

Smart Road Planning

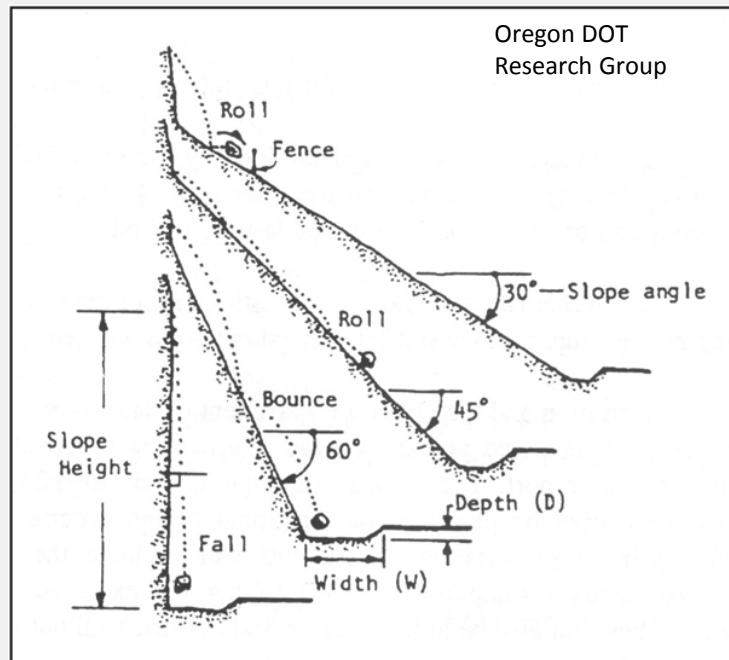
■ Planning & Design

■ 1995 – 1997

■ Limited outcrop exposure

■ Rockslides vs. rock falls

– Vertical slopes not best in folded and faulted rock



Smart Road Goes to Construction

■ Construction

■ June 1998

- Rock Slides
 - Oozing
- Rock Falls
- Delays, stop work



Smart Road – Field Mapping

- July 1998
 - Detailed Mapping
 - Concurrent with construction
 - Windows
 - Other significant areas
 - ID, Group and Prioritize



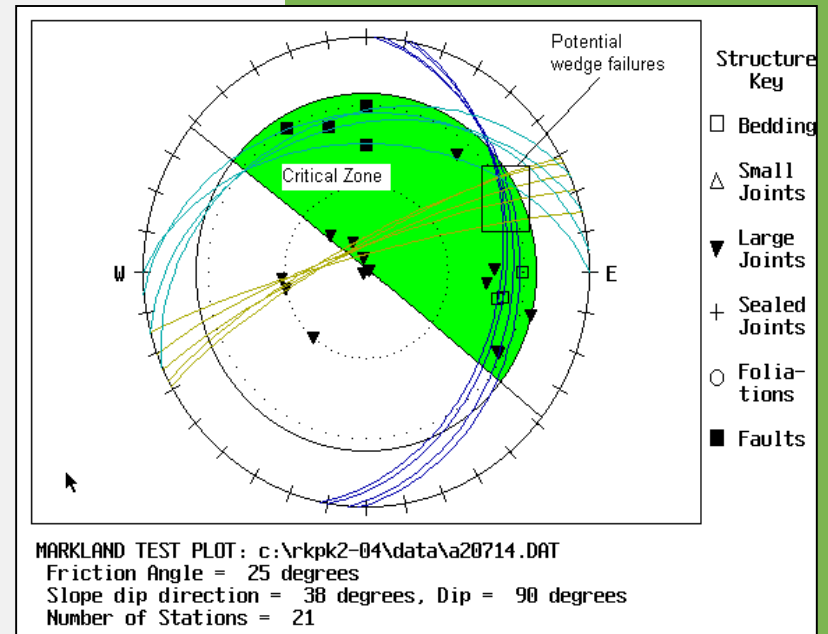
Smart Road – Discontinuities

- Rock Structure/Discontinuities
 - Orientation
- Bedding
- Joints/Faults
- Characteristics
 - Lithology
 - Continuity
 - Infilling
 - Water
 - Roughness
- Samples
 - Shear testing
 - 34° vs 19°



