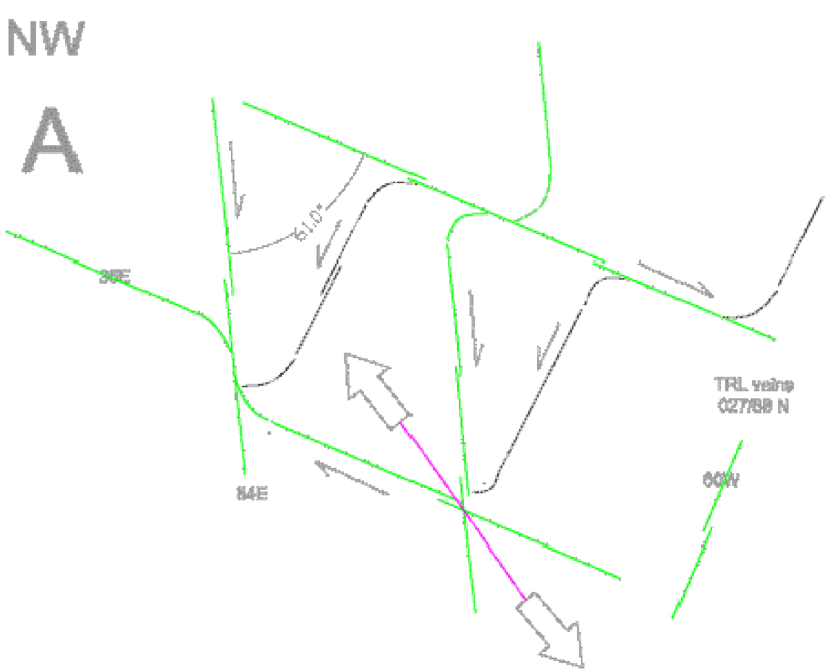
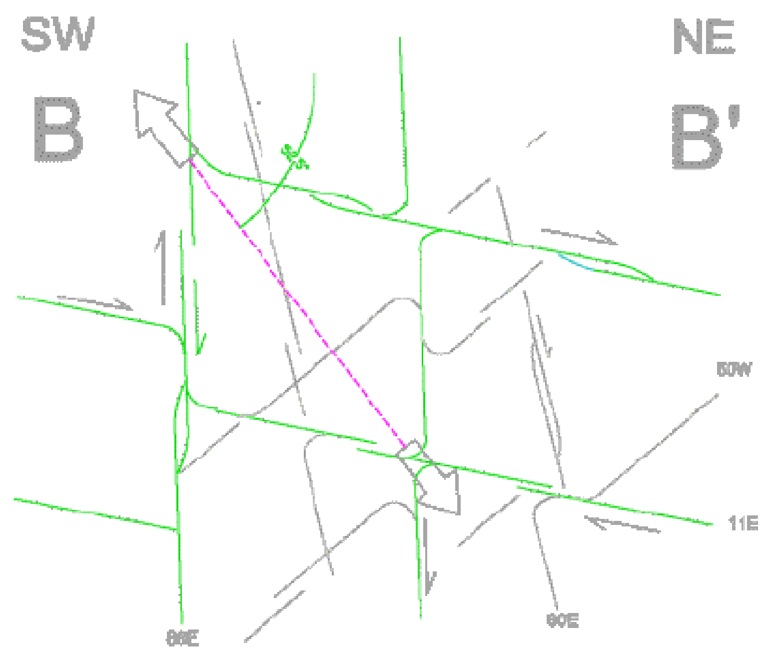
STRUCTURAL PROFILES USING FEATURE DENSITIES AND APPARENT DIPS

primary and secondary structural features profiled using apparent dips of statistical maximums based on outcrop data and stereonet analyses diagrams



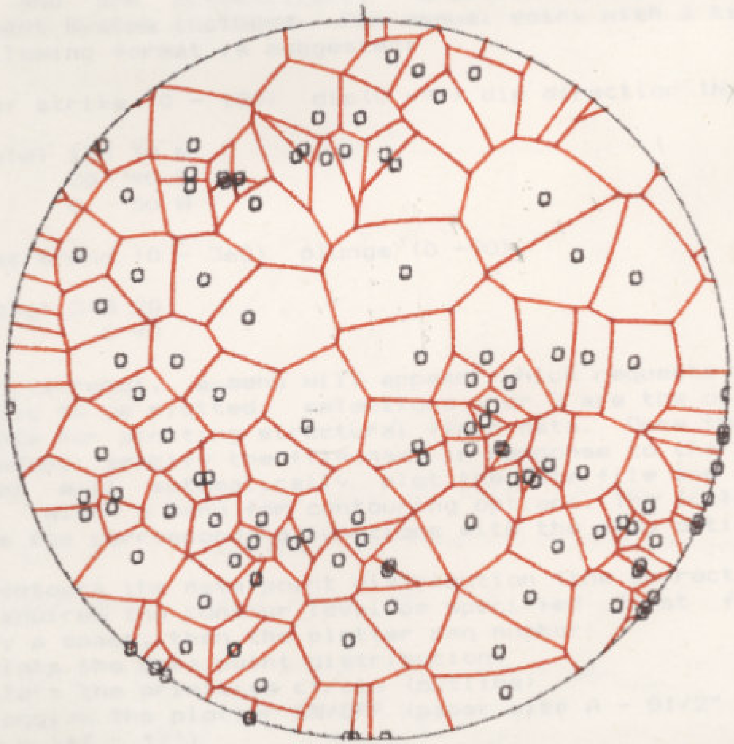


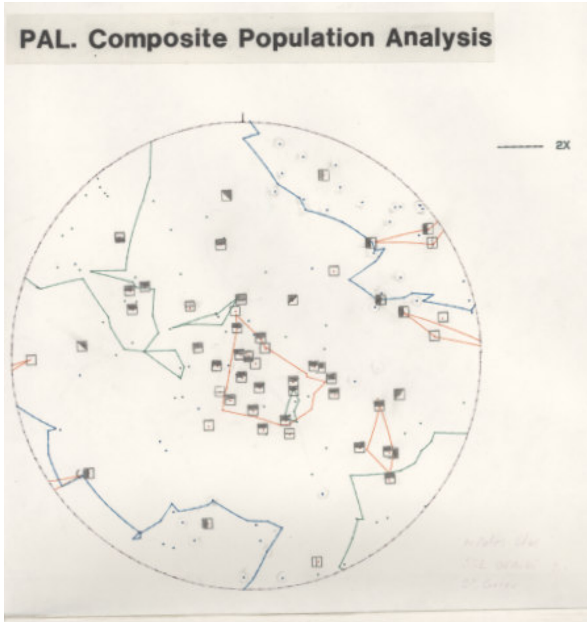
Svoronoi contouring

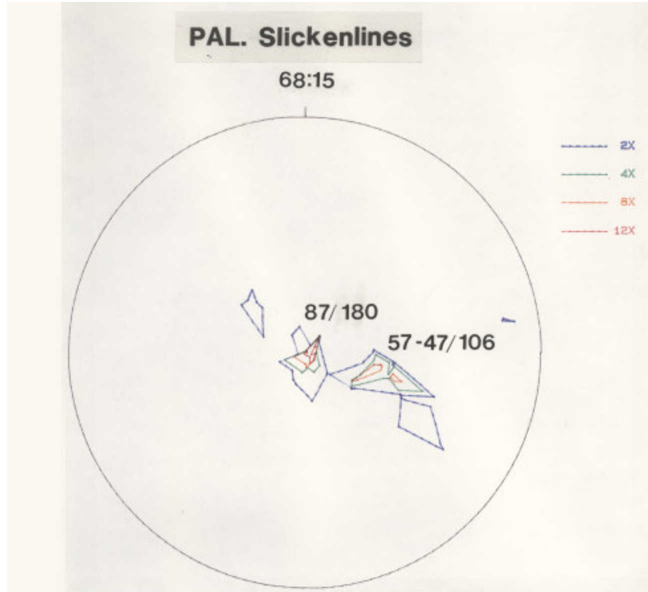
The network of polygons that partitions a plane into regions lying closest to individual members of a given set of points is commonly referred to as a Voronoi tessellation. Similarly, a network of polygons that partions a spherical surface into regions lying closest to individual members of a given set can be referred to as a Voronoi net.

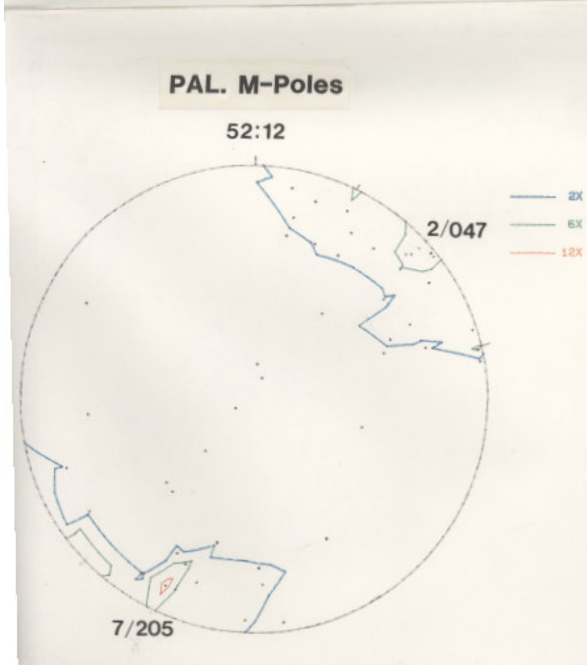
The Voronoi net can be used to delineate those regions having relative maximum point density values for a given set of points on a spherical surface. The relative density of each voronoi polygon is the inverse area of that polygon in relation to the total spherical surface area. Relative density contour values result by interpolating between the assigned relative density point values in multiples of the average (1X) density value determined from the entire set of points.

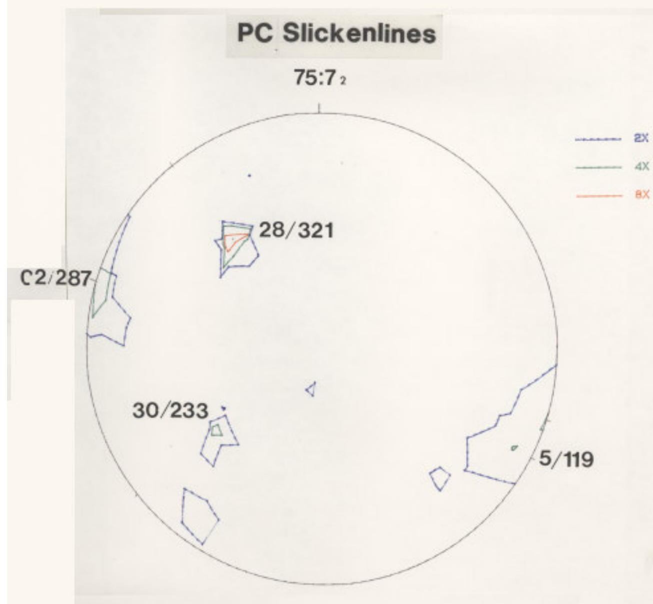
Svoronoi contouring was developed by Dr.Norman Gray and Catherine Lewis from the University of Connecticut, 1986, and is distributed for geologic applications.

