

Kentucky Geohazards In Transportation



[Isaiah 40:4]

**“Every valley shall be lifted up,
and every mountain and hill be made low;
the uneven ground shall become level,
and the rough places a plain.”**



From Then to Now

The Herald-Dispatch

FRIDAY
June 3, 2005

Landslides part of life in West Virginia

By JENNIFER BUNDY
The Associated Press

CHARLESTON — West Virginia Division of Highways crews are faced with repairing 1,598 slips and landslides, which a state geologist calls “an underappreciated danger of living in West Virginia.”

“We are one of the states with landslide problems because we’ve got hills and mountains. It’s going to continue to happen,” said Steve McClelland, a geologist with the West Virginia Geological and Economic Survey in Morgantown.

In fact, West Virginia has 13 percent of the economic damage caused by landslides in the United States, second only to Cal-

ifornia, which has 40 percent, according to a U.S. Geological Survey study of damage from 1975-1983. That is the most recent estimate, said J. Steven Kite, a geographer and geologist at West Virginia University.

A landslide in Laguna Beach, Calif., Wednesday destroyed 17 multimillion-dollar houses. The cause is still under investigation, but Ed Harp of the USGS said it was almost certainly related to the winter storms that drenched the area. The area had its second-rainiest season on record.

Landslides

■ Continued from 1A

The USGS study said West Virginia and Utah had the most per capita damage from landslides. But most of Utah’s damage was from one event, Kite said. Per capita figures were not available.

“We have not only high mountains, we have steep valleys. It’s really the steep valleys where your problems are,” Kite said.

Of the 1,598 slides, 957 are in DOH District 6, which stretches from Tyler County to Hancock County.

“We’ve never had anything at all like this before,” said Bob Whipp, District 6 engineer told *The State Journal*. “We’ve got hundreds of slips at once and hundreds of slides.”

Much of the \$107 million in

road repair costs will be reimbursed by the Federal Emergency Management Agency because most problems stemmed from flooding. About \$40 million will not be reimbursed, said state Highway Engineer Marvin Murphy.

Normally, the state spends about \$4 million a year fixing landslides, Murphy said. Since last July 1, it has fixed 526 slides at a cost of \$18.5 million. It will take three or four years to repair all the slides that now exist, he said.

The Northern Panhandle has more problems than elsewhere in part because the Ohio River has carved a deep valley over the last 150 million years. “It takes a long time for the slopes to adjust,” Kite said.

Also, the Northern Panhandle — and the Morgantown area — has a lot of soil and bedrock rich in a certain type of clay.

The soil expands when it is wet and gets heavy, which can cause landslides. It shrinks when it is dry and when it shrinks, it loses strength, which also can cause landslides.

“And there is the old West Virginia approach to slope engineering: trial and error,” Kite said.

California and Colorado have county geologists that have to approve developments, he said.

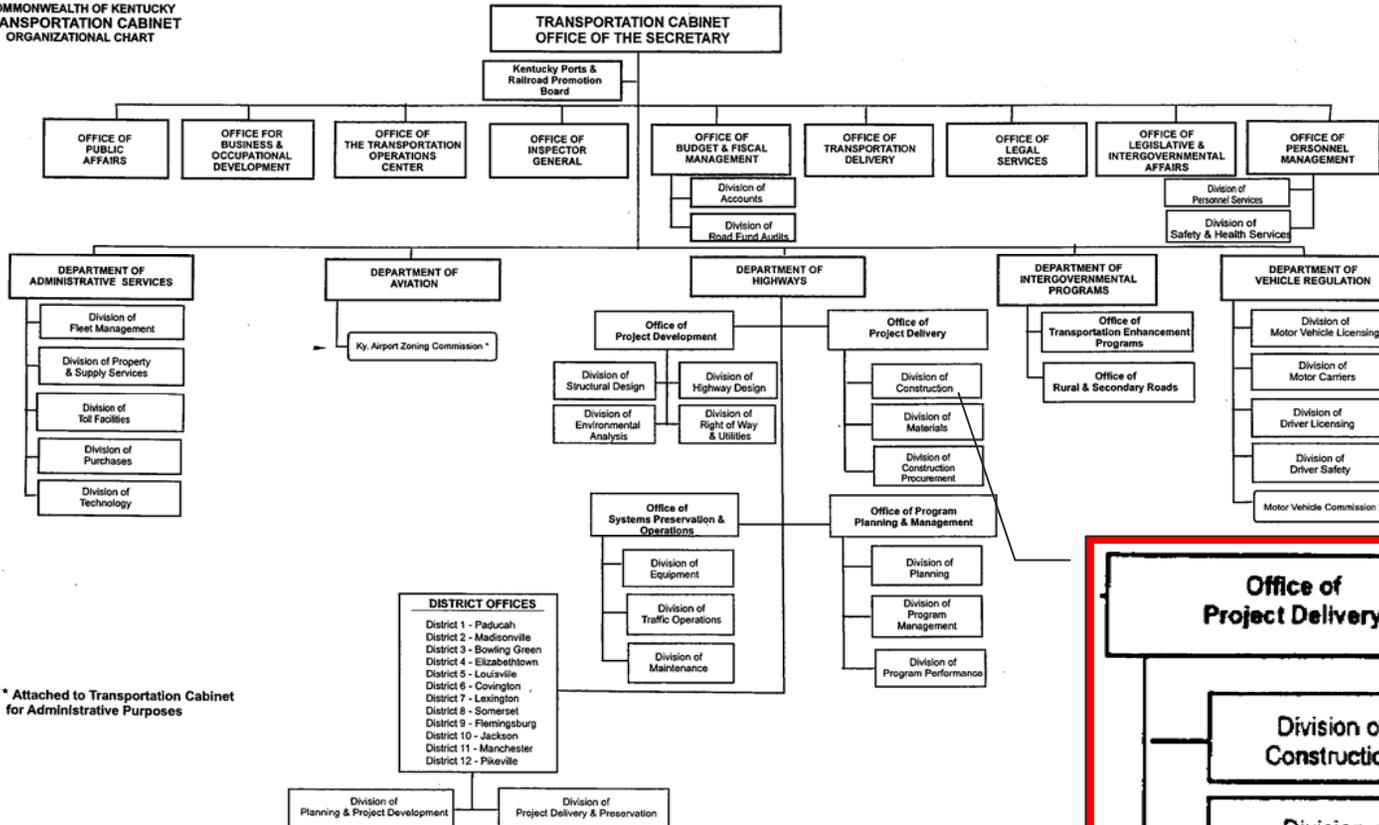
“Around here a lot of counties don’t even have zoning. You can pretty much build whatever you want wherever you want. The result is sometimes the experiments go wrong,” Kite said.

McClelland said landslides are “just something we have to be on the alert for. When people talk about buying houses and worry about being over a coal mine, I tell them you better think about slope stability, too.”

