

(P-2-98)

M E M O R A N D U M

**cc: Balke Engineers
George Best**

TO: Bill Madden, P.E.
Pre-Construction Branch Manager
District 10, Jackson

FROM: William Broyles, P.E.
Geotechnical Engineering
Branch Manager
Division of Materials

BY: E.M. Wright ^{EW} & Everett Gray ^{EG}
Geotechnical Branch

DATE: May 12, 1998

SUBJECT: Wolfe, Morgan, & Magoffin Counties
Mountain Parkway Extension
OSTPR 061-011; FD52 121 MTPK EXTNSON 001 D
Item 10-126.0

At your request, a geotechnical overview for the subject project is completed. This project is in the Eastern Kentucky Coal Field physiographic region which is characterized by dissected uplands with narrow to broad valleys and short to long narrow crested ridges. Maximum elevations of the ridges commonly range from 340M (1115 ft) to 385M (1263 ft) while valley bottom elevations range from 160M (853 ft) to 290M (951 ft). Maximum vertical relief along the alignment is approximately 95M (312 ft).

A dendritic system has developed from stream erosion through sedimentary bedrock. Watershed areas formed by mountainous terrain results in large surface runoff volumes and flash flooding can be a frequent occurrence in the valleys along the alignment. The surface drainage from station 66+528.212 to station 96+200 will flow through tributaries into the Red River and drainage from station 96+200 to station 115+057.714 will flow through tributaries into the Licking River.

The formations along the proposed route are part of the Quaternary and Pennsylvanian systems. The Quaternary alluvium is detrital materials consisting of clays, silts, sands, gravels and boulders. A thickness of 0 to 15 meters is estimated to occur along stream beds. The deposits are usually shallow in narrow

Memorandum to Bill Madden, P.E.

P-02-98

May 12, 1998

Page -2-

tributary streams and deeper in broader valleys.

The Pennsylvanian age rocks are in the Breathitt Formation which consists of cyclic sequences of sandstone, siltstone, shale, and coal. Rock units tend to be lenticular, heterogeneous and discontinuous over relatively short horizontal distances. The sandstones are typically gray to buff, fine to coarse grained, cross-bedded, frequently calcareous and sideritic, and may contain coal stringers, partings, and spars. Interbedded shales are often present within the sandstone units. Shales are generally gray to dark gray and may weather to brown color. The shales are sometimes carbonaceous or calcareous and may contain siderite nodules.

Thirteen coal zones are present in this area. ~~Underground or deep~~ mining has not occurred along this alignment at this time. A strip mine (Whitesburg or Fire Clay) is left of station 79+750 and acid drainage appears to be coming from the reclaimed land. The alignment will not be close to the striped area and stability problems will not be encountered. A small mine adit in the Cannel City coal bed is present left of station 81+000 at elevation 310.9 meters (1020 ft). Coal zones to be encountered along the alignment include the Grassy, Virea, Upper Elkhorn #3, Amburgy, Cannel City, Fire Clay / Whitesburg, Hamlin, Copland, Haddix, Hazard, Peach Orchard, Hindman, and Broas.

If active coal mines are present at the time of construction, then special safety regulations apply to construction activities when crossing mains or active sections of coal mines. These can include temporary suspension of mine production and evacuation of personnel from the mine. The mining companies may request compensation for reduced production during roadway construction blasting activities.

The regional dip is approximately 12 meters per 1.6 kilometers to the East and there are two known faults in the area which will have a local influence on the dip of beds. Near Stillwater part of the Irvine-Paint Creek fault system crosses the alignment from station 74+000 to 74+300 and the beds will dip in both directions parallel to the fault line and drag zone. The Johnson creek fault system will cross the alignment near station 99+100 and the beds may be

Memorandum to Bill Madden, P.E.

P-2-98

May 12, 1998

Page -3-

dipping in the cut section. The most likely locations for springlines, saturated slopes and wet areas can be anticipated to be down dip from coal outcrops or through fault zones.

