BC Geological Survey
Coal Assessment Report
1030

COAL ASSESSMENT REPORT TITLE PAGE AND SUMMARY

TITLE OF REPORT: Panorama North 2016 Assessment Report

TOTAL COST: $1,259,368.17

AUTHOR(S): Daniel Campbell
SIGNATURE(S):

NOTICE OF WORK PERMIT NUMBER(S)/DATE(S): CX-1-005

YEAR OF WORK: 2016

PROPERTY NAME: Panorama North

COAL LICENSE(S) AND/OR LEASES ON WHICH PHYSICAL WORK WAS DONE:
417084, 417086

MINERAL INVENTORY MINFILE NUMBER(S), IF KNOWN:

MINING DIVISION: Omineca
NTS / BCGS: 104A15
LATITUDE: 47 ° 51 ' 16 "
LONGITUDE: 128 ° 38 ' 51 " (at centre of work)
UTM Zone: 9 EASTING: 526360 NORTHING: 6300179

OWNER(S): Atrum Coal Panorama Inc.

MAILING ADDRESS: 780 - 580 Hornby St.
Vancouver, BC
V6C 3B6

OPERATOR(S) [who paid for the work]: Atrum Coal Panorama Inc.

MAILING ADDRESS: 780 - 580 Hornby St., Vancouver BC, V6C 3B6

REPORT KEYWORDS (lithology, age, stratigraphy, structure, alteration, mineralization, size and attitude. **Do not use abbreviations or codes**)
coal, anthracite

REFERENCES TO PREVIOUS ASSESSMENT WORK AND ASSESSMENT REPORT NUMBERS:

SUMMARY OF TYPES OF WORK IN THIS REPORT		EXTENT OF WORK (in metric units)	ON WHICH TENURES
GEOLOGICAL (scale, area)			
	Ground, mapping		
	Photo interpretation		
GEOPHYSICAL (line-kilometres)			
	Ground		
	(Specify types)		
	Airborne		
	(Specify types)		
	Borehole		
	Gamma, Resistivity,	919.96 m	417084, 417086
	Resistivity		
	Caliper	919.96 m	417084, 417086
	Deviation		
	Dip	333.28 m	417086
	Others (specify) Density	919.96 m	417084, 417086
DRILLING			
	Core	1234.90 m	417084, 417086
	Non-Core		
SAMPLING AND ANALYSES			
	Proximate		417084, 417086
	Ultimate		417084, 417086
	Petrographic		
	Vitrinite reflectance		
	Coking		
	Wash tests		417084, 417086
PROSPECTING (scale/area)			
PREPARATORY/PHYSICAL			
Line/grid (km)			
Trench (number, metres)			
Bulk sample(s)			

Part of Section 6.3.2 and Parts of Appendix 4 remain confidential under the terms of the Coal Act Regulation, and have been removed from the public version.

http://www.bclaws.ca/civix/document/id/complete/statreg/251_2004

2016

Panorama North Project

2016 ASSESSMENT REPORT

ATRUM COAL PANORAMA INC.

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4 Introduction

4.1 Location and Physiographic Setting

The Panorama North project (Panorama North) is positioned on the southern extent of the historic Groundhog Coalfield, within the Bowser Basin in northwestern British Columbia (Figure 4.1). Located within the Cassiar Land District, the property is situated approximately 130 km northeast of Stewart, 500 km north-west of Prince George, and 900 km north-west of Vancouver. Panorama is located east of the Nass River, at the north end of the Groundhog Range in the Skeena Mountains.

The exploration field staging area lays at 526360 E and 6300179 N UTM Zone 9N.

FIGURE 4.1 LOCATION MAP OF THE PANORAMA NORTH PROJECT IN BRITISH COLUMBIA, CANADA

4.2 Access

Primary access to Panorama North for the 2016 exploration program was by helicopter from the Meziadin Junction Camp (Meziadin). Panorama is located 100 km northeast of Meziadin which is approximately a 30-minute one-way helicopter flight depending on the weather. Meziadin is accessed by driving 270 km north-west from Smithers, BC. An alternate route to the site is via a 235 km flight north-west of Smithers to the Kluatantan airstrip, followed by a 26 km helicopter ride to the west.

4.3 History

The initial description of the Groundhog Coalfield was conducted by V.H. DuPont in 1900. In 1903, James McEvoy and W. W. Leach staked the first claims in the Groundhog Coalfield and continued to conduct geological reconnaissance from 1910 to 1912. G. S. Malloch, reporting for the Geological Survey of Canada in 1912, described coal occurrences and introduced a stratigraphy for the coalfield, including the Panorama area. Further work was conducted by J. M. Black in 1968 and W. D. Tompson, D. M. Jenkins, and M. W. Roper in 1970 and presented in industry reports.

In 1979, Gulf acquired tenures for the Panorama Coal Project. The company held 37 tenures, totalling an area of 10,357 ha. Gulf conducted its first exploration program in 1980, consisting of helicopter-supported geological mapping, hand trenching, and coal analyses. Gulf's 1981 exploration program was similar to

the previous year, with an additional 6 licences obtained, and formed an inferred resource estimate, following National Research Council 1979 criteria.

Panorama Coal Corp., a subsidiary of Anglo-Pacific Corp., acquired coal titles for the Panorama Coal Project in 2004. No field exploration programs were carried out by Anglo-Pacific during their holding of the tenures. In 2010, Anglo-Pacific hired Moose Mountain Technical Services to produce a technical, geological review of the Panorama area. At this time, Anglo-Pacific owned 12 licences and 5,172 ha that made up the Panorama Coal Project, and one licence application of 1,136 ha. Moose Mountain's technical report states:

> "… The Panorama property has potential to host significant coal resources and is also a property of merit, worthy of further exploration." (2010)

In 2012, Atrum Coal Groundhog Inc., a wholly owned subsidiary of Atrum Coal Ltd. (Atrum), acquired its first two tenures of 850 ha for its Panorama Project. In 2014, Anglo-Pacific transferred ownership of its Panorama Property to Atrum Coal. In the same year, Atrum Coal acquired 10 coal licence applications, consisting of 13,875 ha.

Panstone Mines and Minerals Inc. (Panstone) obtained 10 coal licence applications, totalling 6,937 ha, in the Panorama area in 2012. Panstone sold the tenures to Atrum Coal Groundhog Inc. in 2014, which were then transferred to Atrum Coal Panorama Inc. (Atrum), which currently holds 100% interest of the Panorama North tenures.

4.4 New Work Performed

The 2017 Panorama North exploration program consisted of 1234.90 m of drilling in five fully-cored drillholes, with geophysical testing performed on three of the drillholes.

4.5 Acknowledgements

The work undertaken at Panorama North for the 2016 field season was conducted by various contractors, consultants and staff under the management and supervision of Atrum staff. This report was prepared by Mr. Daniel Campbell and Ms. Holly Hetherington of Atrum Coal with the input from other Atrum geological staff and the following groups:

- Local First Nation's for their support and involvement in the project
- GEEL Enterprises for pad building and first aid services
- JOGMEC for their continued support of the exploration program
- Birtley Coal & Mineral Testing
- Silverking Helicopters for helicopter field support
- Century Wireline for downhole geophysical logging
- Tsayta Aviation for fixed wing air support
- Tower Communications for radio and satellite communications
- Driftwood Diamond Drilling for core drilling services
- Ecofor for archaeological investigations
- Holly Hetherington and Allison Scow for geological interpretation
- A& B Mylec for coal quality interpretation and advice
- Meziadin Junction camp for accommodation

Mr. Campbell holds a B.Sc. in Geology from the University of Manitoba and has extensive exploration experience in the Groundhog Coalfield. He has been developing and advancing Anthracite projects with Atrum Coal for 4 years at the time of writing this report. Mr. Campbell was at the Panorama North project for the entirety of the 2016 data collection and supervised exploration methods and data interpretation.

4.6 Tenure

Panorama North presently consists of 12 contiguous wholly owned coal licences covering an area of 7,359 ha. The Panorama North coal licences are 100% owned by Atrum Coal Panorama Inc., a wholly owned subsidiary of Atrum Coal Ltd. Coal licences 417084 and 417086 are included in the Mineral and Coal Exploration Activities Permit. The coal licences are summarised in Table 4.1 and Figure 4.2.

TABLE 4.1 PANORAMA NORTH COAL TITLES

Tenure Number	Owner	Business Unit	Tenure Type	Area (ha)	Good to Date
418961	Atrum Coal Panorama Inc. (100%)	Panorama North	Coal Licence	71.00	08/09/2017
418958	Atrum Coal Panorama Inc. (100%)	Panorama North	Coal Licence	1345.00	08/09/2017
418957	Atrum Coal Panorama Inc. (100%)	Panorama North	Coal Licence	1415.00	08/09/2017
418953	Atrum Coal Panorama Inc. (100%)	Panorama North	Coal Licence	1346.00	08/09/2017
417084	Atrum Coal Panorama Inc. (100%)	Panorama North	Coal Licence	708.00	31/05/2017
417086	Atrum Coal Panorama Inc. (100%)	Panorama North	Coal Licence	142.00	31/05/2017
417292	Atrum Coal Panorama Inc. (100%)	Panorama North	Coal Licence	279.00	31/05/2017
417296	Atrum Coal Panorama Inc. (100%)	Panorama North	Coal Licence	71.00	31/05/2017
417299	Atrum Coal Panorama Inc. (100%)	Panorama North	Coal Licence	779.00	31/05/2017
417525	Atrum Coal Panorama Inc. (100%)	Panorama North	Coal Licence	425.00	31/05/2017
417526	Atrum Coal Panorama Inc. (100%)	Panorama North	Coal Licence	707.00	31/05/2017
417527	Atrum Coal Panorama Inc. (100%)	Panorama North	Coal Licence	71.00	31/05/2017

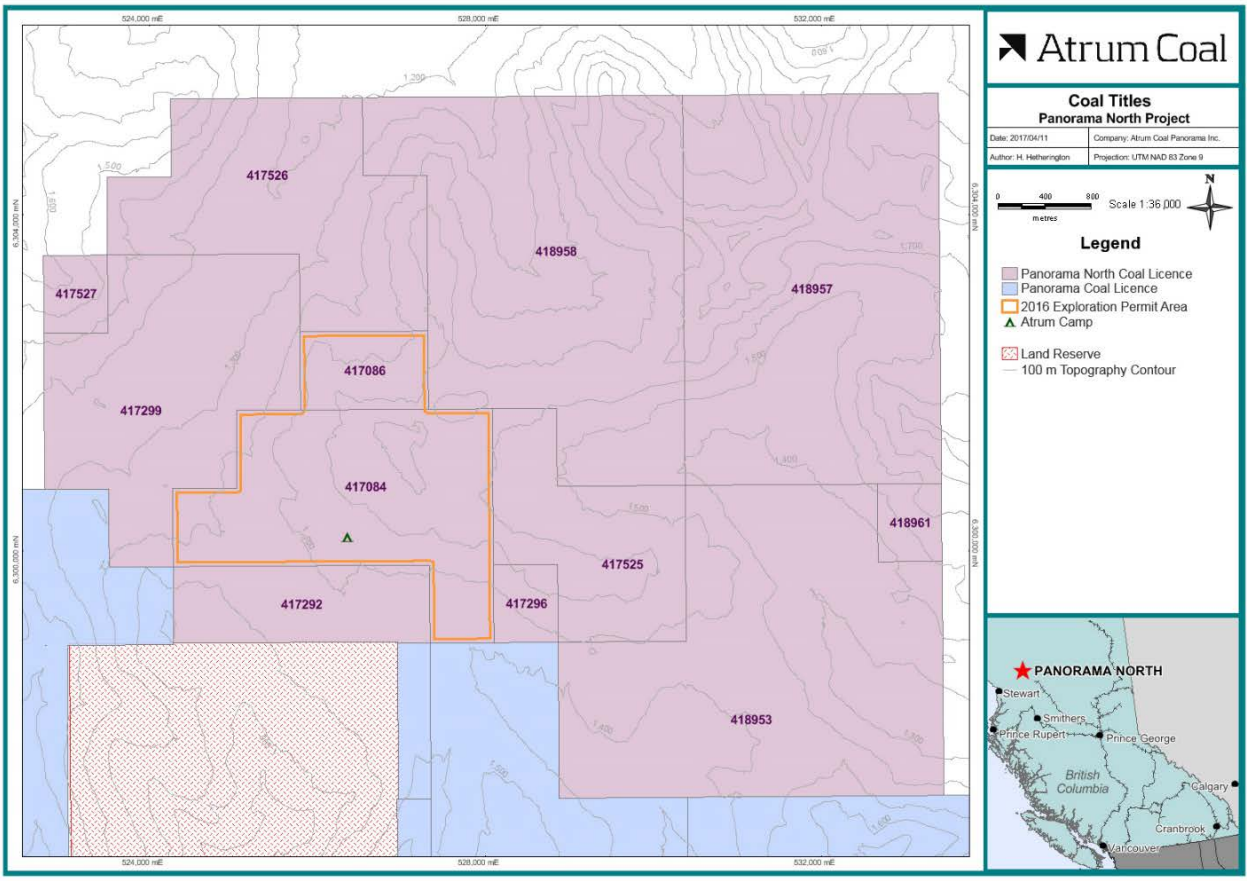

FIGURE 4.2 PANORAMA NORTH COAL TITLES AND EXPLORATION PERMIT AREA

5 Geology

5.1 Regional Geology

The Panorama North property is situated on the historic Groundhog Coalfield, in the northern portion of the Bowser Basin (Figure 5.1). The Bowser Basin, situated within the Intermontane Belt, is bounded to the north by the Stikine Arch and to the south by the Skeena Arch. The basin is situated in the Cordilleran Eugeosyncline and characterised by a regressive coarsening upwards sequence of clastic sediments deposited during the formation of the Coastal Mountains.

Panorama is comprised of sedimentary rocks of the Bowser Lake Group. The Bowser Lake Group is a 3,500 m thick, regressive sedimentary sequence dating from Late Jurassic to Early Cretaceous. Using the nomenclature from Cookanoo and Bustin (1989) the strata are comprised of four formations, from oldest to youngest: the Ashman Formation, the Currier Formation, the McEvoy Formation, and the Devil's Claw Formation (Figure 5.2). Below, the Bowser Lake Group unconformably overlies the Triassic to Jurassic Takla-Hazelton assemblage. Above, rocks of the Late Cretaceous Sustut Group unconformably overlay the Bowser Lake Group.

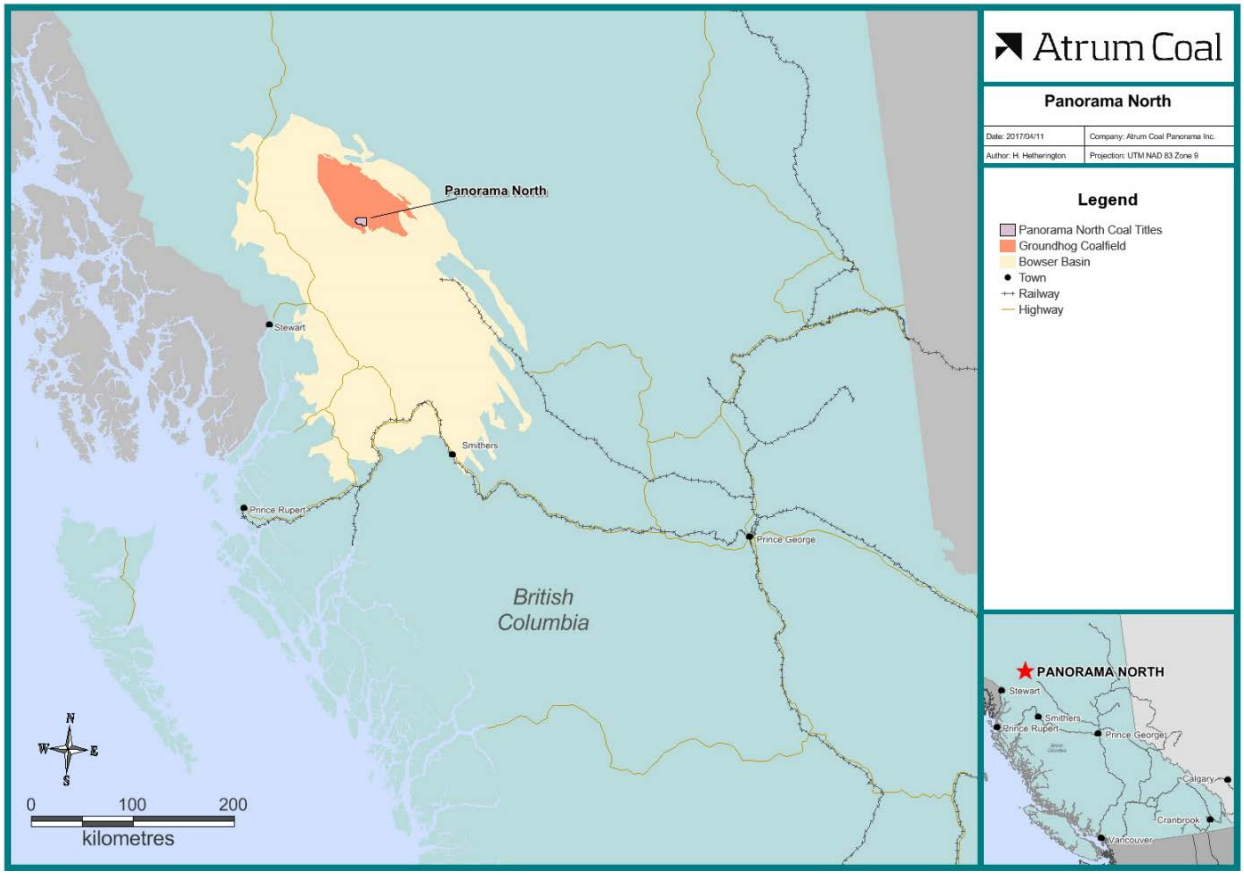

FIGURE 5.1 LOCATION OF PANORAMA NORTH WITHIN THE GROUNDHOG COALFIELD AND SUBSEQUENT BOWSER BASIN

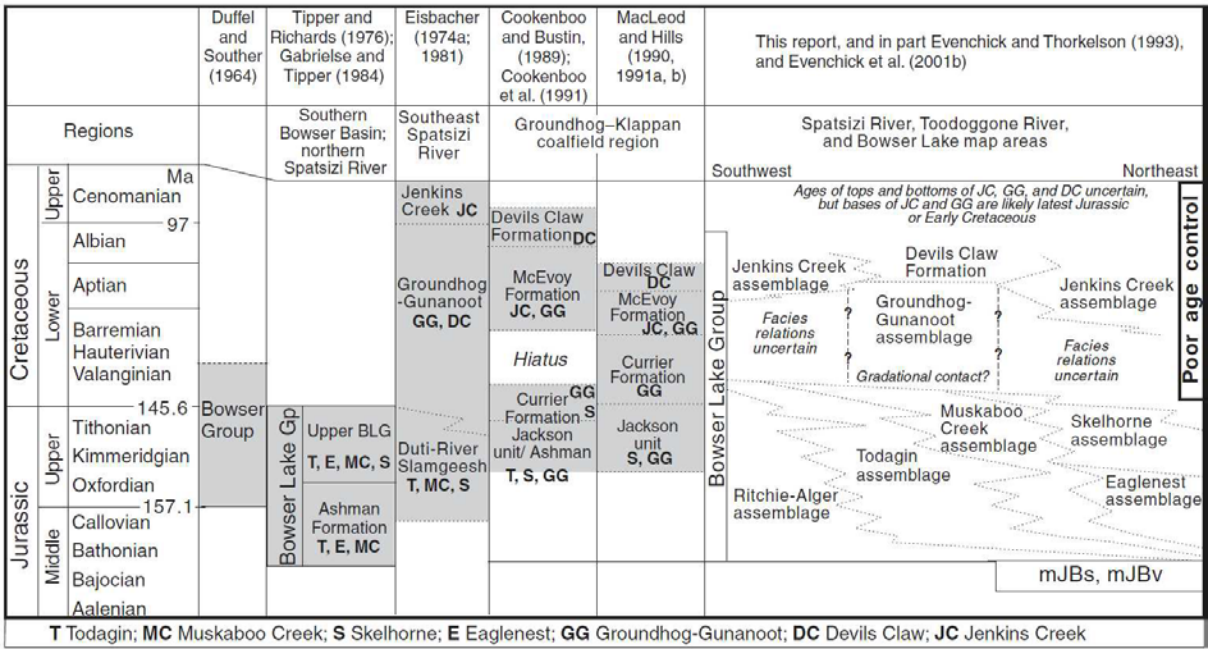

FIGURE 5.2 STRATIGRAPHIC COLUMN OF THE BOWSER LAKE GROUP AND GROUNDHOG-KLAPPAN COALFIELDS

5.1.1 Devil's Claw Formation

The Devil's Claw Formation overlies the McEvoy Formation and consists primarily of thick successions of conglomerates with minor interbeds of sandstone, siltstone and shale. This 300 to 500 m thick formation is interpreted as being deposited in a high-energy environment such as an alluvial fan. Both large-scale cross-bedding of pebble to cobble-conglomerates and homogenous conglomerates can be seen in the Devil's Claw Formation. The conglomerates are clast-supported and composed of well-sorted and well-rounded chert, volcanic quartz, and occasional granodiorite clasts.

5.1.2 McEvoy Formation

The McEvoy Formation overlies the Currier Formation. Strata from the 600 to 1,000 m thick McEvoy Formation are interpreted as being deposited in paralic and brackish waters from a fluvially dominated delta system. Coarsening-upward, silt mudstones are the dominant facies, yet sandstones and conglomerates are present, as well as thin sub-anthracite seams.

5.1.3 Currier Formation

The approximately 1,000 m thick Currier Formation overlies the Ashman Formation and is the primary coal-bearing formation of the Groundhog Coalfield. It is deltaic in origin and records a change from the underlying Ashman Formation to alternating marine and non-marine deposition. The formation consists of alternating beds of shale and sandstone with lesser amounts of siltstone, conglomerate and coal.

Prior to 1991, the Currier Formation was referred to either as the Groundhog Sequence or Groundhog Unit. See Figure 5.3 for the various naming schemes used for the Bowser Lake Group.

5.1.4 Ashman Formation

The approximately 1,800 m thick, fully marine Ashman Formation is the oldest formation in the Bowser Lake Group. The Jurassic age formation is composed of mostly dark bluish grey to black shale that coarsens upwards repetitively to shallow-marine sandy mudstone and sandstone.

		Discovery Property, Gulf Canada Resources, 1988	Panorama Property Gulf Cananda Resources, 1981	Bowser Basin Cookenboo & Bustin, 1991
CRETACEOUS	BOWSER LAKE GROUP	Devils Claw Unit	Rhonnda Sequence	Devil's Claw Formation
		Malloch Unit	Malloch Sequence	McEvoy Formation
		Groundhog Unit	Groundhog Sequence	Currier Formation
JURASSIC		Panorama Unit	Panorama Sequence	Ashman Formation

FIGURE 5.3 COMPARISON OF NOMENCLATURE OF THE BOWSER LAKE GROUP (MOOSE MOUNTAIN TECHNICAL SERVICES, 2010)

5.2 Structural Geology

The Bowser Basin sedimentary sequence experienced two major deformational events. The former (F1), being of higher intensity, resulted from northeast-southwest compression during the uplift of the Coast Crystalline Belt. The northwest-southeast trending Beirnes Synclinorium is the regional dominant structure that was a result of this compression, with associated thrust-faulting. The latter, less intense phase of northwest-southeast, compressional deformation (F2), resulted in broad, open folds and flat-lying thrusts. Gulf (1981) notes that later normal faulting is also evident in the area.

Northwest-southeast compressional F2 deformation is coaxial to that of F1, forming shallow, open northeast-southwest trending folds that affect the plunge of F1 folds by approximately 5o. F2 folds vary in wavelength from 100 m to 700 m and vary in amplitude from 100 m to 200 m. Flat laying thrust faults

resulting from the F2 deformation event are thought to be related to the hanging walls of drag folds and have displacement visible along bedding surfaces.

5.3 Local Geology

The coal-bearing Currier formation is currently interpreted to make up the entirety of Panorama North (Figure 5.4), consisting of alternating beds of shale and siltstone, with lesser amounts of sandstone and coal. Strata are generally arranged in coarsening-upward units. A generalised stratigraphy was identified on a more detailed level following the 2016 drilling program. An overview of the strata is presented in Figure 5.5. At least 450 m of Currier Formation has been intersected to date in at the Panorama North Project.

Panorama is characterised by broad, open synclines spanning distances up to 4 km with steeply, southwest dipping limbs and tighter anticlines. Tight isoclinal folding, occurring over distances of 500 to 700 m, and minor associated faulting can be imprinted on these larger structures (Figure 5.6). Bustin and Moffatt (1983), suggest that the style of deformation in the Bowser Basin is related to lithology in which, as supported by data from Groundhog, more competent, massive beds of sandstone are characterised by broad, open, low-amplitude folds while relatively thinly bedded, fine-grain units are characterised by high amplitude, shorter wavelength folds that tend to be disharmonic with the other adjacent units. Panorama's predominate structures are characteristic of a collisional tectonic regime.

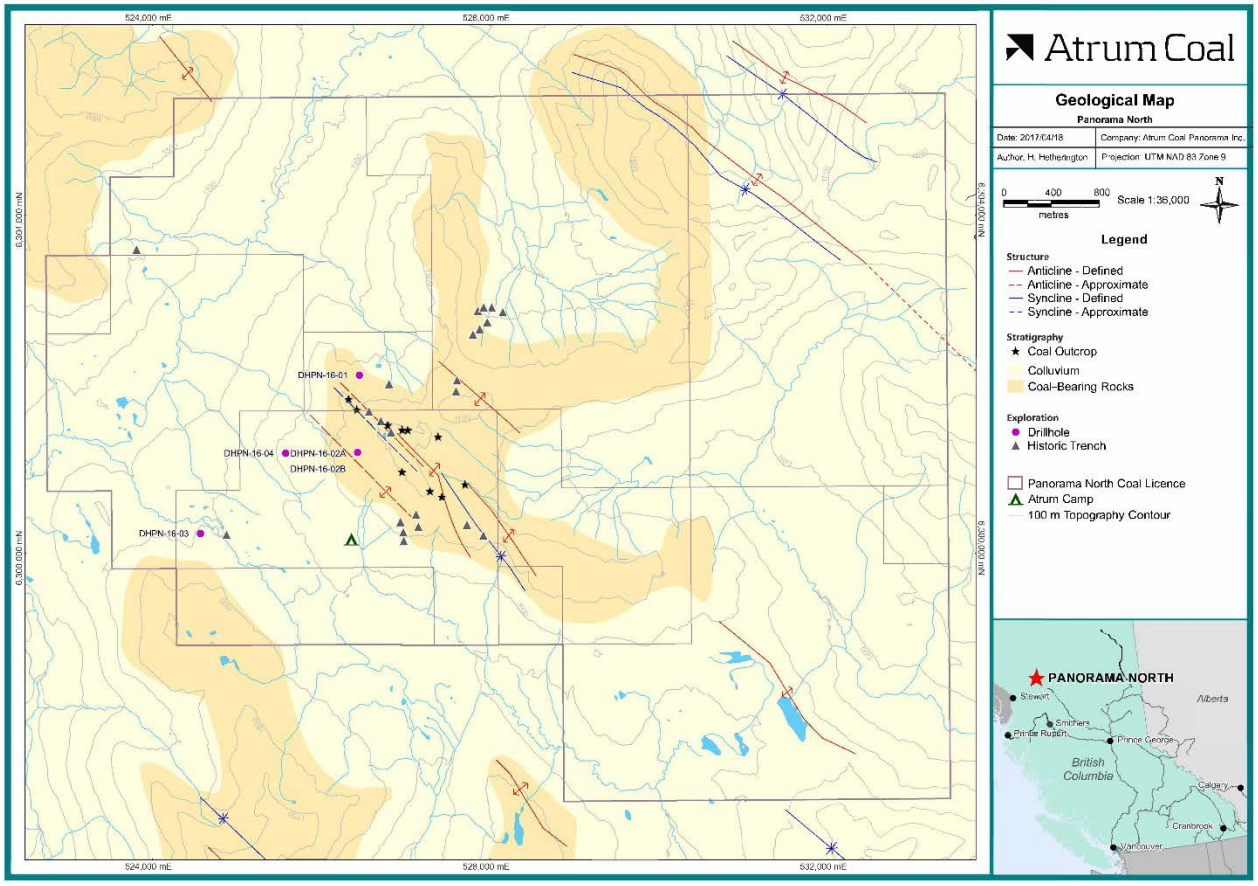

FIGURE 5.4 GEOLOGY OF PANORAMA NORTH AFTER EVENCHICK ET AL. (2008)

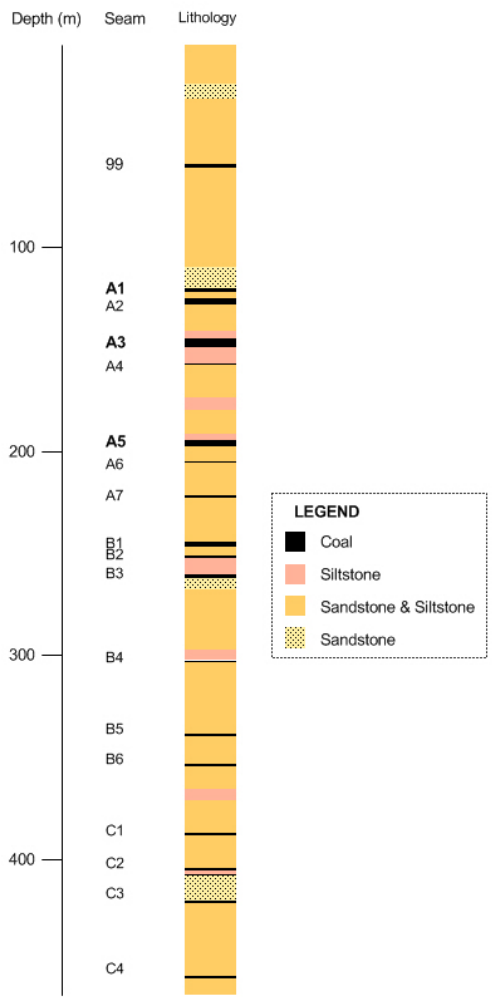

FIGURE 5.5 GENERALISED STRATIGRAPHIC LOG OF PANORAMA NORTH

FIGURE 5.6 REGIONAL STRUCTURES OF THE GROUNDHOG COALFIELD AS SEEN JUST EAST OF THE PANORAMA NORTH PROPERTY. THE OPEN FOLD IS APPROXIMATELY 2 TO 3 KM ACROSS. THE RED LINE SHOWS RELATIVE BEDDING DIP.

6 Exploration

The objective of the 2016 exploration program was to characterise the stratigraphy and classify the depositional environment relationship to that of the Groundhog property, while identifying coal seams of economic significance and determining the rank of coal. The exploration program took place between September 27th and October 22nd, 2017. The program included the completion of four fully cored drillholes. A re-drill of one drillhole was conducted from the same pad and collar location, hence the re-drilled hole is labelled DHPN-16-02B.

6.1 Drilling

Drillhole collar summary information is provided in Table 6.1. All drillholes, the locations of which are conveyed in Figure 6.1, were fully-cored using HQ3.

The drillcore was lithologically logged, sampled, and photographed by geologist on-site at the Panorama North field camp. In addition, the drillcore was logged to a level of detail to be able to calculate Rock Mass Rating (RMR) for use in mine designs and hydrogeological modelling.

Appendix 1 contains descriptive logs and a collar summary spreadsheet. The individual strip logs for each drillhole are in Appendix 2.

All drillcore is stored on-site at Atrum's Panorama North field camp with coal samples stored at Birtley Coal & Mineral Testing in Calgary, Alberta.

TABLE 6.1 2016 DRILLING SUMMARY

Hole	Easting	Northing	Elevation	Dip	Azimuth	Start Date	End Date	Total Depth	Core Size
DHPN-16-01	526453.42	6302111.73	1523.32	-90	0	03/10/2016	06/10/2016	335.4	HQ3
DHPN-16-02A	525577.73	6301193.54	263.5	-90	0	03/10/2016	06/10/2016	41	HQ3
DHPN-16-02B	525577.73	6301193.54	263.5	-80	225	07/10/2016	14/10/2016	263.5	HQ3
DHPN-16-03	524569.69	6300240.65	1411.28	-90	0	07/10/2016	11/10/2016	326	HQ3
DHPN-16-04	526431.15	6301202.19	1636.5	-90	0	12/10/2016	17/10/2016	269	HQ3

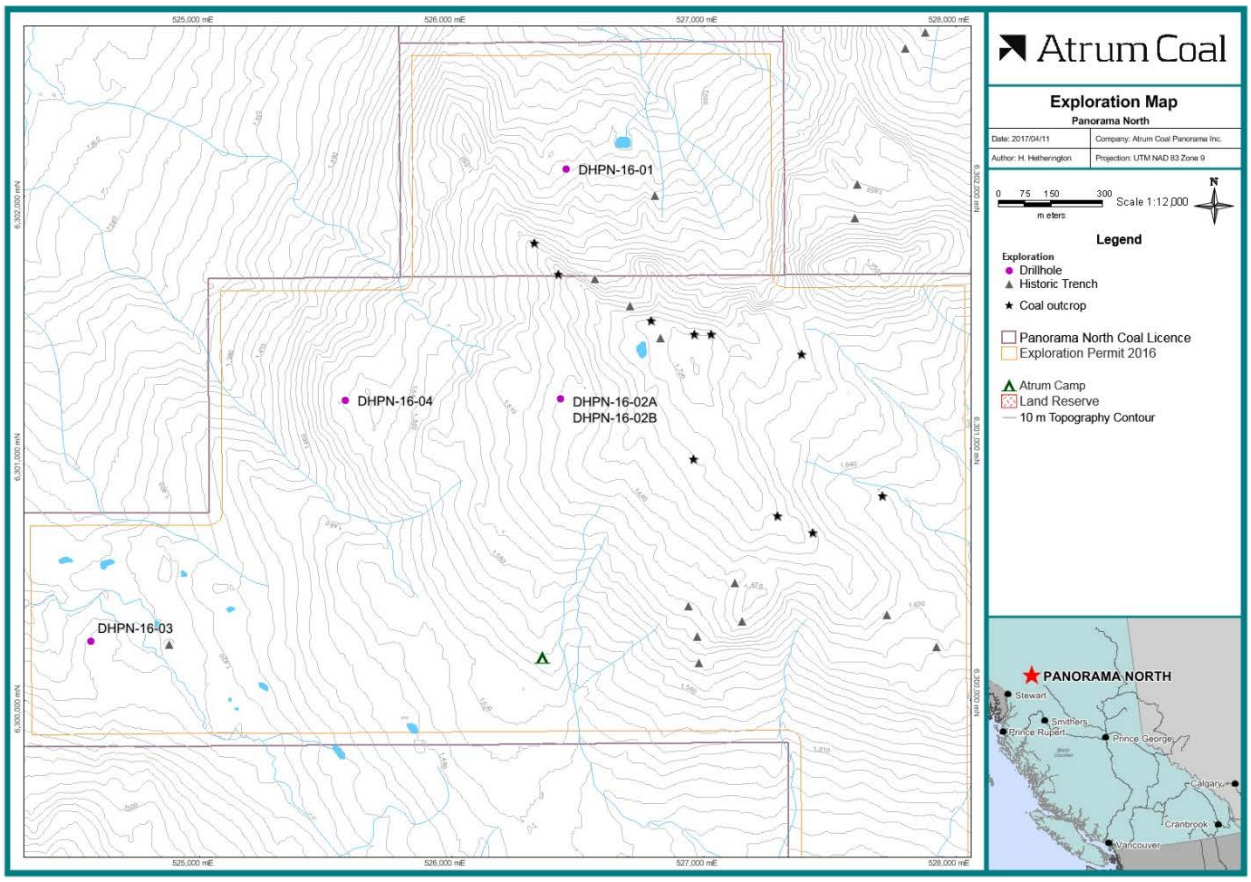

FIGURE 6.1 2016 DRILLING EXPLORATION PROGRAM

6.2 Downhole Geophysics

Downhole geophysical data was captured by Century Wireline Services using geophyisical tools for drillholes DHPN-16-01, DHPN-16-03, and DHPN-16-04. Geophysical tools were not run on DHPN-16-02A or DHPN-16-02B. The tools used for each drillhole are summarised in Table 4.1.

Geophysical logs are located in Appendix 3.

TABLE 6.2 SUMMARY OF DOWNHOLE GEOPHYSICAL LOGS

Hole	Caliper	Density	Dipmeter	Gamma	Neutron	Resistivity
DHPN-16-01	✓	✓	✓	✓	✓	✓
DHPN-16-02A	✗	✗	✗	✗	✗	✗
DHPN-16-02B	✗	✗	✗	✗	✗	✗
DHPN-16-03	✓	✓	✗	✓	✓	✓
DHPN-16-04	✓	✓	✗	✓	✓	✓

6.3 Coal Quality

The evaluation of coal quality for the 2016 Panorama exploration program is based on the analytical results of drillcore samples.

Lab analyses on drillcore samples were performed by Birtley Coal & Mineral Testing of Calgary, Alberta to an ASTM standard. Most of the samples collected were representative of selected coal units and their associated partings. Coal seam recovery averaged 80% for all coal intersections. Roof and floor samples were collected for most of the seams, although only a limited number of roof and floor samples have been analysed. Preliminary coal quality results indicate that the Panorama North coal is anthracite in rank.

In total, 149 core samples were collected from the 2016 drilling program, of which 74 individual ply samples were analysed for raw coal quality, including 25 roof and floor samples. From the initial ply samples, 11 composite samples were made to represent potential product intervals as well as to begin characterising the coal within the project area. Basic size and washability work were carried out on composites. All coal samples are being stored at Birtley Coal & Mineral Testing.

Comprehensive coal quality results are given in Appendix 4.

6.3.1 Raw Coal Analysis

Air dry moisture from the raw coal quality analysis of all samples, excluding roof and floor samples, ranges from less than 0.59 to 2.26% and averages around 1.08%. Air dry ash ranges from 10.12 to 77.66% and averages at 36.72%. Sulphur on an air dry basis ranges from 0.09 to 4.39% with an average of 1.4%. The high sulphur values in some samples are typically due to the nugget effect of pyrite nodules.

6.3.2 Clean Coal Analysis

Multiple seams from the Panorama North 2016 drilling program were composited and analysed for clean coal quality on an air-dry basis to begin characterisation of the coal.

6.4 Physical Work

No disturbance of ground to build trails, roads, trenches, line cuts, or open cuts was carried out during the 2016 Panorama North exploration program.

7 Statement of Costs

Exploration Work type	Comment				Totals
Personnel / Position	**Field Days**	**Days**	**Rate**	**Subtotal***	
Employees			$0.00	$85,234.08	
Geological Consultants			$0.00	$4,740.48	
Geolgoical Students and Technicians			$0.00	$39,091.57	
			$0.00	$0.00	
			$0.00	$0.00	
			$0.00	$0.00	
				$129,066.13	**$129,066.13**
Office Studies	**List Personnel**				
Literature search			$0.00	$0.00	
Database compilation			$0.00	$0.00	
Computer modelling			$0.00	$0.00	
Reprocessing of data			$0.00	$0.00	
General research			$0.00	$0.00	
Report preparation			$0.00	$0.00	
Other (specify)				$0.00	
				$0.00	**$0.00**

Airborne Exploration Surveys	**Line Kilometres / Enter total invoiced amount**				
Aeromagnetics			$0.00	$0.00	
Radiometrics			$0.00	$0.00	
Electromagnetics			$0.00	$0.00	
Gravity			$0.00	$0.00	
Digital terrain modelling			$0.00	$0.00	
Other (specify)			$0.00	$0.00	
				$0.00	**$0.00**
Remote Sensing	**Area in Hectares / Enter total invoiced amount or list personnel**				
Aerial photography			$0.00	$0.00	
LANDSAT			$0.00	$0.00	
Other (specify)			$0.00	$0.00	
				$0.00	**$0.00**
Ground Exploration Surveys	**Area in Hectares/List Personnel**			**$0.00**	
Geological mapping				$0.00	
Regional				$0.00	
Reconnaissance				$0.00	
Prospect				$0.00	
Underground				$0.00	
Trenches				$0.00	
				$0.00	**$0.00**
Ground geophysics	**Line Kilometres / Enter total amount invoiced list personnel**				
Radiometrics				$0.00	
Magnetics				$0.00	
Gravity				$0.00	
Digital terrain modelling				$0.00	
Electromagnetics	*note: expenditures for your crew in the field*			$0.00	
SP/AP/EP	*should be captured above in Personnel*			$0.00	
IP	*field expenditures above*			$0.00	
AMT/CSAMT				$0.00	
Resistivity				$0.00	
Complex resistivity				$0.00	
Seismic reflection				$0.00	
Seismic refraction				$0.00	
Well logging	930.40 m			$49,190.00	
Geophysical interpretation				$0.00	
Petrophysics				$0.00	
Other (specify)				$0.00	
				$49,190.00	**$49,190.00**
Geochemical Surveying	**Number of Samples**	**No.**	**Rate**	**Subtotal**	
Drill (cuttings, core, etc.)		85	$0.00	$60,041.57	
Stream sediment			$0.00	$0.00	
Soil			$0.00	$0.00	
Rock			$0.00	$0.00	
Water			$0.00	$0.00	
Biogeochemistry			$0.00	$0.00	
Whole rock			$0.00	$0.00	
Petrology			$0.00	$0.00	
Other (specify)			$0.00	$0.00	
				$60,041.57	**$60,041.57**
Drilling	**No. of Holes, Size of Core and Metres**	**No.**	**Rate**	**Subtotal**	
Diamond	5, HQ3, 1234.90 m		$0.00	$291,308.29	
Reverse circulation (RC)			$0.00	$0.00	
Rotary air blast (RAB)			$0.00	$0.00	
Other (specify)			$0.00	$0.00	
				$291,308.29	**$291,308.29**
Other Operations	**Clarify**	**No.**	**Rate**	**Subtotal**	
Trenching			$0.00	$0.00	

Bulk sampling			$0.00	$0.00	
Underground development			$0.00	$0.00	
Other (specify)			$0.00	$0.00	
				$0.00	**$0.00**
Reclamation	**Clarify**	**No.**	**Rate**	**Subtotal**	
After drilling			$0.00	$0.00	
Monitoring			$0.00	$0.00	
Other (specify)			$0.00	$0.00	
					$0.00
Transportation		**No.**	**Rate**	**Subtotal**	
Airfare			$0.00	$5,676.85	
Taxi			$0.00	$160.70	
truck rental			$0.00	$8,568.09	
kilometers			$0.00	$0.00	
ATV			$0.00	$0.00	
fuel			$0.00	$0.00	
Helicopter (hours)			$0.00	$393,401.80	
Fuel (litres/hour)			$0.00	$0.00	
Other	Fixed wing transport to camp			$116,873.91	
				$524,681.35	**$524,681.35**
Accommodation & Food	**Rates per day**				
Hotel			$0.00	$6,110.60	
Camp			$0.00	$196,655.29	
Meals	(included in accommodation)		$0.00	$0.00	
				$202,765.89	**$202,765.89**
Miscellaneous					
Telephone	Satellite		$0.00	$1,773.00	
Other (Specify)			$0.00	$0.00	
			$0.00	$1,773.00	**$1,773.00**
Equipment Rentals					
Field Gear (Specify)			$0.00	$0.00	
Other (Specify)					
				$0.00	**$0.00**
Freight, rock samples					
			$0.00	$541.94	
				$541.94	**$541.94**
TOTAL Expenditures					**$1,259,368.17**

8 Conclusions

The 2016 exploration season contributed great value to Atrum's understanding of the geology and resource potential. High-grade to ultra-high grade anthracite coal has been identified based on drilling and geophysical data within the Panorama North property. The coal seams at Panorama North are speculated to be laterally continuous and span large areas similar to those at the Groundhog property, and occur in the same coal-hosting Currier Formation Groundhog. Additional drilling, surface mapping, and trenching are required to increase the confidence level of the current resource potential and understanding of coal quality.

9 Works Cited

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Cookenboo, H. O., & Bustin, R. M. (1989). Jura-Cretaceous (Oxfordian to Cenomanian) stratigraphy of the north-central Bowser Basin, northern British Columbia. *Canadian Journal of Earth Sciences, 26*, 1001-1012.

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Gulf Canada Resources Inc. (1981). *Panorama Coal Project, Geological Report.* Assessment Report 113.

Moose Mountain Technical Services. (2010). *Technical Report - Panorama Coal Property.*

APPENDIX 1

Collar Summaries and Descriptive Core Logs

Drillhole ID	Easting	Northing	Elevation (m)	Drill Start Date	Drill End Date	TD (m)	Type	Core Size
DHPN-16-01	526453.42	6302111.73	1523.32	03/10/2016	06/10/2016	335.40	Fully Cored	HQ3
DHPN-16-02A	525577.73	6301193.54	263.50	03/10/2016	06/10/2016	41.00	Fully Cored	HQ3
DHPN-16-02B	525577.73	6301193.54	263.50	07/10/2016	14/10/2016	263.50	Fully Cored	HQ3
DHPN-16-03	524569.69	6300240.65	1411.28	07/10/2016	11/10/2016	326.00	Fully Cored	HQ3
DHPN-16-04	526431.15	6301202.19	1636.50	12/10/2016	17/10/2016	269.00	Fully Cored	HQ3

Hole: DHPN-16-01

Hole Summary

Hole Type: Fully cored

Location

Site:	PA	Lease:	
Easting:	526453.42	Accuracy:	Surveyed
Northing:	6302111.73	Geodetic Datum:	Universal Transverse Mercator
		UTM Zone:	9
Elevation:	1523.32	Height Datum:	North American Datum 1983
Survey Company:	CENTURY WIRELINE	Survey Date:	October-07-16

Comments

Vertical bedding from 140 m until the end of the hole

Geologists

Depth	Geologist

Drilling

Date Commenced:	October-03-16	Geological Org.:	
Date Completed:	October-06-16	Total Depth:	335.4
Drilling Company			

Run No.	Recovered	Depth	Drill Co	Rig No	Rig Type	Bit Type	Hole Size	Drill Fluid
1	0.22	2.40	DRIFTWOOD DRILLING	30	RS3000			
2	1.19	5.40						
3	1.22	8.40						
4	1.61	11.40						
5	0.54	14.40						
6	0.45	17.40						
7	0.75	20.40						
8	2.10	23.40						
9	2.90	26.40						
10	0.50	29.40						
11	2.90	32.40						
12	2.98	35.40						
13	3.00	38.40						
14	2.80	41.40						
15	2.88	44.40						
16	3.00	47.40						
17	2.80	50.40						
18	3.00	53.40						
19	2.61	56.40						
20	3.00	59.40						
21	3.00	62.40						
22	3.00	65.40						
23	3.00	68.40						

Run No.	Recovered	Depth	Drill Co	Rig No	Rig Type	Bit Type	Hole Size	Drill Fluid
24	3.00	71.40						
25	3.00	74.40						
26	2.71	77.40						
27	3.00	80.40						
28	2.90	83.40						
29	3.00	86.40						
30	3.00	89.40						
31	2.45	92.40						
32	2.89	95.40						
33	3.00	98.40						
34	3.00	101.40						
35	3.00	104.40						
36	2.86	107.40						
37	2.90	110.40						
38	2.92	113.40						
39	2.40	116.40						
40	2.41	119.40						
41	3.00	122.40						
42	3.00	125.40						
43	2.95	128.40						
44	3.00	131.40						
45	3.00	134.40						
46	2.95	137.40						
47	2.84	140.40						
48	2.71	143.40						
49	3.00	146.40						
50	3.00	149.40						
51	3.00	152.40						
52	3.00	155.40						
53	2.96	158.40						
54	2.95	161.40						
55	3.00	164.40						
56	2.90	167.40						
57	3.00	170.40						
58	2.93	173.40						
59	3.00	176.40						
60	3.00	179.40						
61	3.00	182.40						
62	3.00	185.40						
63	3.00	188.40						
64	3.00	191.40						
65	3.00	194.40						
66	2.91	197.40						
67	3.00	200.40						
68	3.00	203.40						
69	3.00	206.40						
70	3.00	209.40						
71	2.75	212.40						
72	3.00	215.40						
73	2.87	218.40						
74	3.00	221.40						
75	3.00	224.40						
76	3.00	227.40						

Run No.	Recovered	Depth	Drill Co	Rig No	Rig Type	Bit Type	Hole Size	Drill Fluid
77	3.00	230.40						
78	3.00	233.40						
79	3.00	236.40						
80	3.00	239.40						
81	3.00	242.40						
82	3.00	245.40						
83	3.00	248.40						
84	3.00	251.40						
85	3.00	254.40						
86	2.80	257.40						
87	3.00	260.40						
88	3.00	263.40						
89	3.00	266.40						
90	3.00	269.40						
91	3.00	272.40						
92	3.00	275.40						
93	2.94	278.40						
94	2.95	281.40						
95	2.90	284.40						
96	3.00	287.40						
97	3.00	290.40						
98	3.00	293.40						
99	3.00	296.40						
100	2.95	299.40						
101	3.00	302.40						
102	3.00	305.40						
103	3.00	308.40						
104	3.00	311.40						
105	3.00	314.40						
106	3.00	317.40						
107	2.74	320.40						
108	3.00	323.40						
109	3.00	326.40						
110	3.00	329.40						
111	3.00	332.40						

Casing

Depth	Type	Size	Recovered
7.50			7.50
8.10			0.60

Cementing

From Depth	To Depth	Date	Volume

Geophysics

Acoustic Scanner	☐
Caliper	☒
Density	☒
Dipmeter	☒
Natural Gamma	☒
Neutron	☒
Resistivity	☒
Sonic	☐
Temperature	☐

Formation/Horizon Summary

Formation/Horizon	From	To	Thickness	RL From	RL To

Seam Summary

Seam	From	To	Thickness	RL From	RL To

Lithology

From	To	Thick	Description	RL From	RL To
0.00	0.22	0.22	Sandstone, Medium grained, grey, Highly weathered	1,523.32	1,523.10
0.22	4.21	3.99	Core Loss	1,523.10	1,519.11
4.21	5.40	1.19	Sandstone, Medium grained, grey, Highly weathered	1,519.11	1,517.92
5.40	7.18	1.78	Core Loss	1,517.92	1,516.14
7.18	9.42	2.24	Sandstone, Medium grained, grey, Highly weathered	1,516.14	1,513.90
9.42	10.03	0.61	Core Loss	1,513.90	1,513.29
10.03	11.40	1.37	Siltstone, Highly weathered	1,513.29	1,511.92
11.40	13.86	2.46	Core Loss	1,511.92	1,509.46
13.86	14.40	0.54	Coaly Siltstone, Highly weathered	1,509.46	1,508.92
14.40	16.95	2.55	Core Loss	1,508.92	1,506.37
16.95	17.40	0.45	Siltstone, Highly weathered	1,506.37	1,505.92
17.40	19.65	2.25	Core Loss	1,505.92	1,503.67
19.65	20.40	0.75	Siltstone, Highly weathered	1,503.67	1,502.92
20.40	21.14	0.74	Colluvium, Highly weathered	1,502.92	1,502.18
21.14	22.04	0.90	Core Loss	1,502.18	1,501.28
22.04	26.30	4.26	Colluvium, Highly weathered	1,501.28	1,497.02
26.30	26.40	0.10	Core Loss	1,497.02	1,496.92
26.40	26.80	0.40	Siltstone, Highly weathered	1,496.92	1,496.52
26.80	29.30	2.50	Core Loss	1,496.52	1,494.02
29.30	29.40	0.10	Siltstone, Highly weathered	1,494.02	1,493.92
29.40	29.50	0.10	Core Loss	1,493.92	1,493.82
29.50	30.75	1.25	Siltstone, Highly weathered	1,493.82	1,492.57
30.75	34.33	3.58	Sandstone and Siltstone, Highly weathered	1,492.57	1,488.99
34.33	34.35	0.02	Core Loss	1,488.99	1,488.97
34.35	37.45	3.10	Sandstone and Siltstone, Fresh	1,488.97	1,485.87
37.45	39.33	1.88	Sandstone, Fine to medium grained, bands Fresh	1,485.87	1,483.99
39.33	39.53	0.20	Core Loss	1,483.99	1,483.79
39.53	41.74	2.21	Sandstone, Fine to medium grained, Fresh	1,483.79	1,481.58
41.74	42.68	0.94	Siltstone, Fresh	1,481.58	1,480.64
42.68	45.45	2.77	Sandstone, Medium grained, bands Fresh	1,480.64	1,477.87
45.45	48.42	2.97	Sandstone and Siltstone, Fresh	1,477.87	1,474.90
48.42	48.62	0.20	Core Loss	1,474.90	1,474.70
48.62	53.28	4.66	Sandstone and Siltstone, Fresh	1,474.70	1,470.04
53.28	53.40	0.12	Core Loss	1,470.04	1,469.92
53.40	55.12	1.72	Sandstone and Siltstone	1,469.92	1,468.20
55.12	55.32	0.20	Sandstone and Siltstone, rare (<1 %) pyrite bands	1,468.20	1,468.00
55.32	55.38	0.06	Core Loss, Lost coal	1,468.00	1,467.94
55.38	55.73	0.35	Coal, bright (>90%), black, Fresh	1,467.94	1,467.59
55.73	55.85	0.12	Coaly Siltstone, black, Fresh	1,467.59	1,467.47
55.85	55.96	0.11	Core Loss	1,467.47	1,467.36
55.96	56.32	0.36	Coaly Siltstone	1,467.36	1,467.00
56.32	56.57	0.25	Coal, bright (>90%), black, Fresh, minor (1-15 %) carbonate in veins	1,467.00	1,466.75
56.57	56.90	0.33	Coal, bright (>90%), black, Fresh	1,466.75	1,466.42
56.90	57.13	0.23	Coal, bright (>90%), black, Fresh	1,466.42	1,466.19
57.13	57.33	0.20	Coaly Siltstone, Fresh	1,466.19	1,465.99
57.33	59.25	1.92	Siltstone, dark grey, Fresh	1,465.99	1,464.07
59.25	60.84	1.59	Sandstone and Siltstone, Fine to medium grained, laminated Fresh	1,464.07	1,462.48
60.84	61.04	0.20	Coaly Siltstone, black, Fresh	1,462.48	1,462.28
61.04	61.32	0.28	Coal, bright (>90%), black, Fresh, rare (<1 %) carbonate bands	1,462.28	1,462.00

