THE VALLEY COALFIELD (MISSISSIPPIAN AGE)
IN MONTGOMERY AND PULASKI COUNTIES, VIRGINIA

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ABSTRACT

Coal-bearing strata of Mississippian age lie structurally below the Pulaski thrust sheet in Montgomery and Pulaski counties, Virginia. These coal-bearing strata are found in the lower portion of the upper (nonmarine) member of the Price Formation. The lower coal measures, which lie directly above the lower (marine) member of the Price, are interpreted as probable lower delta-plain coals, whereas those in the upper portion of the coal measures appear more like upper delta-plain coals. Within Pulaski and Montgomery Counties the coal measures of the upper Price Formation underlie approximately 150 square miles in an area roughly bounded by Brush, Cloyd and Little Walker Mountains on the northwest; Tract and Draper Mountains on the west; Draper, Ingles and Barringer Mountains on the southeast; and a north-trending line from Christiansburg to Brush Mountain on the east. The coal measures are structurally truncated to the southeast and east, respectively, by the southeast-dipping Pulaski fault ramp and the east-dipping Pulaski-Catawba fault lateral ramp. Structural contours generated from limited subsurface data (22 points) suggest the coal measures may occur at depths as great as -2500 feet in the Radford area and northeast along New River. By contrast the outcrop belts of coal generally exceed +2000 feet in elevation indicating that structural relief exceeds 4000 feet. East of the Pulaski-Catawba fault lateral ramp the coal measures formed the footwall glide horizon along which the thrust moved; thus, only thin, scattered, tectonic wedges of coal are likely to be found in northeastern Montgomery County.

A line extending from the mouth of Poverty Creek southwestward to the western end of the Price Mountain window appears to mark the locus of important changes in sedimentation of Mississippian rocks. To the southwest of the line the Cloyd Conglomerate occurs as lenses; commonly one or two coal beds contained within a mudstone sequence are present; and thick dolomite lenses occur near the Price-Maccrady contact. For about 4.5 miles to the northeast of the line as many as five thick coal beds occur; the lower member of the Price Formation thickens dramatically to twice its normal thickness in Pulaski County and sandstones are interbedded with both coal and mudstone.

INTRODUCTION

An examination of coal-bearing strata of Mississippian age was undertaken by the Virginia Division of Mineral Resources in Montgomery and Pulaski Counties, Virginia because of the potential of the coal-bearing strata to serve as a source rock for natural gas beneath the Pulaski thrust sheet. Within a large portion of these two counties the thrust sheet is gently folded and the coal beneath lies at relatively shallow depths. This combination of broad, open folds beneath a thrust surface at shallow depths provides potential for anticlinal or fault-bounded gas traps as well as easy migration of gas into the anticlinal and fault-bounded structures.

Field work on the coal-bearing strata was begun by M.J. Bartholomew during the spring of 1978 in the Blacksburg quadrangle (Bartholomew and Lowry, 1979). Between the summers of 1979 and 1980 mapping of the coal measures in the Radford North and Staffordsville quadrangles was completed by Bartholomew assisted by A.P. Schultz, K.E. Brown and G.R. Ingram. During the summer and fall of 1980 Brown, Ingram and Bartholomew mapped the coal measures in the Long Spur, White Gate, Pulaski, Newport, and MacDonald's Mill quadrangles. Samples collected during 1980 for geochemical evaluation and weathering studies (Ingram, 1981; Ingram and Rimsid, 1984) and sections of the coal measures were described (Appendices I & II) for a study of the environment of deposition of the coal (Brown, 1983). In 1981, five shallow (less than 50 feet) core holes were drilled along the southeastern flanks of Brush, Cloyds, and Little Walker Mountains (Appendix III). In the spring of 1981 the Department of Geological Science, Virginia Polytechnic Institute and State University drilled a shallow core hole along the northwestern flank of Price Mountain (Appendix III, #6). The Department of Geological Science (funded by Virginia Division of Mineral Resources and the U.S. Geological Survey) ran two vibrosion lines (Dysart, 1983) across a portion of the Radford North and Blacksburg 7.5-minute quadrangles for the Division during the spring of 1981. Three deep core holes (W-6533, W-6534, W-6535) were drilled during the first half of 1982 (funded by the Department of Energy grant DE-FG44-81R410431 through the Virginia Division of Mineral Resources). Description of cores from these holes are included in Stanley and Schultz (1983) with petrology by Zentmeyer (1985). Vitrite reflectance and anisotropy of coal samples from all holes are reported by Lewis and Hower (1990).

Bartlett (1974) has a thorough summary of literature pertaining to the stratigraphy of the Price Formation and stratigraphic equivalents in the surrounding states of Tennessee, West Virginia, Ohio, Pennsylvania and Maryland. Whitehead (1979) elaborated on the delta depositional model illustrated by Price stratigraphy by focusing on the finer-grained delta front sequences correlative with the Sunbury Shale.

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The most comprehensive work on the coal of the Price Formation is “The Valley Coal Fields of Virginia” (Campbell and others, 1925). The coal analyses are especially significant because many of the mines closed within a decade or two of the time that Campbell and others (1925) finished their report. Studies since 1925 by Fish and Porter (1933), Fish (1935), Eby and others (1926, 1944), Shelton (1954) and Stevens (1959) have relied on the analyses of Campbell and others (1925). At the present time fresh samples can be obtained only by coring. Bowman (1948) and Stevens (1959) both discuss mining methods and operations within Montgomery County. Detailed history of ownership of the major mines is included in Bowman (1948) and Stevens (1959) includes maps of the underground workings as well as several bore hole locations.

STRUCTURAL SETTING OF THE COAL MEASURES

The exposed coal measures of the Price Formation are found on the Saltville thrust sheet just to the northwest of the leading edge of the structurally higher Pulaski thrust sheet and within the Price Mountain window through the Pulaski thrust sheet (Plate 1). No exposures of the coal measures are known south of the Price Mountain window. Indeed, southward from the Price Mountain window to the East Radford, to the Ingles Barringer Mountain, and to the Christiansburg windows, the age of the youngest rocks exposed increases from middle Mississippian to lower Mississippian to Devonian to middle Ordovician, respectively (Bartholomew, 1987; Bartholomew and Lowry, 1979). This relationship suggests that the allochthonous duplexes, which comprise the core rocks of these windows south of Price Mountain, were derived as successive footwall slices as the Pulaski thrust ramped from a lower decollement level in the Cambrian-age Rome Formation upward to a glide horizon in the middle Mississippian-age Maccrady Formation (Bartholomew, 1987). Thus, the Mississippian-age rocks, and in particular the coal measures, are probably truncated along the Pulaski ramp a few miles south of the Price Mountain window (Figure 1; Bartholomew and Lowry, 1979).

Northeastward from Blacksburg (Plate 1, Figure 1) the sheet climbed only to a glide horizon within the coal measures themselves. Farther northeast, in Roanoke and Botetourt Counties, the sheet is primarily at a glide horizon within Devonian-age shales, although locally along the leading edge, the thrust did ascend as high as the coal measures. Because of the stratigraphic position of the footwall glide horizon along the Catawba fault, the area beneath the Salem synclinorium appears unlikely to contain significant coal reserves in Mississippian rocks.

In the region just east of Blacksburg beneath the Salem synclinorium, the Pulaski thrust sheet ascended an eastward-dipping lateral ramp as it climbed successively from the decollement level in Devonian-age rocks to that in the coal measures and then to that in the Maccrady Formation (Bartholomew and Lowry, 1979). Two east-dipping thrust faults are associated with this ramp between Blacksburg and the valley of the North Fork of the Roanoke River near Elliot (Plate 1). The Yellow Sulphur - Catawba branch line trends north-south across the eastern end of the Price Mountain window. The westward dipping Yellow Sulphur fault is part of the structurally higher (Salem) branch and the Catawba fault is the structurally lower branch of the Pulaski fault system (Bartholomew, 1987). The Pulaski fault per se is the sole fault west of the branch line. For more detailed explanations of the regional structure related to the Pulaski thrust sheet, the reader is referred to Bartholomew (1987), Lewis and Hower (1990), and Schultz (1986). Two aspects of the regional structure not specifically dealt with in these papers are (1) the small high-angle faults which cut both the Pulaski sheet and footwall strata as well as the allochthonous duplex structures and (2) thrust faults with small horizontal displacement which cut footwall strata including the coal measures. At least three high-angle faults are shown on mine maps (Campbell and others, 1925, Stevens, 1959).

HIGH-ANGLE FAULTS

The high-angle faults mapped in this region generally have either a north-northwest or an east-west trend. The latter are found primarily within and near the eastern end of the Price Mountain window. The sense of relative offsets of those within and immediately adjacent to the window suggests that these east-west-trending faults developed as brittle features related to late Alleghanian extension across the arch of the developing Price Mountain anticline.

North to northwest-trending faults both cut and terminate against Alleghanian thrusts of the Pulaski fault system thus their time of development is more difficult to determine. They do, however, generally trend perpendicular to Alleghanian folds in this area. In this respect they are similar to high-angle faults that cut the Read-Coyner Mountain structure and are demonstrably Alleghanian with some being folded and others not (Bartholomew and Hazlett in Bartholomew, 1981).

MINOR THRUST FAULTS

Numerous synthetic and antithetic minor thrusts were mapped within the Devonian and Mississippian strata adjacent to the leading edge of the Pulaski thrust sheet. Five of these thrust faults appear to originate in argillaceous glide horizons in the Upper Brallier or Lower Chemung. Two of these ramp upward to glide horizons within the coal measures. Locally, as on State Highway 100, coal beds may be intensely deformed because they served as a glide horizon. Such deformation influences vitrinite reflectance and anisotropy (Lewis and Hower, 1990; Ingram, 1981).

Five minor thrust faults originate in glide horizons within the lower member of the Price and three of these ramp across the coal measures into the Upper Price or Maccrady. One fault, in a strike belt between New River and State Highway 100 offsets the Price-Maccrady contact. If projected down dip, this thrust fault appears to originate at or below the coal measures.

Two thrust faults offset the Pulaski fault at the western end of the Price Mountain window. The structurally higher one originates in a glide horizon within the coal measures on
the southern flank of the Price Mountain anticline and has increasing displacement westward as it ramps across the Upper Price and the Maccrady and then cuts through Cambrian strata of the Pulaski thrust sheet. The structurally lower thrust originates below the coal measures and overrides the plunging axis of the Price Mountain anticline as it ramps across the Price and Maccrady Formations. Restoration of these two thrust faults, so that the Price-Maccrady contact is aligned around the western plunging nose of the Price Mountain anticline, suggests that total horizontal displacement is on the order of several miles at the western margin of the window.

STRATIGRAPHY

Devonian and Mississippian strata, beneath the Pulaski thrust sheet in Pulaski and Montgomery Counties (Plate 1), is part of the structurally lower Saltville thrust sheet. Only in easternmost Montgomery County and adjacent Roanoke County do Devonian and Mississippian strata occur in the Salem Synclinorium portion of the Pulaski thrust sheet. The stratigraphic succession described in this paper consists of the Millboro, Brallier, Chemung, Price and Maccrady Formations. On the Saltville and Pulaski thrust sheets in this region the Millboro overlies ridge-forming quartzites and sandstones of Silurian and Devonian age.

DEVONIAN SYSTEM

Millboro Formation

The poorly exposed Millboro Formation is dark gray to black claystone. Locally along the valley of Little Walker Creek, thin (6 inch to 2 feet) beds of limestone occur. The top of the Millboro is exposed along State Highway 100 where the contact with the overlying Brallier Formation is placed at the base of the lowest beds of siltstone and fine-grained sandstone. As mapped and defined, the Millboro consists of a distinctive, fairly homogenous lithology.

Brallier Formation

The Brallier Formation is a more heterogenous unit than the underlying Millboro. Good exposures of the Brallier occur in Pulaski County along New River, along the three roads crossing Little Walker Mountain, and along the two streams that transect Chestnut Mountain (Plate 1). Well exposed, but deformed, sections of Brallier occur northwest of Draper Mountain. In Montgomery County the Brallier is poorly exposed except along New River.

The Brallier Formation consists of black claystone interbedded with medium-gray siltstone and fine- to medium-grained sandstone (Figure 2). In general, both the percentage and thickness of beds of sandstone and siltstone increase upward through the section. Thick, massive-bedded, medium- to coarse-grained sandstones occur in the basal portion of the Brallier along Little Walker Creek.

Chemung Formation

The base of the overlying Chemung Formation is placed at the lowest thick beds of sandstone containing abundant fossil debris (Figure 3). The Chemung consists of thick, massive or crossbedded, medium-grained, medium gray sandstone which commonly grades upward into fine-grained sandstone and siltstone (Figure 4). Scour channels and fossil debris typically mark the base of each graded succession, whereas black mudstone, with sharp basal and upper contacts, infrequently lies at the top. Conglomeratic sandstone occurs in the uppermost Chemung. Good exposures of the ridge-forming Chemung Formation are found in both counties along roads and streams which transect the ridges as well as along New River.