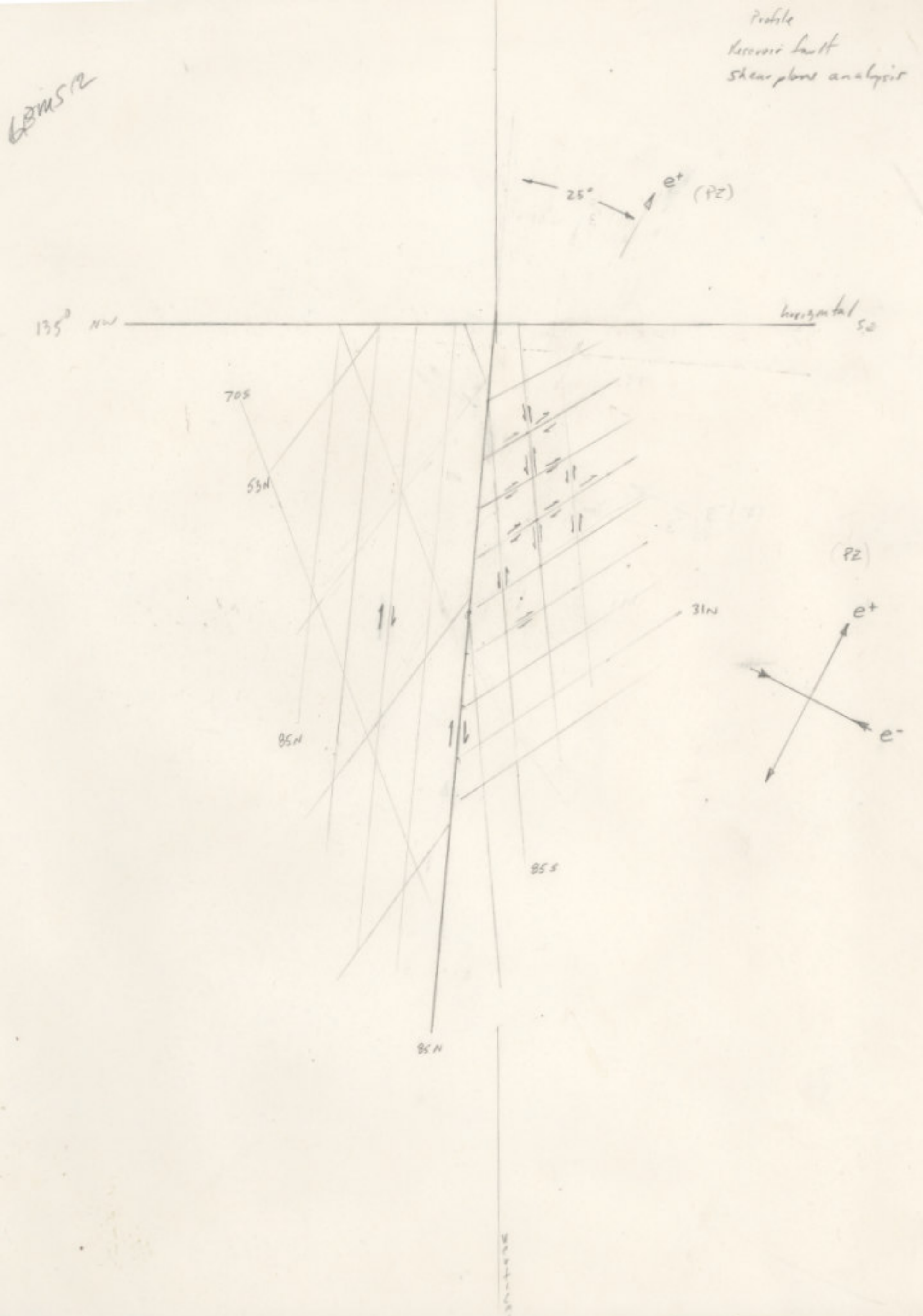



PAL. Composite Population Analysis
2X

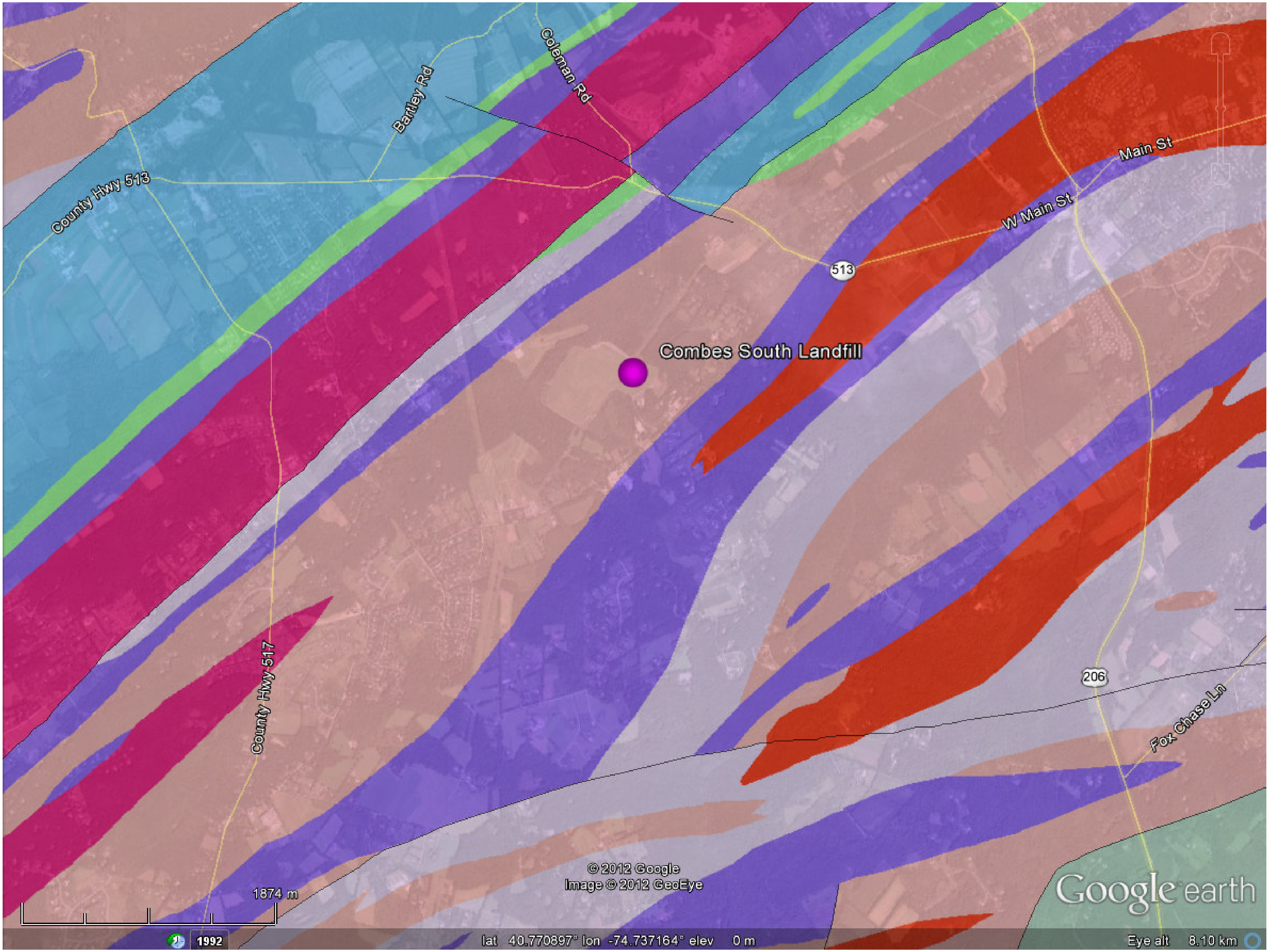

PAL. Slickenlines
68:15
2X
4X
8X
12X
87/180
57-47/106


PAL. M-Poles
52:12
2X
6X
12X
2/047
7/205

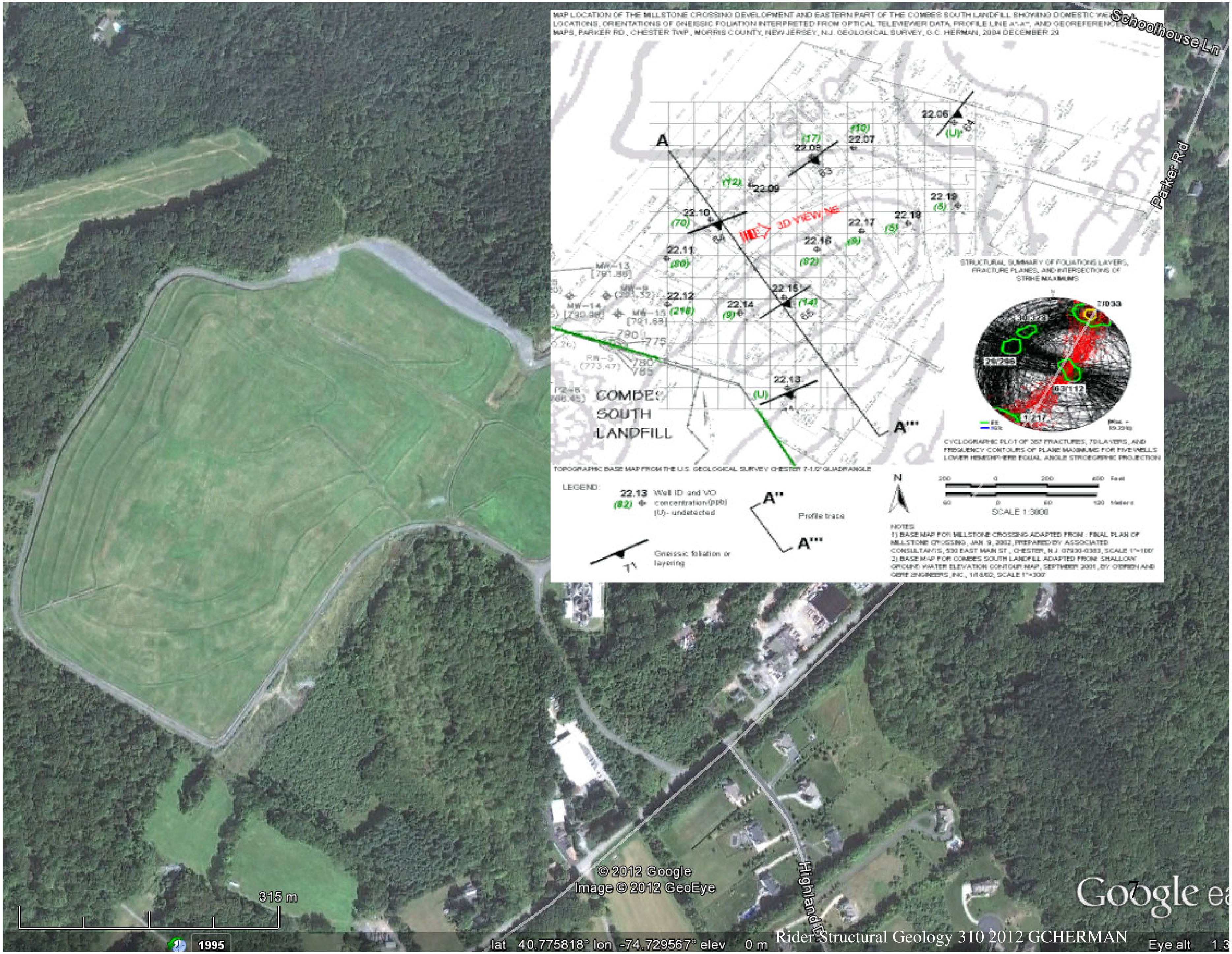

PC Slickenlines
75:72
2X
4X
8X
28/321
C2/287
30/233
5/119



6BMS12
Profile
Reservoir fault
Shear plane analysis
25°
e^+
(PZ)
135° NW
horizontal
SE
70S
55N
85N
85S
85N
31N
(PZ)
e^+
e^-

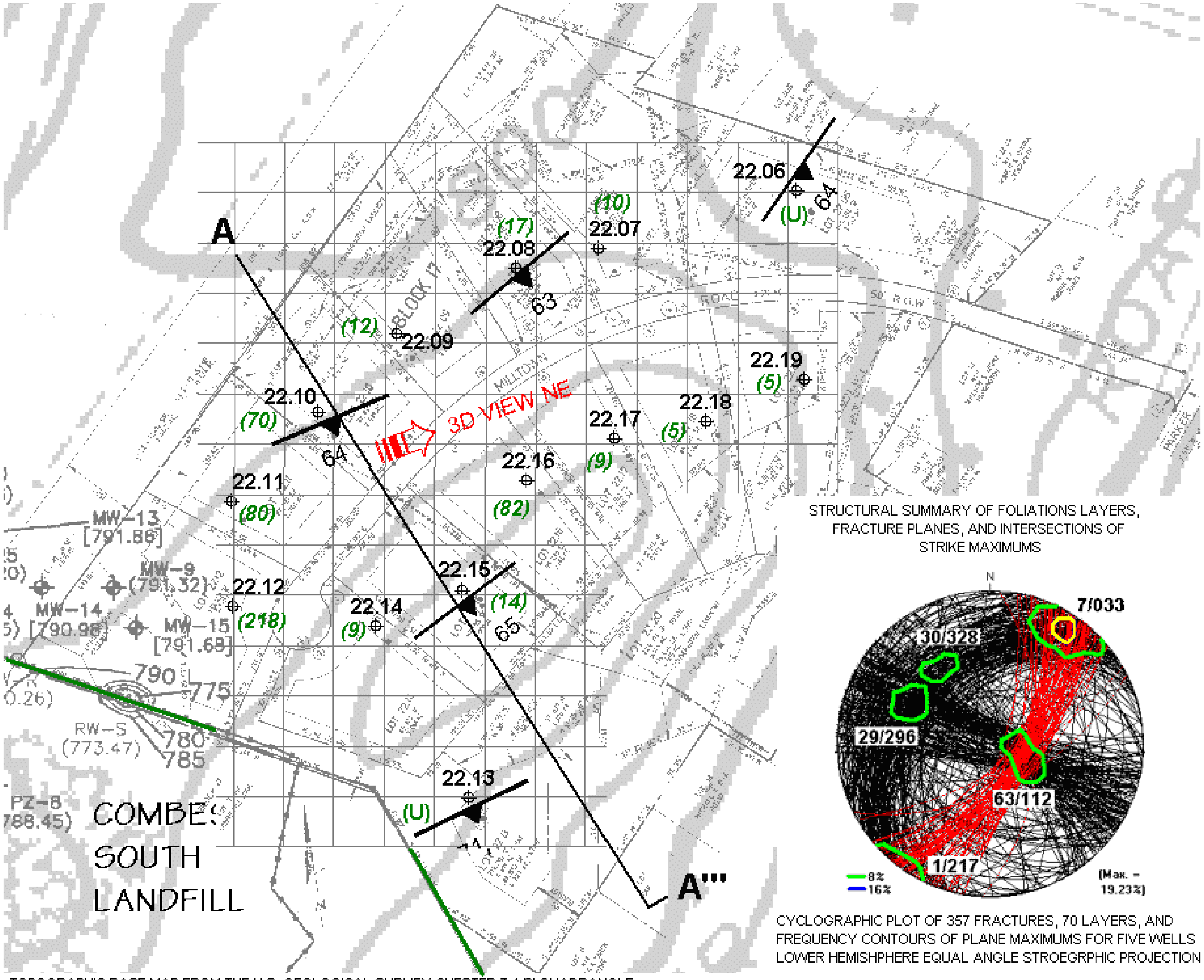


Combes South Landfill
County Hwy 513
Bartley Rd
Coleman Rd
Main St
W Main St
513
County Hwy 517
206
Fox Chase Ln
© 2012 Google
Image © 2012 GeoEye
1874 m
1992
lat 40.770897° lon -74.737164° elev 0 m
Eye alt 8.10 km
Google earth