Smart Road – Kinematic Assessment RockPack II

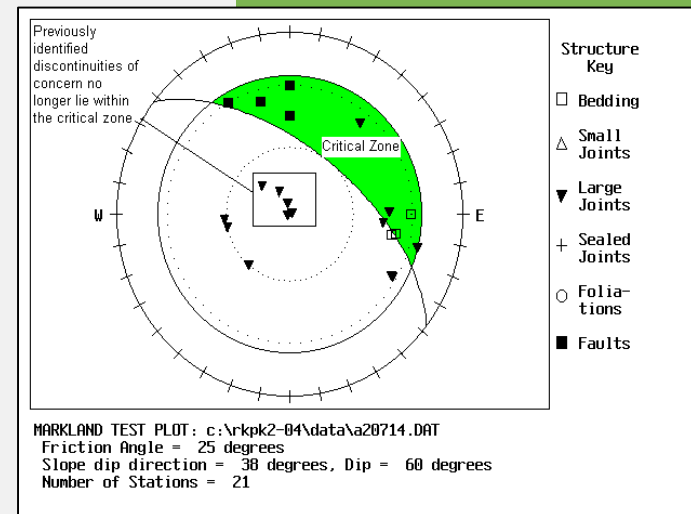
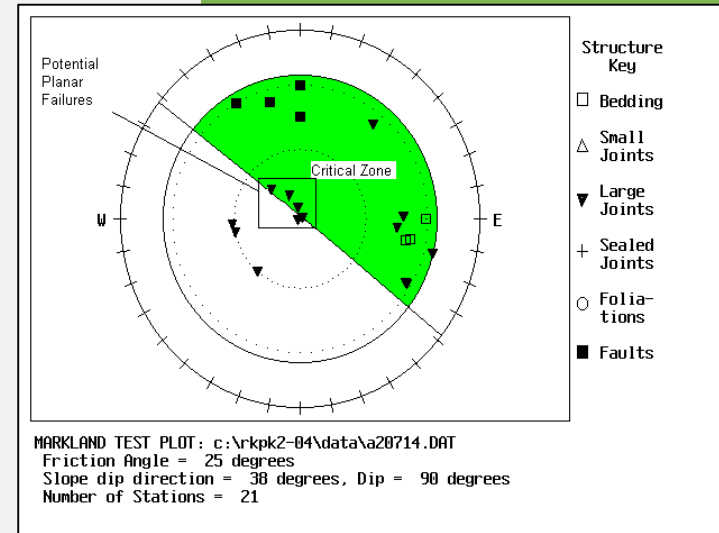
- Kinematics
 - Geometry
 - Potential for motion only
 - Mass and force not considered
 - Stereonets
- Discontinuities
 - Plot as clusters
 - Limiting equilibrium analysis
 - Friction Angle
 - Daylight