Figure 2. Typical Brallier Formation lithology exposed along the east side of State Highway 100 approximately 0.5 miles south of French Chapel (Staffordsville 7.5-minute quadrangle). At this locality the Brallier consists of fine-grained sandstone beds interbedded with thin siltstone and mudstone beds.

Figure 3. Closeup of a Chemung Formation fossil-hash bed overlying fine-grained sandstone exposed along the west side of the railroad where Cloyds Mountain ends at New River (Radford North 7.5-minute quadrangle).
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![Figure 3. Closeup of a Chemung Formation fossil-hash bed overlying fine-grained sandstone exposed along the west side of the railroad where Cloyds Mountain ends at New River (Radford North 7.5-minute quadrangle).](image)
Figure 4. Typical Chemung Formation lithologies - thick bedded sandstone beds with fossil-hash lenses (quarter is on one) and minor mudstone beds exposed along the west side of State Highway 100 at the crest of Little Walker Mountain (Staffordsville 7.5-minute quadrangle).

MISSISSIPPIAN SYSTEM

Price Formation

Because of the lack of a well exposed section of the Price Formation on Price Mountain, Bartlett (1974) suggests the Price exposures along State Highway 100 on Cloyds Mountain be used as the reference section. The entire measured section of the Price Formation on State Highway 100 (modified after Bartlett, 1974) is included as Appendix I. For discussions of evolution of uppermost Devonian and lower Mississippian stratigraphic nomenclature and regional equivalents of the Price, the reader is referred to Kreisa (1972), Bartlett (1974), and Whitehead (1979). The Price Formation, which overlies the Chemung consists of three mappable members in Montgomery and Pulaski Counties: the basal Cloyd Conglomerate member; the lower (marine) member; and the upper (non-marine) member.

Cloyd Conglomerate Member

The basal quartz-pebble conglomerate of the Price Formation was first named the "Ingles" conglomerate by Campbell and others (1925) for an exposure of conglomerate on Ingles Mountain, south of Radford, Pulaski County. Butts (1940) renamed the member for exposures on Cloyds Mountain, west of the New River water gap, because the type Ingles was remapped as Silurian in age. The Cloyd was quarried for millstones during both the 19th and 20th centuries at several locations in both Pulaski and Montgomery Counties.

The classic Cloyd rock type, which consists of very coarse, quartz-cobble conglomerate, is best developed along Brush, Cloyd, and Little Walker Mountains where almost the entire 40- to 60-foot thickness consists of massive to crossbedded (usually on a very large scale), graded 10- to 20-foot sequences of quartz-cobble, quartz-pebble and sandy, quartz-pebble conglomerate. The rock is a distinctive white to light-gray oligomitic conglomerate (Selly, 1976), milky quartz-conglomerate and quartz arenite (Petijohn, 1957). Chert clasts are found in both the conglomerate and arenite. Clasts are rounded to well rounded and range from 0.8- to 4.0- inches in length. Silica cement is predominant, with some hematite cement noted by Kreisa (1972). The associated sandstone is commonly coarse- to very coarse-grained and rarely fine-grained orthoquartzite. BEDDING is medium to thick and includes large trough crossbeds. Many beds are graded. Large wave ripples occur in places on the upper surfaces of large crossbeds, commonly on arenite or fine-pebble conglomerate beds.

Generally, the Cloyd is unfossiliferous; however, Kreisa (1972) collected unbroken spiriferid and rhychonellid brachiopods and modiomorphid and pteroid pelecypods from sandy conglomerate beds along New River near Parrott, Pulaski County. Bambach, Deemer, and Lewis (1974) described these fossils as a benthonic community adapted to living in a turbulent environment.

The amount of conglomerate in the Cloyd varies across the study area. For ten miles on either side of the New River water gap the conglomerate units of the member are developed into thick-bedded to very thick-bedded lenses, up to 35 feet thick. The lenses thin abruptly; conglomerate may be interbedded with quartz arenite or pinch out completely. Throughout this region the base of the Cloyd member is marked by a white, 10- to 20-foot thick, coarse-grained, sandy, quartz-pebble conglomerate and conglomeratic, quartzose sandstone (Figure 5).

At the New River and Poverty Creek water gaps and the wind gap along State Highway 100 the classic conglomerate-lenses are thin and locally the member consists of coarse-grained, light- to medium-gray to reddish-gray quartz arenite with thin (1- to 2-foot thick) sandy quartz-pebble conglomerate lenses (Figure 6). Similar sandstones (Figure 7) occur below the classic lithology in exposures along U.S. Highway 460 and on the southeastern end of Fort Lewis Mountain. However, these beds are included in the Cloyd member because they lie above the distinctive lithologies of the Chemung Formation. The Tract Mountain-Little Walker Mountain conglomerate lens pinches out at the State Highway 100 wind gap and on Tract Mountain suggesting the major Cloyd lenses trended about N45°E at the time of deposition (Plate 1).

In Montgomery County northwest of U.S. Highway 460 the Cloyd Member rapidly changes facies to a clean, coarse-grained, conglomeratic quartzose arenite containing thin (1- to 2-foot thick) lenses of sandy quartz-pebble conglomerate.
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At the New River and Poverty Creek water gaps and the wind gap along State Highway 100 the classic conglomerate-lenses are thin and locally the member consists of coarse-grained, light- to medium-gray to reddish-gray quartz arenite with thin (1- to 2-foot thick) sandy quartz-pebble conglomerate lenses (Figure 6). Similar sandstones (Figure 7) occur below the classic lithology in exposures along U.S. Highway 460 and on the southeastern end of Fort Lewis Mountain. However, these beds are included in the Cloyd member because they lie above the distinctive lithologies of the Chemung Formation. The Tract Mountain-Little Walker Mountain conglomerate lenses pinch out at the State Highway 100 wind gap and on Tract Mountain suggesting the major Cloyd lenses trended about N45°E at the time of deposition (Plate 1).

In Montgomery County northwest of U.S. Highway 460 the Cloyd Member rapidly changes facies to a clean, coarse-grained, conglomeratic quartzose arenite containing thin (1- to 2-foot thick) lenses of sandy quartz-pebble conglomerate.
Similarly, along the southwestern end of Little Walker Mountain the Cloyd thins and its base typically is marked by quartz-pebble conglomerate lenses. However, the dominant lithology is clean medium- to coarse-grained quartzose sandstone and quartzite. In both the Tract Mountain anticline and the Draper Mountain structure, the thin Cloyd Member consists mostly of medium-grained, light gray, clean, quartz arenite and quartzites with only a few thin (0.5- to 3-feet thick), scattered, quartz-pebble conglomerate lenses. To the east in both the Price Mountain and East Radford windows the Cloyd sandstone and quartzite thicken and its base is once again marked by quartz-pebble conglomerate. Likewise, in easternmost Montgomery County on Fort Lewis Mountain the classic Cloyd Conglomerate Member marks the base of the Price Formation.

The upper contact of the Cloyd Conglomerate Member may be either gradation or sharply defined. Where the conglomerate facies of the Cloyd is thick the upper contact is placed at the top of the quartz-cobble/pebble beds whereas in the sandstone facies it is placed at the top of the clean, light-gray to white quartzose arenites and quartzites.

**Lower member**

Lithologies of the lower member of the Price Formation contrast sharply with those of the underlying Cloyd Member. The lower member consists primarily of olive-gray to medium-gray, fine- to medium-grained, well bedded to crossbedded, sublitharenite with interbeds of dark gray mudstone (Figure 8). Because of alignment of detrital mica fragments along bedding and crossbedding surfaces the sandstone weathers into thin plates. Lithic fragments are composed of quartz, feldspar, and mica. Thin trough and planar crossbeds within medium to thick beds are characteristic.
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Figure 7. "Red beds" (above trees) of the Cloyd Conglomerate Member exposed on the east side of U.S. Highway 460 at the crest of Brush Mountain (Newport 7.5-minute quadrangle). Quartz-pebble conglomerate (c) shown in the upper right corner of the photograph and Chemung lithology in lower left corner.
Claystone, very fine-grained sandstone, and coal beds comprise the upper member of the Price Formation. The coal-bearing strata of the upper member lie directly above the sandstone marker bed (Figure 9). Coal outcrops are rare; it weathers rapidly to a black soil. Individual coal beds were mapped by marking locations of mine adits and shafts. Pits 10-40 feet wide mark the location of collapsed adits. Rarely are adits open with roof-rock exposed. Coal dumps, small gauge railroad track and building foundations are associated with the pits. The coal-bearing interval typically ranges from 50 to 120 feet and consists predominantly of dark-gray laminated mudstone; black, laminated to massive, commonly rooted, mudstone; and black, laminated to massive, dull and bright coal. Siltstone and fine-grained sandstone are more abundant in the region near New River and Price Mountain where several coal beds attained minable thickness. In general, however, only one or two beds were mined. The lower interval (Langhorne) reached its maximum thickness in Pulaski County near the Empire mine (Plate 1, P-6, 7). The upper and thicker interval (Merrimac) was mined extensively in Montgomery County and adjoining northeastern Pulaski County. Because individual beds are not traceable continuously across the entire field (Plate 1), and because splays are present, care should be exercised in applying the names Merrimac and Langhorne to particular beds; in this report they are used for the upper and lower, respectively, coal-bearing intervals.

Because of the fine-grained nature of the coal measures, exposures are rare. The best exposure is the reference section along State Highway 100, where both the Langhorne and Merrimac intervals are exposed on the east side of the highway (Plate 1, Sec. H; Figure 9). In the study area the Langhorne is reported to be 1.5 to 3 feet thick (Campbell and others, 1925); however, the tectonically thickened interval, here, is 10 feet thick in measured section (Figure 10). The Langhorne coal contains few partings and grades above and below into dark gray claystone. The thickness of the Merrimac interval varies from 6 and 20 feet in the study area (Campbell and others, 1925). The maximum reported thickness of 60 feet from the Altoona mine (Plate 1, P-8) is attributed to tectonic thickening in the trough of a syncline. Clay partings are abundant in the Merrimac coal (Figure 11). Both coals are highly sheared, and rarely show butt or cleat or dull and bright lamination.

The coal measures on State Highway 100 coarsen upward from thinly laminated siltstone and claystone to medium-grained sandstone above the second (Merrimac) interval. Burrows, root structures and wavy lamination are common sedimentary structures, especially in siltstone units. Plant fragments and coarse-sand-sized carbonized plant debris are abundant. The coal measures are finer grained, in general, to the southwest. At section B (Plate 1), the only calcareous bed which occurs, is a 2-inch bed of silty limestone or dolomite. To the northeast, at section L (Plate 1), fine- to medium-grained feldspathic litharenites dominate the coal measures (Kreisa, 1972).

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Two types of conglomerate are found within the lower Price unit. Near the Cloyd-Lower Price boundary 6-8-inch beds of sandy quartz-pebble conglomerate occur. Toward the upper contact, intraformational conglomerates of very fine-grained sandstone clasts in fine- to medium-grained sandstone occur. The upper portion of the lower member consists of a thicker bedded sequence of distinctive, but laterally variable, light- to medium-gray lithic arenite used as a mapping "marker bed" (Figure 9). Fragments of plant material are locally common as is trough crossbedding. Bedding varies from thick and massive to crossbedded to locally well bedded. Scour channels are present. In general, the unit consists of about 40- to 100-feet of dominantly medium- to coarse-grained sandstone. Millstones were quarried from this sandstone marker bed at the top of the lower member of the Price Formation.

Kreisa (1972) observed at least five phyla of marine fossils below the "marker bed". His fossil identifications include chonetid, spiriferid and rhychonellid brachiopods, pteroid and modiomorphid pelecypods, crinoids, gastropods, and bryozoans. Plant fragments are occasionally seen in the Lower Price, especially in the "marker bed" (e.g., on State Highway 100). The lower member of the Price thickens dramatically to the east of Poverty Creek in Montgomery County (Plate 1).
Figure 8. Typical lithology of the lower member of the Price Formation exposed along the west side of the railroad along New River at Cloyds Mountain (Radford North 7.5-minute quadrangle). The unit here consists of interbedded sublitharenite and mudstone.

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The basal coal-bearing portion of the upper member of the Price Formation is overlain by a thick succession of clastic sequences (Figure 12). Typically thick, medium-gray, coarse-grained, conglomeratic lithic arenite with lithic clasts of mudstone form the basal portions of these sequences which grade upward into thin- to thick-bedded medium-gray, medium- and fine-grained lithic arenite; the thick sandstone beds are often crossbedded, and Kreisa (1972) reported some current-ripple marks. Commonly dark-gray laminated siltstone and mudstone are found at the top of the sequences. Scour channels are common near the base of many depositional sequences, and grayish-red mudstone occurs locally at top of some sequences.

