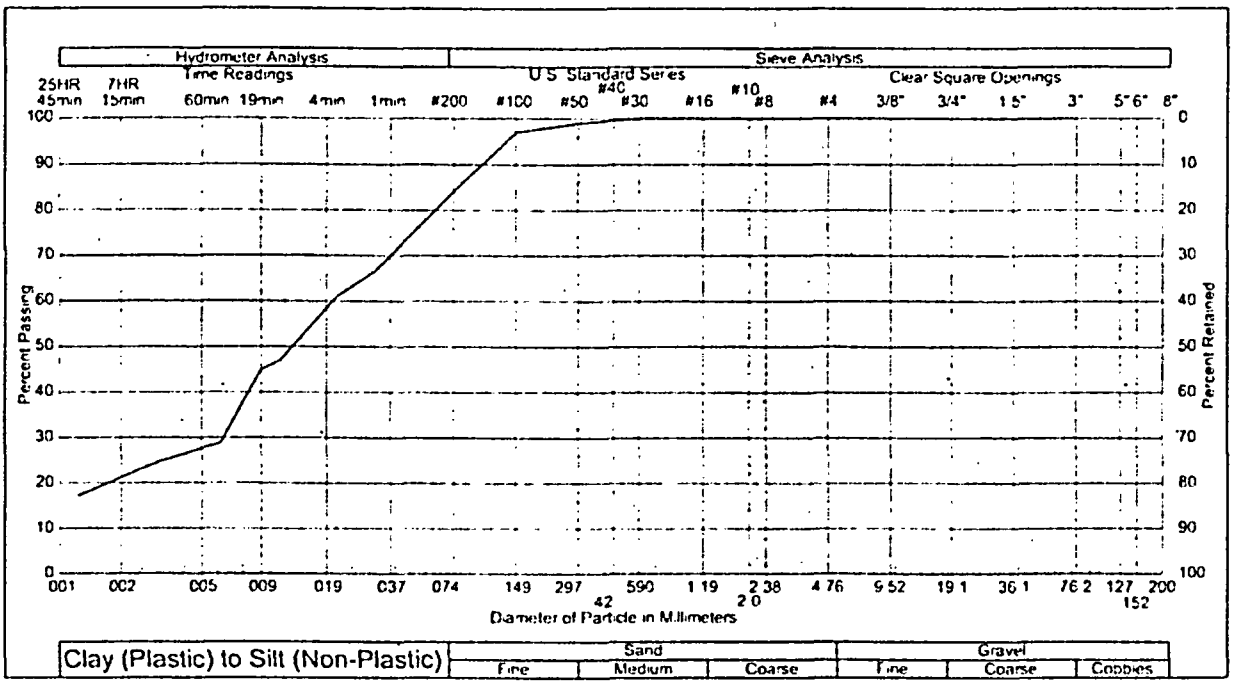
Gradation Test Results

Job No. 2,165

Geotechnical Engineering Group, Inc.

Date: December, 2005

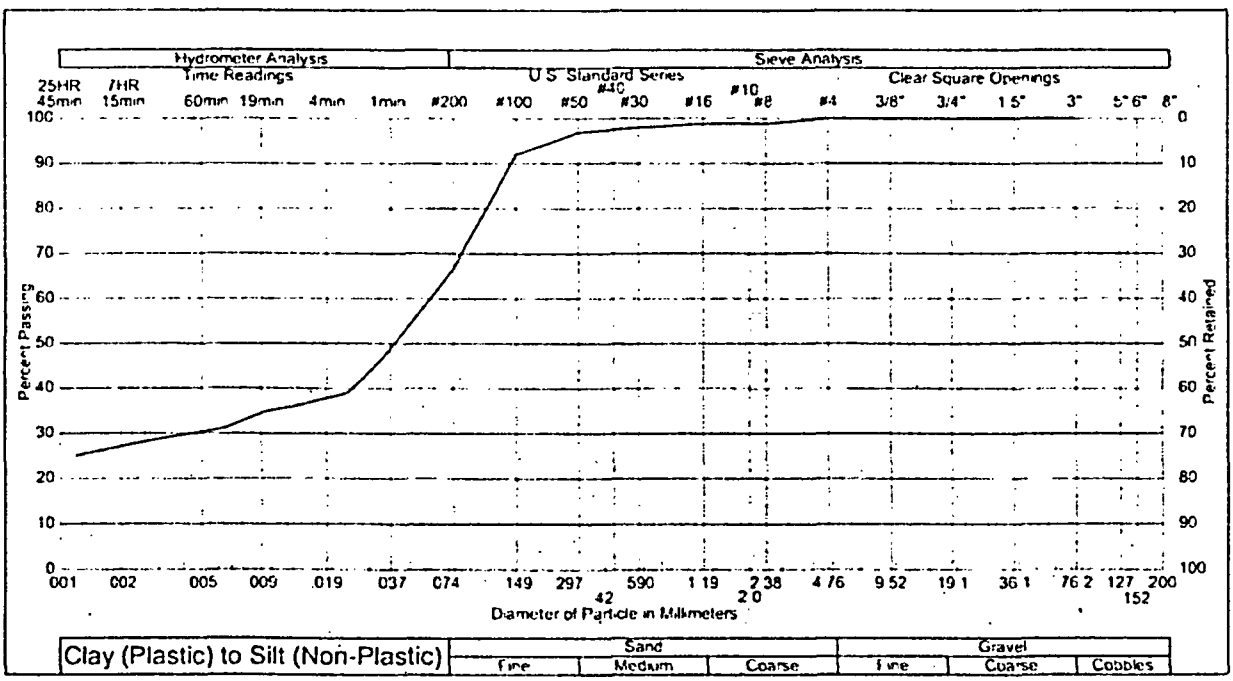
Fig. 3



Sample of: Clay, silty, sandy 05-187
From: TH-154 @ 4 foot depth
Moisture Content: 7.6 %

Gravel: 0 %
Sand: 16 %
Silt & Clay: 84 %

Liquid Limit: 22
Plastic Limit: 18
Plasticity Index: 4
Assumed Specific Gravity: 2.65

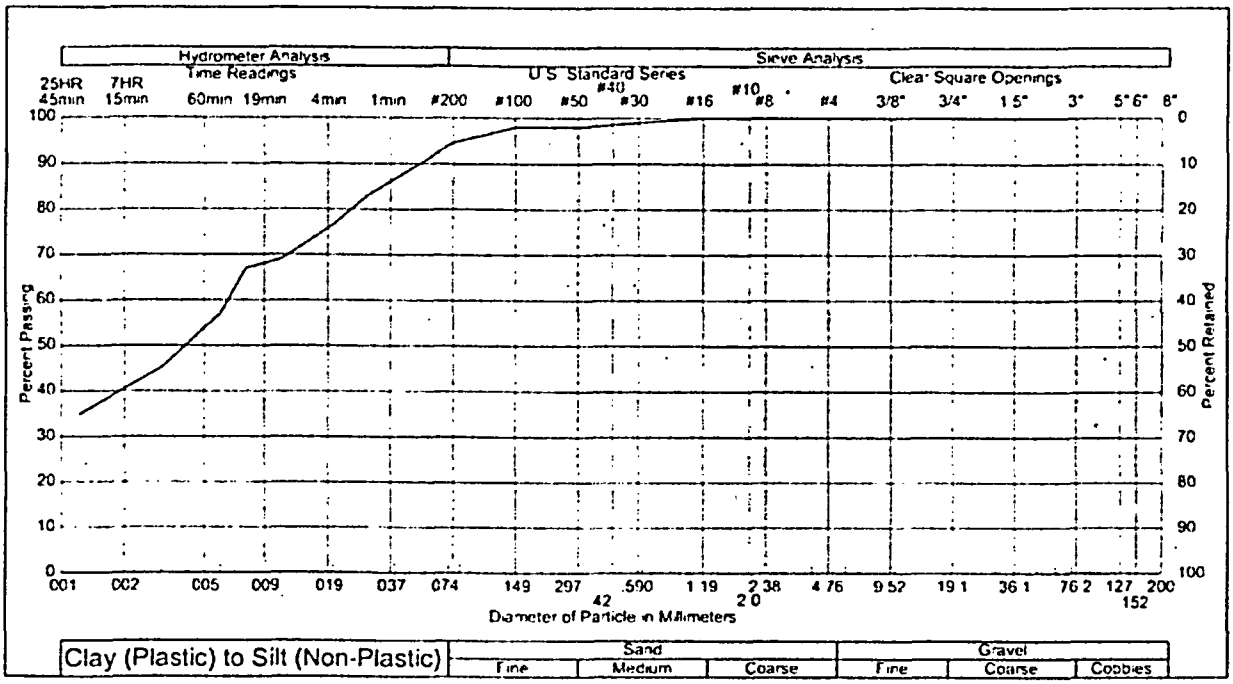


Sample of: Silty, clay,sandy, dry, tan 05-191
From: TH-154 @ 12 foot depth
Moisture Content: 2.7 %