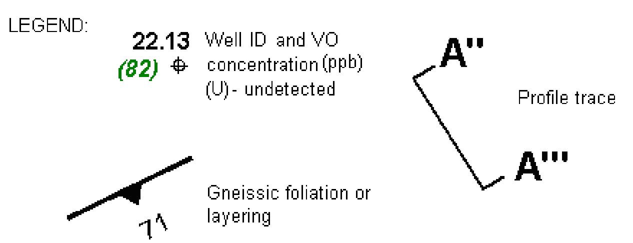


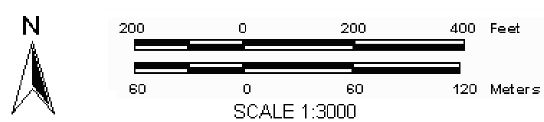
MAP LOCATION OF THE MILLSTONE CROSSING DEVELOPMENT AND EASTERN PART OF THE COMBES SOUTH LANDFILL SHOWING DOMESTIC WE
LOCATIONS, ORIENTATIONS OF GNEISSIC FOLIATION INTERPRETED FROM OPTICAL TELEVIEWER DATA, PROFILE LINE A"-A"', AND GEOREFERENCED
MAPS, PARKER RD., CHESTER TWP., MORRIS COUNTY, NEW JERSEY, N.J. GEOLOGICAL SURVEY, G.C. HERMAN, 2004 DECEMBER 29
Schoolhouse Ln
Parker Rd
A
A'''
3D VIEW NE
COMBES SOUTH LANDFILL
STRUCTURAL SUMMARY OF FOLIATIONS LAYERS, FRACTURE PLANES, AND INTERSECTIONS OF STRIKE MAXIMUMS
CYCLOGRAPHIC PLOT OF 357 FRACTURES, 70 LAYERS, AND FREQUENCY CONTOURS OF PLANE MAXIMUMS FOR FIVE WELLS LOWER HEMISPHERE EQUAL ANGLE STROGRAPHIC PROJECTION
TOPOGRAPHIC BASE MAP FROM THE U.S. GEOLOGICAL SURVEY CHESTER 7-1/2' QUADRANGLE
LEGEND:
22.13 (82) Well ID and VO concentration(ppb) (U)- undetected
Gneissic foliation or layering
A" A''' Profile trace
N
SCALE 1:3000
NOTES:
1) BASE MAP FOR MILLSTONE CROSSING ADAPTED FROM : FINAL PLAN OF MILLSTONE CROSSING, JAN. 9, 2002, PREPARED BY ASSOCIATED CONSULTANTS, 530 EAST MAIN ST., CHESTER, N.J. 07930-0383, SCALE 1"=100'
2) BASE MAP FOR COMBES SOUTH LANDFILL ADAPTED FROM: SHALLOW GROUND WATER ELEVATION CONTOUR MAP, SEPTEMBER 2001, BY O'BRIEN AND GERE ENGINEERS, INC., 1/18/02, SCALE 1"=300'
Highland
© 2012 Google
Image © 2012 GeoEye
315 m
1995
lat 40.775818° lon -74.729567° elev 0 m
Eye alt

MAP LOCATION OF THE MILLSTONE CROSSING DEVELOPMENT AND EASTERN PART OF THE COMBES SOUTH LANDFILL SHOWING DOMESTIC WELL LOCATIONS, ORIENTATIONS OF GNEISSIC FOLIATION INTERPRETED FROM OPTICAL TELEVIEWER DATA, PROFILE LINE A"-A"', AND GEOREFERENCED BASE MAPS, PARKER RD., CHESTER TWP., MORRIS COUNTY, NEW JERSEY, N.J. GEOLOGICAL SURVEY, G.C. HERMAN, 2004 DECEMBER 29



TOPOGRAPHIC BASE MAP FROM THE U.S. GEOLOGICAL SURVEY CHESTER 7-1/2' QUADRANGLE

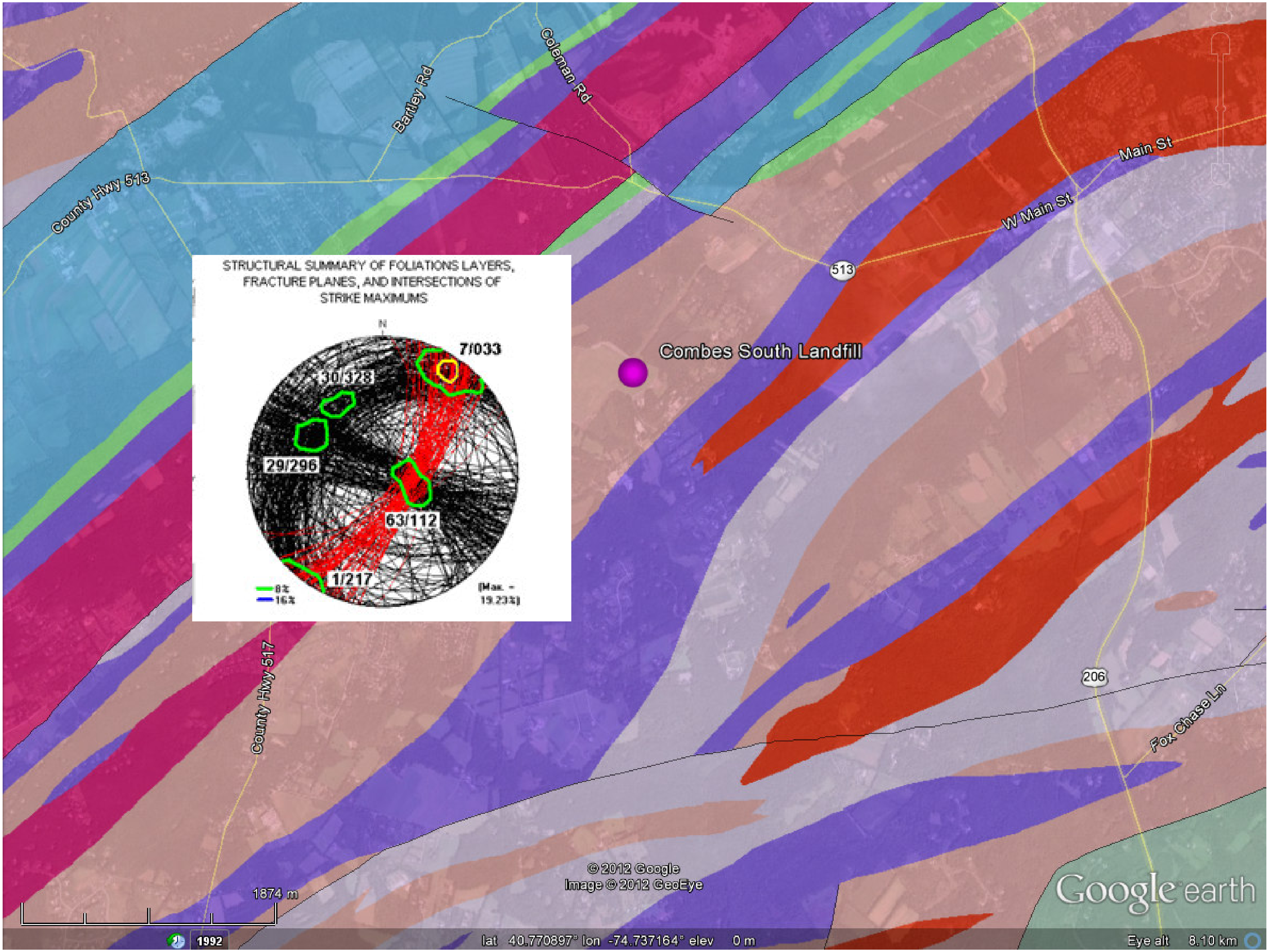




NOTES:

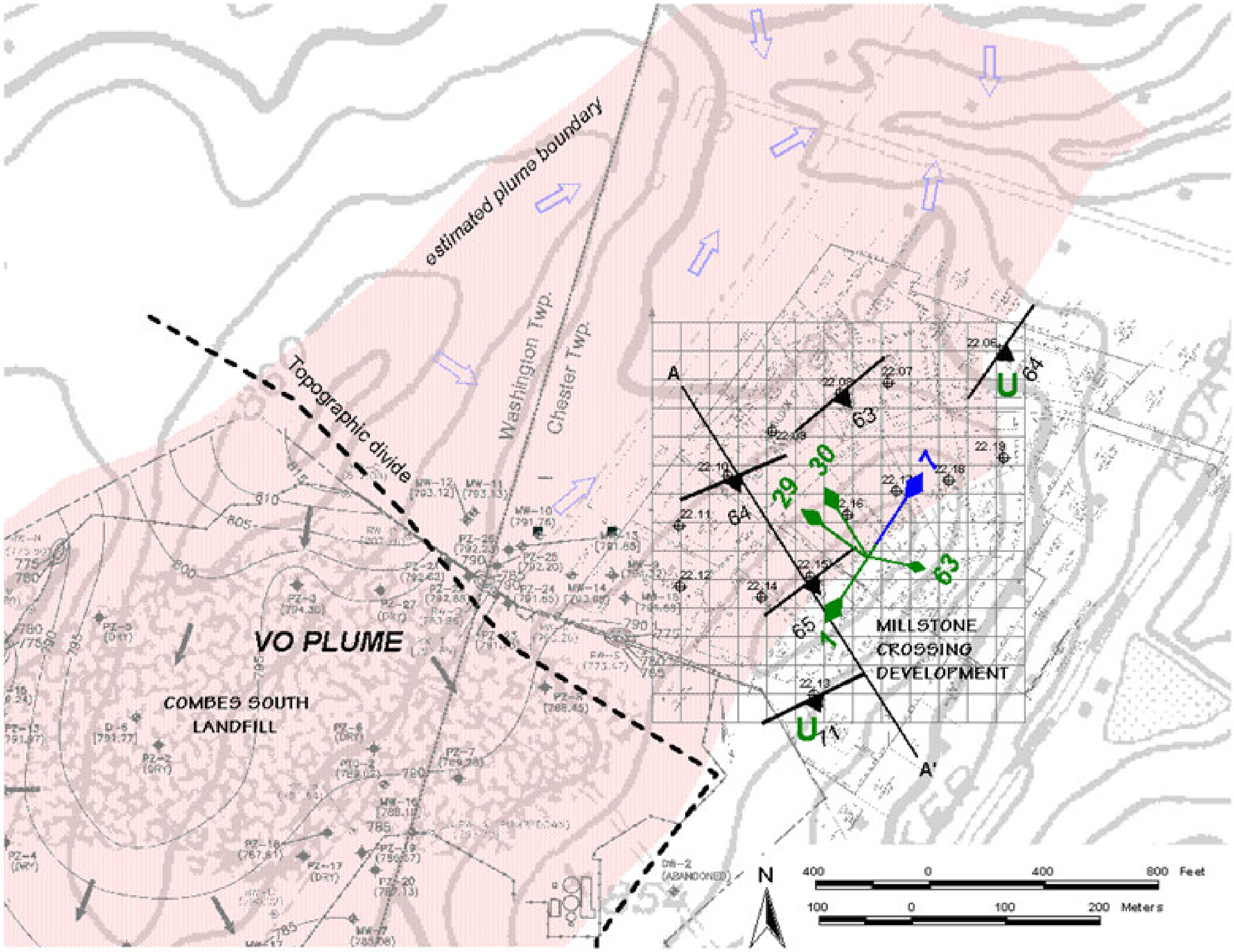
1) BASE MAP FOR MILLSTONE CROSSING ADAPTED FROM : FINAL PLAN OF MILLSTONE CROSSING, JAN. 9, 2002, PREPARED BY ASSOCIATED CONSULTANTS, 530 EAST MAIN ST., CHESTER, N.J. 07930-0383, SCALE 1"=100'

2) BASE MAP FOR COMBES SOUTH LANDFILL ADAPTED FROM: SHALLOW GROUND WATER ELEVATION CONTOUR MAP, SEPTMBER 2001, BY O'BRIEN AND GERE ENGINEERS, INC., 1/18/02, SCALE 1"=300'



STRUCTURAL SUMMARY OF FOLIATIONS LAYERS, FRACTURE PLANES, AND INTERSECTIONS OF STRIKE MAXIMUMS
N
7/033
30/328
29/296
63/112
1/217
8%
16%
(Max. = 19.23%)
Combes South Landfill
County Hwy 513
Bartley Rd
Coleman Rd
Main St
W Main St
513
206
County Hwy 517
Fox Chase Ln
© 2012 Google
Image © 2012 GeoEye
Google earth
1874 m
1992
lat 40.770897° lon -74.737164° elev 0 m
Eye alt 8.10 km

MAP LOCATION OF THE MILLSTONE CROSSING DEVELOPMENT AND EASTERN PART OF THE COMBES SOUTH LANDFILL SHOWING DOMESTIC WELL LOCATIONS, ORIENTATIONS OF GNEISSIC FOLIATION INTERPRETED FROM OPTICAL TELEVIEWER DATA, PROFILE LINE A-A', GEOREFERENCED BASE, WELLFIELD GRID, AND STRUCTURAL LINEATIONS, PARKER RD., CHESTER TWP., MORRIS COUNTY, NEW JERSEY, N.J. GEOLOGICAL SURVEY, G.C. HERMAN, 2004 DECEMBER 29