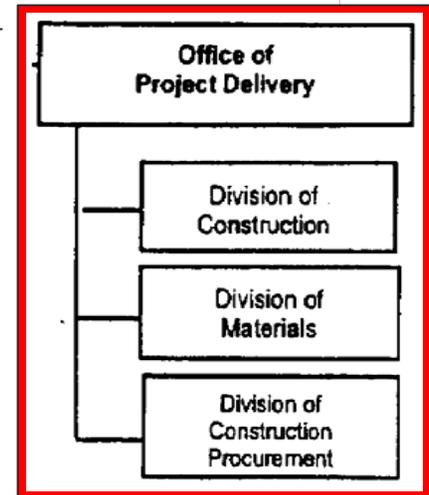
Please see
LANDSLIDES/5A

Transportation Cabinet Organizational Chart

COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET
ORGANIZATIONAL CHART



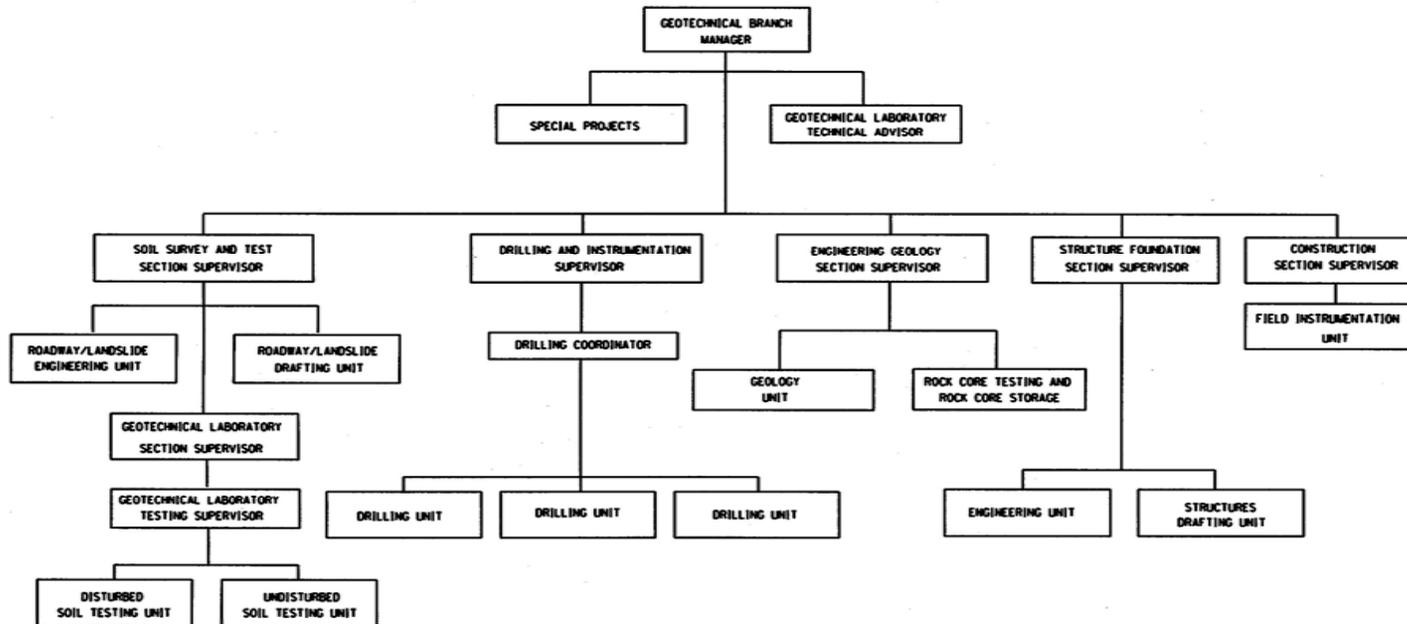
* Attached to Transportation Cabinet
for Administrative Purposes



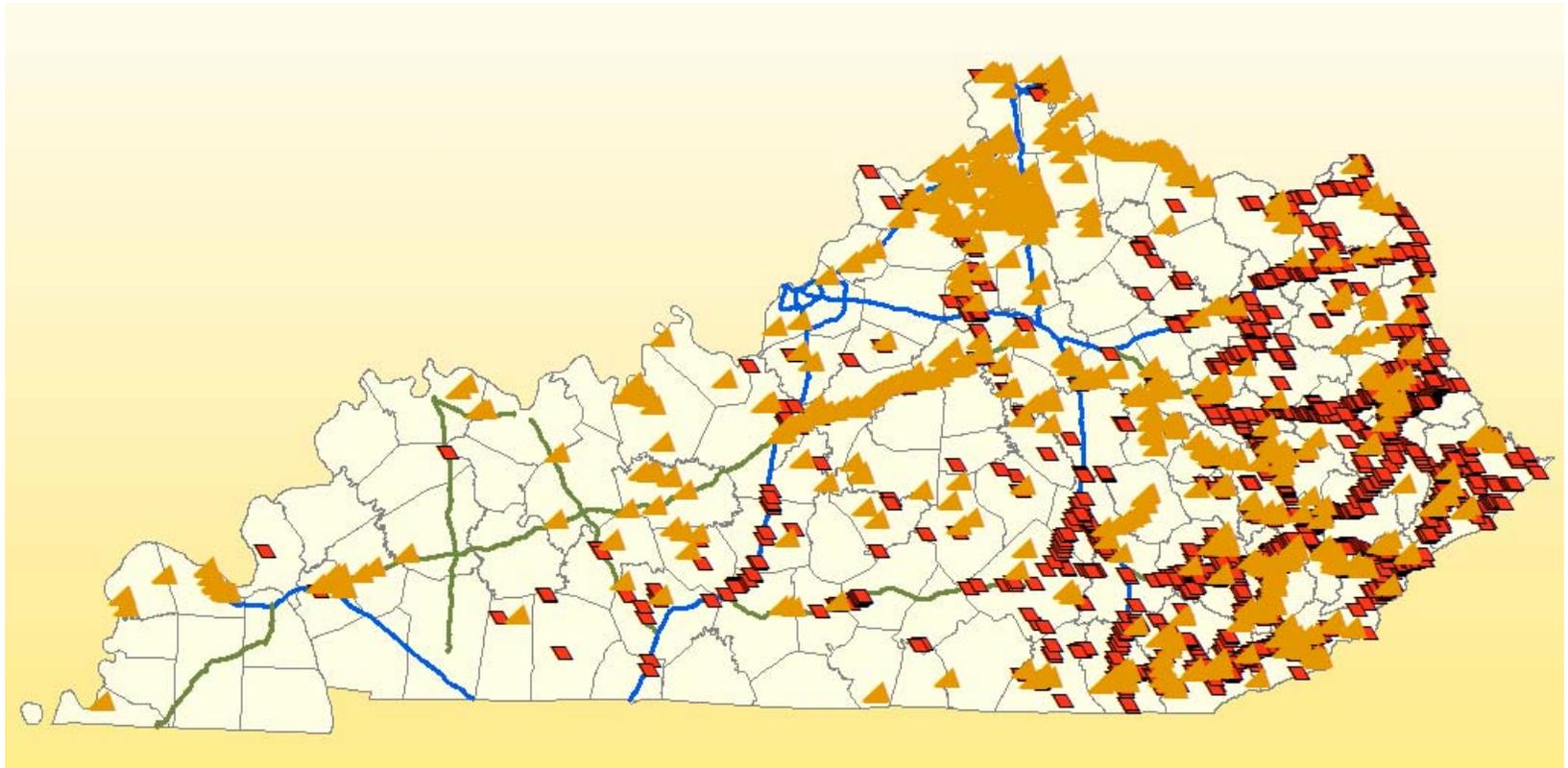
Organizational Chart For Geotechnical Branch