Smart Road – Kinematic Assessment South/Right Slope

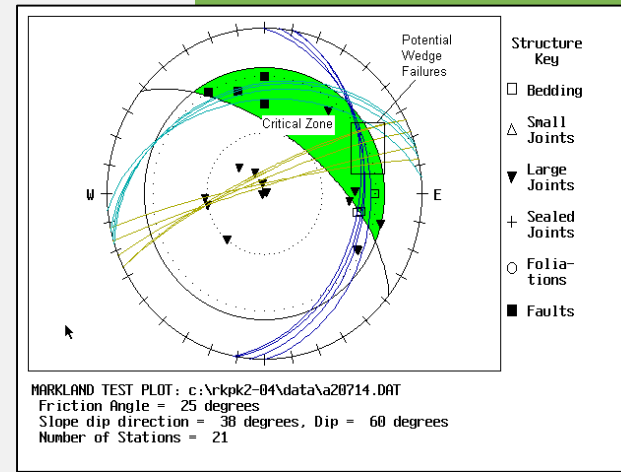
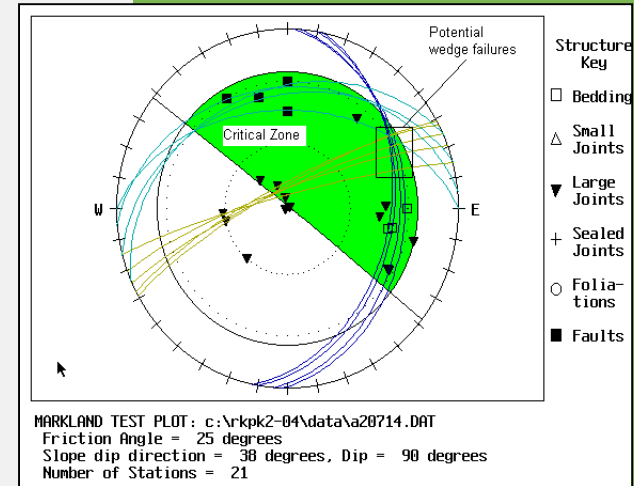
- 90 Degree Slope
 - Planar Failures
 - Large, steeply dipping joints

- 60 Degree Slope
 - Planar failures
 - Significantly reduced



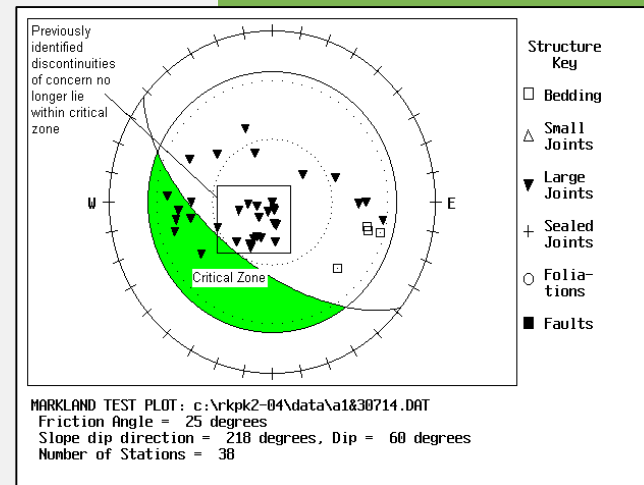
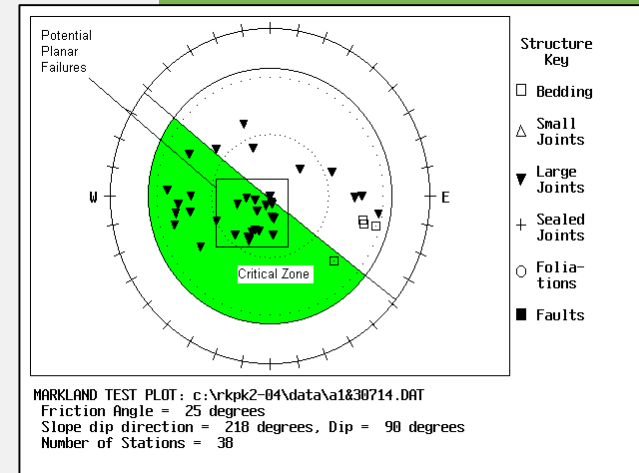
Smart Road – Kinematic Assessment South/Right Slope

- 90 Degree Slope
 - Wedge Failures
 - Bedding
 - Large Joints
- 60 Degree Slope
 - Wedge Failures not eliminated