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Maccrady Formation

The contact between the upper member of the Price Formation and the overlying Maccrady Formation is gradational and is mapped at the lowest dark-grayish-red, medium- to fine-grained sandstone (Figure 13). The lower member of the Maccrady typically consists of dark-grayish-red sandstone, siltstone, and mudstone interbedded with mottled grayish-red and grayish-green mudstone and dark-gray mudstone. A few miles on either side of New River and in the western end of Price Mountain 1- to 5-feet thick, massive bedded to nodular, mottled grayish-red to medium-
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gray lenses of dolomite occur near the Price-Maccrady contact.

The upper member of the Maccrady Formation occurs only in the eastern end of the Price Mountain window and in the tectonic slice along the Catawba fault. The basal portion of this member consists of coarse-grained, conglomeratic sandstone and sandy quartz-pebble (abundant smoky quartz) conglomerate (Figure 14). The poorly exposed strata above this marker bed are primarily medium-gray, fine-grained sandstone and siltstone. The top is structurally truncated by the Pulaski and Catawba faults.

Figure 12. Typical lithology of the upper member of the Price Formation exposed along the railroad tracks on the west side of New River (Radford North 7.5-minute quadrangle); thick bedded lithic arenites are more prominent than siltstone and mudstone lenses.

Figure 13. Price-Maccrady contact (prominent shadow above hammer) exposed at the west entrance to the railroad tunnel in the southeastern corner of the Price Mountain window (Blacksburg 7.5-minute quadrangle); the "redbeds" of the Maccrady overlie gray beds of the upper Price.

Figure 14. Quartz-pebble conglomerate of the upper member of the Maccrady Formation exposed in driveway cut along State Road 648 about 1 mile NW of Mt. Tabor (Newport 7.5-minute quadrangle). The smoky-quartz pebbles contrast sharply with the milky-quartz pebbles found in the stratigraphically lower Cloyd Conglomerate Member of the Price Formation.

**INTERPRETATION OF DEPOSITIONAL ENVIRONMENTS**

Kresia (1972), Kreisa and Bamback (1973), Bartlett (1974), and Whitehead (1979) all describe aspects of the environments under which the Price Formation was deposited. Brown (1983) discussed the applicability of the delta model to the coal measures.

The conditions under which the Chemung was deposited are described by Randall (1984). However, to date, no detailed sedimentological work has been published on the Millboro, Brallier, and Maccrady Formations in Montgomery and Pulaski Counties.

In general, the Devonian and Mississippian strata of the Saltville thrust sheet represent a mixture of distal and proximal marine, as well as deltaic environments of deposition with clastic detritus derived from a southeastern source terrain.
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DEVONIAN UNITS

The thick uniform accumulation of Millboro claystone is succeeded by Brallier sediments including coarser clastic material either introduced as turbidite deposits or generated by storms. The thick, massive-bedded sheet-like, sands found locally near the base in Pulaski County represent turbidite deposits. The presence of fossil-debris beds, scour channels, and graded beds in the Chemung are used, along with the sharply defined mudstone contacts, to infer a shallow water environment dominated by storm deposits interspersed with nonturbulent accumulation of mudstone (Randall, 1984). This environment is inferred to be similar to that described by Kreisa (1980) except that the Chemung represents a region which received considerable clastic detritus when compared to environment for the Martinsburg Formation. As noted by Bartholomew and others (1982) the upward progression of Millboro, Brallier, and Chemung appears to represent a change from distal (and/or deep water) marine to proximal marine to shallow water marine environment.

MISSISSIPPIAN UNITS

Price Formation

Cloyd Conglomerate Member

During deposition of the Cloyd, a large amount of quartz material entered the foreland basin from a source to the north. Longshore currents transported this material southward where offshore barrier bars formed (Kreisa and Bambach, 1973). Sandy quartz-pebble conglomerates in the lower Price unit are interpreted by Kreisa (1972) as storm washovers from the bars. Data from field mapping support this interpretation of the lowest Price member, because: 1) the Cloyd becomes lensoid and pinches out to the south (Figure 15); in Pulaski and Long Spur quadrangles the unit was thinner and finer grained than elsewhere, 2) the Cloyd was mapped as lenses, and 3) trough crossbedding and wave ripples were noted. The elongated-blade grain-shape of the Cloyd pebbles is also characteristic of high energy beach environments (J. Fred Read, oral communication, May, 1981).

Observations of the Cloyd in other outcrop belts led Whitehead (1979) to suggest a base-of-prodelta-slope environment with slump or turbidity current transport mechanism. No evidence supporting this interpretation was found in the Little Walker-Cloyd-Brush Mountain outcrop belt.

Lower Member

At the top of the lower Price unit, sands become slightly coarser and highly crossbedded in the “marker bed” subunit (Figure 15) which may represent a unique stage of Price deposition. Previously, Kreisa (1972) included this unit with the non-marine sandstones of the upper Price unit, as part of a transition zone between marine and nonmarine deposits. He described the transition zone as a brackish or fresh water environment which may have supported plant life and said that the presence of vertical burrows were suggestive of a tidal flat. Our field work fail to yield marine fossils in the “marker bed” sandstones and no other tidal flat features, such as mudcracks, were noted.

Observations that have a bearing on these interpretations are:

1) The “marker bed” extends across the entire study area at a consistent stratigraphic horizon.

2) A petrographic comparison of lower Price, “marker bed” and upper Price sandstones provides evidence for the reworked nature of the “marker bed”. However, because point-count data (Kreisa, 1972) is not available for all three types at one section the results may be coincidental. From the data in Table 1, it is shown that the “marker bed” has a low percent matrix compared to the upper Price sandstone from the same section and the lower Price sandstone from State Road 781. The lowest matrix percent belongs to an upper Price sandstone from U.S. Highway 460.

3) Trough crossbedding and wave ripples are the dominant sedimentary features of the “marker bed”. The trough crossbedding is best developed in eastern Newport and western McDonalds Mill quadrangles. Bartlett (Bartlett and Webb, 1972, p. 27) expressed surprise in results of his paleocurrent studies of the “marker bed” sandstone: “Northwestward flowing currents were anticipated from the eastward thickening isopach and eastern increase in clastic ratio. Oddly, it was found that a preponderance of cross bedding is inclined to the southeast...”

Bartlett proposed the “preponderance” was due to tidal influences or washover fans from shallow marine bars. Schmidt (1973) interpreted crossbedding in the “marker bed” as point-bar deposits.

Thus mapping suggests that portions of the “marker bed” were under marine influence when deposited, and may be representative of a reworked distal distributary mouth bar facies. Sands, possibly from a northern source, were reworked by wave and tidal action and deposited as a delta front beach facies. Tidal channels and subsequent distributary channels dissected this facies to produce the mixture of marine and non-marine features. This hypothesis is based on: 1) lateral extent, 2) petrography, and 3) sedimentary structures.

Kreisa (1972), Bartlett (1974) and Bartholomew and Lowry (1979) report discontinuous thin coal below the “marker bed” on State Highway 100, State Road 781, and Price Mountain, respectively. These seams possibly formed in lower delta-plain-type coal-swamps with the morphology of the swamps modified from an elongated form by wave and tidal action. Plant material also could have accumulated along the shore due to rafting (Spackman, Riegel, and Dolsen, 1969). The presence of the “marker bed” over these coals represents shifting of distributary channels and continued reworking of distributary mouth bars.

A point source of the “marker bed” sheet sand is not known. If a large fluvial-deltaic system existed to the north of the field area during deposition of the Cloyd (Kreisa and Bambach, 1973), it may also have been available later to supply “marker bed” sediments. A thickening of the “marker bed” was noted in western McDonalds Mill quadrangle. Ramping of the Pulaski thrust fault only into the lower Price
section prevents further investigation to the northeast within Montgomery County.

Upper Member

The depositional environment of the upper Price unit can be deduced by applying the previously described coal model to the lower Langhorne and upper Merrimac intervals (Figure 15 and 16). In addition, a simple statistical analysis was performed (Brown, 1983) on the collective stratigraphic sections for the Price coal measures in Pulaski County and the core section from Price Mountain in order to identify any cyclic arrangement of rock types (Selley, 1970). The results revealed no cyclicity in the coal measures. This result suggests the Merrimac coal was not deposited in an environment similar to the Langhorne coal.

The Langhorne was described by Campbell and others (1925) as 1.5 to 3 feet thick and as having rare clay partings. Analyses of the coal show it to be very low in sulfur. This interval is usually located a few feet above the "marker bed" and separated from it by very thin bedded micaceous siltstone. The Langhorne represents accumulation of peat on shoaled-bay fill over a delta front sheet sand and may be compared to the Pennsylvanian transitional lower delta-plain coals.

Roof-rock of the Langhorne coal is silty shale or very fine-grained, flaggy sandstone. As the Price shoreline prograded, Langhorne swamps were filled by overbank flooding. On State Highway 100, 45 feet of highly bioturbated claystone, siltstone and very fine-grained sandstone lie between the Langhorne and Merrimac coals. Plant fossils are abundant throughout this interval.

Campbell and others (1925) described the Merrimac coal as being variable in thickness, even within a single mine. It is thinnest at the Slusser mines (Plate 1) and thickens generally to the southwest. At the Empire Mine (Plate 1), the main coal is 20 feet thick, with many partings in the central 8 feet. This interval of parts becomes a clastic wedge, splitting the Merrimac interval, in Wythe County, southwest of the study area. Within the field area, multiple coal traces above the lower Langhorne horizon generally are considered local splays off the upper Merrimac coal.

Features such as 1) variable thickness, 2) abundant partings, and 3) splitting of the coal identify the Merrimac interval as upper delta-plain in origin. The roof-rock types also support this conclusion. Merrimac mines have sandstone roof-rocks. Recent (1982) reopening of the Keister Mine (Section K, Plate 1) exposed thick, low-angle crossbeds of fine sandstone. These are interpreted as point-bar deposits. On Brookmont Road in Pulaski County (Section C, Plate 1), sandstone rock included upright *Lepidodendropsis* trunks. The upright trees indicate rapid burial and the sandstone is interpreted as crevasse splay deposits.

Maccrady Formation

The Price grades into the red Maccrady Formation suggesting that as the alluvial plain prograded across the delta-plain, red beds became more common. Red beds with nodular dolomite and dolomite lenses traced in the Maccrady suggest a drying trend in the climate. Because of its extremely local extent, due to structural truncation by the Pulaski fault, the upper member of the Maccrady is only used herein to infer a subsequent shift back to a marine environment based on the presence of coarse-grained, quartz-pebble conglomerate overlain by fossiliferous marine sands.

Table 1. Point-count analyses of lower Price, upper Price and "marker bed" sandstones; Kreisa (1972) for exact sample locations.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Quartz</th>
<th>Rock Fragments</th>
</tr>
</thead>
<tbody>
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<td>Section Number</td>
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<td>hydro.</td>
</tr>
<tr>
<td>Upper Price</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>72</td>
<td></td>
</tr>
<tr>
<td>&quot;Marker bed&quot; sandstones</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>Lower Price sandstones</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>72</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>44</td>
<td></td>
</tr>
</tbody>
</table>

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11
COAL RESOURCES

Based on reconnaissance work, Bartholomew (1979) prepared a preliminary coal distribution map for Pulaski and Montgomery Counties. Henderson (1983) used this map and calculated the coal resources using 5 feet and 1.2 feet for his identified and hypothetical coal resources. A revision of the coal resources is probably needed now because of the new data generated during our detailed mapping of this coal field, the new data being generated by new drill holes, and new vitrinite reflectance data (Lewis and Hower, 1990) for the field.

Lewis and Hower (1990) reported new vitrinite maximum-reflectance and anisotropy for Price coal samples from outcrops and cores within Pulaski and Montgomery Counties. They place the coals generally in the range for semi-anthracite rank, although $R_{\text{max}}$ values for these coals do vary both geographically and stratigraphically from 1.61 to 2.60 percent.

Mapping, measured sections, and examination of core suggest that the Merrimac interval does not persist over the western portion of Pulaski County (Figure 16). Likewise, the much misidentified Langhorne interval (see for example: Campbell and others, 1925 and Stanley and Schultz, 1983, who each place Merrimac splay, only 20 feet below the main coal bed, within the Langhorne, which is clearly identifiable at a stratigraphically lower level) thins dramatically or pinches out entirely in the eastern half of the Blacksburg quadrangle (Plate 2). Only within the Radford North, the western half of the Blacksburg, and a portion of the Staffordsville quadrangles do both intervals appear to be of minable thickness within the same area.

