ENHANCED COAL BED METHANE PRODUCTION AND SEQUESTRATION OF CO_2 IN UNMINEABLE COAL SEAMS

Semi-Annual Technical Progress Report
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Disclaimer

ABSTRACT

This is the first Technical Progress report for the subject agreement. During the first six months of the project, progress was made in arranging participation by other CONSOL departments, identifying a prospective site, developing an environmental assessment report, and securing land and coal rights. In addition, correspondences were drafted in response to NETL inquiries. These aspects of the project are discussed in detail in this report.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

INTRODUCTION

The availability of clean, affordable energy is essential for the prosperity and security of the United States and the world in the 21st century. Carbon dioxide (CO_2) emissions to the atmosphere are an inherent part of energy-related activities such as electricity generation, transportation, and building systems. These energy-related activities are responsible for roughly 85 percent of the U.S. greenhouse gas emissions, and 95 percent of these emissions are dominated by CO_2 [(1)]. Over the last few decades, an increased concentration of CO_2 in the earth's atmosphere has been observed. Many scientists believe greenhouse gases, particularly CO_2, trap heat in the earth's atmosphere. Carbon sequestration technology offers an approach to redirect CO_2 emissions into sinks (e.g., geologic formations, oceans, soils and vegetation) and potentially stabilize future atmospheric CO_2 levels. Coal seams are attractive CO_2 sequestration sinks, due to their abundance and proximity to electricity-generation facilities. The recovery of marketable coal bed methane (CBM) provides a value-added stream, reducing the cost to sequester CO_2 gas. Much research is needed to evaluate this technology in terms of CO_2 storage capacity, sequestration stability, commercial feasibility and overall economics.

CONSOL Energy, with support from the US DOE, is conducting a seven-year program to construct and operate a coal bed sequestration site composed of a series of horizontally drilled wells that originate at the surface and extend through overlying coal seams in the subsurface. Once completed, all of the wells will be used to initially drain CBM from both the upper (mineable) and lower (unmineable) coal seams. After sufficient depletion of the reservoir, some of the wells in the lower coal seam will be converted from CBM drainage wells to CO_2 injection ports. CO_2 will be measured and injected into the lower unmineable coal seam while CBM continues to drain from both seams. A conceptual illustration of the arrangement as originally proposed is shown in Figure 1. In addition to metering all injected CO_2 and CBM produced, the program includes a plan to monitor horizontal migration of CO_2 within the lower seam.

This is the first Technical Progress report for this project. The focus of the work to date has been on site selection and pre-construction activities. A prospective site for the project has been identified and site approval activities are progressing. All NEPA requirements for the project must be satisfied and property rights must be secured for the site before any groundbreaking activities can commence. This report provides specific information regarding project activity to date and plans for future work.

EXPERIMENTAL

A well site has not yet been constructed; therefore no experimental work has begun.

RESULTS AND DISCUSSION

STATUS OF COOPERATIVE AGREEMENT

The cooperative agreement between DOE and CONSOL Energy was initiated on October 1, 2001. The Hazardous Substance Plan, the list of anticipated ES&H approvals, and a request for advance waiver of patent rights for the project were submitted to DOE. CONSOL executed amendments M001 and A002 revising reporting requirements and obligating additional DOE funds, respectively. CONSOL personnel toured a horizontal drilling site similar to the proposed project in Greene County, Pennsylvania on October 10, 2001.

CONSOL PARTICIPANTS

CONSOL Energy plans to employ its extensive internal resources to carry out this R&D project. CNX Gas Company LLC (CNX Gas) and CNX Land Resources Inc. (CNX Land), subsidiaries of CONSOL Energy, will play major roles in the development of the DOE project site. CONSOL R&D met with CNX Gas personnel on October 22, 2001 to review the scope of the project and engage their services. CNX Gas, responsible for CONSOL Energy's coal bed methane (CBM) operations in Pennsylvania and northern West Virginia, will direct the site selection, drilling, and production aspects of the project. CNX Land, working under the direction of CNX Gas, will manage the acquisition of land and coal rights required for the project. CONSOL R&D will coordinate project activities between CONSOL participants and the DOE and be responsible for maintaining the program objectives.

STATUS OF SITE SELECTION

In 2001, CONSOL drilled seven exploratory core holes in northern Wetzel County and Marshall County, West Virginia. Geologist logs obtained from those core holes were utilized to evaluate potential locations for the project. Geologic data from the Wetzel County cores indicated very thin or non-existent lower seams in that area. Marshall County was much more promising in terms of seam thickness and continuity. A location near one of the core holes, core ID MC-01-19, was judged most favorable for the project. That location was attractive in terms of thickness of the coal seams, accessibility, topography, and proximity to receiving natural gas pipelines. The complete geologist log for core MC-01-19 is included in this report as Appendix A.

CONSOL's laboratory, in Morgantown, WV, conducted desorption tests on the core samples of coal obtained from core MC-01-19. The results of those analyses were completed in March and are shown below in Table 1.

Table 1. Analyses of CONSOL Core MC-01-19

CONSOL Core MC-01-19						
Coal Seam	**Seam Thickness**		**Depth to Top of Seam**		**Gas Content**	
	Meters	Feet	Meters	Feet	m^3/mT	ft^3/Ton
Sewickley	1.34	4.40	170.41	559.10	2.62	84
Pittsburgh	2.05	6.72	204.03	669.40	4.24	136
Mahoning	1.57	5.15	368.96	1210.50	6.40	205
Upper Freeport	1.30	4.25	384.32	1260.90	5.68	182
Lower Freeport	0.76	2.50	398.11	1306.15	6.05	194
Upper Kittaning	0.61	2.00	413.46	1356.50	5.80	186
Middle Kittaning	0.82	2.70	428.24	1405.00	6.18	198

Gas contents are listed on a dry, ash free basis and include desorbed, residual and lost gases.

The geologist log of core MC-01-19 indicates a thickness of 1.57 m (5.15 ft) for the Mahoning coal seam. However, the other cores completed in the surrounding area indicated that the Mahoning seam varied in thickness and was non-existent at three core locations. Conversely, the Upper Freeport seam thickness remained more uniform throughout the area.

In addition to the coal seams and gas contents in this area, CONSOL owns an abandoned railroad right-of–way which passes through the area surrounding core MC-01-19. The right-of-way, formerly owned by Baltimore and Ohio Railroad Company, is 30.5 m (100 ft) wide on average and would facilitate access into the area.

For the reasons discussed above, the area surrounding CONSOL core MC-01-19 in Marshall County was selected for the project. Furthermore, the Upper Freeport coal seam was selected to be the “lower” or “unmineable” coal seam for the project. The Pittsburgh seam is the “upper” or “mineable” coal seam for the project.

STATUS OF LAND ACQUISITION

The proposed drilling plan for the project was drawn to scale and projected over the targeted area in Marshall County. A project layout was arranged that utilized the existing CONSOL right-of-way and avoided difficult topography in the area as much as possible. A proposed location map for the project was submitted to CNX Land in mid-December. The proposed project location map is shown in Figure 2.

CNX Land identified all landowners and began acquisitions for the area. At the end of this report period, CNX Land reported that approximately 85% of the land and coal rights necessary for the proposed location have either already been secured or can be secured by CONSOL without difficulty. The remaining property rights have been sub-divided into multiple owners through heirships. While this situation is a common occurrence in land work, it will likely require additional time to resolve the heirship issues. Efforts by CNX Land to secure all rights necessary for the project continue.

PROGRESS ON ENVIRONMENTAL ASSESSMENT

CONSOL personnel met with DOE personnel at NETL on October 11, 2001 to discuss the scope and format of the environmental assessment report required for the project. A service contract was established with hefcorp-jon, a registered professional geologist in Buckhannon, WV. Hefcorp-jon was contracted to provide professional geological and environmental services for the project. An environmental assessment report, which described the project and its potential environmental impacts, was developed. The report acknowledged that the project would be constructed and operated at the proposed Marshall County location described above. The 44-page document was reviewed internally and issued to DOE on February 14, 2002.