Kentucky Transportation Cabinet - Division of Materials Organizational Chart For Geotechnical Branch

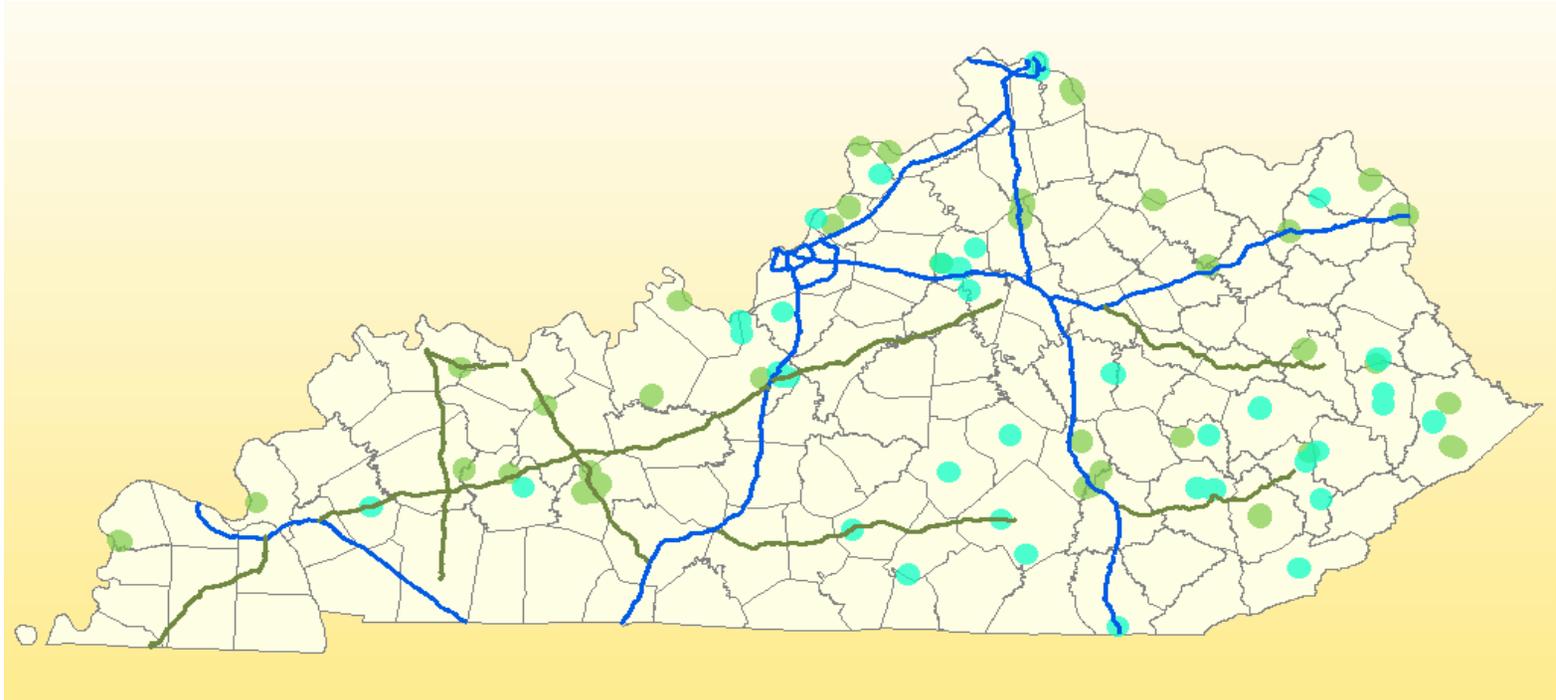
1236 Wilkinson Boulevard; Frankfort KY 40601-1200
PH (502) 564-2374 FAX (502) 564-4839



[Known Landslides & Rockfalls]



[Active Projects]



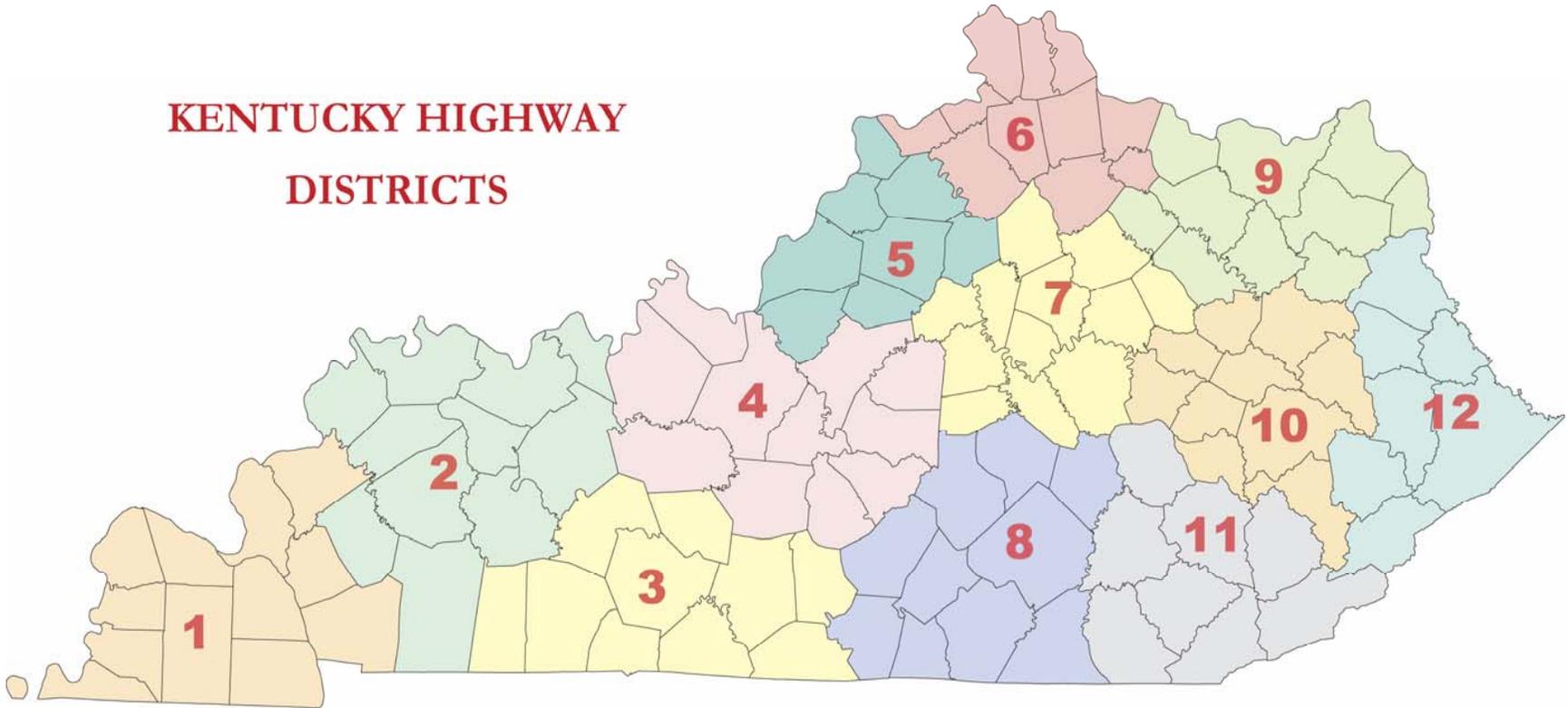
Landslide and Rockfall Costs

- \$44 Million Dollars Spent since 1998
- Six Year Plan
 - Nearly \$50 Million over next six years