The following points need to be considered in calculating and evaluating the coal resources:
1) known or suspected, large, mined-out areas;
2) areas where three or more coal seams are known or suspected (Figure 16);
3) areas where coal is tectonically absent (or thin), such as along the northern flank of Tract Mountain (Plate 1);
4) the large region, east of Blacksburg, where the Pulaski-Catawba fault is at a decollement level within or below the tectonically disrupted coal (Plate 1; Figure 1);
5) the estimated location of the Pulaski ramp where the Mississippian coals are structurally truncated in the subsurface (Figure 1; Bartholomew, 1987);
6) in Pulaski County the Langhorne interval is the principal resource whereas in Montgomery County the stratigraphically higher Merrimac interval is the principal resource (Plate 2).

ACKNOWLEDGMENTS

Dr. W.D. Lowry, J.R. Craig, and R.K. Bambach served, along with Dr. M.J. Bartholomew, on the thesis committee for K.E. Brown. Their comments and guidance for the thesis are appreciated. Fieldwork by K.E. Brown was supported by the Virginia Division of Mineral Resources and was under the direction of Dr. M.J. Bartholomew. Gretchen Bingman assisted with drafting.

Figure 15. Stratigraphic column of the Price Formation at the Reference section, State Highway 100, west of Dublin (modified after Bartlett, 1974).
Figure 16. Interpretive map showing some depositional features of the Price Formation in Pulaski and Montgomery Counties.
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APPENDIX I

Reference section for Price Formation modified from C.S. Bartlett, Jr. (1974) and K. Elizabeth Brown

The reference section (Plate 1, RS) for the Price Formation (Figure 15) is adapted from Bartlett (1974, p. 63-65) with additional observations by K.E. Brown (1983). The lower member is modified from Bartlett (1974). Brown (1983) measured the upper member. The section is located along State Highway 100, six miles north of Dublin. The crest of Cloyd's Mountain is the base of the exposed section and the top is exposed at elevation 2120 feet on the east slope of the mountain. Bedding dips S8°E S36°E.

<table>
<thead>
<tr>
<th>Unit Thickness (feet)</th>
<th>Cumulative Thickness (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRICE FORMATION (1630.8 ft.)</td>
<td></td>
</tr>
<tr>
<td>Upper Member (376.9 ft.)</td>
<td></td>
</tr>
<tr>
<td>Sandstone, light-olive-gray to gray, fine- to medium-grained, thin- to medium-bedded, argillaceous and feldspathic(?); contains some light-gray clay pebbles.</td>
<td>41.0</td>
</tr>
<tr>
<td>Mostly covered except basal 20.0 ft. carbonaceous mudstone, fissile light-brownish-gray, containing carbonized plant stems.</td>
<td>206.0</td>
</tr>
<tr>
<td>Sandstone, light-olive-gray to pale-red, very fine- to medium-grained, medium- to thick-bedded, crossbedded.</td>
<td>33.3</td>
</tr>
<tr>
<td>Sandstone, weathers yellowish-brown, very fine-grained, argillaceous, interbedded with siltstone, light-gray, carbonaceous.</td>
<td>12.2</td>
</tr>
<tr>
<td>Siltstone, very light-gray to yellowish-gray, carbonaceous.</td>
<td>10.7</td>
</tr>
<tr>
<td>Coal, with claystone partings; sharp basal contact.</td>
<td>15.0</td>
</tr>
<tr>
<td>Sandstone, dark-gray, very fine-grained, thin-bedded, thinly laminated to fissile, bioturbated; upper surface contains some small coalified roots(?).</td>
<td>4.3</td>
</tr>
<tr>
<td>Mudstone, light-gray, grades upward into sandstone, thin-bedded, highly bioturbated, abundant Chlidanophyton dublinensis frag- ments.</td>
<td>3.0</td>
</tr>
<tr>
<td>Sandstone, very fine-grained, interlaminated with siltstone, medium-gray, thin-bedded, bioturbated.</td>
<td>4.3</td>
</tr>
<tr>
<td>Sandstone, light-gray, fine- to medium-grained, interbedded with thin beds of siltstone, small plant fragments.</td>
<td>6.0</td>
</tr>
<tr>
<td>Claystone interbedded with siltstone, light-maroonish-gray, thin-bedded.</td>
<td>6.6</td>
</tr>
<tr>
<td>Mudstone, light-tan, interlaminated with claystone, light- to medium-gray, with claystone concretions (3.0-4.0 in.) in upper 1 ft.</td>
<td>11.5</td>
</tr>
<tr>
<td>Siltstone, light-maroonish-gray, thin-bedded, with coaly plant fragments.</td>
<td>1.3</td>
</tr>
<tr>
<td>Claystone, dark-brownish-gray to black, thin-bedded, highly carbonaceous to coaly.</td>
<td>6.6</td>
</tr>
<tr>
<td>Coal, black, highly sheared, grading from and into highly carbonaceous claystone.</td>
<td>10.5</td>
</tr>
<tr>
<td>Siltstone, light-gray to yellowish-gray, very thinly laminated, with coaly plant fragments.</td>
<td>4.6</td>
</tr>
<tr>
<td>Lower Member (1168.0 ft.)</td>
<td></td>
</tr>
<tr>
<td>Sandstone, light- to medium-gray, fine- to coarse-grained, medium- to thick-bedded, siliceous, partly carbonaceous and contains lycopod trunk imprints in upper part.</td>
<td>21.0</td>
</tr>
<tr>
<td>Sandstone, light-gray, fine- to medium-grained, thin- to medium-bedded, argillaceous, partly very carbonaceous with plant imprints; some interbedded mudstone and siltstone in middle part, mica- ceous and carbonaceous.</td>
<td>41.8</td>
</tr>
<tr>
<td>Sandstone, fine- to medium-grained, very light-gray to light-brown, grains subrounded, partly argillaceous, thin- to thick-bedded; some ripplemarked surfaces, trough trends S30°W.</td>
<td>16.3</td>
</tr>
<tr>
<td>Mudstone, fissile, carbonaceous,</td>
<td></td>
</tr>
</tbody>
</table>

VIRGINIA DIVISION OF MINERAL RESOURCES
partly sandy and coaly in upper part, medium-dark-gray to dark-gray; contains trunk segments of lycopsids.  

Sandstone, friable, fine-to medium-grained, subrounded grains, light-gray to grayish-orange-pink, medium- to thick-bedded; some beds contain large clay pebbles. Rare ripplemarked layer with trough trend S65°W. Changes to shaly, very thin-bedded in upper half with mudstone partings. Few feet of sandy, carbonaceous shale 25.0 ft. below top.  

Sandstone, argillaceous, fine- to medium-grained, yellowish-gray to grayish-orange, thin-bedded and with some interbedded silty mudstone  

Covered interval, at turnout.  

Mudstone, clay, pinkish-gray and medium-light-gray, some vertical worm tubes.  

Sandstone, partly argillaceous, friable, fine- to very fine-grained, very light-gray, partly weathered pink, medium- to thick-bedded, crossbedded; contains very fine muscovite flakes and minor partings of very light gray claystone.  

Interbedded silty mudstone, fissile, yellowish-gray, sandy siltstone, olive-gray and argillaceous sandstones, very fine-grained, very thin-bedded, weathered pink, contains rare crinoid columnals. Sandstone-siltstone vs. mudstone ratio estimated 1/5. At 13 ft. above base is 3 in. conglomeratic sandstone with pebbles to 8 mm.  

Interbedded mudstone, sandstone and conglomerate. Mudstone is medium-light-gray and weathers hackly; silty mudstone is medium-light-gray; sandstone partly fine-to very fine-grained, yellowish-gray and partly argillaceous, medium gray, very thin- to medium-bedded. Sandstone/mudstone ratio is 2/1; some bedding planes very micaceous. At 27.0 ft. above base is a 4.0 ft. bed of ferruginous quartz-pebbles to 0.75 in. diameter. Just above this bed is a fossil-bearing sandstone with abundant Chonetes sp. brachiopods and ostracods. At 60.0 ft. above unit base is another ferruginous fossiliferous sandstone, thinly laminated and spheroidally weathered, containing Chonetes sp., Camarotechia mutata Hall and abundant ostracods.  

Sandstone, fine- to medium-grained, light-gray, micaceous, thick- to massive-bedded; at top is 0.5-foot ferruginous quartz-pebble conglomerate with pebbles to 0.5 in. Ferruginous fossiliferous streak at base contains Chonetes sp., crinoid columnals, and unidentified pelecypods and gastropods.  

Interbedded sandstone, fine- to very fine-grained, mostly very thin-bedded but with few thin to medium beds, and silty mudstone, medium-gray.  

Mudstone, medium-light-gray, containing rare imprints of Chonetes sp.; some interbedded siltstone, light-olive-gray, micaceous, increasing upward. Ratio estimated 1/5.  

Interbedded argillaceous sandy siltstone, light olive-gray, very thin bedded, and dense sandstone, very fine-grained, light-gray, slightly carbonaceous, thin-laminated and crosslaminated, medium bedding; and very silty mudstone, light-olive-gray, blocky. Upper 28.0 ft. mostly sandstone.  

Siltstone, quartzitic, medium-gray, and very fine-grained sandstone, light-olive-gray, thin- to medium-bedded.  

Mudstone, slightly silty, yellowish-gray and some coarse siltstone, light-olive-gray, very thin- to thin-bedded. Ratio 1/4.  

Cloyd Conglomerate Member (34.6 ft.)  

Sandstone, conglomeratic, quartzitic, containing pebbles to 1.8 in., medium-gray, thin- to thick-bedded and some orthoquartzite, very fine-grained, light-gray.
Mudstone, silty, and mudstone, very light-gray, slightly carbonaceous; poorly exposed. 15.1 76.4

Quartz-pebble conglomerate, quartzitic, partly ferruginous, thick bedded; top surface studded with rounded quartz and quartzite pebbles to 2.6 in., float pebbles to 3.75 in. 10.0 61.3

Chemung Formation (26 ft.)

Mudstone, soft, medium- to dark-gray, partly light-brownish-gray, weathers fissile; contains rare imprints of ostracods, plecypods and orbiculoid brachiopods 26.0 51.3

Small thrust fault.

Cloyd Conglomerate Member (25.3 ft.)

Interlayered orthoquartzite, very fine- to fine-grained, very light-gray and quartz-pebble conglomerate, light-gray, pebbles to 2.6 in. at 2.0 feet above base; partly ferruginous and contains some light-gray clay-pebbles; upper half has some interbedded soft sandy siltstone and mudstone, yellowish-gray. 25.3 25.3

Chemung Formation (104 ft. measured)

Very silty mudstone, light-olive-gray, hackly. At 17 feet above base is 8.5-foot thick dense fossiliferous sandstone, very fine- to fine-grained brownish-gray, containing some light-gray clay-pebbles; fossils include Chonetes sp., and Camarotoechia contracta Hall. 104.0 104.0

APPENDIX II

Measured sections of coal-bearing portions of the Price Formation

K. Elizabeth Brown, Gayle R. Ingram, and Mervin J. Bartholomew

Copper (1937), Glover (1953), Kreisa (1972), Schmidt (1973), Bartlett (1974), and Whitehead (1979) have published stratigraphic sections of the Price Formation. Measurements of the Langhorne and Merrimac coal intervals were reported by Campbell, and other (1925). In this study partial sections of the Price were measured where coal was exposed. The writers redescribed some of the sections, and measured new sections. Some sections measured by Bartlett (1974) are included.

The methods used in measuring sections were Brunton compass and steel tape, Jacob’s staff, and detailed study with an inch scale. In all cases, units were described on a smaller scale than previously recorded. Locations of the measured sections (as “A”, “B”, etc.) are shown on Plate 1. The stratigraphic correlation diagram (Plate 2) is based in part on the sections described herein.

Section A

Section is located south of the town limits of Pulaski along U.S. Highway 11 between Hermosa Drive and Valley Street (Plate 1); bedding dips 38°N20°W; measurements and descriptions adapted from Bartlett (1974, p. 326).