DOE feedback on the environmental assessment draft was received on March 26, 2002. DOE advised that additional quantitative information was required to add substance and perspective. CONSOL is currently compiling that information so that the environmental assessment can be completed.

CORRESPONDENCES WITH NETL

Three NETL inquiries were received and addressed during this report period. A letter dated January 23, 2002 posed five questions concerning the sequestration integrity of the proposed site with regard to active or abandoned gas wells, oil wells, water wells, or any other boreholes that might be present. A formal response was prepared and issued to NETL on February 4, 2002. An email regarding a Freedom of Information Act (FOIA) request was received on February 11, 2002. A response to the FOIA request was issued on February 14. A letter dated February 19, 2002 posed five questions concerning the integrity of the interburden with regard to future mining activities. A response was prepared, but not issued during this report period.

HORIZONTAL DRILLING STRATEGY

At its own expense, CNX Gas is exploring an alternative drilling strategy that would potentially eliminate the three vertical wells originally proposed. The ability of this sump design to effectively dewater the reservoir has not yet been proven. Water removal is essential for both CBM drainage and subsequent CO_2 sequestration.

With its own funds, CNX Gas has begun horizontal drilling at a CONSOL location in southwestern Pennsylvania named Blockhouse Run. The Blockhouse Run CBM project, using the alternative sump design, is scheduled for an April 2002 completion. The results of this project will be used to evaluate the performance and future prospects of this sump design. Following that evaluation, CNX Gas will finalize a drilling strategy for the DOE project.

PROGRESS ON PUBLIC COMMUNICATIONS

CONSOL issued a press release on this project on January 14, 2002 (Appendix B).

CONFERENCES

Gary Cairns and Shiaw Tseng attended a DOE-sponsored forum in Houston, Texas on March 14 – 15, 2002. The forum was entitled “First International Forum on Geologic Sequestration of CO_2 in Deep, Unmineable Coalseams”.

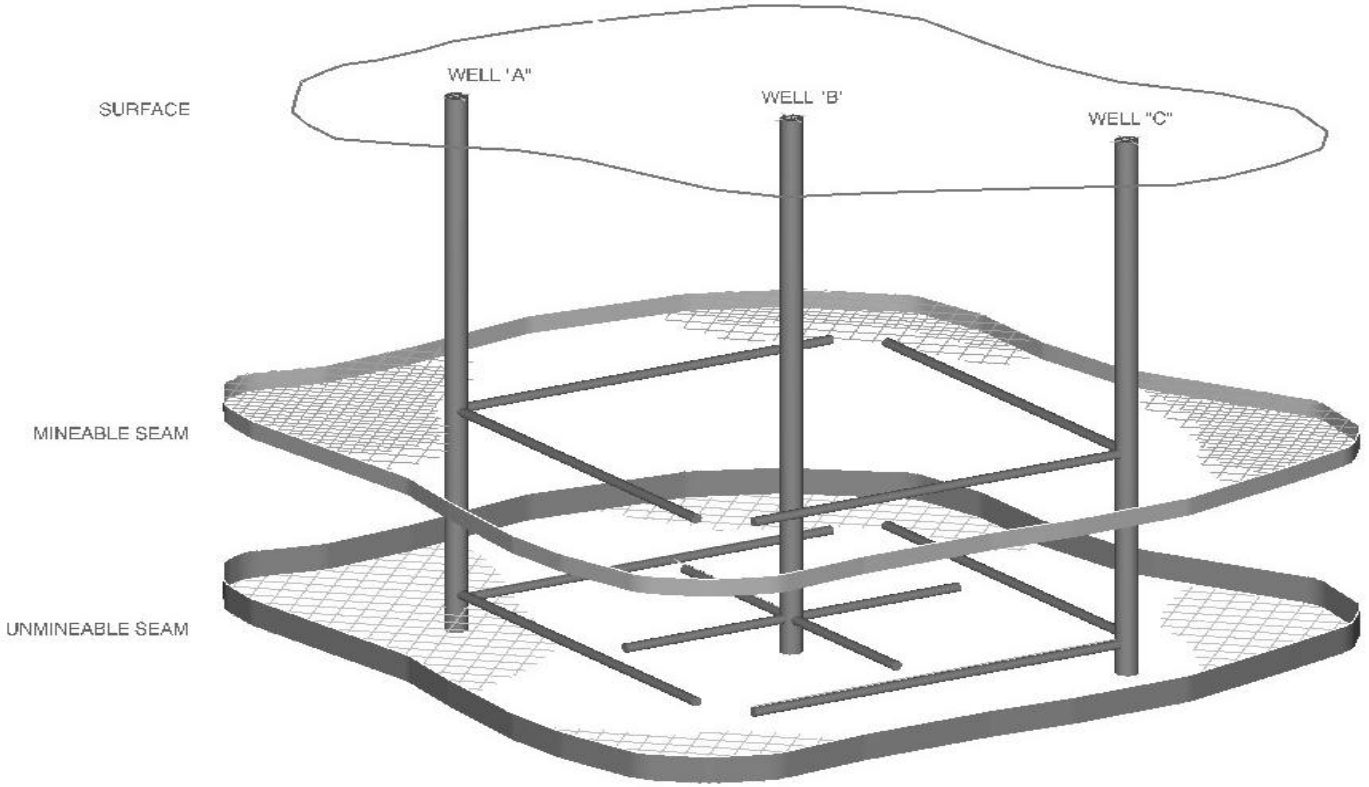
CONCLUSION

CONSOL has engaged an internal team to proceed with the project that includes CONSOL R&D, CNX Gas and CNX Land. A location in Marshall County, West Virginia has been selected for the project. The Pittsburgh and Upper Freeport coal seams have been identified as the upper and lower seams for the project, respectively. CNX Land has acquired much of the land and coal rights needed for the selected project location. An environmental assessment report was drafted and submitted to DOE. Additional information is required to finalize the report and satisfy NEPA requirements. CNX Gas has proposed an alternative sump design that will be field-proven at a CONSOL location in April 2002.