TOPOGRAPHIC BASE MAP FROM THE U.S. GEOLOGICAL SURVEY CHESTER 7-1/2' QUADRANGLE

SCALE 1:4800

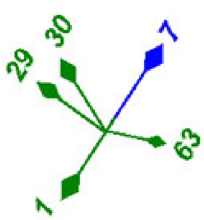
LEGEND:

22.13 Well and ID

Topographic gradient

71 Gneissic foliation or layering

A A' Profile trace

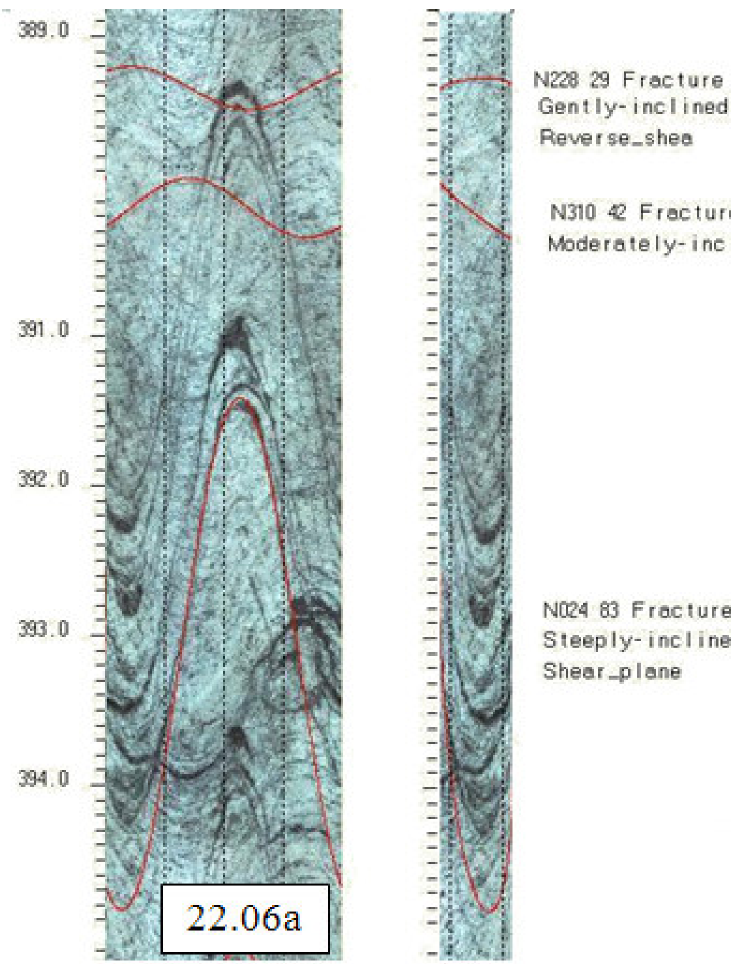


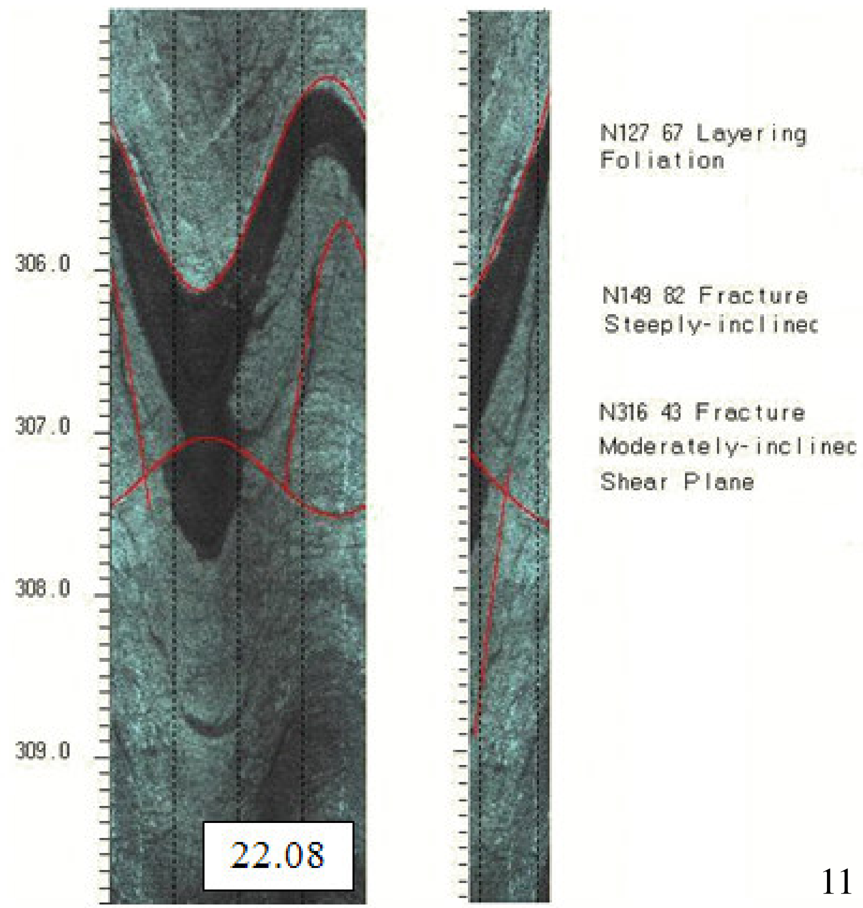
Statistical maximum trend and plunge of planar intersections of foliation layering (S0), and brittle extension (S1) and shear (S2) fractures. Marker with 7 degree plunge occurs with 16% contour interval and the rest are the othersare 8 percent

NOTES:
1) BASE MAP FOR MILLSTONE CROSSING ADAPTED FROM: FINAL PLAN OF MILLSTONE CROSSING, JAN. 9, 2002, PREPARED BY ASSOCIATED CONSULTANTS, 530 EAST MAIN ST., CHESTER, N.J. 07930-0383, SCALE 1"=100'
2) BASE MAP FOR COMBES SOUTH LANDFILL ADAPTED FROM: SHALLOW GROUND WATER ELEVATION CONTOUR MAP, SEPTMBER 2001, BY O'BRIEN AND GERE ENGINEERS, INC., 1/18/02, SCALE 1"=300'
3) WELLFIELD GRID GENERATED WITH 100' CELLS

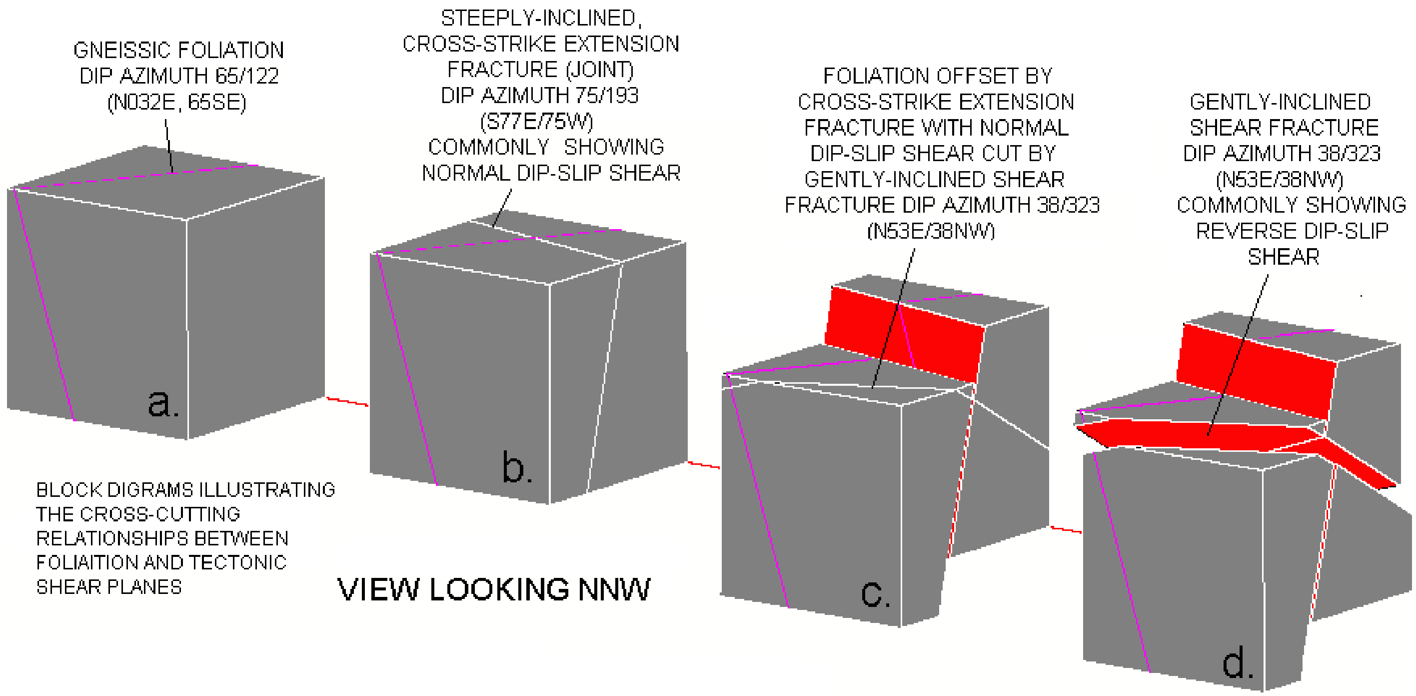
Table 2. Index of geological structures measured from OPTV records.

Well block.lot	Number of foliation measured	S0 (foliation) mean dip/dip azimuth	Number of fractures measured	S1 extension fracture maximums dip/dip azimuth	S2 shear-fracture maximums reverse dip-slip dip/dip azimuth
22.06	17	64/125	123	81/026	39/315, 32/226
22.08	9	53/130	76	82/041, 78/211	32/309
22.10	19	64/113	77	74/051, 80/194	34/300
22.13	7	71/116	62	90/026, 72/056	31/320
22.15	14	65/127	75	84/037	31/322



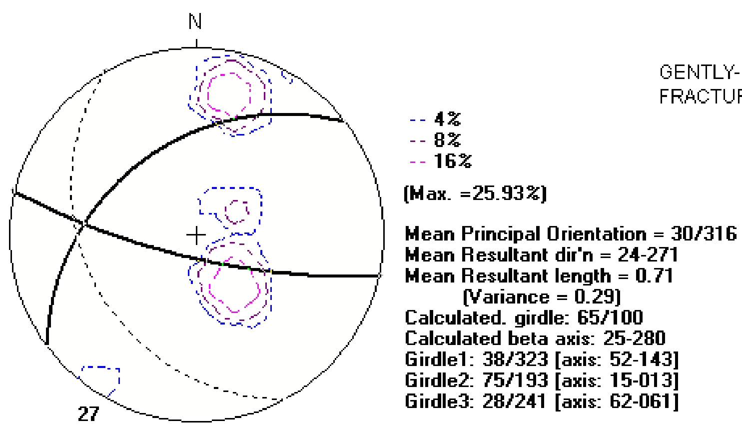


STRUCTURAL INTERPRETATION OF GEOMETRIC RELATIONSHIPS BETWEEN GNEISSIC FOLIATION AND CROSS-CUTTING SHEAR PLANES OBSERVED IN OPTICAL TELEVIEWER DATA FROM FIVE 6-INCH BEDROCK WELLS AT THE MILLSTONE CROSSING DEVELOPMENT, PARKER RD., CHESTER TWP., MORRIS COUNTY, NEW JERSEY, N.J. GEOLOGICAL SUYRVEY, G.C. HERMAN, 2005 JANUARY 3