Kentucky Highway Districts

KENTUCKY HIGHWAY DISTRICTS



Kentucky Transportation Cabinet Highway District 9



Kentucky Geohazards

- Low Cost Landslide Repairs
- Rockfall Mitigation
- Tied Back Retaining Wall
- Gabion Baskets
- Granular Correction
- New Technology
 - Lightweight Fill- Geof foam and Wood Chips
 - Soil Nail Retaining Wall



Why Emphasis on Geohazards?

Name | *****
Address 1 | **** State Rt. 2
Address 2 |
City | Greenup
State | KY
Zip | 41144
Phone | ***-***-****
Email | *****@*****
IP | **-**-***-***
Date | 7/8/2005 1:55:50 PM
Subject | Citizen concern, Rt. 2, Greenup County, KY

I have done everything as a citizen that I know to do and, for what it's worth, thought I would contact you as my Governor. I love the house and land I live on, which is an old log house built in 1842, and is one of the oldest in the State. However, the road to my house is so dangerous I sometimes wonder if I will ever make it home. I know of many citizens who have complained to the local district office and county officials about the road's hazardous condition of Route 2 was declared an emergency in April by the Greenup Fiscal Court and that decision was supported by Tanya Pullin, Charlie Borders, and the DOT. It was not until I contacted Rep. Pullin in the latter part of June, along with Janet Doe of your office, that anything was actually done to start repair of this road. A news release was issued 6/26 by the DOT saying Rt. 2 would be closed for one day on 6/29 and that construction would last 2 weeks. The problems with this state road begin approximately a mile off U.S. 23 and last to my house. How dangerous to my family and how I travel this road every day. In addition to the potholes, and a speed bump crossing both lanes approximately 1.5 miles out. This is the road some people would take to get to the Jesse Stuart home place. How embarrassing it should be for us for people from outside the State to see the disrepair. How dangerous to my family and I who travel that road every day. What is worse is that State Rt. 1459 (Low Gap) is used as one of the detours to connect from Rt. 2 to Rt. 1. That narrow road has a hump so big from where a tree is uprooting that it is just like riding a rollercoaster. One day after Rep. Pullin asked the DOT to give it their attention, 8 orange cones were placed around it. This does nothing to secure the safety of travelers because the hump is sliding down a curve and the cones and hump aren't visible until you come right on it. Governor, please advise me what is going to be done for the citizens of Greenup County to resolve the situation caused by the deplorable condition of Rt. 2. Rep. Pullin has been very helpful in assisting me; however, it disgusts me that the Highway Department has taken this matter so lightly. I have recently been contacted by Jane Doe of your office. She sent me a letter yesterday after being contacted by Janet Doe. Her letter, though, did not indicate that she really understood my position. I wrote her an e-mail this morning setting forth my concerns and she called me this afternoon. She told me to be looking for a letter from the Transportation Cabinet. I inquired of her whether it would be a response to my concerns and she told me "I would just have to wait until I got it" and that the letter had been prepared and was awaiting a signature. It is obvious to me that the Transportation Cabinet/DOH could care less how many people are injured or killed as a result of the conditions of these roads. I am hoping that you care enough to assist me.

[Landslides]

Cost

- Used Guardrail
- 100 Railroad Rails (40 ft. nominal length) @\$9.50
- Drill- \$3.50/ft.
- Stone- \$7.50/ton

Total- \$52,000

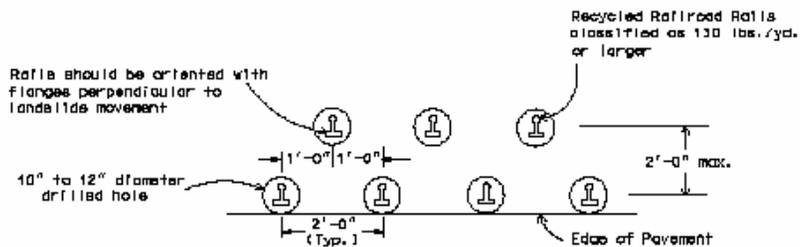


[Landslides]

DETAIL "A"

Slide #1 @ MP 13.7

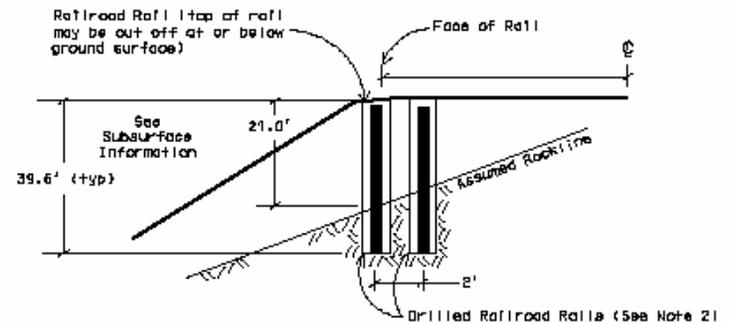
No Scale



TYPICAL CROSS SECTION DETAIL "A"

Slide #1 @ MP 13.7

(No Scale)



Note: At least one third of the total length of each railroad rail should be embedded into rock socket.



[Landslides]



Installation of double row of recycled railroad rails at 2' center



[Landslides]



[Landslides]

Cost

- 840 cu. yds. embankment
- 1475 tons granular embankment
- Type 4 Geotextile Fabric

Total- \$47,500



[Landslides]



[Landslides]

Cost

- Used Guardrail
- 50 Railroad Rails
(40 ft. nominal length)
@\$9.50/ft.
- Drill- \$3.50/ft.
- Stone- \$7.50/ton

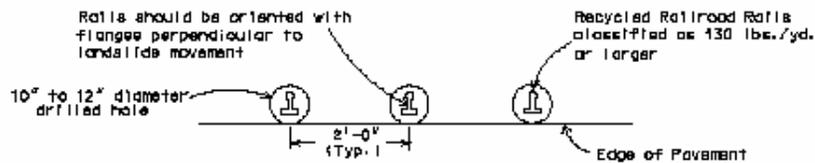
Total- \$26,000



Landslides

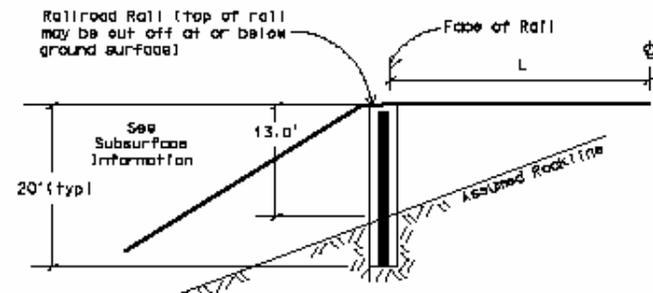
SINGLE ROW

Slide #3 @ MP 14.4
(No Scale)



SINGLE ROW

Slide #3 @ MP 14.4
(No Scale)



Note: At least one third of the total length of each railroad rail should be embedded into rock socket.