REFERENCES

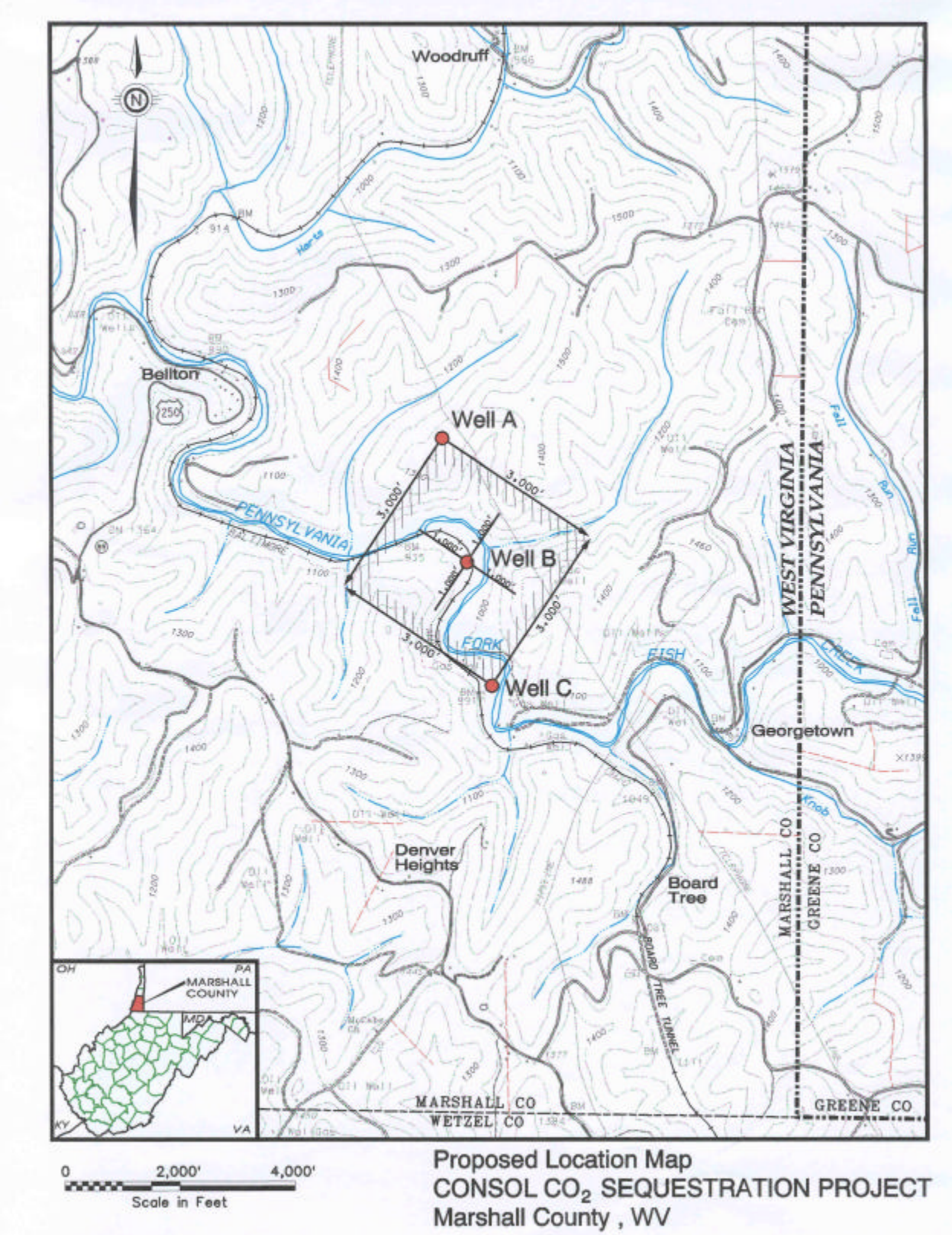
(1) U.S. Environmental Protection Agency, **2000** *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-1998*, EPA 236-R-00-001, April 2000.

Figure 1. Conceptual Illustration of Project



Description: The proposed site plan consists of three vertical wells drilled from the surface and crossing through the desired coal seams. Directional drilling methods will be employed from the surface to drill horizontally through the vertical wells and symmetrically divide the coal seams as shown. Initially, the site will be depressurized by productng coal bed methane (CBM) from both coal seams through the three vertical production wells. After sufficient depressurization, Well B will be conveted from a production well to a CO_2 injection port. Throughout the CO_2 sequestration process, the upper mineable seam will be isolated from the lower unmineable seam and CBM production will continue at Wells A and C.

Figure 2. Map of Proposed Location



APPENDIX A
Geologist Log of CONSOL Core MC-01-19

CONSOL Energy Inc.
Geologist Log
Hole No. MC-01-19
Marshall County, WV
Date Completed: 11/27/2001

Surface Elevation: 943.23

USGS Quad: Littleton
USGS Size: 7 ½ Min.

WV State Plane System : NAD 27

N. Coordinate: 456600
E. Coordinate: 1707419

Fluid: Water
Cemented: .0 – 1780.0

Contractor: L. J. Hughes
Inspector: E. Thomas
Data Source: CONSOL

Comments: Driller's Log only to 524'

*** Data Entered In To – Depths ***

Strata Elevation (Top)	Strata From	Depth To	Strata Thick	Seam Code	Lithology	Characteristics and Comments
943.23	0.00	20.00	20.00		SURFACE CASING, OVERBURDEN	
923.23	20.00	40.00	20.00		SANDSTONE WITH SHALE STREAKS	ELO
903.23	40.00	50.00	10.00		SHALE, GRAY	LIM
893.23	50.00	70.00	20.00		SHALE, GRAY	
873.23	70.00	90.00	20.00		SHALE, DRK GRY, W/LS NOD	
853.23	90.00	95.00	5.00		SHALE, GRAY	LIM
848.23	95.00	102.00	7.00		SHALE, RED	
841.23	102.00	115.00	13.00		SHALE, RED-GREEN	
828.23	115.00	130.00	15.00		SHALE, GRAY	LIM
813.23	130.00	133.00	3.00		SHALE, RED-GREEN	
810.23	133.00	139.00	6.00		SHALE, GRAY	
804.23	139.00	140.00	1.00		CLAYSTONE	GRY
803.23	140.00	160.00	20.00		SANDY SHALE, GRAY, MASSIVE	
783.23	160.00	165.00	5.00		SHALE, GRAY	

Strata Elevation (Top)	Strata From	Depth To	Strata Thick	Seam Code	Lithology	Characteristics and Comments
778.23	165.00	168.30	3.30		LIMESTONE	GRY
774.93	168.30	175.00	6.70		SANDY SHALE, GRAY, MASSIVE	LIM
768.23	175.00	190.00	15.00		SHALE, GRAY	LIM
753.23	190.00	191.60	1.60		SHALE, GRAY	
751.63	191.60	193.60	2.00		SHALE, RED-GREEN	
749.63	193.60	199.60	6.00		SHALE, GRAY	
743.63	199.60	200.00	0.40		COAL	
743.23	200.00	212.00	12.00		SHALE, GRAY	
731.23	212.00	217.00	6.00		LIMESTONE	GRY
725.23	218.00	219.00	1.00		SHALE, GRAY	
724.23	219.00	224.00	5.00		BLACK SHALE WITH COAL STREAKS	
719.23	224.00	227.00	3.00	WRS	SANDSTONE, GRAY	
716.23	227.00	231.00	4.00		SANDY SHALE, GRAY, MASSIVE	
712.23	231.00	232.00	1.00	WS	COAL	
711.23	232.00	236.00	4.00		SANDY SHALE, GRAY, MASSIVE	
707.23	236.00	240.00	4.00		SHALE, DARK GRAY	
703.23	240.00	244.00	4.00		SANDY SHALE, GRAY, MASSIVE	
699.23	244.00	261.30	17.30		SHALE, GRAY	LIM
681.93	261.30	265.00	3.70	MMS	SANDSTONE, GRAY	
678.23	265.00	284.00	19.00		SHALE, GRAY	
659.23	284.00	289.00	5.00	MS	SANDSTONE, GRAY	
654.23	289.00	301.00	12.00		SANDY SHALE, GRAY, MASSIVE	
642.23	301.00	306.30	5.30		SHALE, GRAY	
636.93	306.30	308.30	2.00	WA	COAL	
634.93	308.30	309.40	1.10	MM	LIMESTONE	
633.83	309.40	309.80	0.40	MM	COAL	
633.43	309.80	315.80	6.00	MM	LIMESTONE	GRY
627.43	315.80	328.00	12.20		SHALE, GRAY	LIM
615.23	328.00	344.00	16.00		SANDY SHALE, GRAY, MASSIVE	
599.23	344.00	354.50	10.50	WD	SANDSTONE, GRAY	
588.73	354.50	360.50	6.00		SANDY SHALE, GRAY, MASSIVE	
582.73	360.50	362.50	2.00		SHALE, GRAY	
580.73	362.50	363.80	1.30	WB	COAL	
579.43	363.80	364.90	1.10	WB	SHALE, GRAY	
578.33	364.90	369.40	4.50	WB	COAL	
573.83	369.40	369.90	0.50		SHALE, GRAY	
573.33	369.90	370.00	0.10		COAL	
573.23	370.00	377.00	7.00		SHALE, GRAY	LIM
566.23	377.00	382.00	5.00	WL	LIMESTONE	
561.23	382.00	402.00	20.00		SHALE, GRAY	LIM
541.23	402.00	404.00	2.00		CLAYSTONE, RED-GREEN	
539.23	404.00	416.00	12.00		SHALE, RED-GREEN	
527.23	416.00	421.00	5.00		SANDY SHALE, GRAY, MASSIVE	
522.23	421.00	434.00	13.00		SHALE, GRAY	
509.23	434.00	442.00	8.00	LD	INTERBEDDED LIMESTONE AND SHALE	