Gravel: 0 %
Sand: 33 %
Silt & Clay: 67 %

Liquid Limit: 20
Plastic Limit: 17
Plasticity Index: 3
Assumed Specific Gravity: 2.65

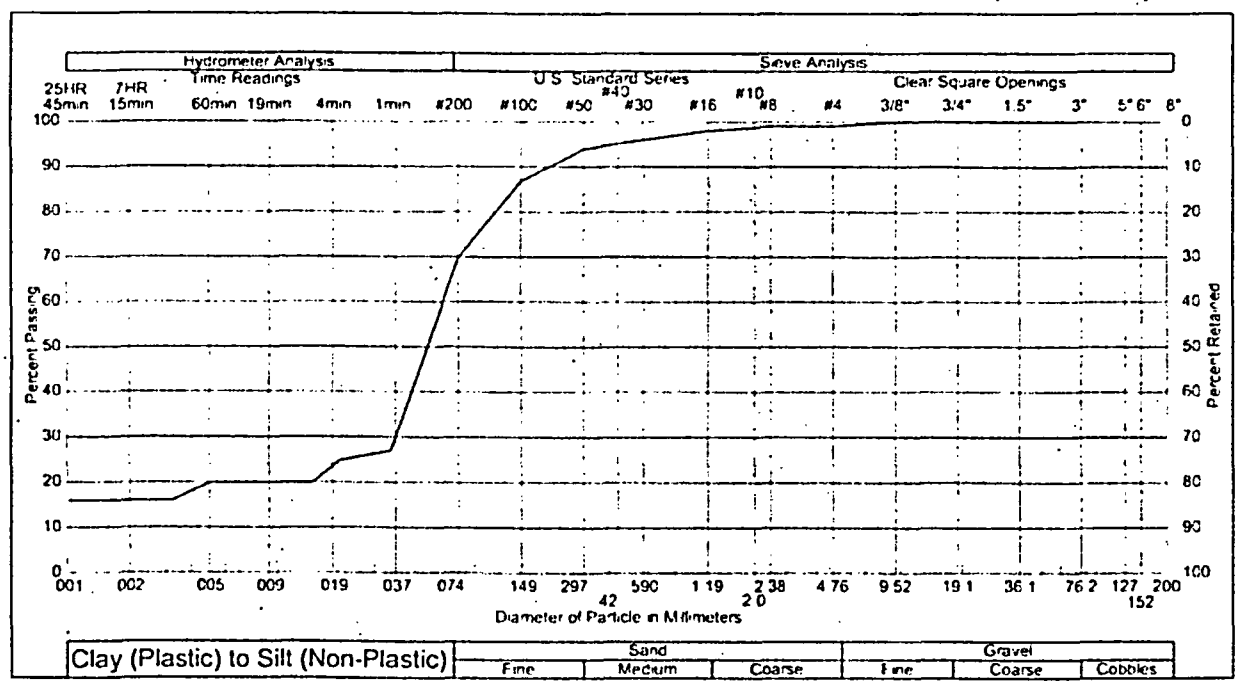
# Gradation Test Results	Job No. 2,165
Geotechnical Engineering Group, Inc.	Date: December, 2005
	Fig. 4



Sample of: Shale, silty, sandy, dry, light tan 05-192
From: TH-154 @ 18 to 20 foot depth
Moisture Content: 5.5 %

Gravel: 0%
Sand: 5 %
Silt & Clay: 95 %

Liquid Limit: 38
Plastic Limit: 20
Plasticity Index: 20
Specific Gravity: 2.73



Sample of: Silty, clay, sandy, moist, brown 05-193
From: TH-15~~5~~6 @ ~~4~~ to 5 foot depth
Moisture Content: 7.2 %

Gravel: 1 %
Sand: 29 %
Silt & Clay: 70 %

Liquid Limit: 24
Plastic Limit: 17
Plasticity Index: 7
Specific Gravity: 2.82

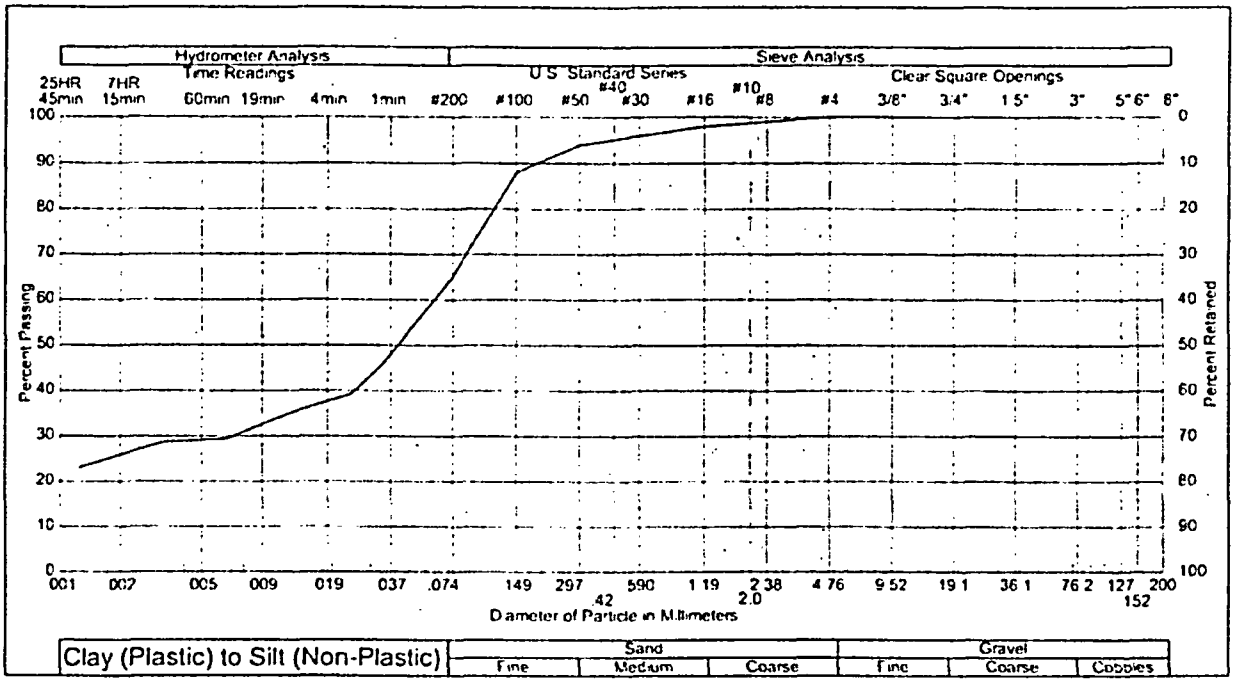
Gradation Test Results

Job No. 2,165

Geotechnical Engineering Group, Inc.

Date: December, 2005

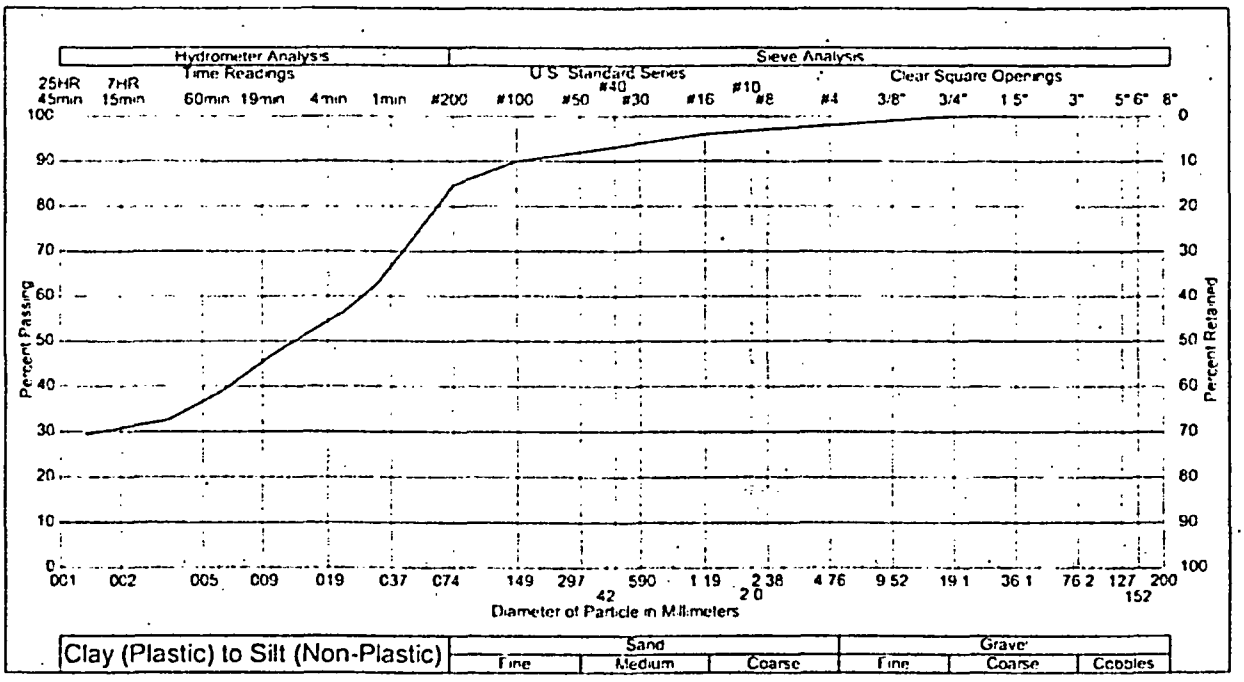
Fig. 5



Sample of: Silty, clay, sandy, moist, tan 05-194
From: TH-156 @ 12 foot depth
Moisture Content: 2.7 %