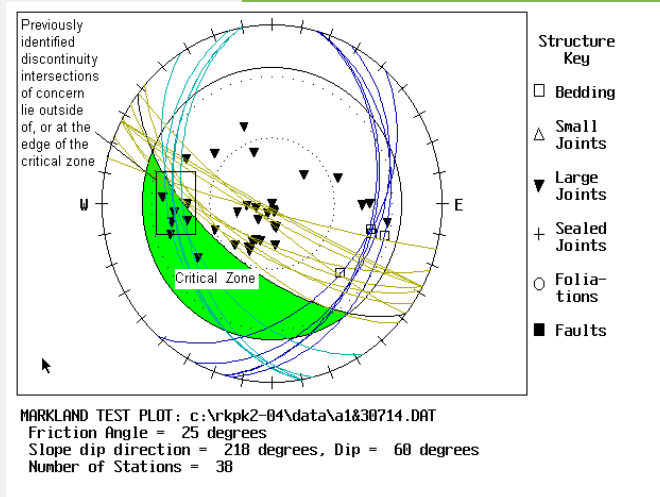
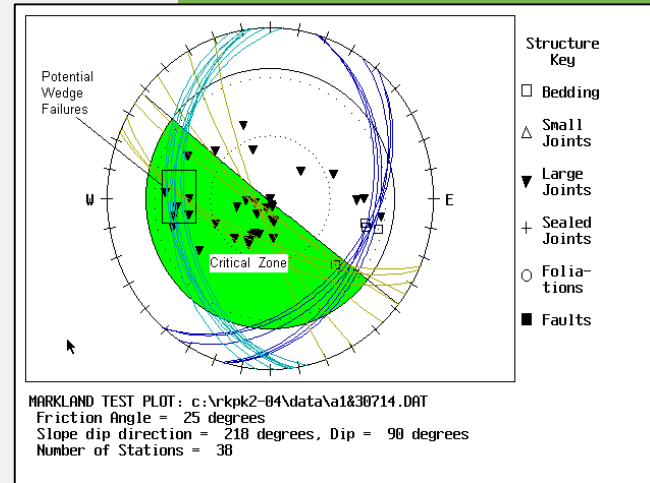
Smart Road – Kinematic Assessment North/Left Slope

- 90 Degree Slope
 - Planar Failures
 - Large, steeply dipping joints
- 60 Degree Slope
 - Significantly reduced



Smart Road – Kinematic Assessment North/Left Slope

- 90 Degree Slope
 - Planar Failures
 - Large, steeply dipping joints
- 60 Degree Slope
 - Slightly reduced potential



Smart Road – Initial Study Results

- Vertical slopes will not be safe
 - Subject to large scale falls and slides
- Reduce slope angle to 60 degrees
- Implement monitoring/protective measures



Smart Road – Problematic Areas

- ID problem areas
 - Safety Factor Calculations
 - Some as low as .86/1.3
- One third of planned depth
 - Significant potential for continued problems
- October 1998
 - Delayed for redesign and construction



MOETLY SUNNY
Electric power 6th
Line in lower 40s
Details on A-2

THE ROANOKE TIMES

Roanoke, Virginia www.roanoke.com THURSDAY, OCTOBER 15, 1998 50¢

Roanoke C2
Blacksburg B1
Frontier C2
Roanoke C7
Sports C8

Cut through mountainous terrain left rockslide danger Unstable rock delays 'smart road' for one year

New River Valley environmentalists and others lost a recent lawsuit, their third, to VDOT, but they have 60 days to appeal the U.S. Court of Appeals decision.

By SARAH CAGLE
FOR THE TIMES

BLACKSBURG — Efforts to stabilize rock along the "smart" road in Montgomery County will delay completion of the highway's first phase by one year, a Virginia Department of Transportation official said Wednesday.

A cut through mountainous terrain southeast of Blacksburg has left unstable rock on either side of the road that could cause rock slides, said David Carter, assistant resident engineer in VDOT's Blacksburg office.