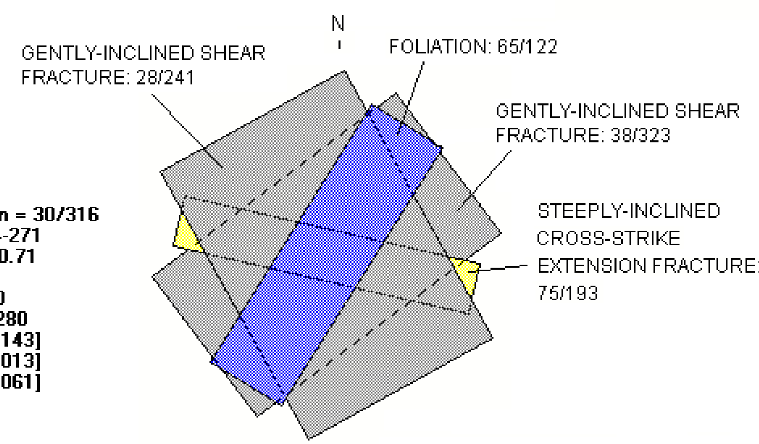


BLOCK DIGRAMS ILLUSTRATING THE CROSS-CUTTING RELATIONSHIPS BETWEEN FOLIAITION AND TECTONIC SHEAR PLANES

VIEW LOOKING NNW

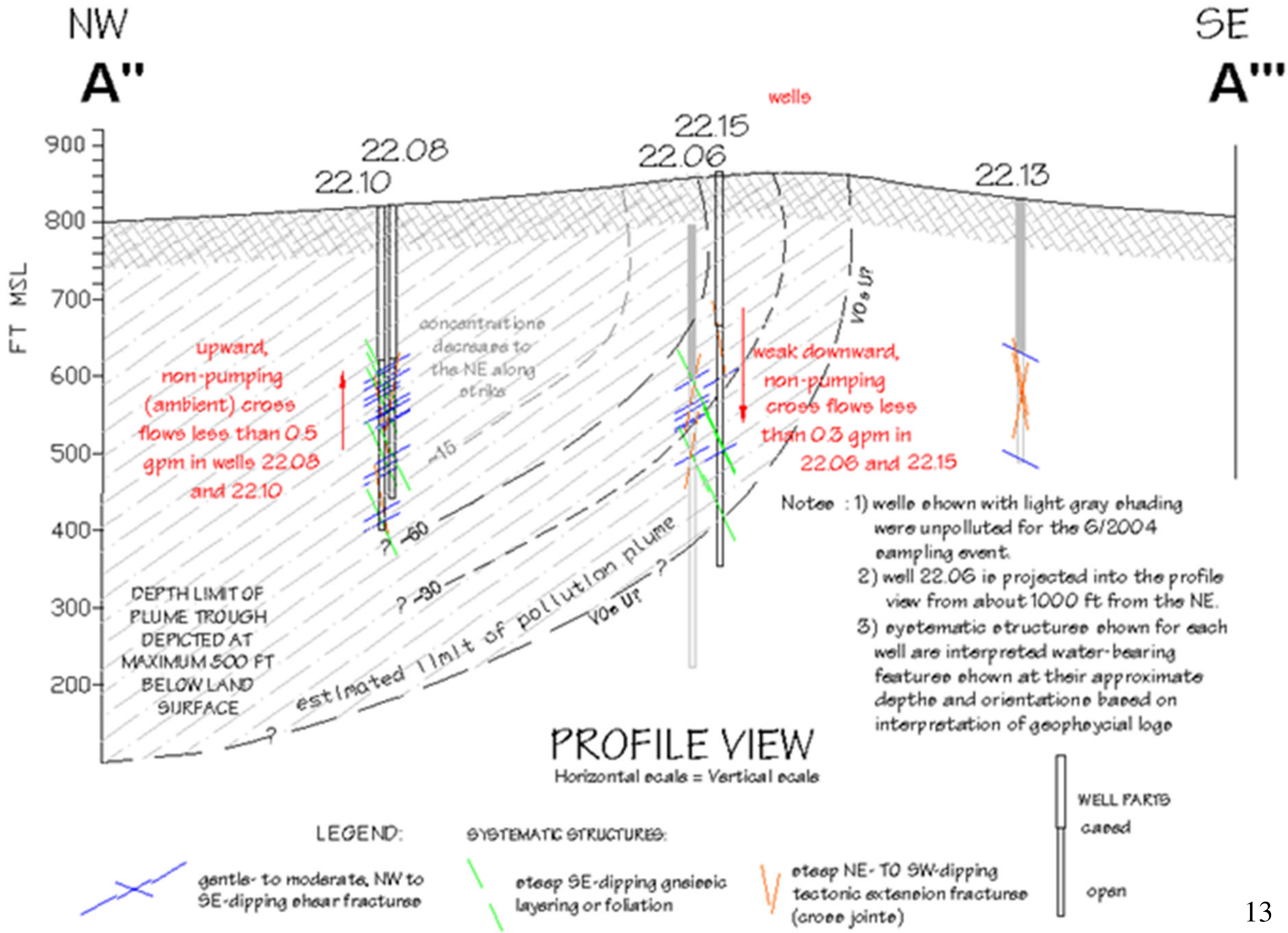


LOWER-HEMISPHERE, EQUAL ANGLE STEREOGRAPHIC PROJECTION OF TECTONIC SHEAR FRACTURES

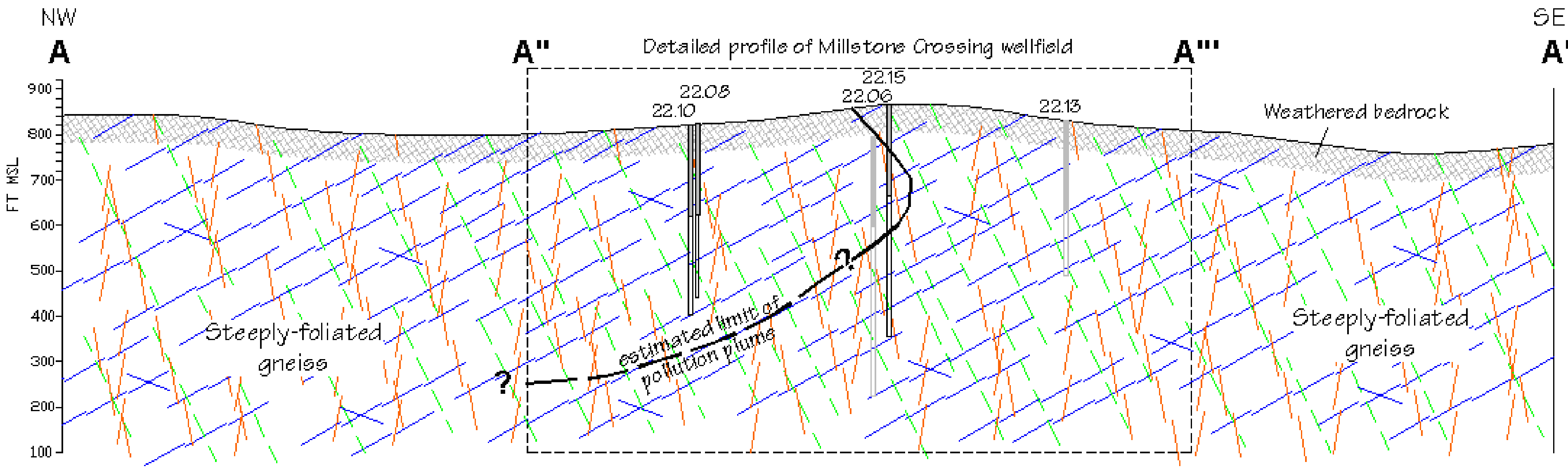


MAP VIEW OF PLANES MODELED IN THE THE 3D BLOCK DIAGRAM

DETAILS OF THE PROFILE HYDROGEOLOGICAL INTERPRETATION OF THE BEDROCK AQUIFER UNDERLYING THE MILLSTONE CROSSING DEVELOPMENT, PARKER RD., CHESTER TP., MORRIS COUNTY, NEW JERSEY, N.J. GEOLOGICAL SURVEY, G.C. HERMAN, 2004 DECEMBER 29



PROFILE HYDROGEOLOGICAL INTERPRETATION OF THE BEDROCK AQUIFER IN THE VICINITY OF THE MILLSTONE CROSSING DEVELOPMENT, PARKER RD., CHESTER TWP., MORRIS COUNTY, NEW JERSEY, N.J. GEOLOGICAL SURVEY, G.C. HERMAN, 2004 DECEMBER 29



PROFILE VIEW

Horizontal scale = Vertical scale

LEGEND:

WELL PARTS

cased

open

SYSTEMATIC STRUCTURES:

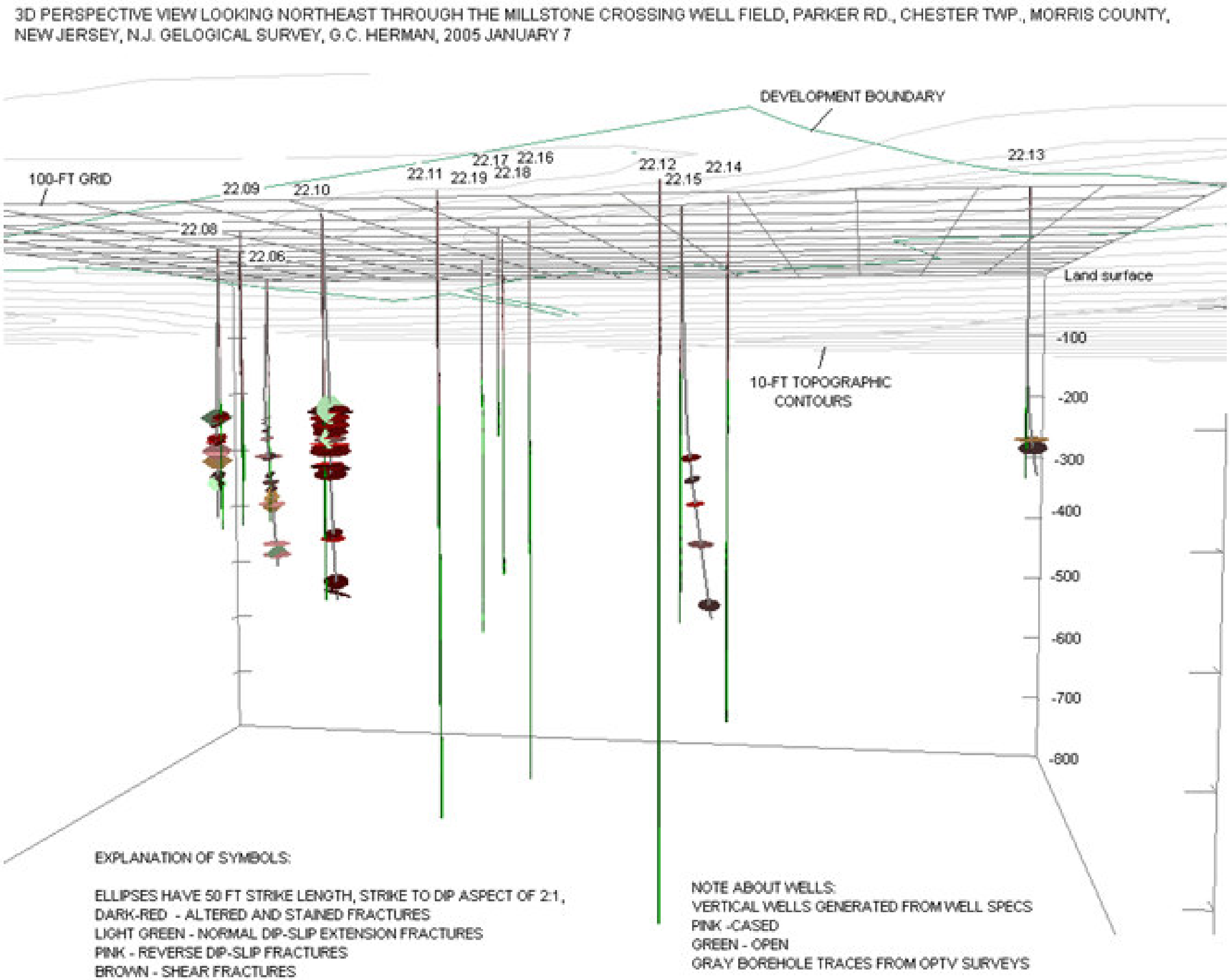
steep SE-dipping gneissic layering or foliation

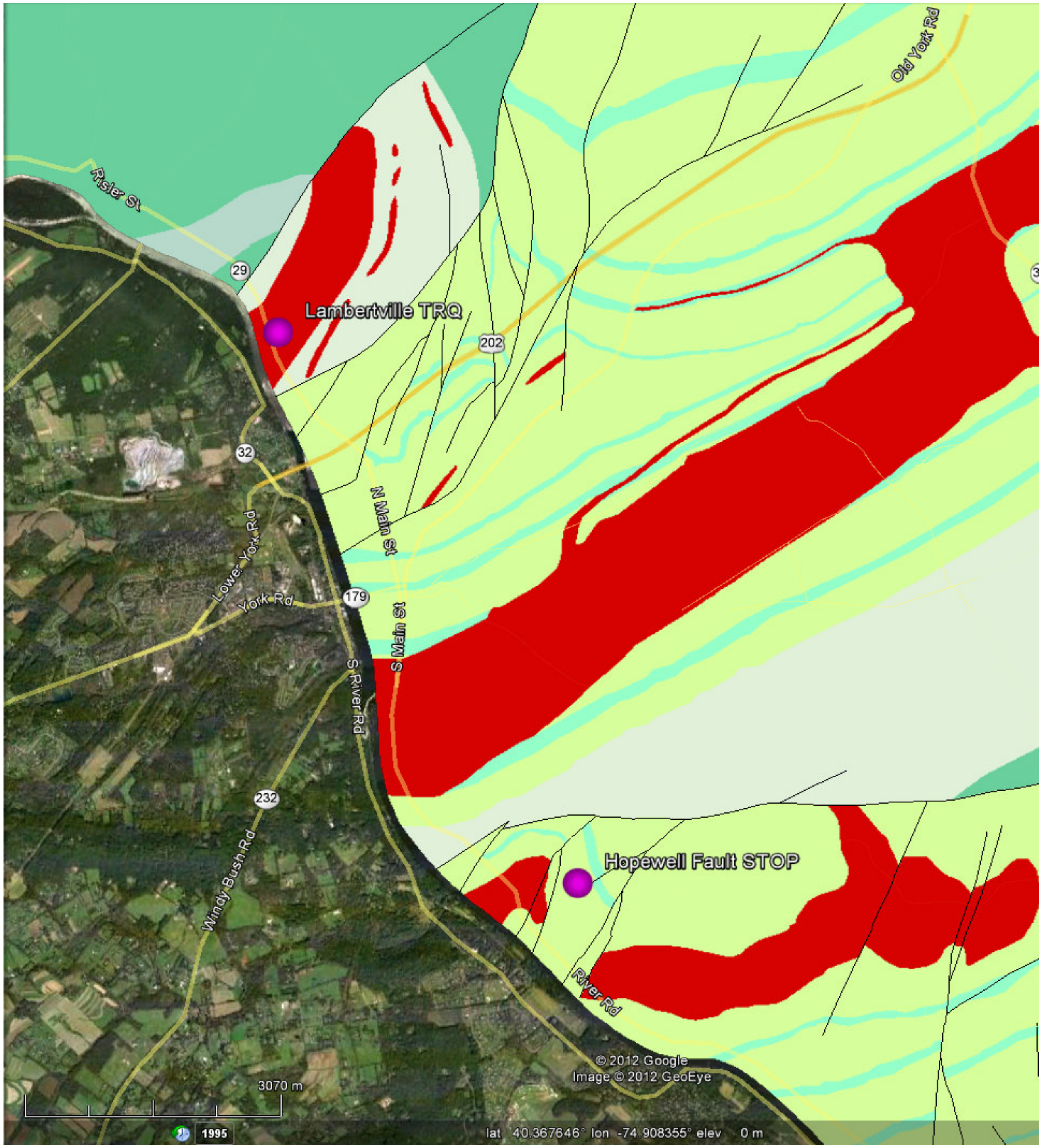
steep NE- TO SW-dipping tectonic extension fractures (cross joints)

gentle- to moderate, NW to SE-dipping shear fractures

Notes: 1) wells shown with light gray shading were unpolluted for the 6/2004 sampling period.