From	To	Thick	Description	RL From	RL To
61.32	61.52	0.20	Siltstone, Fresh	1,462.00	1,461.80
61.52	63.05	1.53	Siltstone, Fresh	1,461.80	1,460.27
63.05	64.38	1.33	Sandstone, Fine to medium grained, dark grey, Fresh	1,460.27	1,458.94
64.38	79.05	14.67	Sandstone and Siltstone, dark grey, laminated Fault Breccia Fresh	1,458.94	1,444.27
79.05	79.40	0.35	Carbonaceous Mudstone, black, Fresh	1,444.27	1,443.92
79.40	80.21	0.81	Siltstone, black, Fresh	1,443.92	1,443.11
80.21	80.46	0.25	Carbonaceous Mudstone, black, Fresh	1,443.11	1,442.86
80.46	80.94	0.48	Carbonaceous Mudstone, black, coaly bands	1,442.86	1,442.38
80.94	81.94	1.00	Carbonaceous Mudstone	1,442.38	1,441.38
81.94	82.14	0.20	Carbonaceous Mudstone, black, Fresh, minor (1-15 %) carbonate in veins	1,441.38	1,441.18
82.14	82.46	0.32	Coal, bright with dull bands (60-90%), black, Fresh, rare (<1 %) carbonate in veins	1,441.18	1,440.86
82.46	82.54	0.08	Core Loss, Lost coal	1,440.86	1,440.78
82.54	82.59	0.05	Coaly Siltstone	1,440.78	1,440.73
82.59	82.75	0.16	Coal, bright with dull bands (60-90%), black, Fresh	1,440.73	1,440.57
82.75	82.88	0.13	Coaly Siltstone, black, Fresh, rare (<1 %) carbonate in veins	1,440.57	1,440.44
82.88	83.06	0.18	Core Loss, Lost coal	1,440.44	1,440.26
83.06	83.12	0.06	Core Loss	1,440.26	1,440.20
83.12	83.36	0.24	Coal, dull with minor bright bands (1-10%)	1,440.20	1,439.96
83.36	83.56	0.20	Coal, dull with minor bright bands (1-10%), black, Fresh, minor (1-15 %) carbonate in cleat	1,439.96	1,439.76
83.56	83.76	0.20	Coaly Mudstone, black, Fresh	1,439.76	1,439.56
83.76	91.03	7.27	Coaly Mudstone, black, Fresh	1,439.56	1,432.29
91.03	99.40	8.37	Mudstone, dark grey, massive Fresh	1,432.29	1,423.92
99.40	101.38	1.98	Sandstone and Siltstone, dark grey, laminated Fresh	1,423.92	1,421.94
101.38	105.08	3.70	Sandstone, Medium grained, grey, massive Fresh	1,421.94	1,418.24
105.08	107.37	2.29	Sandstone and Siltstone, dark grey, laminated Fresh	1,418.24	1,415.95
107.37	109.10	1.73	Sandstone, Medium grained, dark grey, massive Fresh	1,415.95	1,414.22
109.10	109.30	0.20	Sandstone, Medium grained, dark grey, massive Fresh	1,414.22	1,414.02
109.30	109.40	0.10	Core Loss, Lost coal	1,414.02	1,413.92
109.40	109.88	0.48	Coal, bright (>90%), black, Fresh, rare (<1 %) carbonate in cleat	1,413.92	1,413.44
109.88	110.08	0.20	Carbonaceous Mudstone, dark grey, massive Fresh, minor (1-15 %) carbonate concentrated at top	1,413.44	1,413.24
110.08	111.60	1.52	Carbonaceous Mudstone, dark grey, massive Fresh	1,413.24	1,411.72
111.60	112.86	1.26	Sandstone and Siltstone, dark grey, massive Fresh	1,411.72	1,410.46
112.86	112.94	0.08	Core Loss	1,410.46	1,410.38
112.94	113.34	0.40	Sandstone and Siltstone, dark grey, massive Fresh	1,410.38	1,409.98
113.34	114.50	1.16	Sandstone and Siltstone, dark grey, massive Fresh	1,409.98	1,408.82
114.50	114.71	0.21	Coaly Mudstone, black, Fresh	1,408.82	1,408.61
114.71	114.91	0.20	Coaly Mudstone, black, Fresh	1,408.61	1,408.41
114.91	115.34	0.43	Coal, bright with dull bands (60-90%), black, Fresh, minor (1-15 %) carbonate in cleat	1,408.41	1,407.98
115.34	115.80	0.46	Core Loss, Lost coal	1,407.98	1,407.52
115.80	115.91	0.11	Core Loss	1,407.52	1,407.41
115.91	116.21	0.30	Carbonaceous Mudstone, coaly bands	1,407.41	1,407.11
116.21	117.00	0.79	Coal, bright with dull bands (60-90%), black, rare (<1 %) carbonate in cleat	1,407.11	1,406.32
117.00	117.25	0.25	Coal, interbanded dull and bright bands(40-60%), black, minor (1-15 %) carbonate in cleat	1,406.32	1,406.07

From	To	Thick	Description	RL From	RL To
117.25	117.45	0.20	Carbonaceous Mudstone, black, Fresh	1,406.07	1,405.87
117.45	117.56	0.11	Carbonaceous Mudstone, black, Fresh	1,405.87	1,405.76
117.56	118.15	0.59	Core Loss	1,405.76	1,405.17
118.15	129.32	11.17	Sandstone and Siltstone, dark grey, massive 85 dip	1,405.17	1,394.00
129.32	131.40	2.08	Sandstone, Medium grained, medium grey, massive Fresh	1,394.00	1,391.92
131.40	134.30	2.90	Sandstone and Siltstone, grey, laminated Fresh	1,391.92	1,389.02
134.30	136.90	2.60	Sandstone, Fine grained, dark grey, laminated Fresh	1,389.02	1,386.42
136.90	143.35	6.45	Sandstone and Siltstone, dark grey, laminated Fresh, 85 dip	1,386.42	1,379.97
143.35	145.00	1.65	Mudstone, dark grey, laminated Fresh	1,379.97	1,378.32
145.00	159.80	14.80	Sandstone and Siltstone, dark grey, laminated Fresh, 85 dip	1,378.32	1,363.52
159.80	159.85	0.05	Core Loss	1,363.52	1,363.47
159.85	164.65	4.80	Sandstone, Fine grained, dark grey, laminated Fresh, 85 dip	1,363.47	1,358.67
164.65	167.20	2.55	Sandstone and Siltstone, dark grey, laminated Fresh, 85 dip	1,358.67	1,356.12
167.20	171.00	3.80	Sandstone, Fine grained, dark grey, massive Fresh, 85 dip	1,356.12	1,352.32
171.00	171.50	0.50	Sandstone and Siltstone, dark grey, massive Fault Breccia Fresh	1,352.32	1,351.82
171.50	171.57	0.07	Core Loss	1,351.82	1,351.75
171.57	216.13	44.56	Sandstone and Siltstone, dark grey, laminated fossiliferous Fresh, 85 dip	1,351.75	1,307.19
216.13	216.26	0.13	Core Loss	1,307.19	1,307.06
216.26	257.40	41.14	Sandstone and Siltstone, dark grey, laminated fossiliferous Fresh, 85 dip	1,307.06	1,265.92
257.40	257.60	0.20	Core Loss	1,265.92	1,265.72
257.60	278.40	20.80	Sandstone and Siltstone, dark grey, laminated fossiliferous Fresh, 85 dip	1,265.72	1,244.92
278.40	278.46	0.06	Core Loss	1,244.92	1,244.86
278.46	282.10	3.64	Sandstone and Siltstone, dark grey, laminated fossiliferous Fresh, 85 dip	1,244.86	1,241.22
282.10	282.15	0.05	Core Loss	1,241.22	1,241.17
282.15	284.40	2.25	Sandstone and Siltstone, dark grey, laminated fossiliferous Fresh, 85 dip	1,241.17	1,238.92
284.40	284.50	0.10	Core Loss	1,238.92	1,238.82
284.50	335.40	50.90	Sandstone and Siltstone, dark grey, laminated fossiliferous Fresh, 85 dip	1,238.82	1,187.92

Hole: DHPN-16-02A

Hole Summary

Hole Type: Fully cored

Location

Site:	PB	Lease:	
Easting:	525577.73	Accuracy:	Surveyed
Northing:	6301193.54	Geodetic Datum:	Universal Transverse Mercator
		UTM Zone:	9
Elevation:	263.5	Height Datum:	North American Datum 1983
Survey Company:		Survey Date:	

Comments

Geologists

Depth	Geologist
41.00	CATHERINE BANFIELD

Drilling

Date Commenced:	October-03-16	Geological Org.:	
Date Completed:	October-06-16	Total Depth:	41
Drilling Company			

Run No.	Recovered	Depth	Drill Co	Rig No	Rig Type	Bit Type	Hole Size	Drill Fluid
1	1.30	2.00	DRIFTWOOD DRILLING	2	CRS3000			
2	2.40	5.00						
3	2.65	8.00						
4	1.50	11.00						
5	1.50	14.00						
6	1.80	17.00						
7	2.20	20.00						
8	2.65	23.00						
9	2.95	26.00						
10	2.00	29.00						
11	0.65	32.00						
12	2.35	35.00						
13	2.70	38.00						
14	3.00	41.00						

Casing

Depth	Type	Size	Recovered
13.50	HQ		
18.00	HQ		
19.50	HQ		

Cementing

From Depth	To Depth	Date	Volume

Geophysics

Acoustic Scanner	☐
Caliper	☐
Density	☐
Dipmeter	☐
Natural Gamma	☐
Neutron	☐
Resistivity	☐
Sonic	☐
Temperature	☐

Formation/Horizon Summary

Formation/Horizon	From	To	Thickness	RL From	RL To

Seam Summary

Seam	From	To	Thickness	RL From	RL To

Lithology

From	To	Thick	Description	RL From	RL To
0.00	1.30	1.30	Colluvium, brown, Highly weathered	263.50	262.20
1.30	2.00	0.70	Core Loss	262.20	261.50
2.00	4.40	2.40	Colluvium, brown, Highly weathered	261.50	259.10
4.40	5.00	0.60	Core Loss	259.10	258.50
5.00	6.52	1.52	Colluvium, brown, Highly weathered	258.50	256.98
6.52	7.65	1.13	Colluvium, brown, Moderately weathered	256.98	255.85
7.65	9.50	1.85	Core Loss	255.85	254.00
9.50	11.10	1.60	Colluvium, brown, Highly weathered	254.00	252.40
11.10	11.30	0.20	Coal, dull with minor bright bands (1-10%), black, Siltstone bands Moderately weathered	252.40	252.20
11.30	12.50	1.20	Sandstone and Siltstone, dark grey, coaly bands Moderately weathered	252.20	251.00
12.50	14.00	1.50	Core Loss	251.00	249.50
14.00	15.80	1.80	Sandstone and Siltstone, dark grey, Slightly weathered	249.50	247.70
15.80	17.00	1.20	Core Loss	247.70	246.50
17.00	19.10	2.10	Sandstone and Siltstone, dark grey, Slightly weathered	246.50	244.40
19.10	19.90	0.80	Core Loss	244.40	243.60
19.90	21.65	1.75	Sandstone and Siltstone, dark grey, Slightly weathered	243.60	241.85
21.65	22.65	1.00	Sandstone and Siltstone, dark grey, Moderately weathered	241.85	240.85
22.65	23.00	0.35	Core Loss	240.85	240.50
23.00	23.58	0.58	Sandstone and Siltstone, dark grey, Moderately weathered	240.50	239.92
23.58	23.63	0.05	Core Loss	239.92	239.87
23.63	28.00	4.37	Sandstone and Siltstone, dark grey, Moderately weathered	239.87	235.50
28.00	29.00	1.00	Core Loss	235.50	234.50
29.00	29.65	0.65	Sandstone and Siltstone, dark grey, Slightly weathered	234.50	233.85
29.65	32.00	2.35	Core Loss	233.85	231.50
32.00	33.55	1.55	Sandstone and Siltstone, dark grey, Slightly weathered	231.50	229.95
33.55	34.20	0.65	Core Loss	229.95	229.30
34.20	35.90	1.70	Sandstone and Siltstone, dark grey, Slightly weathered	229.30	227.60
35.90	36.50	0.60	Core Loss	227.60	227.00
36.50	41.00	4.50	Sandstone and Siltstone, dark grey, Fresh	227.00	222.50

Hole: DHPN-16-02B

Hole Summary

Hole Type: Fully cored

Location

Site:	PB	Lease:	
Easting:	525577.73	Accuracy:	Surveyed
Northing:	6301193.54	Geodetic Datum:	Universal Transverse Mercator
		UTM Zone:	9
Elevation:	263.5	Height Datum:	
Survey Company:		Survey Date:	

Comments

Geologists

Depth	Geologist
176.00	CB

Drilling

Date Commenced:	October-07-16	Geological Org.:	
Date Completed:	October-14-16	Total Depth:	263.5
Drilling Company			

Run No.	Recovered	Depth	Drill Co	Rig No	Rig Type	Bit Type	Hole Size	Drill Fluid
1	0.30	0.50	DRIFTWOOD DRILLING	3	CRS3000			
2	0.50	1.50						
3	0.60	3.00						
4	0.40	4.50						
5	0.40	6.00						
6	0.40	7.50						
7	0.85	9.00						
8	0.50	10.50						
9	1.50	12.00						
10	0.96	13.50						
11	2.72	16.50						
12	0.97	18.00						
13	0.74	19.50						
14	1.05	21.00						
15	1.43	22.50						
16	1.08	24.00						
17	0.25	25.50						
18	0.85	27.00						
19	1.29	28.50						
20	1.17	30.00						
21	1.18	31.50						
22	1.50	33.00						

Run No.	Recovered	Depth	Drill Co	Rig No	Rig Type	Bit Type	Hole Size	Drill Fluid
23	1.50	34.50						
24	1.35	36.00						
25	1.50	37.50						
26	1.50	39.00						
27	2.14	42.00						
28	1.50	43.50						
29	1.15	45.00						
30	1.33	46.50						
31	0.93	48.00						
32	1.50	49.50						
33	1.11	51.00						
34	1.50	52.50						
35	1.50	54.00						
36	1.07	55.50						
37	1.50	57.00						
38	1.50	58.50						
39	1.50	60.00						
40	1.00	61.50						
41	1.01	63.00						
42	1.21	64.50						
43	1.50	66.00						
44	1.50	67.50						
45	1.04	69.00						
46	1.50	70.50						
47	1.50	72.00						
48	1.40	73.50						
49	1.27	75.00						
50	1.50	76.50						
51	1.20	78.00						
52	1.50	79.50						
53	1.30	81.00						
54	1.50	82.50						
55	1.50	84.00						
56	1.50	85.50						
57	1.50	87.00						
58	1.50	88.50						
59	1.50	90.00						
60	1.50	91.50						
61	1.30	93.00						
62	1.40	94.50						
63	1.40	96.00						
64	1.50	97.50						
65	0.30	97.80						
66	0.84	99.00						
67	1.50	100.50						
68	1.50	102.00						
69	1.50	103.50						
70	1.24	105.00						
71	1.42	106.50						
72	1.50	108.00						
73	1.45	109.50						
74	1.40	111.00						
75	1.50	112.50						

Run No.	Recovered	Depth	Drill Co	Rig No	Rig Type	Bit Type	Hole Size	Drill Fluid
76	1.40	114.00						
77	1.40	115.50						
78	1.40	117.00						
79	1.50	118.50						
80	1.50	120.00						
81	1.43	121.50						
82	1.50	123.00						
83	1.50	124.50						
84	1.35	126.00						
85	1.50	127.50						
86	1.30	129.00						
87	1.50	130.50						
88	1.50	132.00						
89	1.50	133.50						
90	1.00	135.00						
91	1.50	136.50						
92	1.50	138.00						
93	1.50	139.50						
94	1.39	141.00						
95	1.40	142.50						
96	1.30	144.00						
97	1.50	145.50						
98	1.50	147.00						
99	1.50	148.50						
100	1.47	150.00						
101	1.13	151.50						
102	1.50	153.00						
103	1.85	155.50						
104	2.91	158.50						
105	1.50	160.00						
106	1.50	161.50						
107	1.30	163.00						
108	1.50	164.50						
109	1.10	166.00						
110	1.50	167.50						
111	1.30	169.00						
112	1.35	170.50						
113	1.50	172.00						
114	1.50	173.50						
115	1.50	175.00						
116	1.31	176.50						
117	1.50	178.00						
118	1.41	179.50						
119	1.50	181.00						
120	1.35	182.50						
121	1.50	184.00						
122	1.50	185.50						
123	1.50	187.00						
124	1.50	188.50						
125	1.35	190.00						
126	1.35	191.50						
127	1.05	193.00						
128	1.50	194.50						

Run No.	Recovered	Depth	Drill Co	Rig No	Rig Type	Bit Type	Hole Size	Drill Fluid
129	1.50	196.00						
130	1.50	197.50						
131	1.50	199.00						
132	1.50	200.50						
133	1.50	202.00						
134	1.50	203.50						
135	1.40	205.00						
136	1.50	206.50						
137	1.35	208.00						
138	1.50	209.50						
139	1.50	211.00						
140	1.30	212.50						
141	1.50	214.00						
142	1.50	215.50						
143	1.50	217.00						
144	1.50	218.50						
145	1.50	220.00						
146	1.50	221.50						
147	1.50	223.00						
148	1.30	224.50						
149	1.50	226.00						
150	1.50	227.50						
151	1.50	229.00						
152	1.50	230.50						
153	1.50	232.00						
154	1.34	233.50						
155	1.50	235.00						
156	1.50	236.50						
157	1.50	238.00						
158	1.45	239.50						
159	1.50	241.00						
160	1.50	242.50						
161	1.50	244.00						
162	1.46	245.50						
163	1.50	247.00						
164	1.50	248.50						
165	1.48	250.00						
166	1.50	251.50						
167	1.50	253.00						
168	1.50	254.50						
169	1.50	256.00						
170	1.50	257.50						
171	1.50	259.00						

Casing

Depth	Type	Size	Recovered
6.00			6.00
27.00			21.00
36.00			9.00

Cementing

From Depth	To Depth	Date	Volume

Geophysics

Acoustic Scanner	☐
Caliper	☐
Density	☐
Dipmeter	☐
Natural Gamma	☐
Neutron	☐
Resistivity	☐
Sonic	☐
Temperature	☐

Formation/Horizon Summary

Formation/Horizon	From	To	Thickness	RL From	RL To

Seam Summary

Seam	From	To	Thickness	RL From	RL To

Lithology

From	To	Thick	Description	RL From	RL To
0.00	0.30	0.30	Core Loss	263.50	263.20
0.30	0.50	0.20	Colluvium, Highly weathered	263.20	263.00
0.50	1.00	0.50	Core Loss	263.00	262.50
1.00	1.50	0.50	Colluvium, Highly weathered	262.50	262.00
1.50	2.40	0.90	Core Loss	262.00	261.10
2.40	3.00	0.60	Colluvium, Highly weathered	261.10	260.50
3.00	4.10	1.10	Core Loss	260.50	259.40
4.10	4.50	0.40	Colluvium, Highly weathered	259.40	259.00
4.50	7.90	3.40	Mudstone, grey, laminated Highly weathered	259.00	255.60
7.90	8.35	0.45	Carbonaceous Mudstone, black, Highly weathered	255.60	255.15
8.35	9.00	0.65	Core Loss	255.15	254.50
9.00	9.95	0.95	Core Loss	254.50	253.55
9.95	10.50	0.55	Coal, bright with dull bands (60-90%), black, Highly weathered	253.55	253.00
10.50	10.77	0.27	Coal, mainly dull with frequent bright bands (10-40%), black, Highly weathered	253.00	252.73
10.77	11.53	0.76	Coal, mainly dull with frequent bright bands (10-40%), black, Highly weathered	252.73	251.97
11.53	11.80	0.27	Siltstone, black, Highly weathered	251.97	251.70
11.80	12.00	0.20	Coal, bright with dull bands (60-90%), Moderately weathered	251.70	251.50
12.00	12.54	0.54	Core Loss	251.50	250.96
12.54	13.80	1.26	Sandstone and Siltstone, grey, Highly weathered	250.96	249.70
13.80	14.08	0.28	Core Loss	249.70	249.42
14.08	17.00	2.92	Sandstone and Siltstone, grey, laminated Highly weathered	249.42	246.50
17.00	17.53	0.53	Core Loss	246.50	245.97
17.53	18.74	1.21	Sandstone and Siltstone, grey, laminated Highly weathered	245.97	244.76
18.74	19.50	0.76	Core Loss	244.76	244.00
19.50	20.55	1.05	Sandstone and Siltstone, grey, laminated Highly weathered	244.00	242.95
20.55	21.07	0.52	Core Loss	242.95	242.43
21.07	23.58	2.51	Sandstone and Siltstone, grey, laminated Highly weathered	242.43	239.92
23.58	24.00	0.42	Core Loss	239.92	239.50
24.00	24.25	0.25	Sandstone and Siltstone, grey, laminated Highly weathered	239.50	239.25
24.25	26.15	1.90	Core Loss, Lost coal	239.25	237.35
26.15	26.35	0.20	Coal, dull (<1%), black	237.35	237.15
26.35	27.10	0.75	Sandstone and Siltstone, grey, laminated Highly weathered	237.15	236.40
27.10	27.21	0.11	Core Loss	236.40	236.29
27.21	28.50	1.29	Sandstone and Siltstone, grey, laminated Fresh	236.29	235.00
28.50	28.83	0.33	Core Loss	235.00	234.67
28.83	31.18	2.35	Sandstone and Siltstone, grey, laminated Fresh	234.67	232.32
31.18	31.50	0.32	Core Loss	232.32	232.00
31.50	37.30	5.80	Sandstone and Siltstone, grey, laminated Fresh	232.00	226.20
37.30	39.00	1.70	Sandstone, Medium grained, grey, massive Fresh	226.20	224.50
39.00	39.86	0.86	Core Loss	224.50	223.64
39.86	44.65	4.79	Sandstone, Medium grained, grey, massive Fresh	223.64	218.85
44.65	45.00	0.35	Core Loss	218.85	218.50
45.00	45.23	0.23	Sandstone, Medium grained, grey, massive Fresh	218.50	218.27
45.23	45.40	0.17	Core Loss	218.27	218.10
45.40	47.30	1.90	Sandstone, Medium grained, grey, massive Fresh	218.10	216.20
47.30	47.87	0.57	Core Loss	216.20	215.63
47.87	51.00	3.13	Sandstone, Medium grained, grey, laminated Fresh	215.63	212.50
51.00	55.07	4.07	Sandstone and Siltstone, grey, laminated Fresh, 45 dip	212.50	208.43

From	To	Thick	Description	RL From	RL To
55.07	55.55	0.48	Core Loss	208.43	207.95
55.55	61.00	5.45	Sandstone and Siltstone, grey, laminated Fresh, 40 dip	207.95	202.50
61.00	61.50	0.50	Core Loss	202.50	202.00
61.50	62.45	0.95	Sandstone and Siltstone, grey, laminated Fresh, 40 dip	202.00	201.05
62.45	62.51	0.06	Carbonaceous Siltstone, black, rare (<1 %) carbonate bands	201.05	200.99
62.51	63.00	0.49	Core Loss	200.99	200.50
63.00	63.81	0.81	Sandstone and Siltstone, grey, laminated Fresh, 40 dip	200.50	199.69
63.81	64.00	0.19	Core Loss	199.69	199.50
64.00	67.50	3.50	Siltstone, black, massive Fresh	199.50	196.00
67.50	67.96	0.46	Core Loss	196.00	195.54
67.96	91.50	23.54	Sandstone, Fine to medium grained, grey, minor (1-15%) laminated Fresh, 35 dip, minor (1-15 %) calcite in veins	195.54	172.00
91.50	92.80	1.30	Sandstone and Siltstone, black, laminated Fresh, 80 dip	172.00	170.70
92.80	93.00	0.20	Core Loss	170.70	170.50
93.00	95.45	2.45	Sandstone and Siltstone, black, laminated Fresh, 50 dip	170.50	168.05
95.45	95.55	0.10	Core Loss	168.05	167.95
95.55	97.60	2.05	Sandstone and Siltstone, black, laminated Fresh, 80 dip	167.95	165.90
97.60	97.80	0.20	Coal, dull with minor bright bands (1-10%), black, immature/intermixed coaly	165.90	165.70
97.80	98.16	0.36	Core Loss, rare (<1 %) calcite concentrated at base	165.70	165.34
98.16	104.56	6.40	Sandstone and Siltstone, grey, laminated Fresh, 60 dip, rare (<1 %) calcite concentrated at top	165.34	158.94
104.56	105.00	0.44	Coaly Siltstone, black, massive Fresh	158.94	158.50
105.00	105.08	0.08	Core Loss	158.50	158.42
105.08	105.12	0.04	Carbonaceous Mudstone	158.42	158.38
105.12	105.32	0.20	Carbonaceous Mudstone	158.38	158.18
105.32	105.74	0.42	Coal, bright with dull bands (60-90%), black, massive Moderately weathered	158.18	157.76
105.74	105.94	0.20	Carbonaceous Siltstone, black, massive bands Fresh	157.76	157.56
105.94	106.14	0.20	Sandstone and Siltstone, black, laminated Mudstone 50 dip, rare (<1 %) calcite bands	157.56	157.36
106.14	106.64	0.50	Core Loss	157.36	156.86
106.64	108.50	1.86	Sandstone and Siltstone, black, laminated Mudstone 50 dip, rare (<1 %) calcite bands	156.86	155.00
108.50	110.40	1.90	Sandstone and Siltstone, black, massive Mudstone Fresh, 50 dip, rare (<1 %) calcite bands	155.00	153.10
110.40	110.50	0.10	Core Loss	153.10	153.00
110.50	110.60	0.10	Coal, interbanded dull and bright bands(40-60%), black, massive Fresh	153.00	152.90
110.60	110.70	0.10	Sandstone and Siltstone, grey, laminated Fresh, 45 dip, rare (<1 %) calcite bands	152.90	152.80
110.70	110.80	0.10	Carbonaceous Mudstone, black, massive coaly Fresh	152.80	152.70
110.80	113.75	2.95	Sandstone and Siltstone, black, massive Siltstone Fresh, 55 dip, minor (1-15 %) calcite in veins	152.70	149.75
113.75	113.85	0.10	Core Loss	149.75	149.65

From	To	Thick	Description	RL From	RL To
113.85	114.25	0.40	Coal, interbanded dull and bright bands(40-60%), black, massive Fresh, rare (<1 %) calcite concentrated at base	149.65	149.25
114.25	114.54	0.29	Coal, bright with dull bands (60-90%), black, massive bands Fresh, 60 dip	149.25	148.96
114.54	114.64	0.10	Core Loss	148.96	148.86
114.64	114.84	0.20	Coaly Siltstone, black, bands coaly Fresh, 45 dip, minor (1-15 %) calcite in veins	148.86	148.66
114.84	116.84	2.00	Siltstone, black, massive Fresh, rare (<1 %) calcite in blebs	148.66	146.66
116.84	117.00	0.16	Core Loss	146.66	146.50
117.00	118.30	1.30	Siltstone, black, massive Fresh, rare (<1 %) calcite in blebs	146.50	145.20
118.30	118.92	0.62	Sandstone and Siltstone, grey, laminated bands Fresh, 45 dip, minor (1-15 %) calcite bands	145.20	144.58
118.92	119.34	0.42	Sandstone and Siltstone, grey, laminated bands Fresh, 45 dip, minor (1-15 %) calcite bands	144.58	144.16
119.34	120.15	0.81	Sandstone and Siltstone, grey, laminated bands Fresh, 45 dip, minor (1-15 %) calcite bands	144.16	143.35
120.15	120.22	0.07	Core Loss	143.35	143.28
120.22	122.22	2.00	Sandstone and Siltstone, black, laminated bands Fresh, 45 dip, rare (<1 %) pyrite bands Sandstone and Siltstone, rare (<1 %) calcite in veins	143.28	141.28
122.22	124.40	2.18	Sandstone, Fine grained, black, bedded Fresh, 50 dip, minor (1-15 %) calcite in veins	141.28	139.10
124.40	125.85	1.45	Sandstone and Siltstone, black, laminated bands Fresh, 50 dip, minor (1-15 %) calcite concentrated at top	139.10	137.65
125.85	126.00	0.15	Core Loss	137.65	137.50
126.00	128.80	2.80	Sandstone and Siltstone, black, laminated bands Fresh, 50 dip, minor (1-15 %) calcite in veins	137.50	134.70
128.80	129.00	0.20	Core Loss	134.70	134.50
129.00	132.75	3.75	Siltstone, black, massive Fresh, rare (<1 %) calcite in veins	134.50	130.75
132.75	133.50	0.75	Sandstone and Siltstone, grey, laminated Fresh, 45 dip, minor (1-15 %) calcite in veins	130.75	130.00
133.50	134.00	0.50	Core Loss	130.00	129.50
134.00	138.76	4.76	Siltstone, black, massive Fresh, rare (<1 %) calcite in veins	129.50	124.74
138.76	138.96	0.20	Siltstone, black, massive Fresh, rare (<1 %) calcite in veins	124.74	124.54
138.96	139.50	0.54	Coal, bright with dull bands (60-90%), black, massive Fresh, rare (<1 %) calcite clasts	124.54	124.00
139.50	139.98	0.48	Coal, interbanded dull and bright bands(40-60%), black, massive Fresh, rare (<1 %) calcite in veins	124.00	123.52
139.98	140.18	0.20	Siltstone, black, massive coaly Fresh, minor (1-15 %) calcite in veins	123.52	123.32
140.18	140.93	0.75	Siltstone, black, massive coaly Fresh, minor (1-15 %) calcite in veins	123.32	122.57
140.93	141.10	0.17	Core Loss	122.57	122.40
141.10	141.20	0.10	Coaly Siltstone, black, bands coaly Fresh, rare (<1 %) calcite in veins	122.40	122.30
141.20	142.20	1.00	Siltstone, black, massive Fresh, minor (1-15 %) calcite in veins	122.30	121.30

From	To	Thick	Description	RL From	RL To
142.20	143.34	1.14	Sandstone and Siltstone, black, laminated bands Fresh, minor (1-15 %) calcite in veins	121.30	120.16
143.34	143.48	0.14	Coal, mainly dull with frequent bright bands (10-40%), black, massive Fresh	120.16	120.02
143.48	143.68	0.20	Core Loss	120.02	119.82
143.68	149.16	5.48	Sandstone and Siltstone, grey, laminated bands Fresh, 40 dip, rare (<1 %) calcite in veins	119.82	114.34
149.16	150.30	1.14	Siltstone, black, massive coaly Fresh, 50 dip, rare (<1 %)	114.34	113.20
150.30	150.73	0.43	Core Loss	113.20	112.77
150.73	151.15	0.42	Coaly Siltstone, black, Fresh, 75 dip, rare (<1 %) pyrite bands	112.77	112.35
151.15	151.35	0.20	Coaly Siltstone, black, Fresh, 75 dip, rare (<1 %) pyrite bands	112.35	112.15
151.35	151.97	0.62	Coal, mainly dull with frequent bright bands (10-40%), black, bands coaly Fresh, 50 dip, minor (1-15 %) calcite in veins	112.15	111.53
151.97	152.17	0.20	Coaly Siltstone, black, bands coaly Fresh, rare (<1 %) calcite bands	111.53	111.33
152.17	154.85	2.68	Coaly Siltstone	111.33	108.65
154.85	155.50	0.65	Core Loss	108.65	108.00
155.50	155.59	0.09	Core Loss	108.00	107.91
155.59	155.70	0.11	Coal, dull (<1%), black, massive Mudstone Fresh, rare (<1 %) calcite in veins	107.91	107.80
155.70	159.18	3.48	Siltstone, black, bands coaly Fresh, rare (<1 %) calcite bands	107.80	104.32
159.18	160.07	0.89	Coaly Siltstone, black, bands coaly Fresh, rare (<1 %) calcite in veins	104.32	103.43
160.07	160.27	0.20	Coaly Siltstone, black, bands coaly Fresh, rare (<1 %) calcite in veins	103.43	103.23
160.27	160.82	0.55	Coal, interbanded dull and bright bands(40-60%), black, traces Siltstone Fresh, rare (<1 %) calcite in veins	103.23	102.68
160.82	161.32	0.50	Coal, interbanded dull and bright bands(40-60%), black, traces Siltstone Fresh, rare (<1 %) calcite in veins	102.68	102.18
161.32	161.50	0.18	Coaly Siltstone, black, massive Fresh, rare (<1 %) calcite on fracture planes	102.18	102.00
161.50	161.70	0.20	Core Loss	102.00	101.80
161.70	162.32	0.62	Coaly Siltstone, black, massive carbonaceous Fresh, rare (<1 %) calcite in veins	101.80	101.18
162.32	162.55	0.23	Coal, interbanded dull and bright bands(40-60%), black, massive 40 dip, minor (1-15 %) calcite in veins	101.18	100.95
162.55	163.59	1.04	Siltstone, black, laminated bands Fresh, 45 dip, minor (1-15 %) calcite on fracture planes	100.95	99.91
163.59	167.00	3.41	Sandstone and Siltstone, dark grey, laminated bands Fresh, 40 dip, minor (1-15 %) calcite on fracture planes	99.91	96.50
167.00	168.80	1.80	Sandstone, Fine grained, grey, bedded bands Fresh, 45 dip, minor (1-15 %) calcite on fracture planes	96.50	94.70
168.80	169.00	0.20	Core Loss	94.70	94.50
169.00	169.60	0.60	Siltstone, grey, bedded bands Fresh, 35 dip, rare (<1 %) calcite in veins	94.50	93.90
169.60	169.85	0.25	Coal, mainly dull with frequent bright bands (10-40%)	93.90	93.65
169.85	170.00	0.15	Core Loss	93.65	93.50
170.00	172.17	2.17	Siltstone, grey, bedded bands Fresh, 40 dip, rare (<1 %) calcite in veins	93.50	91.33

From	To	Thick	Description	RL From	RL To
172.17	175.81	3.64	Sandstone and Siltstone, dark grey, laminated Fresh, 50 dip, minor (1-15 %) calcite on fracture planes	91.33	87.69
175.81	176.00	0.19	Core Loss	87.69	87.50
176.00	179.40	3.40	Sandstone and Siltstone, grey, massive Fresh, abundant (40-60 %) carbonate bands	87.50	84.10
179.40	179.50	0.10	Core Loss	84.10	84.00
179.50	182.25	2.75	Sandstone and Siltstone, grey, massive Fresh, common (15-40 %) carbonate bands	84.00	81.25
182.25	182.50	0.25	Core Loss	81.25	81.00
182.50	183.41	0.91	Sandstone and Siltstone, grey, massive common (15-40 %) carbonate bands	81.00	80.09
183.41	189.15	5.74	Sandstone, Fine to medium grained, grey, Siltstone laminated minor (1-15 %) carbonate bands	80.09	74.35
189.15	190.59	1.44	Sandstone and Siltstone, grey, Siltstone bands minor (1-15 %) carbonate concentrated at base	74.35	72.91
190.59	190.72	0.13	Coaly Siltstone, black	72.91	72.78
190.72	190.92	0.20	Coaly Siltstone, black	72.78	72.58
190.92	191.50	0.58	Coal, bright (>90%), black, minor (1-15 %) carbonate concentrated at top	72.58	72.00
191.50	191.70	0.20	Core Loss	72.00	71.80
191.70	192.03	0.33	Coal, bright (>90%)	71.80	71.47
192.03	192.36	0.33	Coaly Siltstone, black, coaly Siltstone	71.47	71.14
192.36	196.44	4.08	Sandstone and Siltstone, dark grey, laminated 10 dip, common (15-40 %) carbonate in veins	71.14	67.06
196.44	199.34	2.90	Siltstone, black, rare (<1 %) pyrite concentrated at base	67.06	64.16
199.34	199.54	0.20	Siltstone, black, rare (<1 %) pyrite concentrated at base	64.16	63.96
199.54	200.03	0.49	Coal, bright (>90%), minor (1-15 %) carbonate concentrated at top	63.96	63.47
200.03	200.50	0.47	Core Loss	63.47	63.00
200.50	200.80	0.30	Coaly Siltstone, black, bedded coaly Fresh, rare (<1 %) carbonate in veins	63.00	62.70
200.80	203.50	2.70	Siltstone, black, massive Fresh, rare (<1 %) carbonate in veins	62.70	60.00
203.50	203.60	0.10	Core Loss	60.00	59.90
203.60	207.12	3.52	Siltstone, black, massive carbonaceous Fresh, minor (1-15 %) calcite bands	59.90	56.38
207.12	207.19	0.07	Coaly Siltstone, black, massive massive Fresh, rare (<1 %) calcite concentrated at base	56.38	56.31
207.19	207.39	0.20	Coaly Siltstone, black, massive massive Fresh, rare (<1 %) calcite concentrated at base	56.31	56.11
207.39	207.93	0.54	Coal, bright (>90%), black, common (15-40 %) carbonate bands	56.11	55.57
207.93	208.00	0.07	Core Loss, Lost coal	55.57	55.50
208.00	208.23	0.23	Coal, bright (>90%), black, rare (<1 %) calcite concentrated at base	55.50	55.27
208.23	208.43	0.20	Coaly Siltstone, black, coaly bands Fresh, rare (<1 %) calcite in veins	55.27	55.07
208.43	208.55	0.12	Coaly Siltstone, black, coaly bands Fresh, rare (<1 %) calcite in veins	55.07	54.95
208.55	208.90	0.35	Siltstone, black, massive Fresh, rare (<1 %) calcite in veins	54.95	54.60

From	To	Thick	Description	RL From	RL To
208.90	210.80	1.90	Sandstone and Siltstone, grey, laminated bands Fresh, 20 dip, rare (<1 %) calcite on fracture planes	54.60	52.70
210.80	211.00	0.20	Core Loss, Lost coal	52.70	52.50
211.00	211.68	0.68	Coaly Siltstone, black, massive coaly Fresh, minor (1-15 %) calcite in veins	52.50	51.82
211.68	216.70	5.02	Sandstone and Siltstone, dark grey, laminated bands Fresh, 15 dip, common (15-40 %) calcite in veins	51.82	46.80
216.70	223.00	6.30	Siltstone, black, massive Fresh, rare (<1 %) calcite in veins	46.80	40.50
223.00	223.20	0.20	Core Loss	40.50	40.30
223.20	225.35	2.15	Siltstone, black, massive Fresh, rare (<1 %) calcite in veins	40.30	38.15
225.35	225.55	0.20	Siltstone, black, massive Fresh, rare (<1 %) calcite in veins	38.15	37.95
225.55	225.85	0.30	Coal, interbanded dull and bright bands(40-60%), black, common (15-40 %) carbonate concentrated at top	37.95	37.65
225.85	226.05	0.20	Sandstone and Siltstone, dark grey, laminated bands Fresh, 20 dip	37.65	37.45
226.05	229.23	3.18	Sandstone and Siltstone, dark grey, laminated bands Fresh, 20 dip	37.45	34.27
229.23	233.78	4.55	Siltstone, black, coaly bands Fresh, rare (<1 %) carbonate concentrated at base	34.27	29.72
233.78	233.98	0.20	Siltstone, black, coaly bands Fresh, rare (<1 %) carbonate concentrated at base	29.72	29.52
233.98	234.64	0.66	Coal, interbanded dull and bright bands(40-60%), black, Fresh, rare (<1 %) carbonate clasts	29.52	28.86
234.64	234.84	0.20	Siltstone, black, coaly bands Fresh, abundant (40-60 %) carbonate infilling fault discontinuities	28.86	28.66
234.84	242.83	7.99	Siltstone, black, coaly bands Fresh, abundant (40-60 %) carbonate infilling fault discontinuities	28.66	20.67
242.83	243.03	0.20	Siltstone, black, coaly bands Fresh, abundant (40-60 %) carbonate infilling fault discontinuities	20.67	20.47
243.03	243.25	0.22	Coal, bright (>90%)	20.47	20.25
243.25	245.35	2.10	Sandstone and Siltstone, dark grey, coaly bands Fresh, 35 dip, abundant (40-60 %) carbonate bands	20.25	18.15
245.35	245.55	0.20	Sandstone and Siltstone, dark grey, coaly bands Fresh, 35 dip, abundant (40-60 %) carbonate bands	18.15	17.95
245.55	246.19	0.64	Coal, dull (<1%), black, coaly bands Fresh, rare (<1 %) carbonate in veins	17.95	17.31
246.19	246.39	0.20	Sandstone and Siltstone, dark grey, Fault Breccia bands Fresh, 30 dip, abundant (40-60 %) carbonate bands	17.31	17.11
246.39	254.30	7.91	Sandstone and Siltstone, dark grey, Fault Breccia bands Fresh, 30 dip, abundant (40-60 %) carbonate bands	17.11	9.20
254.30	254.40	0.10	Coal, interbanded dull and bright bands(40-60%), black	9.20	9.10
254.40	263.50	9.10	Sandstone and Siltstone, dark grey, laminated bands Fresh, 45 dip, minor (1-15 %) carbonate in veins	9.10	0.00

Hole: DHPN-16-03

Hole Summary

Hole Type: Fully cored

Location

Site:	PE	Lease:	
Easting:	524569.69	Accuracy:	Surveyed
Northing:	6300240.65	Geodetic Datum:	Universal Transverse Mercator
		UTM Zone:	9
Elevation:	1411.28	Height Datum:	
Survey Company:	CENTURY WIRELINE	Survey Date:	October-11-16

Comments

Geologists

Depth	Geologist

Drilling

Date Commenced:	October-07-16	Geological Org.:	
Date Completed:	October-11-16	Total Depth:	326
Drilling Company			

Run No.	Recovered	Depth	Drill Co	Rig No	Rig Type	Bit Type	Hole Size	Drill Fluid
1	1.18	2.00	DRIFTWOOD DRILLING	30	RS3000			
2	2.70	5.00						
3	2.23	8.00						
4	2.87	11.00						
5	1.35	14.00						
6	1.40	17.00						
7	2.86	20.00						
8	1.80	23.00						
9	2.90	26.00						
10	2.51	29.00						
11	1.75	32.00						
12	3.00	35.00						
13	2.90	38.00						
14	3.00	41.00						
15	3.00	44.00						
16	3.00	47.00						
17	3.00	50.00						
18	3.00	53.00						
19	2.90	56.00						
20	1.30	57.30						
21	1.50	59.00						
22	2.83	62.00						
23	3.00	65.00						

Run No.	Recovered	Depth	Drill Co	Rig No	Rig Type	Bit Type	Hole Size	Drill Fluid
24	3.00	68.00						
25	2.74	71.00						
26	3.00	74.00						
27	3.00	77.00						
28	3.00	80.00						
29	3.00	83.00						
30	3.00	86.00						
31	3.00	89.00						
32	3.00	92.00						
33	3.00	95.00						
34	3.00	98.00						
35	2.87	101.00						
36	3.00	104.00						
37	2.95	107.00						
38	3.00	110.00						
39	3.00	113.00						
40	2.64	116.00						
41	3.00	119.00						
42	3.00	122.00						
43	2.80	125.00						
44	3.00	128.00						
45	2.68	131.00						
46	3.00	134.00						
47	3.00	137.00						
48	3.00	140.00						
49	3.00	143.00						
50	3.00	146.00						
51	2.40	148.40						
52	3.00	151.40						
53	3.00	153.00						
54	1.00	154.00						
55	2.84	157.00						
56	3.00	160.00						
57	3.00	163.00						
58	2.82	166.00						
59	3.00	169.00						
60	3.00	172.00						
61	2.50	174.50						
62	0.50	175.00						
63	2.90	178.00						
64	2.90	181.00						
65	3.00	184.00						
66	3.00	187.00						
67	3.00	190.00						
68	3.00	193.00						
69	3.00	196.00						
70	2.96	199.00						
71	3.00	202.00						
72	3.00	205.00						
73	3.00	208.00						
74	3.00	211.00						
75	2.40	213.40						
76	3.10	216.50						

Run No.	Recovered	Depth	Drill Co	Rig No	Rig Type	Bit Type	Hole Size	Drill Fluid
77	3.10	219.60						
78	3.10	222.70						
79	3.10	225.80						
80	3.10	228.90						
81	3.10	232.00						
82	3.00	235.00						
83	3.00	238.00						
84	3.00	241.00						
85	3.00	244.00						
86	3.00	247.00						
87	2.80	250.00						
88	3.00	253.00						
89	3.00	256.00						
90	3.00	259.00						
91	3.00	262.00						
92	3.00	265.00						
93	3.00	268.00						
94	3.00	271.00						
95	3.00	274.00						
96	3.00	277.00						
97	2.85	280.00						
98	3.00	283.00						
99	3.00	286.00						
100	3.00	289.00						
101	2.75	292.00						
102	3.00	295.00						
103	3.00	298.00						
104	3.00	301.00						
105	3.00	304.00						
106	3.00	307.00						
107	3.00	310.00						
108	3.00	313.00						
109	3.00	316.00						
110	2.85	319.00						
111	2.88	322.00						
112	2.88	325.00						
113	1.00	326.00						

Casing

Depth	Type	Size	Recovered
6.00			6.00
7.50			1.50
8.10			0.60

Cementing

From Depth	To Depth	Date	Volume

Geophysics

Acoustic Scanner	☐
Caliper	☒
Density	☒
Dipmeter	☐
Natural Gamma	☒
Neutron	☒
Resistivity	☒
Sonic	☐
Temperature	☐

Formation/Horizon Summary

Formation/Horizon	From	To	Thickness	RL From	RL To

Seam Summary

Seam	From	To	Thickness	RL From	RL To

Lithology

From	To	Thick	Description	RL From	RL To
0.00	0.82	0.82	Core Loss	1,411.28	1,410.46
0.82	2.00	1.18	Sandstone, Fine to medium grained, grey, massive Weathered	1,410.46	1,409.28
2.00	2.30	0.30	Core Loss	1,409.28	1,408.98
2.30	5.55	3.25	Sandstone, Fine to medium grained, grey, massive Weathered	1,408.98	1,405.73
5.55	6.20	0.65	Sandstone and Siltstone, grey, laminated Weathered	1,405.73	1,405.08
6.20	6.97	0.77	Core Loss	1,405.08	1,404.31
6.97	10.78	3.81	Sandstone and Siltstone, grey, laminated Weathered	1,404.31	1,400.50
10.78	11.55	0.77	Siltstone, dark grey, massive Fresh	1,400.50	1,399.73
11.55	11.67	0.12	Coal, dull with minor bright bands (1-10%), black, Siltstone bands	1,399.73	1,399.61
11.67	12.23	0.56	Siltstone, dark grey, coaly bands	1,399.61	1,399.05
12.23	12.43	0.20	Siltstone, dark grey, massive Fresh	1,399.05	1,398.85
12.43	13.83	1.40	Core Loss, Lost coal	1,398.85	1,397.45
13.83	14.33	0.50	Coal, bright (>90%), black	1,397.45	1,396.95
14.33	14.73	0.40	Core Loss, Lost coal	1,396.95	1,396.55
14.73	15.27	0.54	Coaly Mudstone, black, coaly bands Fresh	1,396.55	1,396.01
15.27	15.59	0.32	Coaly Mudstone, black, massive Fresh	1,396.01	1,395.69
15.59	16.82	1.23	Core Loss	1,395.69	1,394.46
16.82	16.96	0.14	Core Loss	1,394.46	1,394.32
16.96	18.88	1.92	Siltstone, dark grey, massive Fresh, pyrite in blebs	1,394.32	1,392.40
18.88	19.08	0.20	Siltstone, dark grey, massive Fresh	1,392.40	1,392.20
19.08	19.31	0.23	Coal, bright (>90%), black, carbonate in cleat	1,392.20	1,391.97
19.31	19.62	0.31	Coal, mainly dull with frequent bright bands (10-40%), black, Mudstone bands	1,391.97	1,391.66
19.62	19.82	0.20	Siltstone, black, massive Fresh	1,391.66	1,391.46
19.82	21.80	1.98	Carbonaceous Mudstone, black, coaly bands	1,391.46	1,389.48
21.80	23.00	1.20	Core Loss	1,389.48	1,388.28
23.00	23.35	0.35	Mudstone, black, massive Fresh	1,388.28	1,387.93
23.35	25.48	2.13	Siltstone, black, laminated Fresh, 10 dip	1,387.93	1,385.80
25.48	25.68	0.20	Carbonaceous Mudstone, black	1,385.80	1,385.60
25.68	25.88	0.20	Coal, bright (>90%), black	1,385.60	1,385.40
25.88	26.02	0.14	Core Loss, Lost coal	1,385.40	1,385.26
26.02	26.27	0.25	Coal, interbanded dull and bright bands(40-60%), black	1,385.26	1,385.01
26.27	26.35	0.08	Coal, dull (<1%), black, Mudstone bands	1,385.01	1,384.93
26.35	26.57	0.22	Core Loss, Lost coal	1,384.93	1,384.71
26.57	26.77	0.20	Sandstone and Siltstone, dark grey, massive Fresh	1,384.71	1,384.51
26.77	33.17	6.40	Sandstone and Siltstone, dark grey, laminated Fresh, 10 dip	1,384.51	1,378.11
33.17	34.85	1.68	Sandstone, Fine to medium grained, bedded Fresh, 10 dip	1,378.11	1,376.43
34.85	35.28	0.43	Sandstone and Siltstone, dark grey, massive Fresh	1,376.43	1,376.00
35.28	35.38	0.10	Core Loss	1,376.00	1,375.90
35.38	35.42	0.04	Coal, bright (>90%)	1,375.90	1,375.86
35.42	37.40	1.98	Sandstone and Siltstone, laminated Fresh, 10 dip	1,375.86	1,373.88
37.40	38.60	1.20	Sandstone, Fine to medium grained, grey	1,373.88	1,372.68
38.60	43.15	4.55	Sandstone and Siltstone, dark grey, laminated Fresh, 10 dip	1,372.68	1,368.13
43.15	46.19	3.04	Sandstone, Fine to medium grained, grey, massive Fresh	1,368.13	1,365.09
46.19	53.50	7.31	Sandstone and Siltstone, grey, laminated Fresh, 10 dip	1,365.09	1,357.78
53.50	54.10	0.60	Siltstone, massive Fresh	1,357.78	1,357.18