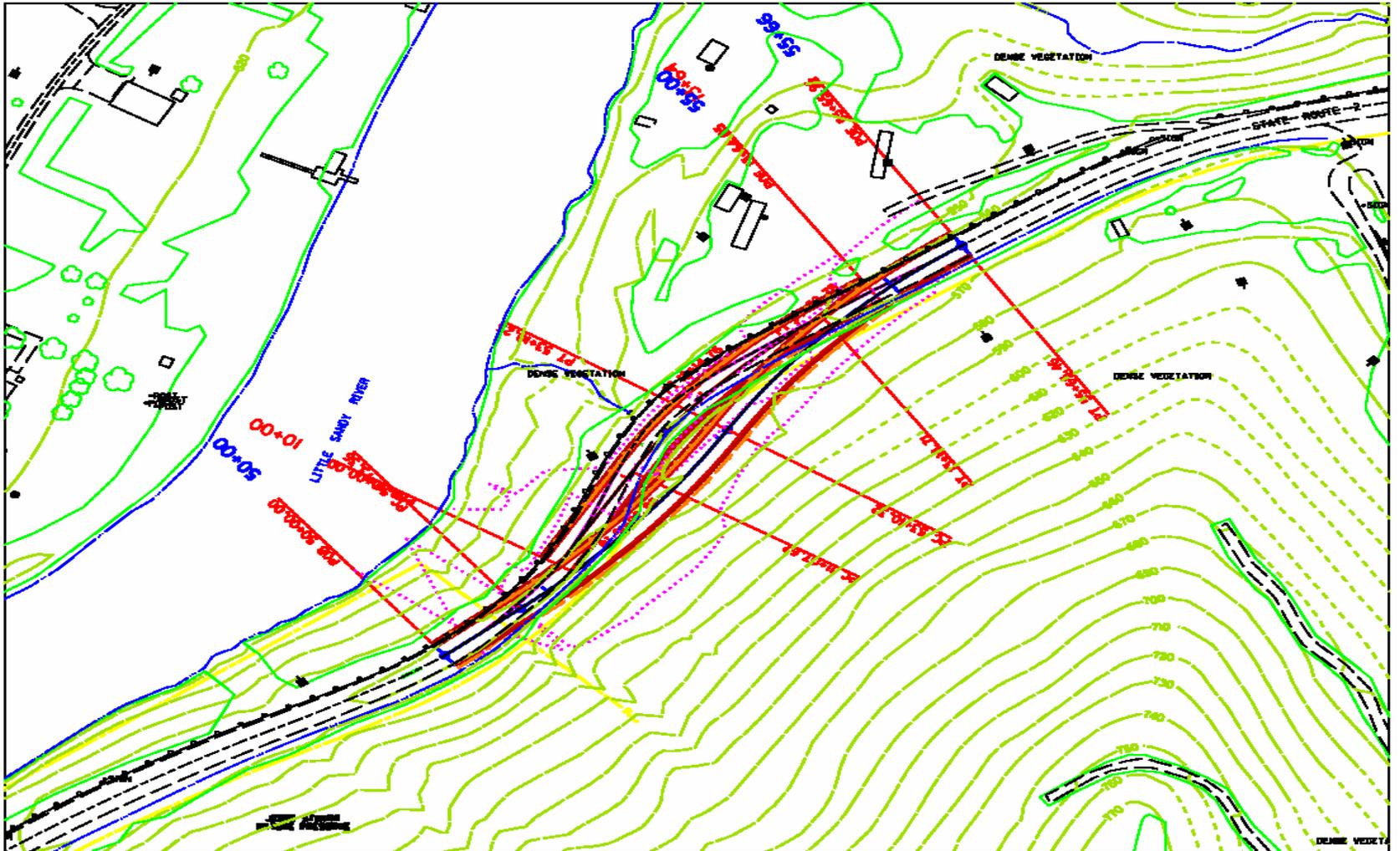


[Landslides]

Realignment of 600' Roadway
Cost Estimate= \$75,000



Landslides



[Rock Fall Mitigation]

Cost

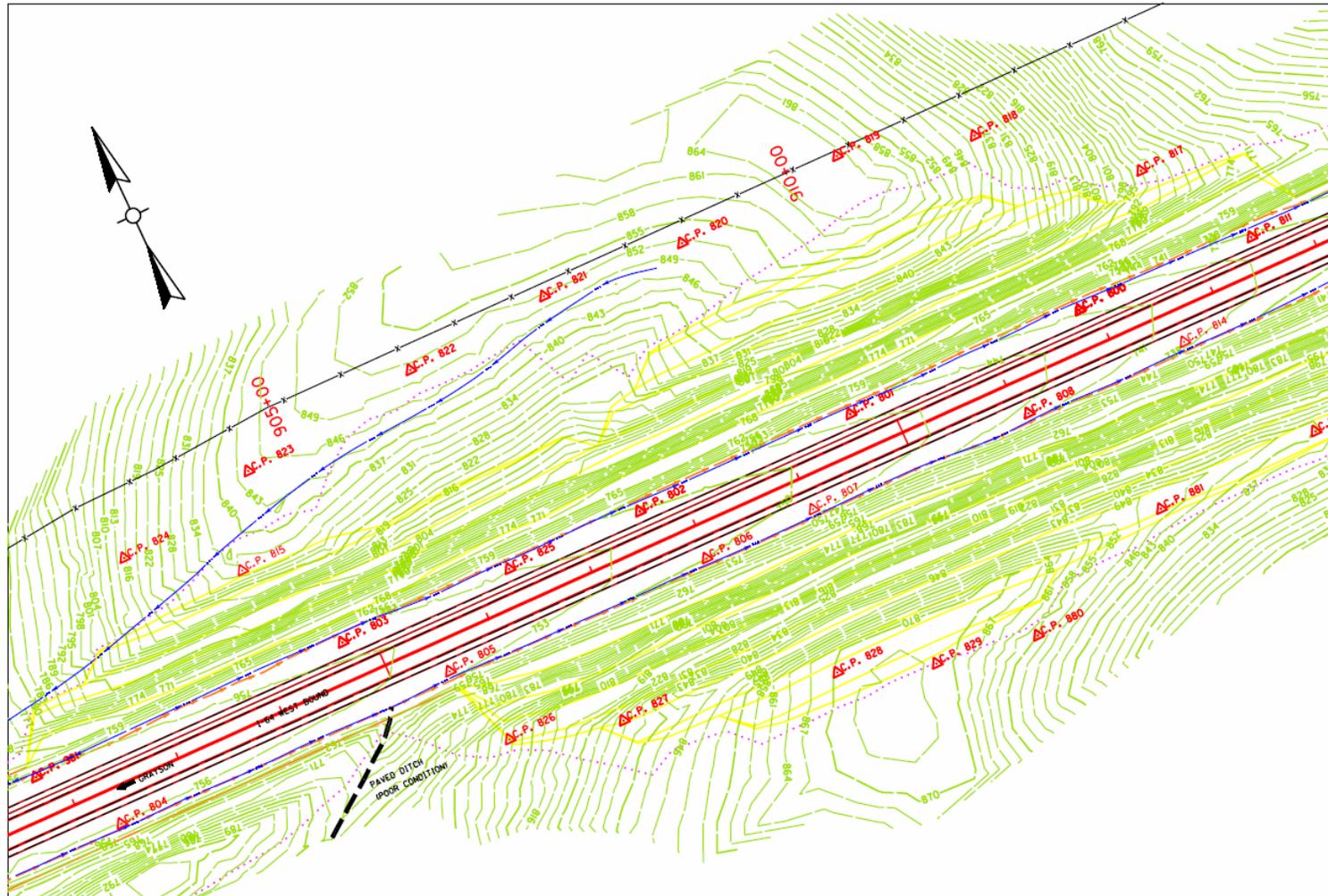
263,750 c.y.