<table>
<thead>
<tr>
<th>Unit Thickness (feet)</th>
<th>Cumulative Thickness (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRICE FORMATION (818.3 ft.)</td>
<td></td>
</tr>
<tr>
<td>Upper Member (617.0 ft.)</td>
<td></td>
</tr>
<tr>
<td>Siltstone, coarse-grained, olive-gray to light-olive-gray, and mudstone, light-olive-gray, hackly. 59.0 818.3</td>
<td></td>
</tr>
<tr>
<td>Mudstone, silty, light-olive-gray, hackly. 17.3 759.3</td>
<td></td>
</tr>
<tr>
<td>Sandstone, very fine-grained, to coarse siltstone, light-olive-gray, dense, medium- to thick-bedded. 31.0 742.0</td>
<td></td>
</tr>
<tr>
<td>Mostly covered. Sandstone, feldspathic, fine- to medium-grained, light-gray, carbonaceous, thin- to medium-bedded and crossbedded. 325.0 711.0</td>
<td></td>
</tr>
<tr>
<td>Mostly covered. Near top is 2.0-foot coal and 10 feet of mudstone, medium-gray. 105.0 386.0</td>
<td></td>
</tr>
</tbody>
</table>
Mudstone, silty, medium-gray to yellowish-gray, brittle, subfissile; some coaly streaks, crumpled near fault. 67.0 281.0

Upper part mostly covered. Mudstone, medium-dark-gray, brittle; plant imprints of *Rhodea endlicheri*, contorted, contains one or two thin coal beds. 13.0 214.0

**Lower Member (44.0 ft.)**

Sandstone, very argillaceous, very fine- to fine-grained, medium-dark-gray, carbonaceous, thin-bedded; weathers shaly; oscillation ripple marks with trough trending S50°E at 9.0 feet above base; some silty mudstone, dark-gray, brittle, very thinly laminated. 16.0 201.0

Sandstone, feldspathic, fine- to coarse-grained, light-gray, light-olive-gray and medium-gray, very carbonaceous in upper part, medium-bedded, crossbedded. 28.0 185.0

**Upper Member (89.6 ft.)**

Claystone, partly silty, light gray, smooth waxy wrinkled surfaces; and sandy carbonaceous siltstone, medium-gray; some plant fragments, mostly covered. 47.0 157.0

Covered interval. 37.6 110.0

Covered, coaly soil. Some fresh coal was dug out but exact thickness of coal uncertain. 5.0 72.4

**Lower Member (67.4 ft.)**

Sandstone, feldspathic, fine- to medium-grained, light-gray; some dark-gray, very carbonaceous at top, thin- to medium-bedded. 39.4 67.4

Covered interval. 28.0 28.0

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**Section B**

Section is located at the Hurd Mine (Inactive mine P-10; Plate 1) 2.05 miles N64°W bearing from the Pulaski High School; accessible by unimproved jeep trail north of State Road 640, 1.5 miles south of the intersection of State Road 738 (Robinson Tract Road) and State Road 640 (Brookmont Road); measured and described by G.R. Ingram and K.E. Brown.

<table>
<thead>
<tr>
<th>PRICE FORMATION (51.3 ft.)</th>
<th>Upper Member (51.3 ft.)</th>
<th>Unit Thickness (feet)</th>
<th>Cumulative Thickness (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Claystone, light- to medium-gray and light-maroonish-gray, thin- to medium-bedded, some portions highly rooted with abundant plant imprints.</td>
<td>10.0</td>
<td>51.3</td>
<td></td>
</tr>
<tr>
<td>Claystone, silty, medium gray, highly rooted.</td>
<td>3.0</td>
<td>41.3</td>
<td></td>
</tr>
<tr>
<td>Coal, black, very sheared.</td>
<td>1.0</td>
<td>38.3</td>
<td></td>
</tr>
<tr>
<td>Siltstone, medium-gray, thin-bedded; grades upward into claystone, light-buff-gray, dense</td>
<td>4.0</td>
<td>37.3</td>
<td></td>
</tr>
<tr>
<td>Siltstone, dark-gray, thin-bedded, fissile.</td>
<td>6.0</td>
<td>33.3</td>
<td></td>
</tr>
<tr>
<td>Coal, black, very sheared.</td>
<td>0.7</td>
<td>27.3</td>
<td></td>
</tr>
<tr>
<td>Claystone, dark-gray, thin-bedded; grades upward into siltstone, carbonaceous, fissile, with iron-stained surfaces.</td>
<td>3.0</td>
<td>26.6</td>
<td></td>
</tr>
<tr>
<td>Siltstone, medium-gray, weathering olive-gray, thin-bedded, slightly calcareous, with small clayey (1 in.) concretions.</td>
<td>5.0</td>
<td>23.6</td>
<td></td>
</tr>
<tr>
<td>Limestone, impure, dark- to medium-gray, weathering orangish-buff, blocky or subspheroidal, persistent across cliff face.</td>
<td>0.2</td>
<td>18.6</td>
<td></td>
</tr>
<tr>
<td>Siltstone, dark-gray, very thin-bedded, becoming sandy upward; middle interval interbedded mudstone and medium-bedded, fine-grained sandstone.</td>
<td>6.0</td>
<td>18.4</td>
<td></td>
</tr>
<tr>
<td>Sandstone, medium-gray, fine-grained, thin-bedded, highly carbonaceous with coaly surfaces along shears, contorted.</td>
<td>7.5</td>
<td>12.4</td>
<td></td>
</tr>
<tr>
<td>Claystone, medium-gray, thinly laminated, lightly carbonaceous, highly fossiliferous; log</td>
<td>28.0</td>
<td>28.0</td>
<td></td>
</tr>
</tbody>
</table>
imprints parallel and perpendicular to bedding. 1.0 4.9
Coal, measured in drift within the mine. 3.9 3.9

Section C

Section is located in a roadcut along State Road 640, slightly less than one mile south of the intersection of State Road 738 (Robinson Tract Road) and State Road 640 (Brookmont Road) (Plate 1); measured and described by G.R. Ingram and K.E. Brown.

<table>
<thead>
<tr>
<th>Unit Thickness (feet)</th>
<th>Cumulative Thickness (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRICE FORMATION</td>
<td></td>
</tr>
<tr>
<td>Upper Member (51.3 ft.)</td>
<td></td>
</tr>
<tr>
<td>Sandstone, light-gray, weathers buff, very fine- to fine-grained, thin-bedded with distinct 1- to 2-inch layers of clay-galls; tree stump casts perpendicular to bedding, 6- to 8-inch diameters; plant fossil imprints on bedding planes.</td>
<td>2.0</td>
</tr>
<tr>
<td>Siltstone, medium-gray to light-gray, with thin irregular laminations, carbonaceous, distinct clay-gall layers.</td>
<td>3.5</td>
</tr>
<tr>
<td>Siltstone, dark-gray, thin-bedded and crossbedded, abundant fine-grained carbonized plant fragments.</td>
<td>0.2</td>
</tr>
<tr>
<td>Coal, with bright and dull laminations.</td>
<td>0.2</td>
</tr>
<tr>
<td>Siltstone, dark-gray to black; very fine-grained sandstone, rooted, abundant fine-grained carbonized plant fragments, coaly streaks, iron-stained.</td>
<td>1.1</td>
</tr>
<tr>
<td>Claystone, dark-gray to black, fossiliferous, with <em>Lepidodendropsis</em> sp. imprints.</td>
<td>2.5</td>
</tr>
<tr>
<td>Coal, with clay partings.</td>
<td>1.8</td>
</tr>
<tr>
<td>Claystone, medium-dark-gray, phytoturbated with root casts.</td>
<td>1.0</td>
</tr>
<tr>
<td>Claystone, light-gray, small roots or burrows, dense.</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Section D

Section is 5 miles north of Pulaski along State Road 738 beginning 0.3 mile west of the crest of Little Walker Mountain and continues to elevation 2200 feet (Plate 1); adopted from Bartlett (1974, p. 302-303).

<table>
<thead>
<tr>
<th>Unit Thickness (feet)</th>
<th>Cumulative Thickness (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRICE FORMATION</td>
<td></td>
</tr>
<tr>
<td>Upper Member (120.2 ft.)</td>
<td></td>
</tr>
<tr>
<td>Carbonaceous mudstone, medium-to dark-gray with 0.5-foot coal bed at base and 0.9-foot coal bed near top.</td>
<td>11.0</td>
</tr>
<tr>
<td>Sandstone, silty, very fine-grained, light-olive-gray, thin-bedded, and interbedded silty mudstone, light-gray, hackly; plant fossil imprints common.</td>
<td>30.8</td>
</tr>
<tr>
<td>Mudstone and claystone, light-gray, sub-fissile, with abundant fossil plant imprints; some silty mudstone, dark-gray, fissile.</td>
<td>28.0</td>
</tr>
<tr>
<td>Mudstone, clayey, medium-gray to medium-light-gray, carbonaceous, fissile and interbedded argillaceous sandstone, weathering light-orange-pink, feldspathic, very fine-grained, ratio of 2/1. One vertebra-like imprint found.</td>
<td>16.8</td>
</tr>
<tr>
<td>Mostly covered.</td>
<td>33.6</td>
</tr>
<tr>
<td>Lower Member (67.2 ft.)</td>
<td></td>
</tr>
<tr>
<td>Sandstone, medium-dark-gray to medium-light-gray, weathering yellowish-gray, feldspathic, medium- to fine-grained with streaks on lower half, medium-to very coarse-grained with scattered subrounded quartz pebbles up to 0.2 inch, thick-to very thick-bedded.</td>
<td>67.2</td>
</tr>
</tbody>
</table>

Section E

Section located 500 feet S7°5'W from the most northern part of State Road 642 (Empire Mine Road), section begins at elevation 2385 feet (Plate 1); measured and described by K.E. Brown.
Section F

Section located 300 feet north of the northernmost point of State Road 642 (Empire Mine Road) along a jeep trail (Plate 1); measured and described by K.E. Brown and M.J. Bartholomew.

<table>
<thead>
<tr>
<th>Unit Thickness (feet)</th>
<th>Cumulative Thickness (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>PRICE FORMATION (75.4 ft.)</td>
<td></td>
</tr>
<tr>
<td>Upper Member (52.5 ft.)</td>
<td></td>
</tr>
<tr>
<td>Sandstone, maroonish-gray, fine-grained, thin-bedded, with fine-grained carbonized plant fragments.</td>
<td>2.0</td>
</tr>
<tr>
<td>Mudstone, dark-medium-gray, thin-bedded.</td>
<td>1.0</td>
</tr>
<tr>
<td>Mudstone, maroonish-gray, thin-bedded.</td>
<td>3.9</td>
</tr>
<tr>
<td>Mudstone, dark- to medium-gray, highly bioturbated.</td>
<td>5.9</td>
</tr>
<tr>
<td>Covered interval; upper portion correlates with horizon containing mine adit.</td>
<td>15.0</td>
</tr>
<tr>
<td>Covered interval; soil is dark gray to black, possible weathered coal.</td>
<td>4.9</td>
</tr>
<tr>
<td>Mudstone, dark- to medium-gray, thin-bedded.</td>
<td>3.0</td>
</tr>
<tr>
<td>Coal.</td>
<td>2.0</td>
</tr>
<tr>
<td>Mudstone, medium-gray, thin-bedded, abundant plant fragments; 0.3-foot coal bed at the bottom.</td>
<td>2.3</td>
</tr>
<tr>
<td>Mudstone, mottled maroonish gray and medium-gray, bioturbated.</td>
<td>2.6</td>
</tr>
<tr>
<td>Siltstone, sandy, maroonish-gray, thin-bedded.</td>
<td>2.0</td>
</tr>
<tr>
<td>Mudstone, dark- to medium-gray, bioturbated.</td>
<td>1.0</td>
</tr>
<tr>
<td>Sandstone, medium-gray, fine-grained, carbonaceous, with abundant carbonized plant fragments, crossbedded.</td>
<td>2.0</td>
</tr>
<tr>
<td>Covered interval. Adit located within this interval.</td>
<td>4.9</td>
</tr>
<tr>
<td>Lower Member (?) (4.9 ft.)</td>
<td></td>
</tr>
<tr>
<td>Sandstone, mostly covered, weathered buff, fine- to medium-grained, friable.</td>
<td>4.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit Thickness (feet)</th>
<th>Cumulative Thickness (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>PRICE FORMATION (75.4 ft.)</td>
<td></td>
</tr>
<tr>
<td>Upper Member (52.5 ft.)</td>
<td></td>
</tr>
<tr>
<td>Partly covered interval, dark-gray to black soil and highly weathered coal.</td>
<td>20.0</td>
</tr>
<tr>
<td>Siltstone, medium-gray, thin-bedded, partly crosslaminated, few plant fragments; upper surface with distinct root-traces (?) evenly spaced.</td>
<td>3.9</td>
</tr>
<tr>
<td>Mudstone, dark- to medium-gray, thin-bedded.</td>
<td>3.0</td>
</tr>
<tr>
<td>Mudstone, medium-grey, thin-bedded with frequent plant fragments.</td>
<td>3.0</td>
</tr>
<tr>
<td>Mudstone, maroonish-gray.</td>
<td>1.0</td>
</tr>
<tr>
<td>Siltstone, medium-gray, thin-bedded and cross-laminated.</td>
<td>1.0</td>
</tr>
<tr>
<td>Sandstone, partly covered, light-gray, medium-grained.</td>
<td>3.0</td>
</tr>
<tr>
<td>Covered interval, black to medium-gray soil.</td>
<td>3.0</td>
</tr>
<tr>
<td>Sandstone, medium-gray, fine-grained, thin-bedded, cross-laminated.</td>
<td>2.0</td>
</tr>
<tr>
<td>Covered interval, dark-gray to black soil.</td>
<td>4.9</td>
</tr>
<tr>
<td>Sandstone, light-gray and maroonish-gray, medium-grained.</td>
<td>3.0</td>
</tr>
<tr>
<td>Claystone, maroonish-gray.</td>
<td>1.0</td>
</tr>
<tr>
<td>Lower Member (24.9 ft.)</td>
<td></td>
</tr>
<tr>
<td>Sandstone, light-gray, weathering light buff, medium-grained, argillaceous, medium-bedded.</td>
<td>24.9</td>
</tr>
</tbody>
</table>
Section G

Section located approximately 7 miles north of Pulaski along State Road 643, beginning about 600 feet north of the Little Walker Mountain crest and continuing down the south slope to elevation 2260 feet (Plate 1); measurements and descriptions adapted from Bartlett (1974, p. 306).

