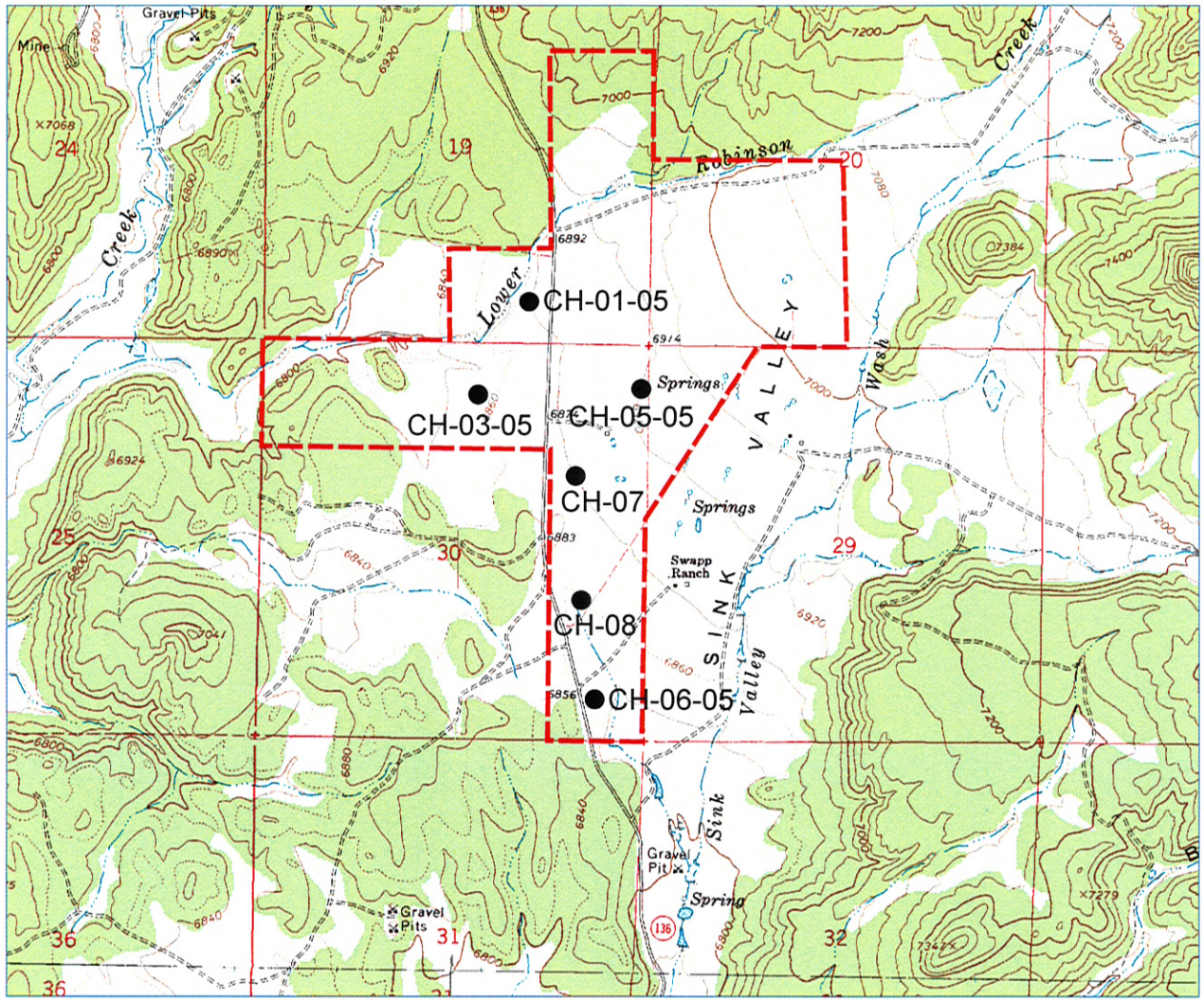
APPENDIX 6-4

Core drilling results and borehole locations

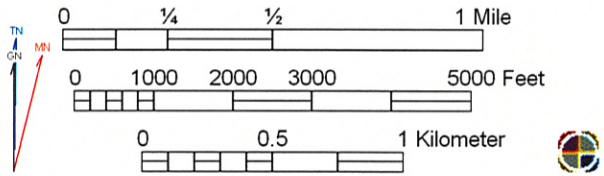
112° 28' 45.517" W
37° 24' 36.220" N

112° 25' 29.180" W
37° 24' 38.632" N



37° 22' 25.703" N
112° 28' 42.952" W

37° 22' 28.112" N
112° 25' 26.710" W



1927 North American Datum; UTM grid zone 12
Generated by BigTopo7 (www.igage.com)
Map compiled from USGS Quads: Alton; UT
Bald Knoll; UT

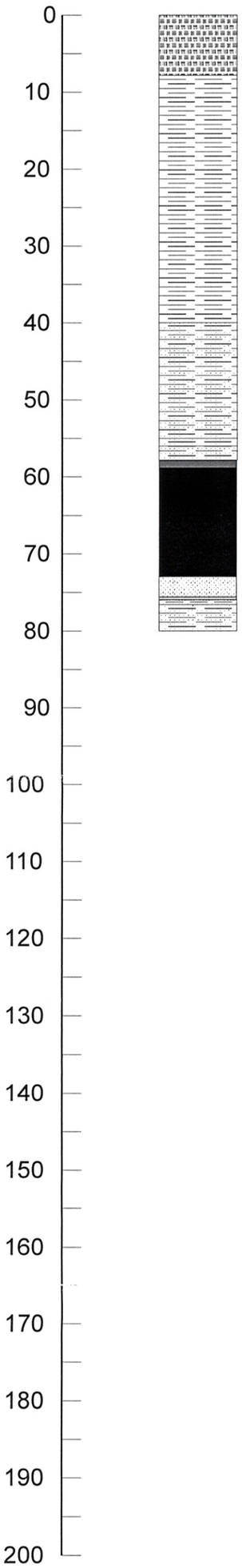
UTM Grid and 2006 Magnetic North
Declination at Center of Sheet
GN to TN 0.882° (16 mills)
TN to MN 12.973° (231 mills)

Locations of boreholes

CH-01-05

Project: Alton Coal Development, LLC
Borehole: CH-01-05
Location (UTM, NAD 27) Northing: 4139959
Easting: 371167
Date Drilled: 9-10 November 2005