\$17.83/ cubic yard

Total- \$4.7 million

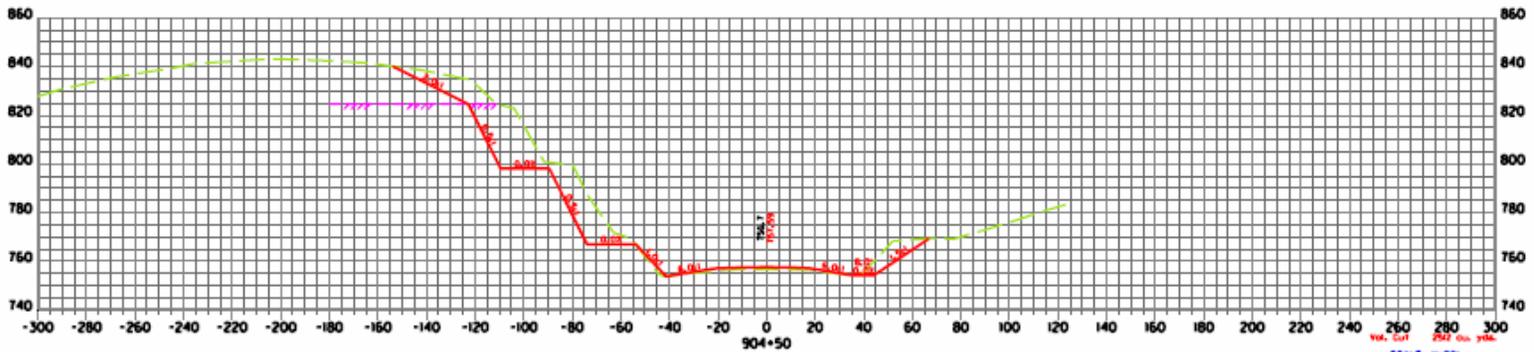
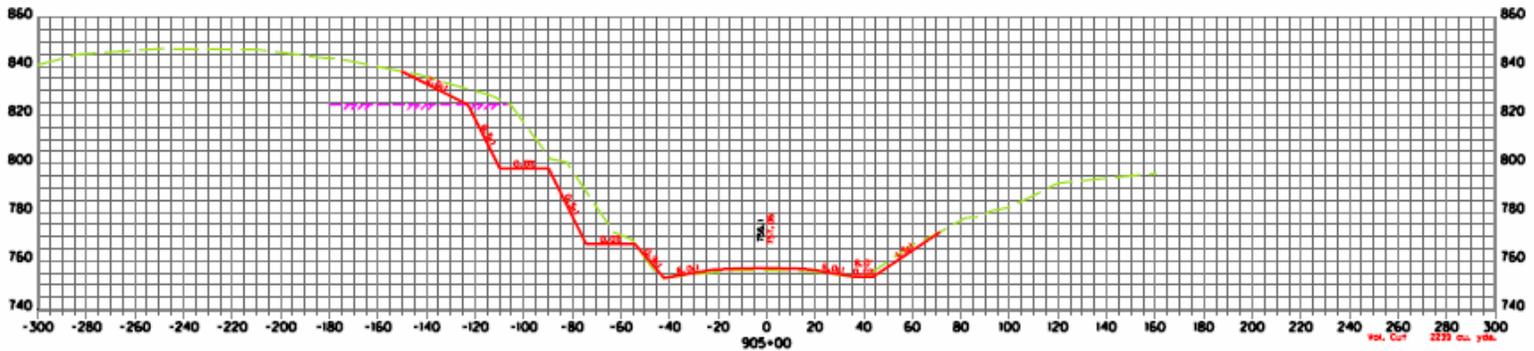


Rock Fall Mitigation



Rock Fall Mitigation

COUNTY OF	CVEN NO.	SHEET NO.
CANTON	9-200	846

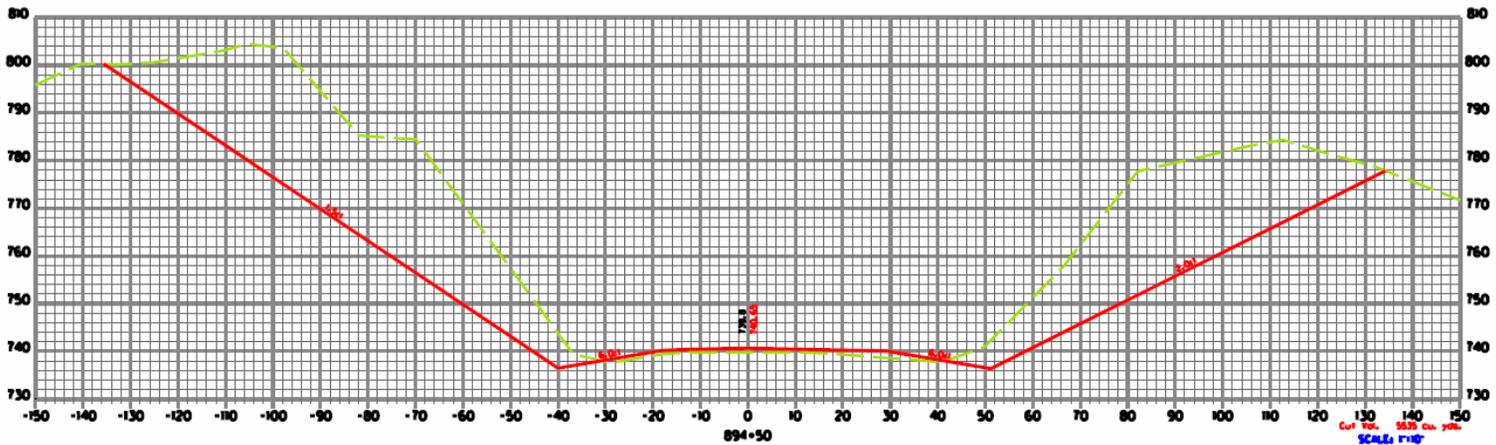


SCALE: 1"=20'

... STA. 904+50 TO STA. 905+00 ...