Strata Elevation (Top)	Strata From	Depth To	Strata Thick	Seam Code	Lithology	Characteristics and Comments
501.23	442.00	445.50	3.50		SANDY SHALE, GRAY, MASSIVE	
497.73	445.50	447.50	2.00	AS	SANDSTONE, GRAY	
495.73	447.50	452.00	4.50		SHALE, GRAY	
491.23	452.00	463.00	11.00	LC	LIMESTONE	
480.23	463.00	464.00	1.00		SHALE, GREEN	
479.23	464.00	467.00	3.00		SHALE, RED-GREEN	
476.23	467.00	474.00	7.00	LB	LIMESTONE	
469.23	474.00	480.00	6.00		SHALE, RED-GREEN	
463.23	480.00	486.00	6.00	LA	LIMESTONE	
457.23	486.00	491.80	5.80		SHALE, GRAY	
451.43	491.80	499.80	8.00		SHALE, RED-GREEN	
443.43	499.80	521.00	21.20	BN	LIMESTONE	
422.23	521.00	524.30	3.30	BN	SHALE, GREEN	MOT
418.93	524.30	525.40	1.10	BN	LIMESTONE, FINE-GRAINED, MASSIVE	LIT GRY
417.83	525.40	525.80	0.40	BN	SHALE, GRAY	LIM MAS
417.43	525.80	527.90	2.10	BN	INTERBEDDED LIMESTONE AND SHALE	LIT GRY
415.33	527.90	531.40	3.50	BN	LIMESTONE, FINE-GRAINED, MOSAIC	LBR HRD SLY
411.83	531.40	531.70	0.30	BN	SHALE, GRAY	LIM
411.53	531.70	537.60	5.90	BN	SHALY LIMESTONE, FGR, MOZ	GRY SHS
405.63	537.60	538.90	1.30	BN	SHALE, GREEN	LIM CAS SPC
404.33	538.90	541.50	2.60	BN	SHALY LIMESTONE, FGR, MOZ	GRY VRY SHY
401.73	541.50	546.20	4.70	BN	MUDSTONE	GRY GRN LIM MAS
397.03	546.20	552.00	5.80	BN	LIMESTONE, FINE-GRAINED, MASSIVE	LBR SLY HRD
391.23	552.00	554.40	2.40	BN	SHALY LIMESTONE, FGR, MAS	GRY
388.83	554.40	555.20	0.80		MUDSTONE	DRK GRY LIM MOT
388.03	555.20	558.70	3.50		CLAYSTONE	DRK GRY CLY SLK BKN PYT
384.53	558.70	559.10	0.40		BLACK SHALE	PYS
384.13	559.10	563.50	4.40	SW	COMMON BANDED COAL	
379.73	563.50	564.30	0.80		CLAYSTONE	DRK GRY FRM
378.93	564.30	565.90	1.60		CLAYSTONE, GREEN	MOT DRK SGT CLY SPC
377.33	565.90	566.70	0.80		BLACK SHALE	LIM WBD FRM
376.53	566.70	569.20	2.50	SL	SHALY LIMESTONE FGR MAS	GRY BRN SLY
374.03	569.20	570.30	1.10	SL	INTERBEDDED LIMESTONE AND SHALE	DRK SHS SSS SPC
372.93	570.30	576.00	5.70	SL	LIMESTONE, FINE-GRAINED, MASSIVE	LBR SLY HRD
367.23	576.00	576.50	0.50	SL	SHALE, DARK GRAY	LIM FRM
366.73	576.50	577.60	1.10	SL	SHALE, GREEN	CLY HSS
365.63	577.60	578.50	0.90	SL	SHALE, DARK GRAY	LIM FRM SPC
364.73	578.50	585.00	6.50	SL	LIMESTONE, FINE-GRAINED, MASSIVE	LBR HRD SLY SHS SPC
358.23	585.00	587.00	2.00	SL	SHALY LIMESTONE, FGR, W/LS NOD	GRY BRN SHS SPC
356.23	587.00	587.20	0.20	SL	SHALE, DARK GRAY	LIM
356.03	587.20	591.70	4.50	SL	LIMESTONE, FINE-GRAINED, MASSIVE	LBR SLY HRD SPC

Strata Elevation (Top)	Strata From	Depth To	Strata Thick	Seam Code	Lithology	Characteristics and Comments
351.53	591.70	592.60	0.90	SL	SHALY LIMESTONE, FGR, W/LS NOD	GRY MOT GLC
350.63	592.60	594.20	1.60		SHALE, GRAY	WBD GRN FRM LIM SPC
349.03	594.20	595.60	1.40		SHALY LIMESTONE FGR MAS	MOT VRY SHY GLC
347.63	595.60	596.90	1.30		SHALE, GRAY, W/ LIMESTONE NODULES	CAN ABT SGT CLY
346.33	596.90	602.20	5.30		SHALE, GRAY, W/ LIMESTONE NODULES	SLY PYT WBD FRM
341.03	602.20	604.00	1.80		SHALE, DRK GRY, W/LS NOD	TBD FRM
339.23	604.00	606.10	2.10	FL	LIMESTONE, FINE-GRAINED, MASSIVE	LIT GRY SLY HRD SPC
337.13	606.10	606.80	0.70	FL	SHALY LIMESTONE FGR MAS	GRY
336.43	606.80	607.90	1.10	FL	CLAYSTONE, GRN, W/LS NOD	LIM CLS
335.33	607.90	608.50	0.60	FL	SHALY LIMESTONE FGR MAS	GRY SPC
334.73	608.50	609.30	0.80		SHALE, DARK GRAY	MOT FRM SPC
333.93	609.30	611.00	1.70		CLAYSTONE	DRK GRN MOT SLK FRK
332.23	611.00	625.30	14.30		CLAYSTONE, GRN, W/LS NOD	SLK BKN GLC
317.93	625.30	626.80	1.50		SHALY LIMESTONE FGR W/ LS NOD	LIT GRY SPC
316.43	626.80	629.50	2.70		CLAYSTONE, GREEN	MOT DRK SLK
313.73	629.50	630.20	0.70		FLINTCLAY, BRECCIATED	TAN GRN BRC
313.03	630.20	631.30	1.10		SHALE, GRAY W/ DISRUPTED BEDDING	CFF CLS MOT SPC
311.93	631.30	632.00	0.70		CLAY	GRY SFT HVS
311.23	632.00	634.80	2.80		SHALE W/ SS STL, GRAY	WBD SLY CAN FEW SPC
308.43	634.80	635.40	0.60	RS	CARBONATE CEMENTED SANDSTONE	FGR SPC
307.83	635.40	637.80	2.40	RS	SANDSTONE, GRAY, W/ SHALE STREAKS	FGR RIP GLC
305.43	637.80	639.40	1.60		SHALE, GRAY	SLY WBD SPC
303.83	639.40	645.60	6.20		SHALE, GRAY, W/ DISRUPTED BEDDING	IPY ABT CAN FEW FRM
297.63	645.60	648.20	2.60		SHALE, DARK GRAY	SLY WBD FRM SPC
295.03	648.20	652.30	4.10		INTBD SANDSTONE & SHALE, DRK GRY	TBD RIP GLC
290.93	652.30	659.50	7.20		SHALE W/ SS STK, DRK GRAY	TBD SLY PLT CPF GLC
283.73	659.50	664.40	4.90		SHALE, DARK GRAY	TBD SMO FRM GLC
278.83	664.40	668.70	4.30		BLACK SHALE	CAR SMO FIS
274.53	668.70	669.00	0.30		FIRECLAY, BLACK	PLT SLK DBD
274.23	669.00	669.30	0.30	P1	COAL WITH SHALE STREAKS	
273.93	669.30	669.40	0.10	DS	SHALE, GRAY	CLE
273.83	669.40	673.10	3.70	PG	COMMON BANDED COAL	
230.13	673.10	673.15	0.05	PG	SHALE, DARK GRAY	
270.80	673.15	676.12	2.97	PG	COMMON BANDED COAL	
267.11	676.12	676.40	0.28		SHALE, DARK GRAY	CLN FRM
266.83	676.40	678.20	1.80		SHALY LIMESTONE, FGR, MAS	GRY SHB
265.03	678.20	680.30	2.10		LIMESTONE, FINE-GRAINED, MASSIVE	LIT GRY SPC
262.93	680.30	681.50	1.20		INTERBEDDED LIMESTONE AND SHALE	LIT GRY SHS SPC
261.73	681.50	682.90	1.40		CLAYSTONE	GRY GRN MOT SLK SPC
260.33	682.90	686.30	3.40		SHALE W/SS, STK, GRAY	SLY WBD GLC
256.93	686.30	687.20	0.90	LPS	SANDSTONE, GRAY, W/ SHALE STREAKS	FGR FUP SPC