Gravel: 0 %
Sand: 35 %
Silt & Clay: 65 %

Liquid Limit: 19
Plastic Limit: 17
Plasticity Index: 2
Specific Gravity: 2.64



Sample of: 05-195
From: TH-156 @ 22 foot depth
Moisture Content: 5.5 %

Gravel: 2 %
Sand: 14 %
Silt & Clay: 84 %

Liquid Limit: 25
Plastic Limit: 18
Plasticity Index: 7
Specific Gravity: 2.56

Gradation Test Results

Job No. 2,165

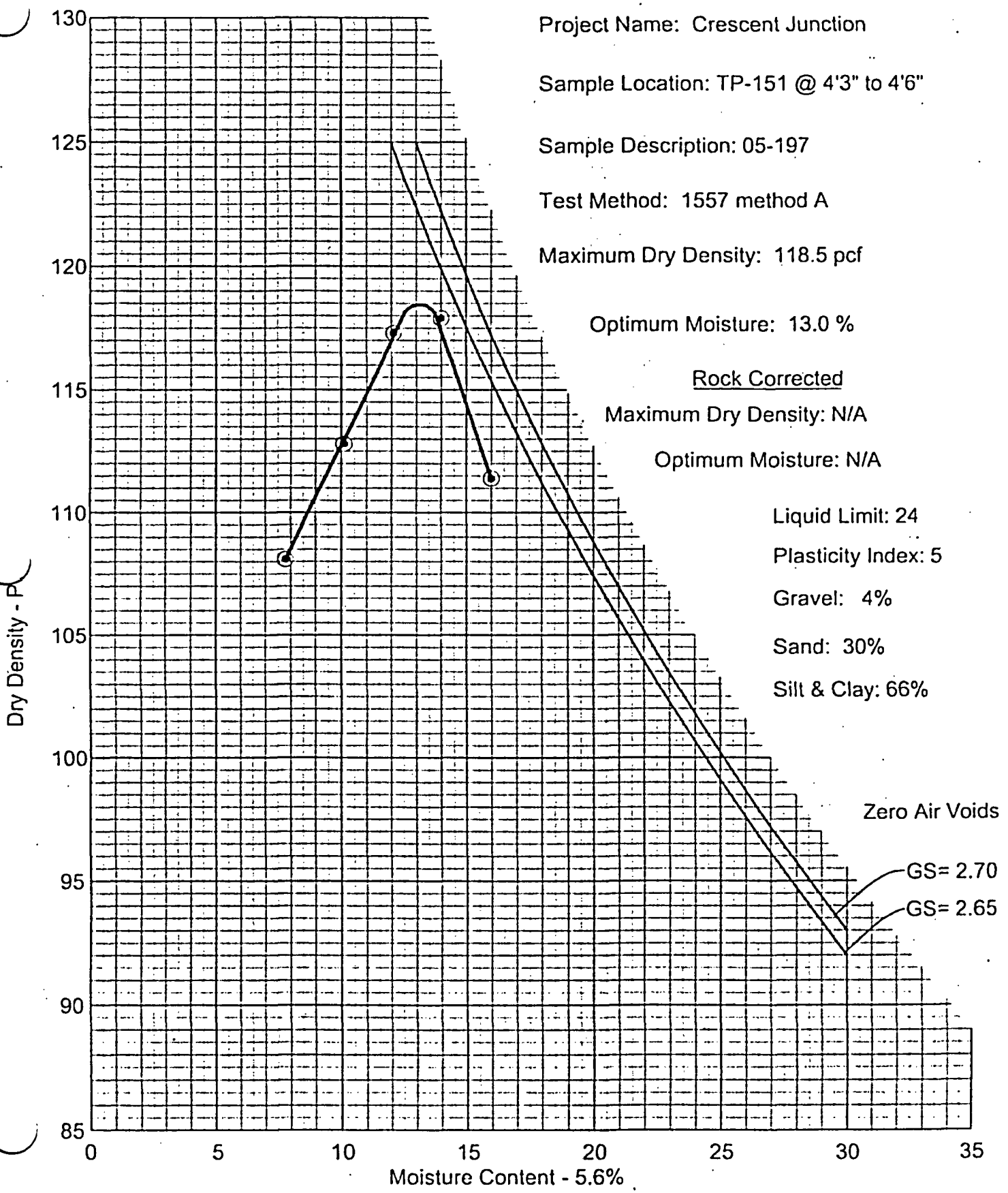
Geotechnical Engineering Group, Inc.

Date: December, 2005

Fig. 6

PROCTOR AND CLASSIFICATION TEST RESULTS

Geotechnical Engineering Group, Inc.
Moisture- Density Relationship



Project Name: Crescent Junction

Sample Location: TP-151 @ 4'3" to 4'6"

Sample Description: 05-197

Test Method: 1557 method A

Maximum Dry Density: 118.5 pcf

Optimum Moisture: 13.0 %

Rock Corrected

Maximum Dry Density: N/A

Optimum Moisture: N/A

Liquid Limit: 24

Plasticity Index: 5

Gravel: 4%

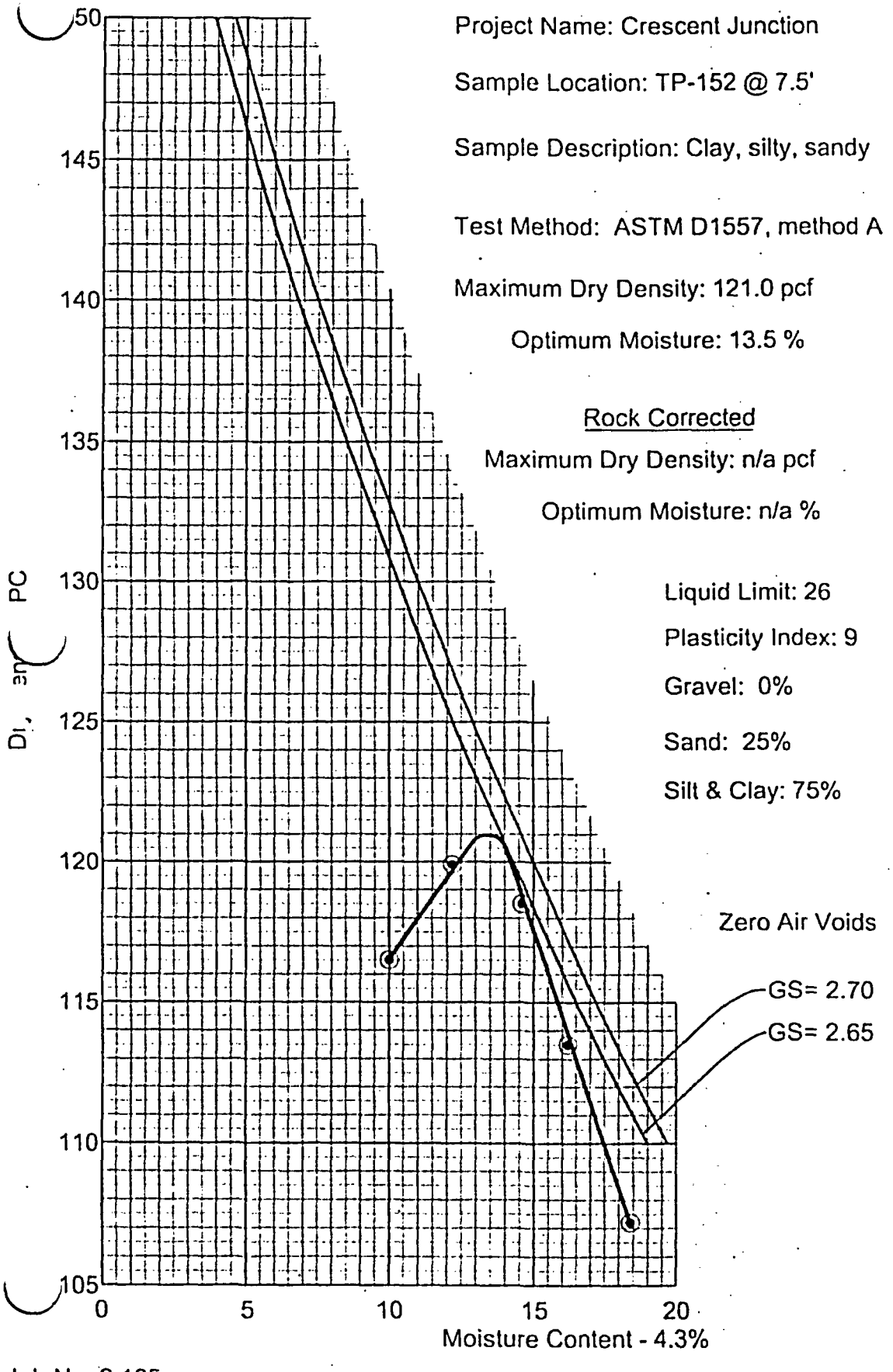
Sand: 30%

Silt & Clay: 66%

Job No. 2,165

Fig. 1

Geotechnical Engineering Group, Inc.
Moisture- Density Relationship



Project Name: Crescent Junction

Sample Location: TP-152 @ 7.5'