Geologist: Erik Petersen, P. G.
Drilling Company: DA Smith Drillers
Grand Junction, CO

Drilling Method: Auger (0-40 feet)
Continuous NQ core (40-180 feet)



0-8 Soil

8-40 Clay, gray (auger drilled)

40-55 Silty clay, gray, dense, and 0.5' bentonite layer, white to orange

55-56 Silty shale, gray
56-58 Carbonaceous shale, dark gray
58-59.2 Low-grade coal and organic shale, dark gray to black, some fossiliferous intervals

59.2-73 Coal, black with some brown mottled zones

73-75.8 Siltstone, gray, clayey
75.8-76.0 Shale, gray; 76.0-76.3 Siltstone, gray, clayey, laminated; 76.3-76.6 Shale, gray
76.6-80 Organic siltstone/shale, highly laminated, dark gray

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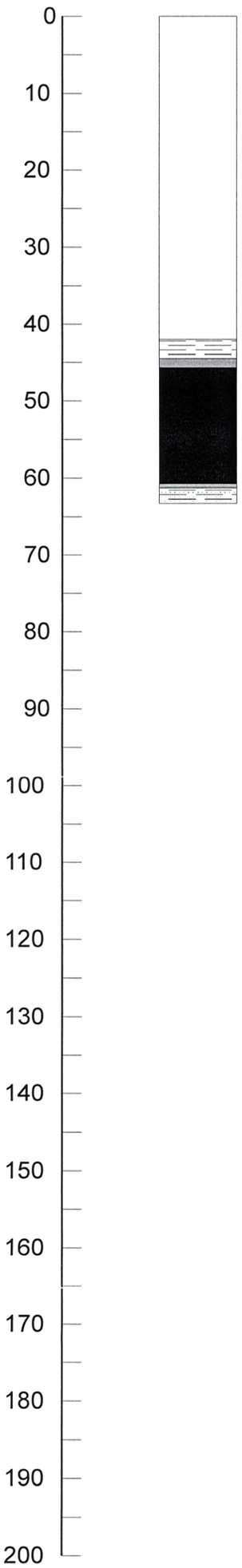
CH-03-05