From	To	Thick	Description	RL From	RL To
54.10	54.20	0.10	Core Loss	1,357.18	1,357.08
54.20	57.13	2.93	Siltstone, black, massive Fresh, pyrite concentrated at base	1,357.08	1,354.15
57.13	57.33	0.20	Siltstone, black, massive Fresh, pyrite concentrated at base	1,354.15	1,353.95
57.33	57.41	0.08	Core Loss, Lost coal, Fresh	1,353.95	1,353.87
57.41	57.82	0.41	Coal, bright (>90%), black, massive Fresh	1,353.87	1,353.46
57.82	58.02	0.20	Carbonaceous Mudstone, black, massive coaly Fresh	1,353.46	1,353.26
58.02	58.50	0.48	Carbonaceous Mudstone, black, massive coaly Fresh	1,353.26	1,352.78
58.50	58.70	0.20	Carbonaceous Mudstone, black, massive	1,352.78	1,352.58
58.70	58.83	0.13	Carbonaceous Mudstone, black, massive coaly Fresh	1,352.58	1,352.45
58.83	58.95	0.12	Core Loss, Lost coal	1,352.45	1,352.33
58.95	59.07	0.12	Carbonaceous Mudstone, black, massive	1,352.33	1,352.21
59.07	59.43	0.36	Coal, bright with dull bands (60-90%), black, rare (<1 %) carbonate in cleat	1,352.21	1,351.85
59.43	59.73	0.30	Core Loss, Lost coal	1,351.85	1,351.55
59.73	59.94	0.21	Coaly Mudstone, black	1,351.55	1,351.34
59.94	60.09	0.15	Coal, bright (>90%), black	1,351.34	1,351.19
60.09	60.29	0.20	Carbonaceous Mudstone, black, bands coaly	1,351.19	1,350.99
60.29	60.52	0.23	Carbonaceous Mudstone, black, bands coaly	1,350.99	1,350.76
60.52	60.94	0.42	Coal, bright (>90%), black	1,350.76	1,350.34
60.94	62.73	1.79	Carbonaceous Mudstone, black	1,350.34	1,348.55
62.73	66.95	4.22	Sandstone and Siltstone, dark grey, laminated	1,348.55	1,344.33
66.95	68.43	1.48	Carbonaceous Mudstone, black	1,344.33	1,342.85
68.43	68.69	0.26	Core Loss	1,342.85	1,342.59
68.69	68.88	0.19	Coal, bright (>90%)	1,342.59	1,342.40
68.88	69.62	0.74	Carbonaceous Mudstone, black, Fresh	1,342.40	1,341.66
69.62	70.66	1.04	Coaly Siltstone, black, bands coaly Fresh	1,341.66	1,340.62
70.66	71.03	0.37	Carbonaceous Mudstone, black, Fresh	1,340.62	1,340.25
71.03	72.06	1.03	Sandstone and Siltstone, grey, laminated immature/intermixed Fresh, 10 dip	1,340.25	1,339.22
72.06	72.17	0.11	Coal, bright (>90%), black, Fresh	1,339.22	1,339.11
72.17	72.32	0.15	Coaly Mudstone, black	1,339.11	1,338.96
72.32	82.75	10.43	Sandstone and Siltstone, Fine to medium grained, grey, massive	1,338.96	1,328.53
82.75	83.01	0.26	Coal, bright (>90%), black, calcite bands	1,328.53	1,328.27
83.01	83.45	0.44	Carbonaceous Mudstone, black	1,328.27	1,327.83
83.45	86.60	3.15	Sandstone and Siltstone, dark grey, laminated immature/intermixed Fresh, 10 dip	1,327.83	1,324.68
86.60	89.69	3.09	Sandstone, Fine to medium grained, grey, Siltstone immature/intermixed Fresh, 10 dip	1,324.68	1,321.59
89.69	90.00	0.31	Carbonaceous Mudstone, black, carbonate laminae	1,321.59	1,321.28
90.00	92.10	2.10	Sandstone and Siltstone, dark grey, laminated immature/intermixed Fresh, 10 dip	1,321.28	1,319.18
92.10	94.04	1.94	Sandstone, Fine to medium grained, grey, laminated immature/intermixed Fresh	1,319.18	1,317.24
94.04	98.70	4.66	Sandstone and Siltstone, dark grey, laminated Fresh, 10 dip, pyrite concentrated at base	1,317.24	1,312.58
98.70	98.94	0.24	Sandstone and Siltstone, dark grey, laminated Fresh, 10 dip, pyrite concentrated at base	1,312.58	1,312.34
98.94	99.04	0.10	Core Loss, Lost coal	1,312.34	1,312.24
99.04	99.27	0.23	Coal, bright with dull bands (60-90%), black, carbonate concentrated at top	1,312.24	1,312.01

From	To	Thick	Description	RL From	RL To
99.27	99.69	0.42	Carbonaceous Mudstone, black, Fresh, carbonate concentrated at base	1,312.01	1,311.59
99.69	100.72	1.03	Coaly Siltstone, black, bands coaly Fresh	1,311.59	1,310.56
100.72	106.94	6.22	Sandstone and Siltstone, dark grey, laminated immature/intermixed Fresh, 10 dip, carbonate laminae	1,310.56	1,304.34
106.94	107.12	0.18	Coaly Mudstone, black, coaly laminae Fresh, pyrite concentrated at base	1,304.34	1,304.16
107.12	107.32	0.20	Coaly Mudstone, black, coaly laminae Fresh, pyrite concentrated at base	1,304.16	1,303.96
107.32	107.73	0.41	Coal, bright (>90%), black	1,303.96	1,303.55
107.73	107.95	0.22	Coal, interbanded dull and bright bands(40-60%), black, Siltstone bands	1,303.55	1,303.33
107.95	108.15	0.20	Coaly Siltstone, black, coaly bands	1,303.33	1,303.13
108.15	108.26	0.11	Coaly Siltstone, black, coaly bands	1,303.13	1,303.02
108.26	109.08	0.82	Siltstone	1,303.02	1,302.20
109.08	110.00	0.92	Sandstone and Siltstone	1,302.20	1,301.28
110.00	111.74	1.74	Sandstone, Fine to medium grained, grey, Siltstone bands Fresh, 10 dip	1,301.28	1,299.54
111.74	113.25	1.51	Sandstone and Siltstone, dark grey	1,299.54	1,298.03
113.25	113.74	0.49	Carbonaceous Mudstone, black	1,298.03	1,297.54
113.74	114.10	0.36	Core Loss	1,297.54	1,297.18
114.10	114.18	0.08	Core Loss, Lost coal	1,297.18	1,297.10
114.18	114.61	0.43	Coal, bright (>90%)	1,297.10	1,296.67
114.61	114.81	0.20	Carbonaceous Mudstone, black, carbonate concentrated at top	1,296.67	1,296.47
114.81	115.68	0.87	Siltstone, dark grey	1,296.47	1,295.60
115.68	116.00	0.32	Siltstone, dark grey	1,295.60	1,295.28
116.00	117.00	1.00	Siltstone, dark grey	1,295.28	1,294.28
117.00	118.20	1.20	Carbonaceous Mudstone, black, coaly bands	1,294.28	1,293.08
118.20	118.48	0.28	Coaly Mudstone, black, coaly bands pyrite concentrated at top	1,293.08	1,292.80
118.48	123.01	4.53	Siltstone, dark grey, carbonate crystals	1,292.80	1,288.27
123.01	123.20	0.19	Coaly Mudstone, black, carbonate concentrated at base	1,288.27	1,288.08
123.20	123.44	0.24	Coaly Mudstone, black, carbonate concentrated at base	1,288.08	1,287.84
123.44	123.54	0.10	Core Loss, Lost coal	1,287.84	1,287.74
123.54	123.95	0.41	Coal, bright (>90%), black	1,287.74	1,287.33
123.95	124.37	0.42	Coaly Mudstone, black, coaly bands 10 dip, pyrite bands	1,287.33	1,286.91
124.37	125.02	0.65	Coaly Mudstone, black, coaly bands 10 dip, pyrite bands	1,286.91	1,286.26
125.02	125.43	0.41	Siltstone, black	1,286.26	1,285.85
125.43	127.11	1.68	Sandstone and Siltstone, dark grey	1,285.85	1,284.17
127.11	155.19	28.08	Sandstone, Fine to medium grained, grey, massive 10 dip	1,284.17	1,256.09
155.19	155.35	0.16	Core Loss	1,256.09	1,255.93
155.35	158.96	3.61	Sandstone, Fine to medium grained, grey, massive Siltstone bands 10 dip	1,255.93	1,252.32
158.96	163.73	4.77	Sandstone and Siltstone, dark grey, laminated 10 dip	1,252.32	1,247.55
163.73	164.39	0.66	Siltstone, black, massive rare (<1 %) pyrite in blebs	1,247.55	1,246.89
164.39	164.59	0.20	Coaly Mudstone, black, minor (1-15 %) pyrite in blebs	1,246.89	1,246.69
164.59	164.69	0.10	Core Loss, Lost coal	1,246.69	1,246.59
164.69	164.95	0.26	Coal, bright with dull bands (60-90%)	1,246.59	1,246.33
164.95	165.50	0.55	Coaly Mudstone, black, coaly bands	1,246.33	1,245.78
165.50	165.76	0.26	Coaly Mudstone, black, coaly bands	1,245.78	1,245.52
165.76	167.37	1.61	Siltstone, black	1,245.52	1,243.91

From	To	Thick	Description	RL From	RL To
167.37	169.86	2.49	Sandstone and Siltstone, dark grey, laminated 10 dip, pyrite concentrated at base	1,243.91	1,241.42
169.86	170.06	0.20	Coaly Siltstone, black, coaly bands	1,241.42	1,241.22
170.06	172.06	2.00	Siltstone, black	1,241.22	1,239.22
172.06	174.69	2.63	Sandstone and Siltstone, dark grey, laminated 10 dip	1,239.22	1,236.59
174.69	179.06	4.37	Sandstone, Medium grained, grey, massive Siltstone bands 15 dip	1,236.59	1,232.22
179.06	179.16	0.10	Core Loss	1,232.22	1,232.12
179.16	194.77	15.61	Sandstone and Siltstone, grey, laminated Siltstone bands Fresh, 15 dip, carbonate concentrated at base	1,232.12	1,216.51
194.77	197.18	2.41	Siltstone, black, pyrite in blebs	1,216.51	1,214.10
197.18	199.36	2.18	Carbonaceous Mudstone, black, coaly bands pyrite concentrated at base	1,214.10	1,211.92
199.36	199.60	0.24	Carbonaceous Mudstone, black, coaly bands pyrite concentrated at base	1,211.92	1,211.68
199.60	199.65	0.05	Core Loss, Lost coal	1,211.68	1,211.63
199.65	199.97	0.32	Coal, bright (>90%)	1,211.63	1,211.31
199.97	200.45	0.48	Coal, bright with dull bands (60-90%)	1,211.31	1,210.83
200.45	200.65	0.20	Coaly Siltstone, black, coaly bands pyrite bands	1,210.83	1,210.63
200.65	200.89	0.24	Coaly Siltstone, black, coaly bands pyrite bands	1,210.63	1,210.39
200.89	203.10	2.21	Carbonaceous Mudstone, black, coaly bands carbonate concentrated at top	1,210.39	1,208.18
203.10	204.01	0.91	Siltstone, dark grey, coaly laminated	1,208.18	1,207.27
204.01	208.18	4.17	Sandstone and Siltstone, dark grey, laminated carbonate bands	1,207.27	1,203.10
208.18	209.08	0.90	Carbonaceous Mudstone, black, carbonate concentrated at top	1,203.10	1,202.20
209.08	209.18	0.10	Coal, bright (>90%)	1,202.20	1,202.10
209.18	209.48	0.30	Carbonaceous Mudstone, black, carbonate bands	1,202.10	1,201.80
209.48	214.22	4.74	Siltstone, dark grey, pyrite bands	1,201.80	1,197.06
214.22	214.42	0.20	Siltstone, dark grey, pyrite bands	1,197.06	1,196.86
214.42	215.04	0.62	Coal, bright (>90%), rare (<1 %) carbonate concentrated at base	1,196.86	1,196.24
215.04	215.24	0.20	Siltstone, black, coaly bands carbonate bands	1,196.24	1,196.04
215.24	218.44	3.20	Siltstone, black, coaly bands carbonate bands	1,196.04	1,192.84
218.44	218.68	0.24	Sandstone and Siltstone, dark grey, laminated	1,192.84	1,192.60
218.68	228.50	9.82	Sandstone, Fine to medium grained, grey, Siltstone bands carbonate bands	1,192.60	1,182.78
228.50	232.18	3.68	Sandstone and Siltstone, dark grey, laminated	1,182.78	1,179.10
232.18	235.22	3.04	Sandstone, Fine to medium grained, grey, Siltstone bands	1,179.10	1,176.06
235.22	236.06	0.84	Siltstone, dark grey, coaly bands carbonate concentrated at top	1,176.06	1,175.22
236.06	245.72	9.66	Sandstone and Siltstone, dark grey, laminated	1,175.22	1,165.56
245.72	246.29	0.57	Siltstone, black, carbonate infilling fault discontinuities	1,165.56	1,164.99
246.29	248.93	2.64	Sandstone and Siltstone, dark grey, laminated	1,164.99	1,162.35
248.93	249.13	0.20	Core Loss	1,162.35	1,162.15
249.13	249.58	0.45	Coaly Siltstone, black, coaly bands	1,162.15	1,161.70
249.58	249.74	0.16	Siltstone, black	1,161.70	1,161.54
249.74	250.42	0.68	Sandstone and Siltstone	1,161.54	1,160.86
250.42	253.33	2.91	Sandstone, Fine to medium grained, dark grey, massive Siltstone bands	1,160.86	1,157.95
253.33	256.58	3.25	Sandstone and Siltstone, dark grey, laminated 10 dip	1,157.95	1,154.70

From	To	Thick	Description	RL From	RL To
256.58	259.22	2.64	Sandstone, Fine to medium grained, grey, Siltstone bands	1,154.70	1,152.06
259.22	260.39	1.17	Sandstone and Siltstone, dark grey, laminated 5 dip	1,152.06	1,150.89
260.39	264.19	3.80	Sandstone, Fine to medium grained, grey, massive 5 dip	1,150.89	1,147.09
264.19	265.70	1.51	Sandstone and Siltstone, dark grey, laminated 10 dip, carbonate concentrated at top	1,147.09	1,145.58
265.70	265.95	0.25	Siltstone, black, massive carbonate concentrated at top	1,145.58	1,145.33
265.95	266.15	0.20	Siltstone, black, massive carbonate concentrated at top	1,145.33	1,145.13
266.15	266.51	0.36	Coal, bright with dull bands (60-90%), carbonate concentrated at top	1,145.13	1,144.77
266.51	266.71	0.20	Siltstone, black, coaly bands pyrite in blebs	1,144.77	1,144.57
266.71	268.47	1.76	Siltstone	1,144.57	1,142.81
268.47	268.67	0.20	Siltstone	1,142.81	1,142.61
268.67	268.97	0.30	Coal, bright (>90%), carbonate disseminated	1,142.61	1,142.31
268.97	269.17	0.20	Siltstone, black, coaly bands pyrite in blebs	1,142.31	1,142.11
269.17	269.89	0.72	Siltstone, black, coaly bands pyrite in blebs	1,142.11	1,141.39
269.89	270.06	0.17	Siltstone, black, coaly bands	1,141.39	1,141.22
270.06	272.54	2.48	Sandstone and Siltstone, dark grey, laminated 10 dip	1,141.22	1,138.74
272.54	277.47	4.93	Sandstone, Fine to medium grained, grey, massive Siltstone bands 10 dip	1,138.74	1,133.81
277.47	280.26	2.79	Siltstone, black	1,133.81	1,131.02
280.26	280.37	0.11	Coaly Siltstone, black	1,131.02	1,130.91
280.37	280.57	0.20	Coaly Siltstone, black	1,130.91	1,130.71
280.57	280.67	0.10	Core Loss, Lost coal	1,130.71	1,130.61
280.67	281.02	0.35	Coal, dull with minor bright bands (1-10%), black, carbonate disseminated	1,130.61	1,130.26
281.02	281.22	0.20	Siltstone	1,130.26	1,130.06
281.22	283.06	1.84	Siltstone, black	1,130.06	1,128.22
283.06	283.84	0.78	Sandstone and Siltstone, dark grey, laminated 10 dip	1,128.22	1,127.44
283.84	285.41	1.57	Sandstone, Fine to medium grained, grey, massive	1,127.44	1,125.87
285.41	289.37	3.96	Fault Gouge, black	1,125.87	1,121.91
289.37	290.81	1.44	Sandstone, Fine to medium grained, grey, massive	1,121.91	1,120.47
290.81	291.06	0.25	Core Loss	1,120.47	1,120.22
291.06	294.28	3.22	Sandstone, Fine to medium grained, grey, massive	1,120.22	1,117.00
294.28	297.12	2.84	Siltstone, black, carbonate concentrated at top	1,117.00	1,114.16
297.12	297.42	0.30	Coal, bright (>90%)	1,114.16	1,113.86
297.42	298.45	1.03	Siltstone	1,113.86	1,112.83
298.45	310.83	12.38	Sandstone and Siltstone, dark grey, laminated	1,112.83	1,100.45
310.83	311.02	0.19	Sandstone and Siltstone, dark grey, laminated	1,100.45	1,100.26
311.02	313.29	2.27	Siltstone, black	1,100.26	1,097.99
313.29	317.19	3.90	Sandstone, Fine to medium grained, grey, massive Siltstone bands 10 dip	1,097.99	1,094.09
317.19	317.39	0.20	Sandstone, Fine to medium grained, grey, massive Siltstone bands 10 dip	1,094.09	1,093.89
317.39	317.44	0.05	Core Loss, Lost coal	1,093.89	1,093.84
317.44	317.75	0.31	Coal, bright (>90%), rare (<1 %) carbonate in veins	1,093.84	1,093.53
317.75	317.95	0.20	Siltstone, black, carbonate disseminated	1,093.53	1,093.33
317.95	319.27	1.32	Siltstone, black, carbonate disseminated	1,093.33	1,092.01
319.27	321.88	2.61	Sandstone and Siltstone, dark grey, laminated	1,092.01	1,089.40
321.88	322.00	0.12	Core Loss	1,089.40	1,089.28

From	To	Thick	Description	RL From	RL To
322.00	324.88	2.88	Sandstone and Siltstone, dark grey, laminated	1,089.28	1,086.40
324.88	325.00	0.12	Core Loss	1,086.40	1,086.28
325.00	326.00	1.00	Sandstone and Siltstone, dark grey, laminated 10 dip	1,086.28	1,085.28

Hole: DHPN-16-04

Hole Summary

Hole Type: Fully cored

Location

Site:	PC	Lease:	
Easting:	526431.15	Accuracy:	Surveyed
Northing:	6301202.19	Geodetic Datum:	Universal Transverse Mercator
		UTM Zone:	9
Elevation:	1636.5	Height Datum:	
Survey Company:	CENTURY WIRELINE	Survey Date:	October-17-16

Comments

Geologists

Depth	Geologist

Drilling

Date Commenced:	October-12-16	Geological Org.:	
Date Completed:	October-17-16	Total Depth:	269
Drilling Company			

Run No.	Recovered	Depth	Drill Co	Rig No	Rig Type	Bit Type	Hole Size	Drill Fluid
1	0.39	2.00	DRIFTWOOD DRILLING	30	RS3000			
2	3.00	5.00						
3	3.00	8.00						
4	2.85	11.00						
5	2.10	13.10						
6	3.90	17.00						
7	3.00	20.00						
8	2.56	23.00						
9	3.00	26.00						
10	2.80	29.00						
11	2.95	32.00						
12	3.00	35.00						
13	2.77	38.00						
14	3.00	41.00						
15	3.00	44.00						
16	3.00	47.00						
17	3.00	50.00						
18	3.00	53.00						
19	2.85	56.00						
20	2.90	59.00						
21	2.79	62.00						
22	3.00	65.00						
23	3.00	68.00						

Run No.	Recovered	Depth	Drill Co	Rig No	Rig Type	Bit Type	Hole Size	Drill Fluid
24	3.00	71.00						
25	2.86	74.00						
26	3.00	77.00						
27	3.00	80.00						
28	2.95	83.00						
29	1.98	86.00						
30	2.18	89.00						
31	1.72	92.00						
32	2.34	95.00						
33	3.00	98.00						
34	3.00	101.00						
35	3.00	104.00						
36	3.00	107.00						
37	3.00	110.00						
38	3.00	111.50						
39	1.35	113.00						
40	3.00	116.00						
41	2.80	119.00						
42	2.44	122.00						
43	3.00	125.00						
44	3.00	128.00						
45	3.00	131.00						
46	3.00	134.00						
47	3.00	137.00						
48	3.00	140.00						
49	3.00	143.00						
50	2.72	146.00						
51	3.00	149.00						
52	3.00	152.00						
53	3.00	155.00						
54	2.90	158.00						
55	2.85	161.00						
56	3.00	164.00						
57	3.00	167.00						
58	3.00	170.00						
59	3.00	173.00						
60	2.85	176.00						
61	3.00	179.00						
62	3.00	182.00						
63	1.00	183.00						
64	1.83	185.00						
65	1.10	186.10						
66	1.90	188.00						
67	3.00	191.00						
68	2.90	194.00						
69	3.00	197.00						
70	2.78	200.00						
71	2.85	203.00						
72	1.30	204.50						
73	0.50	206.00						
74	2.68	209.00						
75	3.00	212.00						
76	2.75	215.00						

Run No.	Recovered	Depth	Drill Co	Rig No	Rig Type	Bit Type	Hole Size	Drill Fluid
77	3.00	218.00						
78	3.00	221.00						
79	3.00	224.00						
80	3.00	227.00						
81	3.00	230.00						
82	3.00	233.00						
83	3.00	236.00						
84	3.00	239.00						
85	3.00	242.00						
86	3.00	245.00						
87	3.00	248.00						
88	3.00	251.00						
89	2.90	254.00						
90	3.00	257.00						
91	3.00	260.00						
92	3.00	263.00						
93	3.00	266.00						
94	3.00	269.00						

Casing

Depth	Type	Size	Recovered
3.00			3.00

Cementing

From Depth	To Depth	Date	Volume

Geophysics

Acoustic Scanner	☐
Caliper	☒
Density	☒
Dipmeter	☐
Natural Gamma	☒
Neutron	☒
Resistivity	☒
Sonic	☐
Temperature	☐

Formation/Horizon Summary

Formation/Horizon	From	To	Thickness	RL From	RL To

Seam Summary

Seam	From	To	Thickness	RL From	RL To

Lithology

From	To	Thick	Description	RL From	RL To
0.00	1.61	1.61	Core Loss	1,636.50	1,634.89
1.61	10.85	9.24	Sandstone, Fine to medium grained, grey, Siltstone bands Weathered	1,634.89	1,625.65
10.85	11.00	0.15	Core Loss, Fresh	1,625.65	1,625.50
11.00	16.00	5.00	Sandstone, Fine to medium grained, grey, Siltstone bands Fresh	1,625.50	1,620.50
16.00	20.60	4.60	Sandstone and Siltstone, dark grey, laminated Fresh	1,620.50	1,615.90
20.60	20.80	0.20	Sandstone and Siltstone, dark grey, laminated Fresh	1,615.90	1,615.70
20.80	20.95	0.15	Coal, interbanded dull and bright bands(40-60%)	1,615.70	1,615.55
20.95	21.12	0.17	Core Loss, Lost coal	1,615.55	1,615.38
21.12	21.39	0.27	Core Loss	1,615.38	1,615.11
21.39	21.54	0.15	Coaly Mudstone, black, Fresh	1,615.11	1,614.96
21.54	24.29	2.75	Siltstone, black, coaly Fresh	1,614.96	1,612.21
24.29	27.14	2.85	Sandstone and Siltstone, dark grey, laminated Fresh	1,612.21	1,609.36
27.14	27.20	0.06	Coal, bright with dull bands (60-90%), black	1,609.36	1,609.30
27.20	27.69	0.49	Sandstone and Siltstone, dark grey, laminated Fresh	1,609.30	1,608.81
27.69	27.89	0.20	Sandstone and Siltstone, dark grey, laminated Fresh	1,608.81	1,608.61
27.89	28.05	0.16	Core Loss, Lost coal	1,608.61	1,608.45
28.05	28.23	0.18	Coal, bright (>90%), black, pyrite in blebs	1,608.45	1,608.27
28.23	28.43	0.20	Coaly Mudstone, black	1,608.27	1,608.07
28.43	29.42	0.99	Sandstone and Siltstone, dark grey, laminated Fresh, pyrite concentrated at base	1,608.07	1,607.08
29.42	29.47	0.05	Core Loss, Lost coal	1,607.08	1,607.03
29.47	29.72	0.25	Coal, interbanded dull and bright bands(40-60%)	1,607.03	1,606.78
29.72	30.57	0.85	Siltstone, black, Fresh	1,606.78	1,605.93
30.57	31.51	0.94	Sandstone and Siltstone, dark grey, laminated Fresh	1,605.93	1,604.99
31.51	32.38	0.87	Sandstone, Fine to medium grained, grey, massive Siltstone bands	1,604.99	1,604.12
32.38	36.33	3.95	Sandstone and Siltstone, dark grey, laminated Fresh, rare (<1 %) carbonate in veins	1,604.12	1,600.17
36.33	36.56	0.23	Core Loss	1,600.17	1,599.94
36.56	36.73	0.17	Coal, bright with dull bands (60-90%)	1,599.94	1,599.77
36.73	36.93	0.20	Coaly Mudstone, black, Fresh	1,599.77	1,599.57
36.93	38.80	1.87	Siltstone, black, Fresh	1,599.57	1,597.70
38.80	54.85	16.05	Sandstone and Siltstone, dark grey, laminated Siltstone bands Fresh	1,597.70	1,581.65
54.85	55.00	0.15	Core Loss	1,581.65	1,581.50
55.00	58.34	3.34	Sandstone and Siltstone, dark grey, laminated Siltstone bands Fresh, pyrite concentrated at base	1,581.50	1,578.16
58.34	58.44	0.10	Core Loss, Lost coal	1,578.16	1,578.06
58.44	58.86	0.42	Coal, bright (>90%), black	1,578.06	1,577.64
58.86	59.07	0.21	Core Loss, Lost coal	1,577.64	1,577.43
59.07	59.27	0.20	Coal, dull (<1%), black, pyrite concentrated at top	1,577.43	1,577.23
59.27	59.48	0.21	Coal, dull (<1%), black, pyrite concentrated at top	1,577.23	1,577.02
59.48	59.54	0.06	Coal, dull (<1%), black, pyrite concentrated at top	1,577.02	1,576.96
59.54	60.38	0.84	Siltstone, black, Fresh	1,576.96	1,576.12
60.38	62.48	2.10	Sandstone and Siltstone, dark grey, laminated Siltstone bands Fresh	1,576.12	1,574.02
62.48	63.80	1.32	Siltstone, black, massive Fresh	1,574.02	1,572.70
63.80	65.34	1.54	Sandstone and Siltstone, dark grey, laminated Fresh, carbonate concentrated at base	1,572.70	1,571.16

From	To	Thick	Description	RL From	RL To
65.34	65.77	0.43	Sandstone and Siltstone, dark grey, laminated Fresh, carbonate concentrated at base	1,571.16	1,570.73
65.77	65.80	0.03	Sandstone and Siltstone, dark grey, laminated Fresh, carbonate concentrated at base	1,570.73	1,570.70
65.80	66.40	0.60	Siltstone, dark grey, coaly bands Fresh	1,570.70	1,570.10
66.40	68.34	1.94	Sandstone and Siltstone, dark grey, laminated Fresh	1,570.10	1,568.16
68.34	68.55	0.21	Siltstone, black, Fresh, rare (<1 %) carbonate concentrated at top	1,568.16	1,567.95
68.55	68.68	0.13	Coal, interbanded dull and bright bands(40-60%)	1,567.95	1,567.82
68.68	68.97	0.29	Siltstone, black, Fresh	1,567.82	1,567.53
68.97	69.23	0.26	Coaly Siltstone, black, Fresh, pyrite concentrated at base	1,567.53	1,567.27
69.23	69.36	0.13	Coal, interbanded dull and bright bands(40-60%)	1,567.27	1,567.14
69.36	69.85	0.49	Coaly Siltstone, black, coaly bands Fresh	1,567.14	1,566.65
69.85	70.99	1.14	Siltstone, black, Fresh	1,566.65	1,565.51
70.99	72.00	1.01	Sandstone and Siltstone, dark grey, laminated Fresh	1,565.51	1,564.50
72.00	72.14	0.14	Core Loss	1,564.50	1,564.36
72.14	76.96	4.82	Sandstone and Siltstone, dark grey, laminated Fresh, pyrite in blebs	1,564.36	1,559.54
76.96	77.19	0.23	Siltstone, black, Fresh	1,559.54	1,559.31
77.19	77.29	0.10	Coaly Siltstone, black, coaly bands Fresh	1,559.31	1,559.21
77.29	77.35	0.06	Coal, bright with dull bands (60-90%)	1,559.21	1,559.15
77.35	77.47	0.12	Coaly Siltstone, black, coaly bands Fresh	1,559.15	1,559.03
77.47	79.42	1.95	Siltstone, black, Fresh, rare (<1 %) carbonate in veins	1,559.03	1,557.08
79.42	81.10	1.68	Sandstone and Siltstone, dark grey, laminated Sandstone bands Fresh	1,557.08	1,555.40
81.10	81.28	0.18	Coaly Siltstone, black, coaly bands Fresh	1,555.40	1,555.22
81.28	81.35	0.07	Coal, bright with dull bands (60-90%), carbonate bands	1,555.22	1,555.15
81.35	81.81	0.46	Coaly Siltstone, black, coaly bands Fresh, pyrite in blebs	1,555.15	1,554.69
81.81	81.86	0.05	Core Loss	1,554.69	1,554.64
81.86	82.08	0.22	Coaly Siltstone, black, coaly bands Fresh, pyrite in blebs	1,554.64	1,554.42
82.08	82.35	0.27	Coal, bright with dull bands (60-90%), carbonate in veins	1,554.42	1,554.15
82.35	83.18	0.83	Siltstone, black, Fresh	1,554.15	1,553.32
83.18	84.20	1.02	Core Loss	1,553.32	1,552.30
84.20	86.72	2.52	Sandstone, Fine to medium grained, grey, massive Fresh, minor (1-15 %) carbonate in veins	1,552.30	1,549.78
86.72	87.10	0.38	Sandstone, Fine to medium grained, grey, massive Fresh, minor (1-15 %) carbonate in veins	1,549.78	1,549.40
87.10	88.15	1.05	Sandstone, Fine to medium grained, grey, massive Fresh, minor (1-15 %) carbonate in veins	1,549.40	1,548.35
88.15	88.97	0.82	Core Loss	1,548.35	1,547.53
88.97	89.00	0.03	Sandstone and Siltstone, dark grey, massive Fresh	1,547.53	1,547.50
89.00	90.28	1.28	Core Loss	1,547.50	1,546.22
90.28	92.03	1.75	Sandstone, Fine to medium grained, grey, massive Fresh	1,546.22	1,544.47
92.03	92.69	0.66	Core Loss	1,544.47	1,543.81
92.69	92.99	0.30	Siltstone, black, Fresh	1,543.81	1,543.51
92.99	93.09	0.10	Coal, bright (>90%), carbonate concentrated at base	1,543.51	1,543.41
93.09	93.43	0.34	Coaly Siltstone, black, Fresh	1,543.41	1,543.07
93.43	93.93	0.50	Siltstone, black, Fresh	1,543.07	1,542.57
93.93	98.78	4.85	Sandstone and Siltstone, dark grey, laminated Fresh, 10 dip, rare (<1 %) carbonate in veins	1,542.57	1,537.72

From	To	Thick	Description	RL From	RL To
98.78	98.85	0.07	Coaly Siltstone, black, Fresh	1,537.72	1,537.65
98.85	98.93	0.08	Coal	1,537.65	1,537.57
98.93	100.58	1.65	Siltstone, black, Fresh	1,537.57	1,535.92
100.58	101.24	0.66	Sandstone and Siltstone, dark grey, Siltstone bands Fresh	1,535.92	1,535.26
101.24	106.51	5.27	Sandstone, Fine to medium grained, grey, massive Fresh	1,535.26	1,529.99
106.51	111.42	4.91	Sandstone and Siltstone, dark grey, laminated Fresh	1,529.99	1,525.08
111.42	111.57	0.15	Core Loss, Lost coal	1,525.08	1,524.93
111.57	111.72	0.15	Coal, bright (>90%)	1,524.93	1,524.78
111.72	115.32	3.60	Siltstone	1,524.78	1,521.18
115.32	118.68	3.36	Sandstone and Siltstone, dark grey, laminated Fresh	1,521.18	1,517.82
118.68	120.88	2.20	Siltstone, black, massive	1,517.82	1,515.62
120.88	121.02	0.14	Coal, bright with dull bands (60-90%)	1,515.62	1,515.48
121.02	121.37	0.35	Core Loss	1,515.48	1,515.13
121.37	121.58	0.21	Core Loss, Lost coal	1,515.13	1,514.92
121.58	121.64	0.06	Coaly Siltstone, black, Fresh, carbonate in veins	1,514.92	1,514.86
121.64	122.24	0.60	Siltstone, black, Fresh	1,514.86	1,514.26
122.24	125.00	2.76	Sandstone and Siltstone, dark grey, laminated Fresh	1,514.26	1,511.50
125.00	125.20	0.20	Coal, bright with dull bands (60-90%)	1,511.50	1,511.30
125.20	130.90	5.70	Siltstone, black, Fresh, rare (<1 %) carbonate in veins	1,511.30	1,505.60
130.90	132.88	1.98	Sandstone and Siltstone, dark grey, laminated Fresh	1,505.60	1,503.62
132.88	135.57	2.69	Siltstone, black, Fresh, carbonate in veins	1,503.62	1,500.93
135.57	136.36	0.79	Mudstone, dark grey, coaly bands Fresh	1,500.93	1,500.14
136.36	142.88	6.52	Siltstone, black, coaly bands Fresh, pyrite in blebs	1,500.14	1,493.62
142.88	143.08	0.20	Siltstone, black, coaly bands Fresh, pyrite in blebs	1,493.62	1,493.42
143.08	143.74	0.66	Coal, interbanded dull and bright bands(40-60%)	1,493.42	1,492.76
143.74	144.22	0.48	Coaly Siltstone, black, Fresh, minor (1-15 %) carbonate in veins	1,492.76	1,492.28
144.22	144.45	0.23	Core Loss, Lost coal	1,492.28	1,492.05
144.45	145.19	0.74	Coal, mainly dull with frequent bright bands (10-40%)	1,492.05	1,491.31
145.19	145.47	0.28	Coaly Siltstone, black, Fresh	1,491.31	1,491.03
145.47	146.68	1.21	Sandstone, Fine to medium grained, grey, massive Fresh	1,491.03	1,489.82
146.68	147.23	0.55	Sandstone and Siltstone, dark grey, laminated Fresh	1,489.82	1,489.27
147.23	155.73	8.50	Siltstone, dark grey, coaly bands Fresh, pyrite in blebs	1,489.27	1,480.77
155.73	155.94	0.21	Carbonaceous Mudstone, black, Fresh	1,480.77	1,480.56
155.94	156.04	0.10	Core Loss, Lost coal	1,480.56	1,480.46
156.04	156.13	0.09	Coal, mainly dull with frequent bright bands (10-40%)	1,480.46	1,480.37
156.13	156.23	0.10	Carbonaceous Mudstone, black, Fresh	1,480.37	1,480.27
156.23	158.50	2.27	Siltstone, black, coaly bands Fresh, minor (1-15 %) carbonate in veins	1,480.27	1,478.00
158.50	158.70	0.20	Siltstone, black, coaly bands Fresh, minor (1-15 %) carbonate in veins	1,478.00	1,477.80
158.70	159.00	0.30	Coal, bright (>90%)	1,477.80	1,477.50
159.00	159.44	0.44	Coal, bright (>90%)	1,477.50	1,477.06
159.44	159.49	0.05	Core Loss, Lost coal	1,477.06	1,477.01
159.49	159.55	0.06	Core Loss	1,477.01	1,476.95
159.55	160.52	0.97	Coaly Siltstone, black, Fresh	1,476.95	1,475.98
160.52	163.12	2.60	Sandstone and Siltstone, dark grey, laminated Fresh, rare (<1 %) carbonate in veins Sandstone and Siltstone	1,475.98	1,473.38
163.12	164.11	0.99	Siltstone, dark grey, coaly Fresh, rare (<1 %) carbonate in veins	1,473.38	1,472.39
164.11	164.78	0.67	Coaly Siltstone, black, Fresh	1,472.39	1,471.72

From	To	Thick	Description	RL From	RL To
164.78	166.00	1.22	Sandstone and Siltstone, dark grey, Fault Breccia Fresh, common (15-40 %) carbonate in veins	1,471.72	1,470.50
166.00	166.59	0.59	Sandstone and Siltstone, dark grey, Fresh, rare (<1 %) carbonate in veins	1,470.50	1,469.91
166.59	166.83	0.24	Coal, bright with dull bands (60-90%), minor (1-15 %) carbonate in veins	1,469.91	1,469.67
166.83	167.63	0.80	Siltstone, dark grey, Fresh, rare (<1 %) carbonate in veins	1,469.67	1,468.87
167.63	172.16	4.53	Sandstone and Siltstone, dark grey, laminated Fresh, rare (<1 %) carbonate in veins	1,468.87	1,464.34
172.16	173.12	0.96	Siltstone, black, Fresh	1,464.34	1,463.38
173.12	174.77	1.65	Sandstone and Siltstone, dark grey, laminated Fresh, rare (<1 %) carbonate in veins	1,463.38	1,461.73
174.77	174.92	0.15	Core Loss	1,461.73	1,461.58
174.92	184.47	9.55	Sandstone and Siltstone, dark grey, laminated Fresh, rare (<1 %) carbonate in veins	1,461.58	1,452.03
184.47	184.64	0.17	Core Loss	1,452.03	1,451.86
184.64	191.04	6.40	Sandstone and Siltstone, dark grey, laminated Fresh, rare (<1 %) carbonate in veins	1,451.86	1,445.46
191.04	191.14	0.10	Core Loss	1,445.46	1,445.36
191.14	199.62	8.48	Sandstone and Siltstone, dark grey, laminated Fresh, rare (<1 %) carbonate in veins	1,445.36	1,436.88
199.62	199.78	0.16	Siltstone, dark grey, massive	1,436.88	1,436.72
199.78	200.00	0.22	Core Loss	1,436.72	1,436.50
200.00	201.96	1.96	Siltstone, dark grey, massive pyrite concentrated at base	1,436.50	1,434.54
201.96	202.16	0.20	Siltstone, dark grey, massive pyrite concentrated at base	1,434.54	1,434.34
202.16	202.59	0.43	Coal, bright (>90%), black	1,434.34	1,433.91
202.59	202.95	0.36	Coal, interbanded dull and bright bands(40-60%), black	1,433.91	1,433.55
202.95	203.00	0.05	Core Loss, Lost coal	1,433.55	1,433.50
203.00	203.12	0.12	Coal, bright (>90%), black	1,433.50	1,433.38
203.12	203.27	0.15	Core Loss, Lost coal	1,433.38	1,433.23
203.27	203.39	0.12	Coaly Siltstone	1,433.23	1,433.11
203.39	203.53	0.14	Coaly Siltstone	1,433.11	1,432.97
203.53	204.56	1.03	Siltstone	1,432.97	1,431.94
204.56	205.02	0.46	Core Loss	1,431.94	1,431.48
205.02	205.52	0.50	Coal, dull with minor bright bands (1-10%)	1,431.48	1,430.98
205.52	206.01	0.49	Core Loss	1,430.98	1,430.49
206.01	206.16	0.15	Coal, dull (<1%)	1,430.49	1,430.34
206.16	206.39	0.23	Core Loss, Lost coal	1,430.34	1,430.11
206.39	211.84	5.45	Siltstone, black, coaly bands rare (<1 %) carbonate	1,430.11	1,424.66
211.84	212.04	0.20	Siltstone, black, coaly bands rare (<1 %) carbonate	1,424.66	1,424.46
212.04	212.57	0.53	Coal, bright with dull bands (60-90%), black, carbonate in cleat	1,424.46	1,423.93
212.57	212.68	0.11	Carbonaceous Mudstone, black	1,423.93	1,423.82
212.68	213.60	0.92	Siltstone, black, carbonate concentrated at base	1,423.82	1,422.90
213.60	213.80	0.20	Siltstone, black, carbonate concentrated at base	1,422.90	1,422.70
213.80	214.57	0.77	Coal, bright (>90%), black	1,422.70	1,421.93
214.57	214.77	0.20	Coaly Siltstone	1,421.93	1,421.73
214.77	215.00	0.23	Coaly Siltstone	1,421.73	1,421.50
215.00	217.11	2.11	Siltstone, black	1,421.50	1,419.39
217.11	220.00	2.89	Sandstone and Siltstone, dark grey, rare (<1 %) carbonate in veins	1,419.39	1,416.50

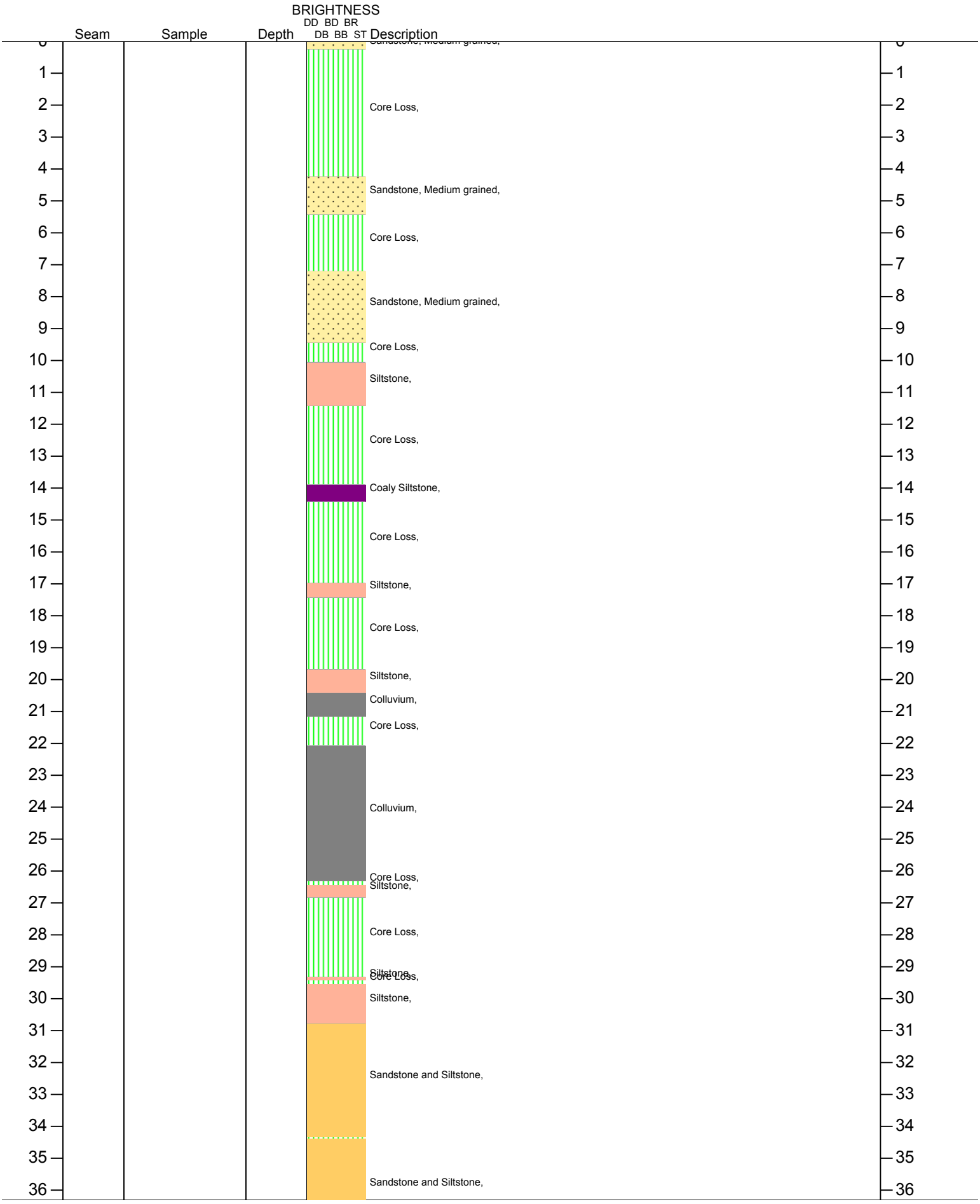
From	To	Thick	Description	RL From	RL To
220.00	220.70	0.70	Siltstone, black, rare (<1 %) carbonate in veins	1,416.50	1,415.80
220.70	224.71	4.01	Sandstone, Fine to medium grained, grey, Siltstone bands pyrite concentrated at base	1,415.80	1,411.79
224.71	232.94	8.23	Sandstone and Siltstone, dark grey, Fresh, 25 dip, rare (<1 %) carbonate in veins	1,411.79	1,403.56
232.94	233.14	0.20	Sandstone and Siltstone, dark grey, Fresh, 25 dip, rare (<1 %) carbonate in veins	1,403.56	1,403.36
233.14	234.03	0.89	Coal, dull (<1%), black	1,403.36	1,402.47
234.03	234.23	0.20	Sandstone and Siltstone, dark grey, massive	1,402.47	1,402.27
234.23	235.60	1.37	Sandstone and Siltstone, dark grey, massive	1,402.27	1,400.90
235.60	236.92	1.32	Sandstone, Fine to medium grained, grey, massive	1,400.90	1,399.58
236.92	239.45	2.53	Sandstone and Siltstone, dark grey, laminated	1,399.58	1,397.05
239.45	240.10	0.65	Carbonaceous Mudstone, black, coaly bands	1,397.05	1,396.40
240.10	241.17	1.07	Siltstone, black, Fresh	1,396.40	1,395.33
241.17	241.72	0.55	Sandstone and Siltstone, dark grey, laminated 15 dip	1,395.33	1,394.78
241.72	241.95	0.23	Carbonaceous Mudstone, black, coaly bands	1,394.78	1,394.55
241.95	249.71	7.76	Sandstone and Siltstone, dark grey, laminated Fresh, 15 dip	1,394.55	1,386.79
249.71	250.27	0.56	Carbonaceous Mudstone, black, coaly bands	1,386.79	1,386.23
250.27	252.87	2.60	Siltstone, black, rare (<1 %) pyrite bands	1,386.23	1,383.63
252.87	253.04	0.17	Coal, mainly dull with frequent bright bands (10-40%), black	1,383.63	1,383.46
253.04	253.60	0.56	Coaly Siltstone, black, coaly bands	1,383.46	1,382.90
253.60	254.29	0.69	Siltstone, black	1,382.90	1,382.21
254.29	257.16	2.87	Sandstone and Siltstone, dark grey, laminated Fresh	1,382.21	1,379.34
257.16	259.00	1.84	Sandstone, Fine to medium grained, grey, rare (<1 %) carbonate concentrated at top	1,379.34	1,377.50
259.00	260.11	1.11	Siltstone, black, rare (<1 %) bands	1,377.50	1,376.39
260.11	262.80	2.69	Sandstone and Siltstone, dark grey, laminated Fresh, rare (<1 %) carbonate concentrated at base	1,376.39	1,373.70
262.80	264.38	1.58	Carbonaceous Mudstone, black, Fresh, minor (1-15 %) in veins	1,373.70	1,372.12
264.38	264.90	0.52	Sandstone and Siltstone, dark grey, laminated Fresh	1,372.12	1,371.60
264.90	269.00	4.10	Sandstone, Fine to medium grained, grey, Siltstone bands Fresh, rare (<1 %) carbonate in veins	1,371.60	1,367.50

APPENDIX 2

Strip Logs

ATRUM COAL PANORAMA INC.
PANORAMA
HOLE DHPN-16-01
SCALE 1:50

GEOPHYSICAL PROFILE



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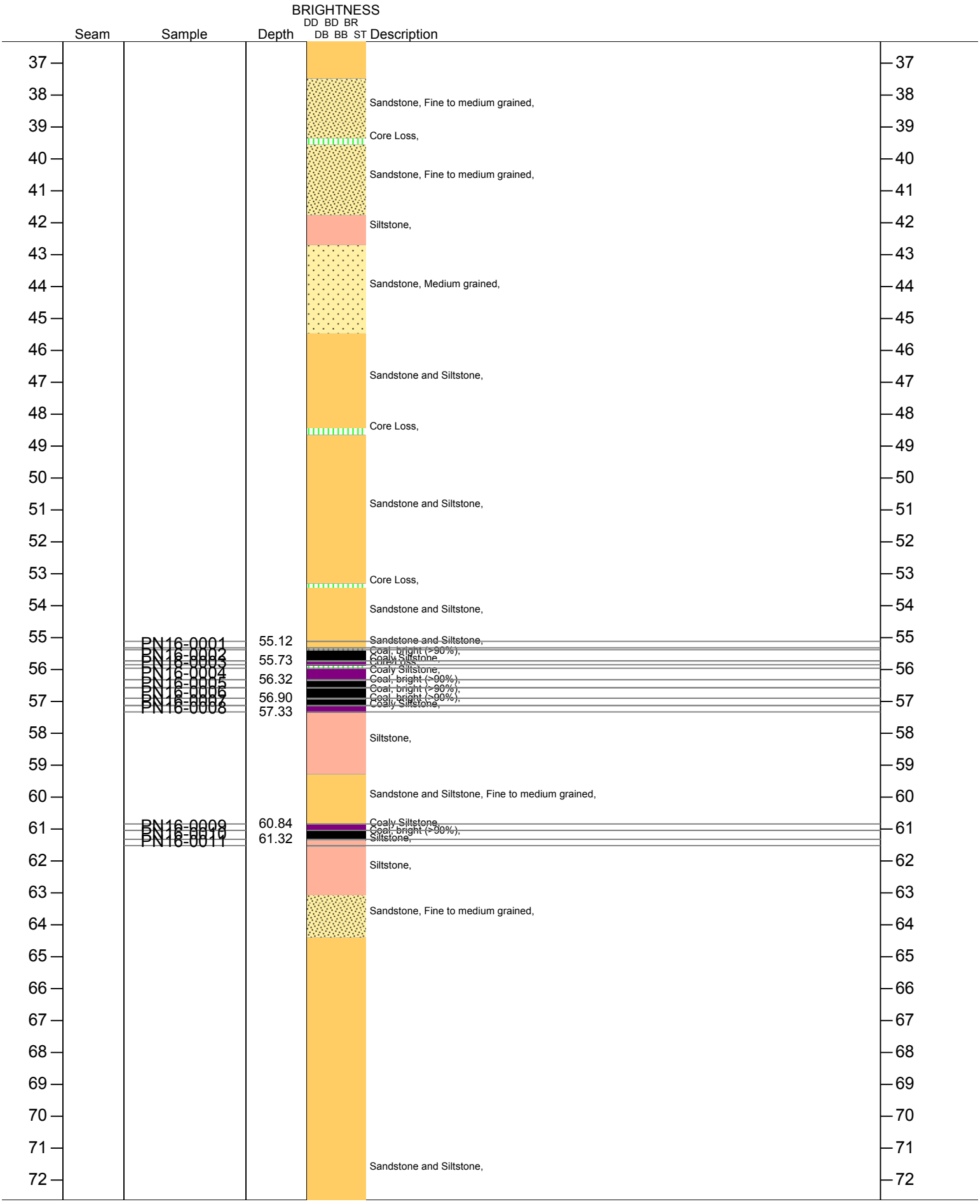
PANORAMA
HOLE DHPN-16-01
SCALE 1:50

GEOPHYSICAL PROFILE



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PANORAMA
HOLE DHPN-16-01
SCALE 1:50

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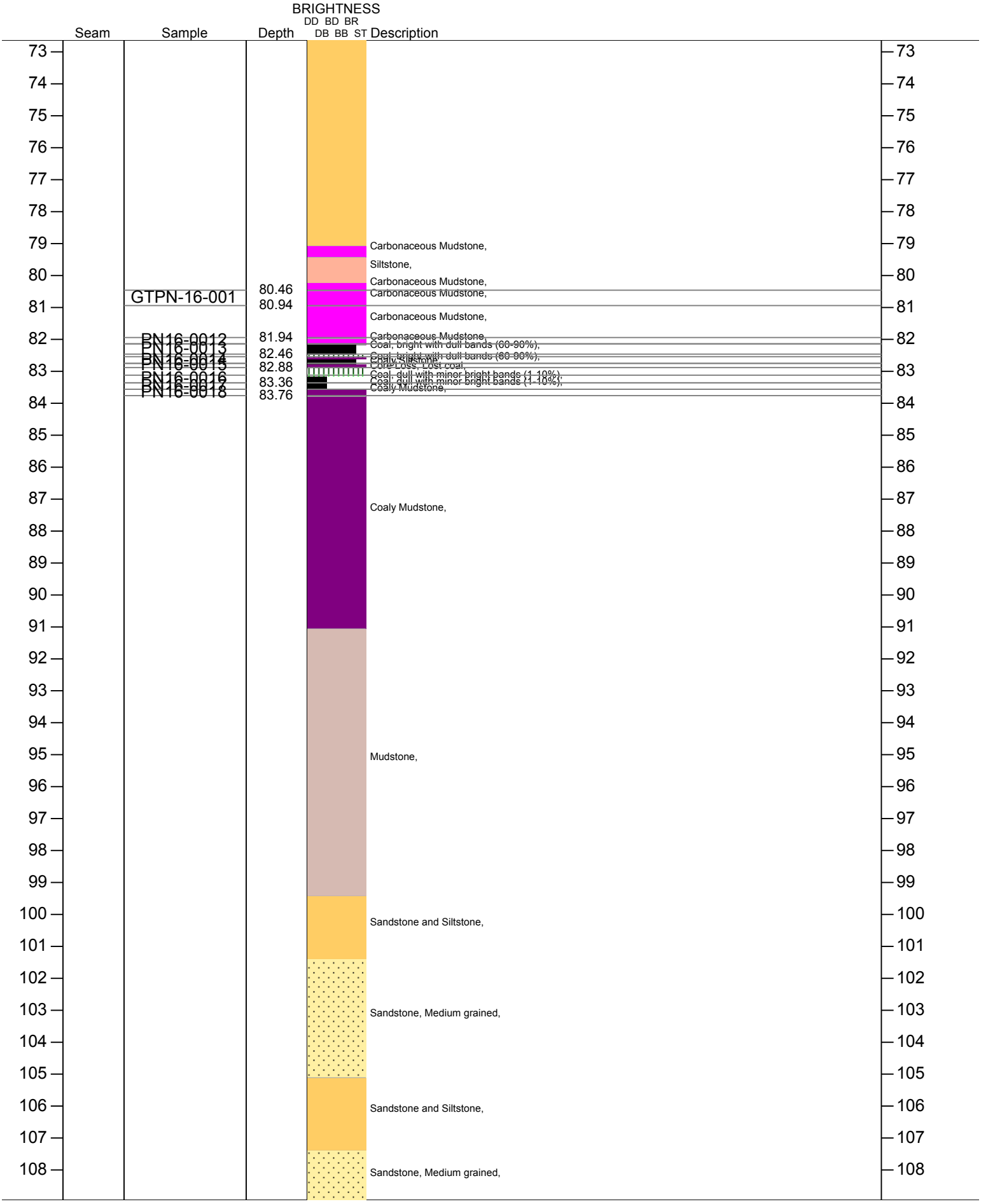