Strata Elevation (Top)	Strata From	Depth To	Strata Thick	Seam Code	Lithology	Characteristics and Comments
256.03	687.20	689.60	2.40		SHALE, GRAY	FRM TBD GLC
253.63	689.60	690.40	0.80		SHALE, GRAY	TBD CLS WEK
252.83	690.40	691.00	0.60		SHALY LIMESTONE, FGR, MAS	GRY MOT
252.23	691.00	698.90	7.90		SANDY SHALE, GRAY, W/ LS NOD	WBD SSS NBM
244.33	698.90	701.30	2.40		LIMESTONE, FINE-GRAINED, MASSIVE	LBR SLY SPC
241.93	701.30	703.20	1.90		SHALY LIMESTONE, FGR, W/LS NOD	LIT GRY SPC
240.03	703.20	704.00	0.80		SHALE, GREEN	WBD FRM
239.23	704.00	706.30	2.30		SANDSTONE, GRAY, CHURNED	VFG GLC
236.93	706.30	712.10	5.80		SANDY SHALE, GRAY, MASSIVE	WBD ISP FEW SSS GLC
231.13	712.10	717.60	5.50		CLAYSTONE , RED-GREEN	MOT CLS SLK WEK
225.63	717.60	725.10	7.50		SANDY SHALE, GRAY, W/ LS NOD	WBD SSB IKY SPC
218.13	725.10	727.20	2.10		SHALE, GRAY, W/LS NOD	IKY SLY SDR ABT
216.03	727.20	727.40	0.20		SHALE, RED-GREEN	
215.83	727.40	731.30	3.90		SHALE, GRAY	SLY WBD IKY
211.93	731.30	734.00	2.70		SHALE, RED-GREEN	CLY SFT HSS WEK SPC
209.23	734.00	740.10	6.10		CLAYSTONE, RED-GREEN	CLY SFT HSS WEK SPC
203.13	740.10	740.50	0.40		SHALE, GREEN	SLY LIM
202.73	740.50	741.50	1.00		SHALY LIMESTONE, FGR, W/LS NOD	GRY VRY SHY
201.73	741.50	746.70	5.20		SHALE, GREEN, W/LS NOD	SLY WBD FRM SDR NBM
196.53	746.70	751.80	5.10		SHALE, RED-GREEN	MOT YEL SLK FRK NBM SPC
191.43	751.80	753.90	2.10		SHALY LIMESTONE, FGR, MOZ	LIT GRY SHB
189.33	753.90	757.10	3.20		CLAYSTONE, RED-GREEN	CLS CLY SLK BKN WEK
186.13	757.10	758.50	1.40		SHALY LIMESTONE, FGR, W/LS NOD	LIT
184.73	758.50	760.00	1.50		SHALE, GRAY, W/LS NOD	MOT YEL CLS SLK
183.23	760.00	766.10	6.10		SANDY SHALE, GRAY, W/ LS NOD	WBD IKY SSB GLC
177.13	766.10	775.60	9.50		SANDY SHALE, GRAY, MASSIVE	WBD SSS GLC
167.63	775.60	779.00	3.40		INTBD SANDSTONE & SHALE, GRY	TBD SSB SPC
164.23	779.00	789.30	10.30		SANDSTONE, GRAY, MASSIVE	MGR CGR HOM DIR CLE
153.93	789.30	789.50	0.20		IRONSTONE, MASSIVE	DBR
153.73	789.50	796.80	7.30		SANDSTONE, GRAY, MASSIVE	MGR DIR DRK ZNS SPC
146.43	796.80	800.00	3.20		SHALE, GRAY, W/LS NOD	MOT DRK SLY WBD
143.23	800.00	802.10	2.10		SHALE, GRAY, W/LS NOD	CAN ABT LIM FRM
141.13	802.10	816.20	14.10		SANDY SHALE, GRAY, W/ LS NOD	SSB SHY NTP
127.03	816.20	818.30	2.10		SANDSTONE, GRAY, W/ SHALE STREAKS	FGR MGR
124.93	818.30	820.60	2.30		SANDY SHALE, GRAY, MASSIVE	SLY WBD
122.63	820.60	835.80	15.20		SANDSTONE, GRAY, MASSIVE	MGR CGR DIR SHS FEW SPC
107.43	835.80	845.70	9.90		SANDY SHALE, GRAY, W/ LS NOD	WBD SSS NBM GLC
97.53	845.70	851.60	5.90		SHALE, GRAY	SLY WBD RED RAR PYT GLC
91.63	851.60	853.00	1.40		SHALE, RED-GREEN	CLY HSS SFT SPC
90.23	853.00	857.30	4.30		CLAYSTONE, RED-GREEN, W/LS NOD	LIM SLK FRM GLC
85.93	857.30	865.10	7.80		CLAYSTONE, RED, W/LS NOD	LIM SFT CLY
78.13	865.10	875.50	10.40		INTBD SANDSTONE & SHALE, GRAY	CAN NTP WBD SDY GLC