Geological details can be found on the following Geological Quadrangle maps:

Campton	GQ #1502	Station	66+528	to	73+150
Hazel Green	GQ #266	Station	73+800	to	75+100
		Station	86+250	to	86+550
Cannel City	GQ #1498	Station	86+550	to	97+900
Lee City	GQ #198	Station	97+900	to	98+850
Seitz	GQ #1435	Station	98+850	to	105+400
		Station	106+800	to	110+950
White Oak	GQ #1480	Station	105+400	to	106+800
Landsaw	GQ #201	Station	73+150	to	73+825
		Station	75+100	to	86+250
Salyersville					
South	GQ #1373	Station	110+950	to	115+057.7

Environmental Considerations ...

1. The alignment crosses several coal zones which may be producing acid drainage. The Hindman, Francis, Grassy, and Cannel City coal seams are anticipated to contain levels of acid producing materials. The "hot coal" should be wasted outside of the roadway and buried or encased with 1.5 meters of soil and or nondurable shale. Cut sections in acidic material should have drainage ditches lined with limestone or calcareous sandstone.

2. The alignment crosses 12 blueline streams where disturbance may be required and attempts should be made to minimize the impacts by appropriate methods such as limited channel changing, erosion control and fish habitat improvement.

3. The Corbin sandstone is a friable sandstone and is exposed at various locations, including the watershed of Campton's Municipal water supply and headwaters of the Red River. Where exposed, erosion control methods such as silt fences, straw bales, rock check dams, and settling ponds will be needed to prevent stream siltation.

Memorandum to Bill Madden, P.E.
P-02-98
May 12, 1998
Page -4-

Geotechnical Considerations ...

1. Soil overburden depths may vary from a few tenths of a meter on ridge tops to more than 15 meters along the Licking River.

2. The average soil stripping depth is estimated to be 0.15 meters and a soil shrinkage factor of 2 percent is recommended to be applied in accordance with the Design Guidance Manual Section.

3. Rock Swell Factors for this project are estimated to be as follows: 0% to 10% for Non-Durable Shales; and 15% for Sandstone, and Durable Shales.

4. A CBR value of 6 is recommended if nondurable shales are utilized. If sandstone or durable shales are available in sufficient quantities for subgrade a CBR of 11 or 9 respectfully is anticipated.

5. Cut slopes in the durable shales, and sandstones will be stable on 1:20 - 1/2:1 presplit slopes with 5.5 M to 6.1 M benches and a 4.5 meter overburden bench at the bottom of the overburden and rock disintegration depth. Back slopes will depend on the joint angles and the lift heights will be determined by lithology. The average RDZ depth extends approximately 3 to 4.5 meters below groundline in cut sections.

6. Cut slopes in nondurable shales should be 1:1 or flatter. Side hill conditions should be avoided in these formations where possible.

7. For estimation purposes, an overall 1:1.25 slope should be used for cuts and a 1:2 slope for embankments.

8. Special shale compaction procedures may be required where nondurable shales are utilized.

Memorandum to Bill Madden, P.E.

P-02-98

May 12, 1998

Page -5-

9. Sandstone or siltstones should be placed in bottom of fills to the maximum high water elevation at the following locations: Swift Camp Creek, Trace Fork, Baptist Fork, Stillwater Creek, Landsaw Creek, Lacy Creek Gillmore Creek Red River, State Road Fork, Johnson Creek, Cow Creek, and the Licking River.

10. Embankment benches will be necessary in sidehill conditions. Limestone or sandstone (2 feet minimum) should be placed on the benches for drainage.

11. Spring boxes and underdrains will be necessary when springs, and water bearing coal seams are encountered in the embankment areas and undercuts.

12. Durable Sandstone & Durable Shale are suitable for all roadway uses.

13. Friable Sandstone is suitable for free draining fill & embankments, however it shall be constructed in 0.1 Meter lifts and protected from erosion.

14. This project is in a classified Seismic Risk Zone 1 which is defined as an area of moderate damage due to earthquake activity.

Log of detrimental conditions:

Listed below are utilities at stations which may require relocation.