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PANORAMA
HOLE DHPN-16-01
SCALE 1:50

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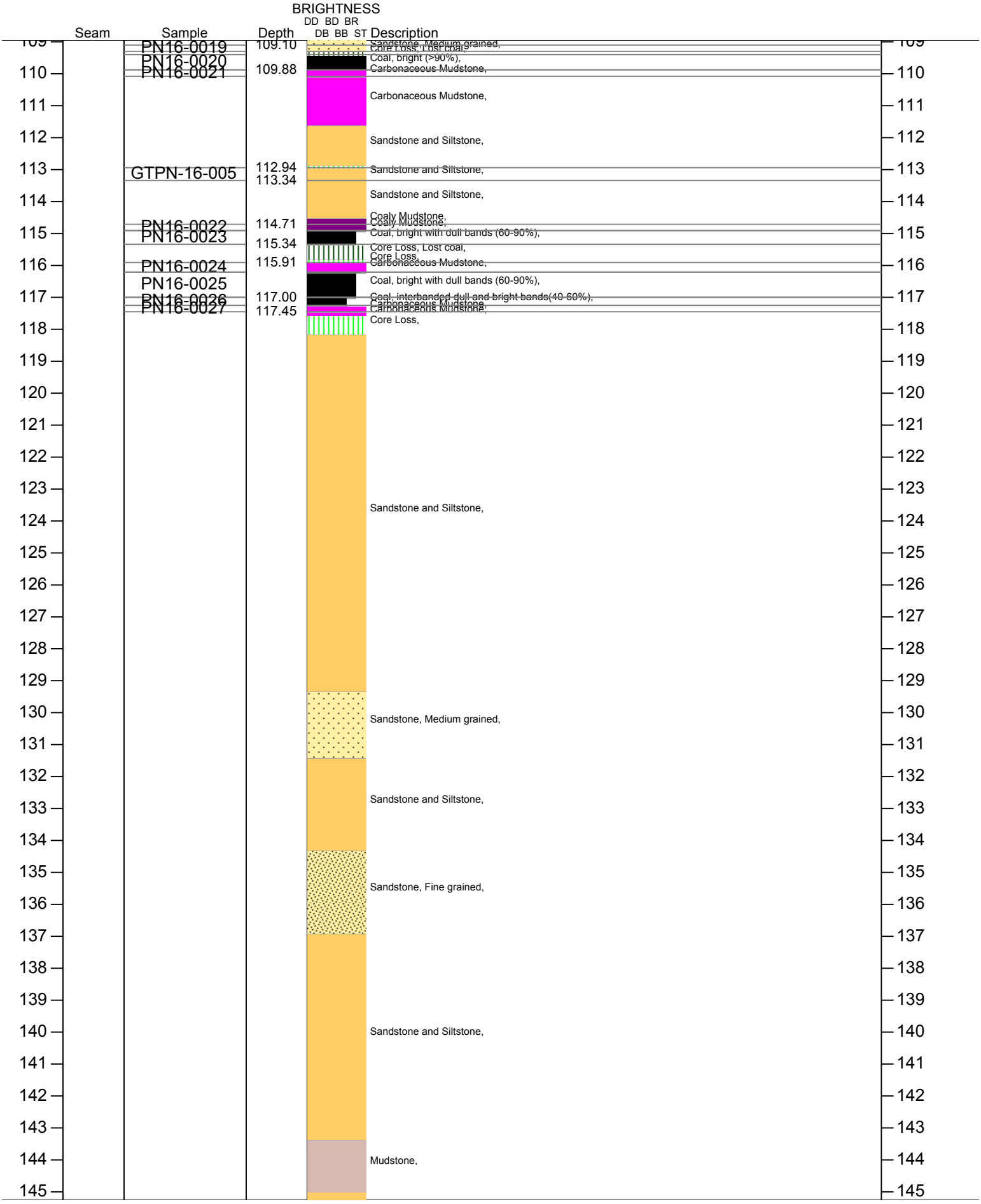

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HOLE DHPN-16-01
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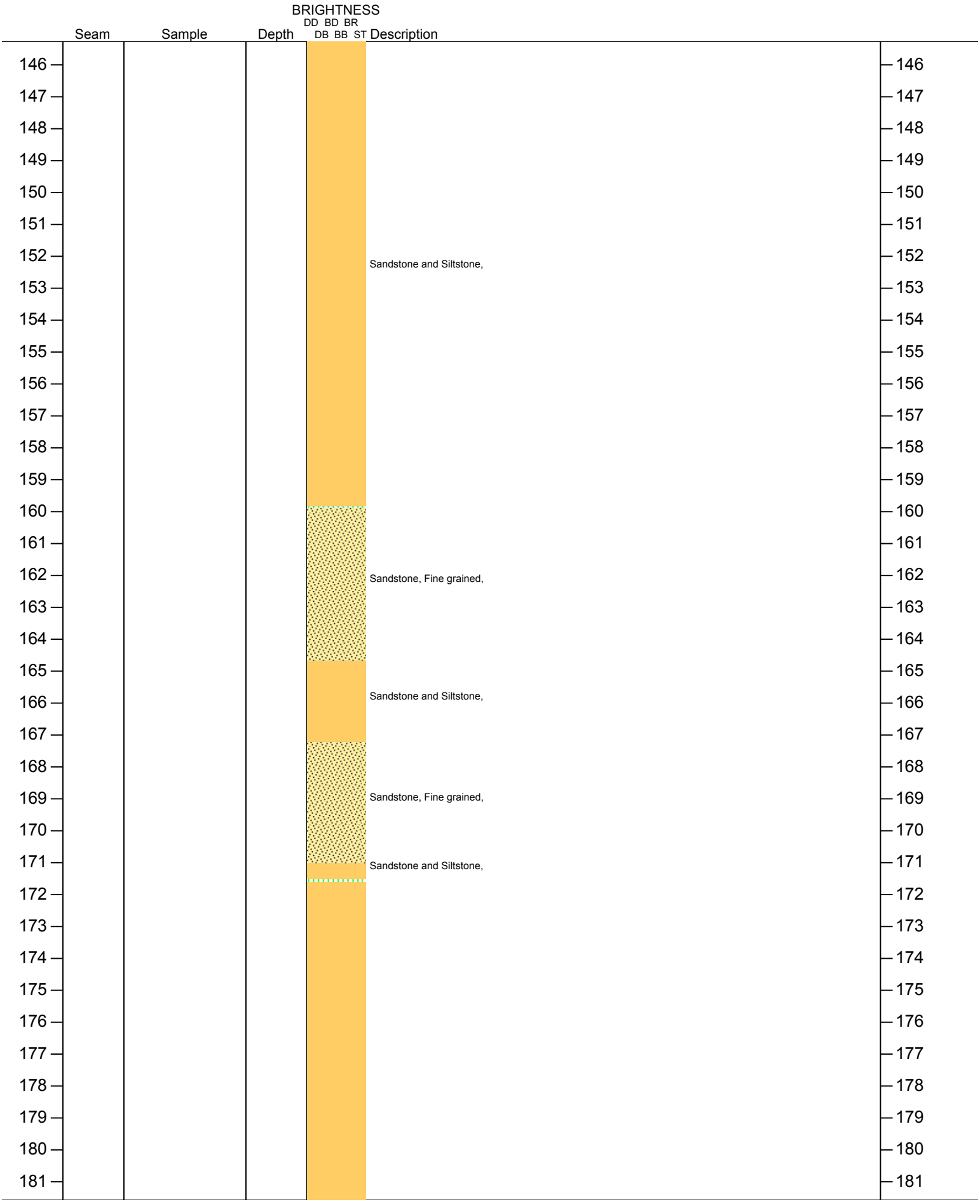

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PANORAMA
HOLE DHPN-16-01
SCALE 1:50

GEOPHYSICAL PROFILE

Seam	Sample	Depth	BRIGHTNESS DD BD BR DB BB ST	Description
				Sandstone and Siltstone,
				Core Loss,

ATRUM COAL PANORAMA INC.
PANORAMA
HOLE DHPN-16-01
SCALE 1:50

GEOPHYSICAL PROFILE

Seam	Sample	Depth	BRIGHTNESS DD BD BR DB BB ST	Description
				Sandstone and Siltstone,

218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254

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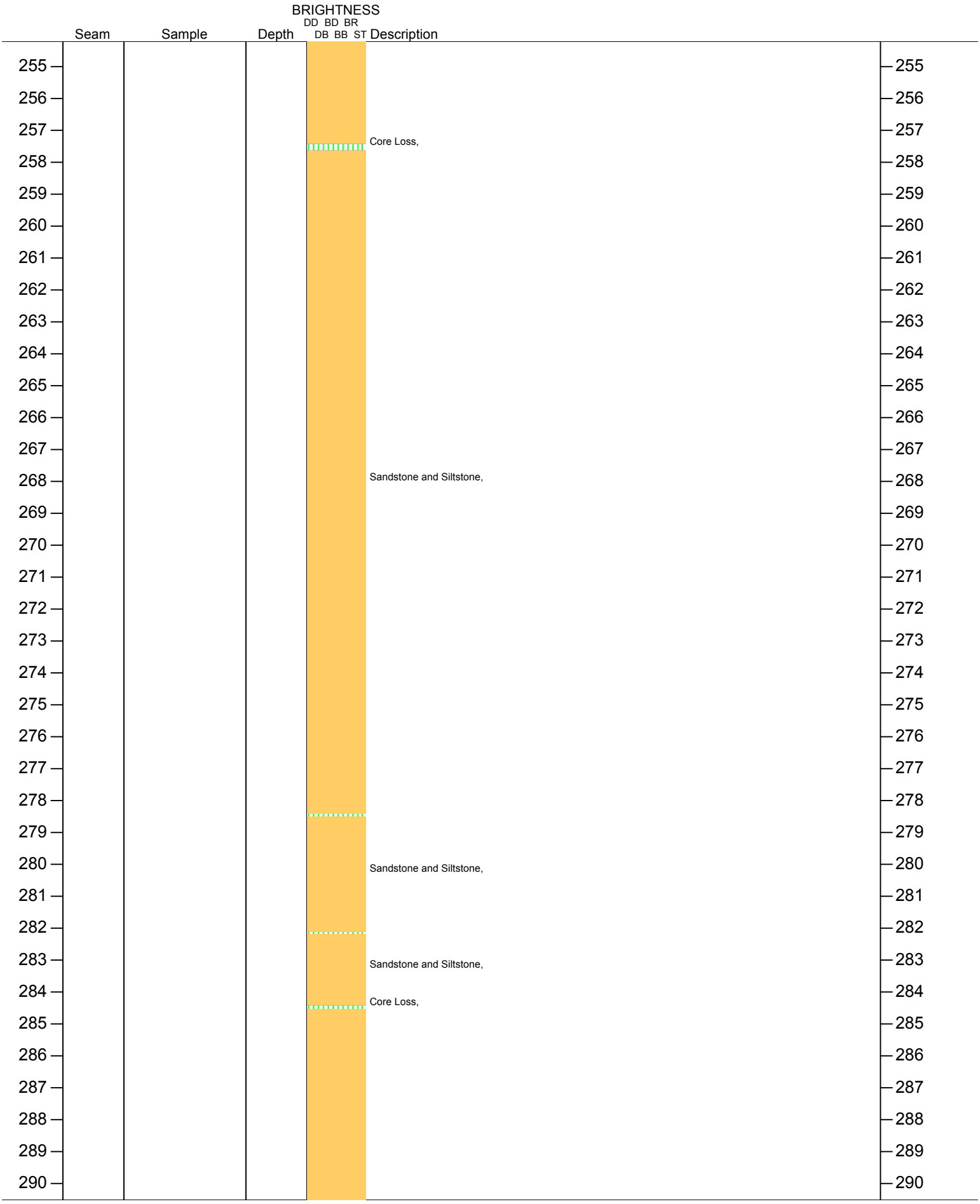
PANORAMA
HOLE DHPN-16-01
SCALE 1:50

GEOPHYSICAL PROFILE



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HOLE DHPN-16-01
SCALE 1:50

GEOPHYSICAL PROFILE

Seam	Sample	Depth	BRIGHTNESS DD BD BR DB BB ST	Description
				Sandstone and Siltstone,

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PANORAMA
HOLE DHPN-16-01
SCALE 1:50

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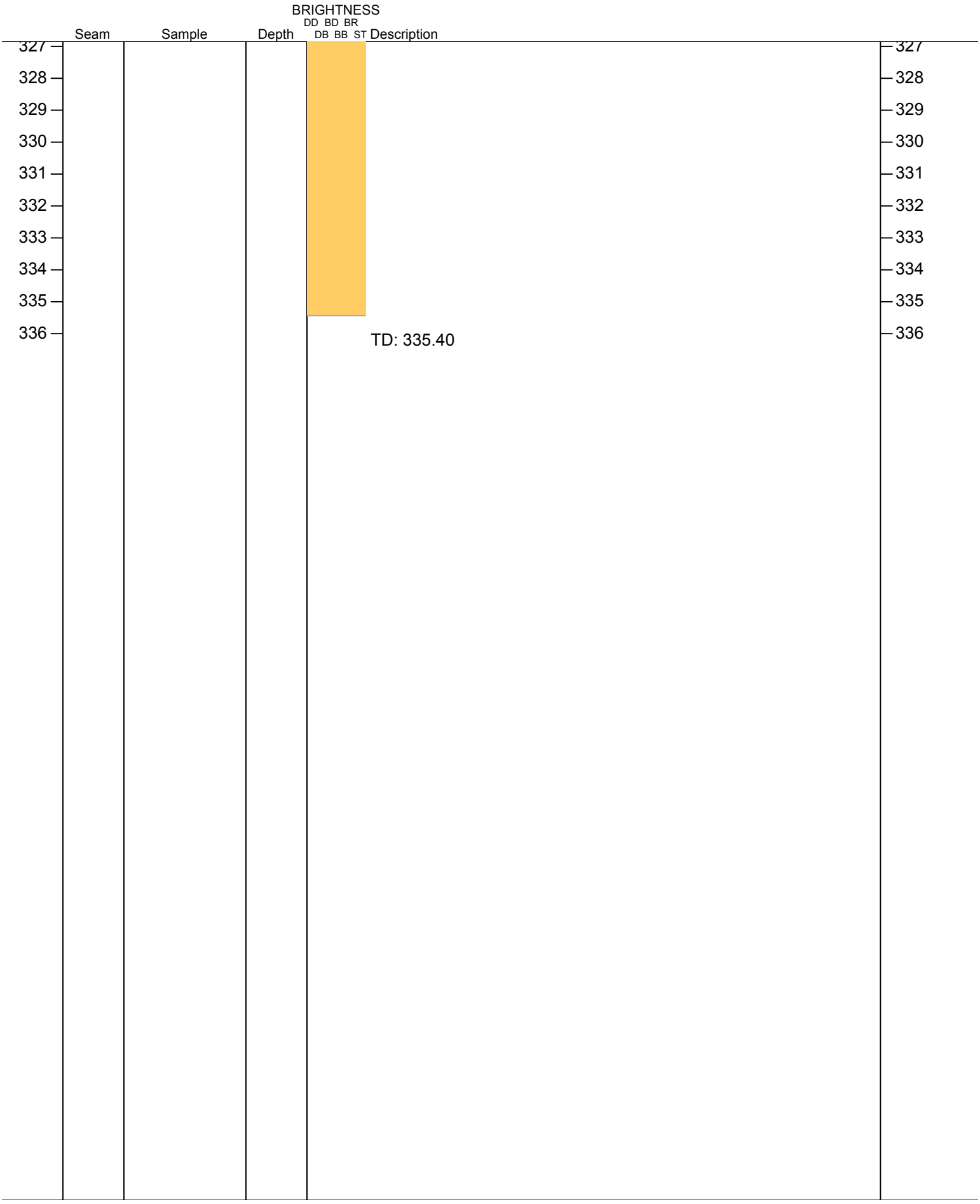

ATRUM COAL
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HOLE DHPN-16-02A
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PAGE 1 of 2

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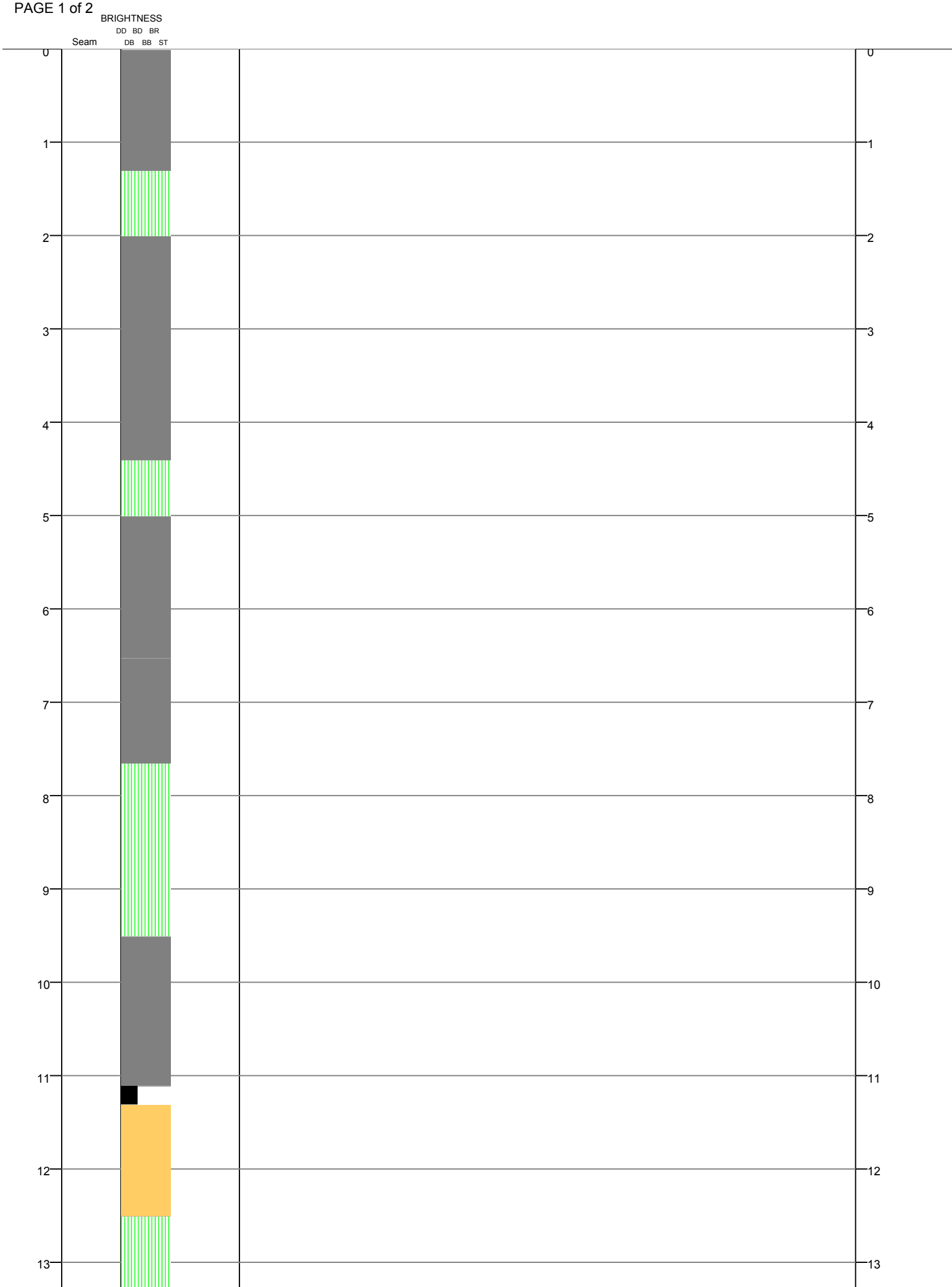

ATRUM COAL
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PAGE 2 of 2

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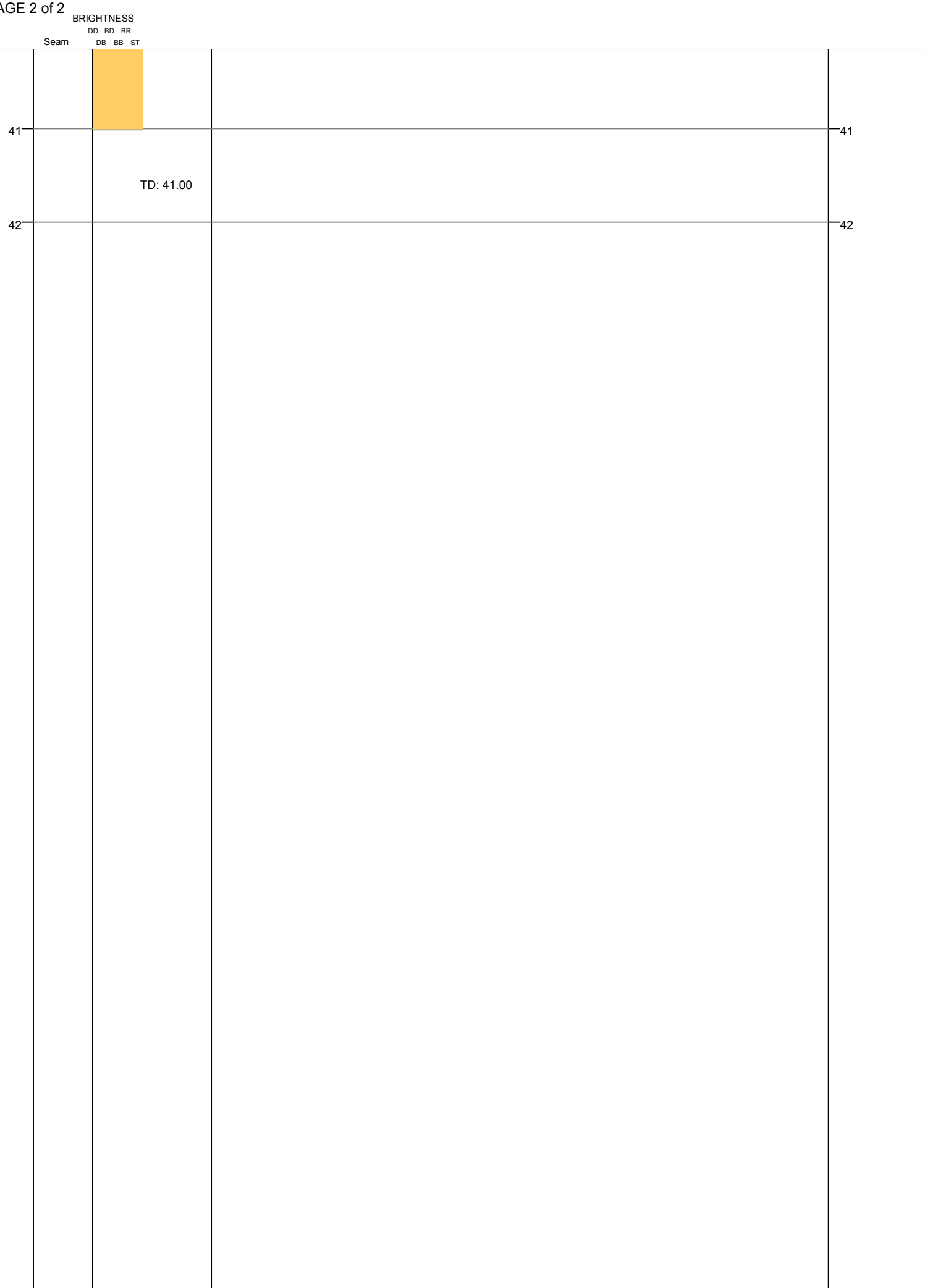
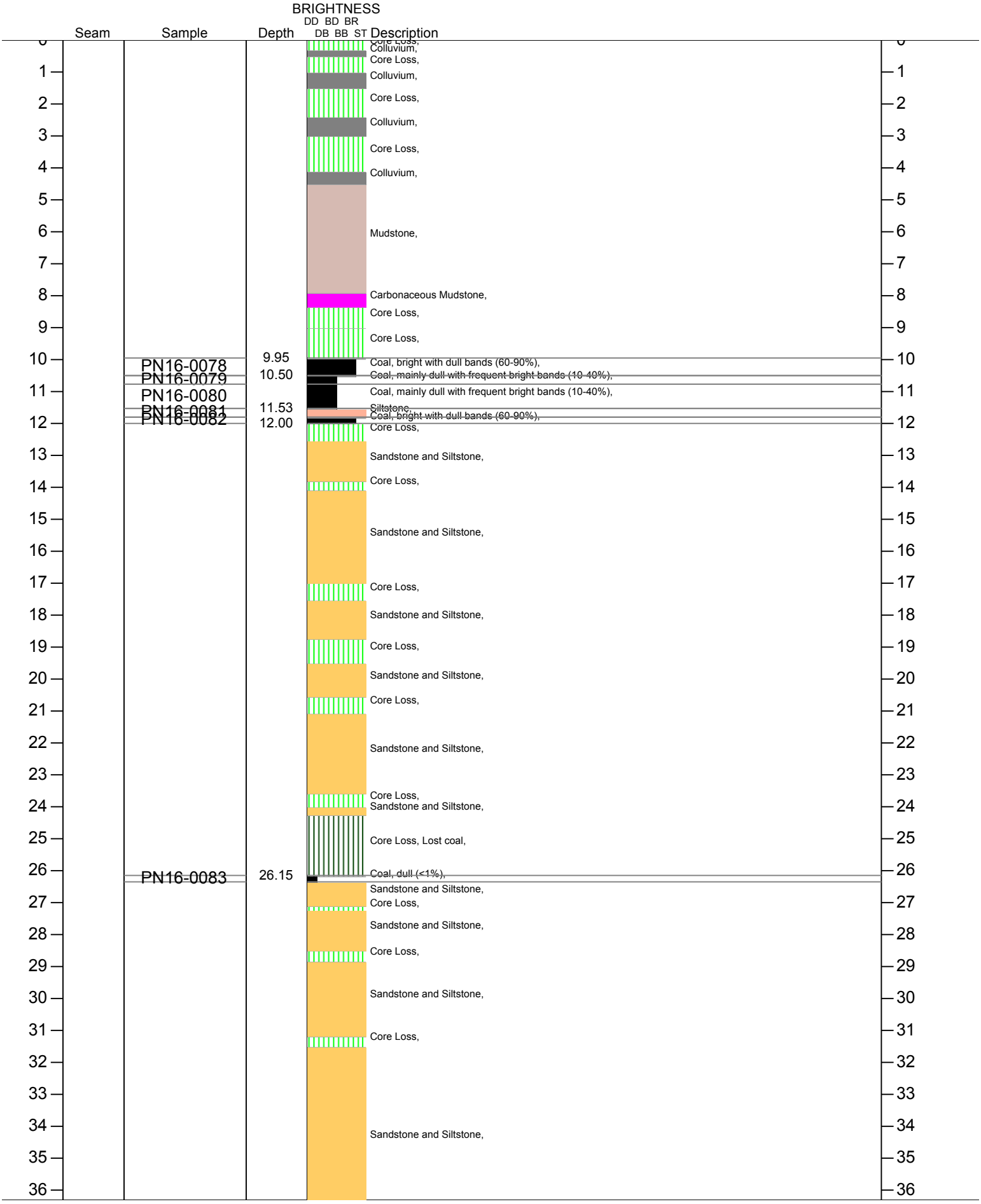


Atrum Coal
PANORAMA
HOLE DHPN-16-02B
SCALE 1:50

GEOPHYSICAL PROFILE



Atrum Coal
PANORAMA
HOLE DHPN-16-02B
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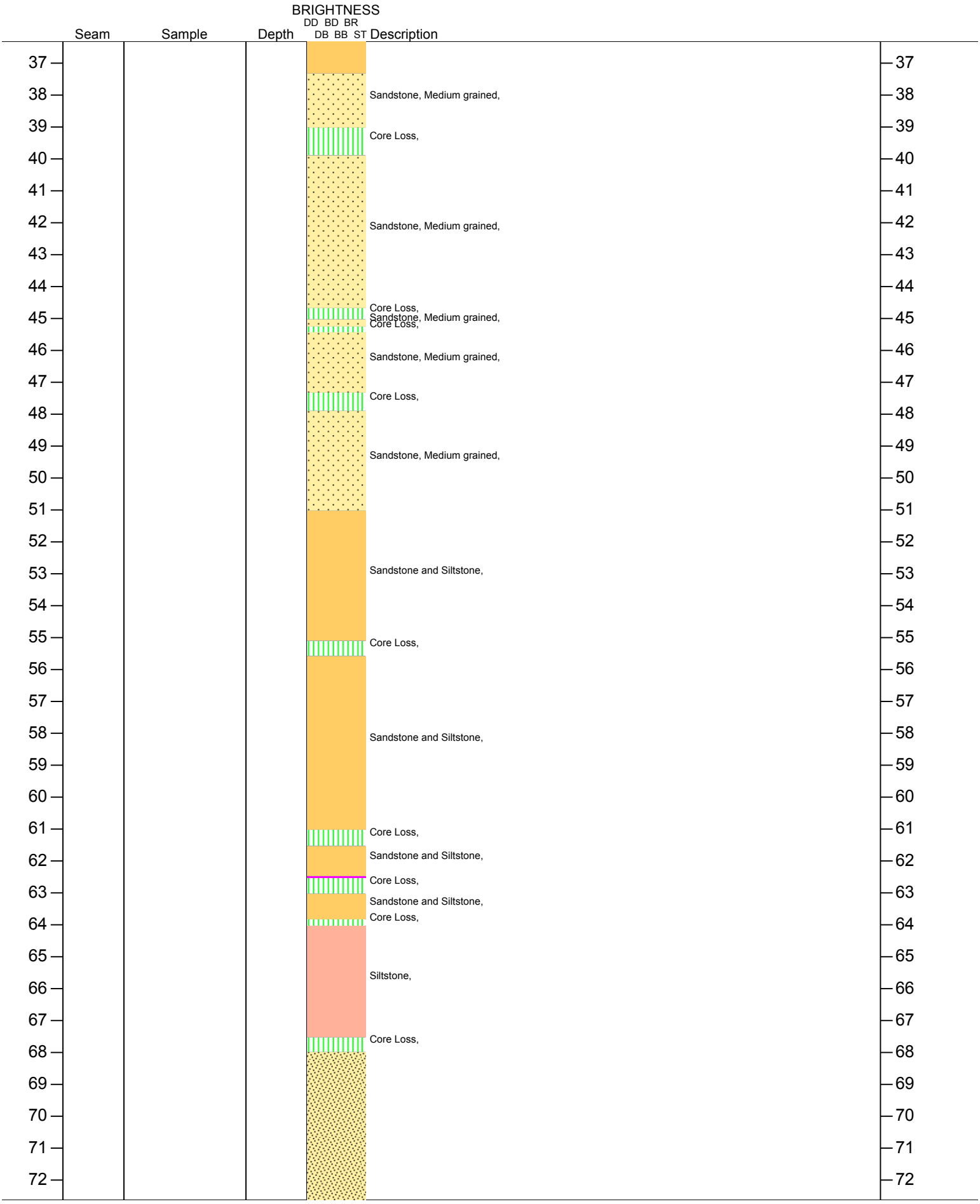
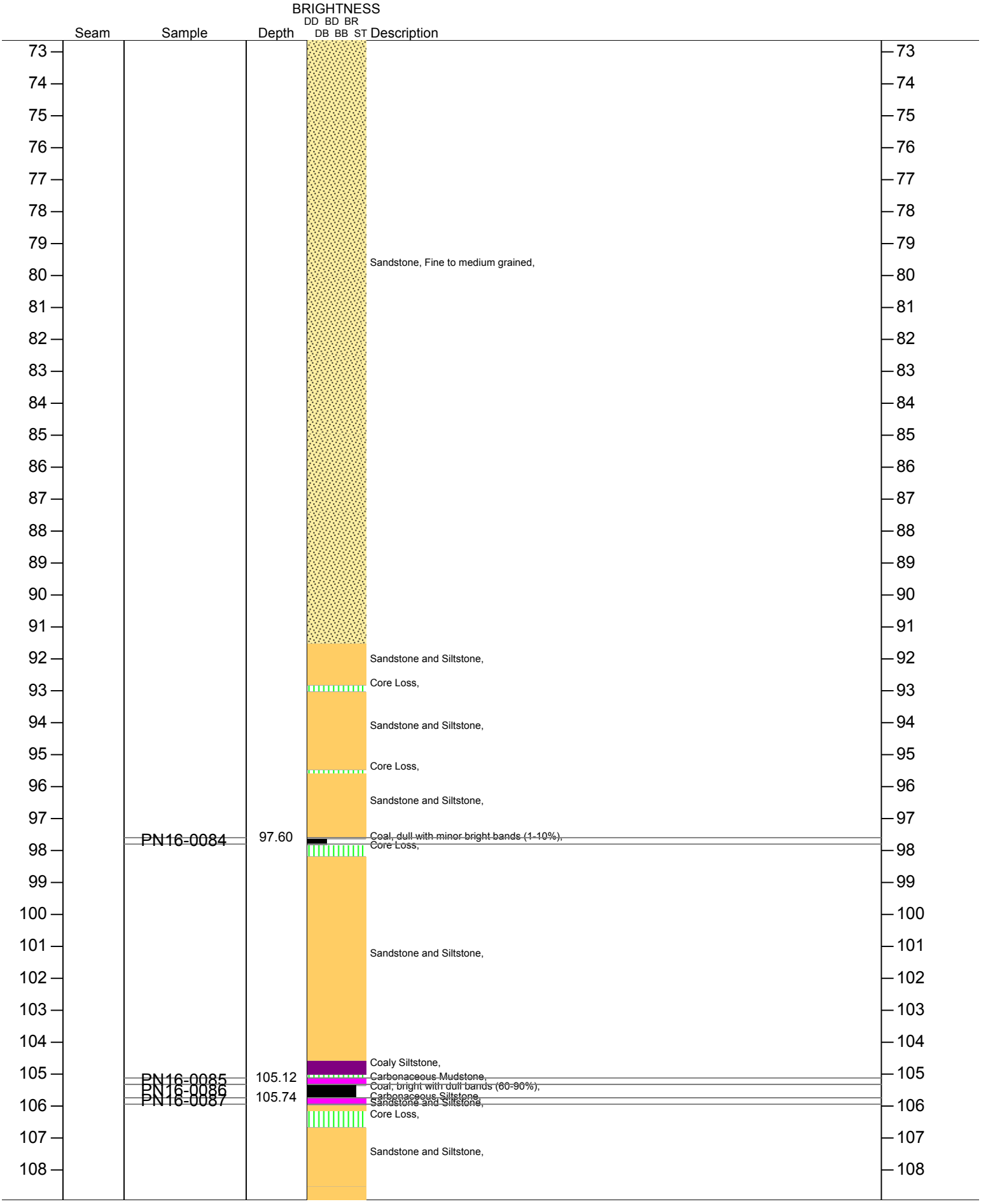


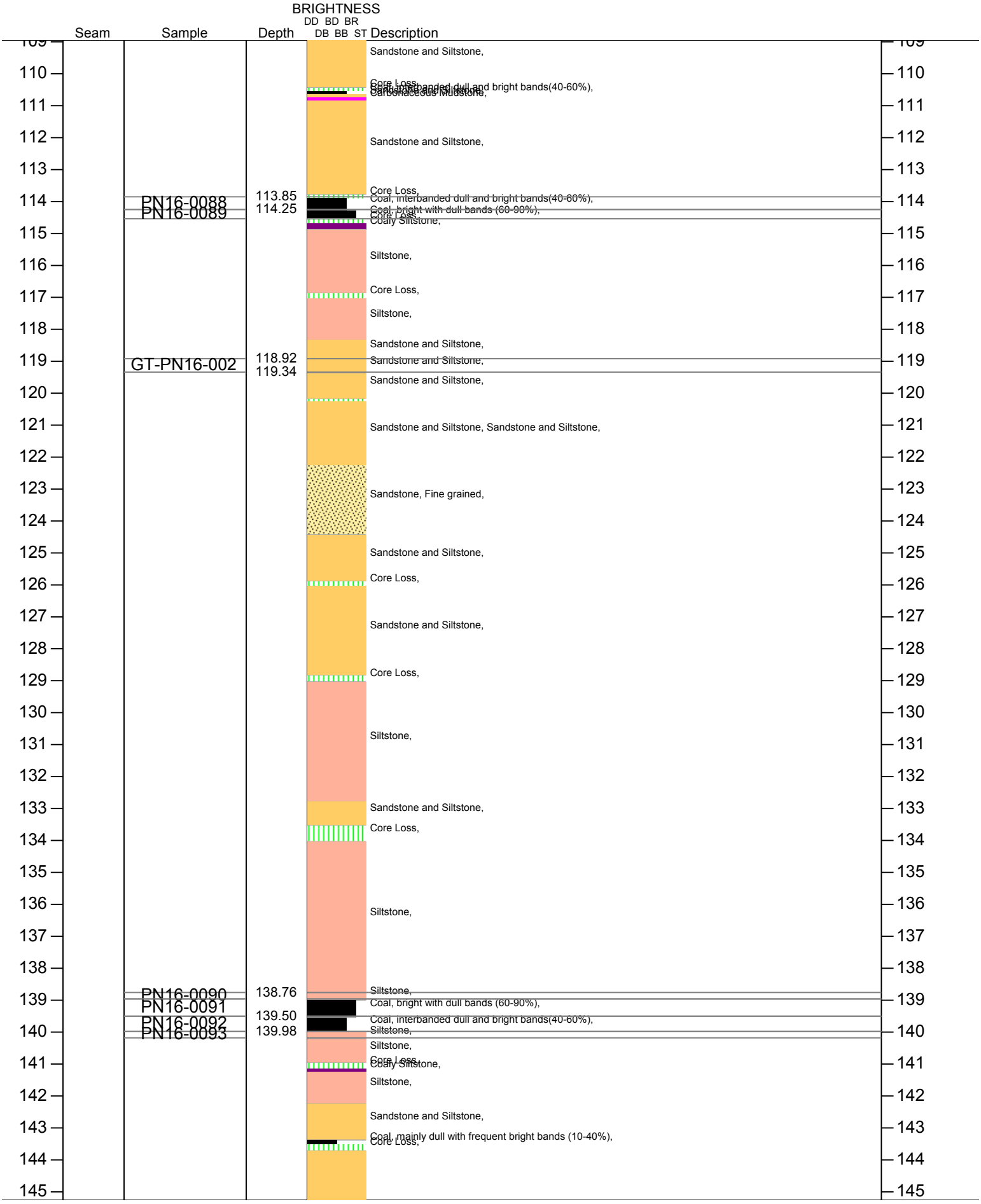
Atrum Coal
PANORAMA
HOLE DHPN-16-02B
SCALE 1:50

GEOPHYSICAL PROFILE



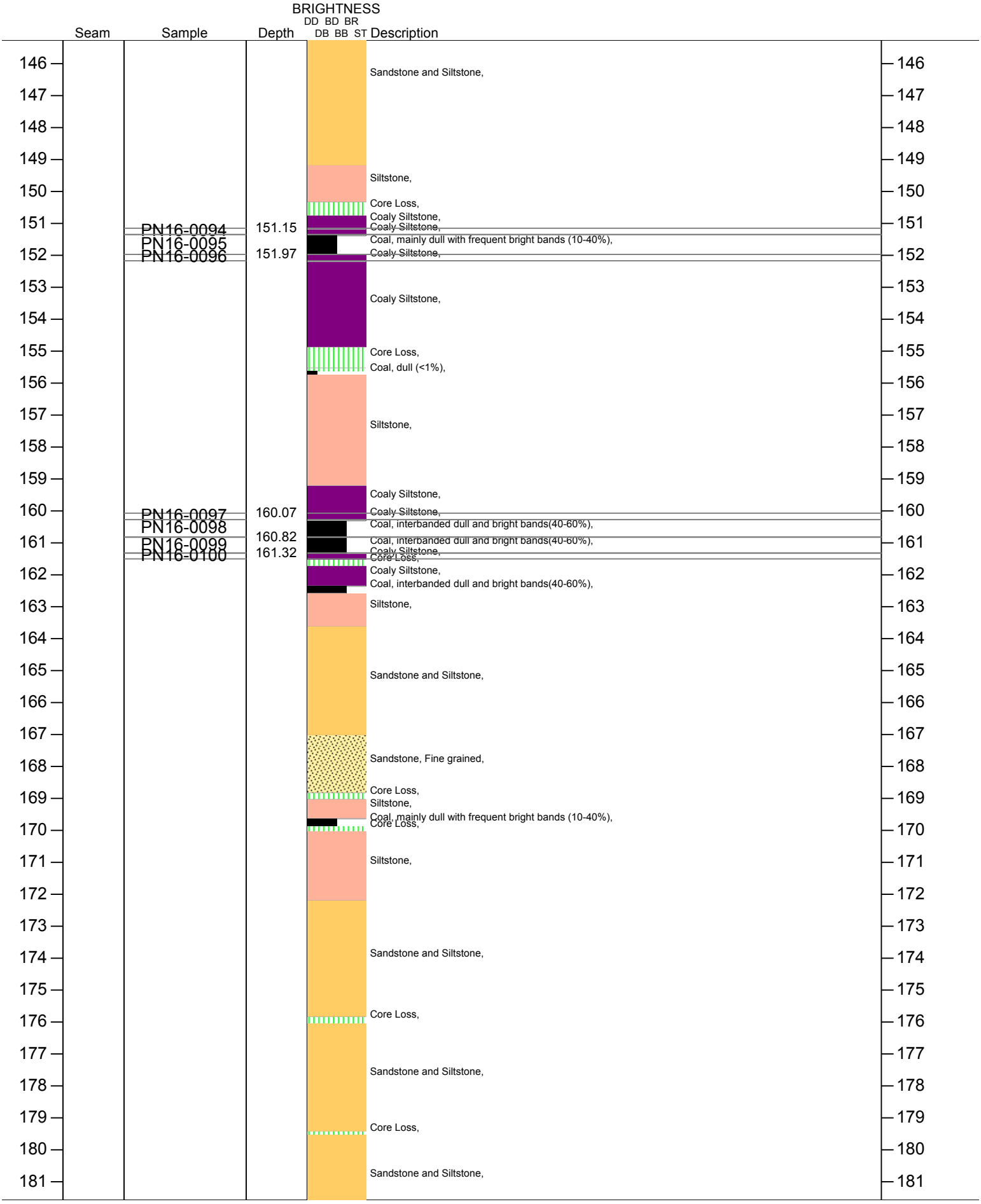
Atrum Coal
PANORAMA
HOLE DHPN-16-02B
SCALE 1:50

GEOPHYSICAL PROFILE



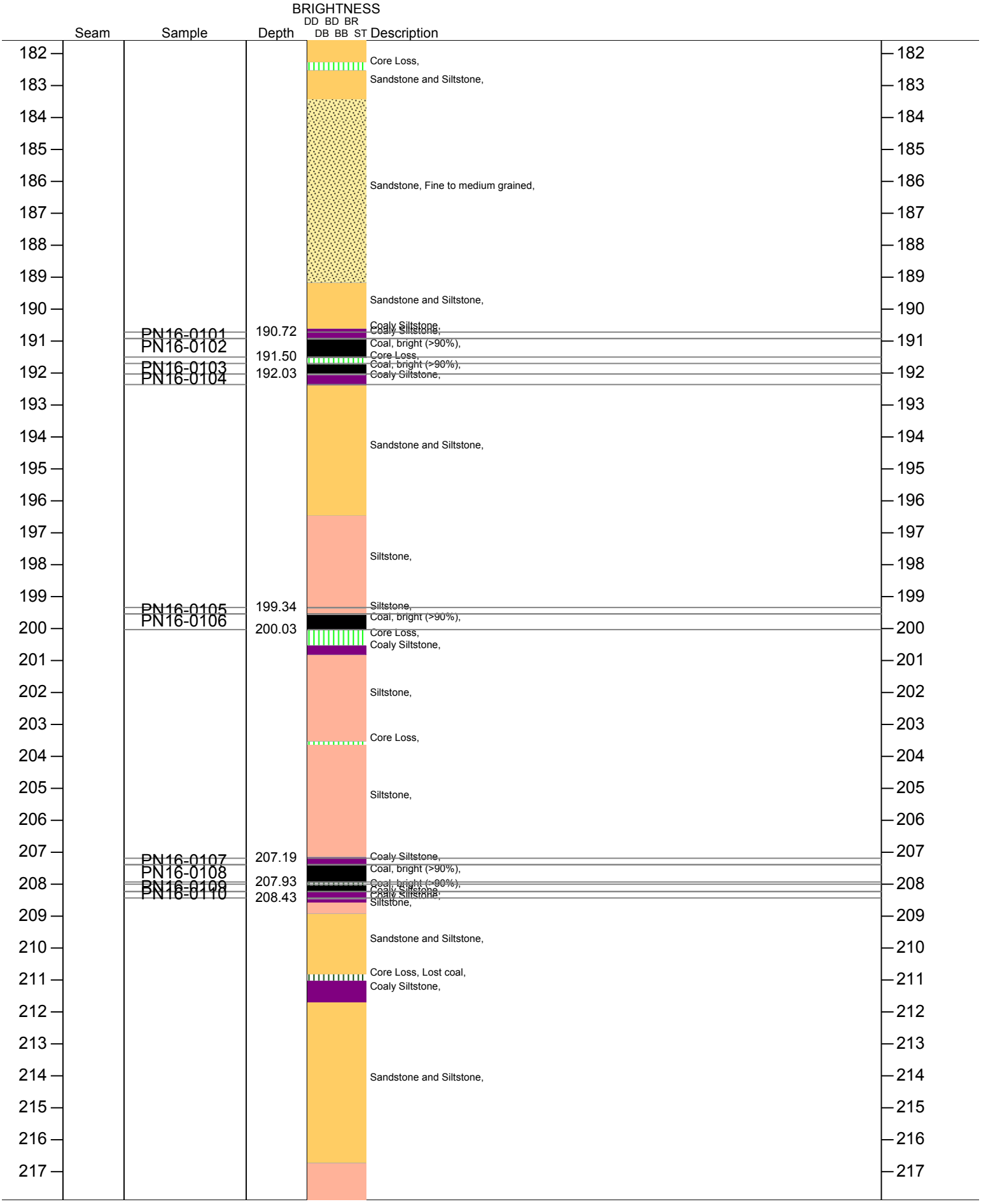
Atrum Coal
PANORAMA
HOLE DHPN-16-02B
SCALE 1:50

GEOPHYSICAL PROFILE



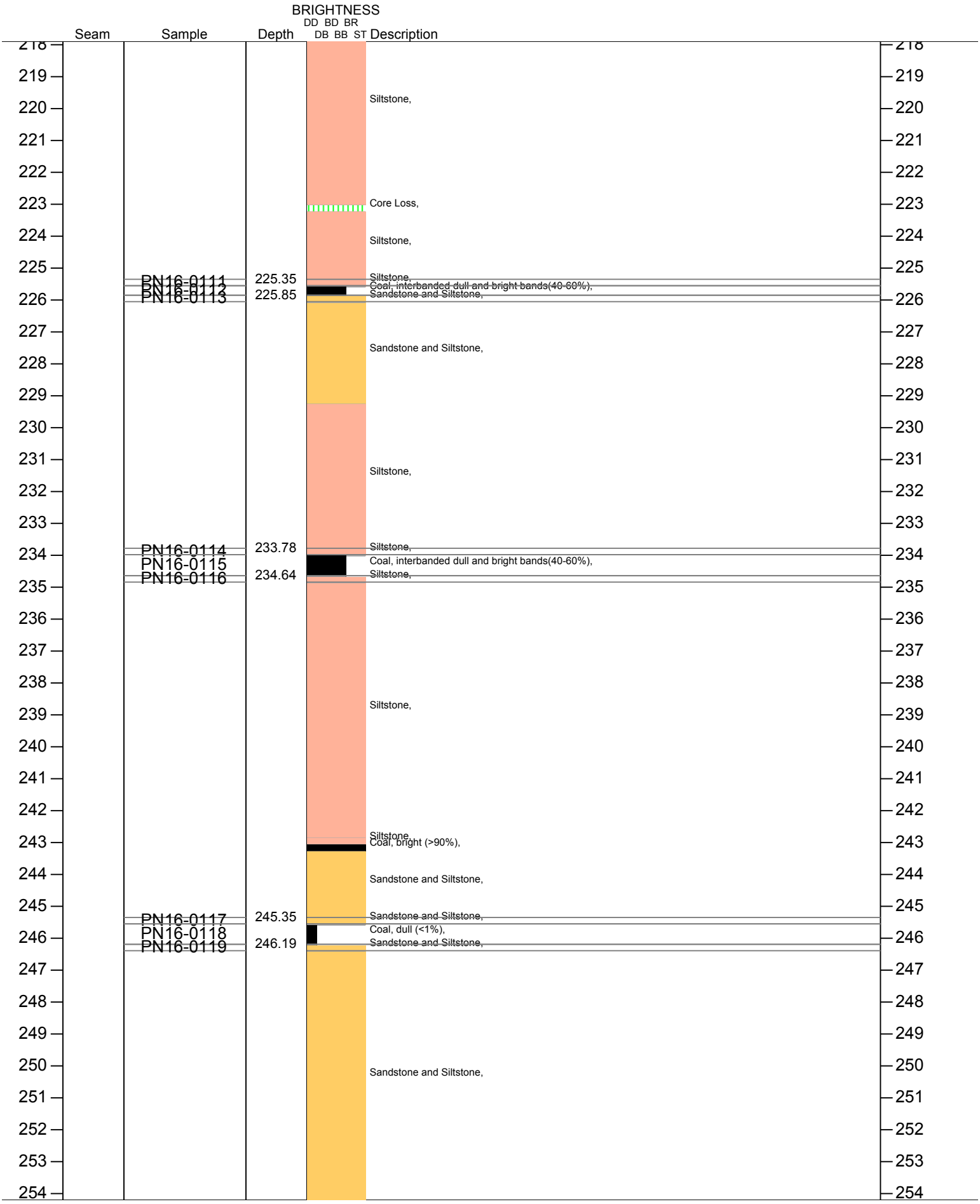
Atrum Coal
PANORAMA
HOLE DHPN-16-02B
SCALE 1:50

GEOPHYSICAL PROFILE



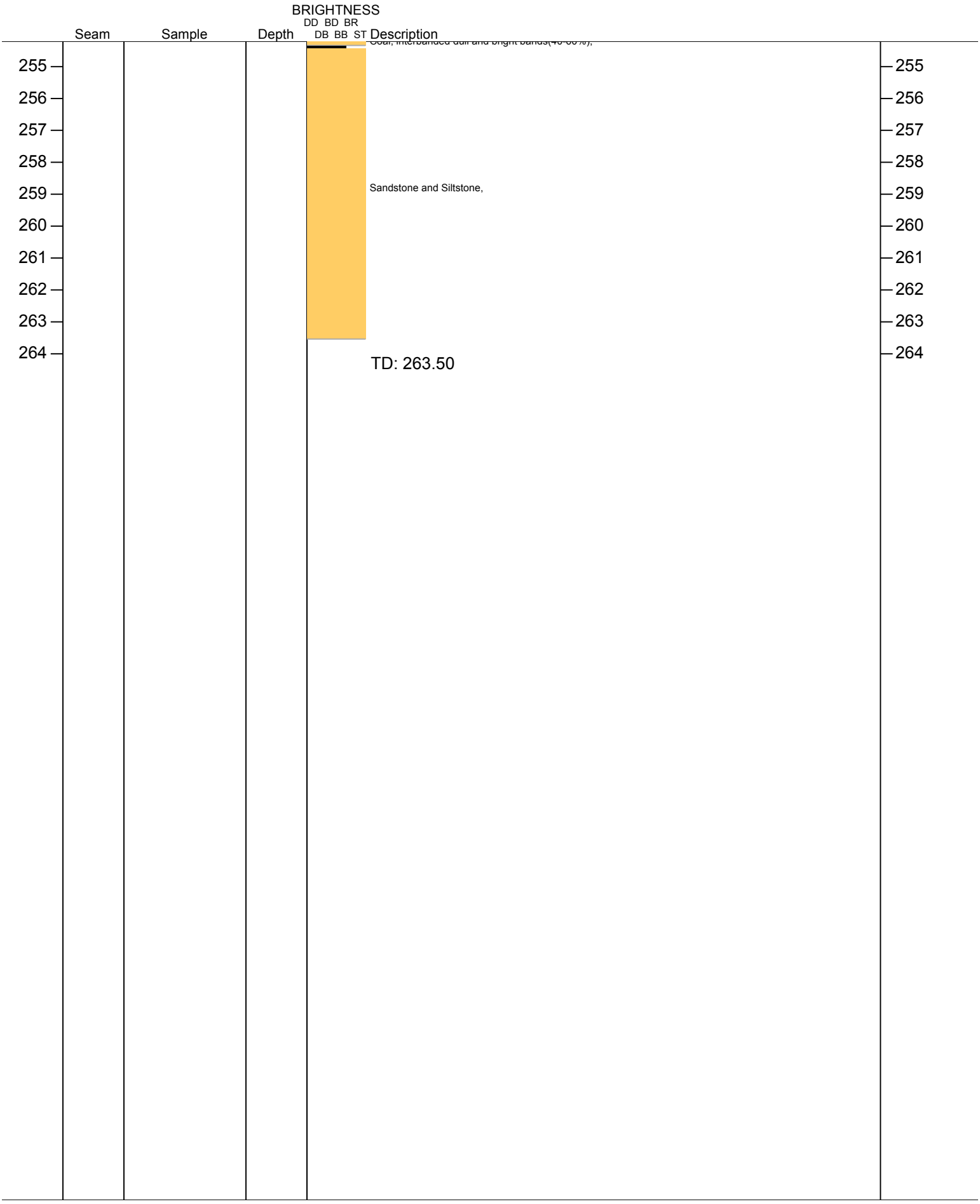
Atrum Coal
PANORAMA
HOLE DHPN-16-02B
SCALE 1:50