Strata Elevation (Top)	Strata From	Depth To	Strata Thick	Seam Code	Lithology	Characteristics and Comments
67.73	875.50	887.40	11.90		SHALE W/SS, STK, GRAY	TBD SLY IPY FEW GLC
55.83	887.40	894.10	6.70		SHALE, GRAY	FRM TBD SLK BKN RED RAR
49.13	894.10	898.00	3.90		CLAYSTONE, RED-GREEN	MOT YEL LIM SLK BKN RED RAR
45.23	898.00	900.70	2.70		CLAYSTONE, RED-GREEN	CLY SFT HSS HVS SPC
42.53	900.70	902.30	1.60		SHALE, DRK GRY, W/LS NOD	WBD FRM
40.93	902.30	903.80	1.50		SHALY LIMESTONE, FGR, W/LS NOD & FOS	LIT GRY SPC
39.43	903.80	910.10	6.30		SHALE, DARK GRAY,W/LS NOD	WBD LIM FRM GLC
33.13	910.10	914.00	3.90		SHALE, DARK GRAY,W/LS NOD	LIM CLS CAB WEK
29.23	914.00	915.30	1.30		SHALE, DARK GRAY,W/LS NOD & FOS	LIM FRM
27.93	915.30	916.00	0.70	AM	SHALY LIMESTONE, FGR, W/LS NOD & FOS	LIT GRY SPC
27.23	916.00	919.70	3.70		SHALE, GRAY	WBD SLY FRM GLC
23.53	919.70	924.00	4.30		SANDY SHALE, GRAY, MASSIVE	SHY
19.23	924.00	925.30	1.30		SANDSTONE, GRAY, W/ SHALE STREAKS	FGR CAN GLC
17.93	925.30	927.30	2.00		SHALE W/SS, STK, GRAY	TBD RIP GLC
15.93	927.30	930.80	3.50		SHALE, DARK GRAY	TBD FRM GLC
12.43	930.80	934.30	3.50		SHALE W/SS, STK, GRAY	TBD FLT GLC
8.93	934.30	936.90	2.60		SHALE, GRAY	TBD PYT FRM SPC
6.33	936.90	937.05	0.15		BLACK SHALE	CAR
6.18	937.05	938.25	1.20	UB	COMMON BANDED COAL	
4.98	938.25	939.00	0.75		FIRECLAY, DARK GRAY	RTD WBD FRM GLC
4.23	939.00	948.40	9.40		SHALE, GRAY, W/LS NOD	LIM SLK BKN FRK
-5.17	948.40	957.00	8.60		CLAYSTONE, RED-GREEN, W/LS NOD	LIM CLY SLK FRK WEK
-13.77	957.00	963.30	6.30		CLAYSTONE, RED-GREEN, W/LS NOD	CLY WEK HSS MOT
-20.07	963.30	964.10	0.80		CLAYSTONE, GREEN	CLY HSS SFT
-20.87	964.10	969.40	5.30		SHALE, GREEN	TBD MOT FRM RED NOD SPC
-26.17	969.40	972.30	2.90		SHALE, RED-GREEN	TBD CLY SFT HSS
-29.07	972.30	973.60	1.30		SHALE, GRAY	SLY SDR ABT FRM
-30.37	973.60	975.10	1.50		SHALE, GREEN	CLY SFT HSS WEK SPC
-31.87	975.10	977.30	2.20		SHALE, GREEN	WBD PYT ABT HRD DNS SPC
-34.07	977.30	978.00	0.70		SHALE, RED-GREEN	CLY SFT HSS
-34.77	978.00	983.20	5.20		SHALE, RED-GREEN	TBD FRM MOT SPC
-39.97	983.20	985.10	1.90		SHALE, GRAY, W/LS NOD	SLY EBD LIM
-41.87	985.10	987.30	2.20		SHALY LIMESTONE, FGR, W/LS NOD & FOS	LIT GRY SLK
-44.07	987.30	988.40	1.10		FLINTCLAY	TAN HRD MAS SPC
-45.17	988.40	994.10	5.70		CLAYSTONE, RED-GREEN, W/LS NOD	LIM SLY FRM GLC
-50.87	994.10	1006.00	11.90		SANDY SHALE, GRAY, W/ LS NOD	WBD SSS NBM GLC
-62.77	1006.00	1011.30	5.30		INTBD SANDSTONE AND SHALE, GRAY	TBD RIP GLC
-68.07	1011.30	1016.40	5.10		SANDSTONE, GRAY, W/ SHALE STREAKS	FGR VER VNS LIM GAS

Strata Elevation (Top)	Strata From	Depth To	Strata Thick	Seam Code	Lithology	Characteristics and Comments
-73.17	1016.40	1026.60	10.20		SANDSTONE, GRAY, MASSIVE	MGR FGR STK SPC
-83.37	1026.60	1031.60	5.00		SHALE, DARK GRAY	TBD FRM GLC
-88.37	1031.60	1031.75	0.15		BLACK SHALE	CAR PYN SPC
-88.52	1031.75	1032.90	1.15	BK	COAL WITH SHALE LAYERS	
-89.67	1032.90	1036.40	3.50		FIRECLAY	GRY RTD SLK BKN
-93.17	1036.40	1037.00	0.60		CLAY	GRY VRY SFT
-93.77	1037.00	1040.60	3.60		SHALE, GRAY	SLY WBD CLS FEW
-97.37	1040.60	1044.70	4.10		SHALE, RED-GREEN	TBD CLY SFT HSS GLC
-101.47	1044.70	1051.50	6.80		SHALE, GREEN	WBD FRM PYT NTP SSS ABT NBT
-108.27	1051.50	1057.10	5.60		SANDY SHALE, GREEN, MASSIVE	WBD SDR ABT HRD SHY GLC
-113.87	1057.10	1061.00	3.90		CLAYSTONE, RED-GREEN	CLY SFT HSS HVS MOT
-117.77	1061.00	1065.40	4.40		CLAYSTONE, RED-GREEN	MOT SLK FRK BKN DRK NOD
-122.17	1065.40	1065.90	0.50		SHALE, RED-GREEN, W/FOSSIL SHELLS	LIM CAN FOS ABT
-122.67	1065.90	1071.20	5.30		SHALE, RED, W/LS NOD	WBD FRM GLC
-127.97	1071.20	1073.10	1.90		SHALE, DARK GRAY, W/FOSSIL SHELLS	GRN TBD FRM
-129.87	1073.10	1074.40	1.30		SHALY LIMESTONE, FGR, W/LS NOD & FOS	LIT GRAY
-131.17	1074.40	1076.10	1.70		SANDY SHALE, GRAY, MASSIVE	TBD SSS GLC
-132.87	1076.10	1082.50	6.40		SANDSTONE, GRAY, W/ SHALE STREAKS	FGR RIP SPC
-139.27	1082.50	1089.40	6.90		INTBD SANDSTONE AND SHALE, GRAY	THB CUP GLC
-146.17	1089.40	1092.50	3.10		SHALE,W/SS STK, GRAY	TBD SLY GLC
-149.27	1092.50	1104.20	11.70		SHALE, W/SS STK, DARK GRAY	SLY TDB SSB FEW PLT FRM
-160.97	1104.20	1119.50	15.30		SANDY SHALE, DARK GRAY, MASSIVE	SHY SSS MBD GLC
-176.27	1119.50	1123.80	4.30		SHALE, W/SS STK, DARK GRAY	SLY TBD FRM PLT MAR FEW
-180.57	1123.80	1132.20	8.40		SHALE, DARK GRAY	TBD FRM ISP MAR FEW GLC
-188.97	1132.20	1134.20	2.00		SHALE, DARK GRAY, W/FOSSIL SHELLS	TBD FRM BLK SPC
-190.97	1134.20	1134.40	0.20	BC	COMMON BANDED COAL	
-191.17	1134.40	1135.60	1.20		FIRECLAY	GRY BRN RTD SLK GLC
-192.37	1135.60	1141.10	5.50		SHALE, GRAY, W/LS NOD	MOT GRY SLY SLK BKN MID GLC
-197.87	1141.10	1144.10	3.00		SANDY SHALE, GRAY, W/ LS NOD	MAS GLC
-200.87	1144.10	1147.70	3.60		SHALE, GRAY	SLY WBD GLC
-204.47	1147.70	1151.00	3.30		SANDSTONE, GRAY, W/ SHALE STREAKS	VFG SHY GLC
-207.77	1151.00	1155.40	4.40		CARBONATE CEMENTED SANDSTONE	FGR HRD SPC
-212.17	1155.40	1177.10	21.70		SANDSTONE, GRAY, MASSIVE	MGR SPC
-233.87	1177.10	1183.70	6.60		SANDSTONE, GRAY, MASSIVE	CGR QTZ SPC
-240.47	1183.70	1195.10	11.40		SANDSTONE, GRAY, MASSIVE	MGR LIM ZNS SPC
-251.87	1195.10	1195.90	0.80		SANDSTONE, GRAY, W/ SHALE STREAKS	FGR SPC
-252.67	1195.90	1199.10	3.20		SANDSTONE, GRAY, MASSIVE	MGR SPC