The additional work will delay the opening of the 1.2-mile road and road use for smart vehicle technology until November 1999. That section, which barely will

not be open to the public, had been scheduled to be finished next month by contractor Veolia & Dragon of Berkeley, Va.

Work on the \$121 million contract began in July 1997. VDOT had given Veolia & Dragon until November 1998 to finish, though the contractor had actually set the 2008 completion date.

VDOT is having the cut widened to create a firmer rock slope that will catch any stone before it reaches the shoulder. The original plan was to have 165-foot-high vertical rock walls on either side of the road. Carter said "The rock simply isn't stable

More work will be required on the smart road after easements was found in the rock walls of the cut through the mountain near Blacksburg. Additional costs are unknown.

PHOTO BY AP/WIDEWORLD

Gilmore denies clemency for Dwayne Allen Wright

Young murderer executed

Wright, 26, had admitted killing an 8-year-old child when he was 17 years old. Gov. Gilmore said, "There has never been any question as to Wright's guilt."

Associated Press

LANCASTER — Dwayne Allen Wright, convicted of killing an 8-year-old child when he was a teenager, was executed Wednesday night, becoming the first Virginian in 74 years to be put to death for a crime considered as a juvenile.

Wright was executed by injection at the Greensville Correctional Center's low-toxin state Gov. Jim Gilmore denied his request for clemency and the U.S. Supreme Court, on a 5-2 vote, rejected a final appeal. Wright was pronounced dead at 9:15 p.m.

Wright had no final statement. His attorney, Robert Lee, said Wright's last words to his wife, 71-year-old...

Before the TV that would carry lethal chemicals were inserted into Wright's arm, he raised his head briefly and purred into the witness booth.

Larry Traylor, a Department of Corrections spokesman, said several relatives of the victim attended the execution.

About 15 death penalty opponents stood outside the prison's main gate as the execution hour approached. They carried candles and read the names

REFUGEES' PLIGHT IN FLIGHT FROM KOSOVO

Vote, adjournment could be today

Congress shapes up budget provisions



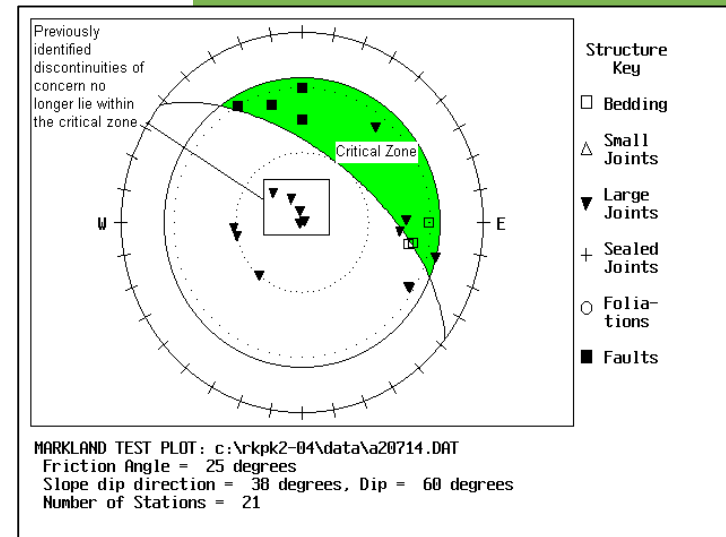
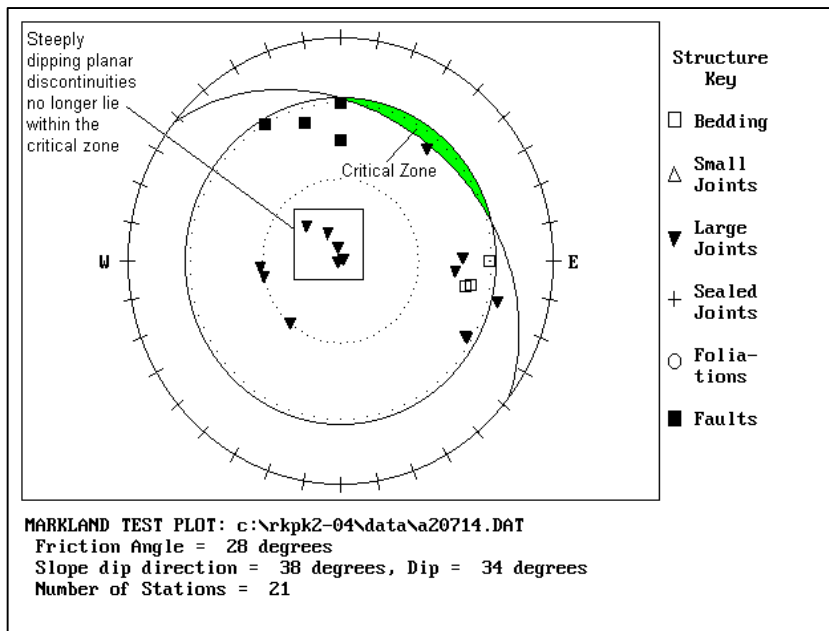
Smart Road – Reevaluation