GEOPHYSICAL PROFILE



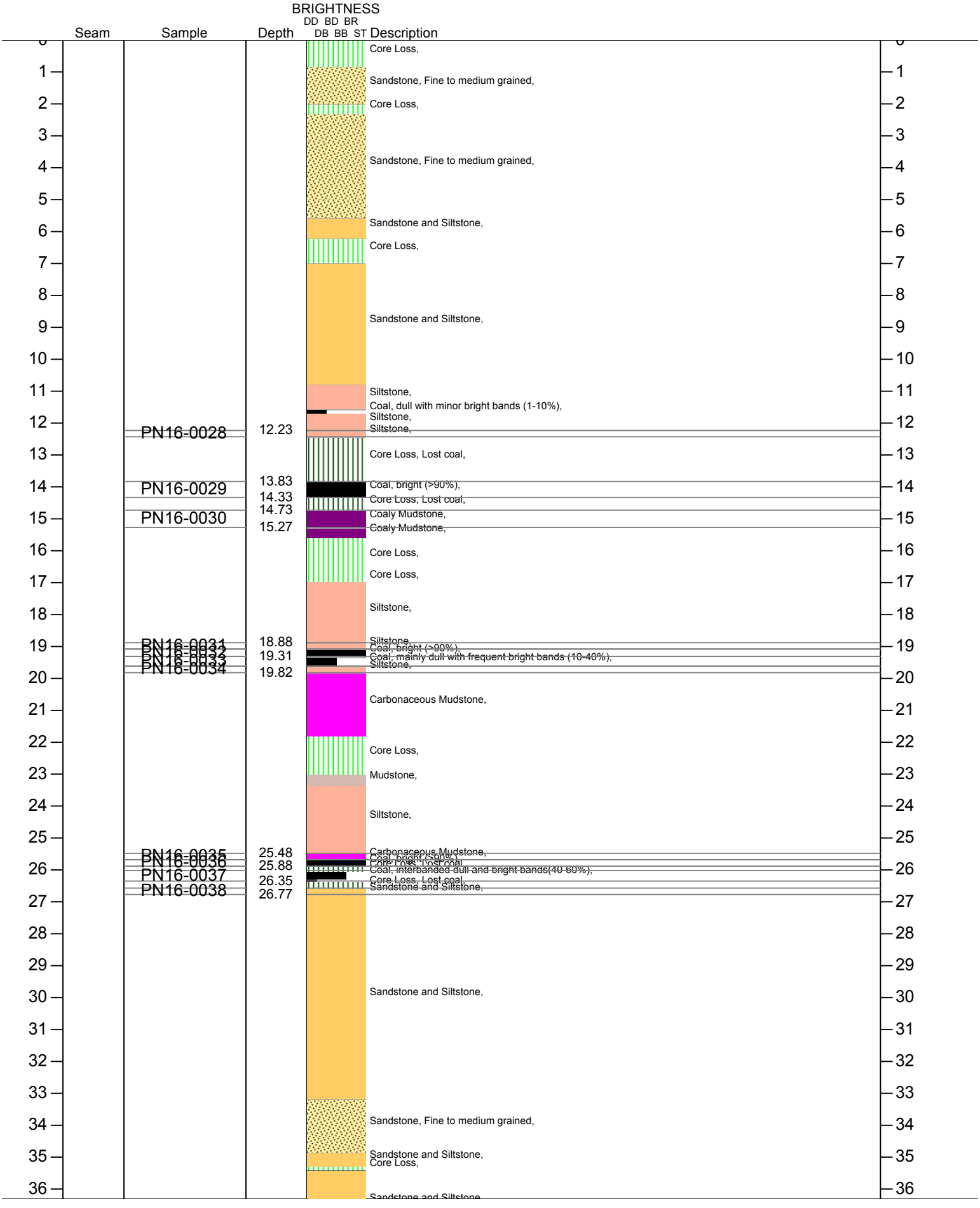
Atrum Coal
PANORAMA
HOLE DHPN-16-02B
SCALE 1:50

GEOPHYSICAL PROFILE



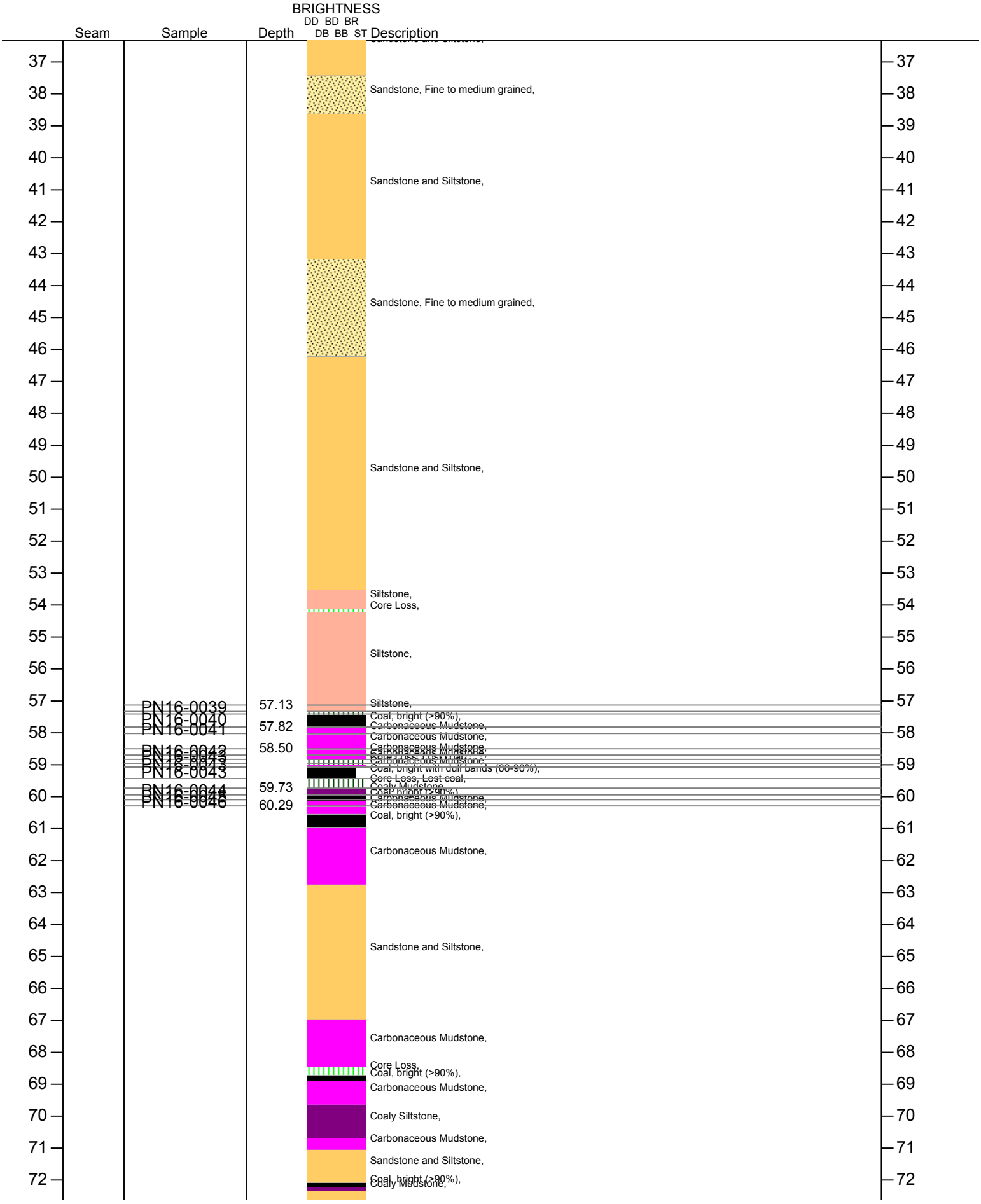
Atrum Coal
PANORAMA
HOLE DH-PN-16-03
SCALE 1:50

GEOPHYSICAL PROFILE



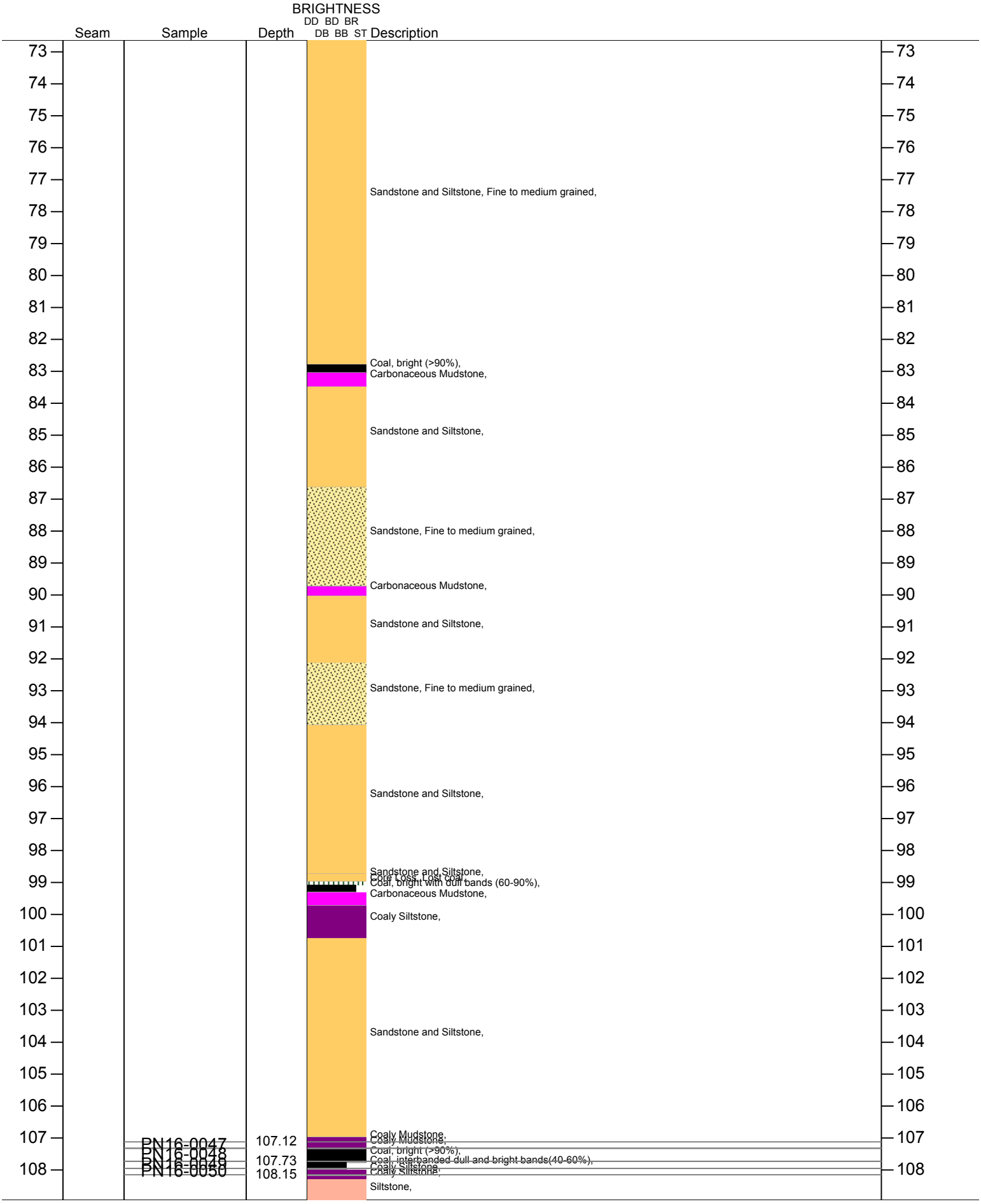
Atrum Coal
PANORAMA
HOLE DH-PN-16-03
SCALE 1:50

GEOPHYSICAL PROFILE



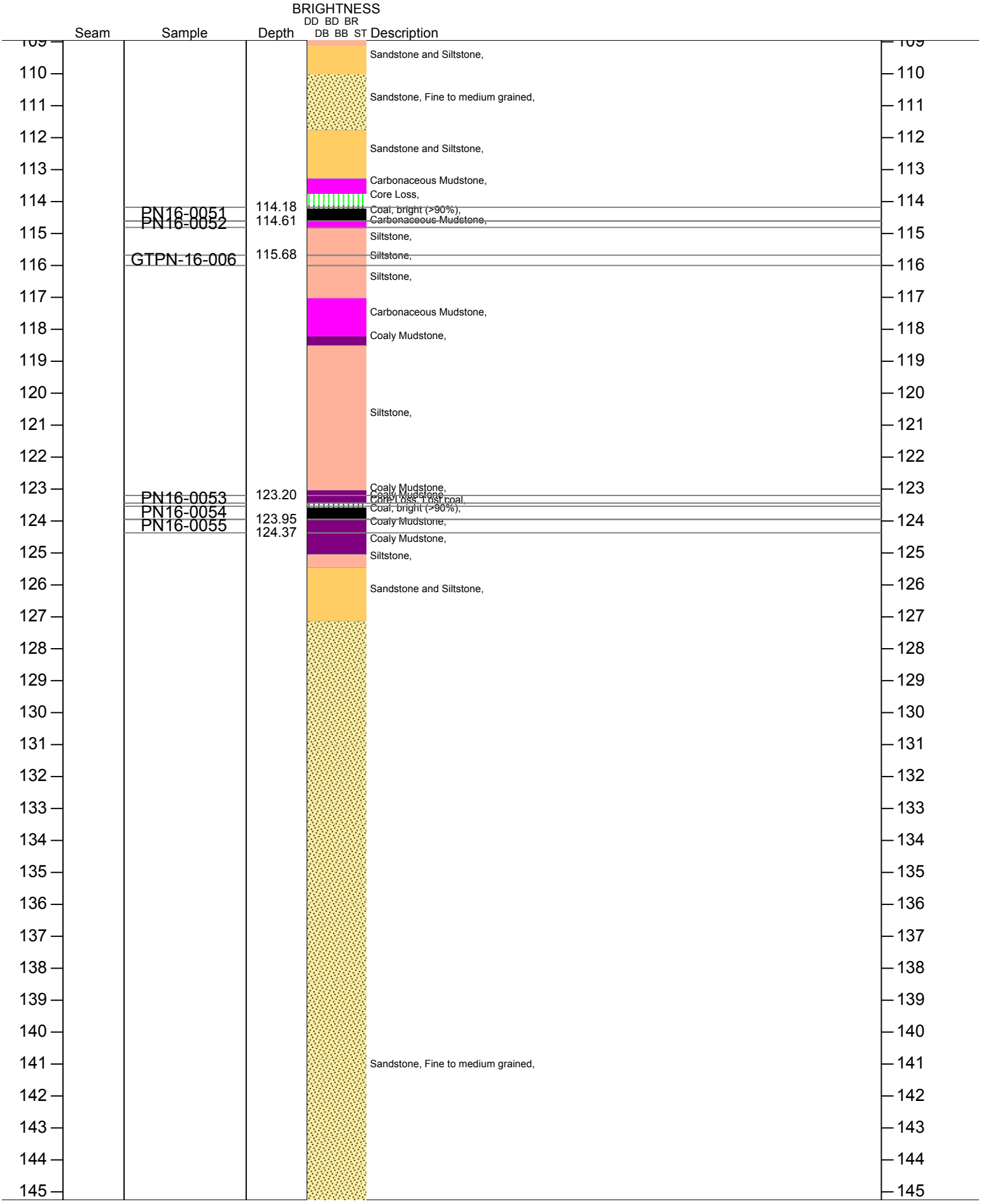
Atrum Coal
PANORAMA
HOLE DH-PN-16-03
SCALE 1:50

GEOPHYSICAL PROFILE



Atrum Coal
PANORAMA
HOLE DH-PN-16-03
SCALE 1:50

GEOPHYSICAL PROFILE



Atrum Coal
PANORAMA
HOLE DH-PN-16-03
SCALE 1:50

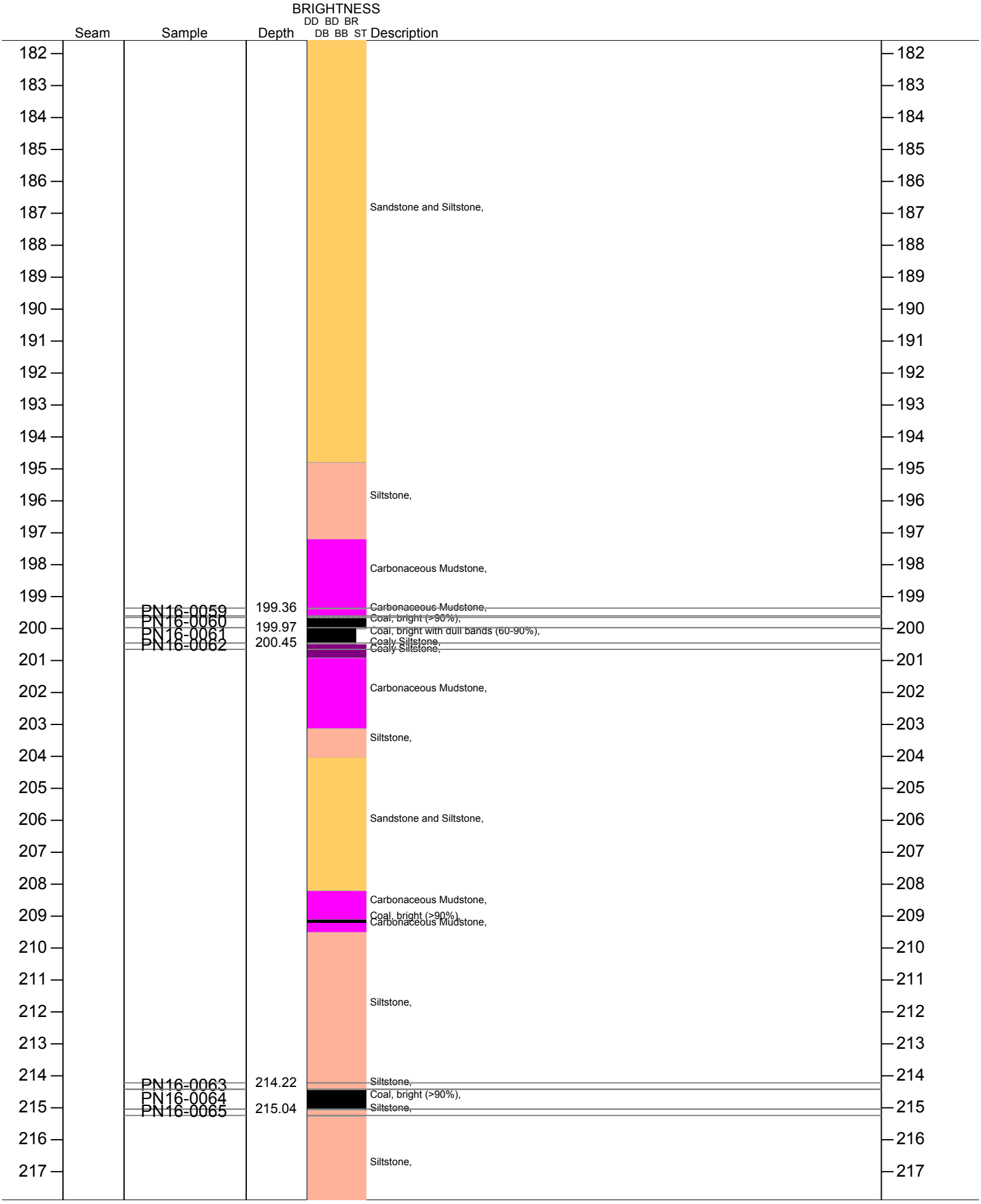
GEOPHYSICAL PROFILE

BRIGHTNESS
DD BD BR
DB BB ST

Seam	Sample	Depth	Description
			Core Loss,
			Sandstone, Fine to medium grained,
			Sandstone and Siltstone,
			Siltstone,
	PN16-0056	164.39	Coaly Mudstone,
			Coaly Mudstone,
	PN16-0057	164.95	Coal, bright with dull bands (60-90%),
	PN16-0058	165.50	Coaly Mudstone,
			Coaly Mudstone,
			Siltstone,
			Sandstone and Siltstone,
			Coaly Siltstone,
			Siltstone,
			Sandstone and Siltstone,
			Sandstone, Medium grained,
			Core Loss,

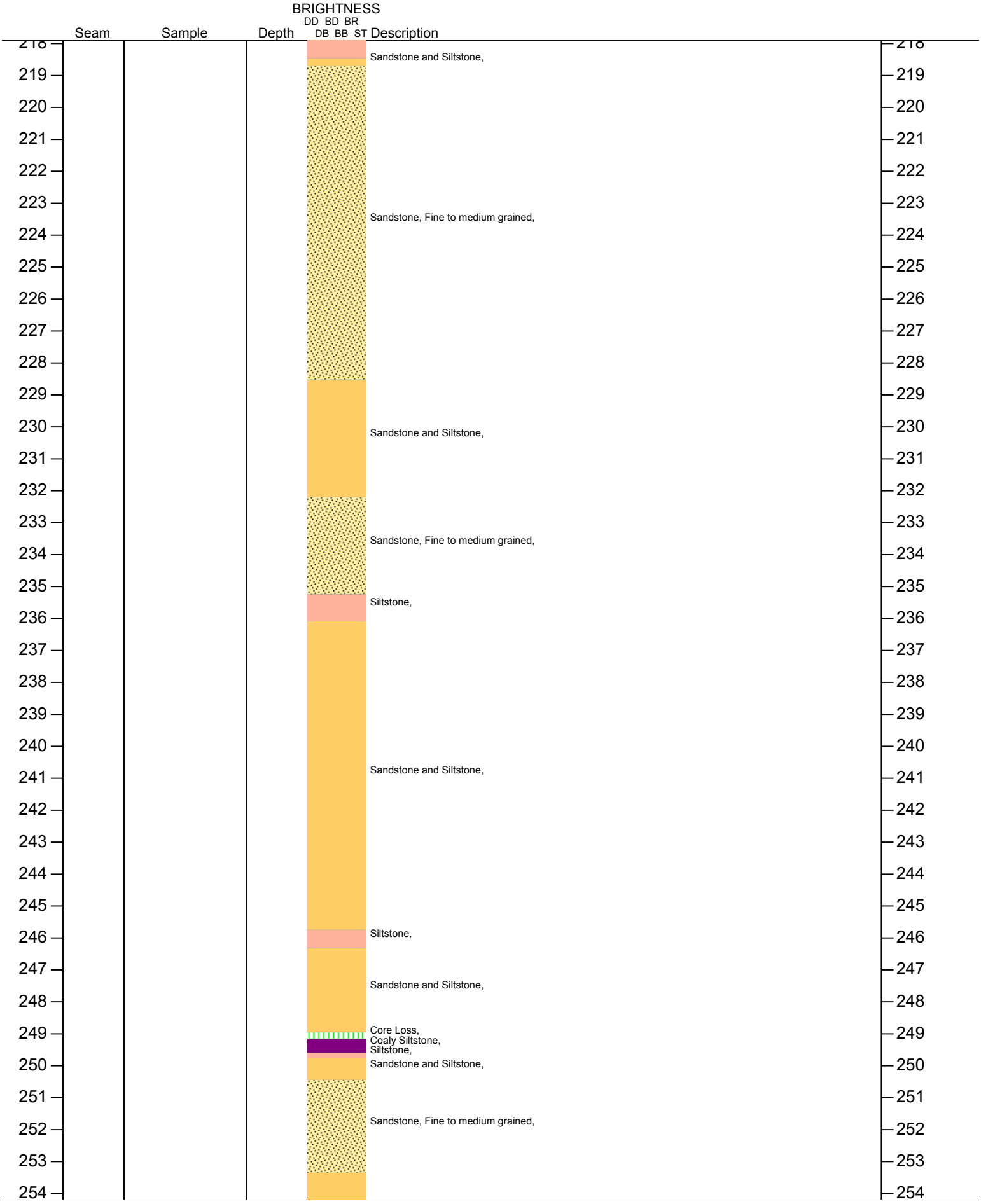
Atrum Coal
PANORAMA
HOLE DH-PN-16-03
SCALE 1:50

GEOPHYSICAL PROFILE



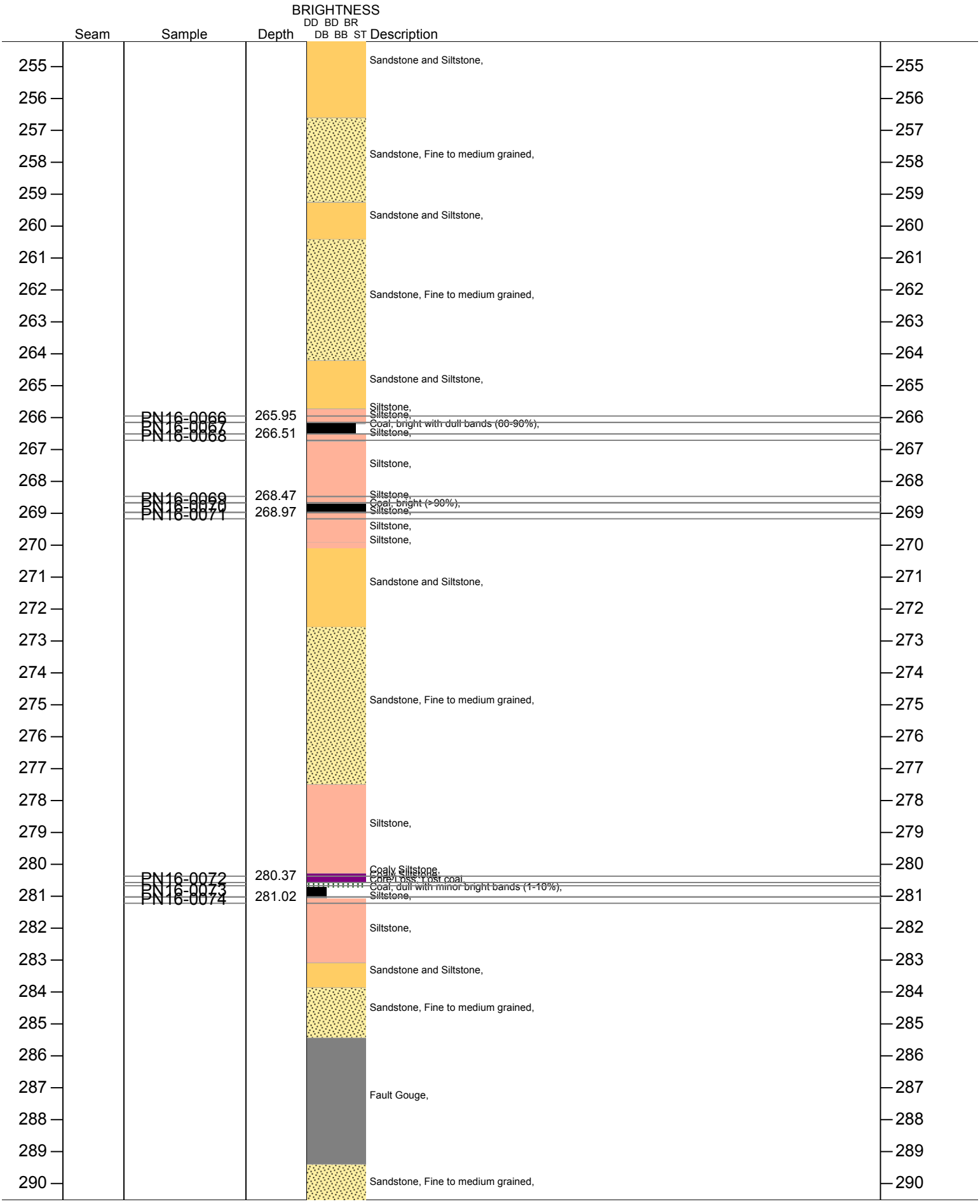
Atrum Coal
PANORAMA
HOLE DH-PN-16-03
SCALE 1:50

GEOPHYSICAL PROFILE



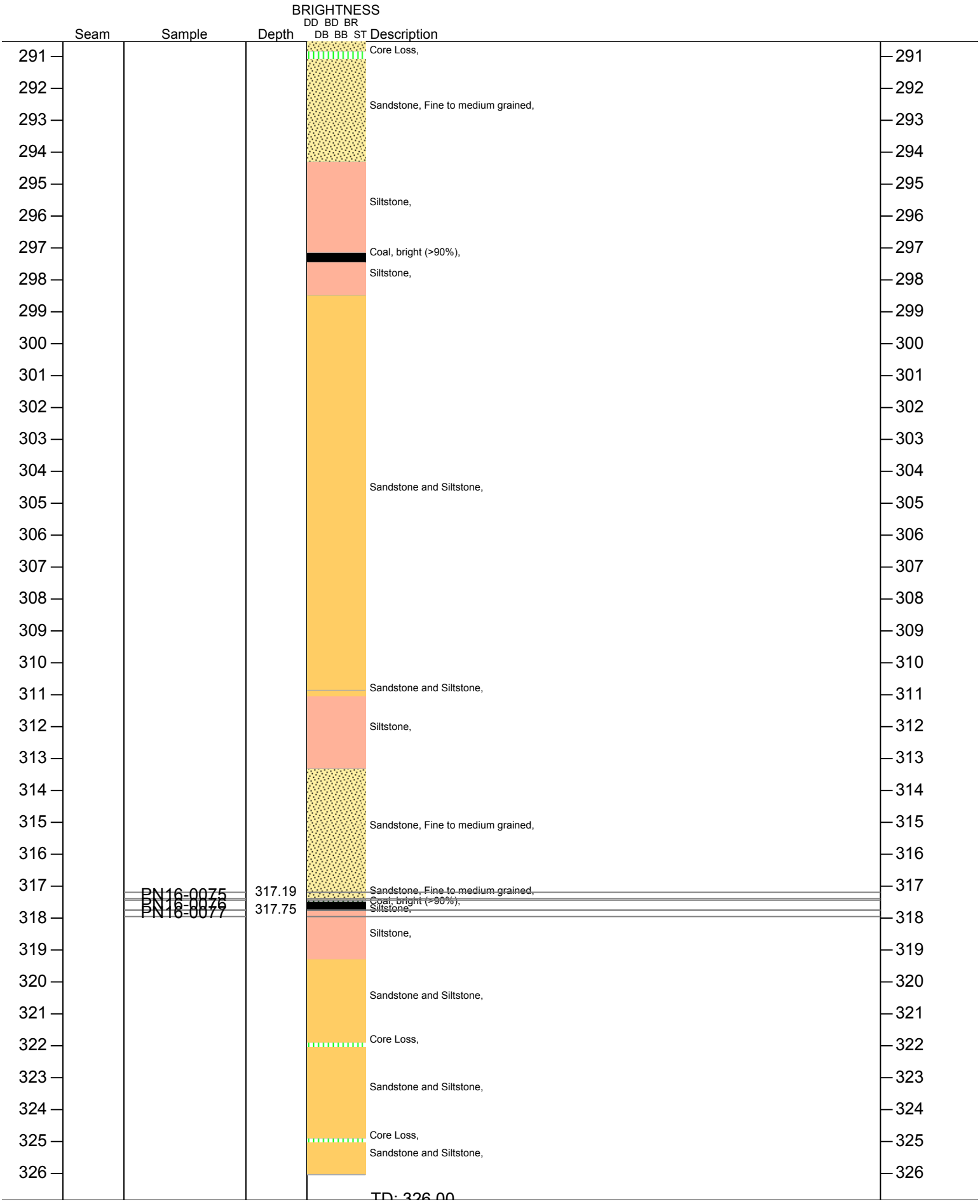
Atrum Coal
PANORAMA
HOLE DH-PN-16-03
SCALE 1:50

GEOPHYSICAL PROFILE



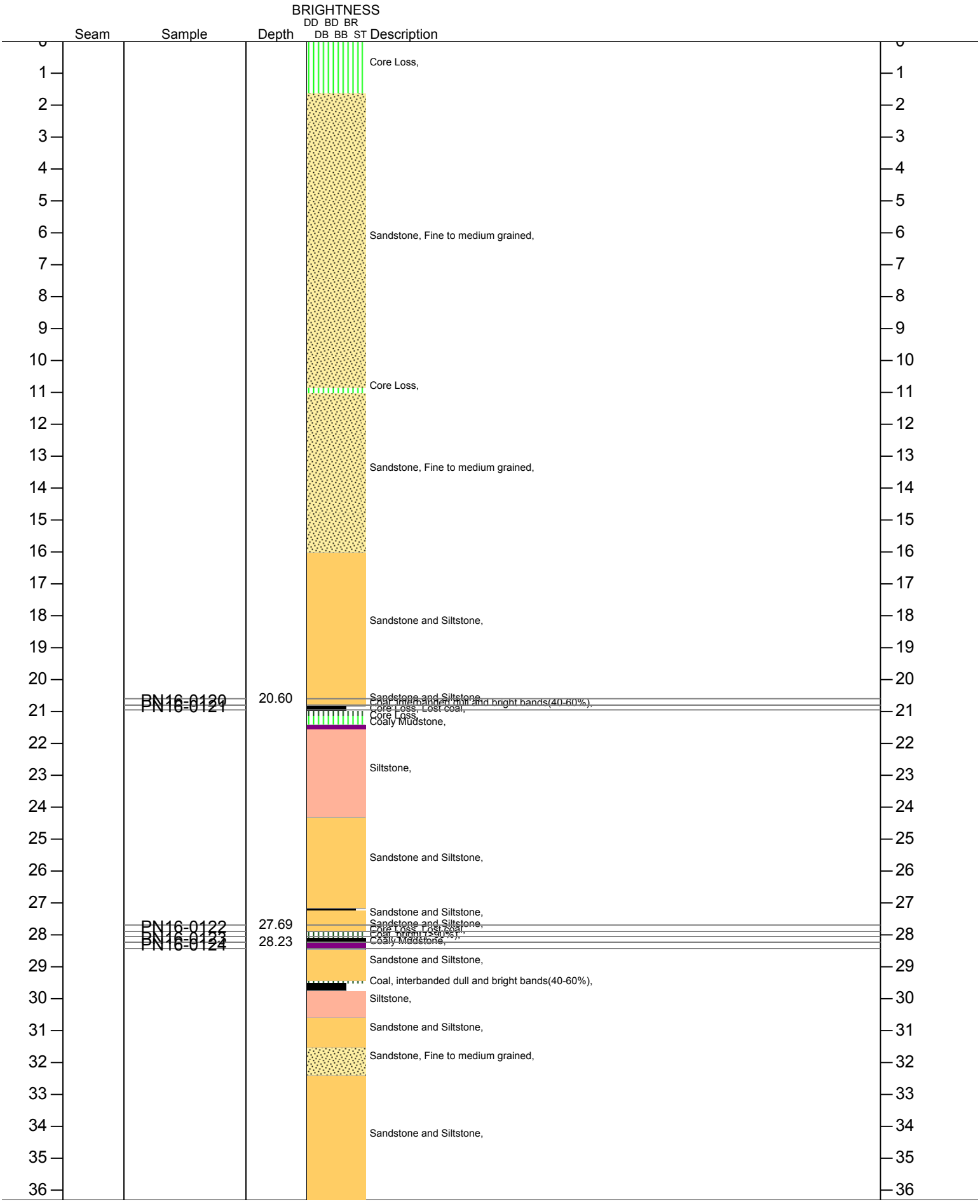
Atrum Coal
PANORAMA
HOLE DH-PN-16-03
SCALE 1:50

GEOPHYSICAL PROFILE



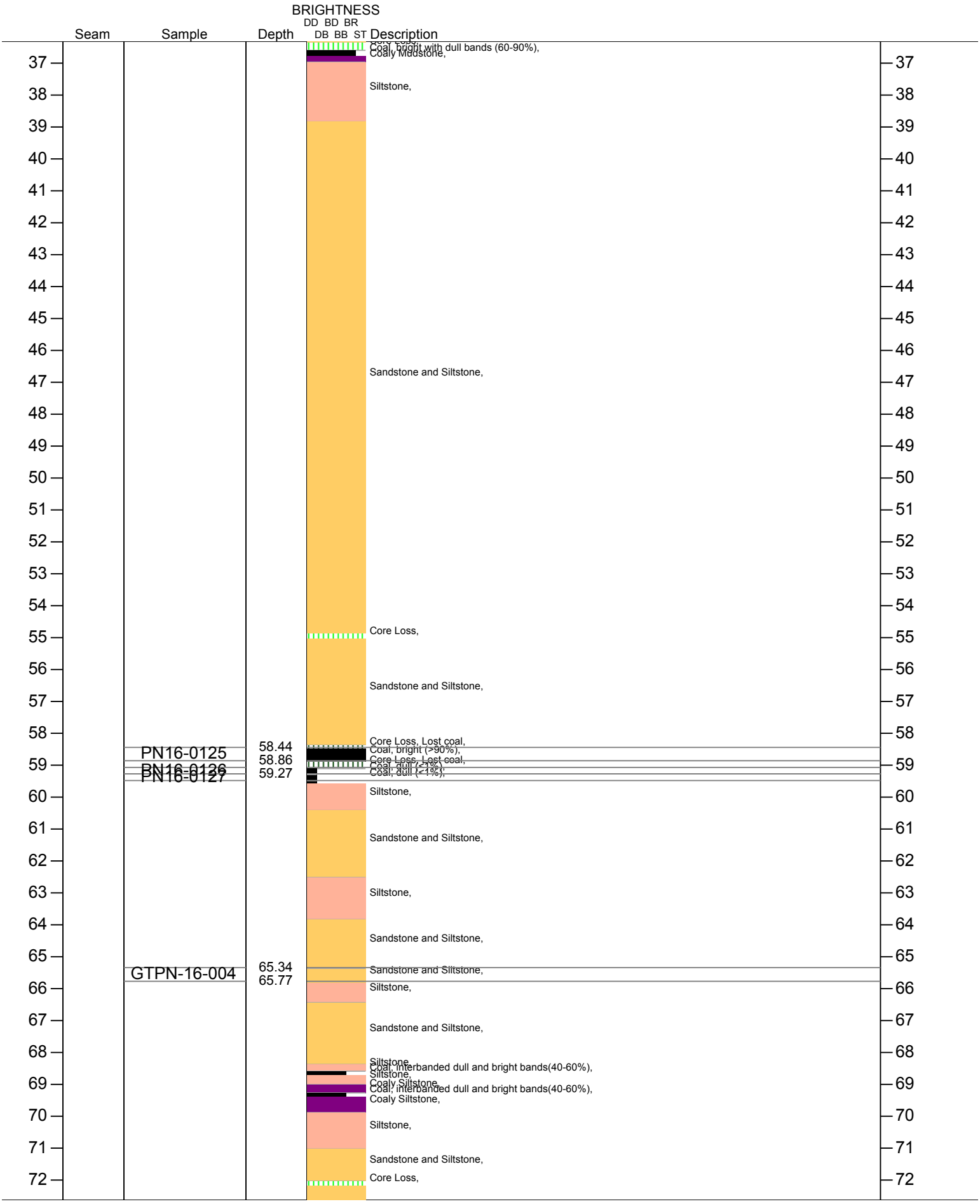
ATRUM COAL
PANORAMA
HOLE DHPN-16-04
SCALE 1:50

GEOPHYSICAL PROFILE



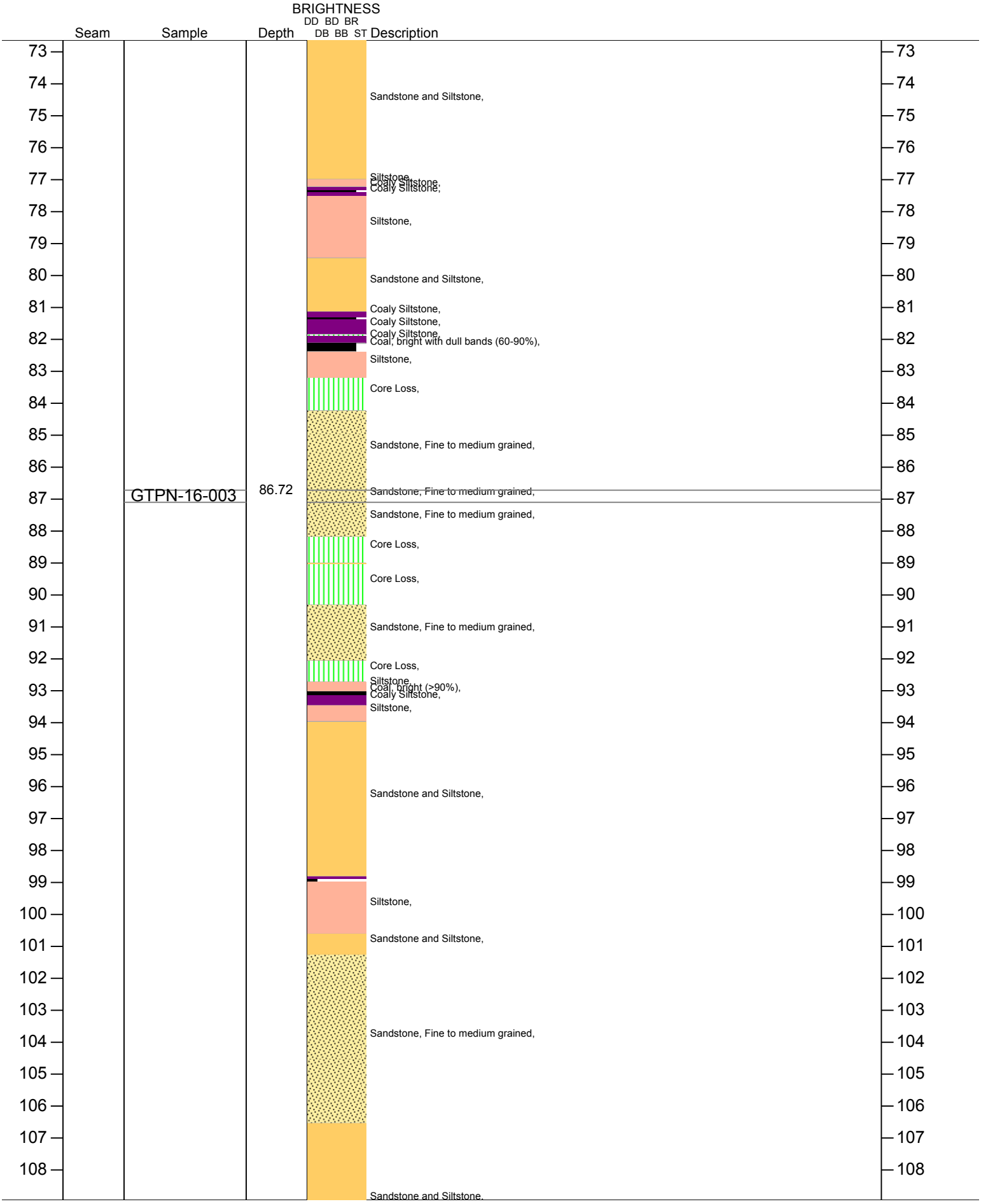
ATRUM COAL
PANORAMA
HOLE DHPN-16-04
SCALE 1:50

GEOPHYSICAL PROFILE



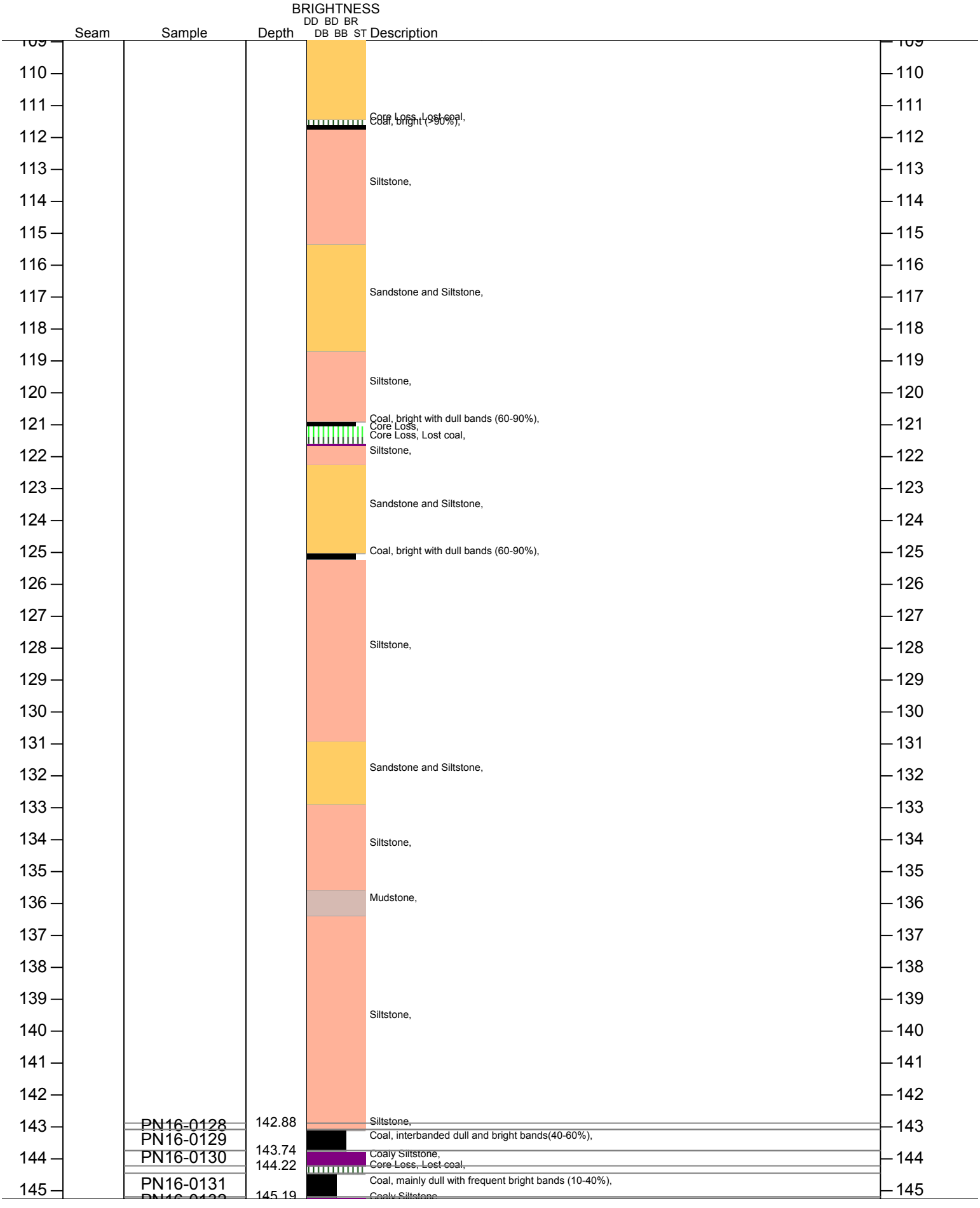
ATRUM COAL
PANORAMA
HOLE DHPN-16-04
SCALE 1:50

GEOPHYSICAL PROFILE



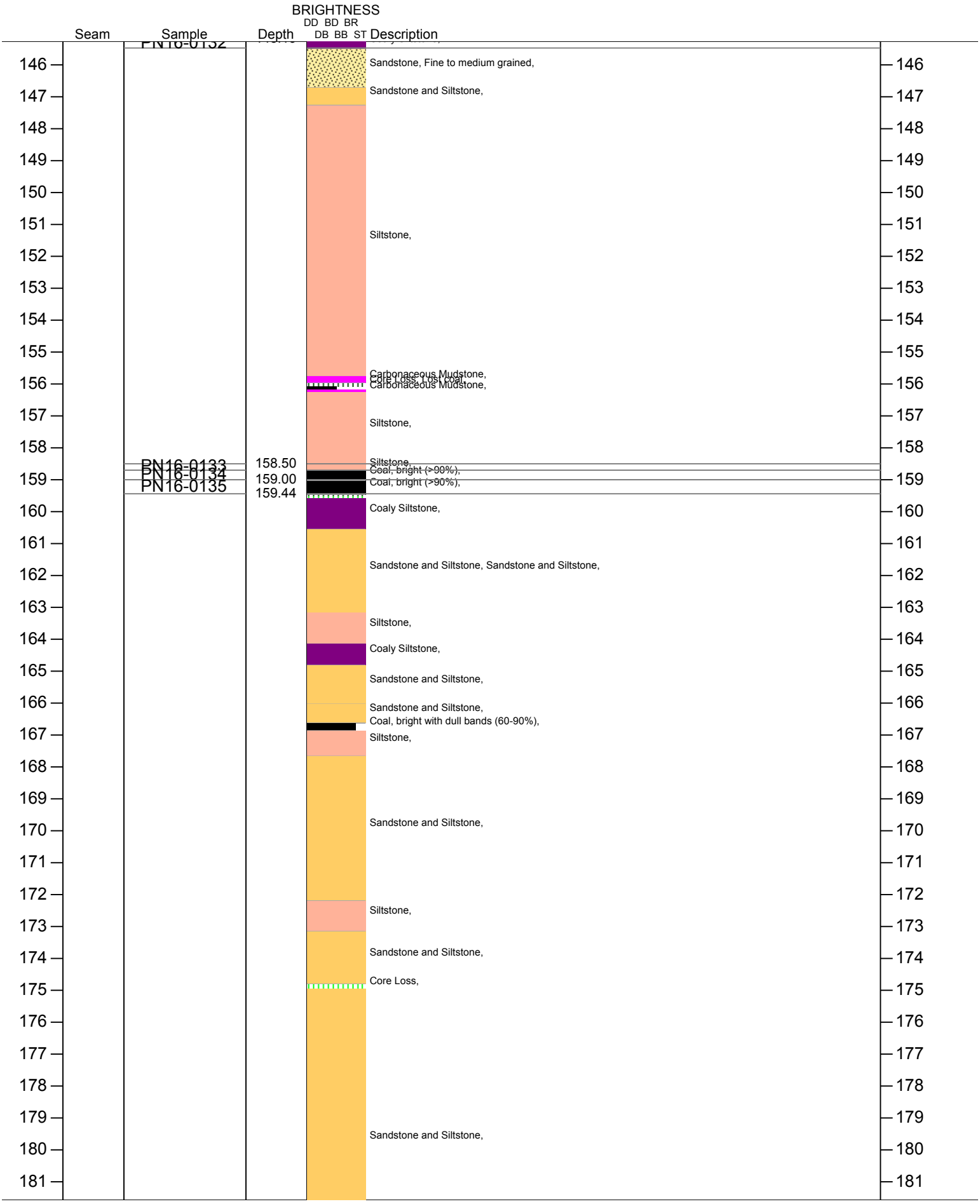
ATRUM COAL
PANORAMA
HOLE DHPN-16-04
SCALE 1:50

GEOPHYSICAL PROFILE



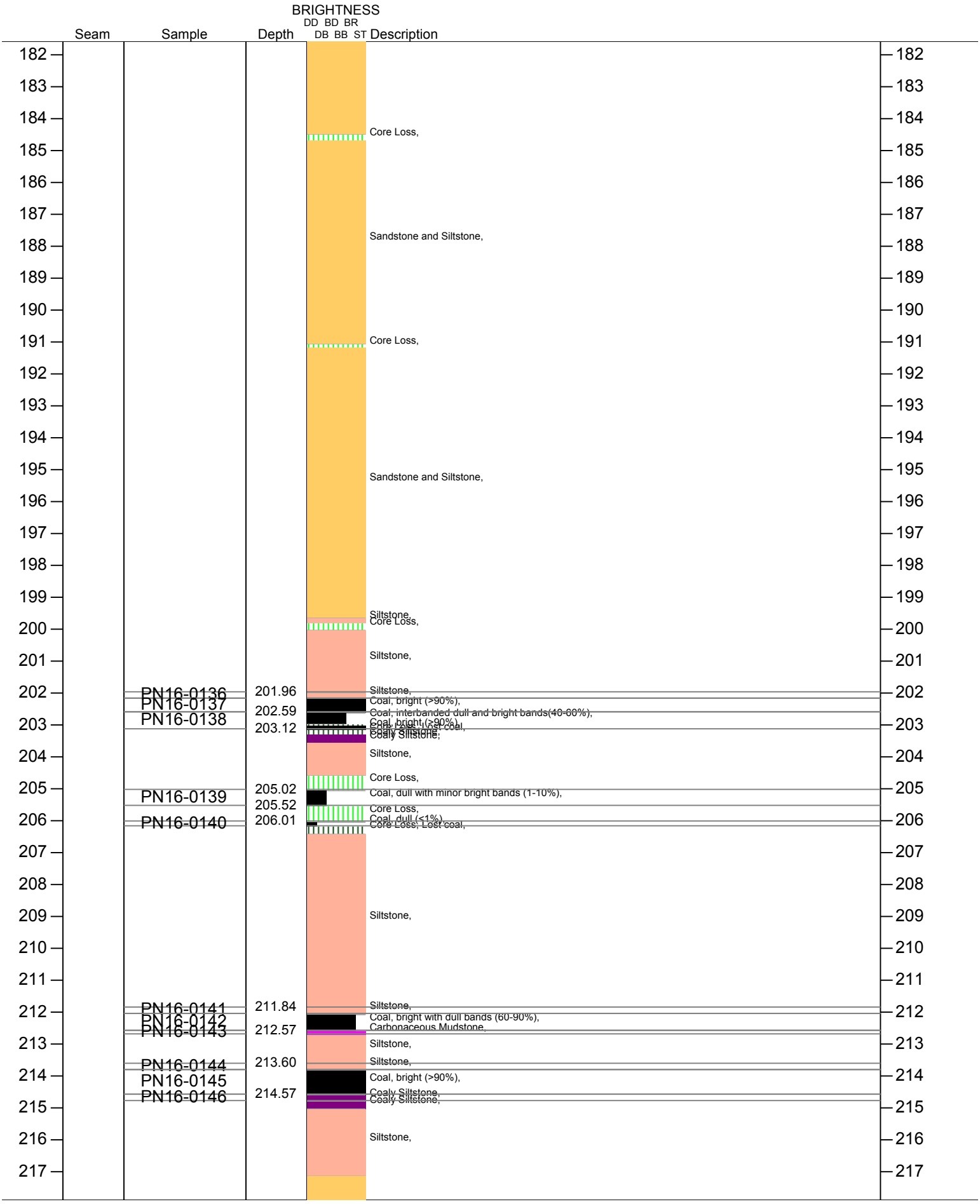
ATRUM COAL
PANORAMA
HOLE DHPN-16-04
SCALE 1:50