A Fiber Optic Line

Right of Station	68+500	to	70+650
Left of Station	70+650	to	72+500
Left of Station	78+000	to	87+500
Right of Station	87+500	to	105+500
Right of Station	106+700	to	114+900
Left of Station	14+900	to	115+057

Memorandum to Bill Madden, P.E.
P-02-98
May 12, 1998
Page -6-

Gas Line Crossings

Station 68+575
Station 79+300
Station 108+500

A radio tower guy wire

Right of Station 68+800

Line adjustments may be necessary to avoid (or relocate) cemeteries.

Left of Station 76+000
Left of Station 93+000
Left of Station 101+495
Left of Station 102+425

Line should be adjusted to avoid Campton Lake

Left of Station 68+750 to 70+000

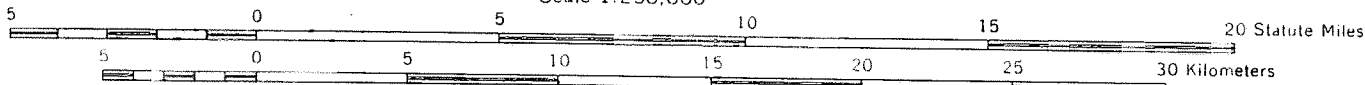
Line should be adjusted to avoid embankment failures

Right of Station 70+700
Right of Station 71+100

If additional information is required, please advise.