- Design Change Proposed
 - 1.5 H : 1.0 V (34 degrees)
- New Shear Strength Testing
 - Powder-coated bedding planes, zeolite
 - Friction angle of 28 degrees, $c=0$
- October 1998
 - Delayed for redesign and construction



Smart Road – Redesign South/Right Slope

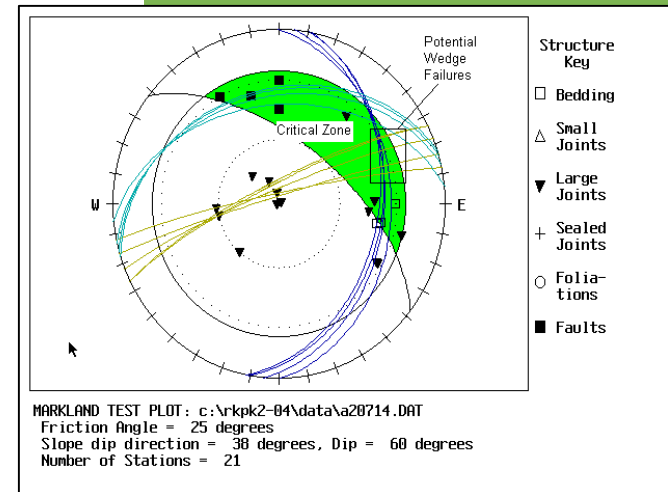
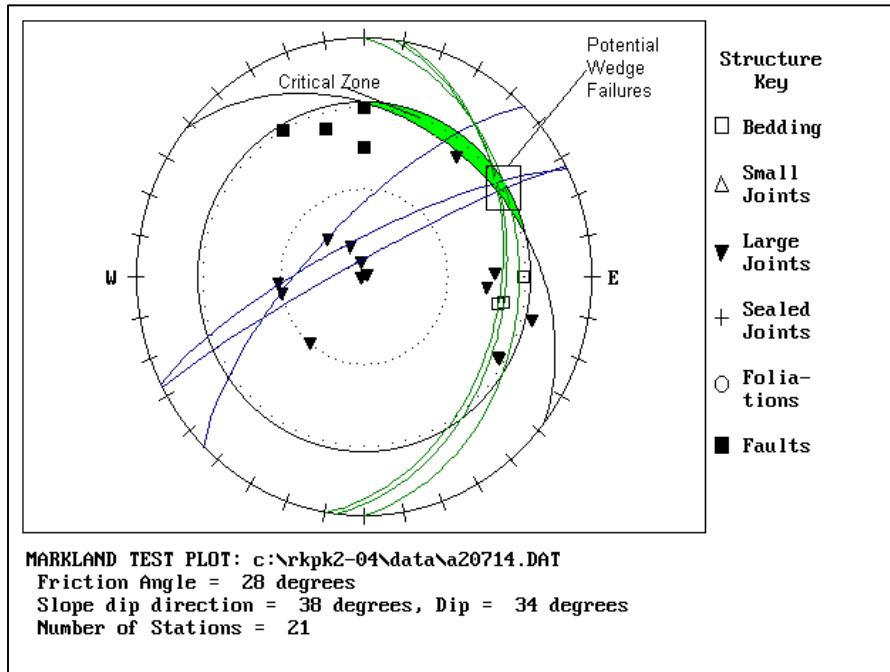
- 34 degree Slope
- Planar virtually eliminated