Sample Description: Clay, silty, sandy

Test Method: ASTM D1557, method A

Maximum Dry Density: 121.0 pcf

Optimum Moisture: 13.5 %

Rock Corrected

Maximum Dry Density: n/a pcf

Optimum Moisture: n/a %

Liquid Limit: 26

Plasticity Index: 9

Gravel: 0%

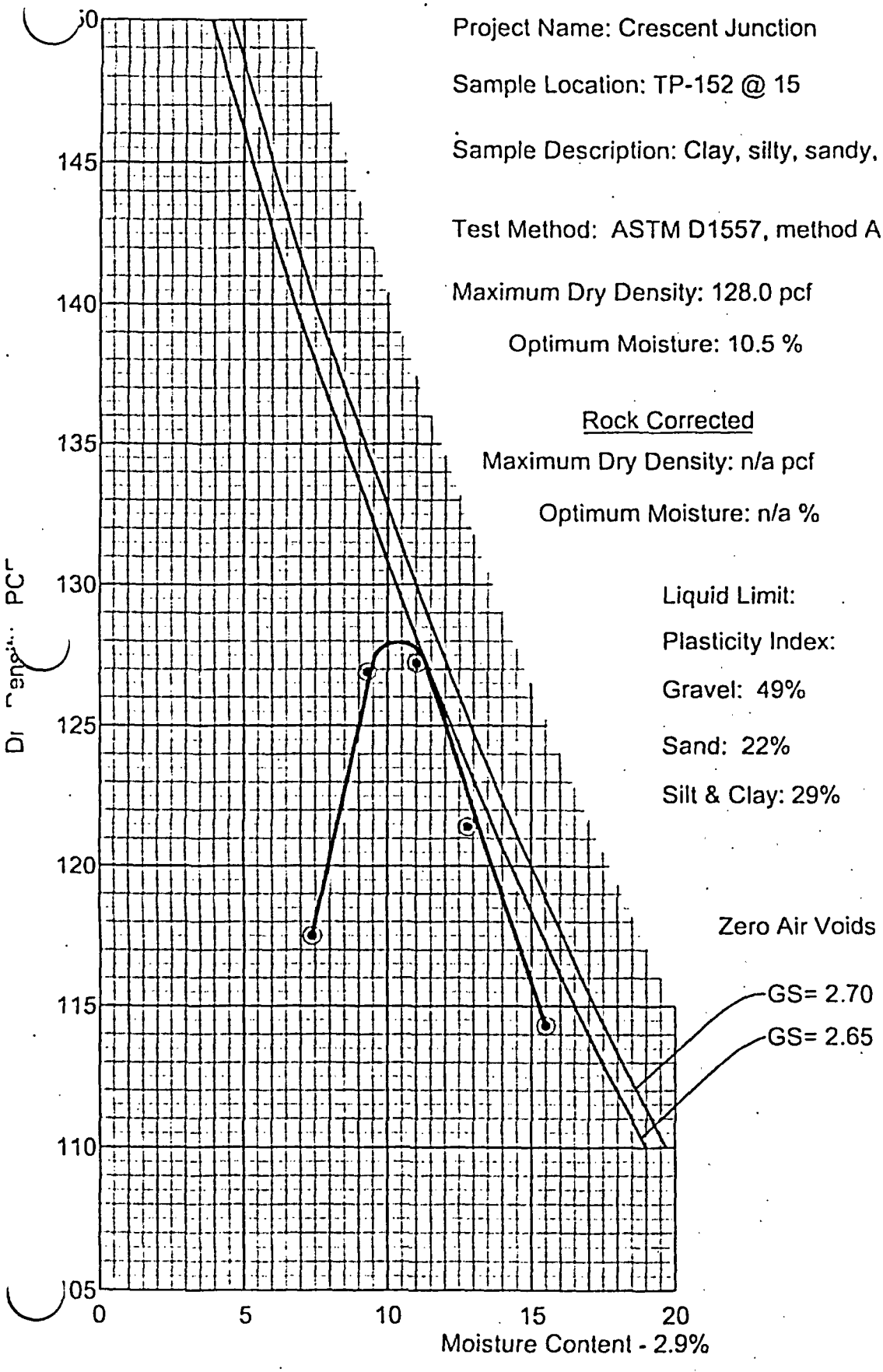
Sand: 25%

Silt & Clay: 75%

Job No. 2,165

Fig. 2

Geotechnical Engineering Group, Inc.
Moisture- Density Relationship



Project Name: Crescent Junction

Sample Location: TP-152 @ 15

Sample Description: Clay, silty, sandy, sandstone

Test Method: ASTM D1557, method A

Maximum Dry Density: 128.0 pcf

Optimum Moisture: 10.5 %

Rock Corrected

Maximum Dry Density: n/a pcf

Optimum Moisture: n/a %

Liquid Limit:

Plasticity Index:

Gravel: 49%

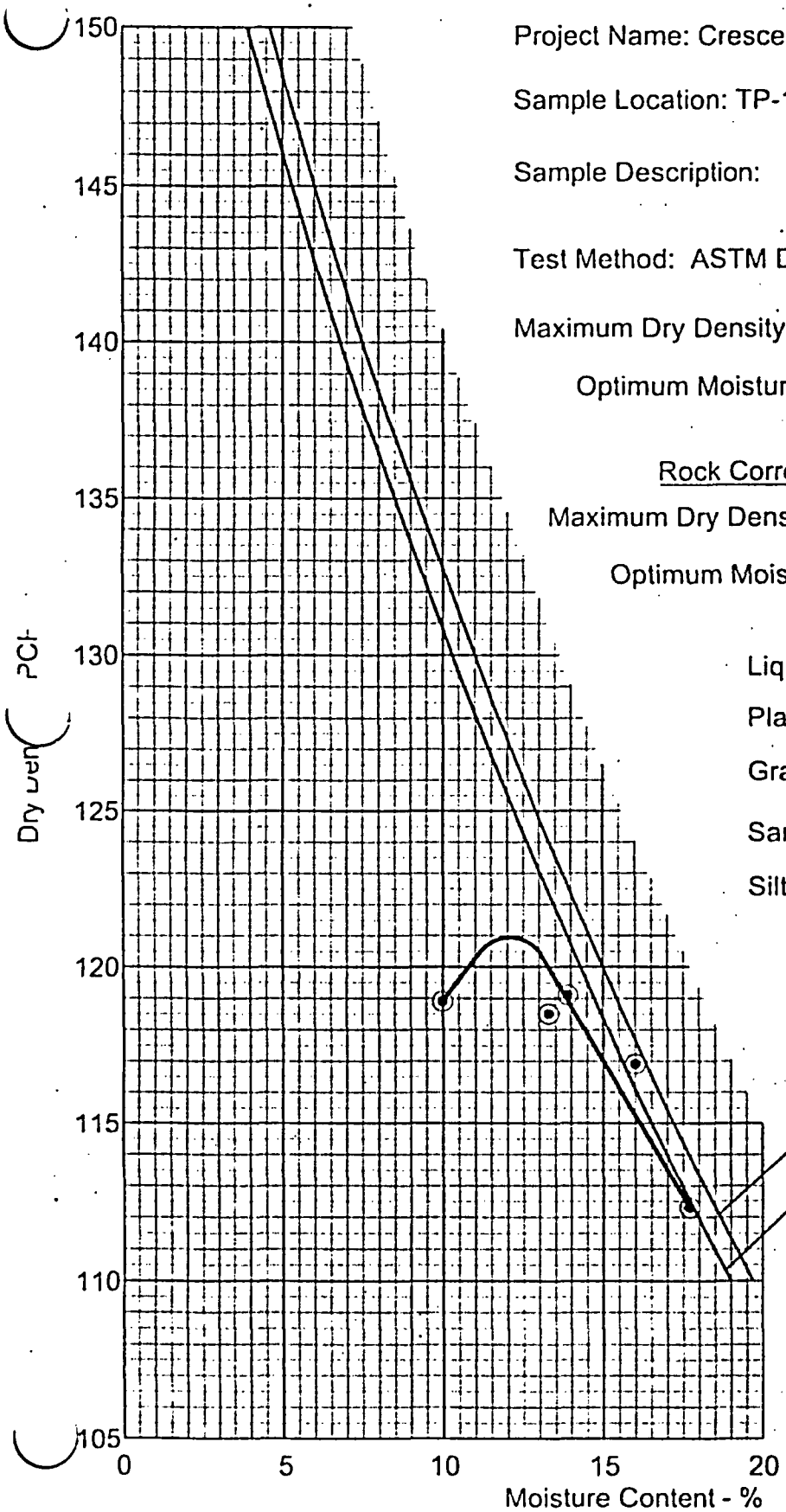
Sand: 22%

Silt & Clay: 29%

Job No. 2,165

Fig. 3

Geotechnical Engineering Group, Inc.
Moisture- Density Relationship



Project Name: Crescent Junction

Sample Location: TP-152 @ 23, 05-198

Sample Description:

Test Method: ASTM D1557, method A

Maximum Dry Density: 121.0 pcf

Optimum Moisture: 12 %

Rock Corrected

Maximum Dry Density: n/a pcf

Optimum Moisture: n/a %

Liquid Limit: 33

Plasticity Index: 12

Gravel: 0%

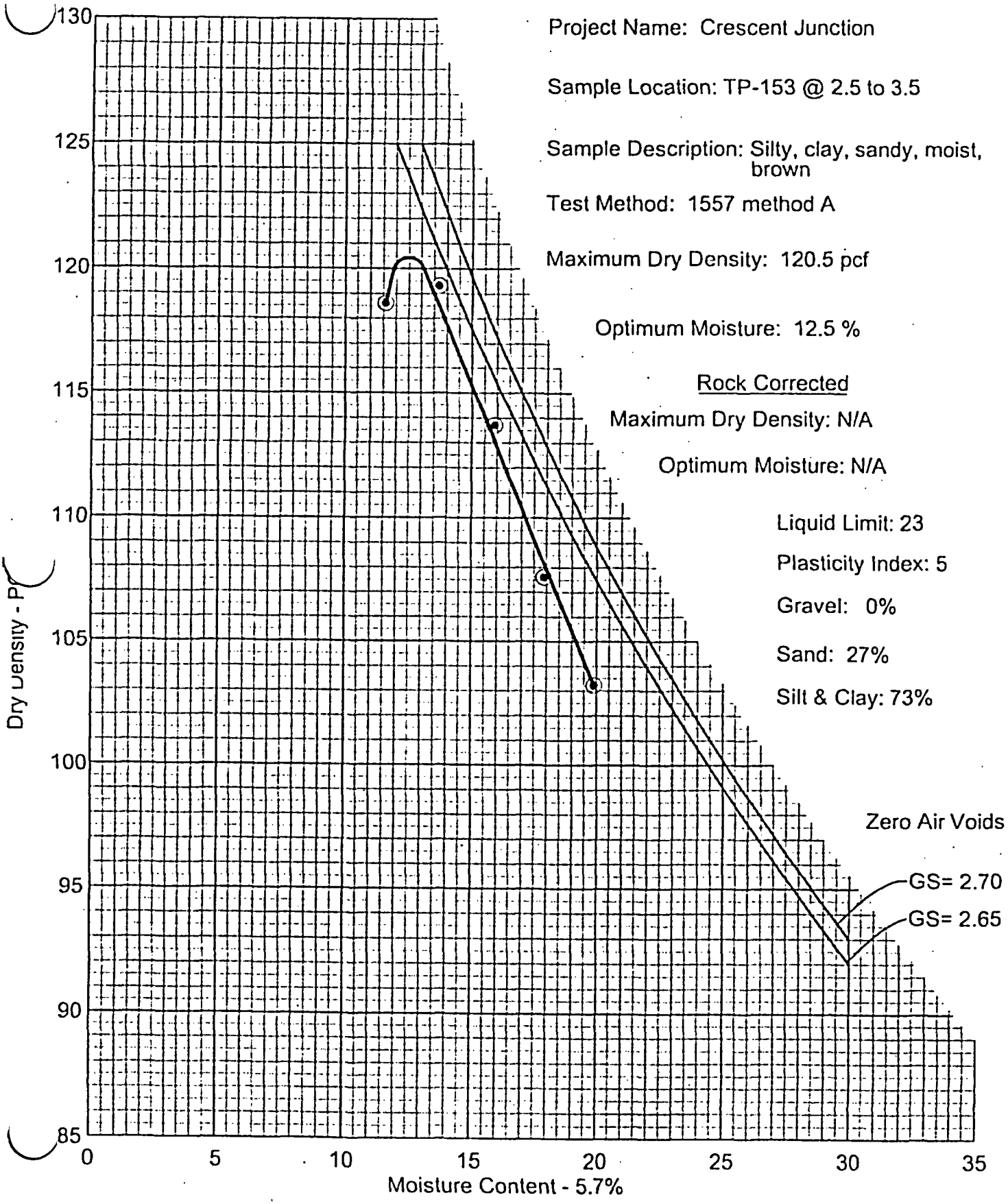
Sand: 3%

Silt & Clay: 97%

Job No. 2,165

Fig. 4

Geotechnical Engineering Group, Inc.
Moisture- Density Relationship



Project Name: Crescent Junction

Sample Location: TP-153 @ 2.5 to 3.5

Sample Description: Silty, clay, sandy, moist, brown

Test Method: 1557 method A

Maximum Dry Density: 120.5 pcf

Optimum Moisture: 12.5 %

Rock Corrected

Maximum Dry Density: N/A

Optimum Moisture: N/A

Liquid Limit: 23

Plasticity Index: 5

Gravel: 0%

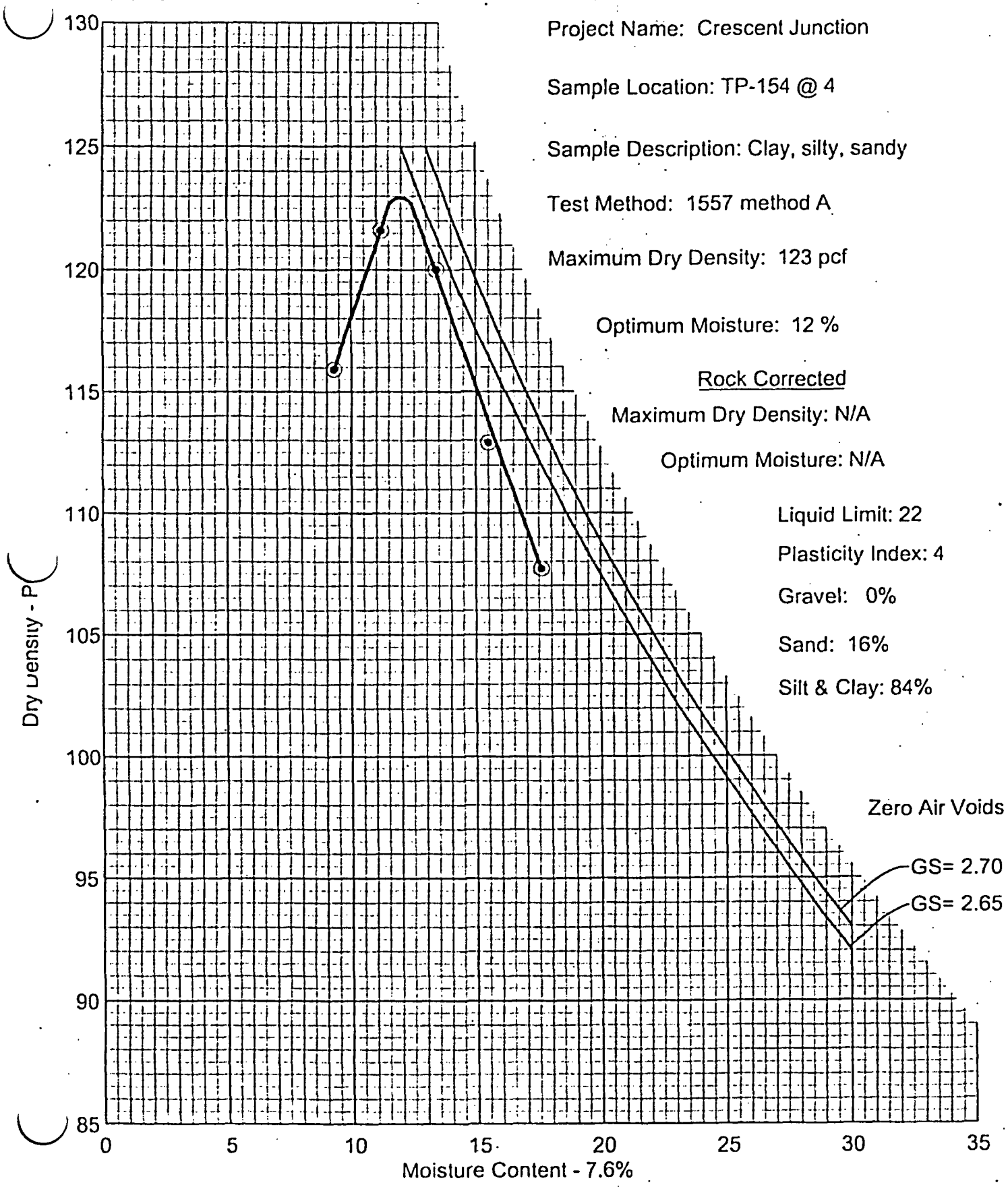
Sand: 27%

Silt & Clay: 73%

Job No. 2,165

Fig. 5

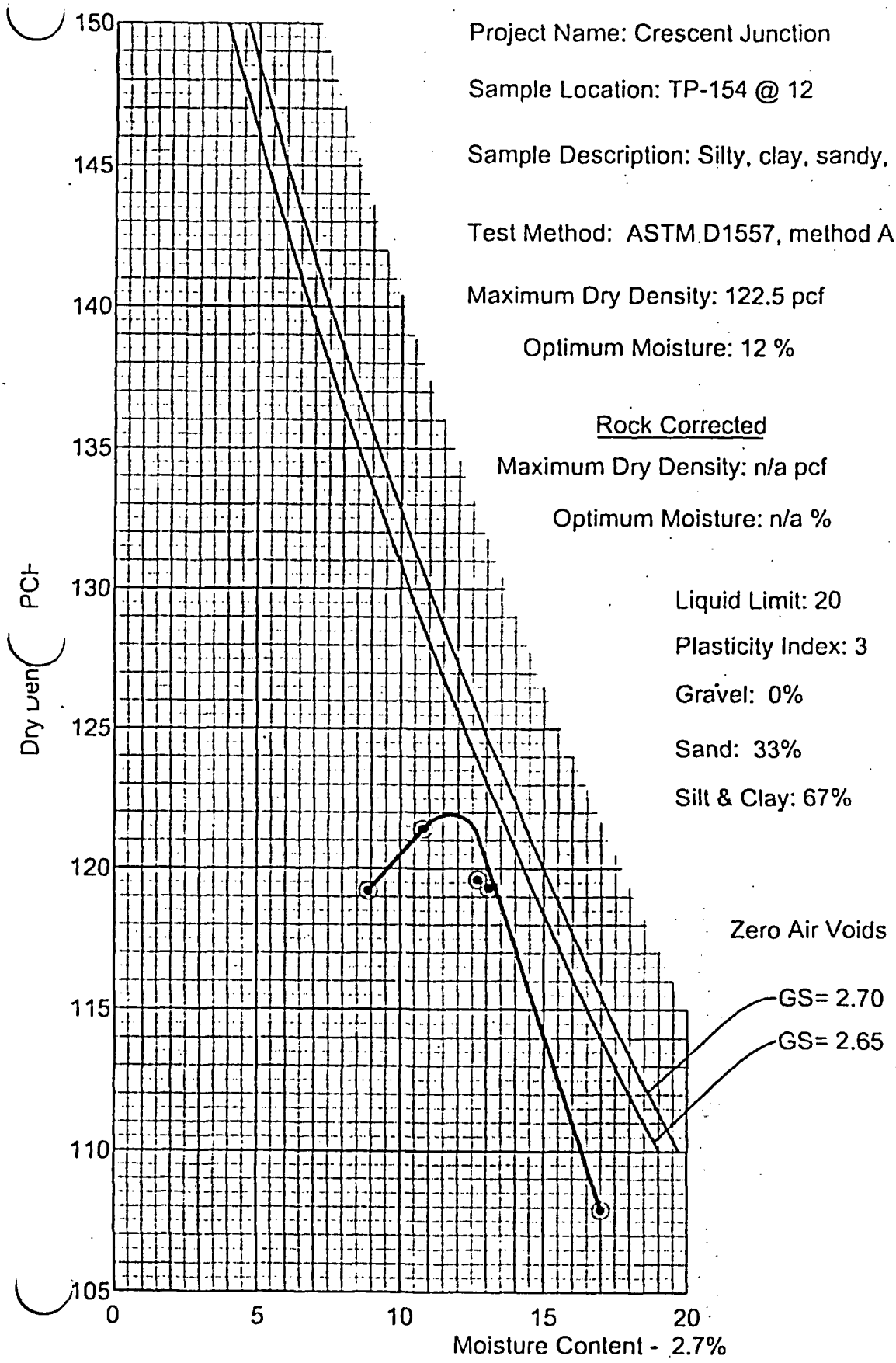
Geotechnical Engineering Group, Inc.
Moisture- Density Relationship