Attachments - 2

Scale 1:250,000



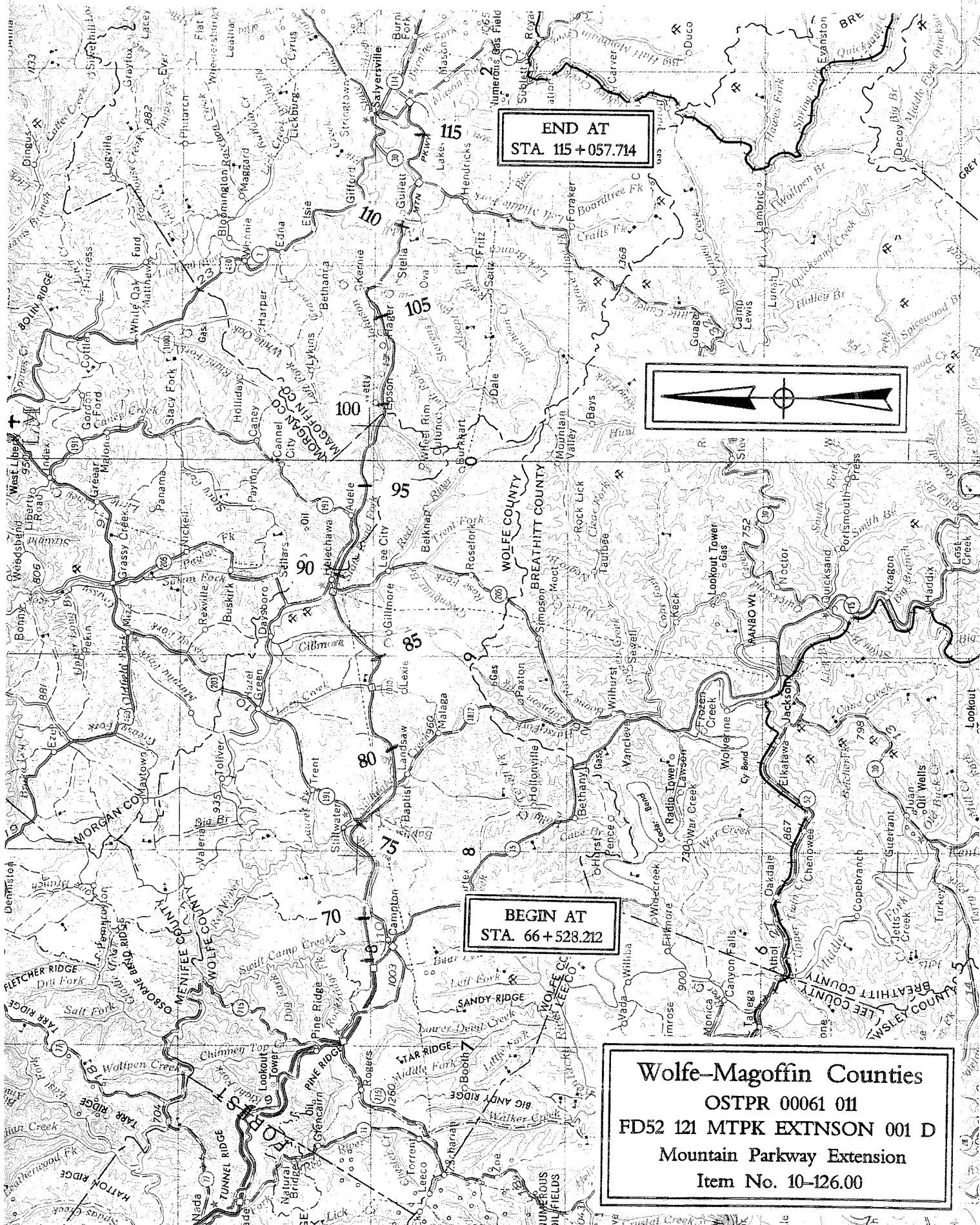
CONTOUR INTERVAL 100 FEET

**END AT
STA. 115 +057.714**

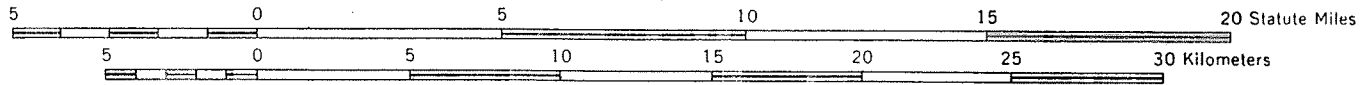


**BEGIN AT
STA. 66 +528.212**

Wolfe-Magoffin Counties
 OSTPR 00061 011
 FD52 121 MTPK EXTNSON 001 D
 Mountain Parkway Extension
 Item No. 10-126.00



Scale 1:250,000

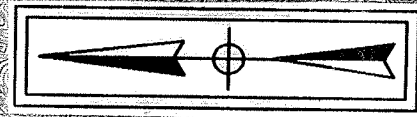


CONTOUR INTERVAL 100 FEET

END AT
STA. 115+057.714

BEGIN AT
STA. 66+528.212

SERIES	GROUP, FORMATION, MEMBER, AND BED	LITHOLOGY	THICKNESS IN FEET	THICKNESS IN METERS
TERTIARY AND QUATERNARY SYSTEM	Quaternary	Alluvium	0-10	0-3
	Pleistocene	Terrace deposits	0-100	0-30
PENNSYLVANIAN	Middle Pennsylvanian Lee and Breathitt Formations Lee Formation and lower part of Breathitt Formation	High-level fluvial deposits		
		Knob (Richardson) coal zone	150+	45+
		Broas coal zone		
		Hindman coal bed		
		France Coal Bed	750-800	76-190
		Pracht Orchard coal zone		
		Hazard (Barton Mountain) coal bed		
		Hazard No 7 Coal Bed		
		Hazard (Barton Mountain) coal bed		
		Haddix coal zone		
		Magoffin Member	0-16	0-16
		Sharp (Copland) coal bed		
		Hamlin coal zone		
		Fire Clay-Whitesburg coal zone		
		Cannal City coal bed		
Amburg coal zone				
Jordan coal bed				
Upper Elkhorn No. 3 coal zone	500-800	150-240		
Elk Gap coal bed				
Utah Covey Coal Bed				
Grassy Coal Bed				
Vine Coal Bed				
Zachariah Coal Bed				
Van Clave Coal Bed				
Corbin Sandstone Member of Lee Formation	0-100	0-56		
Gray Hawk coal bed				
Brantville coal bed				



Wolfe-Magoffin Counties
 OSTPR 00061 011
 FD52 121 MTPK EXTNSON 001 D
 Mountain Parkway Extension
 Item No. 10-126.00