GEOPHYSICAL PROFILE



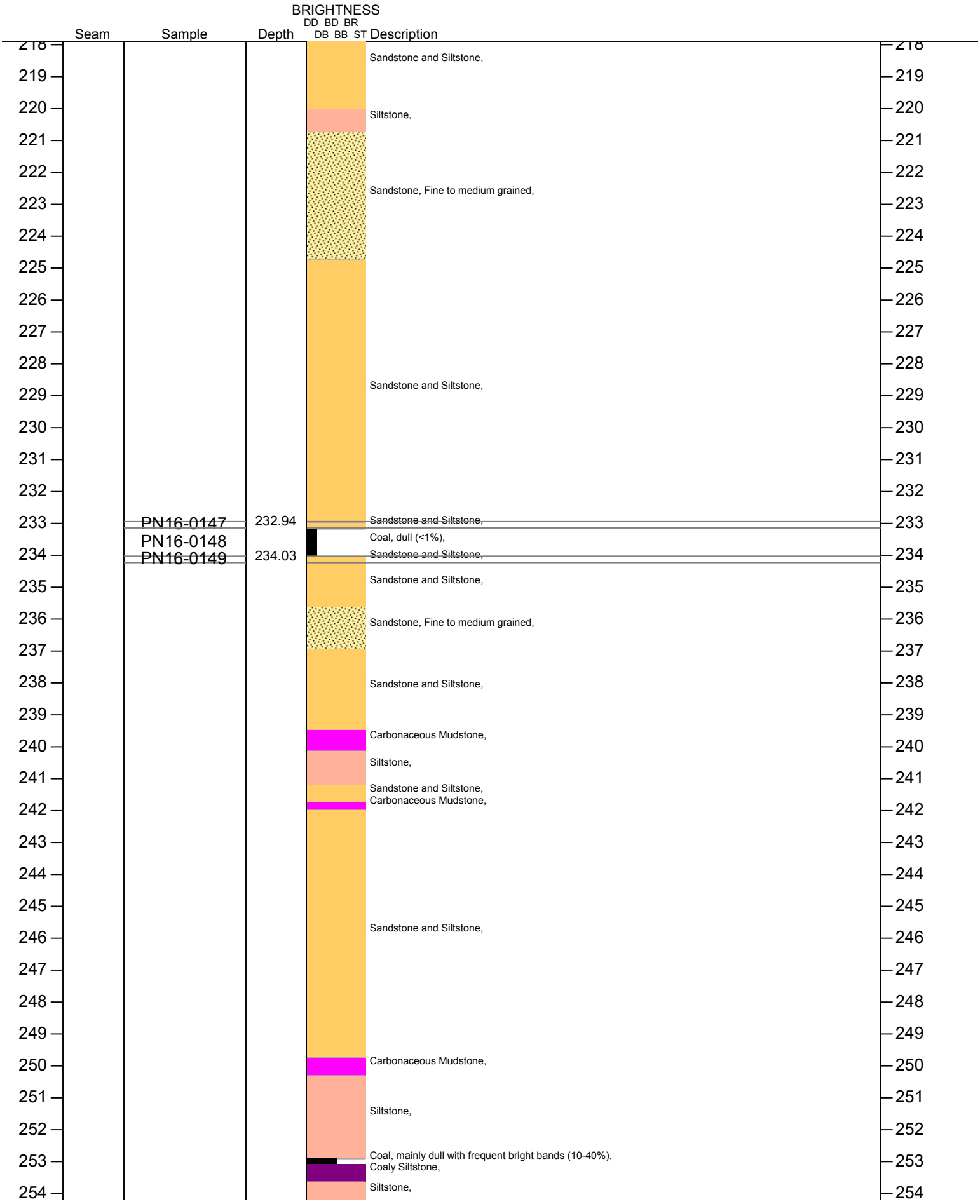
ATRUM COAL
PANORAMA
HOLE DHPN-16-04
SCALE 1:50

GEOPHYSICAL PROFILE



ATRUM COAL
PANORAMA
HOLE DHPN-16-04
SCALE 1:50

GEOPHYSICAL PROFILE



ATRUM COAL
PANORAMA
HOLE DHPN-16-04
SCALE 1:50

GEOPHYSICAL PROFILE

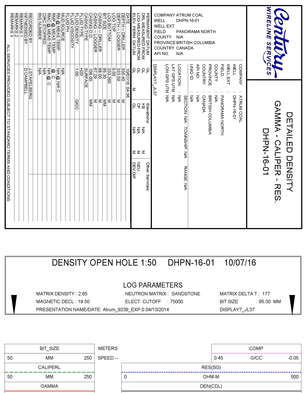
BRIGHTNESS
DD BD BR
DB BB ST

Seam	Sample	Depth	Description
		255	
		256	Sandstone and Siltstone,
		257	
		258	Sandstone, Fine to medium grained,
		259	
		260	Siltstone,
		261	Sandstone and Siltstone,
		262	
		263	
		264	Carbonaceous Mudstone,
		265	Sandstone and Siltstone,
		266	
		267	Sandstone, Fine to medium grained,
		268	
		269	
		270	TD: 269.00

APPENDIX 3

Geophysical Logs

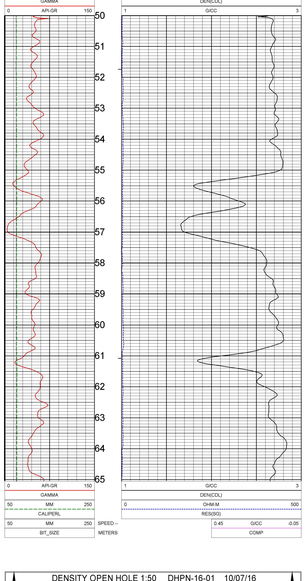
DENSITY OPEN HOLE + CBL
GAMMA RAY API
CASING COLLAR LOCATOR
CBL AMPLITUDE
CBL VARIABLE DENSITY
CBL TRANSIT TIME



DENSITY OPEN HOLE 1:50 DHPN-16-01 10/07/16

LOG PARAMETERS

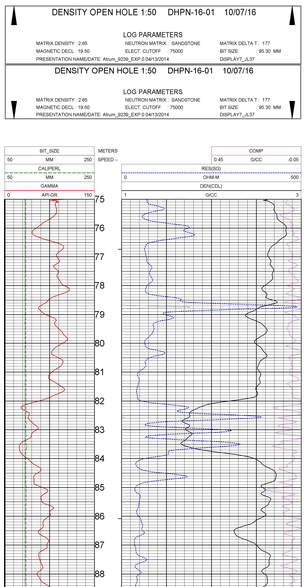
MATRIX DENSITY : 2.65	NEUTRON MATRIX : SANDSTONE	MATRIX DELTA T : 177
MAGNETIC DECL : 19.50	ELECT : CUTOFF 75000	BIT SIZE 95.30 MM
PRESENTATION NAME/DATE: Atrium_8236_EXP.0 04/13/2014		DISPLAY?_JL37



DENSITY OPEN HOLE 1:50 DHPN-16-01 10/07/16

LOG PARAMETERS

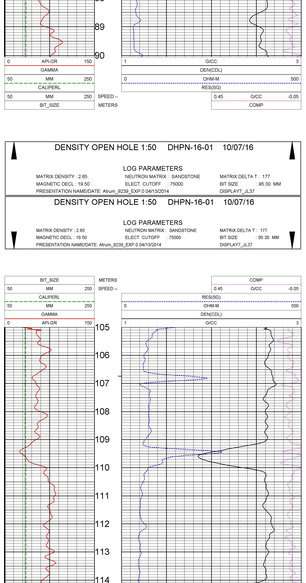
MATRIX DENSITY : 2.65	NEUTRON MATRIX : SANDSTONE	MATRIX DELTA T : 177
MAGNETIC DECL : 19.50	ELECT : CUTOFF 75000	BIT SIZE 95.30 MM
PRESENTATION NAME/DATE: Atrium_8236_EXP.0 04/13/2014		DISPLAY?_JL37



DENSITY OPEN HOLE 1:50 DHPN-16-01 10/07/16

LOG PARAMETERS

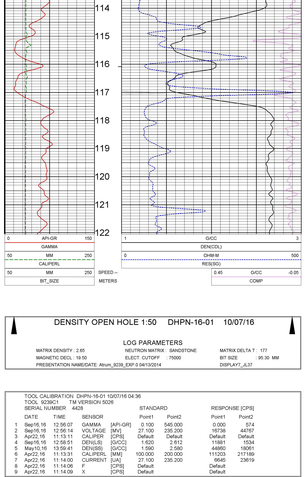
MATRIX DENSITY : 2.65	NEUTRON MATRIX : SANDSTONE	MATRIX DELTA T : 177
MAGNETIC DECL : 19.50	ELECT : CUTOFF 75000	BIT SIZE 95.30 MM
PRESENTATION NAME/DATE: Atrium_8236_EXP.0 04/13/2014		DISPLAY?_JL37



DENSITY OPEN HOLE 1:50 DHPN-16-01 10/07/16

LOG PARAMETERS

MATRIX DENSITY : 2.65	NEUTRON MATRIX : SANDSTONE	MATRIX DELTA T : 177
MAGNETIC DECL : 19.50	ELECT : CUTOFF 75000	BIT SIZE 95.30 MM
PRESENTATION NAME/DATE: Atrium_8236_EXP.0 04/13/2014		DISPLAY?_JL37



DENSITY OPEN HOLE 1:50 DHPN-16-01 10/07/16

LOG PARAMETERS

MATRIX DENSITY : 2.65	NEUTRON MATRIX : SANDSTONE	MATRIX DELTA T : 177
MAGNETIC DECL : 19.50	ELECT : CUTOFF 75000	BIT SIZE 95.30 MM
PRESENTATION NAME/DATE: Atrium_8236_EXP.0 04/13/2014		DISPLAY?_JL37

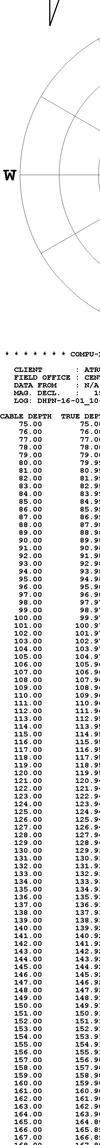
TOOL CALIBRATION DHPN-16-01 10/07/16 04:36
TOOL 8236C1 TM VERSION 5039
SERIAL NUMBER 4428

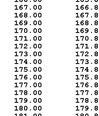
	DATE	TIME	SENSOR	STANDARD Point1	STANDARD Point2	RESPONSE [CPS] Point1	RESPONSE [CPS] Point2
1	Sep16,16	12:56:07	GAMMA	(API-GR) 0.100	545.000	0.000	574
2	Sep16,16	12:56:14	VOLTAGE	(MV) 27.100	235.200	16738	44767
3	Apr22,16	11:13:11	CALIPER	(CPS) Default	Default	Default	Default
4	Apr22,16	11:13:31	CALIPER	(MM) 100.000	200.000	44660	88291
5	May10,16	10:59:41	DENSITY	(GICC) 1.500	2.580	44660	16061
6	Apr22,16	11:13:31	CALIPER	(MM) 100.000	200.000	111203	217189
7	Apr22,16	11:14:00	CURRENT	(uA) 27.100	235.200	9540	23619
8	Apr22,16	11:14:06	F	[CPS] Default	Default	Default	Default
9	Apr22,16	11:14:09	F	[CPS] Default	Default	Default	Default

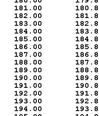
PLAN VIEW
COMPU-LOG DEVIATION

CLIENT: ATRUM COAL
LOCATION: PANORAMA NORTH
HOLE ID: DHPN-16-01
DATE OF LOG: 10/07/16
PROBE: 9411A4502
MAG DECL: 19.5

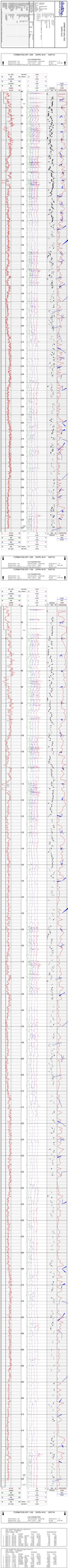
SCALE: 2 M/CM
TRUE DEPTH: 332.14 M
AZIMUTH: 98.4
DISTANCE: 13.5 M
+ = 50 M INCR
o = BOTTOM OF HOLE







CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
75.00	75.00	-0.00	0.00	0.0	108.1	2.7	108.1
76.00	76.00	-0.01	0.04	0.0	107.5	2.7	107.6
77.00	77.00	-0.03	0.09	0.1	107.5	2.7	107.7
78.00	78.00	-0.04	0.14	0.1	107.4	2.7	108.2
79.00	79.00	-0.06	0.18	0.2	107.4	2.8	107.7
80.00	79.99	-0.07	0.23	0.2	107.6	2.8	110.3
81.00	80.99	-0.09	0.27	0.3	107.7	2.9	108.0
82.00	81.99	-0.10	0.32	0.3	107.8	2.9	108.7
83.00	82.99	-0.12	0.37	0.4	107.7	3.0	107.9
84.00	83.99	-0.13	0.42	0.4	107.6	2.9	105.5
85.00	84.99	-0.15	0.47	0.5	107.4	2.9	101.0
86.00	85.99	-0.16	0.52	0.5	107.1	2.9	100.3
87.00	86.99	-0.17	0.57	0.6	106.8	2.8	103.1
88.00	87.98	-0.18	0.61	0.6	106.5	2.7	104.4
89.00	88.98	-0.19	0.66	0.7	106.3	2.6	102.4
90.00	89.98	-0.20	0.70	0.7	106.1	2.6	103.2
91.00	90.98	-0.21	0.74	0.8	105.9	2.6	104.4
92.00	91.98	-0.22	0.79	0.8	105.8	2.5	103.9
93.00	92.98	-0.23	0.83	0.9	105.7	2.6	103.2
94.00	93.98	-0.24	0.87	0.9	105.6	2.6	104.8
95.00	94.98	-0.26	0.92	1.0	105.6	2.6	104.4
96.00	95.98	-0.27	0.96	1.0	105.5	2.6	104.6
97.00	96.98	-0.28	1.01	1.0	105.5	2.7	105.4
98.00	97.97	-0.29	1.05	1.1	105.5	2.7	105.3
99.00	98.97	-0.30	1.10	1.1	105.5	2.7	105.4
100.00	99.97	-0.32	1.14	1.2	105.5	2.7	105.5
101.00	100.97	-0.33	1.19	1.2	105.5	2.8	104.0
102.00	101.97	-0.34	1.24	1.3	105.5	2.8	103.5
103.00	102.97	-0.36	1.28	1.3	105.5	2.8	105.2
104.00	103.97	-0.37	1.33	1.4	105.5	2.8	103.0
105.00	104.97	-0.38	1.38	1.4	105.5	2.9	103.1
106.00	105.96	-0.40	1.43	1.5	105.6	2.9	103.1
107.00	106.96	-0.41	1.48	1.5	105.6	2.9	102.8
108.00	107.96	-0.43	1.53	1.6	105.6	2.9	105.8
109.00	108.96	-0.44	1.58	1.6	105.7	2.9	107.1
110.00	109.96	-0.46	1.63	1.7	105.7	3.0	107.8
111.00	110.96	-0.47	1.68	1.7	105.7	3.1	107.2
112.00	111.96	-0.49	1.73	1.8	105.8	3.1	106.5
113.00	112.95	-0.50	1.78	1.9	105.8	3.1	105.4
114.00	113.95	-0.52	1.83	1.9	105.8	3.1	104.6
115.00	114.95	-0.53	1.89	2.0	105.7	3.1	103.2
116.00	115.95	-0.54	1.94	2.0	105.7	3.1	102.4
117.00	116.95	-0.55	1.99	2.1	105.6	2.8	99.0
118.00	117.95	-0.56	2.03	2.1	105.5	3.0	96.7
119.00	118.95	-0.57	2.08	2.2	105.4	2.8	101.0
120.00	119.95	-0.58	2.13	2.2	105.3	2.6	102.4
121.00	120.94	-0.59	2.17	2.3	105.3	2.7	103.6
122.00	121.94	-0.60	2.22	2.3	105.2	2.7	104.8
123.00	122.94	-0.61	2.26	2.3	105.2	2.6	102.9
124.00	123.94	-0.62	2.31	2.4	105.1	2.7	103.5
125.00	124.94	-0.63	2.35	2.4	105.1	2.7	103.6
126.00	125.94	-0.64	2.40	2.5	105.0	2.7	101.8
127.00	126.94	-0.66	2.44	2.5	105.0	2.6	103.2
128.00	127.94	-0.67	2.49	2.6	105.0	2.6	103.5
129.00	128.94	-0.68	2.53	2.6	105.0	2.6	104.0
130.00	129.93	-0.69	2.58	2.7	104.9	2.6	103.4
131.00	130.93	-0.70	2.62	2.7	104.9	2.6	103.6
132.00	131.93	-0.71	2.67	2.8	104.9	2.6	105.1
133.00	132.93	-0.72	2.71	2.8	104.9	2.7	105.1
134.00	133.93	-0.73	2.76	2.9	104.9	2.7	103.4
135.00	134.93	-0.75	2.80	2.9	104.9	2.6	103.7
136.00	135.93	-0.76	2.85	2.9	104.9	2.6	103.8
137.00	136.93	-0.77	2.89	3.0	104.9	2.7	103.9
138.00	137.93	-0.78	2.94	3.0	104.9	2.7	103.5
139.00	138.93	-0.79	2.98	3.1	104.9	2.7	103.7
140.00	139.92	-0.80	3.03	3.1	104.8	2.7	103.6
141.00	140.92	-0.81	3.07	3.2	104.8	2.7	103.6
142.00	141.92	-0.82	3.12	3.2	104.8	2.7	103.6
143.00	142.92	-0.83	3.16	3.3	104.8	2.7	103.2
144.00	143.92	-0.85	3.21	3.3	104.8	2.7	103.3
145.00	144.92	-0.86	3.26	3.4	104.7	2.7	102.7
146.00	145.92	-0.87	3.30	3.4	104.7	2.8	103.1
147.00	146.92	-0.88	3.35	3.5	104.7	2.7	102.9
148.00	147.92	-0.89	3.40	3.5	104.7	2.7	102.7
149.00	148.92	-0.90	3.44	3.6	104.6	2.8	103.0
150.00	149.91	-0.91	3.49	3.6	104.6	2.8	103.9
151.00	150.91	-0.92	3.54	3.7	104.6	2.8	103.5
152.00	151.91	-0.93	3.59	3.7	104.6	2.8	103.6
153.00	152.91	-0.95	3.64	3.8	104.6	2.9	103.4
154.00	153.91	-0.96	3.68	3.8	104.6	2.9	102.7
155.00	154.91	-0.97	3.73	3.9	104.5	2.9	103.3
156.00	155.91	-0.98	3.78	3.9	104.5	2.8	103.3
157.00	156.90	-0.99	3.83	4.0	104.5	2.8	101.9
158.00	157.90	-1.00	3.88	4.0	104.5	2.8	103.7
159.00	158.90	-1.01	3.92	4.1	104.4	2.7	102.2
160.00	159.90	-1.02	3.97	4.1	104.4	2.9	102.3
161.00	160.90	-1.03	4.02	4.1	104.4	2.9	101.9
162.00	161.90	-1.04	4.07	4.2	104.4	2.9	102.1
163.00	162.90	-1.05	4.12	4.3	104.4	3.0	102.6
164.00	163.90	-1.07	4.17	4.3	104.3	3.1	105.1
165.00	164.89	-1.08	4.22	4.4	104.3	3.2	103.5
166.00	165.89	-1.09	4.28	4.4	104.3	3.2	103.6
167.00	166.89	-1.10	4.33	4.5	104.3	3.2	102.6
168.00	167.89	-1.12	4.38	4.5	104.3	3.2	102.0
169.00	168.89	-1.13	4.44	4.6	104.3	3.1	100.5
170.00	169.89	-1.14	4.49	4.6	104.2	3.1	99.6
171.00	170.89	-1.14	4.54	4.7	104.1	3.0	97.6
172.00	171.88	-1.15	4.59	4.7	104.1	2.8	97.2
173.00	172.88	-1.16	4.64	4.8	104.0	2.8	97.9
174.00	173.88	-1.16	4.69	4.8	104.0	2.8	98.3
175.00	174.88	-1.17	4.74	4.9	103.9	2.8	98.3
176.00	175.88	-1.18	4.79	4.9	103.8	2.7	97.8
177.00	176.88	-1.18	4.83	5.0	103.8	2.7	98.2
178.00	177.88	-1.19	4.88	5.0	103.7	2.7	97.9
179.00	178.88	-1.20	4.93	5.1	103.7	2.7	98.7
180.00	179.87	-1.20	4.97	5.1	103.6	2.7	97.7
181.00	180.87	-1.21	5.02	5.2	103.6	2.7	97.9
182.00	181.87	-1.22	5.07	5.2	103.5	2.7	98.7
183.00	182.87	-1.22	5.12	5.3	103.5	2.7	98.0
184.00	183.87	-1.23	5.16	5.3	103.4	2.8	97.7
185.00	184.87	-1.24	5.21	5.4	103.3	2.8	97.5
186.00	185.87	-1.24	5.26	5.4	103.3	2.8	97.5
187.00	186.87	-1.25	5.31	5.5	103.2	2.8	96.9
188.00	187.87	-1.25	5.36	5.5	103.2	2.8	96.7
189.00	188.86	-1.26	5.40	5.5	103.1	2.8	96.6
190.00	189.86	-1.27	5.45	5.6	103.1	2.8	96.4
191.00	190.86	-1.27	5.50	5.6	103.0	2.8	97.1
192.00	191.86	-1.28	5.55	5.7	103.0	2.8	96.1
193.00	192.86	-1.28	5.60	5.7	102.9	2.8	95.2
194.00	193.86	-1.29	5.65	5.8	102.9	2.8	96.0
195.00	194.86	-1.29	5.69	5.8	102.8	2.8	95.8
196.00	195.86	-1.30	5.74	5.9	102.7	2.8	95.8
197.00	196.85	-1.30	5.79	5.9	102.7	2.8	95.5
198.00	197.85	-1.31	5.84	6.0	102.6	2.8	95.9
199.00	198.85	-1.31	5.89	6.0	102.6	2.8	95.9
200.00	199.85	-1.32	5.94	6.1	102.5	2.9	95.1
201.00	200.85	-1.32	5.99	6.1	102.4	2.9	95.6
202.00	201.85	-1.33	6.04	6.2	102.4	2.7	95.5
203.00	202.85	-1.33	6.09	6.2	102.3	2.8	95.4
204.00	203.85	-1.34	6.14	6.3	102.3	2.9	95.7
205.00	204.85	-1.34	6.19	6.3	102.2	2.9	94.8
206.00	205.84	-1.35	6.24	6.4	102.2	3.0	95.1
207.00	206.84	-1.35	6.29	6.4	102.1	3.0	94.9
208.00	207.84	-1.35	6.35	6.5	102.1	3.0	94.8
209.00	208.84	-1.36	6.40	6.5	102.0	2.9	94.5
210.00	209.84	-1.36	6.45	6.6	101.9	3.0	94.8
211.00	210.84	-1.37	6.50	6.6	101.9	2.9	95.4
212.00	211.84	-1.37	6.55	6.7	101.8	2.9	93.9
213.00	212.83	-1.37	6.60	6.7	101.8	2.8	93.5
214.00	213.83	-1.38	6.65	6.8	101.7	2.8	93.1
215.00	214.83	-1.38	6.70	6.8	101.6	2.9	93.1
216.00	215.83	-1.38	6.75	6.9	101.6	2.9	93.1
217.00	216.83	-1.39	6.80	6.9	101.5	2.7	93.4
218.00	217.83	-1.39	6.84	7.0	101.5	2.7	93.2
219.00	218.83	-1.39	6.89	7.0	101.4	2.7	94.0
220.00	219.83	-1.40	6.94	7.1	101.4	2.8	94.5
221.00	220.82	-1.40	6.99	7.1	101.3	2.8	94.0
222.00	221.82	-1.40	7.04	7.2	101.3	2.8	93.9
223.00	222.82	-1.41	7.09	7.2	101.2	2.8	93.8
224.00	223.82	-1.41	7.13	7.3	101.2	2.9	93.9
225.00	224.82	-1.42	7.18	7.3	101.1	2.9	94.1
226.00	225.82	-1.42	7.23	7.4	101.0	2.7	94.9
227.00	226.82	-1.42	7.28	7.4	101.1	2.8	94.9
228.00	227.82	-1.43	7.33	7.5	101.0	2.7	94.9
229.00	228.81	-1.43	7.38	7.5	101.0	2.8	95.0
230.00	229.81	-1.43	7.43	7.6	100.9	2.8	95.0
231.00	230.81	-1.44	7.48	7.6	100.9	2.8	95.4
232.00	231.81	-1.44	7.52	7.7	100.9	2.8	95.4
233.00	232.81	-1.45	7.58	7.7	100.8	3.0	95.8
234.00	233.81	-1.45	7.63	7.8	100.8	3.0	95.7
235.00	234.81	-1.46	7.68	7.8	100.8	3.0	95.6
236.00	235.81	-1.47	7.73	7.9	100.7	3.1	95.2
237.00	236.80	-1.47	7.78	7.9	100.7	3.1	95.6
238.00	237.80	-1.48	7.84	8.0	100.7	3.1	95.6
239.00	238.80	-1.48	7.89	8.0	100.6	3.0	98.0
240.00	239.80	-1.49	7.95	8.1	100.6	3.1	97.6
241.00	240.80	-1.49	8.00	8.1	100.6	3.1	98.0
242.00	241.80	-1.50	8.06	8.2	100.5	3.1	97.1
243.00	242.80	-1.51	8.11	8.2	100.5	3.0	97.9
244.00	243.79	-1.51	8.16	8.3	100.5	3.0	97.5
245.00	244.79	-1.52	8.21	8.4	100.5	3.0	98.7
246.00	245.79	-1.53	8.26	8.4	100.5	2.9	97.7
247.00	246.79	-1.53	8.31	8.5	100.4	2.9	96.9
248.00	247.79	-1.54	8.36	8.5	100.4	3.0	96.8
249.00	248.79	-1.55	8.42	8.6	100.4	3.0	97.1
250.00	249.79	-1.55	8.47	8.6	100.4	3.0	97.6
251.00	250.78	-1.56	8.52	8.7	100.4	3.0	97.7
252.00	251.78	-1.57	8.57	8.7	100.4	3.0	97.2
253.00	252.78	-1.57	8.62	8.8	100.3	3.0	97.2
254.00	253.78	-1.58	8.68	8.8	100.3	3.0	97.3
255.00	254.78	-1.59	8.73	8.9	100.3	3.0	97.5
256.00	255.78	-1.60	8.78	8.9	100.3	3.0	97.5
257.00	256.78	-1.60	8.83	9.0	100.3	3.1	97.1
258.00	257.77	-1.61	8.89	9.0	100.3	3.1	97.3
259.00	258.77	-1.62	8.94	9.1	100.2	3.2	96.9
260.00	259.77	-1.62	9.00	9.1	100.2	3.1	97.5
261.00	260.77	-1.63	9.05	9.2	100.2	3.2	97.0
262.00	261.77	-1.64	9.11	9.3	100.2	3.2	97.5
263.00	262.77	-1.64	9.16	9.3	100.2	3.2	96.7
264.00	263.77	-1.65	9.22	9.4	100.2	3.2	97.0
265.00	264.76	-1.66	9.27	9.4	100.1	3.2	96.2
266.00	265.76	-1.66	9.33	9.5	100.1	3.2	97.0
267.00	266.76	-1.67	9.38	9.5	100.1	3.1	96.5
268.00	267.76	-1.68	9.43	9.6	100.1	3.1	96.5
269.00	268.76	-1.68	9.49	9.6	100.1	3.1	96.6
270.00	269.76	-1.69	9.54	9.7	100.0	3.2	96.4
271.00	270.76	-1.70	9.60	9.7	100.0	3.2	96.7
272.00	271.75	-1.70	9.65	9.8	100.0	3.2	96.3
273.00	272.75	-1.71	9.71	9.9	100.0	3.2	96.1
274.00	273.75	-1.71	9.77	9.9	99.9	3.3	95.7
275.00	274.75	-1.72	9.82	10.0	99.9	3.3	96.1
276.00	275.75	-1.72	9.88	10.0	99.9	3.3	95.2
277.00	276.75	-1.73	9.94	10.1	99.9	3.3	95.3
278.00	277.74	-1.73	10.00	10.1	99.8	3.3	98.4
279.00	278.74	-1.74	10.05	10.2	99.8	3.3	95.0
280.00	279.74	-1.74	10.11	10.3	99.8	3.3	95.5
281.00	280.74	-1.75	10.17	10.3	99.8	3.3	95.5
282.00	281.74	-1.76	10.23	10.4	99.7	3.4	95.2
283.00	282.74	-1.76	10.29	10.4	99.7	3.4	95.0
284.00	283.73	-1.77	10.34	10.5	99.7	3.3	95.2
285.00	284.73	-1.77	10.40	10.6	99.7	3.3	94.8
286.00	285.73	-1.78	10.46	10.6	99.6	3.4	94.8
287.00	286.73	-1.78	10.52	10.7	99.6	3.4	96.3
288.00	287.73	-1.79	10.58	10.7	99.6	3.4	95.0
289.00	288.72	-1.79	10.64	10.8	99.6	3.4	95.2
290.00	289.72	-1.80	10.70	10.8	99.5	3.4	94.1
291.00	290.72	-1.80	10.76	10.9	99.5	3.5	95.4
292.00	291.72	-1.81	10.82	11.0	99.5	3.4	96.4
293.00	292.72	-1.81	10.88	11.0	99.5	3.5	95.5
294.00	293.72	-1.82	10.94	11.1	99.5	3.4	94.9
295.00	294.71	-1.83	11.00	11.1	99.4	3.5	94.8
296.00	295.71	-1.83	11.06	11.2	99.4	3.5	95.6
297.00	296.71	-1.84	11.12	11.3	99.4	3.5	95.5
298.00	297.71	-1.84	11.18	11.3	99.4	3.5	95.3
299.00	298.70	-1.85	11.24	11.4	99.3	3.5	95.1
300.00	299.70	-1.86	11.30	11.5	99.3	3.5	95.0
301.00	300.70	-1.86	11.36	11.5	99.3	3.6	95.5
302.00	301.70	-1.87	11.42	11.6	99.3	3.6	95.7
303.00	302.70	-1.87	11.49	11.6	99.3	3.6	95.2
304.00	303.70	-1.88	11.55	11.7	99.2	3.6	95.6
305.00	304.70	-1.88	11.61	11.8	99.2	3.6	96.0
306.00	305.69	-1.89	11.67	11.8	99.2	3.6	96.5
307.00	306.69	-1.90	11.74	11.9	99.2	3.6	95.8
308.00	307.69	-1.90	11.80	12.0	99.2	3.7	94.8
309.00	308.69	-1.91	11.86	12.0	99.1	3.7	94.8
310.00	309.68	-1.91	11.93	12.1	99.1	3.6	94.5
311.00	310.68	-1.92	11.99	12.1	99.1	3.6	95.2
312.00	311.68	-1.92	12.05	12.2	99.1	3.5	92.9
313.00	312.68	-1.92	12.11	12.3	99.0	3.4	92.9
314.00	313.68	-1.93	12.17	12.3	99.0	3.5	91.9
315.00	314.68	-1.93	12.23	12.4	99.0	3.5	91.6
316.00	315.67	-1.93	12.29	12.4	98.9	3.5	91.1
317.00	316.67	-1.93	12.35	12.5	98.9	3.5	91.6
318.00	317.67	-1.93	12.41	12.6	98.9	3.6	91.8
319.00	318.67	-1.94	12.48	12.6	98.8	3.6	92.1
320.00	319.67	-1.94	12.54	12.7	98.8	3.6	92.1
321.00	320.66	-1.94	12.61	12.8	98.8	3.8	93.1
322.00	321.66	-1.94	12.67	12.8	98.7	3.8	92.5
323.00	322.66	-1.95	12.74	12.9	98.7	3.8	91.5
324.00	323.66	-1.95	12.81	13.0	98.7	3.8	92.4
325.00	324.66	-1.95	12.87	13.0	98.6	3.8	92.4
326.00	325.66	-1.96	12.94	13.1	98.6	3.8	92.5
327.00	326.65	-1.96	13.01	13.2	98.6	3.8	92.9
328.00	327.65	-1.96	13.07	13.2	98.5	3.8	92.9
329.00	328.65	-1.97	13.14	13.3	98.5	3.8	93.5
330.00	329.64	-1.97	13.20	13.3	98.5	3.8	92.3
331.00	330.64	-1.97	13.27	13.4	98.4	3.8	92.4
332.00	331.64	-1.97	13.34	13.5	98.4	3.7	92.2
332.50	332.14	-1.98	13.37	13.5	98.4	3.7	91.9


FORMATION EVAL
Schlumberger
FORMATION SPF LOG - DEPTH: 56.00 - 1620.00
LOG PARAMETERS
DEPTH MEASURED FROM: KB
ELEVATION: 1000.00 m
DEPTH REFERENCE: TIME LOG
DEPTH REFERENCE: 56.00 m
DEPTH REFERENCE: 1620.00 m
RUN NUMBER: 1
DATE: 12/12/07
TIME: 12:00:00
DEPTH: 56.00 m
SPEED: 1000.00 m/h
MUD TYPE: WATER BASED
MUD WEIGHT: 1.00 g/cm3
MUD VISCOSITY: 1.00 cP
MUD PH: 7.00
MUD RESISTIVITY: 0.10 ohm.m
MUD SALINITY: 0.00 ppm
MUD CHLORIDES: 0.00 ppm
MUD CALCIUM: 0.00 ppm
MUD MAGNESIUM: 0.00 ppm
MUD SULFATES: 0.00 ppm
MUD BICARBONATES: 0.00 ppm
MUD CARBONATES: 0.00 ppm
MUD HARDNESS: 0.00 ppm
MUD SODIUM: 0.00 ppm
MUD POTASSIUM: 0.00 ppm
MUD FLUORIDES: 0.00 ppm
MUD NITRATES: 0.00 ppm
MUD PHOSPHATES: 0.00 ppm
MUD SILICATES: 0.00 ppm
MUD IRON: 0.00 ppm
MUD MANGANESE: 0.00 ppm
MUD ZINC: 0.00 ppm
MUD COPPER: 0.00 ppm
MUD LEAD: 0.00 ppm
MUD NICKEL: 0.00 ppm
MUD COBALT: 0.00 ppm
MUD CHROMIUM: 0.00 ppm
MUD VANADIUM: 0.00 ppm
MUD TITANIUM: 0.00 ppm
MUD ALUMINUM: 0.00 ppm
MUD BORON: 0.00 ppm
MUD BROMIDES: 0.00 ppm
MUD IODIDES: 0.00 ppm
MUD ARSENIC: 0.00 ppm
MUD SELENIUM: 0.00 ppm
MUD MOLYBDENUM: 0.00 ppm
MUD TUNGSTEN: 0.00 ppm
MUD MERCURY: 0.00 ppm
MUD CADMIUM: 0.00 ppm
MUD ANTIMONY: 0.00 ppm
MUD BISMUTH: 0.00 ppm
MUD THORIUM: 0.00 ppm
MUD URANIUM: 0.00 ppm
MUD RADIUM: 0.00 ppm
MUD RADON: 0.00 ppm
MUD POLONIUM: 0.00 ppm
MUD ASTATINE: 0.00 ppm
MUD FRANCIUM: 0.00 ppm
MUD RADIUM: 0.00 ppm
MUD ACTINIUM: 0.00 ppm
MUD THORIUM: 0.00 ppm
MUD PROTACTINIUM: 0.00 ppm
MUD URANIUM: 0.00 ppm
MUD NEPTUNIUM: 0.00 ppm
MUD PLUTONIUM: 0.00 ppm
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MUD HEXBIHEXIUM: 0.00 ppm
MUD HEXBISEPTIUM: 0.00 ppm
MUD HEXBIOCTIUM: 0.00 ppm
MUD HEXBIENNIUM: 0.00 ppm
MUD HEXTRINILIUM: 0.00 ppm
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MUD HEXTRIBIUM: 0.00 ppm
MUD HEXTRITRIUM: 0.00 ppm
MUD HEXTRIQUADIUM: 0.00 ppm
MUD HEXTRIPENTIUM: 0.00 ppm
MUD HEXTRIHEXIUM: 0.00 ppm
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MUD HEXTRIENNIUM: 0.00 ppm
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MUD HEXQUADQUADIUM: 0.00 ppm
MUD HEXQUADPENTIUM: 0.00 ppm
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MUD HEXQUADSEPTIUM: 0.00 ppm
MUD HEXQUADOCTIUM: 0.00 ppm
MUD HEXQUADENNIUM: 0.00 ppm
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MUD HEXHEXHEXIUM: 0.00 ppm
MUD HEXHEXSEPTIUM: 0.00 ppm
MUD HEXHEXOCTIUM: 0.00 ppm
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MUD HEXSEPTUNIUM: 0.00 ppm
MUD HEXSEPTBIUM: 0.00 ppm
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MUD HEXSEPTOCTIUM: 0.00 ppm
MUD HEXSEPTENNIUM: 0.00 ppm
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MUD SEPTNILHEXIUM: 0.00 ppm
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MUD SEPTNILOCTIUM: 0.00 ppm
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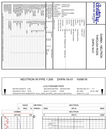
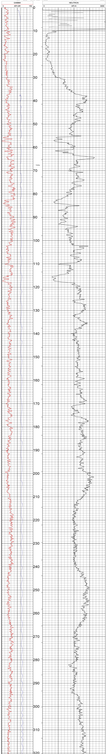
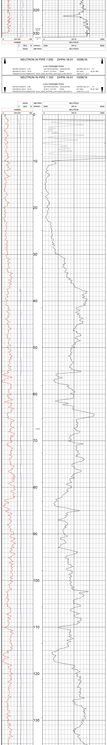
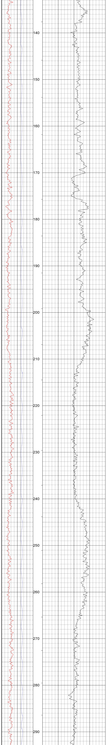
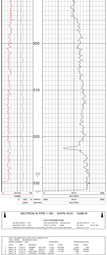


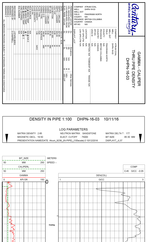
MD/TVD/ALTK/RPCEC/RPCTC | 1:200 | DEPTH: 50.00 - 10384.76

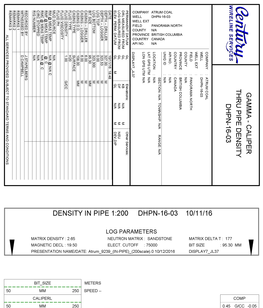








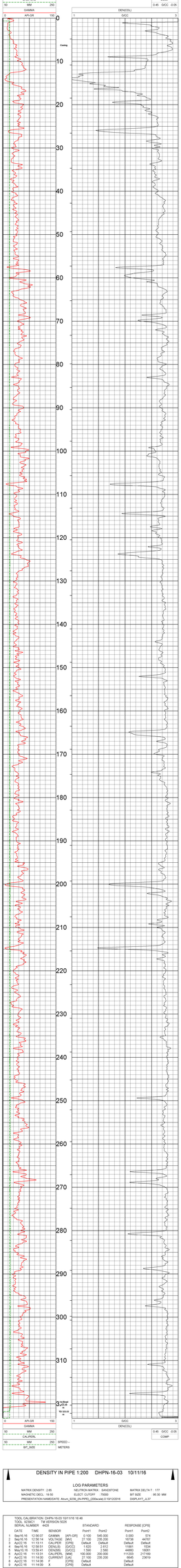

Schlumberger
Compensated Neutron Formation Density
Litho-Density
Gamma Ray (API)
Caliper (in)
Bit Size (in)
Photoelectric Factor (PEF)
Bulk Density (RHOB)
Delta Rho (DRHO)
Neutron Porosity (NPHI)

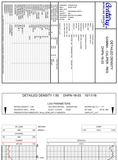


DENSITY IN PIPE 1:200 DHPN-16-03 10/11/16

LOG PARAMETERS

NEUTRON MATRIX SANDSTONE MATRIX DELTA T 177
MAGNETIC DECL -16.50 ELECT CUTOFF 75000 BIT SIZE 95.30 MM
PRESENTATION NAMEDATE Atnam_8236_(IN-PIPE)_(2)Decades.0 10/12/2016 DISPLAY_JL37

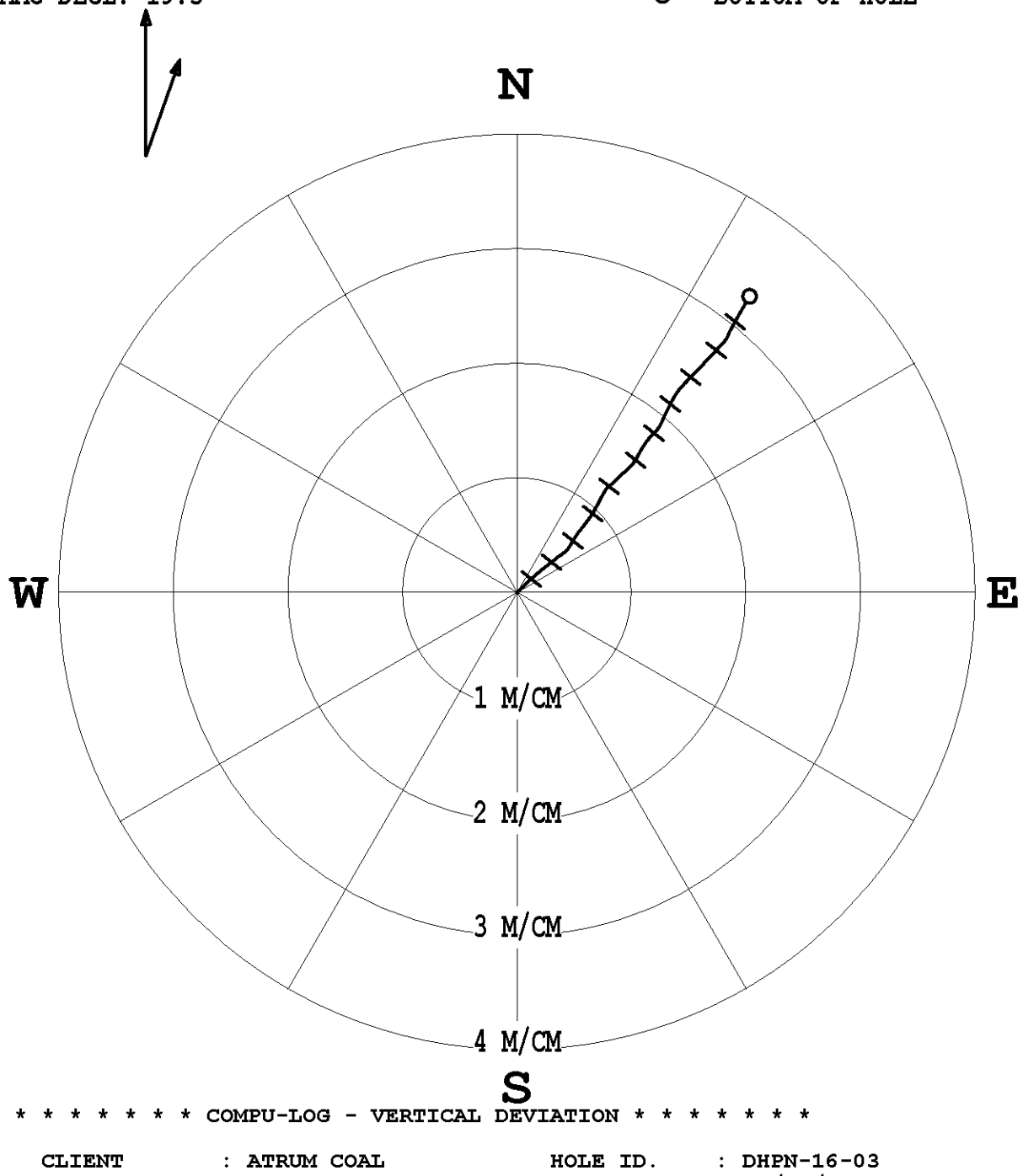


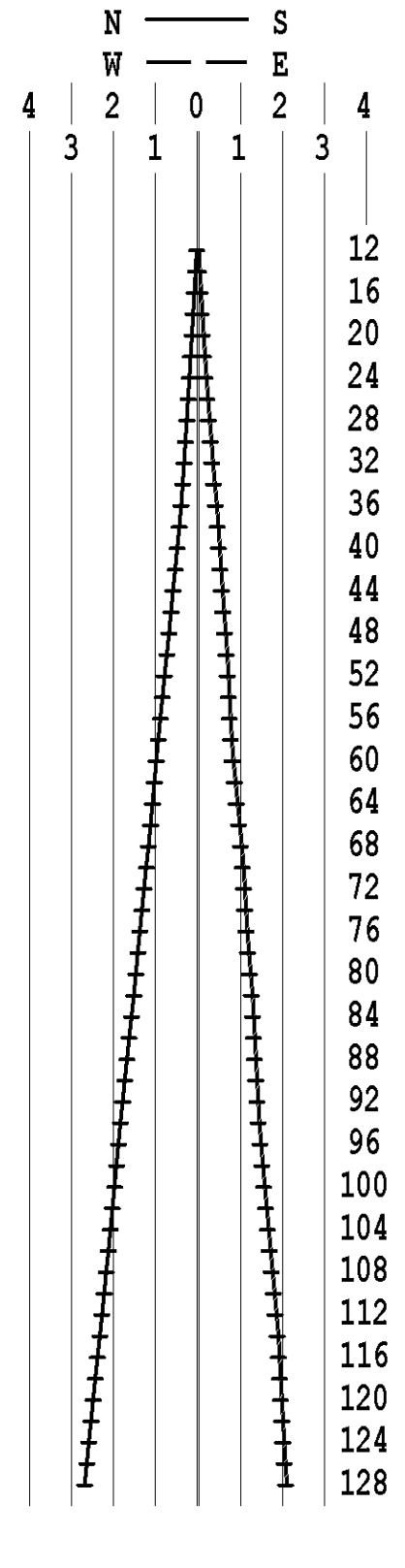

Schlumberger
Gamma Ray
Caliper
Density Correction
Neutron Porosity
Bit Size
Density Porosity
Photoelectric Factor
Delta Rho
Gamma Ray in Casing
Tension
Cable Speed
Mud Type
Mud Density
Mud Viscosity
Mud Resistivity
Mud Filtrate Resistivity
Mud Cake Resistivity
Mud Filtrate Sample Temperature
Mud Cake Sample Temperature
Max Recorded Temperature
Max Recorded Temperature
Time Since Circulation
Time Since Circulation
Max Rec Temp
Equipment Number
Location
Recorded By
Witnessed By
Run Number
Depth Driller
Depth Logger
Bottom Logged Interval
Top Logged Interval
Casing Driller Size @ Depth
Casing Logger Size @ Depth
Bit Size
Type Fluid in Hole
Density
Viscosity
PH
Fluid Loss
Source of Sample
Rm @ Meas Temp
Rmf @ Meas Temp
Rmc @ Meas Temp
Source of Rmf and Rmc
Rm @ BHT
Time Circulation Stopped
Time Logger on Bottom

PLAN VIEW
COMPU-LOG DEVIATION

CLIENT: ATRUM COAL
LOCATION: PANORAMA NORTH
HOLE ID: DHPN-16-03
DATE OF LOG: 10/12/16
PROBE: 9058A 2633
MAG DECL: 19.5

SCALE: 1 M/CM
TRUE DEPTH: 128.98 M
AZIMUTH: 38.2
DISTANCE: 3.3 M
+ = 10 M INCR
o = BOTTOM OF HOLE





* * * * * * * COMPU-LOG - VERTICAL DEVIATION * * * * * * *

CLIENT : ATRUM COAL
FIELD OFFICE : CENTURY
DATA FROM : N/A
MAG. DECL. : 19.500
LOG: DHPN-16-03_10-12-16_00-13_9058A_.02_11.00_129.20_DEVI.log