Job No. 2,165

Fig. 7

Geotechnical Engineering Group, Inc.
Moisture- Density Relationship



Project Name: Crescent Junction

Sample Location: TP-154 @ 12

Sample Description: Silty, clay, sandy, dry, tan

Test Method: ASTM D1557, method A

Maximum Dry Density: 122.5 pcf

Optimum Moisture: 12 %

Rock Corrected

Maximum Dry Density: n/a pcf

Optimum Moisture: n/a %

Liquid Limit: 20

Plasticity Index: 3

Gravel: 0%

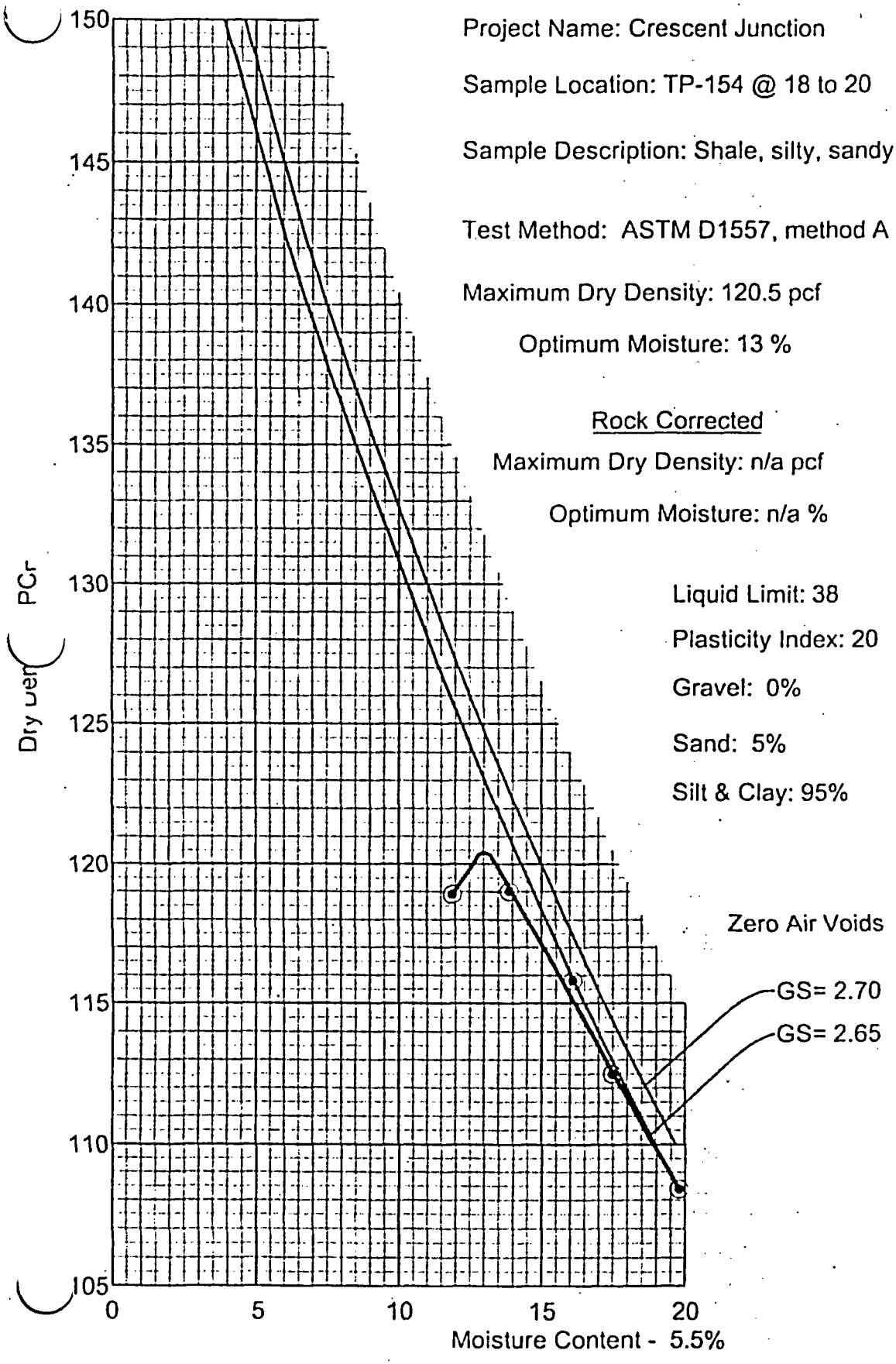
Sand: 33%

Silt & Clay: 67%

Job No. 2,165

Fig. 8

Geotechnical Engineering Group, Inc.
Moisture- Density Relationship



Project Name: Crescent Junction

Sample Location: TP-154 @ 18 to 20

Sample Description: Shale, silty, sandy, dry, light, tan

Test Method: ASTM D1557, method A

Maximum Dry Density: 120.5 pcf

Optimum Moisture: 13 %

Rock Corrected

Maximum Dry Density: n/a pcf

Optimum Moisture: n/a %

Liquid Limit: 38

Plasticity Index: 20

Gravel: 0%

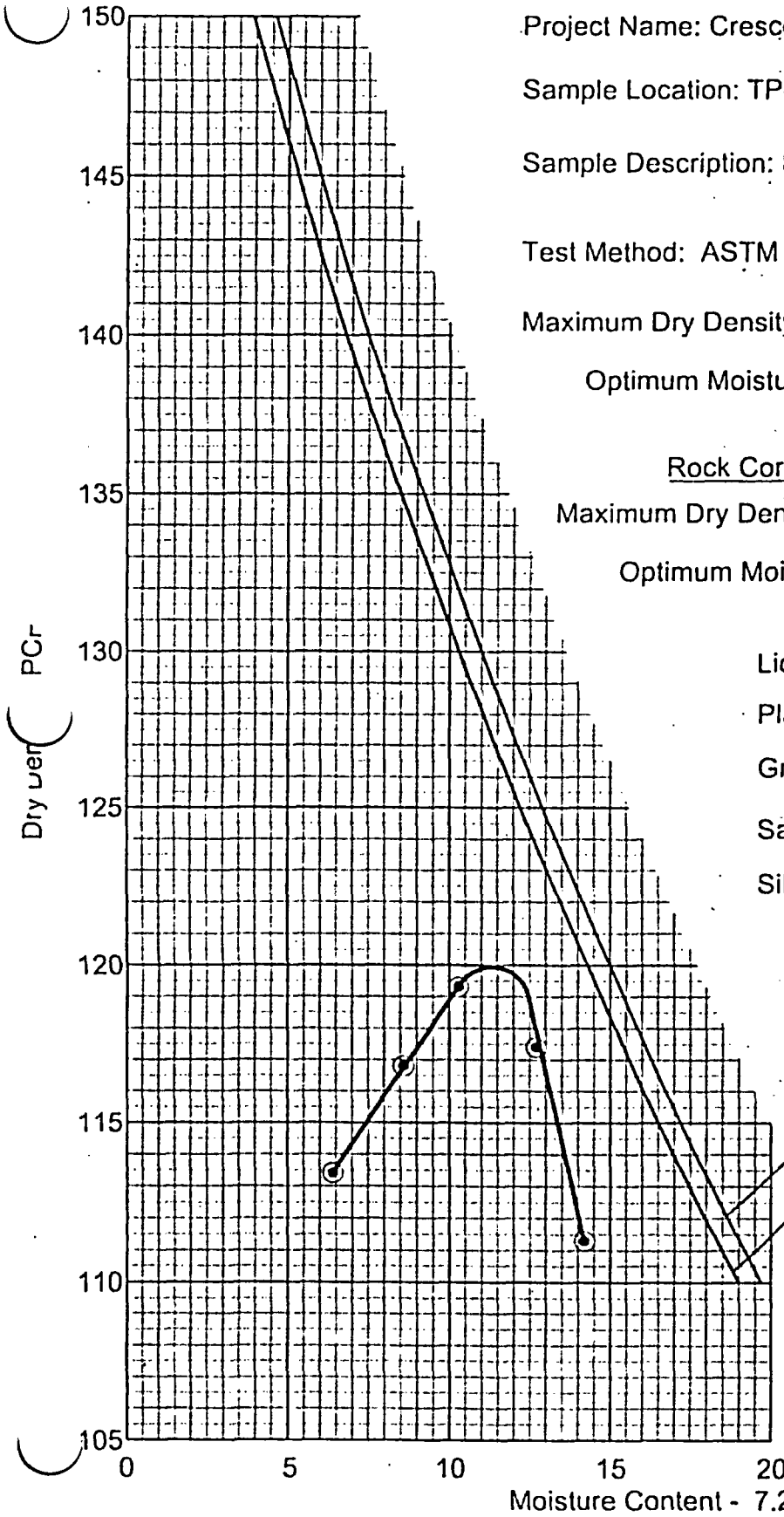
Sand: 5%

Silt & Clay: 95%

Job No. 2,165

Fig. 9

Geotechnical Engineering Group, Inc.
Moisture- Density Relationship



Project Name: Crescent Junction

Sample Location: TP-15~~5~~6 @ 4 to 5

Sample Description: Silty, clay, sandy, moist, brown

Test Method: ASTM D1557, method A

Maximum Dry Density: 120 pcf

Optimum Moisture: 11.5 %

Rock Corrected

Maximum Dry Density: n/a pcf

Optimum Moisture: n/a %

Liquid Limit: 24

Plasticity Index: 7

Gravel: 1%

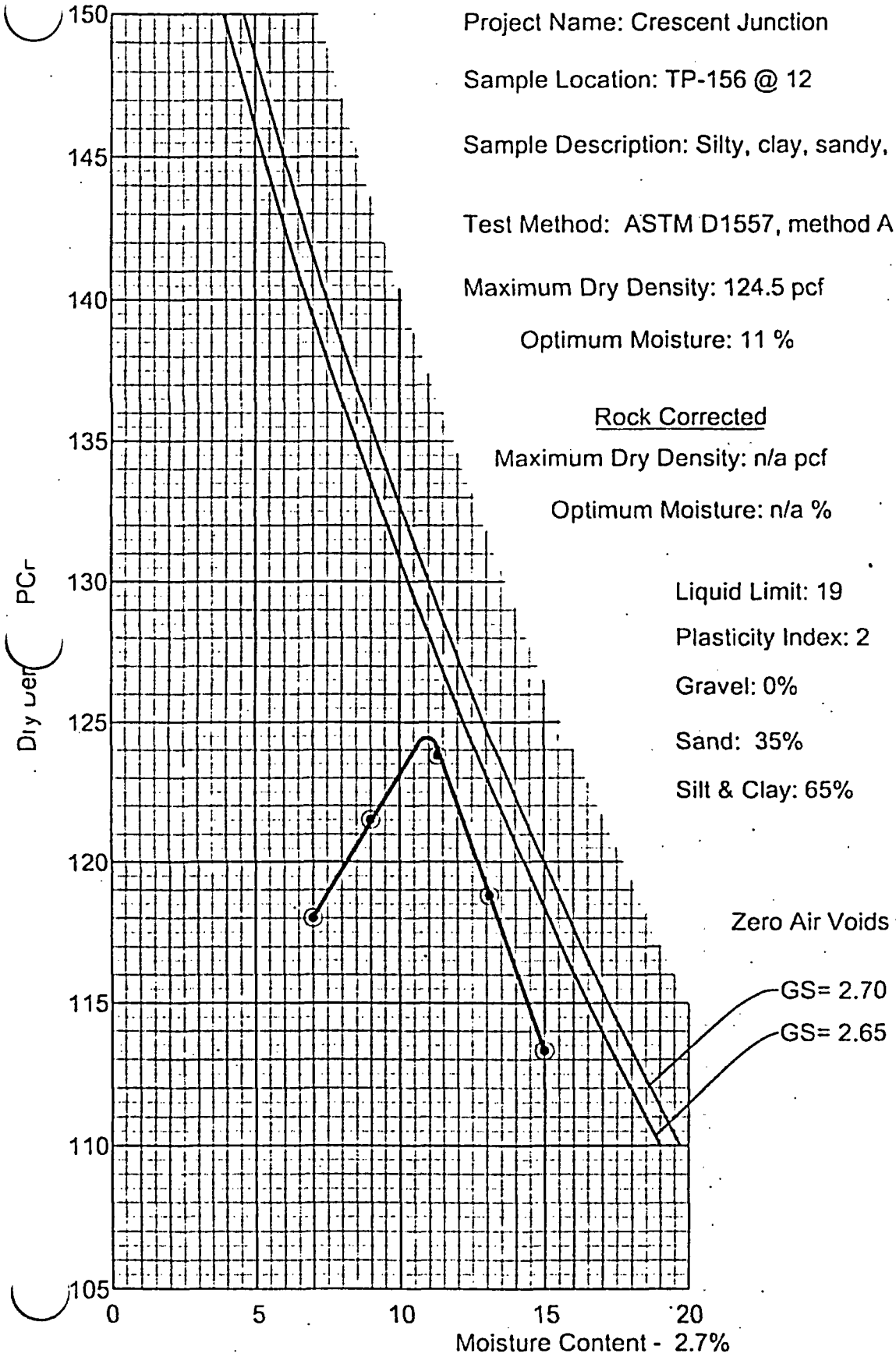
Sand: 29%

Silt & Clay: 70%

Job No. 2,165

Fig. 10

Geotechnical Engineering Group, Inc.
Moisture- Density Relationship



Project Name: Crescent Junction

Sample Location: TP-156 @ 12

Sample Description: Silty, clay, sandy, moist, tan

Test Method: ASTM D1557, method A

Maximum Dry Density: 124.5 pcf

Optimum Moisture: 11 %

Rock Corrected

Maximum Dry Density: n/a pcf

Optimum Moisture: n/a %

Liquid Limit: 19

Plasticity Index: 2

Gravel: 0%

Sand: 35%

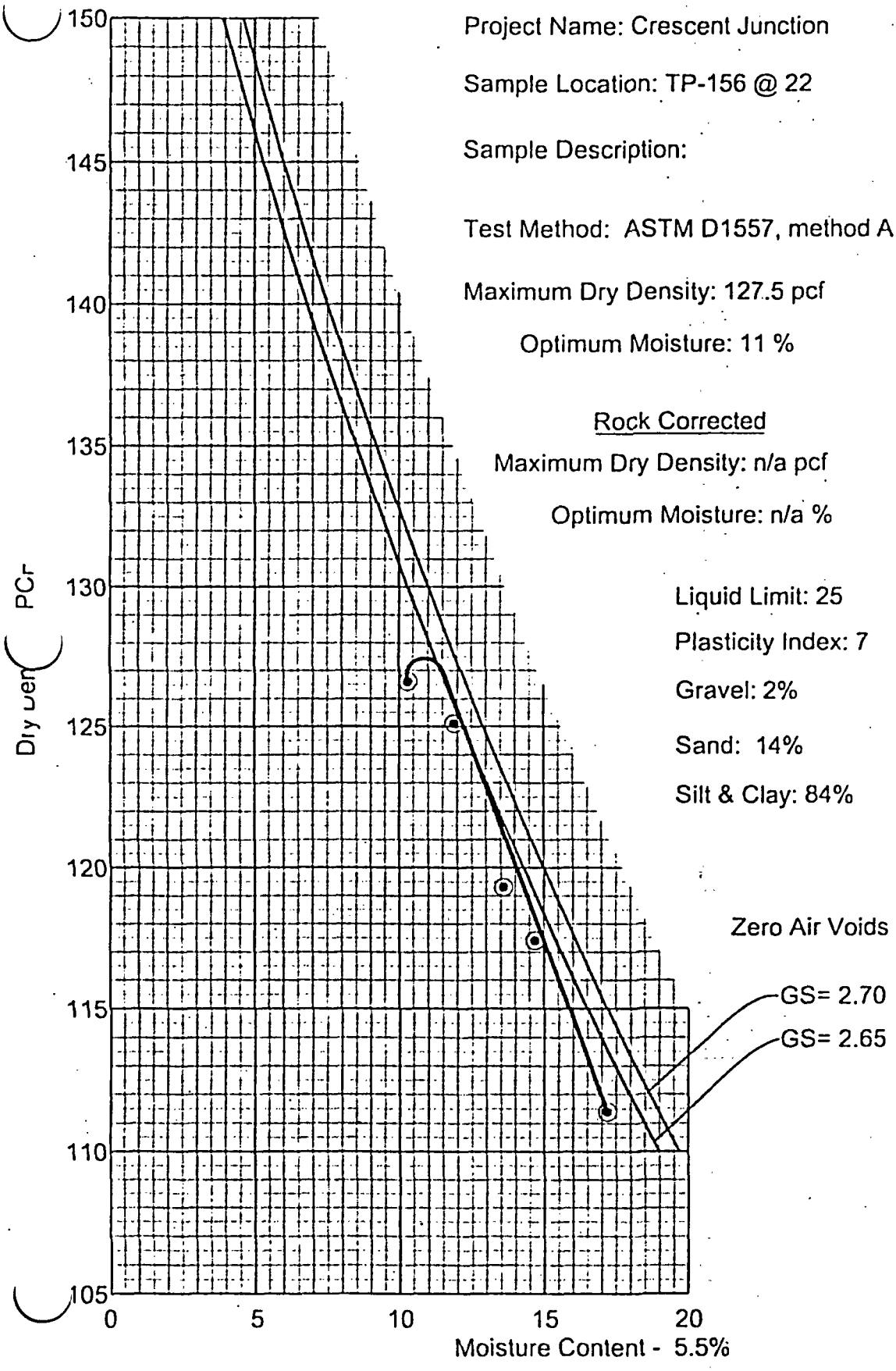
Silt & Clay: 65%