Strata Elevation (Top)	Strata From	Depth To	Strata Thick	Seam Code	Lithology	Characteristics and Comments
-255.87	1199.10	1200.20	1.10		SANDSTONE, GRAY, W/ SHALE STREAKS	VFG SPC
-256.97	1200.20	1201.60	1.40		SANDSTONE, GRAY, MASSIVE	CGR GLC
-258.37	1201.60	1208.10	6.50		SANDSTONE, GRAY, W/ SHALE STREAKS	VFG SHY LIM ZNS
-264.87	1208.10	1210.50	2.40		SHALE, DARK GRAY	SLY TBD
-267.27	1210.50	1210.95	0.45	MA	COMMON BANDED COAL	
-267.72	1210.95	1211.55	0.60	MA	COAL WITH SHALE STREAKS	
-268.32	1211.55	1214.80	3.25	MA	COMMON BANDED COAL	
-271.57	1214.80	1214.95	0.15	MA	BLACK SHALE WITH COAL STREAKS	
-271.72	1214.95	1215.65	0.70	MA	COMMON BANDED COAL	
-272.42	1215.65	1217.00	1.35		FIRECLAY	GRY RTD FRM GLC
-273.77	1217.00	1221.90	4.90		SANDY SHALE, GRAY, MASSIVE	RTD CAN FEW GLC
-278.67	1221.90	1222.70	0.80		SHALE, DARK GRAY	CLS WBD
-279.47	1222.70	1223.30	0.60		IRONSTONE, MASSIVE	SDR HRD BRN
-280.07	1223.30	1224.00	0.70		FIRECLAY	WBD RTD FRM GRY GLC
-280.77	1224.00	1229.30	5.30		SHALE, DARK GRAY	SMO FRM TBD IPY ABT SPC
-286.07	1229.30	1231.40	2.10		SHALY LIMESTONE, FGR, MAS	GRY BRN MOT GLC
-288.17	1231.40	1232.90	1.50		SHALE, DARK GRAY	WBD SDR FRM SLY
-289.67	1232.90	1233.10	0.20		SHALY LIMESTONE, FGR, MAS	GRY BRN
-289.87	1233.10	1241.50	8.40		SHALE, DARK GRAY, W/LS NOD	SLY IKY ABT WBD CAN ABT GLC
-298.27	1241.50	1244.10	2.60		SANDY SHALE, GRAY, W/ LS NOD	MAS GLC
-300.87	1244.10	1251.40	7.30		SANDSTONE, GRAY, W/ SHALE STREAKS	VFG SHY IPY GLC
-308.17	1251.40	1255.70	4.30		SANDY SHALE, GRAY, MASSIVE	SSS WBD SPC
-312.47	1255.70	1257.00	1.30		SLUMPED SANDY SHALE	GRY SSS AGL SPC
-313.77	1257.00	1257.50	0.50		SHALE, DARK GRAY	CLY HSS
-314.27	1257.50	1258.00	0.50		IRONSTONE, MASSIVE	BRN HRD
-314.77	1258.00	1259.10	1.10		SHALE, DARK GRAY	CLY HSS SFT BLK STK
-315.87	1259.10	1260.90	1.80		BLACK SHALE	SMO BNY PYN SPC
-317.67	1260.90	1261.70	0.80	UF	COMMON BANDED COAL	FRK BKN
-318.47	1261.70	1261.75	0.05	UF	BONE	
-318.52	1261.75	1265.15	3.40	UF	COMMON BANDED COAL	FRK BKN
-321.92	1265.15	1266.40	1.25		FIRECLAY	GRY BRN RTD FRM GLC
-323.17	1266.40	1277.00	10.60		SANDY SHALE, GRAY, MASSIVE	BRN RTD SDY GLC
-333.77	1277.00	1282.10	5.10		SHALE, DARK GRAY	SLY FRM
-338.87	1282.10	1283.20	1.10		SHALY LIMESTONE, FGR, MAS	GRY HRD SLY
-339.97	1283.20	1283.90	0.70		CLAYSTONE, GREEN	CLY HSS
-340.67	1283.90	1286.60	2.70		SANDSTONE, GRAY, CHURNED	FGR SHS GLC
-343.37	1286.60	1298.10	11.50		SHALE W/SS, STK, GRAY	ISP FEW FLT TBD FRM SLY
-354.87	1298.10	1302.80	4.70		BLACK SHALE	PYN FIS FRM SPC
-359.57	1302.80	1304.90	2.10		SHALY LIMESTONE, FGR, W/LS NOD	DRK GRY MOT GLC
-361.67	1304.90	1306.00	1.10		FIRECLAY, DARK GRAY	CLN SLK SGT CLY
-362.77	1306.00	1306.15	0.15		CLAY	GRN GRY CLY HVS
-362.92	1306.15	1308.65	2.50	LF	COMMON BANDED COAL	
-365.42	1308.65	1309.50	0.85		FIRECLAY	RTD PLT CLS GLC

Strata Elevation (Top)	Strata From	Depth To	Strata Thick	Seam Code	Lithology	Characteristics and Comments
-366.27	1309.50	1315.30	5.80		SHALE, GRAY	GRN SLY WBD FRM ISP FEW
-372.07	1315.30	1321.10	5.80		CLAYSTONE, GREEN, W/LS NOD	MAS FRM SPC
-377.87	1321.10	1323.30	2.20		INTBD SANDSTONE AND SHALE, GRAY	CAN WBD RIP
-380.07	1323.30	1326.10	2.80		SHALE W/SS, STK, GRAY	TBD SLY
-382.87	1326.10	1326.70	0.60		SHALE, GRAY	TBD FRM SPC
-383.47	1326.70	1327.00	0.30		SHALE W/SS, STK, GRAY	TBD SPC
-383.77	1327.00	1328.20	1.20		FIRECLAY, DARK GRAY	BRN RTD FRM SPC
-384.97	1328.20	1330.00	1.80		SANDSTONE, GRAY, CHURNED	FGR BUR
-386.77	1330.00	1333.30	3.30		SANDSTONE, GRAY, MASSIVE	FGR SHS FEW
-390.07	1333.30	1341.70	8.40		SANDY SHALE, GRAY, MASSIVE	WBD IPY SHY GLC
-398.47	1341.70	1345.80	4.10		BLACK SHALE	SLY TBD GLC
-402.57	1345.80	1346.90	1.10		BLACK SHALE W/FOSSIL SHELLS	FOS SLY FRM TBD GLC
-403.67	1346.90	1356.50	9.60		BLACK SHALE	TBD SLY FOS FEW
-413.27	1356.50	1358.50	2.00	UK	COMMON BANDED COAL	
-415.27	1358.50	1362.70	4.20		FIRECLAY	GRY BRN RTD FRM DRK NBM
-419.47	1362.70	1364.00	1.30		SANDY FIRECLAY	GRY BRN RTD GLC
-420.77	1364.00	1373.70	9.70		SANDSTONE, GRAY, W/ SHALE STREAKS	FGR FLT
-430.47	1373.70	1378.40	4.70		SANDSTONE, GRAY, MASSIVE	MGR HOM SPC
-435.17	1378.40	1381.70	3.30		SHALE, DARK GRAY	SLY WBD ISP SPC
-438.47	1381.70	1382.00	0.30		IRONSTONE, MASSIVE	BRN HRD SLY
-438.77	1382.00	1383.30	1.30		FLINTCLAY, BRECCIATED	TAN DRK SPC
-440.07	1383.30	1388.80	5.50		SHALE, DARK GRAY	FRM WBD SLY GLC
-445.57	1388.80	1398.50	9.70		SHALE, DARK GRAY	ISP TBD FRM GLC
-455.27	1398.50	1399.90	1.40		BLACK SHALE	CAR SMO SPC
-456.67	1399.90	1403.80	3.90		INTBD SANDSTONE AND SHALE, DARK GRAY	ILA RIP ISP
-460.57	1403.80	1405.00	1.20		SHALE W/SS, STK, DARK GRAY	TBD BLK NBM SPC
-461.77	1405.00	1405.20	0.20		COMMON BANDED COAL	
-461.97	1405.20	1405.80	0.60		SHALE, DARK GRAY, W/COAL STREAKS	BBC FRM
-462.57	1405.80	1408.30	2.50	MK	COMMON BANDED COAL	
-465.07	1408.30	1409.00	0.70		CLAYSTONE	DRK GRY MOT CLS WEK GLC
-465.77	1409.00	1413.70	4.70		SANDY FIRECLAY	GRY BRN RTD MAS GLC
-470.47	1413.70	1417.10	3.40		INTBD SANDSTONE AND SHALE, GRAY	LIT GRN WBD SDR MOT GLC
-473.87	1417.10	1419.50	2.40		SLUMPED SANDY SHALE	GRY GRN BRC AGL
-476.27	1419.50	1420.30	0.80		FLINTCLAY, MASSIVE	GRN MAS SPC
-477.07	1420.30	1422.40	2.10		FIRECLAY	GRY BRN DRK SDR ABT RTD
-479.17	1422.40	1424.00	1.60		SHALE, DARK GRAY	SLY TBD GLC
-480.77	1424.00	1424.10	0.10		BLACK SHALE	CAR RED STK
-480.87	1424.10	1428.10	4.00		FIRECLAY	GRN SLY RTD FRM
-484.87	1428.10	1430.20	2.10		FLINTCLAY, BRECCIATED	GRN BRC MOZ HRD SPC
-486.97	1430.20	1430.60	0.40		CLAYSTONE	GRY BRN CLYSFT HSS
-487.37	1430.60	1434.00	3.40		SANDY FIRECLAY	BRN RTD MAS GLC