HOLE ID. : DHPN-16-03
DATE OF LOG : 10/12/16
PROBE : 9058A , 2633
DEPTH UNITS : METERS

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
11.00	11.00	-0.01	-0.00	0.0	215.4	1.1	47.0
12.00	12.00	0.01	0.01	0.0	56.2	1.1	45.6
13.00	13.00	0.02	0.02	0.0	48.9	1.1	41.7
14.00	14.00	0.03	0.03	0.0	46.6	1.0	40.3
15.00	15.00	0.05	0.05	0.1	46.2	1.2	51.5
16.00	16.00	0.06	0.06	0.1	45.8	1.2	42.2
17.00	17.00	0.08	0.08	0.1	45.4	1.1	49.2
18.00	18.00	0.09	0.09	0.1	46.0	1.2	48.5
19.00	19.00	0.10	0.11	0.1	46.2	1.1	45.4
20.00	20.00	0.12	0.12	0.2	46.3	1.1	47.9
21.00	21.00	0.13	0.14	0.2	46.4	1.2	46.5
22.00	22.00	0.15	0.15	0.2	46.3	1.2	46.5
23.00	23.00	0.16	0.17	0.2	46.6	1.2	52.8
24.00	24.00	0.17	0.18	0.3	47.0	1.3	50.0
25.00	25.00	0.19	0.20	0.3	47.3	1.3	51.2
26.00	26.00	0.20	0.22	0.3	47.6	1.4	48.1
27.00	27.00	0.22	0.24	0.3	47.9	1.4	55.3
28.00	28.00	0.23	0.26	0.3	48.2	1.5	51.7
29.00	29.00	0.25	0.28	0.4	48.4	1.5	51.6
30.00	30.00	0.26	0.30	0.4	48.7	1.4	51.6
31.00	31.00	0.28	0.32	0.4	48.9	1.4	51.1
32.00	32.00	0.29	0.34	0.4	48.9	1.4	47.8
33.00	33.00	0.31	0.36	0.5	49.0	1.5	55.3
34.00	34.00	0.32	0.38	0.5	49.5	1.5	56.3
35.00	35.00	0.34	0.40	0.5	49.7	1.6	51.9
36.00	36.00	0.36	0.42	0.6	49.7	1.7	47.8
37.00	37.00	0.38	0.44	0.6	49.4	1.7	39.1
38.00	38.00	0.40	0.46	0.6	48.7	1.5	27.6
39.00	39.00	0.43	0.47	0.6	48.0	1.5	32.1
40.00	40.00	0.45	0.49	0.7	47.3	1.6	31.4
41.00	41.00	0.47	0.50	0.7	46.6	1.6	32.5
42.00	42.00	0.50	0.52	0.7	46.1	1.7	30.5
43.00	43.00	0.52	0.53	0.7	45.6	1.7	38.4
44.00	44.00	0.54	0.55	0.8	45.4	1.7	38.2
45.00	45.00	0.57	0.57	0.8	45.1	1.7	38.6
46.00	46.00	0.59	0.59	0.8	44.9	1.7	36.5
47.00	47.00	0.61	0.61	0.9	44.6	1.7	38.5
48.00	48.00	0.64	0.62	0.9	44.3	1.7	36.1
49.00	49.00	0.66	0.64	0.9	44.0	1.7	35.9
50.00	50.00	0.69	0.66	1.0	43.7	1.7	32.0
51.00	51.00	0.71	0.67	1.0	43.3	1.7	28.6
52.00	52.00	0.74	0.69	1.0	42.9	1.6	33.1
53.00	53.00	0.76	0.70	1.0	42.6	1.5	23.8
54.00	54.00	0.79	0.71	1.1	42.2	1.6	24.3
55.00	55.00	0.81	0.72	1.1	41.8	1.6	26.7
56.00	56.00	0.83	0.74	1.1	41.4	1.5	28.4
57.00	57.00	0.86	0.75	1.1	41.1	1.5	35.6
58.00	58.00	0.88	0.76	1.2	40.9	1.6	31.7
59.00	59.00	0.90	0.78	1.2	40.7	1.8	49.2
60.00	60.00	0.92	0.80	1.2	40.9	1.8	47.4
61.00	61.00	0.95	0.82	1.3	41.1	1.8	48.3
62.00	62.00	0.97	0.85	1.3	41.2	1.8	46.5
63.00	63.00	0.99	0.87	1.3	41.3	1.9	46.3
64.00	64.00	1.01	0.90	1.4	41.5	1.9	46.8
65.00	65.00	1.04	0.92	1.4	41.6	1.9	47.1
66.00	66.00	1.06	0.94	1.4	41.7	1.9	46.1
67.00	67.00	1.08	0.97	1.4	41.8	1.9	44.7
68.00	68.00	1.10	0.99	1.5	41.9	1.9	44.5
69.00	69.00	1.13	1.01	1.5	41.9	1.9	42.1
70.00	70.00	1.15	1.03	1.5	41.8	1.8	27.1
71.00	71.00	1.18	1.05	1.6	41.6	1.7	26.9
72.00	72.00	1.20	1.06	1.6	41.3	1.6	28.4
73.00	73.00	1.23	1.07	1.6	41.1	1.6	28.5
74.00	74.00	1.25	1.09	1.7	40.9	1.6	33.3
75.00	75.00	1.28	1.10	1.7	40.8	1.6	32.8
76.00	76.00	1.30	1.12	1.7	40.7	1.6	35.0
77.00	77.00	1.32	1.13	1.7	40.6	1.6	36.5
78.00	78.00	1.35	1.15	1.8	40.6	1.7	37.2
79.00	79.00	1.37	1.17	1.8	40.6	1.7	43.2
80.00	80.00	1.39	1.19	1.8	40.6	1.8	45.1
81.00	81.00	1.41	1.21	1.9	40.7	1.8	42.1
82.00	82.00	1.44	1.23	1.9	40.7	1.8	37.8
83.00	83.00	1.46	1.25	1.9	40.5	1.7	25.2
84.00	84.00	1.49	1.26	2.0	40.3	1.7	24.2
85.00	85.00	1.52	1.27	2.0	40.0	1.7	24.5
86.00	86.00	1.54	1.29	2.0	39.8	1.6	24.2
87.00	87.00	1.57	1.30	2.0	39.6	1.6	25.8
88.00	88.00	1.59	1.31	2.1	39.4	1.6	26.4
89.00	89.00	1.62	1.32	2.1	39.3	1.6	26.3
90.00	90.00	1.64	1.34	2.1	39.1	1.6	27.1
91.00	91.00	1.67	1.35	2.1	39.0	1.6	28.9
92.00	92.00	1.69	1.36	2.2	38.8	1.6	30.3
93.00	93.00	1.72	1.38	2.2	38.7	1.6	31.0
94.00	94.00	1.74	1.39	2.2	38.6	1.6	33.7
95.00	95.00	1.76	1.41	2.3	38.6	1.6	36.4
96.00	96.00	1.79	1.43	2.3	38.6	1.7	39.6
97.00	97.00	1.81	1.45	2.3	38.7	1.8	42.7
98.00	98.00	1.83	1.47	2.3	38.7	1.8	44.1
99.00	99.00	1.85	1.49	2.4	38.8	1.8	43.0
100.00	100.00	1.88	1.51	2.4	38.9	1.8	44.8
101.00	101.00	1.90	1.54	2.4	39.0	1.8	43.8
102.00	102.00	1.92	1.56	2.5	39.0	1.8	44.8
103.00	103.00	1.95	1.58	2.5	39.1	1.8	45.6
104.00	104.00	1.97	1.60	2.5	39.1	1.8	42.9
105.00	105.00	1.99	1.62	2.6	39.2	1.8	42.7
106.00	106.00	2.02	1.65	2.6	39.2	1.9	43.2
107.00	107.00	2.04	1.67	2.6	39.3	1.9	43.0
108.00	108.00	2.06	1.69	2.7	39.3	1.9	43.6
109.00	109.00	2.09	1.71	2.7	39.4	1.9	43.3
110.00	110.00	2.11	1.74	2.7	39.4	1.9	42.3
111.00	111.00	2.14	1.76	2.8	39.4	1.9	43.0
112.00	112.00	2.16	1.78	2.8	39.5	1.9	44.2
113.00	113.00	2.19	1.80	2.8	39.5	1.9	42.4
114.00	114.00	2.21	1.82	2.9	39.5	1.8	29.5
115.00	115.00	2.24	1.84	2.9	39.4	1.7	24.4
116.00	116.00	2.26	1.85	2.9	39.2	1.6	24.2
117.00	117.00	2.29	1.86	2.9	39.1	1.6	27.7
118.00	118.00	2.31	1.87	3.0	39.0	1.6	28.5
119.00	119.00	2.34	1.89	3.0	38.9	1.6	28.6
120.00	120.00	2.36	1.90	3.0	38.8	1.6	29.3
121.00	121.00	2.39	1.91	3.1	38.7	1.6	29.2
122.00	122.00	2.41	1.93	3.1	38.6	1.6	29.4
123.00	123.00	2.44	1.94	3.1	38.6	1.6	29.3
124.00	124.00	2.46	1.96	3.1	38.5	1.6	30.4
125.00	125.00	2.48	1.97	3.2	38.4	1.6	30.8
126.00	126.00	2.51	1.98	3.2	38.3	1.6	34.1
127.00	127.00	2.53	2.00	3.2	38.3	1.6	32.8
128.00	128.00	2.56	2.01	3.3	38.2	1.6	29.5
129.00	129.00	2.58	2.03	3.3	38.2	0.0	0.0
129.20	128.98	2.58	2.03	3.3	38.2	1.7	34.0

COMPANY	ANADARKO
WELL	SHERIDAN 16-23
FIELD	WILDCAT
COUNTY	SHERIDAN
STATE	WYOMING
API NUMBER	49-033-05-00
LOCATION	SEC 16 TWP 43N RGE 79W
OTHER SERVICES	
PERMANENT DATUM	GROUND LEVEL
ELEVATION	4,000 FT
LOG MEASURED FROM	KELLY BUSHING
DRILLING MEASURED FROM	KELLY BUSHING
DATE	10/11/16
RUN NUMBER	ONE
DEPTH DRILLER	10,000 FT
DEPTH LOGGER	10,000 FT
BOTTOM LOGGED INTERVAL	10,000 FT
TOP LOGGED INTERVAL	0 FT
CASING DRILLER	9.625 @ 1,000 FT
CASING LOGGER	1,000 FT
BIT SIZE	8.75 IN
TYPE FLUID IN HOLE	WATER BASED MUD
DENSITY / VISCOSITY	8.9 LB/GAL / 40 SEC
PH / FLUID LOSS	9.5 / 6.0 ML
SOURCE OF SAMPLE	MUD PIT
RM @ MEAS TEMP	0.08 @ 70 DEG F
RMF @ MEAS TEMP	0.07 @ 70 DEG F
RMC @ MEAS TEMP	0.09 @ 70 DEG F
SOURCE RMF / RMC	MEASURED / MEASURED
RM @ BHT	0.04 @ 180 DEG F
TIME SINCE CIRCULATION	12 HRS
MAX REC TEMP	180 DEG F
EQUIP LOCATION	1
RECORDED BY	J. SMITH
WITNESSED BY	M. JONES

NEUTRON IN PIPE 1.100 DHPN-16-23 10/11/16

LOG PARAMETERS

MATRIX DENSITY 2.65	ELECTRON DENSITY 1.0000	MATRIX DELTA T 47
MAGNETIC DECL 16.00	FLUID VOLUME 100%	DEPTH 00 IN 00

PRESENTATION COMMENTS: Sonic, Gamma Ray, Caliper, Neutron, Density

GAMMA RAY (GAPI) 0 — 100 | CALIPER (IN) 6 — 16 | NEUTRON (APU) 1000 — 0 | NEUTRON (APU) 1000 — 0

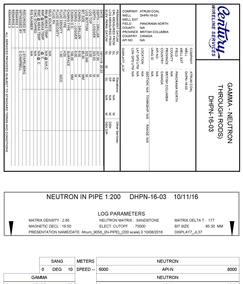
NEUTRON IN PIPE 1.100 DHPN-16-23 10/11/16

LOG PARAMETERS

MATRIX DENSITY 2.65	ELECTRON DENSITY 1.0000	MATRIX DELTA T 47
MAGNETIC DECL 16.00	FLUID VOLUME 100%	DEPTH 00 IN 00

PRESENTATION COMMENTS: Sonic, Gamma Ray, Caliper, Neutron, Density

GAMMA RAY (GAPI) 0 — 100 | CALIPER (IN) 6 — 16 | NEUTRON (APU) 1000 — 0 | NEUTRON (APU) 1000 — 0



NEUTRON IN PIPE 1:200 DHPN-16-03 10/11/16

LOG PARAMETERS

MATRIX DENSITY 2.65 NEUTRON MATRIX SANDSTONE MATRIX DELTA T 177
MAGNETIC DECL 16.50 ELECT CUTOFF 75000 BIT SIZE 95.50 MM
PRESENTATION NAMEGATE Atom_9056_EH.PRES_(200 scale) 0 10/06/2016 DISPLAY7_JL37

SANG METERS NEUTRON
0 DEG 10 SPEED - 6000 API-N 8000
GAMMA NEUTRON
0 API-GR 150 0 API-N 6000
0
10
20
30
40
50
Casing
Casing
0 API-GR 150 0 API-N 6000
GAMMA NEUTRON
0 DEG 10 SPEED - 6000 API-N 8000
SANG METERS NEUTRON

NEUTRON IN PIPE 1:200 DHPN-16-03 10/11/16

MATRIX DENSITY 2.65 NEUTRON MATRIX SANDSTONE MATRIX DELTA T 177
MAGNETIC DECL 16.50 ELECT CUTOFF 75000 BIT SIZE 95.50 MM
PRESENTATION NAMEGATE Atom_9056_EH.PRES_(200 scale) 0 10/06/2016 DISPLAY7_JL37

NEUTRON IN PIPE 1:200 DHPN-16-03 10/11/16

LOG PARAMETERS

MATRIX DENSITY 2.65 NEUTRON MATRIX SANDSTONE MATRIX DELTA T 177
MAGNETIC DECL 16.50 ELECT CUTOFF 75000 BIT SIZE 95.50 MM
PRESENTATION NAMEGATE Atom_9056_EH.PRES_(200 scale) 0 10/06/2016 DISPLAY7_JL37

SANG METERS NEUTRON
0 DEG 10 SPEED - 4000 API-N 8000
GAMMA NEUTRON
0 API-GR 150 0 API-N 4000
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
300
310
3 Final TD at 316
0 API-GR 150 0 API-N 4000
GAMMA NEUTRON
0 DEG 10 SPEED - 4000 API-N 8000
SANG METERS NEUTRON

NEUTRON IN PIPE 1:200 DHPN-16-03 10/11/16

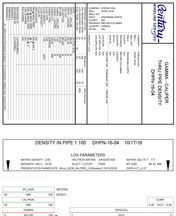
MATRIX DENSITY 2.65 NEUTRON MATRIX SANDSTONE MATRIX DELTA T 177
MAGNETIC DECL 16.50 ELECT CUTOFF 75000 BIT SIZE 95.50 MM
PRESENTATION NAMEGATE Atom_9056_EH.PRES_(200 scale) 0 10/06/2016 DISPLAY7_JL37

TOOL CALIBRATION DHPN-16-03 10/11/16 20:33
TOOL 9056A TW VERSION 2004
SERIAL NUMBER 2633

CATE	TIME	SENSOR	STANDARD Point1	STANDARD Point2	RESPONSE [DFS] Point1	RESPONSE [DFS] Point2
1 Rec27-16	12:33:31	GAMMA	(API-GR) 0.100	545.000	0.000	595
2 Rec27-16	12:33:13	GAMMA	(DECAY) 0.000	80.000	3.000	83.000
3 Rec27-16	12:32:55	NEUTRON	(API-N) 0.000	2713.000	0.000	69.000
4 Rec27-16	12:33:31	FORESLG	(FERCO) 100.000		101	

NEUTRON IN PIPE 1:200 DHPN-16-03 10/11/16

MATRIX DENSITY 2.65 NEUTRON MATRIX SANDSTONE MATRIX DELTA T 177
MAGNETIC DECL 16.50 ELECT CUTOFF 75000 BIT SIZE 95.50 MM
PRESENTATION NAMEGATE Atom_9056_EH.PRES_(200 scale) 0 10/06/2016 DISPLAY7_JL37



DENSITY IN PIPE 1:100 CHPN-16-04 10/17/16

LOG PARAMETERS

MATRIX DENSITY: 2.65		MATRIX DELTA T: 51.0	
MAGNETIC DECL: 10.55	BLOCK HEIGHT: 10.00	AT SEA:	40.30 MM
PRESENTATION NAMEGATE: Wave_BOB_AVG.PRS_;;Default;;1 10/12/2016		DEPLAY: _0.0"	

BIT SIZE
6.25 IN
CAL/DEL
MM
BIT_SIZE

METERS
SPEED

COMP
0.45 GCC 0.25

GR_EDTC
0 GAPI 150
DENSITY
1.95 G/C3 2.95

TIME

0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
260

GR_EDTC
0 GAPI 150
CAL/DEL
MM
BIT_SIZE

SPEED
CASING
DENSITY
0.45 GCC 0.25
COMP

DENSITY IN PIPE 1:100 CHPN-16-04 10/17/16

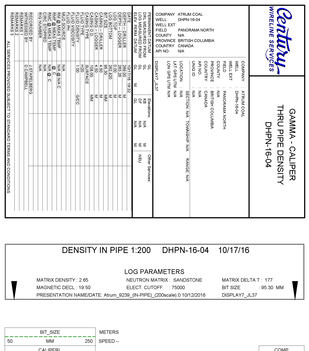
LOG PARAMETERS

MATRIX DENSITY: 2.65		MATRIX DELTA T: 51.0	
MAGNETIC DECL: 10.55	BLOCK HEIGHT: 10.00	AT SEA:	40.30 MM
PRESENTATION NAMEGATE: Wave_BOB_AVG.PRS_;;Default;;1 10/12/2016		DEPLAY: _0.0"	

TOOL CALIBRATION: GAIN DATE 12/17/15 16:52
TOOL NUMBER: TM GAMMA RUN#: 1

DETAIL CURVES

	TOOL	MNEMONIC	WORKSHEET		RESPONSE [CPS]	
	NUMBER		NAME	DATE	0 GAPI	150 GAPI
1	Sig-01 SL 12:00:15	GAMMA	API-CPS	21 OCT	307.000	47.4
2	Sig-01 SL 12:00:15	GAMMA	API-CPS	21 OCT	307.000	47.4
3	Sig23 SL 12:00:15	CALIPER	CPS	Default	Default	Default
4	Sig23 SL 12:00:15	CALIPER	CPS	Default	Default	Default
5	Sig23 SL 12:00:15	DENSITY	CPS	21 OCT	4000	1000
6	Sig23 SL 12:00:15	DENSITY	CPS	21 OCT	4000	1000
7	Sig23 SL 12:00:15	CAPTURE	API	21 OCT	4000	1000
8	Sig23 SL 12:00:15	CAPTURE	API	21 OCT	4000	1000
9	Sig23 SL 12:00:15	A	CPS	Default	Default	Default
10	Sig23 SL 12:00:15	A	CPS	Default	Default	Default


Geoway
WIRELINE SERVICES
GAMMA - CALIPER
THRU PIPE DENSITY
DHPN-16-04
COMPANY ATNA COAL
WELL DHPN-16-04
WELL EXT
FIELD PANORAMA NORTH
COUNTY
PROVINCE BRITISH COLUMBIA
COUNTRY CANADA
API NO N/A
LOCATION
LOCATION EXT
PERMANENT DATUM
LOG MEASURED FROM
DRILLING MEASURED FROM
ELEVATION
KB
DF
GL
DATE LOGGED
RUN NUMBER
DEPTH DRILLER
DEPTH LOGGER
BTM LOG INTERVAL
TOP LOG INTERVAL
CASING DRILLER
CASING LOGGER
BIT SIZE
TYPE FLUID IN HOLE
DENSITY
VISCOSITY
PH
FLUID LOSS
SOURCE OF SAMPLE
RM @ MEAS TEMP
RMF @ MEAS TEMP
RMC @ MEAS TEMP
SOURCE RMF RMC
RM @ BHT
TIME CIRC ENDED
TIME LOGGER ON BOTTOM
MAX REC TEMP
EQUIP LOCATION
RECORDED BY
WITNESSED BY
TOOL NUMBER
TOOL TYPE
TOOL STRING
TOOL EXT
TOOL OD
TOOL WEIGHT
SPACING
MAX HOLE DEVIATION
BOTTOM HOLE DEVIATION
LOGGING DISTANCE
LOGGING SPEED
DENSITY TOOL
DENSITY SOURCE
DENSITY SOURCE STRENGTH
DENSITY SOURCE SPACING
DENSITY DETECTOR
DENSITY MATRIX
DENSITY FLUID
DENSITY MAX CORRECTION
DENSITY MATRIX DENSITY
DENSITY FLUID DENSITY
DENSITY LOGGING SPEED
DENSITY TIME CONSTANT
DENSITY CALIBRATION
DENSITY CALIBRATION DATE
DENSITY CALIBRATION TIME
DENSITY CALIBRATION BY
DENSITY CALIBRATION WITNESS
DENSITY CALIBRATION TYPE
DENSITY CALIBRATION REMARKS
DENSITY CALIBRATION REMARKS
DENSITY CALIBRATION REMARKS

DETAILED DENSITY 1:50 - [SHIPIL 06-04] - 10/17/06

LOG PARAMETERS

DETAILED DENSITY 1:50 - [SHIPIL 06-04] - 10/17/06

LOG PARAMETERS

DETAILED DENSITY 1:50 - [SHIPIL 06-04] - 10/17/06

LOG PARAMETERS

DETAILED DENSITY 1:50 - [SHIPIL 06-04] - 10/17/06

LOG PARAMETERS

DETAILED DENSITY 1:50 - [SHIPIL 06-04] - 10/17/06

LOG PARAMETERS

DETAILED DENSITY 1:50 - [SHIPIL 06-04] - 10/17/06

LOG PARAMETERS

DETAILED DENSITY 1:50 - [SHIPIL 06-04] - 10/17/06

LOG PARAMETERS

DETAILED DENSITY 1:50 - [SHIPIL 06-04] - 10/17/06

LOG PARAMETERS

DETAILED DENSITY 1:50 - [SHIPIL 06-04] - 10/17/06

LOG PARAMETERS

DETAILED DENSITY 1:50 - [SHIPIL 06-04] - 10/17/06

LOG PARAMETERS

DETAILED DENSITY 1:50 - [SHIPIL 06-04] - 10/17/06

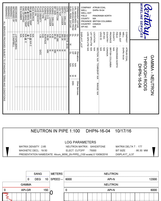
LOG PARAMETERS

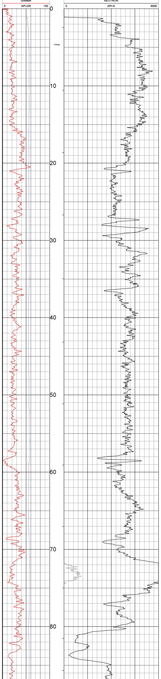
DETAILED DENSITY 1:50 - [SHIPIL 06-04] - 10/17/06

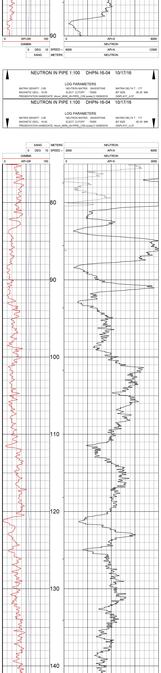
LOG PARAMETERS

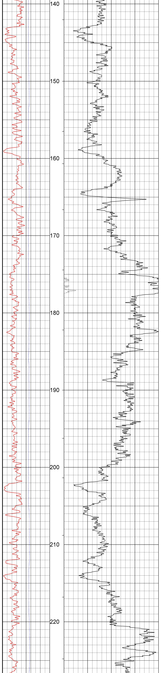
DETAILED DENSITY 1:50 - [SHIPIL 06-04] - 10/17/06

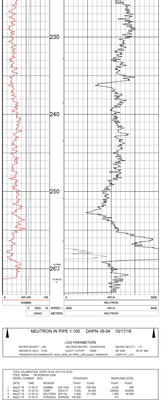
LOG PARAMETERS

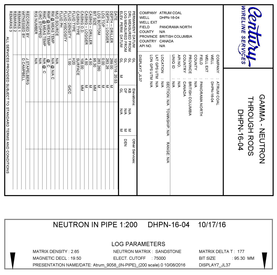

Gearhart
Gearhart Industries, Inc.
Fort Worth, Texas
CASING COLLAR LOCATOR
CCL
GAMMA RAY
NEUTRON


NEUTRON IN PIPE 1.100 DHPN-16-04 10/17/16
LOG PARAMETERS
MATRIX DENSITY: 2.65 MATRIX DELTA-T: 55.5
MUD WEIGHT: 10.0 MUD DELTA-T: 189.0 MUD SALINITY: 0 PPM
FORMATION WATER SALINITY: 0 PPM FORMATION DENSITY: 1.0 FORMATION SALINITY: 0 PPM
BASE_GAMMA
GAMMA
0
200
BASE_NEUTRON
NEUTRON
60
0
BASE_DEPTH
DEPTH
0
100


NEUTRON IN PIPE 1.100 DHPN-16-04 10/17/16
LOG PARAMETERS
MATRIX DENSITY: 2.65 MATRIX DELTA-T: 55.5
MUD WEIGHT: 10.0 MUD DELTA-T: 189.0 MUD SALINITY: 0 PPM
FORMATION WATER SALINITY: 0 PPM FORMATION DENSITY: 1.0 FORMATION SALINITY: 0 PPM
BASE_GAMMA
GAMMA
0
200
BASE_NEUTRON
NEUTRON
60
0
BASE_DEPTH
DEPTH
0
100


NEUTRON IN PIPE 1.100 DHPN-16-04 10/17/16
LOG PARAMETERS
MATRIX DENSITY: 2.65 MATRIX DELTA-T: 55.5
MUD WEIGHT: 10.0 MUD DELTA-T: 189.0 MUD SALINITY: 0 PPM
FORMATION WATER SALINITY: 0 PPM FORMATION DENSITY: 1.0 FORMATION SALINITY: 0 PPM
BASE_GAMMA
GAMMA
0
200
BASE_NEUTRON
NEUTRON
60
0
BASE_DEPTH
DEPTH
0
100


NEUTRON IN PIPE 1.100 DHPN-16-04 10/17/16
LOG PARAMETERS
MATRIX DENSITY: 2.65 MATRIX DELTA-T: 55.5
MUD WEIGHT: 10.0 MUD DELTA-T: 189.0 MUD SALINITY: 0 PPM
FORMATION WATER SALINITY: 0 PPM FORMATION DENSITY: 1.0 FORMATION SALINITY: 0 PPM
BASE_GAMMA
GAMMA
0
200
BASE_NEUTRON
NEUTRON
60
0
BASE_DEPTH
DEPTH
0
100



NEUTRON IN PIPE 1:200 DHPN-16-04 10/17/16

LOG PARAMETERS

MATRIX DENSITY : 2.65	NEUTRON MATRIX : SANDSTONE	MATRIX DELTA T : 177	
MAGNETIC DECL. : 19.50	ELECT. CUTOFF : 75000	BIT SIZE	95.30 MM
PRESENTATION NAMEDATE: Atrum_8058_(IN-PIPE)_(200 scale)-3 10/06/2016		DISPLAYT_A.ST	

SANG METERS NEUTRON

0 DEG 10 SPEED – 6000 API-N 12000

GAMMA NEUTRON

0 API-GR 150 0 API-N 6000

Casing

0 10 20 30 40 50 60 70 80 90

0 API-GR 150 0 API-N 6000

GAMMA NEUTRON

0 DEG 10 SPEED – 6000 API-N 12000

SANG METERS NEUTRON

NEUTRON IN PIPE 1:200 DHPN-16-04 10/17/16

LOG PARAMETERS

MATRIX DENSITY : 2.65	NEUTRON MATRIX : SANDSTONE	MATRIX DELTA T : 177	
MAGNETIC DECL. : 19.50	ELECT. CUTOFF : 75000	BIT SIZE	95.30 MM
PRESENTATION NAMEDATE: Atrum_8058_(IN-PIPE)_(200 scale)-3 10/06/2016		DISPLAYT_A.ST	

NEUTRON IN PIPE 1:200 DHPN-16-04 10/17/16

LOG PARAMETERS

MATRIX DENSITY : 2.65	NEUTRON MATRIX : SANDSTONE	MATRIX DELTA T : 177	
MAGNETIC DECL. : 19.50	ELECT. CUTOFF : 75000	BIT SIZE	95.30 MM
PRESENTATION NAMEDATE: Atrum_8058_(IN-PIPE)_(200 scale)-3 10/06/2016		DISPLAYT_A.ST	

SANG METERS NEUTRON

0 DEG 10 SPEED – 3000 API-N 6000

GAMMA NEUTRON

0 API-GR 150 0 API-N 3000

80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250

TD 248.3M

0 API-GR 150 0 API-N 3000

GAMMA NEUTRON

0 DEG 10 SPEED – 3000 API-N 6000

SANG METERS NEUTRON

NEUTRON IN PIPE 1:200 DHPN-16-04 10/17/16

LOG PARAMETERS

MATRIX DENSITY : 2.65	NEUTRON MATRIX : SANDSTONE	MATRIX DELTA T : 177	
MAGNETIC DECL. : 19.50	ELECT. CUTOFF : 75000	BIT SIZE	95.30 MM
PRESENTATION NAMEDATE: Atrum_8058_(IN-PIPE)_(200 scale)-3 10/06/2016		DISPLAYT_A.ST	

TOOL CALIBRATION: DHPN-16-04 10/17/16 20:53
TOOL 9058A TM VERSION 2004
SERIAL NUMBER 2633

	DATE	TIME	SENSOR	STANDARD		RESPONSE [CPS]	
				Point1	Point2	Point1	Point2
1	Sep27,16	12:33:27	GAMMA	[API-GR]	0.100	545.000	0.000	585
2	Sep27,16	12:33:19	TEMP	[DEG-F]	0.000	80.000	330000	434000
3	Sep27,16	12:33:13	NEUTRON	[API-N]	0.000	271.000	1.000	68.000
4	Sep27,16	12:33:31	PORNEU	[PERCEN	100.000		101	

APPENDIX 4

Coal Quality Results

GWIL INDUSTRIES Birtley Coal & Minerals Testing Division

Gwil Industries Inc.
7784 - 62nd St SE
Calgary, AB
T2C 5K2
Tel: (403) 253-8273
Email: info@birtley.ca
www.birtley.ca

CERTIFICATE OF ANALYSIS

CLIENT: **ATRUM COAL**

PROJECT: **ATRUM COAL - Panorama**

LAB#: 163755-761, 163772-777

INSTRUCTED: November 17, 2016

REPORT DATE: December 7, 2016 updated

HOLE #DHPN-16-01

LAB NO:	SAMPLE ID:	Wet Wt(g)	Dry Wt (g)	ADM%	+2mm weight (g)	-2mm weight (g)	+2mm Wt%	ARD +2mm	ARD -2mm	Total ARD	BASIS
163755 Claw B1	PN 16-0002 55.38-55.73	1554	1514	2.57	1484	29	98.08	1.79	-	1.79	adb
163756 Parting	PN 16-0003 55.73-55.85	845	827	2.15	820	7	99.19	2.21	-	2.21	adb
163757 Parting	PN 16-0004 55.96-56.32	2532	2412	4.76	2411	1	99.96	2.33	-	2.33	adb
163758 Claw B1	PN 16-0005 56.32-56.57	1042	1023	1.81	1005	18	98.22	1.78	-	1.78	adb
163759 Claw B1	PN 16-0006 56.57-56.90	1261	1221	3.14	1165	56	95.43	1.46	-	1.46	adb
163760 Claw B1	PN 16-0007 56.90-57.13	1165	1090	6.46	920	169	84.49	1.67	1.42	1.63	adb
163772 Roof	PN16-0001 55.12-55.32	1605	1601	0.25	1600	1	99.94	2.78	-	2.78	adb
163773 Floor	PN16-0008 57.13-57.33	1128	1110	1.60	1107	2	99.83	2.12	-	2.12	adb

HOLE #DHPN-16-02B

LAB NO:	SAMPLE ID:	Wet Wt(g)	Dry Wt (g)	ADM%	+2mm weight (g)	-2mm weight (g)	+2mm Wt%	ARD +2mm	ARD -2mm	Total ARD	BASIS
163761 Claw E	PN 16-0095 151.35-151.97	3671	3594	2.10	3397	195	94.57	2.13	1.40	2.09	adb
163774 Claw D	PN16-0088 113.85-114.25	1989	1894	4.78	1371	525	72.31	1.70	2.00	1.78	adb
163775 Claw D	PN16-0089 114.25-114.54	1480	1427	3.58	1276	151	89.40	2.02	2.01	2.02	adb
163776 Roof	PN16-0094 151.15-151.35	1064	1032	3.01	901	132	87.19	2.21	1.89	2.17	adb
163777 Floor	PN16-0096 151.97-152.17	1193	1177	1.34	1168	9	99.20	2.37	-	2.37	adb
163937	PN16-0115 233.98-234.64	3539	3353	5.26	2569	783	76.64	1.48	1.20	1.41	adb

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This report is invalid without signatures of approved persons.

We accept no responsibility for the origin of the sample, nor for any deviation between the sample and the bulk of the material it purports to represent.

Heather Dexter
Operations Manager
GWIL Industries

GWIL INDUSTRIES Birtley Coal & Minerals Testing Division

Gwil Industries Inc.
7784 - 62nd St SE
Calgary, AB
T2C 5K2
Tel: (403) 253-8273
Email: info@birtley.ca
www.birtley.ca

CERTIFICATE OF ANALYSIS

CLIENT: **ATRUM COAL**

PROJECT: **ATRUM COAL - Panorama**

LAB#: 163762-763, 163778-786, 163788-789

INSTRUCTED: November 17, 2016

REPORT DATE: December 7, 2016 updated

HOLE #DHPN-16-03

LAB NO:	SAMPLE ID:	Wet Wt(g)	Dry Wt (g)	ADM%	+2mm weight (g)	-2mm weight (g)	+2mm Wt%	ARD +2mm	ARD -2mm	Total ARD	BASIS
163762 Scow A	PN 16-0048 107.32-107.73	1948	1797	7.75	1697	100	94.45	1.53	1.53	1.53	adb
163763 Scow A	PN 16-0049 107.73-107.95	814	779	4.33	646	132	83.01	1.65	1.28	1.59	adb
163778 Claw E2	PN16-0043 59.07-59.43	3032	2942	2.97	2493	448	84.76	1.89	0.96	1.75	adb
163779 Parting	PN16-0044 59.73-59.94	1253	1236	1.36	1227	9	99.30	2.16	-	2.16	adb
163780 Claw E2	PN16-0045 59.94-60.09	633	612	3.32	564	50	91.87	1.53	1.24	1.51	adb
163781 Roof	PN16-0047 107.12-107.32	1321	1314	0.53	1313	1	99.93	2.57	-	2.57	adb
163782 Floor	PN16-0050 107.95-108.15	1043	1016	2.59	970	48	95.29	2.23	-	2.23	adb
163783 Scow B	PN16-0051 114.18-114.61	1838	1690	8.05	1241	448	73.47	1.82	1.17	1.65	adb
163784 Scow C	PN16-0054 123.54-123.95	1655	1550	6.34	1098	450	70.94	1.69	1.49	1.63	adb
163785 Scow #	PN16-0057 164.69-164.95	1363	1326	2.71	1203	125	90.61	1.96	1.46	1.92	adb
163786 Thorn B	PN16-0076 317.44-317.75	1577	1496	5.14	1143	355	76.33	1.95	1.81	1.92	adb
163938 Claw E1	PN16-0040 57.41-57.82	1608	1519	5.53	1164	355	76.63	1.54	1.10	1.44	adb
163939 Thorn B1	PN16-0067 266.15-266.51	1674	1628	2.75	1561	67	95.88	1.79	-	1.79	adb
163940 Thorn B2	PN16-0070 268.67-268.97	1248	1210	3.04	1056	154	87.27	1.83	0.99	1.72	adb
163941 Thorn C	PN16-0073 280.67-281.02	1661	1601	3.61	1371	230	85.63	1.90	1.40	1.83	adb

HOLE #DHPN-16-04

LAB NO:	SAMPLE ID:	Wet Wt(g)	Dry Wt (g)	ADM%	+2mm weight (g)	-2mm weight (g)	+2mm Wt%	ARD +2mm	ARD -2mm	Total ARD	BASIS
163788	PN16-0139 205.02-205.52	2492	2185	12.32	2137	47	97.84	1.99	-	1.99	adb
163789	PN16-0140 206.01-206.16	735	696	5.31	666	30	95.71	2.37	-	2.37	adb
163942 Claw G	PN16-0148 233.14-234.03	4531	4292	5.27	3757	532	87.60	1.57	1.11	1.51	adb

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REPORT DATE: December 7, 2016 updated

HOLE ID #DHPN-16-01						STONE ANALYSIS ,air dried basis								
LAB ID	SAMPLE ID	From	To	Thickness	ADM %	MOIST%	ASH%	VOL%	F.C.%	%S	Cal/g	SG	BASIS	
163772	PN16-0001	55.12	55.32	0.20	0.25	0.80	86.91	7.60	4.69	6.28	-	2.81	adb	
						1.05	86.69	7.58	4.68	6.26	-		arb	
							87.61	7.66	4.73	6.33	-		db	
163773	PN16-0008	57.13	57.33	0.20	1.60	1.64	68.94	4.38	25.04	0.69	2000	1.92	adb	
						3.21	67.84	4.31	24.64	0.68	1968		arb	
							70.09	4.45	25.46	0.70	2033		db	
163434	PN16-0012	81.94	82.14	0.20	2.36	0.87	84.12	5.50	9.51	3.10	-	2.38	adb	
						3.21	82.13	5.37	9.29	3.03	-		arb	
							84.86	5.55	9.59	3.13	-		db	
163440	PN16-0018	83.56	83.76	0.20	1.34	1.11	89.21	9.73	-0.05	0.07	-	2.70	adb	*
						2.44	88.01	9.60	-0.05	0.07	-		arb	
							90.21	9.84	-0.05	0.07	-		db	
163444	PN16-0022	114.71	114.91	0.20	1.65	0.78	73.05	4.14	22.03	2.33	-	2.00	adb	
						2.42	71.84	4.07	21.67	2.29	-		arb	
							73.62	4.17	22.20	2.35	-		db	
163449	PN16-0027	117.25	117.45	0.20	1.85	0.67	82.28	6.88	10.17	0.49	-	2.29	adb	
						2.51	80.76	6.75	9.98	0.48	-		arb	
							82.83	6.93	10.24	0.49	-		db	

HOLE ID #DHPN-16-02B						STONE ANALYSIS ,air dried basis							
LAB ID	SAMPLE ID	From	To	Thickness	ADM %	MOIST%	ASH%	VOL%	F.C.%	%S	Cal/g	SG	BASIS
163469	PN16-0085	105.12	105.32	0.20	3.38	1.02	81.86	7.88	9.24	1.97	-	2.36	adb
						4.37	79.09	7.61	8.93	1.90	-		arb
							82.70	7.96	9.34	1.99	-		db
163471	PN16-0087	105.74	105.94	0.20	3.25	0.97	90.96	5.68	2.39	0.08	-	2.55	adb
						4.19	88.00	5.50	2.31	0.08	-		arb
							91.85	5.74	2.41	0.08	-		db
163476	PN16-0101	190.72	190.92	0.20	4.07	1.13	81.22	4.87	12.78	0.34	-	2.06	adb
						5.15	77.91	4.67	12.26	0.33	-		
							82.15	4.93	12.93	0.34	-		db
163479	PN16-0104	192.03	192.36	0.33	4.15	0.50	90.56	5.53	3.41	0.14	-	2.56	adb
						4.63	86.80	5.30	3.27	0.13	-		
							91.02	5.56	3.43	0.14	-		db
163482	PN16-0107	207.19	207.39	0.20	1.98	0.66	85.06	6.07	8.21	0.37	-	2.42	adb
						2.63	83.38	5.95	8.05	0.36	-		
							85.63	6.11	8.26	0.37	-		db
163485	PN16-0110	208.23	208.43	0.20	2.02	0.99	90.68	6.36	1.97	0.11	-	2.57	adb
						2.99	88.85	6.23	1.93	0.11	-		
							91.59	6.42	1.99	0.11	-		db

*Proximate analysis checked

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HOLE ID #DHPN-16-03						STONE ANALYSIS ,air dried basis							
LAB ID	SAMPLE ID	From	To	Thickness	ADM %	MOIST%	ASH%	VOL%	F.C.%	%S	Cal/g	SG	BASIS
163450	PN16-0028	12.23	12.43	0.20	1.62	0.77	84.12	9.86	5.25	0.05	-	2.50	adb
						2.38	82.76	9.70	5.16	0.05	-		arb
							84.77	9.94	5.29	0.05	-		db
163452	PN16-0030	14.73	15.27	0.54	1.77	1.08	69.24	8.99	20.69	0.17	1815	1.95	adb
						2.83	68.01	8.83	20.32	0.17	1783		arb
							70.00	9.09	20.92	0.17	1835		db
163453	PN16-0035	25.48	25.68	0.20	1.35	0.66	85.72	4.50	9.12	0.32	-	2.27	adb
						2.00	84.56	4.44	9.00	0.32	-		arb
							86.29	4.53	9.18	0.32	-		db
163456	PN16-0038	26.57	26.77	0.20	2.13	0.93	90.62	6.94	1.51	0.09	-	2.56	adb
						3.04	88.69	6.79	1.48	0.09	-		arb
							91.47	7.01	1.52	0.09	-		db
163781	PN16-0047	107.12	107.32	0.20	0.53	0.80	81.21	5.99	12.00	6.24	-	2.87	adb
						1.33	80.78	5.96	11.94	6.21	-		arb
							81.86	6.04	12.10	6.29	-		db
163782	PN16-0050	107.95	108.15	0.20	2.59	1.20	76.71	4.37	17.72	0.71	-	2.13	adb
						3.76	74.72	4.26	17.26	0.69	-		arb
							77.64	4.42	17.94	0.72	-		db
163457	PN16-0059	199.36	199.60	0.24	1.41	0.55	81.27	7.40	10.78	4.01	-	2.46	adb
						1.95	80.12	7.30	10.63	3.95	-		arb
							81.72	7.44	10.84	4.03	-		db
163460	PN16-0062	200.45	200.65	0.20	0.83	0.38	79.54	4.70	15.38	0.75	-	2.16	adb
						1.21	78.88	4.66	15.25	0.74	-		arb
							79.84	4.72	15.44	0.75	-		db

HOLE ID #DHPN-16-04						STONE ANALYSIS ,air dried basis								
LAB ID	SAMPLE ID	From	To	Thickness	ADM %	MOIST%	ASH%	VOL%	F.C.%	%S	Cal/g	SG	BASIS	
163489	PN16-0128	142.88	143.08	0.20	2.33	1.09	91.37	4.76	2.78	0.76	-	2.94	adb	
						3.39	89.24	4.65	2.72	0.74	-		arb	
							92.38	4.81	2.81	0.77	-		db	
163493	PN16-0132	145.19	145.47	0.28	4.33	1.10	66.00	6.44	26.46	0.17	2283	1.85	adb	***
						5.38	63.14	6.16	25.31	0.16	2184		arb	
							66.73	6.51	26.75	0.17	2308		db	
163497	PN16-0136	201.96	202.16	0.20	1.90	0.98	84.07	7.74	7.21	3.63	-	2.48	adb	
						2.86	82.47	7.59	7.07	3.56	-			
							84.90	7.82	7.28	3.67	-		db	
163494	PN16-0133	158.50	158.70	0.20	1.69	0.90	85.74	4.78	8.58	1.31	-	2.26	adb	
						2.57	84.29	4.70	8.43	1.29	-			
							86.52	4.82	8.66	1.32	-		db	
163788	PN16-0139	205.02	205.52	0.50	12.32	1.19	74.99	5.57	18.25	1.56	-	2.15	adb	
						13.36	65.75	4.88	16.00	1.37	-			
							75.89	5.64	18.47	1.58	-		db	

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Dropped shattered 20X from 2 meter height and then screened at 31.5mm, +31.5mm hand knapped to pass 31.5mm and homogenized with natural 31.5mmx0. Representative 1/4 split taken for Raw Coal Analysis and 3/4 split retained.

HOLE ID #DHPN-16-02B						RAW COAL ANALYSIS ,air dried basis									
LAB ID	SAMPLE ID	Seam Name	From	To	Thickness	+31.5mm	-31.5mm	ADM %	MOIST%	ASH%	VOL%	F.C.%	%S	Cal/g	SG	BASIS
163470	PN16-0086	Claw C	105.32	105.74	0.42	0	1479	7.94	0.72	19.83	8.77	70.68	2.25	6402	1.55	adb
									8.60	18.26	8.07	65.07	2.07	5894		arb
						Retain =	**1108**			19.97	8.83	71.19	2.27	6448		db
163473	PN16-0091		138.96	139.5	0.54	146	2494	4.84	0.96	51.28	6.76	41.00	2.23	3430	1.81	adb
									5.75	48.80	6.43	39.02	2.12	3264		arb
						Retain =	**1952**			51.78	6.83	41.40	2.25	3463		db
163474	PN16-0092		139.5	139.98	0.48	100	1968	6.11	0.93	45.21	5.39	48.47	0.63	4209	1.58	adb
									6.98	42.45	5.06	45.51	0.59	3952		arb
						Retain =	**1520**			45.63	5.44	48.93	0.64	4249		db
163761	PN16-0095	Claw E	151.35	151.97	0.62	1423	2116	2.10	1.62	64.71	4.93	28.74	4.12	2322	2.00	adb
									3.69	63.35	4.83	28.14	4.03	2273		arb
						Retain =	**2799**			65.78	5.01	29.21	4.19	2360		db
163477	PN16-0102	Scow A	190.92	191.5	0.58	184	2492	4.90	1.10	40.05	7.41	51.44	1.72	4608	1.62	adb
									5.95	38.09	7.05	48.92	1.64	4382		arb
						Retain =	**2059**			40.50	7.49	52.01	1.74	4659		db
163478	PN16-0103	Scow A	191.7	192.03	0.33	0	1255	8.67	0.77	46.61	4.92	47.70	0.56	4124	1.62	adb
									9.37	42.57	4.49	43.56	0.51	3766		arb
						Retain =	**938**			46.97	4.96	48.07	0.56	4156		db
163464	PN16-0078		9.95	10.50	0.55	186	1510	8.55	2.26	21.13	8.24	68.37	0.55	6178	1.56	adb
									10.62	19.32	7.54	62.52	0.50	5650		arb
						Retain =	**1216**			21.62	8.43	69.95	0.56	6321		db
163465	PN16-0079		10.50	10.77	0.27	131	927	11.56	1.96	32.14	7.24	58.66	0.47	5281	1.54	adb
									13.29	28.42	6.40	51.88	0.42	4671		arb
						Retain =	**772**			32.78	7.38	59.83	0.48	5387		db
163466	PN16-0080		10.77	11.53	0.76	346	3342	5.83	1.79	63.11	6.19	28.91	0.23	2424	1.92	adb
									7.52	59.43	5.83	27.22	0.22	2283		arb
						Retain =	**2799**			64.26	6.30	29.44	0.23	2468		db
163483	PN16-0108	Scow C	207.39	207.93	0.54	864	1819	2.70	0.78	24.11	9.19	65.92	0.96	5944	1.59	adb
									3.46	23.46	8.94	64.14	0.93	5784		arb
						Retain =	**1960**			24.30	9.26	66.44	0.97	5991		db
163484	PN16-0109	Scow C	208.00	208.23	0.23	201	881	6.04	0.71	54.37	6.79	38.13	0.24	3273	1.84	adb
									6.71	51.09	6.38	35.83	0.23	3075		arb
						Retain =	**791**			54.76	6.84	38.40	0.24	3296		db

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HOLE ID #DHPN-16-03						RAW COAL ANALYSIS ,air dried basis										
LAB ID	SAMPLE ID	Seam Name	From	To	Thickness	+31.5mm	-31.5mm	ADM %	MOIST%	ASH%	VOL%	F.C.%	%S	Cal/g	SG	BASIS
163451	PN16-0029	Claw C	13.83	14.33	0.50	371	1207	3.74	0.93	32.35	8.06	58.66	0.39	5291	1.62	adb
									4.64	31.14	7.76	56.47	0.38	5093		arb
						Retain =	**1197**			32.65	8.14	59.21	0.39	5341		db
163458	PN16-0060	Scow F	199.65	199.97	0.32	333	1073	2.70	0.90	15.10	5.11	78.89	1.76	6921	1.54	adb ***
									3.58	14.69	4.97	76.76	1.71	6734		arb
						Retain =	**1093**			15.24	5.16	79.61	1.78	6984		db
163459	PN16-0061	Scow F	199.97	200.45	0.48	730	1469	2.70	1.06	31.47	5.77	61.70	0.58	5421	1.64	adb
									3.73	30.62	5.61	60.03	0.56	5275		arb
						Retain =	**1627**			31.81	5.83	62.36	0.59	5479		db
163454	PN16-0036	Scow D	25.68	25.88	0.20	262	436	3.15	1.01	18.02	5.62	75.35	2.32	6724	1.50	adb
									4.13	17.45	5.44	72.98	2.25	6512		arb
						Retain =	**580**			18.20	5.68	76.12	2.34	6793		db
163455	PN16-0037	Scow D	26.02	26.27	0.25	917	609	2.39	1.12	45.59	6.32	46.97	0.31	4139	1.71	adb
									3.48	44.50	6.17	45.85	0.30	4040		arb
						Retain =	**1128**			46.11	6.39	47.50	0.31	4186		db
163762	PN16-0048	Scow A	107.32	107.73	0.41	517	1265	7.75	1.07	16.15	6.27	76.51	4.39	6800	1.52	adb
									8.74	14.90	5.78	70.58	4.05	6273		arb
						Retain =	**1178**			16.32	6.34	77.34	4.44	6874		db
163763	PN16-0049	Scow A	107.73	107.95	0.22	119	651	4.33	0.84	29.39	5.84	63.93	2.02	5655	1.60	adb
									5.13	28.12	5.59	61.16	1.93	5410		arb
						Retain =	**572**			29.64	5.89	64.47	2.04	5703		db
163783	PN16-0051	Scow B	114.18	114.61	0.43	440	1175	8.05	0.91	40.67	9.25	49.17	0.76	4385	1.88	adb
									8.89	37.40	8.51	45.21	0.70	4032		arb
						Retain =	**1167**			41.04	9.33	49.62	0.77	4425		db
163784	PN16-0054	Scow C	123.54	123.95	0.41	94	1406	6.34	0.72	34.92	6.86	57.50	2.15	5139	1.71	adb
									7.01	32.71	6.43	53.85	2.01	4813		arb
						Retain =	**1110**			35.17	6.91	57.92	2.17	5176		db
163462	PN16-0064	Scow G	214.42	215.04	0.62	598	2379	2.50	1.10	26.12	5.67	67.11	1.86	5879	1.62	adb
									3.57	25.47	5.53	65.43	1.81	5732		arb
						Retain =	**2240**			26.41	5.73	67.86	1.88	5944		db

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HOLE ID #DHPN-16-04						RAW COAL ANALYSIS ,air dried basis										
LAB ID	SAMPLE ID	Seam Name	From	To	Thickness	+31.5mm	-31.5mm	ADM %	MOIST%	ASH%	VOL%	F.C.%	%S	Cal/g	SG	BASIS
163490	PN16-0129	Claw C	143.08	143.74	0.66	648	2647	4.89	0.95	42.19	5.79	51.07	1.95	4582	1.56	adb
									5.79	40.13	5.51	48.57	1.85	4358		arb
						Retain =	**2393**			42.59	5.85	51.56	1.97	4626		db
163491	PN16-0130	Claw C	143.74	144.22	0.48	1682	1291	1.83	0.54	60.47	22.87	16.12	0.13	1478	2.17	adb *
									2.36	59.36	22.45	15.83	0.13	1451		arb **
						Retain =	**2234**			60.80	22.99	16.21	0.13	1486		db ***
163492	PN16-0131	Claw C	144.45	145.19	0.74	937	2387	4.27	1.73	32.15	6.32	59.80	0.36	5279	1.63	adb
									5.93	30.78	6.05	57.25	0.34	5054		arb
						Retain =	**2429**			32.72	6.43	60.85	0.37	5372		db
163486	PN16-0125	99	58.44	58.86	0.42	349	1290	7.51	0.62	23.37	10.46	65.55	3.90	6023	1.63	adb
									8.08	21.61	9.67	60.63	3.61	5571		arb
						Retain =	**1226**			23.52	10.53	65.96	3.92	6061		db
163487	PN16-0126	99	59.07	59.27	0.20	548	576	2.72	0.68	50.13	23.86	25.33	2.47	2506	2.02	adb ^
									3.38	48.77	23.21	24.64	2.40	2438		arb **
						Retain =	**852**			50.47	24.02	25.50	2.49	2523		db
163495	PN16-0134	Claw D	158.70	159.00	0.30	254	874	3.53	0.71	30.62	8.17	60.50	2.43	5495	1.70	adb
									4.21	29.54	7.88	58.36	2.34	5301		arb
						Retain =	**879**			30.84	8.23	60.93	2.45	5534		db
163496	PN16-0135	Claw D	159.00	159.44	0.44	96	1437	5.55	0.59	22.56	9.47	67.38	1.13	6116	1.60	adb
									6.11	21.31	8.94	63.64	1.07	5777		arb
						Retain =	**1085**			22.69	9.53	67.78	1.14	6152		db
163498	PN16-0137	Claw E	202.16	202.59	0.43	553	1328	2.76	1.08	22.00	7.28	69.64	0.73	6285	1.53	adb
									3.81	21.39	7.08	67.72	0.71	6112		arb
						Retain =	**1431**			22.24	7.36	70.40	0.74	6354		db
163499	PN16-0138	Claw E	202.59	203.12	0.48	710	1234	4.51	0.91	26.70	10.05	62.34	0.33	5676	1.54	adb
									5.38	25.50	9.60	59.53	0.32	5420		arb
						Retain =	**1416**			26.95	10.14	62.91	0.33	5728		db
163501	PN16-0142		212.04	212.57	0.53	915	1478	2.71	1.12	32.62	7.02	59.24	1.69	5305	1.67	adb
									3.80	31.74	6.83	57.63	1.64	5161		arb
						Retain =	**1881**			32.99	7.10	59.91	1.71	5365		db
163504	PN16-0145		213.80	214.57	0.77	342	2770	5.13	0.85	25.50	7.47	66.18	2.03	5962	1.63	adb
									5.94	24.19	7.09	62.78	1.93	5656		arb
						Retain =	**2366**			25.72	7.53	66.75	2.05	6013		db