Zero Air Voids

Job No. 2,165

Fig. 11

Geotechnical Engineering Group, Inc.
Moisture- Density Relationship



Project Name: Crescent Junction

Sample Location: TP-156 @ 22

Sample Description:

Test Method: ASTM D1557, method A

Maximum Dry Density: 127.5 pcf

Optimum Moisture: 11 %

Rock Corrected

Maximum Dry Density: n/a pcf

Optimum Moisture: n/a %

Liquid Limit: 25

Plasticity Index: 7

Gravel: 2%

Sand: 14%

Silt & Clay: 84%

Job No. 2,165

Fig. 12

Appendix C

Geotechnical Testing Results

February 23, 2006

Geotechnical
Engineering
Group, Inc.

February 23, 2006

S.M Stoller Corporation
2597 B ¾ Road
Grand Junction, CO 81503

Attention: Mr. Rex Sellers
Senior Contract Adviser

Subject: Geotechnical Testing Services
Cresent Junction
Utah Disposal Site
GEG Job No. 2,165

Dear Mr. Sellers,

As requested, Geotechnical Engineering Group, Inc. (GEG) has performed laboratory testing for the subject project. The laboratory tests were performed on samples obtained by others. Laboratory tests performed include moisture content tests, dry density tests, percent passing No. 200 sieve tests and Atterberg limits tests, presented on Table I. Routine Agronomic Analysis laboratory tests performed were determined by Enviro-Chem, presented on Table II.

Moisture Content and Dry Density

Moisture content and dry density were determined for each sample tested. The moisture content was determined according to ASTM Test Method D2216. The dry density of the sample was determined by using the wet weight of the entire sample tested. The results of the moisture and dry density determinations are presented on Table 1.

Geotechnical, Environmental and Materials Testing Consultants
Grand Junction - Montrose - Moab - Crested Butte
(970) 245-4078 • fax (970) 245-7115 • geotechnicalgroup.com
2308 Interstate Avenue, Grand Junction, Colorado 81505

Percent Passing No. 200 Sieve

Percent passing No. 200 sieve was determined on select samples in general accordance with ASTM Test Method C117. Percent passing No. 200 sieve are presented in Table 1.