Project: Alton Coal Development, LLC
Borehole: CH-West-05
Location (UTM, NAD 27) Northing: 4139608
Easting: 370977
Date Drilled: 12 November 2005
Core logged by: Erik Petersen, P. G.
Drilling Company: DA Smith Drillers
Grand Junction, CO

Drilling Method: Auger (0-41 feet)
Continuous HQ core (41-63.5 feet)



No core (auger hole)

41-44.5 Carbonaceous shale, waxy, soft, dark gray to black
44.5-46 Low-grade coal, carbonaceous silty shale

46-61 Coal, black, minor brownish coal, minor pyrite

61-61.5 Low-grade coal, carbonaceous shale, some finely disseminated pyrite
61.5-63.5 Silty shale, waxy, gray

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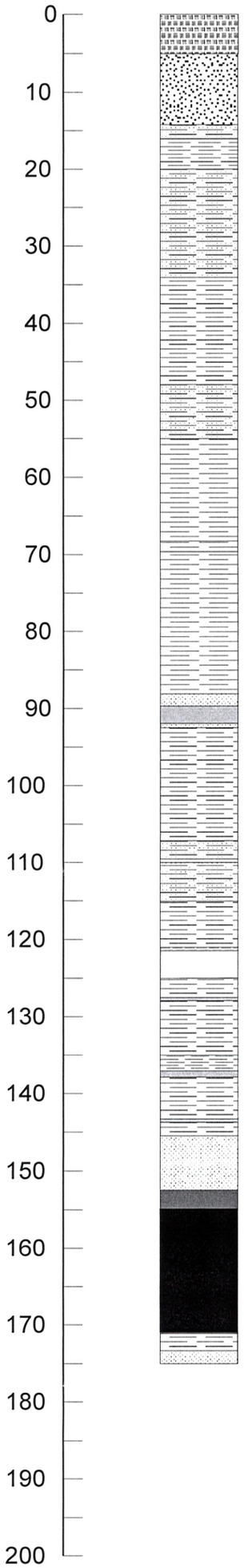
CH-05-05



0-5 Soil, Clayey

5-14 Gravel with sand and silt, reddish

14-16.5 Clayey silt, wet

16.5-20 Clay, moist, tight

20-34 Silty clay, dark gray, less dense than above

34-48 Clay, stiff, medium gray

48-55 Dark gray silty carbonaceous shale, soft waxy texture, some minor interbedded shaley siltstone, iron-stained fracture zone at 50-51 feet

55-68 Carbonaceous shale with minor silt, dark gray to black, more competent that above

68-69.5 Fractured/broken carbonaceous shale, dark gray to black

69.5-88.5 Carbonaceous shale, dark gray to black, soft, waxy texture

88.5-89.5 Medium gray siltstone

89.5-92 Bentonite, medium to dark gray, pure

92-92.5 Siltstone, medium gray

92.5-107 Carbonaceous shale, dark gray to black, soft, waxy texture

107-109.5 Siltstone and carbonaceous shale, interbedded, thinly laminated, dark gray

109.5-110 Carbonaceous shale, dark gray to black, soft, waxy texture

110-115 Siltstone and carbonaceous shale, interbedded, thinly laminated, dark gray

115-121.5 Carbonaceous shale, dark gray to black, soft, waxy texture, (poor core recovery)