Rockfall Mitigation

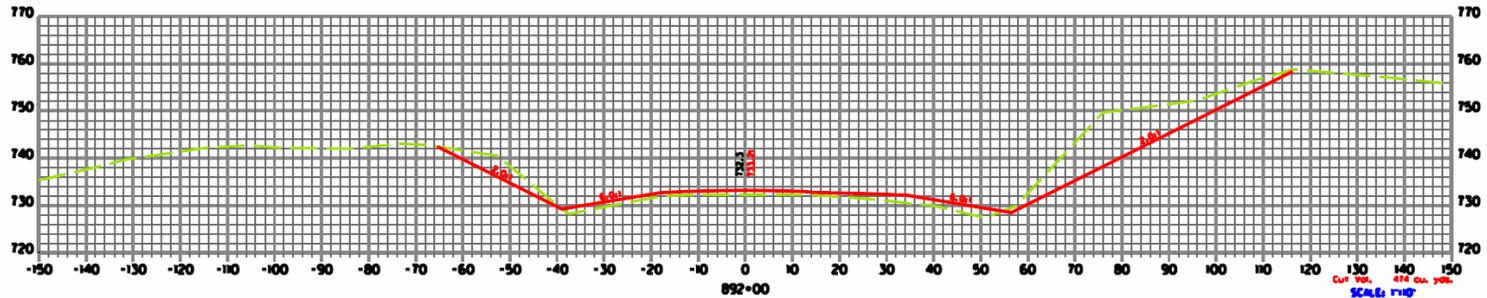
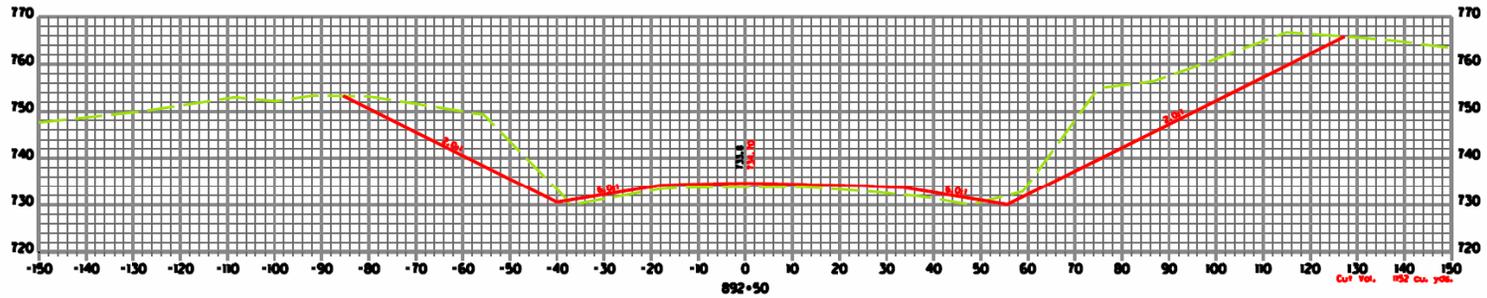
COUNTY OF	ITEM NO.	SHEET NO.
Carroll	9-200	105



--- STA. 894+50 TO STA. 894+50 ---

Rockfall Mitigation

COUNTY OF	ITEM NO.	SHEET NO.
Calaveras	9.200	402



... STA. 892+00 TO STA. 892+50 ...

[Rock Fall Mitigation]



[Rock Fall Mitigation]



[Tied Back Retaining Wall]

Cost

8,650 sq. ft. @ \$76/ sq. ft.

Total- \$657,000



[Gabion Wall]

Cost of Baskets: \$40-\$60

Gabion Basket Dimensions

- 6' X 3' X 3'
- 9' X 3' X 3'
- 12' X 3' X 3'
- 6' X 3' X 18"

Cost in Place: \$50/ c.y.



[Granular Correction]

Cost

Class II Ch. Lining-\$17/ton

Geotextile Fabric Ty4
Type 4- \$1.10/ s.y.



[Granular Correction]

-51,662 tons

Class II Ch. Lining-

\$17.63/ton

-49,392 tons

KY 2's – \$17.63

-10,435 s.y.

Geotextile Fabric Ty 4-

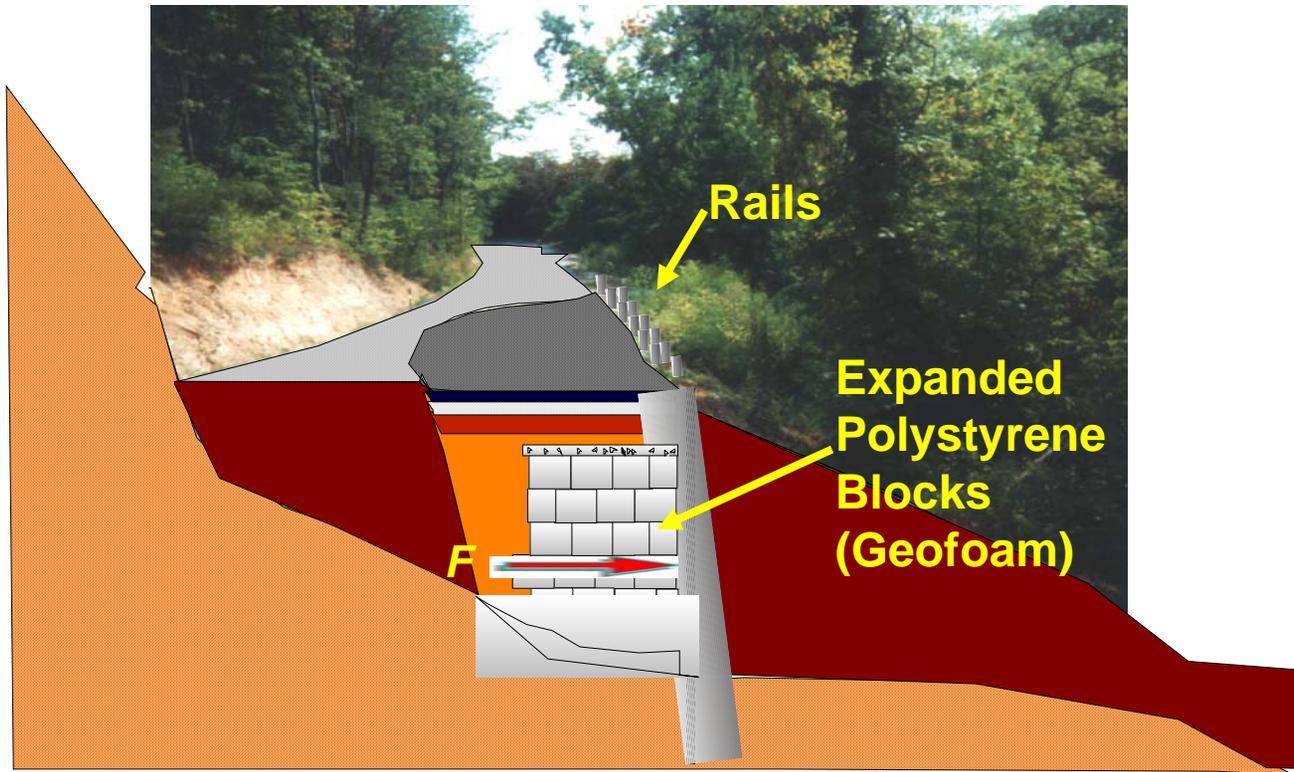
\$1.10/ s.y.