Smart Road – Redesign

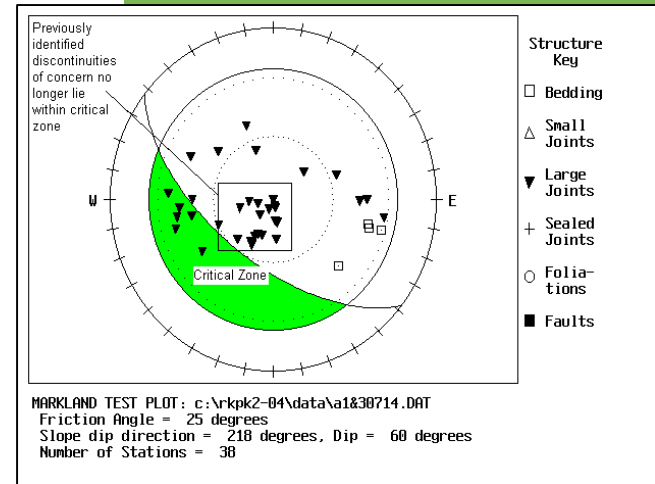
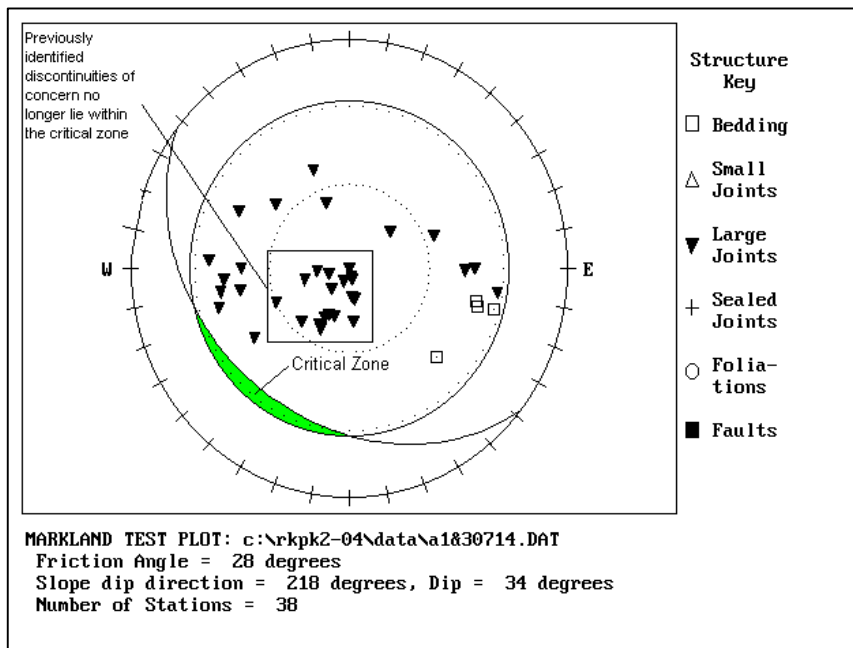
South/Right Slope