121.5-122 Limey claystone, dark gray, fossiliferous, (small, open fracture in this interval)

122-125 Little or no recovery in this zone

125-127.5 Carbonaceous shale, dark gray to black, soft, waxy texture

127.5-128 Bentonite, medium to light gray

128-135 Carbonaceous shale, dark gray to black, soft, waxy texture

135-137 Carbonaceous shale, dark gray to black, harder than above

137-138 Bentonite, medium to light gray

138-143.5 Carbonaceous shale, dark gray to black, soft, waxy texture

143.5-144 Bentonite and interbedded carbonaceous shale, dark and medium gray, thinly laminated

144-146 Carbonaceous shale and thin interbeds of siltstone, dark gray to black

146-152.3 Siltstone with minor thin interbeds of carbonaceous shale, mottled gray to black

152.3-154.7 Coal, low grade or highly carbonaceous shale, black, abundant white fossils/fossil hash

154.7-171.5 Coal, black, some brown mottled zones

171.5-171.7 Coal, low grade, brown and black

171.7-173.5 Carbonaceous shale, dark gray to black

173.5-175 Siltstone, gray, interbedded with minor carbonaceous shale

Project: Alton Coal Development, LLC
Borehole: CH-05-05
Location (UTM, NAD 27) Northing: 4139608
Easting: 371651
Date Drilled: 8 November 2005
Geologist: Erik Petersen, P. G.
Drilling Company: DA Smith Drillers
Grand Junction, CO

Drilling Method: Auger (0-40 feet)
Continuous NQ core (40-175 feet)

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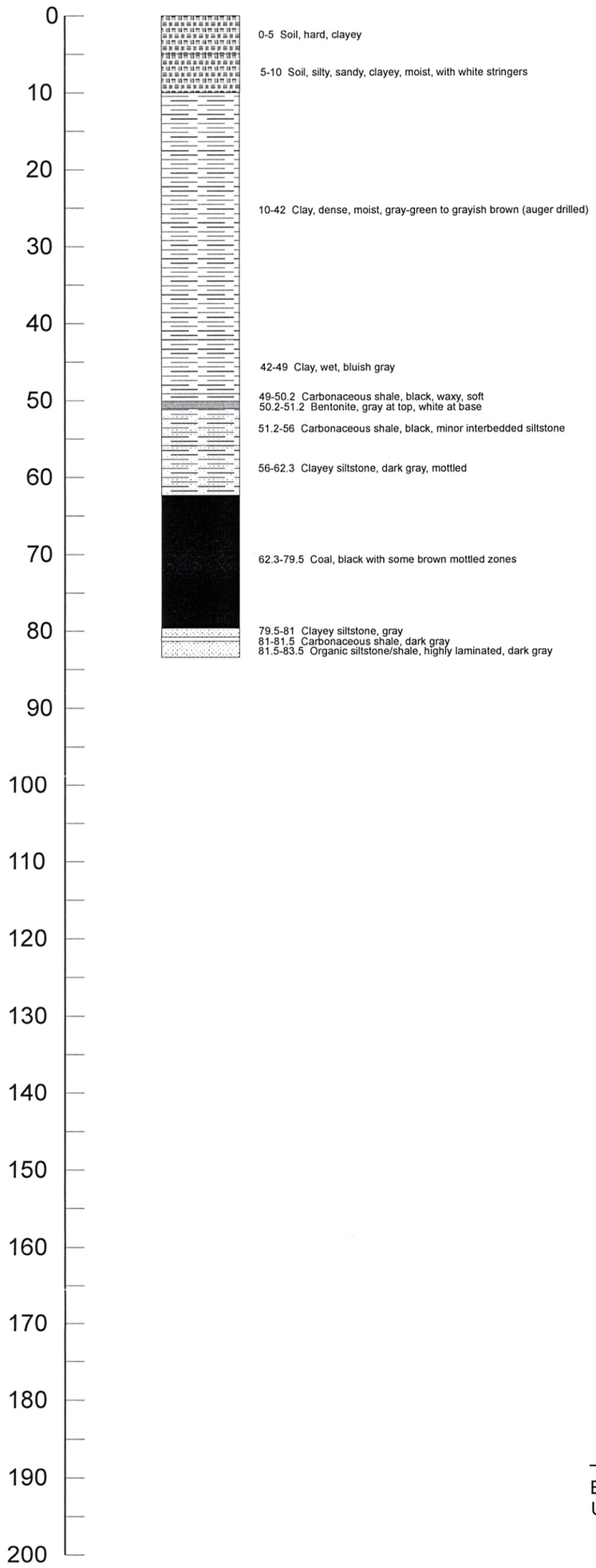
CH-06-05