Strata Elevation (Top)	Strata From	Depth To	Strata Thick	Seam Code	Lithology	Characteristics and Comments
-490.77	1434.00	1446.00	12.00		INTBD SANDSTONE AND SHALE, GRAY	BRN SDY TBD IPY FEW DRK NBM
-502.77	1446.00	1449.70	3.70		SANDSTONE, GRAY, W/ SHALE STREAKS	MGR BRN HRD QTZ
-506.47	1449.70	1474.00	24.30		SANDSTONE, GRAY, MASSIVE	MGR BRN HRD OIL SCB
-530.77	1474.00	1474.90	0.90		SANDY SHALE, DARK GRAY, MASSIVE	SHY WBD SPC
-531.67	1474.90	1475.60	0.70		BLACK SHALE	CAR TBD
-532.37	1475.60	1476.55	0.95		BLACK SHALE WITH COAL STREAKS	BNY PYN COL PLT
-533.32	1476.55	1478.50	1.95		BLACK SHALE	CLS WBD PYN GLC
-535.27	1478.50	1479.00	0.50		FIRECLAY	GRY BRN RTD CLY SPC
-535.77	1479.00	1480.60	1.60		FLINTCLAY, BRECCIATED	TAN BRC CLS WEK
-537.37	1480.60	1481.70	1.10		FIRECLAY	BRN CLY SFT RTD GLC
-538.47	1481.70	1489.60	7.90		SANDY FIRECLAY	GRY BRN RTD MAS SDR ZNS GLC
-546.37	1489.60	1491.10	1.50		SHALE, DARK GRAY	TBD SLY FRM
-547.87	1491.10	1491.50	0.40	LK	BLACK SHALE WITH COAL STREAKS	BNY CAR
-548.27	1491.50	1494.00	2.50		FIRECLAY	GRY BRN MAS CLS WEK GLC
-550.77	1494.00	1502.00	8.00		SANDY FIRECLAY	GRY BRN RTD WBD SSS GLC
-558.77	1502.00	1514.00	12.00		SANDSTONE, GRAY, W/ SHALE STREAKS	FGR MGR XBD
	1514.00				BOTTOM HOLE	

APPENDIX B
CONSOL Energy Press Release of January 14, 2002

CONSOL Energy to demonstrate drilling technology
Project to sequester CO_2 in coal seams, enhance methane recovery

PITTSBURGH (January 14, 2002) - CONSOL Energy Inc. (NYSE: CNX) has signed a contract with the U.S. Department of Energy to demonstrate a novel drilling and production process that creates sequestration sinks for carbon dioxide in unmineable coal seams, produces usable coalbed methane and reduces potential methane emissions to the atmosphere.

In the seven-year project, CONSOL Energy will use a technology known as "slant-hole" drilling to drain methane from coal seams not suitable for mining. Carbon dioxide (CO_2) will then be injected into the coal seam to test the capacity of coal seams to sequester CO_2, a greenhouse gas, following stimulation of methane production.

"A unique feature of this particular project is that slant-hole drilling also will be used to drain coalbed methane simultaneously from a mineable coal seam overlying the unmineable seams. The mineable seam will be sealed off before CO_2 injection begins, so that CO_2 does not infiltrate the mineable seam," said Dr. Frank Burke, CONSOL Energy's vice president for research and development.

"Removing coalbed methane from the mineable seam helps ensure the safety of subsequent mining operations, and it recovers methane that would otherwise have been vented to the atmosphere," Burke said.

Thus, the technology provides the dual greenhouse-gas-reduction benefits of sequestering CO_2 in the unmineable seams and avoiding emissions of methane from the mineable coal, Burke said.

"Slant-hole drilling promises to be a more productive and much lower cost alternative to more conventional vertical frac wells for this application," he said. "We believe this process will be effective in most coal seams, especially those that are not suitable for conventional vertical fracturing.

"This demonstration will provide much-needed data on the technical and economic potential for CO_2 sequestration, and could permit early commercialization of a potentially economic method for coalbed methane management," Burke said.

CONSOL Energy's proposal is to drain coalbed methane from a mineable coal seam and multiple underlying unmineable coal seams. Upon drainage of 50-60 percent of the coalbed methane, some of the production wells will be used for CO_2 injection to sequester the CO_2 in the unmineable seam, while stimulating additional methane production.

The slant-hole technique involves drilling a vertical production well through the targeted coal seams, and then intersecting that hole with a guided borehole, drilled from the surface, which deviates from the vertical hole to extend up to 3,000 feet horizontally in the coal seams. This allows methane production and CO_2 sequestration over a large extent of the reserve from relatively few surface locations.

In full commercial application, a typical five-hole, four-seam pattern could sequester up to 9 billion cubic feet (bcf) of CO_2, and avoid 1.5 bcf of methane emissions, while producing 6 bcf of methane.

Burke said CONSOL Energy would demonstrate the technology in a three-well, two-seam section, using commercial scale (3,000-foot) slant-hole completions.

CONSOL Energy Inc. is one of the largest U.S. producers of coalbed methane and currently has production of approximately 130 million cubic feet per day, primarily from wells in Virginia. The company recently has begun coalbed methane production in Pennsylvania and West Virginia. CONSOL Energy also is the largest producer of high-Btu bituminous coal in the United States, and the largest exporter of U.S. coal. CONSOL Energy has 27 bituminous coal mining complexes in seven states, two Canadian provinces and Australia. CONSOL Energy had revenues of $2.4 billion during the fiscal year ended June 30, 2001. It is listed among the *Forbes* "Platinum 400" companies and won the Platts 2001 *Financial Times* Global Energy Award as Coal Company of the Year. Additional information about the company can be found at its web site: www.consolenergy.com.

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