Atterberg Limits Tests

Atterberg limits tests were conducted on select samples. Atterberg limits tests were conducted in general accordance with ASTM Test Method D4318. The results of the Atterberg limits tests are presented in Table 1.

We believe the laboratory study was performed and this letter was prepared in a manner consistent with that level of care and skill ordinarily used by geotechnical engineers practicing in this area at this time. No other warranty, either express or implied, is made. When we may be of further service or answer any questions from a geotechnical or construction materials point of view, please call.

Sincerely,
GEOTECHNICAL ENGINEERING GROUP, INC.

Robert W. Anderson
Laboratory Supervisor

RWA:cb
(3 copies sent)

JOB NO. 2,165

Geotechnical Engineering Group, Inc.

TABLE I

SUMMARY OF LABORATORY TEST RESULTS

HOLE	DEPTH (FEET)	NATURAL MOISTURE (%)	DRY DENSITY (PCF)	Atterberg Limits		Swell / Consolidation		PASSING NO. 200 SIEVE (%)	WATER SOLUBLE SULFATES (ppm)	SOIL TYPE
				LIQUID LIMIT (%)	PLASTICITY INDEX (%)	SWELL (%)	CONFINING PRESSURE (PSF)			
TH- 7	6.5	6.5	*	23	5					Clay, silty, sandy (CL)
TH- 7	7	4.9	*	23	8			94		Clay, silty, sandy (CL)
TH- 11	11.5	2.6	*	21	4			19		Sand, clayey, gravely
TH- 13	2.5	5.8	89	24	9			70		Clay, silty, sandy (CL)
TH- 23	3.5	6.0	*	25	8			72		Clay, silty, sandy (CL)
TH- 25	6	4.9	89	24	9			59		Clay, silty, sandy (CL)
TH- 26	15.5	5.7	*	24	10			71		Clay, silty, sandy (CL)
TH- 27	4	5.9	*	24	3			44		Sand, clayey, silty (SC)
TH- 31	5.5	7.0	87	25	9			85		Clay, silty, sandy (CL)
TH- 43	6	5.0	93	24	16			47		Sand, clayey, silty (SC)
TH- 45	6.5	8.6	98	32	9			78		Clay, silty, sandy (CL)
TH- 62	4	7.6	103	29	10			69		Clay, silty, sandy (CL)
TH- 64	3.5	10.0	109	31	19			86		Clay, silty sandy (CL)
TH- 79	10.5	4.4	*	25	10			78		Clay, silty, sandy (CL)
TH- 100	4	8.0	*	25	5			69		Clay, silty, sandy (CL)

*– Indicates sample disturbed.