Project: Alton Coal Development, LLC
Borehole: CH-06-05
Location (UTM, NAD 27) Northing: 4138401
Easting: 371434
Date Drilled: 11 November 2005
Geologist: Erik Petersen, P.G.
Drilling Company: DA Smith Drillers
Grand Junction, CO

Drilling Method: Auger (0-40 feet)
Continuous NQ core (40-83.5 feet)



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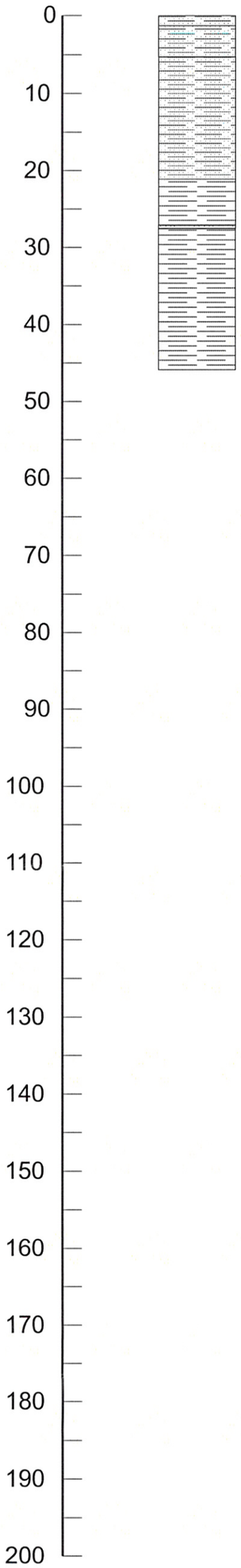
CH-07



0-2 Clayey silty soil, little organic content, brown, dry

2-6 Clayey silt, brown, damp, possibly weathered Tropic Shale

6-21 Clayey silt - weathered Tropic Shale, dark grayish brown, dry

21-27 Silty clay - weathered Tropic Shale, brownish gray, dry

27-27.5 Siltstone, Tropic shale, dark gray, dry

27.5-46 Silty claystone, dark greenish gray, Tropic Shale.

Project: Alton Coal Development, LLC
Borehole: CH-07
Location (UTM, NAD 27) Northing: 4139552
Easting: 371358
Ground elevation: 6881.4
Date Drilled: 30 November 2007
Geologist: Erik Petersen, P. G.
Drilling Company: Geotechnical Drilling Services
St. George, Utah

Drilling Method: Auger (0-33 feet)
Air-rotary (33-46 feet)

1/23/08

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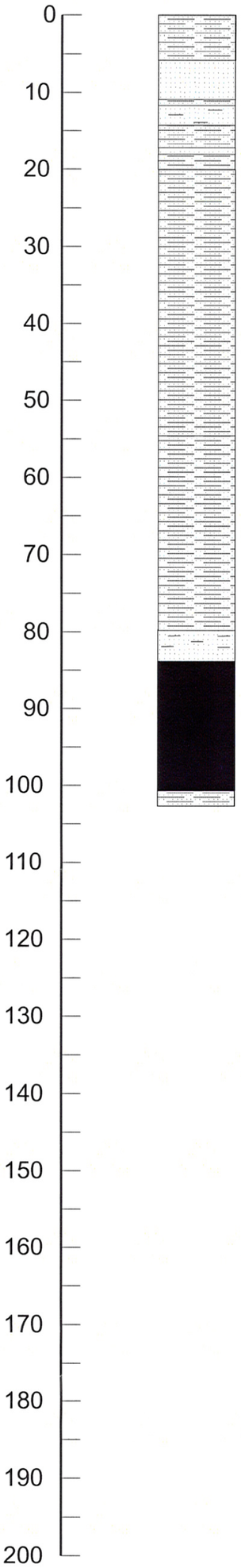
CH-08