- 34 Degree Slope
- Pesky wedgies



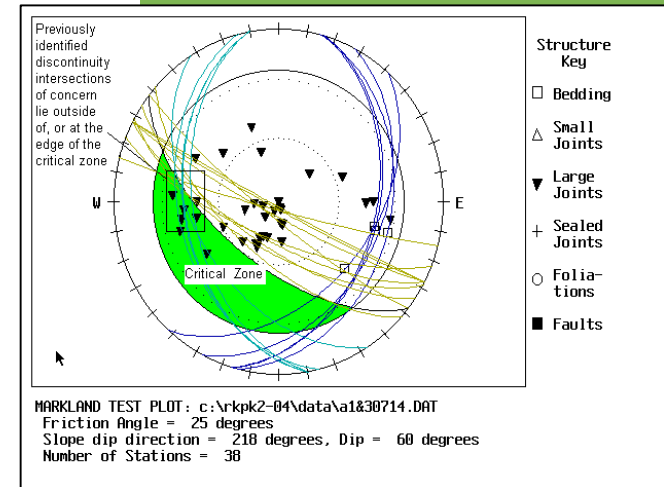
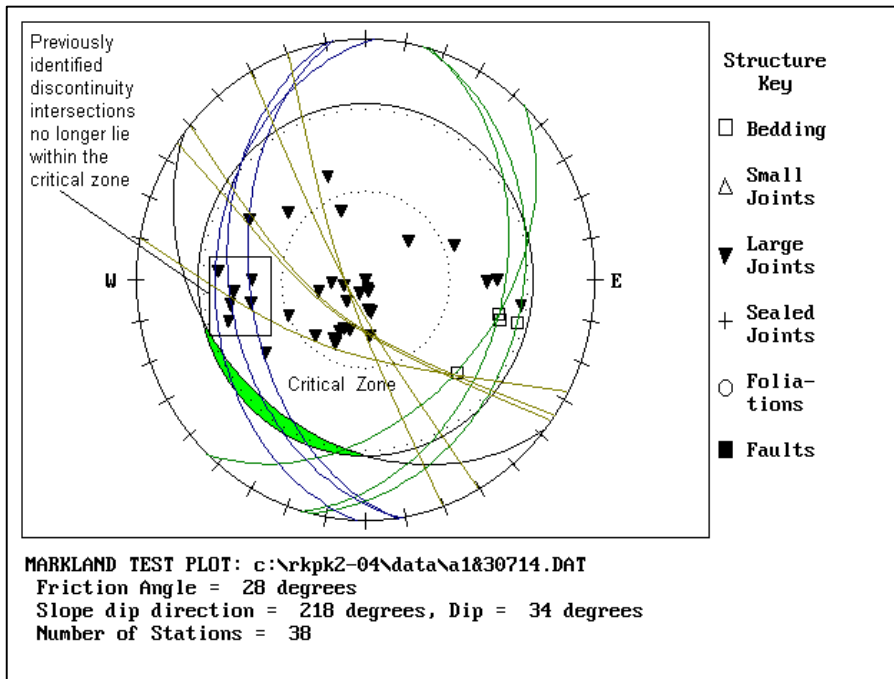
Smart Road – Reevaluation North/Left Slope

- 34 Degree Slope
 - Planar Failures
 - Virtually eliminated



Smart Road – Kinematic Assessment North/Left Slope

- 34 Degree Slope
 - Wedge Failures
 - Virtually eliminated



Smart Road – Final Recommendations

- Left Slope
 - 60 Degrees: monitoring, protective measures
 - Less ROW acquisition, less excavation
- Right Slope
 - Would need to be dealt with regardless
- Final Slope
 - VDOT announces 30 - 40 degree slopes
 - \$2.7 million



Smart Road – Summary and Conclusions

- Valley and Ridge Province
 - Structurally complex, folded and faulted - discontinuities
 - Steep to vertical rock cuts dangerous without protective measures
- Pre-construction
 - Understand regional and site-specific geology
 - Valuable information from pre-construction mapping, even if limited
- During Construction
 - Verify pre-construction assessment(s)
 - Changed conditions can be recognized early