^ Volatile checked

** lots of carbonates present *Proximate analysis checked *** SG checked

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CERTIFICATE OF ANALYSIS

CLIENT: **ATRUM COAL**

PROJECT: **ATRUM COAL - Panorama**

REPORT DATE: December 7, 2016

Phase 2 — **RAW COAL ANALYSIS ,air dried basis**

LAB ID	SAMPLE ID	Seam Name	From	To	Thickness	ULTIMATE ANALYSIS									
						ADM %	MOIST%	%C	%H	%N	%S	ASH%	%O b/d	%Cl	BASIS
163755	PN16-0002	Claw B1	55.38	55.73	0.35	2.57	1.65	52.31	1.71	0.93	3.18	39.51	0.71	0.009	adb
							4.18	50.97	1.66	0.91	3.10	38.49	0.70	0.008	arb
								53.19	1.74	0.95	3.23	40.17	0.73	0.009	db
163758	PN16-0005	Claw B1	56.32	56.57	0.25	1.81	1.37	52.51	1.66	0.76	2.99	39.59	1.12	0.009	adb
							3.16	51.56	1.63	0.75	2.94	38.87	1.10	0.009	arb
								53.24	1.68	0.77	3.03	40.14	1.14	0.009	db
163759	PN16-0006	Claw B1	56.57	56.90	0.33	3.14	1.46	81.34	2.42	1.26	1.00	10.12	2.40	0.009	adb
							4.55	78.79	2.34	1.22	0.97	9.80	2.33	0.009	arb
								82.55	2.45	1.28	1.01	10.27	2.44	0.009	db
163760	PN16-0007	Claw B1	56.90	57.13	0.23	6.46	0.92	59.00	1.93	1.00	0.49	32.94	3.72	0.012	adb
							7.32	55.19	1.80	0.94	0.46	30.81	3.48	0.011	arb
								59.55	1.95	1.01	0.49	33.25	3.76	0.012	db
163761	PN16-0095	Claw E	151.35	151.97	0.62	2.10	1.62	27.48	1.11	0.52	4.12	64.71	0.44	0.006	adb
							3.69	26.90	1.09	0.51	4.03	63.35	0.43	0.005	arb
								27.93	1.13	0.53	4.19	65.78	0.45	0.006	db
163435	PN16-0013	Claw C	82.14	82.46	0.32	4.03	1.19	66.09	2.07	0.98	1.52	27.56	0.59	0.015	adb
							5.17	63.43	1.98	0.94	1.46	26.45	0.57	0.015	arb
								66.89	2.09	0.99	1.54	27.89	0.60	0.015	db
163436	PN16-0014	Claw C	82.54	82.75	0.21	2.30	1.36	60.42	1.91	1.02	0.42	33.15	1.72	0.010	adb
							3.63	59.03	1.86	1.00	0.41	32.39	1.68	0.010	arb
								61.25	1.94	1.03	0.43	33.61	1.74	0.010	db
163437	PN16-0015	Claw C	82.75	82.88	0.13	5.28	1.53	26.22	1.06	0.52	0.15	65.80	4.72	0.006	adb
							6.73	24.84	1.00	0.49	0.14	62.33	4.47	0.006	arb
								26.63	1.08	0.53	0.15	66.82	4.79	0.006	db
163438	PN16-0016	Claw C	83.12	83.36	0.24	2.58	1.06	45.73	1.44	0.72	1.27	45.90	3.88	0.010	adb
							3.61	44.55	1.41	0.70	1.24	44.72	3.78	0.010	arb
								46.22	1.46	0.73	1.28	46.39	3.92	0.010	db
163445	PN16-0023	Claw E	114.91	115.34	0.43	4.94	0.80	49.12	1.63	0.75	2.91	43.68	1.11	0.013	adb
							5.70	46.69	1.55	0.71	2.77	41.52	1.05	0.012	arb
								49.52	1.64	0.76	2.93	44.03	1.12	0.013	db
163446	PN16-0024	Claw E	115.91	116.21	0.30	8.52	0.93	27.31	1.14	0.51	5.17	64.33	0.61	0.007	adb
							9.37	24.98	1.04	0.47	4.73	58.85	0.56	0.006	arb
								27.57	1.15	0.51	5.22	64.93	0.62	0.007	db
163447	PN16-0025	Claw E	116.21	117.00	0.79	3.07	0.92	68.23	2.17	0.93	2.16	24.60	0.99	0.011	adb
							3.96	66.14	2.10	0.90	2.09	23.84	0.96	0.011	arb
								68.86	2.19	0.94	2.18	24.83	1.00	0.011	db
163448	PN16-0026	Claw E	117.00	117.25	0.25	2.09	0.63	43.19	1.44	0.72	0.87	50.11	3.04	0.006	adb
							2.71	42.29	1.41	0.70	0.85	49.06	2.98	0.006	arb
								43.46	1.45	0.72	0.88	50.43	3.06	0.006	db

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CERTIFICATE OF ANALYSIS

CLIENT: **ATRUM COAL**

PROJECT: **ATRUM COAL - Panorama**

REPORT DATE: December 7, 2016

Phase 2						RAW COAL ANALYSIS ,air dried basis									
LAB ID	SAMPLE ID	Seam Name	From	To	Thickness	ULTIMATE ANALYSIS									
						ADM %	MOIST%	%C	%H	%N	%S	ASH%	%O b/d	%Cl	BASIS
163458	PN16-0060	Scow F	199.65	199.97	0.32	2.70	0.90	77.53	2.05	0.94	1.76	15.10	1.72	0.010	adb
							3.58	75.44	1.99	0.91	1.71	14.69	1.67	0.009	arb
								78.23	2.07	0.95	1.78	15.24	1.74	0.010	db
163459	PN16-0061	Scow F	199.97	200.45	0.48	2.70	1.06	62.46	1.68	0.86	0.58	31.47	1.89	0.009	adb
							3.73	60.77	1.64	0.84	0.56	30.62	1.84	0.009	arb
								63.13	1.70	0.87	0.59	31.81	1.91	0.009	db
163470	PN16-0086	Claw C	105.32	105.74	0.42	7.94	0.72	71.00	2.25	1.14	2.25	19.83	2.81	0.020	adb
							8.60	65.36	2.07	1.05	2.07	18.26	2.59	0.018	arb
								71.51	2.27	1.15	2.27	19.97	2.83	0.020	db
163473	PN16-0091		138.96	139.50	0.54	4.84	0.96	40.79	1.58	0.77	2.23	51.28	2.39	0.008	adb
							5.75	38.82	1.51	0.73	2.12	48.80	2.27	0.008	arb
								41.19	1.60	0.78	2.25	51.78	2.41	0.008	db
163474	PN16-0092		139.50	139.98	0.48	6.11	0.93	48.82	1.72	0.88	0.63	45.21	1.81	0.007	adb
							6.98	45.84	1.61	0.83	0.59	42.45	1.70	0.006	arb
								49.28	1.73	0.89	0.64	45.63	1.83	0.007	db
163477	PN16-0102	Scow A	190.92	191.50	0.58	4.90	1.10	52.66	1.70	0.86	1.72	40.05	1.91	0.008	adb
							5.95	50.08	1.61	0.82	1.64	38.09	1.82	0.008	arb
								53.25	1.72	0.87	1.74	40.50	1.93	0.008	db
163478	PN16-0103	Scow A	191.70	192.03	0.33	8.67	0.77	48.12	1.65	0.86	0.56	46.61	1.43	0.022	adb
							9.37	43.95	1.51	0.79	0.51	42.57	1.30	0.020	arb
								48.49	1.67	0.87	0.56	46.97	1.44	0.022	db
163451	PN16-0029	Claw C	13.83	14.33	0.50	3.74	0.93	60.40	1.87	0.94	0.39	32.35	3.12	0.009	adb
							4.64	58.14	1.80	0.90	0.38	31.14	3.01	0.008	arb
								60.97	1.88	0.95	0.39	32.65	3.15	0.009	db
163490	PN16-0129	Claw C	143.08	143.74	0.66	4.89	0.95	52.05	1.71	0.79	1.95	42.19	0.36	0.024	adb
							5.79	49.50	1.63	0.75	1.85	40.13	0.34	0.023	arb
								52.55	1.73	0.80	1.97	42.59	0.36	0.024	db
163491	PN16-0130	Claw C	143.74	144.22	0.48	1.83	0.54	24.44	0.73	0.33	0.13	60.47	13.36	0.006	adb
							2.36	23.99	0.72	0.32	0.13	59.36	13.12	0.006	arb
								24.57	0.73	0.33	0.13	60.80	13.43	0.006	db
163492	PN16-0131	Claw C	144.45	145.19	0.74	4.27	1.73	60.44	1.79	0.97	0.36	32.15	2.56	0.051	adb
							5.93	57.86	1.71	0.93	0.34	30.78	2.45	0.048	arb
								61.50	1.82	0.99	0.37	32.72	2.61	0.051	db

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CERTIFICATE OF ANALYSIS

CLIENT: **ATRUM COAL**

PROJECT: **ATRUM COAL - Panorama**

REPORT DATE: December 7, 2016

Phase 2 - Head Raw Analysis

MINERAL ANALYSIS OF ASH - ASTM D3682														
LAB NO:	ID	SiO_2	Al_2O_3	TiO_2	CaO	BaO	SrO	Fe_2O_3	MgO	Na_2O	K_20	P_2O_5	SO_3	Undet.
163755	PN16-0002	53.18	15.51	1.05	11.61	0.41	0.07	11.07	1.19	1.59	1.92	0.20	1.10	1.10
163758	PN16-0005	47.53	16.97	0.79	6.21	0.39	0.08	11.72	3.02	1.11	1.24	0.61	8.27	2.06
163759	PN16-0006	24.29	16.86	1.11	15.23	0.49	0.14	14.10	5.60	0.74	0.57	2.91	16.23	1.73
163760	PN16-0007	55.76	19.60	0.57	7.72	0.36	0.14	4.69	3.27	1.17	1.77	1.27	4.17	-0.49
163761	PN16-0095	65.78	17.76	0.41	0.32	0.29	0.04	10.75	1.16	1.38	1.72	0.14	0.47	-0.22
163435	PN16-0013	61.81	18.75	0.55	3.34	0.16	0.12	5.95	0.91	1.29	2.31	2.02	1.42	1.37
163436	PN16-0014	66.77	16.70	0.86	2.77	0.25	0.08	5.30	1.74	1.28	1.96	1.20	1.20	-0.11
163437	PN16-0015	61.55	19.86	0.57	4.44	0.27	0.08	3.32	2.44	2.29	1.81	0.06	1.02	2.29
163438	PN16-0016	55.11	17.72	0.46	8.82	0.23	0.14	8.15	3.68	1.11	0.94	1.00	2.25	0.39
163445	PN16-0023	66.95	16.80	0.62	2.11	0.38	0.06	8.45	0.99	0.77	1.59	0.30	1.20	-0.22
163446	PN16-0024	59.97	19.35	0.90	1.01	0.42	0.05	11.04	1.04	0.97	2.90	0.06	1.40	0.89
163447	PN16-0025	51.59	20.14	0.61	5.28	0.31	0.31	12.83	1.39	0.90	1.33	2.88	2.77	-0.34
163448	PN16-0026	66.81	15.76	0.71	3.88	0.32	0.09	5.08	2.14	0.90	1.83	0.34	1.92	0.22
163458	PN16-0060	44.93	16.04	0.91	9.18	0.65	0.30	12.78	2.52	0.94	1.07	4.20	6.74	-0.26
163459	PN16-0061	62.10	18.56	0.40	3.89	0.48	0.06	4.85	2.69	0.66	1.31	0.06	3.02	1.92
163470	PN16-0086	33.82	15.65	0.74	12.69	0.46	0.34	17.40	5.29	0.65	0.76	2.57	8.39	1.24
163473	PN16-0091	59.51	23.07	0.86	1.93	0.48	0.09	7.55	1.51	1.24	1.96	0.44	1.60	-0.24
163474	PN16-0092	63.98	21.07	0.79	1.83	0.33	0.09	4.72	1.44	1.15	1.67	0.57	1.25	1.11
163477	PN16-0102	55.02	19.58	0.90	1.41	0.46	0.07	14.96	2.64	0.88	1.84	0.60	0.92	0.72
163478	PN16-0103	71.55	18.05	0.67	0.48	0.28	0.07	2.99	1.31	1.02	2.30	0.11	0.27	0.90
163451	PN16-0029	52.59	20.28	0.51	8.23	0.30	0.18	5.00	3.47	1.98	0.89	1.74	4.72	0.11
163490	PN16-0129	59.91	20.79	0.71	2.97	0.37	0.09	6.23	1.38	1.27	1.75	0.97	2.92	0.64
163491	PN16-0130	34.61	17.61	1.03	19.05	0.25	0.11	12.10	9.37	0.70	0.69	0.98	1.50	2.00
163492	PN16-0131	62.07	16.06	0.92	6.52	0.41	0.14	3.76	2.45	1.15	0.96	1.45	4.15	-0.04

LAB NO:	ID	%P in coal (db)
163755	PN16-0002	0.035
163758	PN16-0005	0.107
163759	PN16-0006	0.130
163760	PN16-0007	0.184
163761	PN16-0095	0.040
163435	PN16-0013	0.246
163436	PN16-0014	0.176
163437	PN16-0015	0.017
163438	PN16-0016	0.202
163445	PN16-0023	0.058
163446	PN16-0024	0.017
163447	PN16-0025	0.312

LAB NO:	ID	%P in coal (db)
163448	PN16-0026	0.075
163458	PN16-0060	0.279
163459	PN16-0061	0.008
163470	PN16-0086	0.224
163473	PN16-0091	0.099
163474	PN16-0092	0.114
163477	PN16-0102	0.106
163478	PN16-0103	0.023
163451	PN16-0029	0.248
163490	PN16-0129	0.180
163491	PN16-0130	0.260
163492	PN16-0131	0.207

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CERTIFICATE OF ANALYSIS

CLIENT: **ATRUM COAL**

PROJECT: **ATRUM COAL - Panorama**

REPORT DATE: December 20, 2016

Phase 2						RAW COAL ANALYSIS ,air dried basis									
LAB ID	SAMPLE ID	Seam Name	From	To	Thickness	ULTIMATE ANALYSIS									
						ADM %	MOIST%	%C	%H	%N	%S	ASH%	%O b/d	%Cl	BASIS
163483	PN16-0108	Scow C	207.39	207.93	0.54	2.70	0.78	67.97	2.02	0.93	0.96	24.11	3.23	0.016	adb
							3.46	66.13	1.97	0.90	0.93	23.46	3.14	0.015	arb
								68.50	2.04	0.94	0.97	24.30	3.25	0.016	db
163484	PN16-0109	Scow C	208.00	208.23	0.23	6.04	0.71	39.64	1.39	0.65	0.24	54.37	3.00	0.012	adb
							6.71	37.25	1.31	0.61	0.23	51.09	2.82	0.011	arb
								39.92	1.40	0.65	0.24	54.76	3.02	0.012	db
163454	PN16-0036	Scow D	25.68	25.88	0.20	3.15	1.01	73.83	2.27	1.28	2.32	18.02	1.27	0.015	adb
							4.13	71.50	2.20	1.24	2.25	17.45	1.23	0.015	arb
								74.58	2.29	1.29	2.34	18.20	1.29	0.015	db
163455	PN16-0037	Scow D	26.02	26.27	0.25	2.39	1.12	48.11	1.71	0.74	0.31	45.69	2.32	0.016	adb
							3.48	46.96	1.66	0.72	0.30	44.60	2.27	0.016	arb
								48.65	1.72	0.75	0.31	46.21	2.35	0.016	db
163762	PN16-0048	Scow A	107.32	107.73	0.41	7.75	1.07	75.66	2.20	1.00	4.39	16.15	-0.47	0.013	adb
							8.74	69.80	2.03	0.92	4.05	14.90	-0.43	0.012	arb
								76.48	2.22	1.01	4.44	16.32	-0.48	0.013	db
163763	PN16-0049	Scow A	107.73	107.95	0.22	4.33	0.84	63.63	1.99	0.95	2.02	29.39	1.18	0.015	adb
							5.13	60.87	1.90	0.91	1.93	28.12	1.13	0.014	arb
								64.17	2.00	0.96	2.04	29.64	1.19	0.015	db
163462	PN16-0064	Scow G	204.42	205.04	0.62	2.50	1.10	66.70	1.87	0.89	1.86	26.12	1.46	0.012	adb
							3.57	65.03	1.82	0.87	1.81	25.47	1.43	0.012	arb
								67.44	1.89	0.90	1.88	26.41	1.48	0.012	db
163495	PN16-0134	Claw D	158.70	159.00	0.30	3.53	0.71	61.82	1.95	0.89	2.43	30.62	1.58	0.029	adb
							4.21	59.64	1.88	0.86	2.34	29.54	1.52	0.028	arb
								62.26	1.97	0.90	2.45	30.84	1.59	0.029	db
163496	PN16-0135	Claw D	159.00	159.44	0.44	5.55	0.59	69.49	2.08	0.98	1.13	22.56	3.17	0.016	adb
							6.11	65.63	1.97	0.93	1.07	21.31	2.99	0.015	arb
								69.90	2.10	0.99	1.14	22.69	3.18	0.016	db
163498	PN16-0137	Claw E	202.16	202.59	0.43	2.76	1.08	70.42	2.08	0.96	0.73	22.00	2.73	0.020	adb
							3.81	68.48	2.02	0.93	0.71	21.39	2.65	0.019	arb
								71.19	2.10	0.97	0.74	22.24	2.76	0.020	db
163499	PN16-0138	Claw E	202.59 203.00	202.95 203.12	0.48	4.51	0.91	65.36	1.96	0.96	0.33	26.70	3.78	0.027	adb
							5.38	62.41	1.87	0.92	0.32	25.50	3.61	0.025	arb
								65.96	1.98	0.97	0.33	26.95	3.82	0.027	db
163501	PN16-0142		212.04	212.57	0.53	2.71	1.12	60.55	1.79	0.94	1.69	32.62	1.29	0.012	adb
							3.80	58.91	1.74	0.91	1.64	31.74	1.26	0.012	arb
								61.24	1.81	0.95	1.71	32.99	1.31	0.012	db
163504	PN16-0145		213.80	214.57	0.77	5.13	0.85	67.53	2.01	0.88	2.03	25.50	1.20	0.012	adb
							5.94	64.07	1.90	0.83	1.93	24.19	1.14	0.012	arb
								68.11	2.02	0.89	2.05	25.72	1.21	0.013	db

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CERTIFICATE OF ANALYSIS

CLIENT: **ATRUM COAL**

PROJECT: **ATRUM COAL - Panorama**

REPORT DATE: December 20, 2016

Phase 2 - Head Raw Analysis

MINERAL ANALYSIS OF ASH - ASTM D3682														
LAB NO:	ID	SiO_2	Al_2O_3	TiO_2	CaO	BaO	SrO	Fe_2O_3	MgO	Na_2O	K_20	P_20_5	SO_3	Undet.
163483	PN16-0108	53.13	6.56	0.68	13.04	0.21	0.09	10.72	5.99	0.35	0.57	0.59	7.79	0.28
163484	PN16-0109	69.54	13.72	0.95	3.33	0.27	0.05	4.23	2.75	1.05	1.18	0.12	1.22	1.59
163454	PN16-0036	47.83	16.89	0.93	6.06	0.42	0.36	17.27	2.30	0.98	1.51	2.50	3.77	-0.82
163455	PN16-0037	62.03	20.90	1.12	1.19	0.48	0.11	6.88	2.54	1.75	1.73	0.49	0.55	0.23
163762	PN16-0048	40.34	8.39	0.78	7.35	0.45	0.09	31.06	2.74	0.47	0.40	1.51	6.89	-0.47
163763	PN16-0049	57.69	15.93	0.91	5.08	0.51	0.17	8.58	2.30	1.06	1.01	1.63	3.72	1.41
163462	PN16-0064	53.22	15.51	1.09	7.02	0.45	0.22	8.88	2.84	1.17	1.07	1.91	5.57	1.05
163495	PN16-0134	43.27	14.66	1.07	10.83	0.42	0.19	12.12	3.47	0.90	0.93	3.21	6.89	2.04
163496	PN16-0135	54.99	4.44	0.88	13.60	0.48	0.11	10.67	5.82	0.30	0.19	1.27	7.67	-0.42
163498	PN16-0137	41.73	16.01	1.03	15.84	0.38	0.32	6.58	3.91	0.88	1.66	4.53	5.22	1.91
163499	PN16-0138	40.30	15.57	0.99	12.31	0.45	0.13	17.50	7.06	0.55	0.54	1.51	3.12	-0.03
163501	PN16-0142	59.47	8.99	1.03	7.98	0.44	0.23	8.89	2.95	0.49	0.42	2.57	5.84	0.70
163504	PN16-0145	46.33	12.41	0.82	10.72	0.44	0.27	11.75	3.48	1.20	0.83	3.09	7.17	1.49

LAB NO:	ID	%P in coal (db)
163483	PN16-0108	0.063
163484	PN16-0109	0.029
163454	PN16-0036	0.199
163455	PN16-0037	0.099
163762	PN16-0048	0.108
163763	PN16-0049	0.211
163462	PN16-0064	0.220
163495	PN16-0134	0.432
163496	PN16-0135	0.126
163498	PN16-0137	0.440
163499	PN16-0138	0.178
163501	PN16-0142	0.370
163504	PN16-0145	0.347

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CERTIFICATE OF ANALYSIS

CLIENT: **ATRUM COAL**

PROJECT: **ATRUM COAL - Panorma**

LAB#: 163755-761, 163772-777

INSTRUCTED: November 17, 2016

REPORT DATE: November 25, 2016 updated

HOLE #DHPN-16-01

LAB NO:	SAMPLE ID:	Wet Wt(g)	Dry Wt (g)	ADM%	+2mm weight (g)	-2mm weight (g)	+2mm Wt%	ARD +2mm	ARD -2mm	Total ARD	BASIS
163755 Claw B1	PN 16-0002 55.38-55.73	1554	1514	2.57	1484	29	98.08	1.79	-	1.79	adb
163756 Parting	PN 16-0003 55.73-55.85	845	827	2.15	820	7	99.19	2.21	-	2.21	adb
163757 Parting	PN 16-0004 55.96-56.32	2532	2412	4.76	2411	1	99.96	2.33	-	2.33	adb
163758 Claw B1	PN 16-0005 56.32-56.57	1042	1023	1.81	1005	18	98.22	1.78	-	1.78	adb
163759 Claw B1	PN 16-0006 56.57-56.90	1261	1221	3.14	1165	56	95.43	1.46	-	1.46	adb
163760 Claw B1	PN 16-0007 56.90-57.13	1165	1090	6.46	920	169	84.49	1.67	1.42	1.63	adb
163772 Roof	PN16-0001 55.12-55.32	1605	1601	0.25	1600	1	99.94	2.78	-	2.78	adb
163773 Floor	PN16-0008 57.13-57.33	1128	1110	1.60	1107	2	99.83	2.12	-	2.12	adb

HOLE #DHPN-16-02B

LAB NO:	SAMPLE ID:	Wet Wt(g)	Dry Wt (g)	ADM%	+2mm weight (g)	-2mm weight (g)	+2mm Wt%	ARD +2mm	ARD -2mm	Total ARD	BASIS
163761 Claw E	PN 16-0095 151.35-151.97	3671	3594	2.10	3397	195	94.57	2.13	1.40	2.09	adb
163774 Claw D	PN16-0088 113.85-114.25	1989	1894	4.78	1371	525	72.31	1.70	2.00	1.78	adb
163775 Claw D	PN16-0089 114.25-114.54	1480	1427	3.58	1276	151	89.40	2.02	2.01	2.02	adb
163776 Roof	PN16-0094 151.15-151.35	1064	1032	3.01	901	132	87.19	2.21	1.89	2.17	adb
163777 Floor	PN16-0096 151.97-152.17	1193	1177	1.34	1168	9	99.20	2.37	-	2.37	adb

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CERTIFICATE OF ANALYSIS

CLIENT: **ATRUM COAL**

PROJECT: **ATRUM COAL - Panorma**

LAB#: 163762-763, 163778-786, 163788-789

INSTRUCTED: November 17, 2016

REPORT DATE: November 25, 2016 updated

HOLE #DHPN-16-03

LAB NO:	SAMPLE ID:	Wet Wt(g)	Dry Wt (g)	ADM%	+2mm weight (g)	-2mm weight (g)	+2mm Wt%	ARD +2mm	ARD -2mm	Total ARD	BASIS
163762 Scow A	PN 16-0048 107.32-107.73	1948	1797	7.75	1697	100	94.45	1.53	1.53	1.53	adb
163763 Scow A	PN 16-0049 107.73-107.95	814	779	4.33	646	132	83.01	1.65	1.28	1.59	adb
163778 Claw E2	PN16-0043 59.07-59.43	3032	2942	2.97	2493	448	84.76	1.89	0.96	1.75	adb
163779 Parting	PN16-0044 59.73-59.94	1253	1236	1.36	1227	9	99.30	2.16	-	2.16	adb
163780 Claw E2	PN16-0045 59.94-60.09	633	612	3.32	564	50	91.87	1.53	1.24	1.51	adb
163781 Roof	PN16-0047 107.12-107.32	1321	1314	0.53	1313	1	99.93	2.57	-	2.57	adb
163782 Floor	PN16-0050 107.95-108.15	1043	1016	2.59	970	48	95.29	2.23	-	2.23	adb
163783 Scow B	PN16-0051 114.18-114.61	1838	1690	8.05	1241	448	73.47	1.82	1.17	1.65	adb
163784 Scow C	PN16-0054 123.54-123.95	1655	1550	6.34	1098	450	70.94	1.69	1.49	1.63	adb
163785 Scow #	PN16-0057 164.69-164.95	1363	1326	2.71	1203	125	90.61	1.96	1.46	1.92	adb
163786 Thorn B	PN16-0076 317.44-317.75	1577	1496	5.14	1143	355	76.33	1.95	1.81	1.92	adb

HOLE #DHPN-16-04

LAB NO:	SAMPLE ID:	Wet Wt(g)	Dry Wt (g)	ADM%	+2mm weight (g)	-2mm weight (g)	+2mm Wt%	ARD +2mm	ARD -2mm	Total ARD	BASIS
163788	PN16-0139 205.02-205.52	2492	2185	12.32	2137	47	97.84	1.99	-	1.99	adb
163789	PN16-0140 206.01-206.16	735	696	5.31	666	30	95.71	2.37	-	2.37	adb

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CERTIFICATE OF ANALYSIS

CLIENT: **ATRUM COAL**

PROJECT: **ATRUM COAL - Panorma**

REPORT DATE: November 28, 2016

HOLE ID #DHPN-16-01						STONE ANALYSIS ,air dried basis								
LAB ID	SAMPLE ID	From	To	Thickness	ADM %	MOIST%	ASH%	VOL%	F.C.%	%S	Cal/g	SG	BASIS	
163772	PN16-0001	55.12	55.32	0.20	0.25	0.80	86.91	7.60	4.69	6.28	-	2.81	adb	
						1.05	86.69	7.58	4.68	6.26	-		arb	
							87.61	7.66	4.73	6.33	-		db	
163773	PN16-0008	57.13	57.33	0.20	1.60	1.64	68.94	4.38	25.04	0.69	2000	1.92	adb	
						3.21	67.84	4.31	24.64	0.68	1968		arb	
							70.09	4.45	25.46	0.70	2033		db	
163434	PN16-0012	81.94	82.14	0.20	2.36	0.87	84.12	5.50	9.51	3.10	-	2.38	adb	
						3.21	82.13	5.37	9.29	3.03	-		arb	
							84.86	5.55	9.59	3.13	-		db	
163440	PN16-0018	83.56	83.76	0.20	1.34	1.11	89.21	9.73	-0.05	0.07	-	2.70	adb	*
						2.44	88.01	9.60	-0.05	0.07	-		arb	
							90.21	9.84	-0.05	0.07	-		db	
163444	PN16-0022	114.7	114.9	0.20	1.65	0.78	73.05	4.14	22.03	2.33	-	2.00	adb	
						2.42	71.84	4.07	21.67	2.29	-		arb	
							73.62	4.17	22.20	2.35	-		db	
163449	PN16-0027	117.3	117.5	0.20	1.85	0.67	82.28	6.88	10.17	0.49	-	2.29	adb	
						2.51	80.76	6.75	9.98	0.48	-		arb	
							82.83	6.93	10.24	0.49	-		db	

HOLE ID #DHPN-16-02B						STONE ANALYSIS ,air dried basis							
LAB ID	SAMPLE ID	From	To	Thickness	ADM %	MOIST%	ASH%	VOL%	F.C.%	%S	Cal/g	SG	BASIS
163469	PN16-0085	105.1	105.3	0.20	3.38	1.02	81.86	7.88	9.24	1.97	-	2.36	adb
						4.37	79.09	7.61	8.93	1.90	-		arb
							82.70	7.96	9.34	1.99	-		db
163471	PN16-0087	105.7	105.9	0.20	3.25	0.97	90.96	5.68	2.39	0.08	-	2.55	adb
						4.19	88.00	5.50	2.31	0.08	-		arb
							91.85	5.74	2.41	0.08	-		db
163476	PN16-0101	190.7	190.9	0.20	4.07	1.13	81.22	4.87	12.78	0.34	-	2.06	adb
						5.15	77.91	4.67	12.26	0.33	-		
							82.15	4.93	12.93	0.34	-		db
163479	PN16-0104	192	192.4	0.33	4.15	0.50	90.56	5.53	3.41	0.14	-	2.56	adb
						4.63	86.80	5.30	3.27	0.13	-		
							91.02	5.56	3.43	0.14	-		db

*Proximate analysis checked

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CLIENT: **ATRUM COAL**

PROJECT: **ATRUM COAL - Panorma**

REPORT DATE: November 28, 2016

HOLE ID #DHPN-16-03 — **STONE ANALYSIS ,air dried basis**

LAB ID	SAMPLE ID	From	To	Thickness	ADM %	MOIST%	ASH%	VOL%	F.C.%	%S	Cal/g	SG	BASIS
163450	PN16-0028	12.23	12.43	0.20	1.62	0.77	84.12	9.86	5.25	0.05	-	2.50	adb
						2.38	82.76	9.70	5.16	0.05	-		arb
							84.77	9.94	5.29	0.05	-		db
163452	PN16-0030	14.73	15.27	0.54	1.77	1.08	69.24	8.99	20.69	0.17	1815	1.95	adb
						2.83	68.01	8.83	20.32	0.17	1783		arb
							70.00	9.09	20.92	0.17	1835		db
163453	PN16-0035	25.48	25.68	0.20	1.35	0.66	85.72	4.50	9.12	0.32	-	2.27	adb
						2.00	84.56	4.44	9.00	0.32	-		arb
							86.29	4.53	9.18	0.32	-		db
163456	PN16-0038	26.57	26.77	0.20	2.13	0.93	90.62	6.94	1.51	0.09	-	2.56	adb
						3.04	88.69	6.79	1.48	0.09	-		arb
							91.47	7.01	1.52	0.09	-		db
163781	PN16-0047	107.12	107.3	0.20	0.53	0.80	81.21	5.99	12.00	6.24	-	2.87	adb
						1.33	80.78	5.96	11.94	6.21	-		arb
							81.86	6.04	12.10	6.29	-		db
163782	PN16-0050	107.95	108.2	0.20	2.59	1.20	76.71	4.37	17.72	0.71	-	2.13	adb
						3.76	74.72	4.26	17.26	0.69	-		arb
							77.64	4.42	17.94	0.72	-		db
163457	PN16-0059	199.36	199.6	0.24	1.41	0.55	81.27	7.40	10.78	4.01	-	2.46	adb
						1.95	80.12	7.30	10.63	3.95	-		arb
							81.72	7.44	10.84	4.03	-		db
163460	PN16-0062	200.45	200.7	0.20	0.83	0.38	79.54	4.70	15.38	0.75	-	2.16	adb
						1.21	78.88	4.66	15.25	0.74	-		arb
							79.84	4.72	15.44	0.75	-		db

HOLE ID #DHPN-16-04 — **STONE ANALYSIS ,air dried basis**

LAB ID	SAMPLE ID	From	To	Thickness	ADM %	MOIST%	ASH%	VOL%	F.C.%	%S	Cal/g	SG	BASIS	
163489	PN16-0128	142.88	143.1	0.20	2.33	1.09	91.37	4.76	2.78	0.76	-	2.94	adb	
						3.39	89.24	4.65	2.72	0.74	-		arb	
							92.38	4.81	2.81	0.77	-		db	
163493	PN16-0132	145.19	145.5	0.28	4.33	1.10	66.00	6.44	26.46	0.17	2283	1.85	adb	***
						5.38	63.14	6.16	25.31	0.16	2184		arb	
							66.73	6.51	26.75	0.17	2308		db	
163497	PN16-0136	201.96	202.2	0.20	1.90	0.98	84.07	7.74	7.21	3.63	-	2.48	adb	
						2.86	82.47	7.59	7.07	3.56	-			
							84.90	7.82	7.28	3.67	-		db	

*** SG checked

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CLIENT: **ATRUM COAL**

PROJECT: **ATRUM COAL - Panorma**

REPORT DATE: November 28, 2016

Dropped shattered 20X from 2 meter height and then screened at 31.5mm, +31.5mm hand knapped to pass 31.5mm and homogenized with natural 31.5mmx0. Representative 1/4 split taken for Raw Coal Analysis and 3/4 split retained.

HOLE ID #DHPN-16-01								RAW COAL ANALYSIS ,air dried basis								
LAB ID	SAMPLE ID	Seam Name	From	To	Thickness	+31.5mm	-31.5mm	ADM %	MOIST%	ASH%	VOL%	F.C.%	%S	Cal/g	SG	BASIS
163755	PN16-0002	Claw B1	55.38	55.73	0.35	348	1149	2.57	1.65	39.51	5.34	53.50	3.18	4678	1.66	adb
									4.18	38.49	5.20	52.13	3.10	4558		arb
						Retain =	**1102**			40.17	5.43	54.40	3.23	4756		db
163756	PN16-0003	Claw B1	55.73	55.85	0.12	368	446	2.15	1.48	72.51	4.52	21.49	0.51	1489	2.09	adb
									3.60	70.95	4.42	21.03	0.50	1457		arb
						Retain =	**600**			73.60	4.59	21.81	0.52	1511		db
163757	PN16-0004	Claw B1	55.96	56.32	0.36	1977	421	4.76	0.77	72.65	10.96	15.62	0.37	1218	2.09	adb
									5.49	69.19	10.44	14.88	0.35	1160		arb
						Retain =	**1837**			73.21	11.05	15.74	0.37	1227		db
163758	PN16-0005	Claw B1	56.32	56.57	0.25	435	576	1.81	1.37	39.59	8.51	50.53	2.99	4588	1.76	adb
									3.16	38.87	8.36	49.62	2.94	4505		arb
						Retain =	**782**			40.14	8.63	51.23	3.03	4652		db
163759	PN16-0006	Claw B1	56.57	56.9	0.33	127	1070	3.14	1.46	10.12	7.96	80.46	1.00	7329	1.48	adb ***
									4.55	9.80	7.71	77.93	0.97	7099		arb
						Retain =	**934**			10.27	8.08	81.65	1.01	7438		db
163760	PN16-0007	Claw B1	56.9	57.13	0.23	199	853	6.46	0.92	32.94	7.83	58.31	0.49	5184	1.58	adb
									7.32	30.81	7.32	54.54	0.46	4849		arb
						Retain =	**770**			33.25	7.90	58.85	0.49	5232		db
163435	PN16-0013	Claw C	82.14	82.46	0.32	235	1341	4.03	1.19	27.56	4.95	66.30	1.52	5953	1.44	adb *
									5.17	26.45	4.75	63.63	1.46	5713		arb
						Retain =	**1183**			27.89	5.01	67.10	1.54	6025		db
163436	PN16-0014	Claw C	82.54	82.75	0.21	368	627	2.30	1.36	33.15	5.39	60.10	0.42	5314	1.56	adb *
									3.63	32.39	5.27	58.72	0.41	5192		arb
						Retain =	**752**			33.61	5.46	60.93	0.43	5387		db
163437	PN16-0015	Claw C	82.75	82.88	0.13	127	876	5.28	1.53	65.80	8.86	23.81	0.15	1958	1.94	adb *
									6.73	62.33	8.39	22.55	0.14	1855		arb
						Retain =	**679**			66.82	9.00	24.18	0.15	1988		db
163438	PN16-0016	Claw C	83.12	83.36	0.24	816	1168	2.58	1.06	45.90	10.11	42.93	1.27	3885	1.76	adb *
									3.61	44.72	9.85	41.82	1.24	3785		arb
						Retain =	**1308**			46.39	10.22	43.39	1.28	3927		db
163439	PN16-0017		83.36	83.5	0.14	1387	80	0.93	0.94	77.66	12.88	8.52	0.09	667	2.33	adb *
									1.86	76.94	12.76	8.44	0.09	661		arb
						Retain =	**1080**			78.40	13.00	8.60	0.09	673		db
163445	PN16-0023	Claw E	114.91	115.34	0.43	555	1367	4.94	0.80	43.68	5.14	50.38	2.91	4289	1.69	adb
									5.70	41.52	4.89	47.89	2.77	4077		arb
						Retain =	**1471**			44.03	5.18	50.79	2.93	4324		db
163446	PN16-0024	Claw E	115.91	116.21	0.30	150	1105	8.52	0.93	64.33	6.32	28.42	5.17	2469	2.07	adb
									9.37	58.85	5.78	26.00	4.73	2259		arb
						Retain =	**940**			64.93	6.38	28.69	5.22	2492		db
163447	PN16-0025	Claw E	116.21	117.00	0.79	240	3449	3.07	0.92	24.60	5.61	68.87	2.16	6157	1.60	adb **
									3.96	23.84	5.44	66.76	2.09	5968		arb
						Retain =	**2809**			24.83	5.66	69.51	2.18	6214		db
163448	PN16-0026	Claw E	117.00	117.25	0.25	580	828	2.09	0.63	50.11	7.40	41.86	0.87	3638	1.84	adb
									2.71	49.06	7.25	40.99	0.85	3562		arb
						Retain =	**1083**			50.43	7.45	42.13	0.88	3661		db

*Proximate analysis checked
* SG checked

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CERTIFICATE OF ANALYSIS

CLIENT: **ATRUM COAL**

PROJECT: **ATRUM COAL - Panorma**

REPORT DATE: November 28, 2016

Dropped shattered 20X from 2 meter height and then screened at 31.5mm, +31.5mm hand knapped to pass 31.5mm and homogenized with natural 31.5mmx0. Representative 1/4 split taken for Raw Coal Analysis and 3/4 split retained.

HOLE ID #DHPN-16-02B — **RAW COAL ANALYSIS ,air dried basis**

LAB ID	SAMPLE ID	Seam Name	From	To	Thickness	+31.5mm	-31.5mm	ADM %	MOIST%	ASH%	VOL%	F.C.%	%S	Cal/g	SG	BASIS	
163470	PN16-0086	Claw C	105.32	105.74	0.42	0	1479	7.94	0.72	19.83	8.77	70.68	2.25	6402	1.55	adb	
									8.60	18.26	8.07	65.07	2.07	5894		arb	
						Retain =	**1108**			19.97	8.83	71.19	2.27	6448		db	
163473	PN16-0091		138.96	139.5	0.54	146	2494	4.84	0.96	51.28	6.76	41.00	2.23	3430	1.81	adb	
									5.75	48.80	6.43	39.02	2.12	3264		arb	
						Retain =	**1952**			51.78	6.83	41.40	2.25	3463		db	
163474	PN16-0092		139.5	139.98	0.48	100	1968	6.11	0.93	45.21	5.39	48.47	0.63	4209	1.58	adb	
									6.98	42.45	5.06	45.51	0.59	3952		arb	
						Retain =	**1520**			45.63	5.44	48.93	0.64	4249		db	
163761	PN16-0095	Claw E	151.35	151.97	0.62	1423	2116	2.10	1.62	64.71	4.93	28.74	4.12	2322	2.00	adb	
									3.69	63.35	4.83	28.14	4.03	2273		arb	
						Retain =	**2799**			65.78	5.01	29.21	4.19	2360		db	
163477	PN16-0102	Scow A	190.92	191.5	0.58	184	2492	4.90	1.10	40.05	7.41	51.44	1.72	4608	1.62	adb	
									5.95	38.09	7.05	48.92	1.64	4382		arb	
						Retain =	**2059**			40.50	7.49	52.01	1.74	4659		db	
163478	PN16-0103	Scow A	191.7	192.03	0.33	0	1255	8.67	0.77	46.61	4.92	47.70	0.56	4124	1.62	adb	
									9.37	42.57	4.49	43.56	0.51	3766		arb	
						Retain =	**938**			46.97	4.96	48.07	0.56	4156		db	

HOLE ID #DHPN-16-03 — **RAW COAL ANALYSIS ,air dried basis**

LAB ID	SAMPLE ID	Seam Name	From	To	Thickness	+31.5mm	-31.5mm	ADM %	MOIST%	ASH%	VOL%	F.C.%	%S	Cal/g	SG	BASIS	
163451	PN16-0029	Claw C	13.83	14.33	0.50	371	1207	3.74	0.93	32.35	8.06	58.66	0.39	5291	1.62	adb	
									4.64	31.14	7.76	56.47	0.38	5093		arb	
						Retain =	**1197**			32.65	8.14	59.21	0.39	5341		db	
163458	PN16-0060	Scow F	199.65	199.97	0.32	333	1073	2.70	0.90	15.10	5.11	78.89	1.76	6921	1.54	adb	***
									3.58	14.69	4.97	76.76	1.71	6734		arb	
						Retain =	**1093**			15.24	5.16	79.61	1.78	6984		db	
163459	PN16-0061	Scow F	199.97	200.45	0.48	730	1469	2.70	1.06	31.47	5.77	61.70	0.58	5421	1.64	adb	
									3.73	30.62	5.61	60.03	0.56	5275		arb	
						Retain =	**1627**			31.81	5.83	62.36	0.59	5479		db	

HOLE ID #DHPN-16-04 — **RAW COAL ANALYSIS ,air dried basis**

LAB ID	SAMPLE ID	Seam Name	From	To	Thickness	+31.5mm	-31.5mm	ADM %	MOIST%	ASH%	VOL%	F.C.%	%S	Cal/g	SG	BASIS	
163490	PN16-0129	Claw C	143.08	143.74	0.66	648	2647	4.89	0.95	42.19	5.79	51.07	1.95	4582	1.56	adb	
									5.79	40.13	5.51	48.57	1.85	4358		arb	
						Retain =	**2393**			42.59	5.85	51.56	1.97	4626		db	
163491	PN16-0130	Claw C	143.74	144.22	0.48	1682	1291	1.83	0.54	60.47	22.87	16.12	0.13	1478	2.17	adb	*
									2.36	59.36	22.45	15.83	0.13	1451		arb	**
						Retain =	**2234**			60.80	22.99	16.21	0.13	1486		db	***
163492	PN16-0131	Claw C	144.45	145.19	0.74	937	2387	4.27	1.73	32.15	6.32	59.80	0.36	5279	1.63	adb	
									5.93	30.78	6.05	57.25	0.34	5054		arb	
						Retain =	**2429**			32.72	6.43	60.85	0.37	5372		db	

** lots of carbonates pressent
*** SG checked

*Proximate analysis checked

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CERTIFICATE OF ANALYSIS

CLIENT: **ATRUM COAL**

PROJECT: **ATRUM COAL - Panorma**

LAB#: 163434-505

INSTRUCTED: October 31, 2016 (received October 26, 2016)

REPORT DATE: November 3, 2016

HOLE #DHPN-16-01

LAB NO:	SAMPLE ID:	Wet Wt(g)	Dry Wt (g)	ADM%	+2mm weight (g)	-2mm weight (g)	+2mm Wt%	ARD +2mm	ARD -2mm	Total ARD	BASIS
163434	PN 16-0012	1400	1367	2.36	1356	13	99.05	2.49	-	2.49	adb
163435	PN 16-0013	1713	1644	4.03	1462	181	88.98	1.60	1.19	1.55	adb
163436	PN 16-0014	1042	1018	2.30	1003	15	98.53	1.70	-	1.70	adb
163437	PN 16-0015	1098	1040	5.28	992	48	95.38	2.01	-	2.01	adb
163438	PN 16-0016	2133	2078	2.58	2022	56	97.31	1.82	-	1.82	adb
163439	PN 16-0017	1499	1485	0.93	1485	0	100.00	2.45	-	2.45	adb
163440	PN 16-0018	1496	1476	1.34	1466	10	99.32	2.63	-	2.63	adb
163441	PN 16-0019	1538	1527	0.72	1526	1	99.93	2.63	-	2.63	adb
163442	PN 16-0020	2751	2617	4.87	2174	442	83.10	1.95	1.36	1.85	adb
163443	PN 16-0021	1434	1415	1.32	1402	13	99.08	2.69	-	2.69	adb
163444	PN 16-0022	1452	1428	1.65	1420	8	99.44	2.21	-	2.21	adb
163445	PN 16-0023	2127	2022	4.94	1896	126	93.77	1.75	1.14	1.71	adb
163446	PN 16-0024	1537	1406	8.52	1349	57	95.95	1.74	-	1.74	adb
163447	PN 16-0025	3939	3818	3.07	2513	1305	65.82	1.64	1.10	1.46	adb
163448	PN 16-0026	1480	1449	2.09	1396	53	96.34	1.81	-	1.81	adb
163449	PN 16-0027	1186	1164	1.85	1151	13	98.88	2.39	-	2.39	adb

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CLIENT: **ATRUM COAL**

PROJECT: **ATRUM COAL - Panorma**

LAB#: 163434-505

INSTRUCTED: October 31, 2016 (received October 26, 2016)

REPORT DATE: November 3, 2016

HOLE #DHPN-16-03

LAB NO:	SAMPLE ID:	Wet Wt(g)	Dry Wt (g)	ADM%	+2mm weight (g)	-2mm weight (g)	+2mm Wt%	ARD +2mm	ARD -2mm	Total ARD	BASIS
163450	PN 16-0028	1356	1334	1.62	1328	6	99.55	2.47	-	2.47	adb
163451	PN 16-0029	1686	1623	3.74	1599	24	98.52	1.68	-	1.68	adb
163452	PN 16-0030	3106	3051	1.77	2975	76	97.51	2.19	-	2.19	adb
163453	PN 16-0035	1338	1320	1.35	1314	6	99.55	2.44	-	2.44	adb
163454	PN 16-0036	730	707	3.15	703	4	99.43	1.54	-	1.54	adb
163455	PN 16-0037	1593	1555	2.39	1542	13	99.16	1.83	-	1.83	adb
163456	PN 16-0038	1173	1148	2.13	1144	4	99.65	2.63	-	2.63	adb
163457	PN 16-0059	1776	1751	1.41	1731	20	98.86	2.54	-	2.54	adb
163458	PN 16-0060	1483	1443	2.70	1384	59	95.91	1.58	-	1.58	adb
163459	PN 16-0061	2335	2272	2.70	2110	162	92.87	1.67	1.12	1.63	adb
163460	PN 16-0062	1446	1434	0.83	1416	15	98.95	2.37	-	2.37	adb
163461	PN 16-0063	1672	1654	1.08	1653	1	99.94	2.65	-	2.65	adb
163462	PN 16-0064	3159	3080	2.50	2477	603	80.42	1.67	1.15	1.57	adb
163463	PN 16-0065	1538	1526	0.78	1525	1	99.93	2.57	-	2.57	adb

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PROJECT: **ATRUM COAL - Panorma**

LAB#: 163434-505

INSTRUCTED: October 31, 2016 (received October 26, 2016)

REPORT DATE: November 3, 2016

HOLE #DHPN-16-02

LAB NO:	SAMPLE ID:	Wet Wt(g)	Dry Wt (g)	ADM%	+2mm weight (g)	-2mm weight (g)	+2mm Wt%	ARD +2mm	ARD -2mm	Total ARD	BASIS
163464	PN 16-0078	1966	1798	8.55	1635	162	90.98	1.53	1.43	1.52	adb
163465	PN 16-0079	1324	1171	11.56	895	276	76.43	1.59	1.50	1.57	adb
163466	PN 16-0080	4137	3896	5.83	3361	535	86.27	2.05	1.76	2.01	adb
163467	PN 16-0081	1656	1593	3.80	1568	25	98.43	2.78	-	2.78	adb
163468	PN 16-0082	981	926	5.61	872	54	94.17	1.56	1.70	1.57	adb
163469	PN 16-0085	1123	1085	3.38	1047	38	96.50	2.38	-	2.38	adb
163470	PN 16-0086	1776	1635	7.94	1197	438	73.21	1.41	1.00	1.30	adb
163471	PN 16-0087	1325	1282	3.25	1236	46	96.41	2.80	-	2.80	adb
163472	PN 16-0090	1395	1361	2.44	1630	1	99.94	2.50	-	2.50	adb
163473	PN 16-0091	2852	2714	4.84	2114	603	77.81	1.83	1.41	1.74	adb
163474	PN 16-0092	2275	2136	6.11	1388	747	65.01	1.85	1.25	1.64	adb
163475	PN 16-0093	1287	1235	4.04	1177	58	95.30	2.44	-	2.44	adb
163476	PN 16-0101	1107	1062	4.07	1034	27	97.46	2.32	-	2.32	adb
163477	PN 16-0102	2858	2718	4.90	2068	647	76.17	1.83	1.34	1.71	adb
163478	PN 16-0103	1395	1274	8.67	906	368	71.11	1.78	1.26	1.63	adb
163479	PN 16-0104	2218	2126	4.15	2004	123	94.22	2.37	2.02	2.35	adb
163480	PN 16-0105	1610	1584	1.61	1580	4	99.75	2.62	-	2.62	adb
163481	PN 16-0106	2759	2691	2.46	2398	292	89.14	1.88	1.44	1.83	adb
163482	PN 16-0107	1211	1187	1.98	1172	14	98.82	2.48	-	2.48	adb
163483	PN 16-0108	2811	2735	2.70	2483	251	90.82	1.65	1.45	1.63	adb
163484	PN 16-0109	1192	1120	6.04	849	270	75.87	1.76	1.66	1.73	adb
163485	PN 16-0110	1532	1501	2.02	1483	18	98.80	2.62	-	2.62	adb

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PROJECT: **ATRUM COAL - Panorma**

LAB#: 163434-505

INSTRUCTED: October 31, 2016 (received October 26, 2016)

REPORT DATE: November 3, 2016

HOLE #DHPN-16-04

LAB NO:	SAMPLE ID:	Wet Wt(g)	Dry Wt (g)	ADM%	+2mm weight (g)	-2mm weight (g)	+2mm Wt%	ARD +2mm	ARD -2mm	Total ARD	BASIS
163486	PN 16-0125	1877	1736	7.51	1288	448	74.19	1.62	1.68	1.64	adb
163487	PN 16-0126	1175	1143	2.72	1126	17	98.51	2.22	-	2.22	adb
163488	PN 16-0127	1206	1170	2.99	1155	16	98.63	1.97	-	1.97	adb
163489	PN 16-0128	1330	1299	2.33	1295	4	99.69	2.56	-	2.56	adb
163490	PN 16-0129	3596	3420	4.89	2985	433	87.33	1.68	1.27	1.63	adb
163491	PN 16-0130	3165	3107	1.83	3032	75	97.59	2.29	-	2.29	adb
163492	PN 16-0131	3603	3449	4.27	3110	333	90.33	1.71	1.37	1.67	adb
163493	PN 16-0132	1570	1502	4.33	1428	74	95.07	2.09	-	2.09	adb
163494	PN 16-0133	1006	989	1.69	987	2	99.80	2.47	-	2.47	adb
163495	PN 16-0134	1191	1149	3.53	961	188	83.64	1.72	1.51	1.69	adb
163496	PN 16-0135	1677	1584	5.55	1216	366	76.86	1.49	1.38	1.46	adb
163497	PN 16-0136	1525	1496	1.90	1486	10	99.33	2.55	-	2.55	adb
163498	PN 16-0137	1992	1937	2.76	1856	81	95.82	1.57	-	1.57	adb
163499	PN 16-0138	2063	1970	4.51	1798	172	91.27	1.64	1.16	1.60	adb
163500	PN 16-0141	1170	1141	2.48	1140	1	99.91	2.43	-	2.43	adb
163501	PN 16-0142	2505	2437	2.71	2398	37	98.48	1.68	-	1.68	adb
163502	PN 16-0143	1259	1221	3.02	1211	10	99.18	2.59	-	2.59	adb
163503	PN 16-0144	1294	1261	2.55	1260	1	99.92	2.48	-	2.48	adb
163504	PN 16-0145	3334	3163	5.13	2578	583	81.56	1.59	1.32	1.54	adb
163505	PN 16-0146	1174	1146	2.39	1129	17	98.52	2.32	-	2.32	adb

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This report is invalid without signatures of approved persons.

We accept no responsibility for the origin of the sample, nor for any deviation between the sample and the bulk of the material it purports to represent.

Heather Dexter
Operations Manager
GWIL Industries

APPENDIX 5

Maps

524,000 mE
528,000 mE
532,000 mE
6,304,000 mN
6,300,000 mN

417526
418958
417527
418957
417086
417299
417084
417525
418961
417292
417296
418953

1,200
1,600
1,500
1,700
1,300
1,400

Atrum Coal

Coal Titles
Panorama North Project

Date: 2017/04/11	Company: Atrum Coal Panorama Inc.
Author: H. Hetherington	Projection: UTM NAD 83 Zone 9

0 400 800
metres

Scale 1:36,000

N

Legend

- Panorama North Coal Licence
- Panorama Coal Licence
- 2016 Exploration Permit Area
- Atrum Camp
- Land Reserve
- 100 m Topography Contour

Atrum Coal

Panorama North

Date: 2017/04/11	Company: Atrum Coal Panorama Inc.
Author: H. Hetherington	Projection: UTM NAD 83 Zone 9

Legend

- Panorama North Coal Titles
- Groundhog Coalfield
- Bowser Basin
- Town
- Railway
- Highway

Panorama North

Stewart

Smithers

Prince Rupert

Prince George

British Columbia

N
W E
S

0 100 200
kilometres

524,000 mE
528,000 mE
532,000 mE
6,304,000 mN
6,300,000 mN

DHPN-16-01
DHPN-16-04
DHPN-16-02A
DHPN-16-02B
DHPN-16-03

Atrum Coal

Geological Map

Panorama North

Date: 2017/04/18	Company: Atrum Coal Panorama Inc.
Author: H. Hetherington	Projection: UTM NAD 83 Zone 9

0 400 800
metres

Scale 1:36,000

N

Legend

Structure
- Anticline - Defined
- Anticline - Approximate
- Syncline - Defined
- Syncline - Approximate

Stratigraphy
- Coal Outcrop
- Colluvium
- Coal-Bearing Rocks

Exploration
- Drillhole
- Historic Trench

- Panorama North Coal Licence
- Atrum Camp
- 100 m Topography Contour

525,000 mE | 526,000 mE | 527,000 mE | 528,000 mE

6,302,000 mN | 6,301,000 mN | 6,300,000 mN

DHPN-16-01

DHPN-16-04

DHPN-16-02A
DHPN-16-02B

DHPN-16-03

Atrum Coal

Exploration Map

Panorama North

Date: 2017/04/11	Company: Atrum Coal Panorama Inc.
Author: H. Hetherington	Projection: UTM NAD 83 Zone 9

0 75 150 300
meters

Scale 1:12,000

N

Legend

Exploration

- Drillhole
- Historic Trench
- Coal outcrop

- Panorama North Coal Licence
- Exploration Permit 2016

- Atrum Camp
- Land Reserve
- 10 m Topography Contour