0-6 Clayey silt with fine-grained sand, brown, dry

6-11 Silty fine-grained sand, yellowish brown, wet

11-12 Clayey silt, dark grayish brown, wet

12-14 Silty, clayey, very-fine-grained sand, yellowish brown, wet

14-17 Clayey silt, little very-fine-grained sand, grayish brown, wet

17-18 Fine- and medium-grained sand with silt, gray, wet

18-20 Clayey silt, two 3-inch thick sandy zones, gray and brown, wet

20-28 Silty clay, minor fine-grained sand, hard, bluish gray and greenish gray, wet

28-40 Silty clay, minor fine-grained sand, yellowish brown, wet

40-55 Tropic Shale, silty claystone, brownish gray, wet

55-60 Tropic Shale, claystone, gray/greenish gray, wet

60-65 Tropic Shale, silty claystone, gray, wet

65-73 Tropic Shale, claystone, greenish gray, dry

73-79.2 Tropic Shale, silty claystone, dark gray, dry

79.2-82.3 Tropic Shale, clayey siltstone, medium to dark gray, dry

82.3-83.8 Tropic Shale, organic-rich siltstone/very-fine-grained sandstone, gray, dry

83.8-101 Coal, bituminous, black

101-103 Dakota Formation, silty claystone/siltstone, gray

Project: Alton Coal Development, LLC
Borehole: CH-08
Location (UTM, NAD 27) Northing:4139015
Easting: 371348
Ground elevation: 6860.20
Date Drilled: 27-29 November 2007
Geologist: Erik Petersen, P. G.
Drilling Company: Geotechnical Drilling Services
St. George, Utah

Drilling Method: Auger (0-73 feet)
Continuous NQ core (73-84 feet)
Air-rotary (84-103 feet)

1/23/08

Erik C. Petersen, P.G.
Utah PG #5373615-2250

PETERSEN HYDROLOGIC, LLC
CONSULTANTS IN HYDROGEOLOGY

Drilling Log

Drillhole ID: CH-7 Project: Coal Hollow (ACD)

Date drilled: Nov 30, 2007 Drilling method: Auger / Air-rotary

Logged by: Erik Petersen Location: Northing 4139552, Easting 371358, UTM NAD 27
Elevation 6881.4

From	To	Lithologic description	Color	Wetness
0		Auger drilling:		
0	2	clayey silty soil, little organic content	brown + reddish brown	dry
2	6	clayey silt	brown + reddish brown	damp
6	9	clayey silt / weathered Tropic Shale	medium brown	dry
9	15	clayey silt, hard drilling / weathered Tropic shale	brownish gray	dry
15	19	clayey silt / weathered Tropic shale	brownish gray	dry
19	21	clayey silt / silty clay / weathered Tropic shale	dark brownish gray	dry
21	23	silty clay / weathered Tropic Shale	dark gray / greenish gray	dry / moist
23	25	silty clay / weathered Tropic Shale	dark gray / greenish gray	dry
25	27	Silty clay / weathered Tropic Shale	dark gray	dry
27	27.5	Tropic Shale, siltstone	gray, dark	dry
27.5	29	Tropic Shale, silty claystone	dark greenish gray	dry
29	33	Tropic Shale, silty claystone	dark greenish gray	moist
		Auger binding up in the hole, switched to air-rotary		

Drilling Log

Drillhole ID: CH-7 Project: Coal Hollow (ACD)