<table>
<thead>
<tr>
<th>Unit</th>
<th>Cumulative Thickness (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRICE FORMATION (355.9 ft.)</td>
<td></td>
</tr>
<tr>
<td>Upper Member (273.4 ft.)</td>
<td></td>
</tr>
<tr>
<td>Sandstone, argillaceous, feldspathic, light-gray, very fine- to fine-grained, thin-bedded, grades upward to sandy argillaceous siltstone, grayish-orange and light-olive-gray.</td>
<td>54.0</td>
</tr>
<tr>
<td>Mudstone, silty, dark gray, trace carbonaceous matter, brittle and fissile.</td>
<td>7.4</td>
</tr>
<tr>
<td>Mudstone, silty, yellowish-gray to pinkish-gray, laminated, very thinly bedded.</td>
<td>92.0</td>
</tr>
<tr>
<td>Black coal and claystone, light brownish-gray with abundant plant fragments.</td>
<td>5.0</td>
</tr>
<tr>
<td>Mudstone, slightly silty, very light-gray; and argillaceous sandy siltstone, weathers yellowish gray.</td>
<td>79.0</td>
</tr>
<tr>
<td>Lower Member (118.5 ft.)</td>
<td></td>
</tr>
<tr>
<td>Sandstone, medium to light-gray, fine- to medium-grained, medium- to thick-bedded.</td>
<td>118.5</td>
</tr>
</tbody>
</table>

Section H

Section located at the Bell Hampton Mine #1 (Plate 1, Inactive Mine P-3) beginning at elevation 2080 feet; the section is accessible by hiking along the jeep trail that intersects State Road 612 about 1.14 miles west-southwest of the junction with State Road 600 near New River; measured and described by G.R. Ingram and K.E. Brown.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Cumulative Thickness (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRICE FORMATION (99.6 ft.)</td>
<td></td>
</tr>
<tr>
<td>Upper Member (96.6 ft.)</td>
<td></td>
</tr>
<tr>
<td>Sandstone, light-gray, fine- to medium-grained, with large (greater than 2 feet) log impressions.</td>
<td>9.8</td>
</tr>
<tr>
<td>Claystone, light-gray, highly burrowed, with sparse plant fossils.</td>
<td>2.6</td>
</tr>
<tr>
<td>Siltstone, clayey, medium-gray, thin-bedded, highly carbonaceous with coaly streaks, abundant plant fossils.</td>
<td>0.7</td>
</tr>
<tr>
<td>Coal, black, banded, sheared; interbedded with claystone, dark-gray to black, thin-bedded.</td>
<td>6.6</td>
</tr>
<tr>
<td>Siltstone, and clayey siltstone, dark-gray to black, coaly surfaces.</td>
<td>1.6</td>
</tr>
<tr>
<td>Claystone, light-gray, burrowed, sparse fossil leaves and fragments.</td>
<td>0.3</td>
</tr>
<tr>
<td>Covered interval; may include part of lower member.</td>
<td>75.0</td>
</tr>
<tr>
<td>Lower Member (3.0 ft.)</td>
<td></td>
</tr>
<tr>
<td>Sandstone, light- to medium-gray, medium-grained, thick- to medium-bedded.</td>
<td>3.0</td>
</tr>
</tbody>
</table>
**Section I**

Section located along Norfolk and Western Railway north of Parrott (Plate I); section begins at the railroad signal lights 900 feet north of prominent outcrop of the Cloyd Conglomerate Member; measurements and descriptions adapted from Bartlett (1974, p. 309).

<table>
<thead>
<tr>
<th>Unit Thickness (feet)</th>
<th>Cumulative Thickness (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRICE FORMATION (410.1 ft.)</td>
<td></td>
</tr>
<tr>
<td>Upper Member (394.5 ft.)</td>
<td></td>
</tr>
<tr>
<td>Sandstone, feldspathic, medium to light-gray, fine-grained, subangular, thin-bedded, crossbedded; and clayey siltstone, medium- to dark-gray, carbonaceous, very thin bedded.</td>
<td>33.6</td>
</tr>
<tr>
<td>Claystone; weathers dusky-yellow, poorly exposed.</td>
<td>22.4</td>
</tr>
<tr>
<td>Interbedded clayey siltstone, light-olive-gray and sandstone, light-olive-gray, very fine-grained, thin- to medium-bedded.</td>
<td>28.0</td>
</tr>
<tr>
<td>Claystone, medium- to dark-gray and light-olive-gray.</td>
<td>28.0</td>
</tr>
<tr>
<td>Mudstone, very silty, light-olive-gray, medium- to thick-bedded.</td>
<td>22.4</td>
</tr>
<tr>
<td>Claystone, slightly silty, medium- to dark-gray.</td>
<td>28.9</td>
</tr>
<tr>
<td>Covered interval, possible fault, steep dip in unit below.</td>
<td>67.2</td>
</tr>
<tr>
<td>Sandstone, argillaceous, light-olive-gray, very fine- to fine-grained, subangular, medium-bedded, weathers spheroidally.</td>
<td>10.1</td>
</tr>
<tr>
<td>Poorly exposed; clayey siltstone, light-olive-gray; and silty claystone, medium gray. At 29.0 feet above base some thin coaly mudstone streaks.</td>
<td>50.2</td>
</tr>
<tr>
<td>Sandstone, light-gray, very fine-grained, thin-bedded, thinly laminated, interbedded with silty mudstone, medium-gray, carbonaceous, poorly bedded.</td>
<td>16.8</td>
</tr>
<tr>
<td>Mudstone, slightly silty, medium-gray, hackly.</td>
<td>26.3</td>
</tr>
<tr>
<td>Coal, black.</td>
<td>8.0</td>
</tr>
</tbody>
</table>

**Section J**

Section located eight miles west of Blacksburg along State Road 781 about 1.2 miles northwest of Sunnyside Church (Plate I); measurements and descriptions adapted from Bartlett (1974, p. 314-315).

<table>
<thead>
<tr>
<th>Unit Thickness (feet)</th>
<th>Cumulative Thickness (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRICE FORMATION (376.5 ft.)</td>
<td></td>
</tr>
<tr>
<td>Upper Member (336.3 ft.)</td>
<td></td>
</tr>
<tr>
<td>Sandstone, feldspathic, light-olive-gray, very fine- to fine-grained, partly argillaceous with trace carbonaceous material, thin- to thick-bedded, crossbedded; forms topographic ridge.</td>
<td>39.0</td>
</tr>
<tr>
<td>Covered interval.</td>
<td>60.0</td>
</tr>
<tr>
<td>Sandstone, feldspathic, medium-gray, fine- to medium-bedded, argillaceous, thin-bedded, partly crossbedded; interbedded with siltstone, light-olive-gray; thin, dense ferruginous layer 30 feet from base.</td>
<td>67.5</td>
</tr>
<tr>
<td>Sandstone, very feldspathic, medium- to light-gray, fine- to medium-grained, finely micaceous and very carbonaceous on some bedding planes, thin- to thick-bedded, crossbedded.</td>
<td>54.5</td>
</tr>
</tbody>
</table>
Covered interval. 32.0 155.5  
Sandstone, medium- to light-gray, very fine- to fine-grained, slightly carbonaceous; interbedded with silty mudstone, medium-gray, subfissile. 9.0 123.5  
Coal, black, sheared. 4.0 114.5  
Siltstone, medium- to dark-gray, partly carbonaceous. 16.9 110.5  
Covered interval. 15.8 93.6  
Siltstone, sandy, light-olive-gray, thin-bedded; grades upward into silty mudstone, medium- to dark-gray, subfissile; partly covered. 37.6 77.8  
Lower Member (40.2 ft.)  
Sandstone, medium-gray to light-olive-gray, very fine- to medium-grained, thin- to medium-bedded, dominantly composed of quartz with some feldspar; argillaceous; ripple marks with trough trends at S60°W and due W. 40.2 40.2

Section K

Section located along and near U.S. Highway 460 close to the base of Brush Mountain (Plate 1); section measured from the culvert on Coal Bank Hollow Road, where the road intersects the highway, south along U.S. Highway 460 to the intersection with State Road 648; measured and described by K.E. Brown and M.J. Bartholomew with reference to Bartlett (1974, p. 326).

Unit Thickness (feet)  Cumulative Thickness (feet)

PRICE FORMATION (334.6 ft.)  
Upper member (281.4 ft.)  
Siltstone, light- to medium-gray, with some fine-grained sandstone beds, medium-gray, thin- to medium-bedded. 33.6 334.6  
Siltstone, dark-gray, carbonaceous, thin-bedded, brittle; with minor very fine-grained sandstone, light-gray, very thin-bedded. At top is 1.5-foot thick coal with some sulfur bloom. 50.4 301.0  
Covered interval. 105.0 250.6  
Sandstone, weathering pink and orange, fine- to medium-grained, thin- to medium-bedded, possibly including some feldspar, with argillaceous matrix. 11.2 145.6  
Small normal fault repeats part of unit below.  
Claystone, medium gray to black, highly sheared, with bright coaly streaks. 14.0 134.4  
Mudstone, medium gray to brownish-gray, very thin bedded, carbonaceous, with small plant fossils. 33.6 120.4  
Covered interval, dark-gray to black soil, possible coal bed horizon. 22.4 86.8  
Siltstone, medium-gray to brownish-gray, sandy, thin-bedded, fissile, with carbonized plant fossils, and mica flakes on bedding planes. 11.2 64.4  
Lower Member (53.2 ft., incomplete)  
Sandstone, light-gray, fine- to medium-grained, medium-bedded with cross bedding; lower parts are interbedded with siltstone, with grain size and bedding thickening upward. Top of unit is marked by symmetrical ripple marks. 53.2 53.2
APPENDIX III

Descriptions of cores through the coal-bearing portion of the Price Formation

Mervin J. Bartholomew and K. Elizabeth Brown

The descriptions of core holes 1, 2, 3A, 4, and 5 are keyed to the cored interval rather than depth below the surface. The lithologic logs presented in Figure 17 show the recovered portions to scale with appropriate dips within each cored interval. Core holes 3 and 6 are described in the conventional manner.

Core hole #1
Located along east side of U.S. Highway 460 on the south slope of Brush Mountain near Coal Bank Hollow (Plate 1); drilled on January 9, 1981; cored from 5.5 to 50.0 feet T.D.; 1 1/8-inch core; 59 percent recovery.