Total- \$1.8 million



[New Technology for Repairs]

Geofoam



Typical Roadway Application

[New Technology for Repairs]

Geofoam

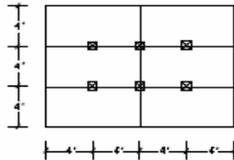


New Technology for Repairs

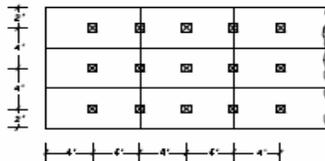
Geofoam

GRIPPER PLATE PATTERN DETAILS

No Scale



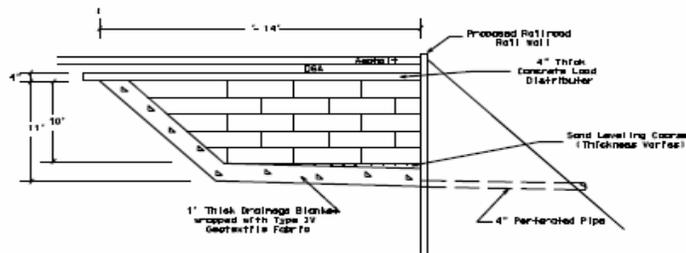
NOTE: Place Single-Sided Gripper Plates at 4-foot centers on top layer of blocks.



NOTE: Place Double-Sided Gripper Plates at 4-foot centers between horizontal layers of blocks.

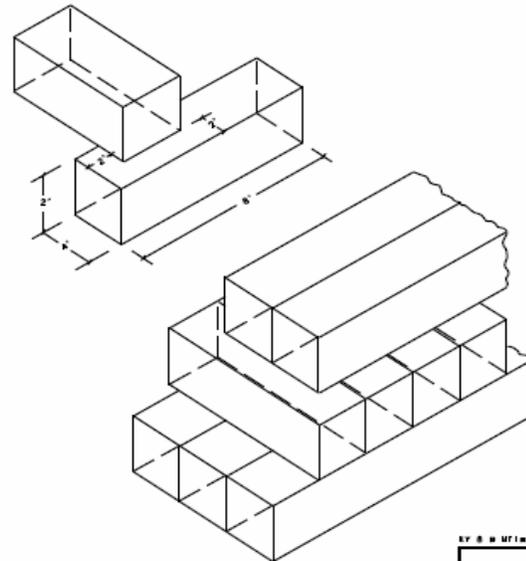
CROSS-SECTION DETAIL

No Scale



GEOFOAM BLOCK AND PATTERN DETAIL

No Scale



DISTRICT	FUND	POST NO.	JOB
CAMPBELL			
ITEM NO. 6-5003			
PROJECT NO. 018 008 018-020			
KY # # MILE POST 18-20			

KY # # MILE POST 18-20

KENTUCKY
DEPARTMENT OF HIGHWAYS
COUNTY OF
CAMPBELL

PROJECT: ITEM NO. 6-5003
 DRAWING: F204 018 008 018-020

1" = 1' SCALE DRAWING

New Technology for Repairs

KYTC DEPARTMENT OF HIGHWAYS
 UNIT BID TAB SHEET FOR LETTING 02-04-05
 Call: 301 Contract ID: 05-1004 Sheet 2
 Date Run :February 07, 2005 02:07 pm

Prop Line #	Item Description	Quantity	Unit	Bidder 1	Bidder 2	Bidder 3	Bidder 4	Bidder 5
0380	STEEL REINFORCEMENT	120.000	LB	2.0000	1.0000	1.0000	1.1700	1.0000
0390	SILT CHECK (MOD)	19.000	EACH	150.0000	600.0000	250.0000	318.5200	200.0000
0400	CLEAN SILT CHECK (MOD)	19.000	EACH	25.0000	50.0000	250.0000	81.2800	100.0000
0410	LIGHTWEIGHT FILL (GEOFOAM BLOCKS)...\$2.76/CU. FT	17,506.000	CUFT	2.7600	3.8500	3.3000	4.3800	3.0000
0420	WELDED STEEL WIRE FABRIC	13,608.000	LB	1.3100	0.8500	1.3200	1.3400	0.5000
0430	LAGGING	24,000.000	LF	5.7500	6.0000	8.0000	6.3600	3.0000
0440	CLEAN SLOTTED DRAIN PIPE	45.000	LF	12.0000	60.0000	29.0000	21.0000	6.0000
0450	CLEAN OUT PIPE STORM SYSTEM	1.000	LS	5000.0000	4230.0000	2500.0000	1050.0000	500.0000
0460	CLEAN CULVERT	1.000	LS	100.0000	1700.0000	2500.0000	1890.0000	1500.0000
0470	CONCRETE CLASS B	2,886.000	SQYD	29.3500	16.0000	32.0000	13.2300	41.5800
0480	CONCRETE PAVED DITCH	519.000	SQYD	90.0000	43.0000	70.0000	58.8600	60.0000
0490	MOBILIZATION	1.000	LS	151000.0000	168099.2400	9000.0000	171922.9800	180955.0500
0500	DEMobilIZATION	1.000	LS	45400.0000	50429.7700	53247.8400	53566.5300	54286.5100
TOTAL BIDS				3222847.87	3579993.89	3612084.00	3729926.25	3854342.77

[New Technology for Repairs]



Soil Nail Retaining Wall



[New Technology for Repairs]



Lightweight Fill Using Wood Chips

Kentucky Geohazards

- Low Cost Landslide Repairs
- Rockfall Mitigation
- Tied Back Retaining Wall
- Gabion Baskets
- Granular Correction
- New Technology
 - Lightweight Fill- Geofabric and Wood Chips
 - Soil Nail Retaining Wall





KENTUCKY
TRANSPORTATION
CABINET



KENTUCKY
TRANSPORTATION
CABINET

Mission Statement

~~..safe, secure, and reliable..~~
"To provide a safe, secure, and reliable highway system that ensures the efficient mobility of people and goods, thereby enhancing both the quality of life and the economic vitality of the Commonwealth."



KENTUCKY
TRANSPORTATION
CABINET



KENTUCKY
TRANSPORTATION
CABINET