Date drilled: Nov 30, 2007 Drilling method: Auger / Air-rotary

Logged by: Erik Petersen Location:

From	To	Lithologic description	Color	Wetness
33	36	Tropic Shale, silty claystone	dark greenish gray	dry
36	46	Tropic Shale, silty claystone, increased silt content	dark greenish gray	dry

Drilling Log

Drillhole ID: CH-8 Project: Coal Hollow (ACD) Page 1 of 3

Date drilled: Nov 27-29, 2007 Drilling method: Auger / Air-rotary / Core

Logged by: Erik Petersen Location: Northing 4139015, Easting 371348, UTM NAD 27
Elevation 6860.20

From	To	Lithologic description	Color	Wetness
		Auger drilling, split spoon sampling		
0	2	Clayey silt with very-fine-grained sand	medium-brown	dry
2	4	Clayey silt, minor fine-grained sand	medium reddish brown	dry
4	6	Clayey silt, minor fine-grained sand	medium reddish brown	slightly moist
6	8	silty very-fine-grained sand, soft	yellowish and reddish brown	wet
		saturated at about 5 feet		
8	10	Silty fine-grained sand – Encountered a rock/boulder at appx 9 feet.	brownish, yellowish gray	wet
10	11	Silty fine-grained sand	medium yellowish brown	wet
11	12	Clayey silt, plastic	dark grayish brown	wet
12	14	Silty clayey v.fine-grained sand	medium yellowish grayish brown	wet
14	16	clayey silt, little very-fine-grained sand	medium grayish brown	drier than above
16	17	clayey silt, little very-fine-grained sand	medium grayish brown	wet
17	18	fine- and medium-grained sand with silt	gray	wet

Drilling Log

Drillhole ID: CH-8 Project: Coal Hollow

Date drilled: Nov 27-29, 2007 Drilling method: Auger/Air-rotary/Core

Logged by: Erik Petersen Location:

From	To	Lithologic description	Color	Wetness
18	20	clayey silt, two 3-inch sandy zones	gray + brown	wet
20	22	silty clay, minor fine-grained sand	bluish gray and greenish gray	moist
22	24	silty clay, hard and dense	bluish gray and greenish gray	moist
24	26	silty clay, hard and dense	bluish gray and greenish gray	moist
26	28	silty clay, very hard and dense.	bluish gray and greenish gray	moist
		Switched to air-rotary drilling, couldn't establish cutting circulation with the moist clay		
		Resumed auger drilling, logged and sampled from auger cutting returns		
28	30	silty clay, minor fine-grained sand	yellowish brown	wet
30	40	silty clay, minor fine-grained sand	yellowish brown	drier than above
40	55	Tropic Shale, silty claystone	brownish gray	wet
55	60	Tropic Shale, claystone	gray, greenish gray	

Drilling Log

Drillhole ID: CH-8 Project: Coal Hollow

Date drilled: Nov 27-29, 2007 Drilling method: Auger / Air-rotary / Core

Logged by: Erik Petersen Location:

From	To	Lithologic description	Color	Wetness
60	65	Tropic Shale, silty claystone	gray	wet
65	67	Tropic Shale, claystone	gray	wet
67	73	Tropic Shale, claystone	greenish gray	wet
		Started core drilling - poor recovery 18" of 5 feet core barrel.		
73	79.2	Tropic Shale, silty claystone / shale	dark gray	dry
79.2	81.6	Tropic shale, clayey siltstone, harder than below	medium gray	dry
81.6	82.3	Tropic Shale, hard, clayey siltstone	dark gray to black	dry
82.3	83.8	Tropic Shale, organic-rich siltstone / very-fine-grained Sandstone	medium to dark gray	dry
83.8	101	Coal, Smirl coal zone (increased water)	black	dry
101	103	Dakota Formation, silty claystone / siltstone	gray	
		Note: Switched from core drilling to air-rotary within the coal seam because the cored coal would not stay in the core barrel. Samples in this interval were collected from air-rotary cutting returns.		