Core hole #1
Price Formation, upper member

<table>
<thead>
<tr>
<th>Interval</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.5' - 12.9'</td>
<td>Mudstone, dark-gray, laminated (0.75'); sandstone light-gray, medium-grained (0.2'); coal, black, dull (0.1'); mudstone, dark-gray laminated (0.1')</td>
</tr>
<tr>
<td>12.9' - 20.0'</td>
<td>Coal, black; dull (0.5'); mudstone, dark-gray, laminated (upper 1.5') over-lying interbedded medium-gray, siltstone, and dark-gray, laminated mudstone, 10° dip (2.1'); mudstone, dark-gray, laminated, interbedded with siltstone, medium-gray (0.25')</td>
</tr>
<tr>
<td>20.0' - 25.0'</td>
<td>Coal, black, dull interbedded with mudstone, black (0.1'); mudstone, dark-gray, interbedded with thin lenses of siltstone, medium-gray, 15° dip (2.65'); mudstone, black with coal partings (0.05'); mudstone, dark-gray, laminated; 25° dip (0.35') overlying siltstone, medium-gray (1.65'); mudstone, dark-gray, laminated (0.1)</td>
</tr>
<tr>
<td>25.0' - 30.0'</td>
<td>Coal, black, dull (0.2'); siltstone, light-gray, interbedded with mudstone, dark-gray, laminated (0.45') mudstone, black, with coal partings and pyrite, interbedded with siltstone, medium-gray (0.25'); mudstone, medium-gray, laminated (0.95')</td>
</tr>
<tr>
<td>30.0' - 35.0'</td>
<td>Mudstone, dark-gray, laminated (0.3'); sandstone, medium-gray, medium-grained, massive (0.5'); interbedded mudstone and siltstone, medium gray, burrowed (0.1'); sandstone, light-gray, fine-grained with mudstone lenses (0.3'); sandstone, medium-gray, medium-grained, massive; 25° dip (0.3'); mudstone, dark-gray, laminated and crossbedded with siltstone lenses, burrowed (0.9')</td>
</tr>
<tr>
<td>35.0' - 40.0'</td>
<td>Coal, black, dull (0.1'); overlying sandstone, dark-gray, medium-grained, massive (0.1'); overlying mudstone, medium-gray, laminated with siltstone content increasing downward (1.65'); overlying siltstone, medium-gray, crossbedded with mudstone lenses (0.1'); overlying sandstone, medium-gray, medium-grained, quartzofeldspathic, cross bedded with siltstone, fine-grained sandstone, and mudstone lenses; 25° dip (3.05'); overlying</td>
</tr>
<tr>
<td>40.0' - 45.0'</td>
<td>Mudstone, black, laminated with siltstone lenses and coal partings (0.1'); coal, black, dull laminated (0.2'); sandstone, medium-gray, fine-grained, laminated with calcite-filled fractures (0.8'); sharp contact with underlying siltstone, medium-gray, crossbedded and graded from siltstone at base upward into mudstone, dark-gray, laminated at top of cycles; graded cycles truncated at tops; 20° dip (1.9'); mudstone, dark-gray, laminated (0.5'); sandstone, medium-gray, medium-grained, interbedded with lenses of siltstone, medium-gray, and mudstone, dark-gray, laminated (0.25')</td>
</tr>
</tbody>
</table>
Price Formation, lower member

45.0'- 50.0' 4.85' Sandstone, medium-gray, medium-grained (0.3'); well bedded lenses of sandstone, medium-gray, fine-grained (0.5'); overlying sandstone, medium-gray, medium-grained, massive (1.4'); overlying sandstone, medium-gray, medium-grained, well bedded with lenses of sandstone, medium-gray, fine-grained (2.95')

50.0' Total depth

Core hole #2
Located along east side of State Road 100 on the southern flank of Cloyds Mountain (Plate 1); Drilled on January 26-27, 1981, Cored from 5.1' to 52.0' T.D.; 1 1/8" core; 46 percent recovery

Price Formation, upper member

5.1' - 10.3' 2.05' Mudstone, dark-gray, mm-laminated, with interbedded lenses of siltstone light-gray (2.05')

10.3' - 17.0' 3.25' Mudstone, dark-gray, mm-laminated, interbedded with lenses of siltstone, light-gray (1.2'); coal, dull, laminated (0.05'); mudstone, dark-gray with thin coal seams and coalified plant fragments; rooted, 40° dip (1.2'); mudstone, dark-gray, mm-laminated, rooted, interbedded with siltstone lenses, light-gray (0.3'); coal, dull, laminated (0.2'); siltstone, dark-gray, fine-grained, well laminated (0.3')

17.0' - 22.0' 3.9' Sandstone, light-gray, fine-grained, cross bedded, interbedded with siltstone lenses, dark-gray, crossbedded (2.2'); mudstone, dark-gray, mm-laminated (0.15'); sandstone, medium-gray, fine-grained, cross bedded, interbedded with siltstone lenses, dark-gray, crossbedded; 40° dip (1.55')

22.0' - 24.5' 1.55' Sandstone, medium-gray, medium-grained, interbedded with fine-grained, light-gray sandstone and minor siltstone lenses; 40° dip (1.45'); mudstone, medium-gray mm-laminated (0.1')

24.5' - 27.0' 1.85' Mudstone, dark-gray, mm-laminated; 40° dip

27.0' - 32.0' 2.60' Mudstone, dark-gray, mm-laminated; 40° dip

32.0' - 37.0' 3.70' Mudstone, mm-laminated, dark- and medium-gray, 40° dip

37.0' - 42.0' 1.00' Mudstone, mm-laminated dark- and medium-gray; 40° dip (0.6'); mudstone, black, poorly laminated with coal partings (0.4')

42.0' - 47.0' 1.80' Coal, black, dull with black mudstone lenses (0.3'); mudstone, black, dull, poorly laminated with coal partings (0.4'); mudstone, mm-laminated dark- and medium-gray (0.6'); mudstone, black, dull, poorly laminated (0.5')

47.0' - 52.0' No recovery

52.0' Total depth

Core hole #3
Located along east side of State Highway 100 on southern flank of Cloyds Mountain (Plate 1), drilled on January 27-28, 1981; cored from 7.0' to 52.3' T.D.; 1 1/8" core; 74 percent recovery.

Price Formation, upper member

7.0' - 12.0' No recovery

12.0' - 14.0' Coal, black, dull, mm-laminated (0.05')

14.0' - 17.0' Sandstone, medium-gray (brownish-gray where weathered, fine-grain with dark-gray siltstone partings (0.55')
17.0' - 17.1'  Sandstone, medium-gray, brownish-gray where weathered, fine-grained
17.1' - 17.3'  No recovery

Price Formation, lower member

17.3' - 17.35'  Sandstone, light-brownish-gray (weathered), coarse-grained
17.35' - 17.55'  No recovery
17.55' - 18.85'  Sandstone, medium-gray, brownish-gray where weathered; coarse-grained; quartzose well bedded; gradational lower contact with

18.85' - 20.15'  Sandstone, medium-gray, coarse-grained, massive, quartzose;
20.15' - 21.1'  Sandstone, medium-gray, medium-grained, massive, 40° dip; gradational lower contact with
21.1' - 22.4'  Sandstone, dark-gray, fine-grained, massive;
22.4' - 23.8'  Sandstone, medium-gray, medium-grained, massive;
23.8' - 24.0'  Sandstone, dark-gray, fine-grained, massive, 40° dip;
24.0' - 24.9'  Sandstone, medium-gray, medium-grained, massive;
24.9' - 25.4'  Sandstone, dark-gray, fine-grained, massive;
25.4' - 25.85'  Sandstone, medium-gray, medium-grained, massive;
25.85' - 27.00'  Sandstone, dark-gray, fine-grained, massive;
27.00' - 30.85'  Sandstone, medium-gray, medium-grained, massive, 40° dip;
30.85' - 31.2'  Sandstone, medium-gray, coarse-grained, massive;
31.2' - 32.0'  Sandstone, medium-gray, medium-grained, massive to well bedded;
32.0' - 32.2'  No recovery
32.2' - 36.8'  Sandstone, medium-gray, medium-grained, massive to well bedded, 40° dip;
36.8' - 38.5'  No recovery
38.5' - 41.8'  Sandstone medium-gray, medium-grained, massive to bedded; 40° dip;
41.8' - 42.0'  Sandstone, dark-gray, fine-grained, well bedded;
42.0' - 47.15'  Sandstone, medium-gray, medium-grained, massive;
47.15' - 47.6'  Sandstone, dark-gray, fine-grained, well bedded;
47.6' - 47.8'  Sandstone, medium-gray, medium-grained, massive;
47.8' - 48.1'  Sandstone, dark-gray, fine-grained, well bedded;
48.1' - 48.5'  Sandstone, medium-gray, medium-grained, massive, with coalified plant fragments and partings;
48.5' - 50.45'  Sandstone, medium-gray, medium-grained, massive, quartzose with lithic feldspar and mica grains;
50.45' - 50.6'  Sandstone, dark-gray, fine-grained, massive; 40° dip;
VIRGINIA DIVISION OF MINERAL RESOURCES

50.6' - 52.3'
Sandstone, medium-gray, medium grained, massive;

52.3'
Total depth

Core hole #3A
Located along east side of State Route 100 on the southern flank of Cloyd Mountain about 3 feet south of #3; drilled January 28, 1981; cored from 4.0' to 17.0' T.D.; 2" core; 9 percent recovery
Price Formation, upper member
4.0' - 8.5'
0.15' Mudstone, dark-gray, well laminated with coalified plant fragments
8.5' - 17.0'
1.0' Mudstone, dark-gray to black, well laminated, with coalified plant fragments (0.25'), sandstone, light-gray, medium-grained, quartzose with minor feldspar and mica (0.1'); sandstone, light-gray, fine-grained, with lenses of mudstone, dark-gray, well laminated, and coalified plant fragments; 40° dip (0.65°)
17.0'
Total depth

Core hole #4
Located along west side of State Road 643 on the southern flank of Little Walkers Mountain (Plate 1), drilled January 29-February 5, 1981; cored from 9.0' to 39.0' T.D.; 1 1/8" core; 30 percent recovery.
Price Formation, upper member
9.0' - 14.0'
0.25' Siltstone, light-brown (weathered), laminated
14.0' - 19.0'
1.7' Sandstone, lithic, light-reddish-brown (weathered), medium-grained, well bedded with argillaceous partings to massive; contains quartz, feldspar and mica, 40° dip
19.0' - 24.0'
2.45' Sandstone lithic, light-brown with reddish-brown streaks (weathered), medium-grained, well bedded with argillaceous partings; contains rounded 0.5 cm clasts of claystone (minor); grades downward into coarse grained sandstone at base; 40° dip
24.0' - 29.0'
0.25' Sandstone, reddish-brown (weathered), medium-grained (0.1'); sandstone, light-brown (weathered), fine-grained (0.15')
29.0' - 34.0'
2.2' Mudstone, medium-gray, mm-laminated with coalified plant fragments near base (2.15'); coal, black, dull, as coalified parting in gray mudstone (0.05')
34.0' - 39.0'
2.3' Coal, black, bright, massive (0.4'); coal, black, bright, massive, disseminated within medium- grained quartz sandstone and concentrated along bedding surfaces (0.5')
Price Formation, lower member
1.4' Sandstone, medium- to dark-gray, medium-grained with coal partings, calcite veins and coalified plant fragments
39.0'
Total depth

Core hole #5
Located along west side of State Road 781 about 20' south of where road crosses creek (Plate 1); drilled February 6, 1981; cored from 4.0' to 44.0' T.D.; 1 1/8" core; 57 percent recovery.
Price Formation, upper member
4.0' - 9.0'
1.9' Siltstone, medium-gray, well laminated (0.1'); sandstone, light-gray, medium-grained, well laminated, calcite-filled fractures (0.65'); siltstone, medium-gray, well laminated,
grades downward into sandstone, medium gray, fine-grained, well laminated (0.3'); overlies with sharp contact, sandstone, medium-gray, medium-grained, massive, 30° dip (0.5'); siltstone, dark-gray interbedded with lenses of sandstone, dark-gray, fine-grained (0.35')

<table>
<thead>
<tr>
<th>Depth Range</th>
<th>Thickness (ft)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.0' - 14.0'</td>
<td>4.05'</td>
<td>Sandstone, light-gray, medium-grained, massive with sharp contact (0.35'); overlies mudstone, dark-gray, laminated, burrowed (0.1'); overlying sandstone, light-gray, medium-grained, massive with sharp contact (0.15'); overlying complete cycle of mudstone, dark-gray, laminated at top; grades downward into fine-grained massive sandstone than grades into crossbedded, dark-gray siltstone and fine-grained sandstone with massive, light-gray, medium-grained sandstone at base (1.05'); mudstone, dark-gray, laminated grades downward into dark-gray fine-grained sandstone (0.05'); overlies sandstone, light-gray, medium-grained with lenses with mudstone clasts and lenses of mudstone, 25° dip (0.90'); sandstone, dark-gray, fine-grained (0.1'); siltstone, dark-gray, interbedded with dark-gray mudstone (0.2'); sandstone, light-gray, medium-grained (1.0'); sandstone, light-gray, fine-grained with scattered mudstone lenses (0.15')</td>
</tr>
<tr>
<td>14.0' - 19.0'</td>
<td>2.3'</td>
<td>Sandstone, light-gray, fine-grained with scattered, thin, mudstone lenses (0.95'); siltstone, dark-gray, laminated (0.55'); sandstone, light-gray, fine-grained with mudstone partings (0.3'); sandstone, light-gray, medium-grained; 25° dip (0.1'); sandstone, medium-gray, medium-grained with mudstone lenses (0.2'); sandstone, medium-gray, medium-grained (0.2')</td>
</tr>
<tr>
<td>19.0' - 24.0'</td>
<td>1.3'</td>
<td>Sandstone, light-gray, medium-grained (0.2'); sandstone, light-gray, fine-grained (0.05'); sandstone, light-gray, medium-grained, 30° dip (0.35'); mudstone, dark-gray, laminated (0.05'); siltstone, dark-gray, with fine-grained sandstone lenses (0.15'); sandstone, medium-gray, fine-grained with siltstone partings (0.1); sandstone, light-gray, medium-grained (0.1'); mudstone, dark-gray, mm-laminated (0.3')</td>
</tr>
<tr>
<td>24.0' - 29.5'</td>
<td>0.45'</td>
<td>Coal, black, dull, laminated, 30° dip (0.2'); siltstone, dark-gray interbedded with light-gray, fine-grained sandstone (0.25')</td>
</tr>
<tr>
<td>29.5' - 34.0'</td>
<td>3.65'</td>
<td>Coal, black, dull (0.1'); sandstone, dark-gray, well bedded; interbedded with lenses of siltstone, dark-gray, laminated, 25° dip (2.0'); coal, black, bright (0.35'); mudstone, dark-gray, with coal partings and coalified plant fragments (1.2')</td>
</tr>
<tr>
<td>34.0' - 39.5'</td>
<td>4.75'</td>
<td>Mudstone, medium-gray, mm-laminated with scattered coalified plant fragments (2.2'); overlying siltstone, dark-gray, with lenses of fine-grained, dark-gray sandstone (0.2'); overlying mudstone, black, dull with pyrite and coalified plant fragments (0.6'); overlying mudstone, dark-gray, mm-laminated, 30° dip (0.4'); overlying</td>
</tr>
</tbody>
</table>