2) well 22.06 is shown at the correct topographic elevation and is projected into the profile view about 1000' from the NE.


3D PERSPECTIVE VIEW LOOKING NORTHEAST THROUGH THE MILLSTONE CROSSING WELL FIELD, PARKER RD., CHESTER TWP., MORRIS COUNTY, NEW JERSEY, N.J. GELOGICAL SURVEY, G.C. HERMAN, 2005 JANUARY 7
DEVELOPMENT BOUNDARY
100-FT GRID
22.09
22.10
22.08
22.06
22.11
22.17
22.16
22.19
22.18
22.12
22.15
22.14
22.13
Land surface
10-FT TOPOGRAPHIC CONTOURS
-100
-200
-300
-400
-500
-600
-700
-800
EXPLANATION OF SYMBOLS:
ELLIPSES HAVE 50 FT STRIKE LENGTH, STRIKE TO DIP ASPECT OF 2:1,
DARK-RED - ALTERED AND STAINED FRACTURES
LIGHT GREEN - NORMAL DIP-SLIP EXTENSION FRACTURES
PINK - REVERSE DIP-SLIP FRACTURES
BROWN - SHEAR FRACTURES
NOTE ABOUT WELLS:
VERTICAL WELLS GENERATED FROM WELL SPECS
PINK -CASED
GREEN - OPEN
GRAY BOREHOLE TRACES FROM OPTV SURVEYS


Risler St
29
Lambertville TRQ
202
Old York Rd
32
N Main St
Lower York Rd
York Rd
179
S Main St
S River Rd
232
Windy Bush Rd
Hopewell Fault STOP
River Rd
© 2012 Google
Image © 2012 GeoEye
3070 m
1995
lat 40.367646° lon -74.908355° elev 0 m

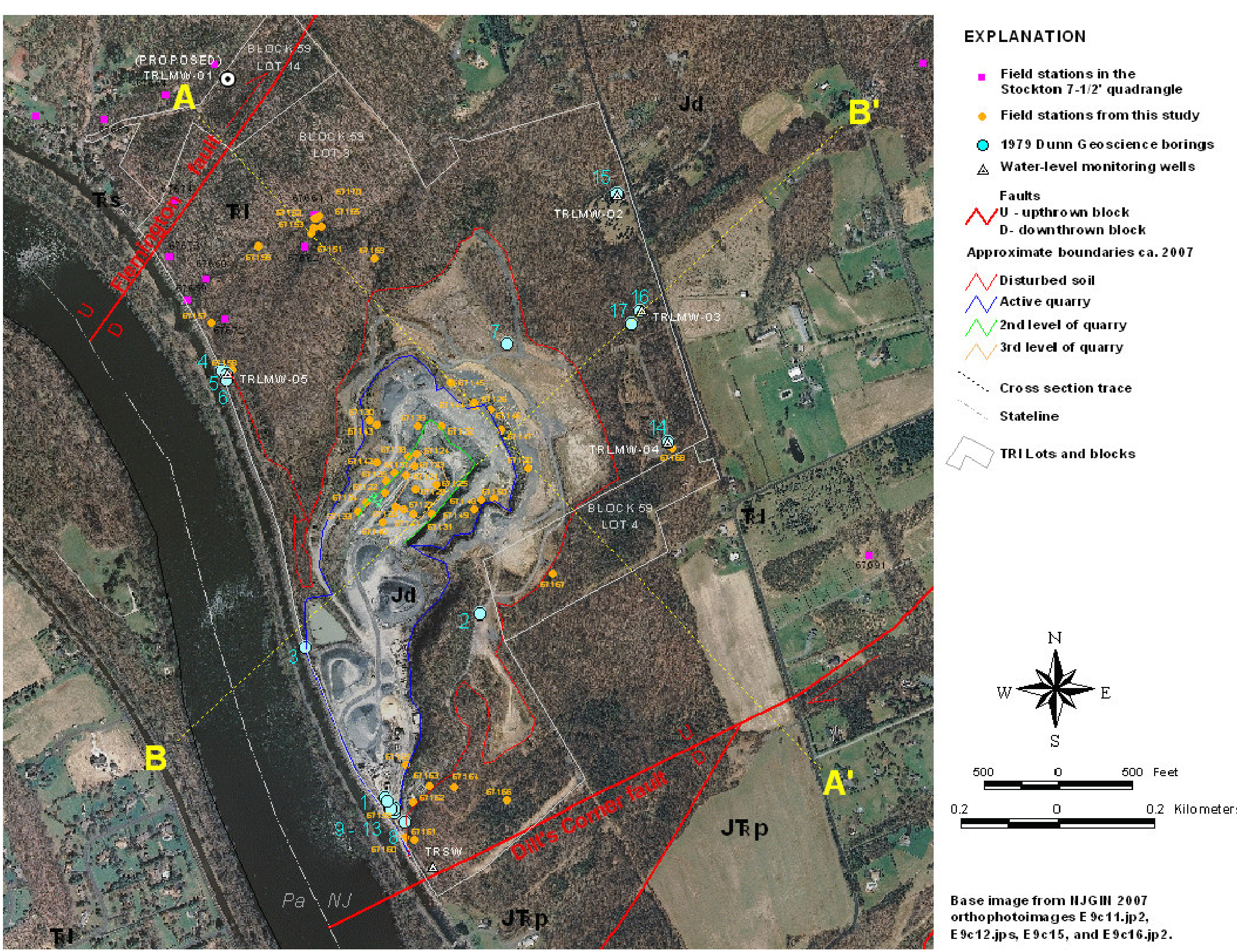
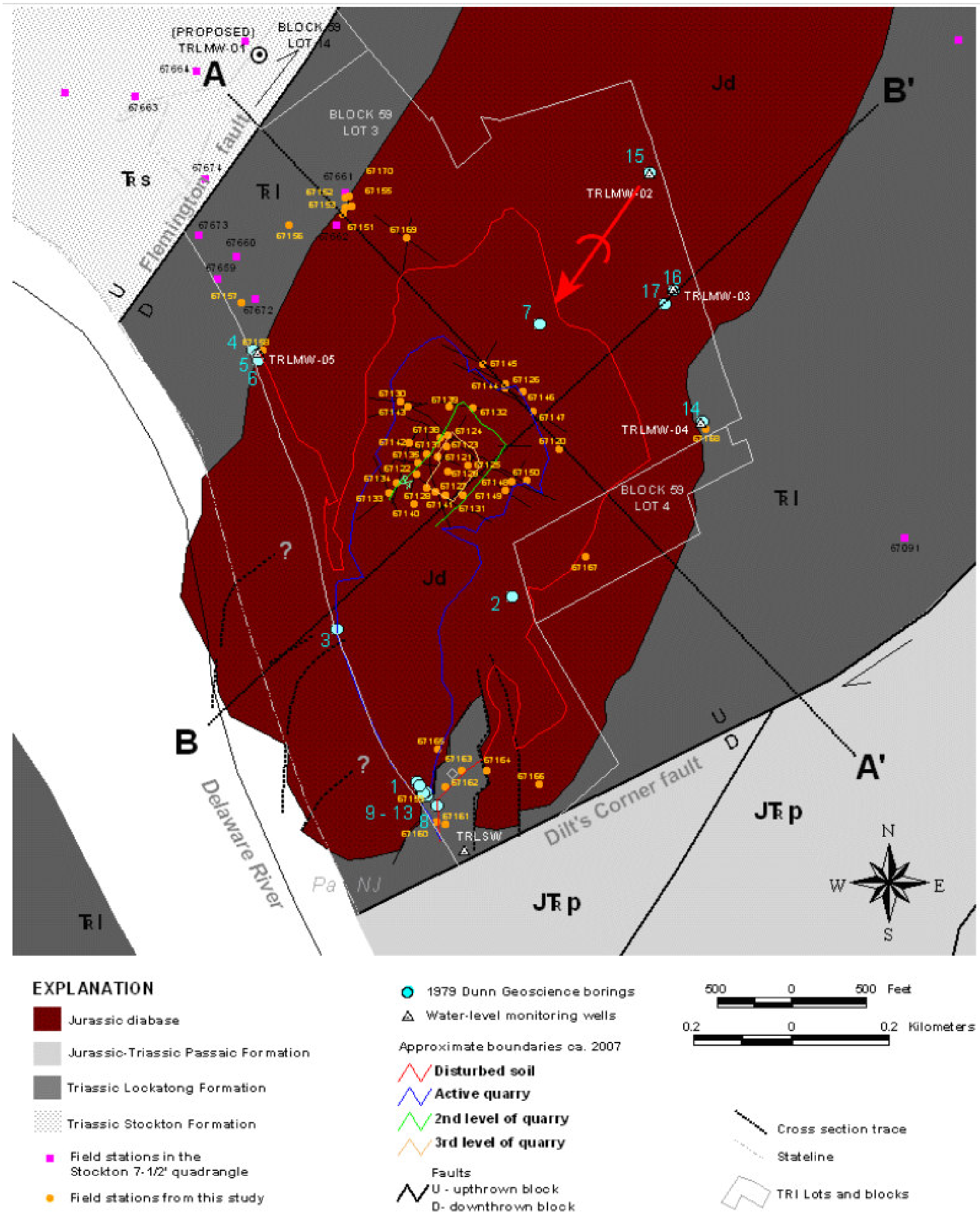


Figure 2. Detailed view of study area showing the quarry in relation to geological faults (Drake and others, 1997), NJGS field stations, Dunn Geoscience borings (1997), water-monitoring wells, and cross-section traces.



EXPLANATION
Jurassic diabase
Jurassic-Triassic Passaic Formation
Triassic Lockatong Formation
Triassic Stockton Formation
Field stations in the Stockton 7-1/2' quadrangle
Field stations from this study
1979 Dunn Geoscience borings
Water-level monitoring wells
Approximate boundaries ca. 2007
Disturbed soil
Active quarry
2nd level of quarry
3rd level of quarry
Faults
U - upthrown block
D- downthrown block
Cross section trace
Stateline
TRI Lots and blocks
Feet
Kilometers
Flemington fault
Dilt's Corner fault
Delaware River
BLOCK 59 LOT 14
BLOCK 59 LOT 3
BLOCK 59 LOT 4
(PROPOSED) TRLMW-01
TRLMW-02
TRLMW-03
TRLMW-04
TRLMW-05
TRLSW

Figure 5. A. NJGS geologist measuring a small fault plane at station 67144 (slickensided shear plane - table 1). B. Anastomosing shear planes surround pods of less-fractured rock that locally impart a "watermelon seed" texture to the face cuts (station 67124)

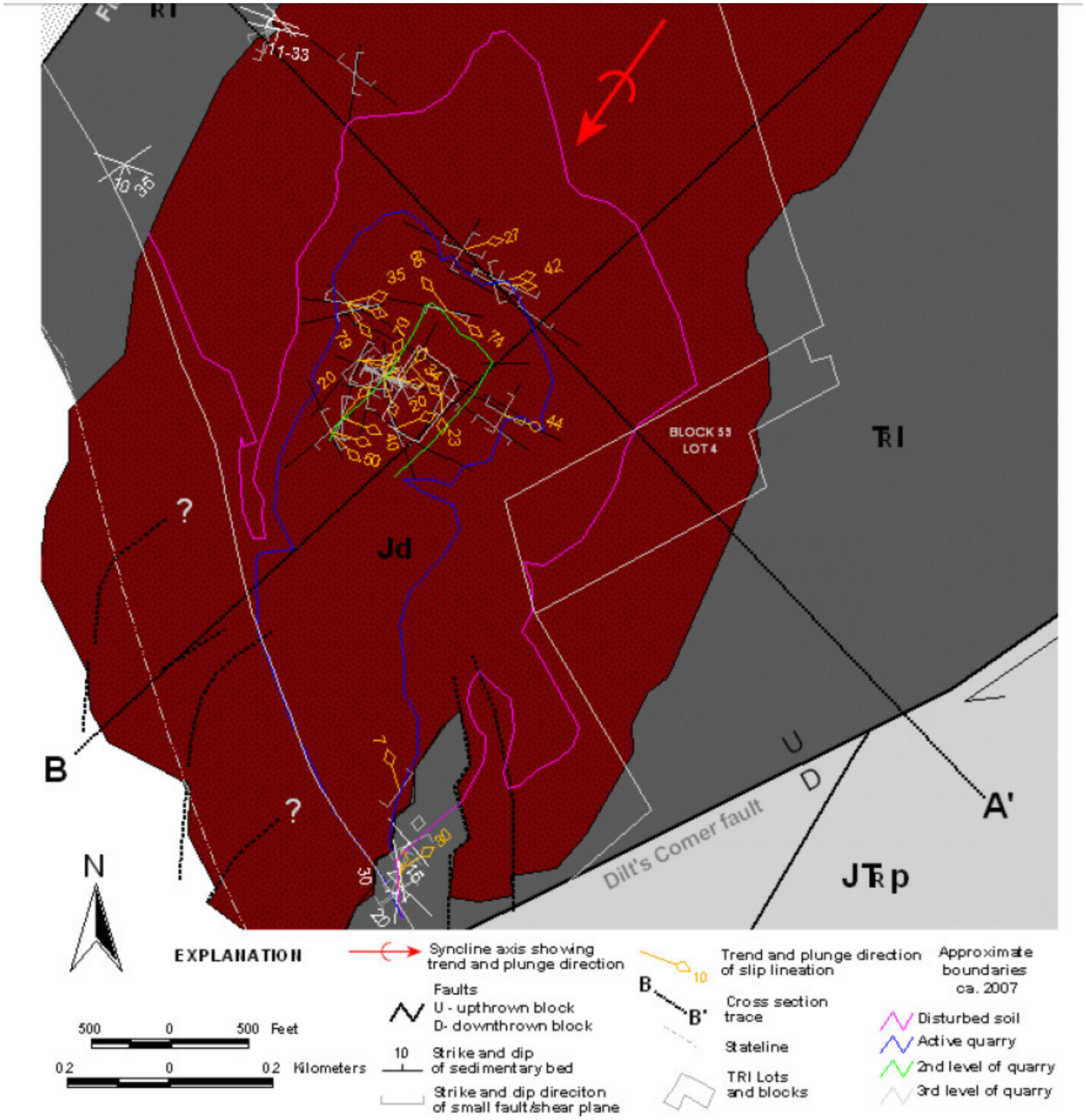


Figure 8. Detailed view of the quarry area showing the orientation of beds in the Lockatong Formation, and small faults (shear planes) and slip lineation (slickenlines) in and around the quarry. The most prominent set of faults mapped in the quarry strike NW-SE which is one of the two primary fault strikes mapped in the area (fig. 7C). Slip on faults is mostly to the East and Southeast (fig. 4D). Inferred fault lines are dashed and queried.

Two primary (P) and two secondary (S) statistical maximums for shear planes:

P 88/025, 37/120
S 66/283, 76/161

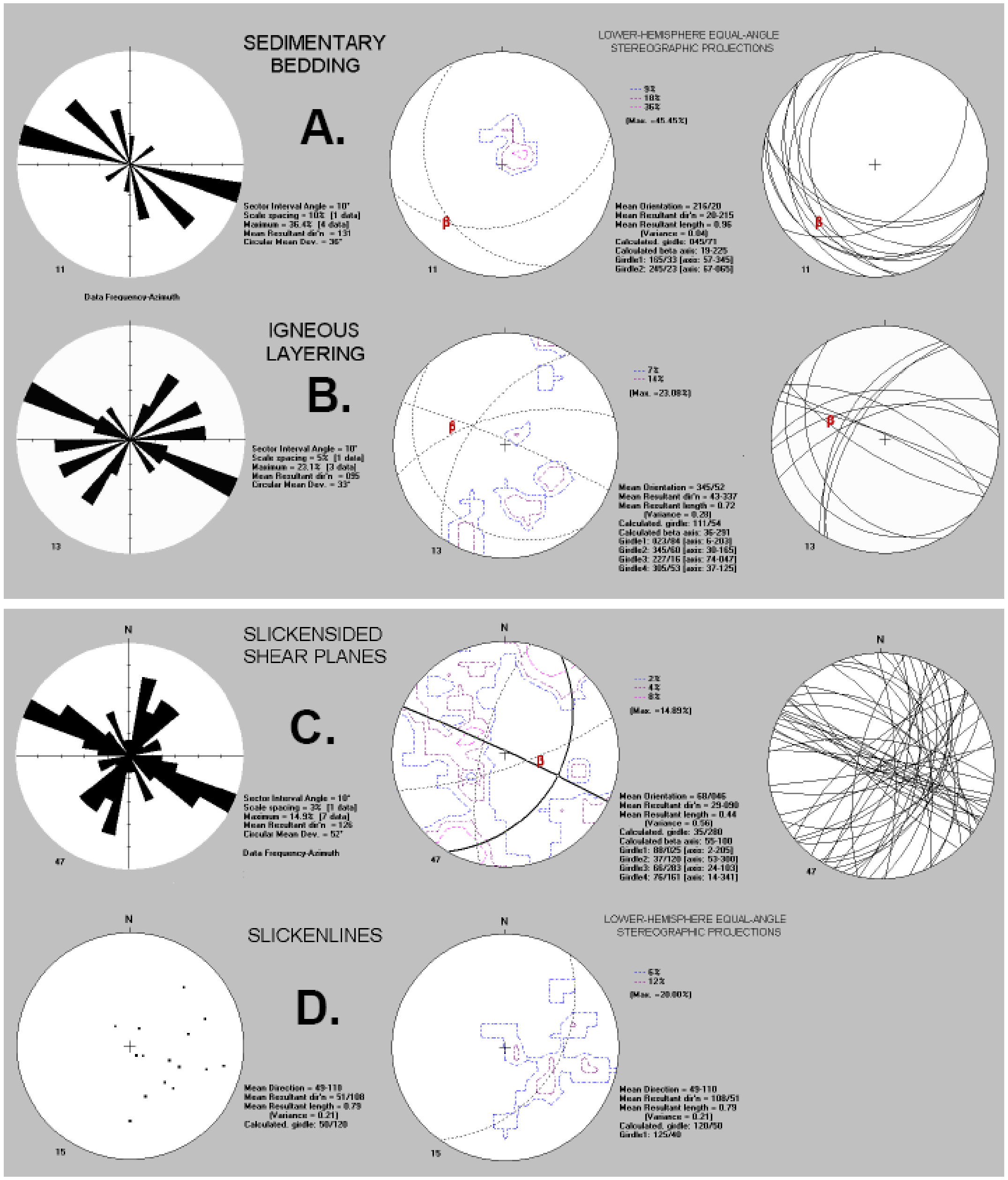
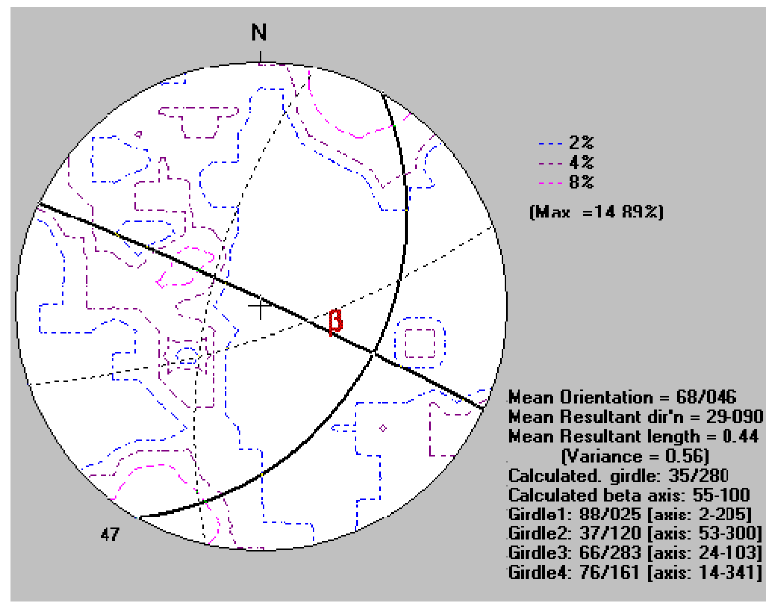
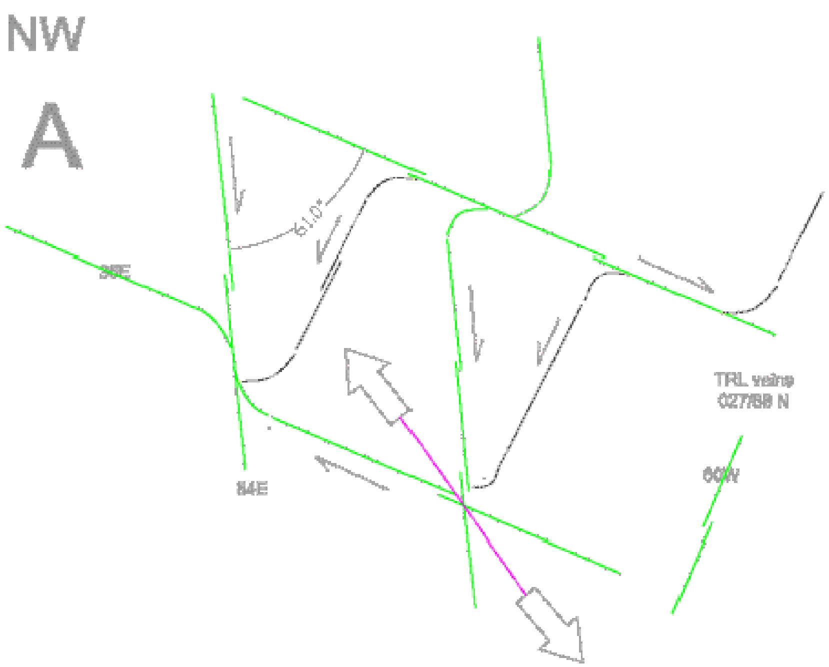
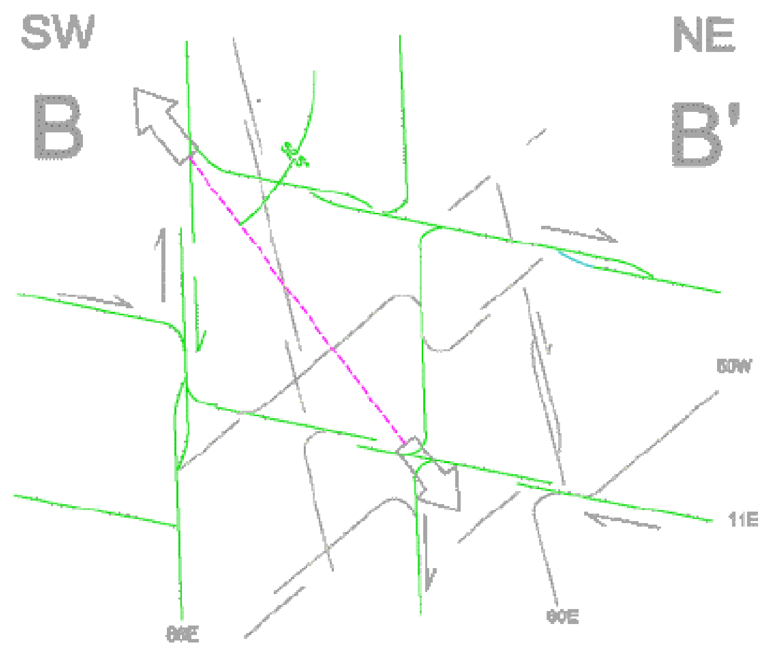


Figure 7. Structural analyses of the sedimentary bedding (A), metamorphic layering (B), slickensided shear planes (C), and slip lineation (D - slickenlines) mapped in the TRI Lambertville trap rock quarry. The Beta axes are lines in space that are parallel to the local fold axis. The fold axis shown on figs. 3 and 8 are taken from A.



P 88/025, 37/120 and S 66/283, 76/161 corrected for apparent dip based on





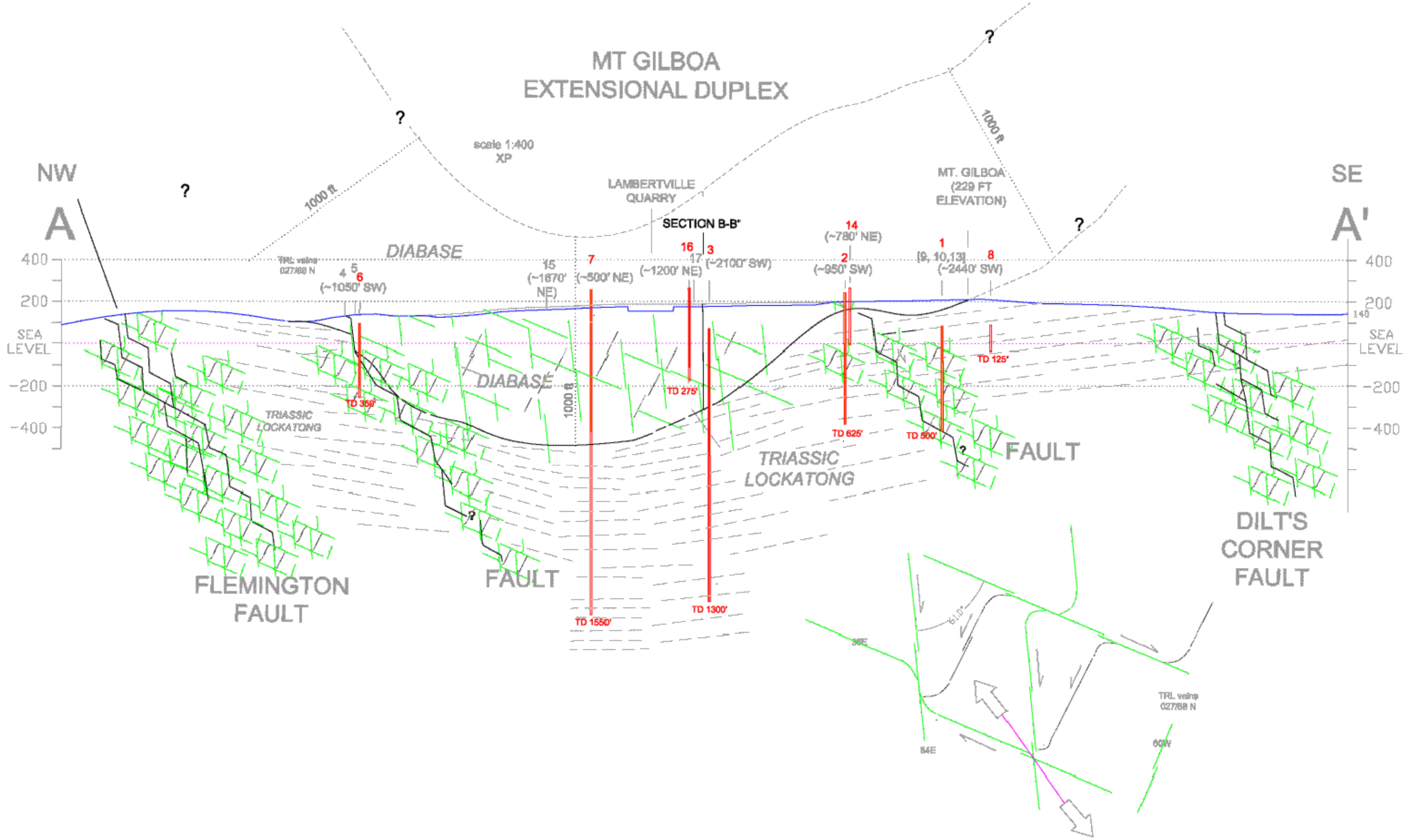


Figure 9. Detailed profile view of the quarry looking northeast, showing the orientation of mapped bedding planes, small faults (shear planes) and slip lineation in and around the quarry.