Price Formation, lower member

sandstone, medium-gray, fine-grained, with lenses of siltstone, dark-gray (1.35')

<table>
<thead>
<tr>
<th>Depth Range</th>
<th>Thickness (ft)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>39.5' - 39.9'</td>
<td>0.15'</td>
<td>Sandstone, medium-gray, fine-grained</td>
</tr>
<tr>
<td>39.9' - 43.8'</td>
<td>3.9'</td>
<td>Sandstone, medium-gray, fine-grained, (0.25') overlying sandstone, medium-gray, fine-grained interbedded with lenses of dark-gray siltstone, 25° dip (0.3'); overlying siltstone, dark-gray, well bedded (0.25'); overlying sandstone, medium-gray, fine-grained interbedded with lenses of dark-gray siltstone (0.75'); overlying siltstone, dark-gray, well bedded (0.20'); gradation lower contact with sandstone, medium-gray, fine-grained (0.25'); overlies siltstone, dark-gray, crossbedded, (0.2'); gradation lower contact with sandstone, medium-gray, fine-grained, (1.3')</td>
</tr>
<tr>
<td>43.8' - 44.0'</td>
<td>0.2'</td>
<td>Sandstone, dark-gray, fine-grained with lenses of dark-gray siltstone</td>
</tr>
<tr>
<td>44.0'</td>
<td>Total depth</td>
<td></td>
</tr>
</tbody>
</table>
Core hole #6

Located along north side of State Road 619 about 50' north of bend which is 2900' east of junction with State Road 705 (formerly 659) (Plate I); drilled March, 1981 cored from 16.0' to 122.0' T.D.; 3" core from 16.0' to 19.0'; 1 7/8" core from 19.0' to 122.0'; 95 percent recovery.

Price Formation, upper member

16.0' - 16.2'
Sandstone, light-brownish-gray (weathered) medium-grained;

16.2' - 16.4'
No recovery

16.4' - 16.5'
Conglomerate, quartz pebble, in dark-gray, coarse-grained sandstone matrix.

16.5' - 16.7'
No recovery

16.7' - 16.8'
Sandstone, medium-gray, medium-grained;

16.8' - 18.7'
Sandstone, light-gray, medium-grained, massive, with lithic (mudstone) fragments (1-2 cm), quartzose, with lithic feldspar and mica grains, 50° dip;

18.7' - 20.0'
No recovery

20.0' - 20.2'
Sandstone, light-gray, medium-grained, massive;

20.2' - 21.4'
Sandstone, light-gray, coarse-grained, massive; quartzose, with lithic feldspar and mica grains; quartz veins

21.4' - 22.2'
Sandstone, light-gray, medium-grained, massive, quartzose, with lithic feldspar and mica grains, lithic (mudstone) fragments (1-5 cm); 1-2 mm quartz veins;

22.2' - 33.9'
Sandstone, light-gray, coarse-grained, massive, with quartz veins and vugs filled with quartz crystals;

33.9' - 34.0'
No recovery

34.0' - 35.5'
Sandstone, light-gray, coarse-grained, massive;

35.5' - 40.7'
Sandstone, light-gray, medium-grained, massively bedded at top, grades downward into poorly bedded - defined by irregular black partings;

40.7' - 40.9'
Sandstone, light-gray, coarse-grained, massive;

40.9' - 42.0'
Sandstone, medium-gray, medium-grained, irregularly bedded with black, wavey, slickensided mudstone partings 25° dip;

42.0' - 42.8'
Conglomerate, lithic with rounded clasts (0.1-1 cm) of fine- and medium-grained sands, medium-grained, medium-gray quartzose sandstone matrix, 4 cycles of conglomerate fining upward to sandstone thence to mudstone at top of each cycle;

42.8' - 43.3'
Mudstone, dark-gray, slickensided, 30° dip;

43.3' - 44.0'
No recovery

44.0' - 52.6'
Mudstone, dark-gray, mm-laminated; rooted at about 45' and 48', concretions at about 50.5'; fine-grained crossbedded sandstone lenses at about 50.6' and 54.3';

52.6' - 53.4'
Sandstone, light-gray, medium-grained, well bedded, both upper and lower contacts are sharp;

53.4' - 58.1'
Sandstone, medium-gray, medium-grained at bases of five cycles with scoured bases; each grades upward to fine grained, dark gray sandstone and siltstone, 30° dip, burrowed at 56.1'; scoured bases at 54.8', 55.9', 56.8', 57.8' and 58.2';
58.1' - 58.8'
Sandstone, dark-gray, fine-grained, interbedded with siltstone, dark-gray, burrowed;

58.8' - 60.3'
Mudstone, dark-gray, mm-laminated, rooted from 58.8' to 59.4', iron concretions at 59.3' forms top of cycle above

60.3' - 60.8'
Siltstone, dark-gray interbedded with sandstone, dark-gray, fine-grained, crossbedded, burrowed; gradation contact within

60.8' - 61.2'
Sandstone, medium-gray, fine-grained, burrowed, scoured base is base of cycle;

61.2' - 66.0'
Sandstone, medium-gray, fine-grained, interbedded with siltstone, dark gray, crossbedded, burrowed;

66.0' - 64.7'
Mudstone, dark-gray, mm-laminated with lenses of siltstone, dark-gray, iron concretions at 63.7', rooted at 64.2';

64.7' - 64.9'
Coal, black, dull

64.9' - 69.8'
Mudstone, dark-gray, mm-laminated, coal partings at 69.1; 50° dip;

69.8' - 70.6'
No recovery

70.6' - 71.2'
Siltstone, dark-gray, interbedded with sandstone, dark-gray, fine-grained, 20° dip; gradational lower contact with

71.2' - 71.5'
Sandstone, dark-gray, fine-grained, scoured base, fills in irregular surface above deformed beds; below is

71.5' - 71.8'
Sandstone, medium-gray, fine-grained, folded (soft sediment slump);

71.8' - 75.0'
Mudstone, dark gray, mm-laminated to 73.0', folded (soft sediment slump) with vertical beds at top, highly disrupted bedding 73.6' - 75.0';

75.0' - 75.5'
No recovery

75.5' - 76.1'
Mudstone, dark-gray, mm-laminated;

76.1' - 76.3'
Siltstone, dark-gray, well bedded;

76.3' - 76.5'
Mudstone, dark-gray, mm-laminated;

76.5' - 76.7'
Siltstone, dark-gray well bedded;

76.7' - 77.1'
Mudstone, dark-gray, mm-laminated;

77.1' - 77.7'
Siltstone, dark-gray, interbedded with mudstone, dark gray, well bedded;

77.7' - 78.3'
Siltstone, medium-gray, interbedded with sandstone, medium-gray, fine-grained

78.3' - 79.0'
Siltstone, medium-gray, interbedded with sandstone, medium-gray, fine-grained, slump structure; 80° dip;

79.0' - 79.3'
No recovery

79.3' - 79.5'
Siltstone, dark-gray well bedded;

79.5' - 79.7'
Sandstone, dark-gray, fine-grained, 20° dip;

79.7' - 80.0'
Siltstone, dark-gray, well bedded;
80.0' - 81.7' Mudstone, dark-gray, mm-laminated, disturbed bedding;
81.7' - 84.0' No recovery
84.0' - 85.1' Mudstone, dark-gray, mm-laminated, disturbed bedding;
85.1' - 86.6' Coal, black, bright, laminated with dull lenses;
86.6' - 88.3' Mudstone, dark-gray, mm-laminated;
88.3' - 89.05' Mudstone, black, with coal partings;
89.05' - 89.45' Coal, black, bright, laminated with dull lenses;
89.45' - 90.5' Mudstone, black, mm-laminated, coal partings, rooted;
90.5' - 90.7' Siltstone, dark-gray, interbedded with black mudstone;
90.7' - 91.2' Mudstone, dark-gray, mm-laminated;
91.2' - 91.4' Siltstone, medium-gray, fine-grained;
91.4' - 95.0' Mudstone, dark-gray, mm-laminated, disrupted bedding at 91.8', 92.7', 93.9';
95.0' - 95.3' Sandstone, medium-gray, fine-grained, cross bedded;
95.3' - 95.5' Mudstone, dark-gray, mm-laminated;
95.5' - 95.7' Sandstone, medium-gray, fine-grained, cross bedded;
95.7' - 95.9' Mudstone, dark-gray, mm-laminated;
95.9' - 96.8' Siltstone, medium-gray, interbedded with sandstone, medium-gray, fine-grained; crossbedded;
96.8' - 97.3' Sandstone, medium-gray, medium-grained, interbedded with lenses of medium-gray, fine-grained sandstone;
97.3' - 97.5' Mudstone, dark-gray, mm-laminated;
97.5' - 97.7' Sandstone, medium-gray, medium-grained;
97.7' - 98.1' Mudstone, dark-gray, mm-laminated;
98.1' - 98.6' No recovery
98.6' - 99.3' Mudstone, black, with minor coalified partings;
99.3' - 101.8' Mudstone, dark-gray, mm-laminated;
101.8' - 102.0' Sandstone, medium-gray, fine-grained;
102.0' - 102.3' Siltstone, dark-gray, well bedded;
102.3' - 103.3' Sandstone, medium-gray, fine-grained, interbedded with medium-gray siltstone lenses, crossbedded;
103.3' - 103.6' Siltstone, dark-gray, well bedded;
103.6' - 109.0' Mudstone, dark-gray, mm-laminated; with siltstone lenses; minor coal partings, minor rooted;
109.0' - 111.55' Mudstone, black, dull, massive to poorly laminated, rooted, fossils at 109.3', 109.9', calcite vein at 110.2', coal parting at 110.5', 20º dip;
111.55' - 112.2'
Coal, black, bright;

112.2' - 112.5'
Mudstone, dark-gray, with coal partings;

112.5' - 112.7'
Coal, black, bright;

112.7' - 113.0'
Mudstone, dark-gray; with coal partings, slickensided base;

113.0' - 122.0'
No recovery; entered 9' high abandoned shaft filled with water; upon removal of drill pipe well flowed and was plugged at surface

122.0'
Total depth
INSERT MAP AFTER PAGE 33
GEOLOGIC MAP OF DEVONIAN AND MISSISSIPPIAN STRATA IN MONTGOMERY AND PULASKI COUNTIES, VIRGINIA

Mervin J. Bartholomew and K. Elizabeth Brown

1992

EXPLANATION

KEY

CONTACTS

 Deposited, preserved, or covered

 Deposited, preserved, or covered; 7, upper most

 FOULS

 Antithetic: trend, direction of plunge

 Synthetics: trend, direction of plunge

 FAULTS

 Deposited, preserved, or covered

 ATTITUDE OF ROCKS

 Angle of dip and dip of bed

 Angle of strike of bedding

 Angle of dip of overturned bed

 Horizontal bed

 SCALE

 1:100,000

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 Mccarthy Formation: Mns-Upper member; Mnt- Lower member

 Price Formation: Mns-Upper member; Mnt-Lower member; Mps-Clayey Conglomerate Member

 Chinnery Formation

 Bridget Formations

 Mouths Shale

 Devonian and Silurian rocks unfoliated

 Devonian, Emsian, and Ordovician rocks unfoliated

 Silurian, Ordovician, and Cambrian rocks unfoliated

 Cambrian rocks unfoliated

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 COMMUNILE OF VIRGINIA
 DEPARTMENT OF MINES, MINERALS, AND ENERGY
 DIVISION OF MINERAL RESOURCES

 MINES AND PROSPECTS

 A-15 K. and XL: Location of stratigraphic sections described in Appendix I and II.

 GAST SYSTEM

 W-62: Kipps-Armour Coal Company #1 well, California County (Chesapeake Gas Company), plug and abandoned.

 CORE HOLES

 W-6536, Prince Park well; W-6535, Harvard well; W-6534, Harvard well; W-6531, in Blount County, 1932, for core drilling.

 Holes: Elevation

 1. 2. 3. 4. 5. 6. Core description in Appendix III this volume. P-2, Blount Co., 1936, 1936 data not fit; approximate boundary.