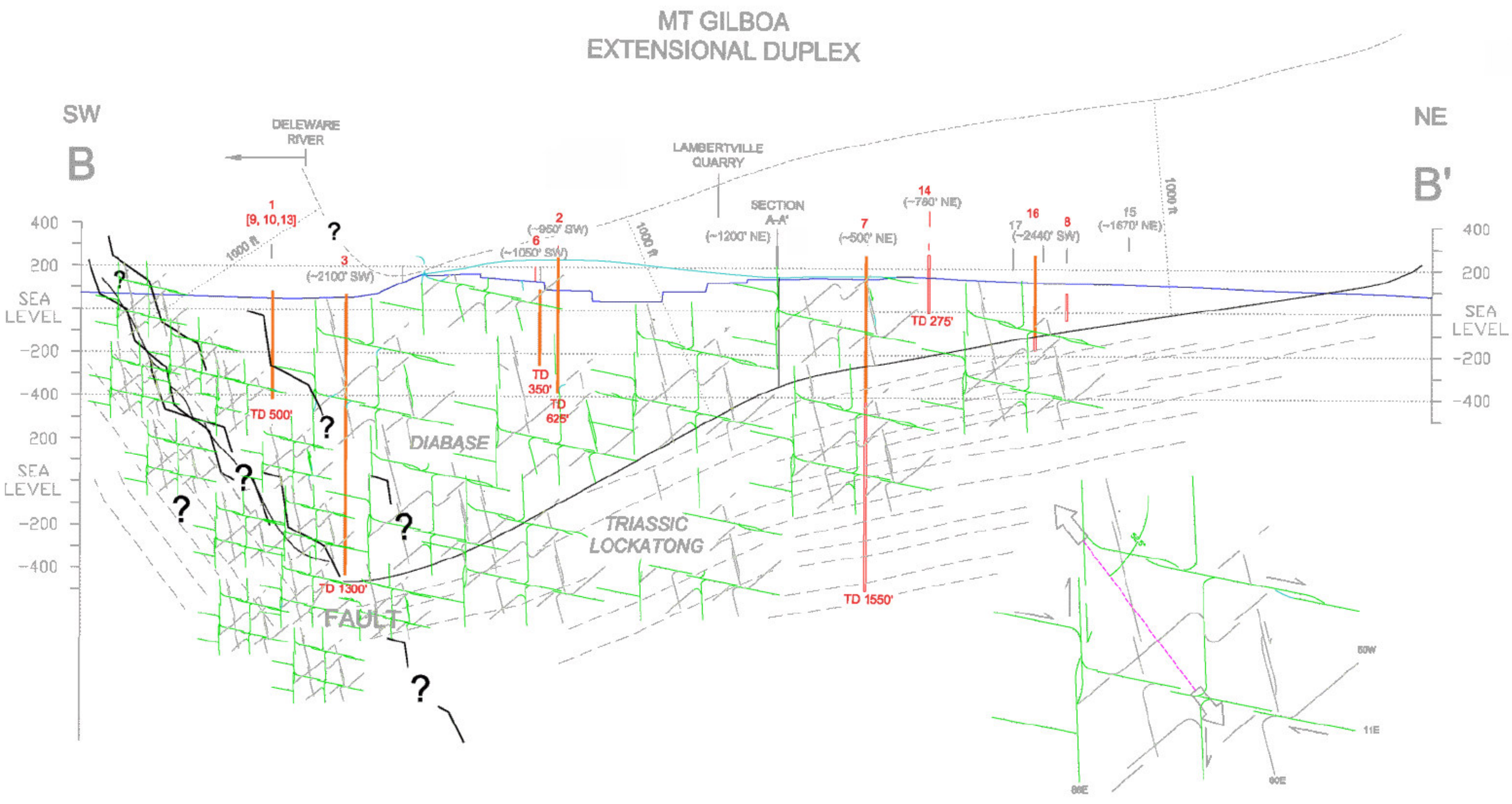


Figure 10. Detailed profile view looking NW of the quarry area showing the orientation of mapped bedding planes, small faults (shear planes) and slip lineation in and around the quarry.

Mt. Gilboa extensional duplex

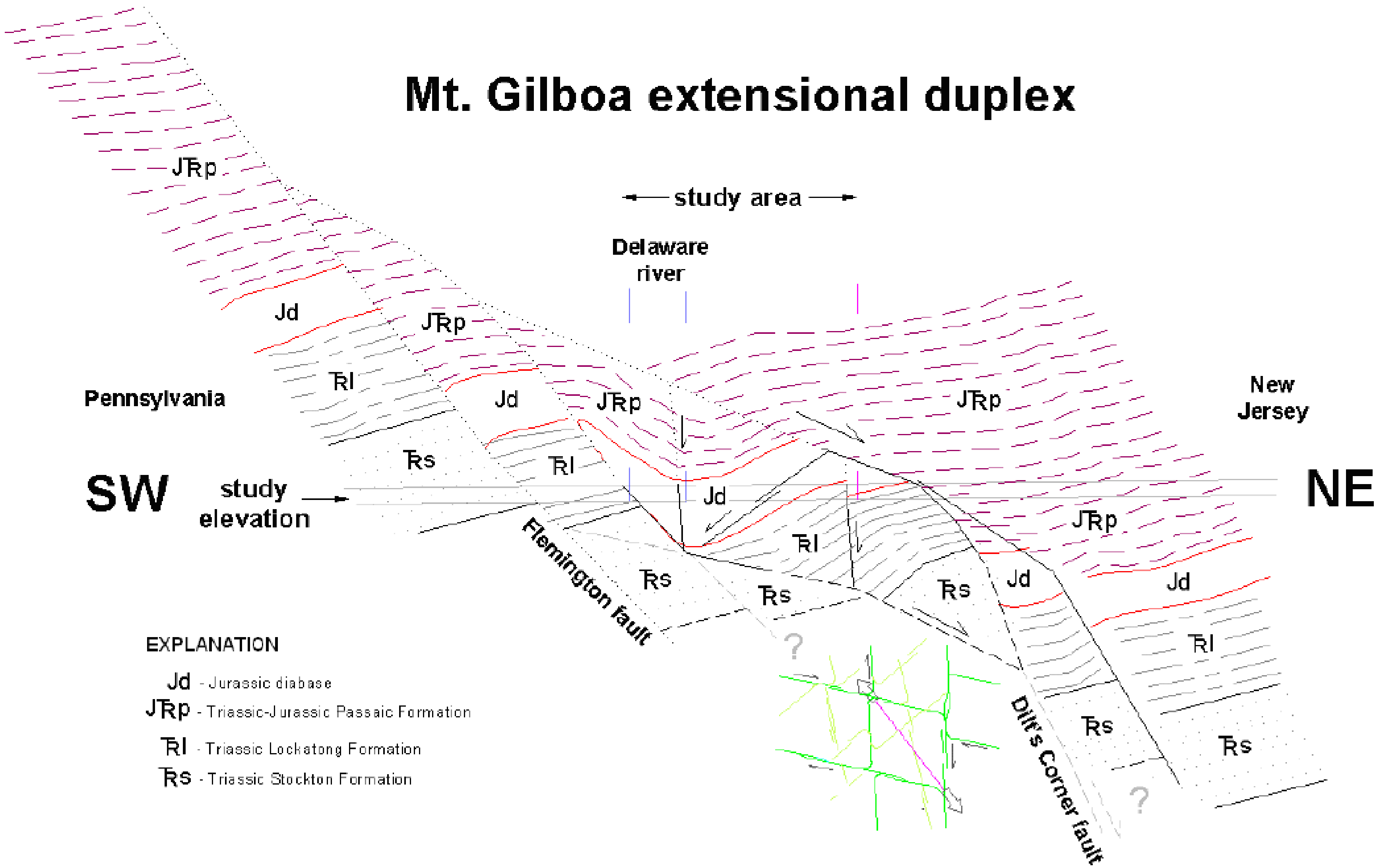
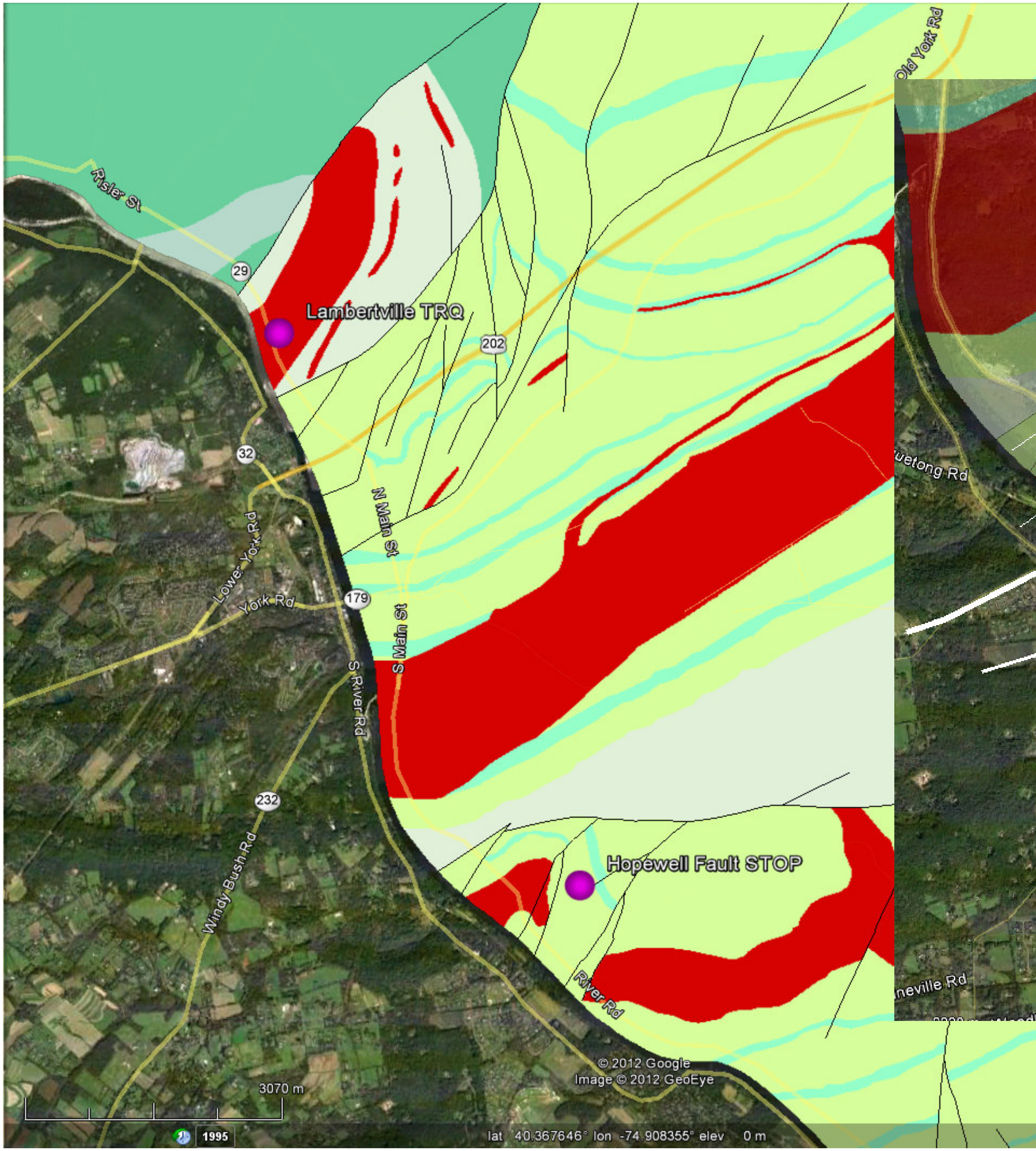
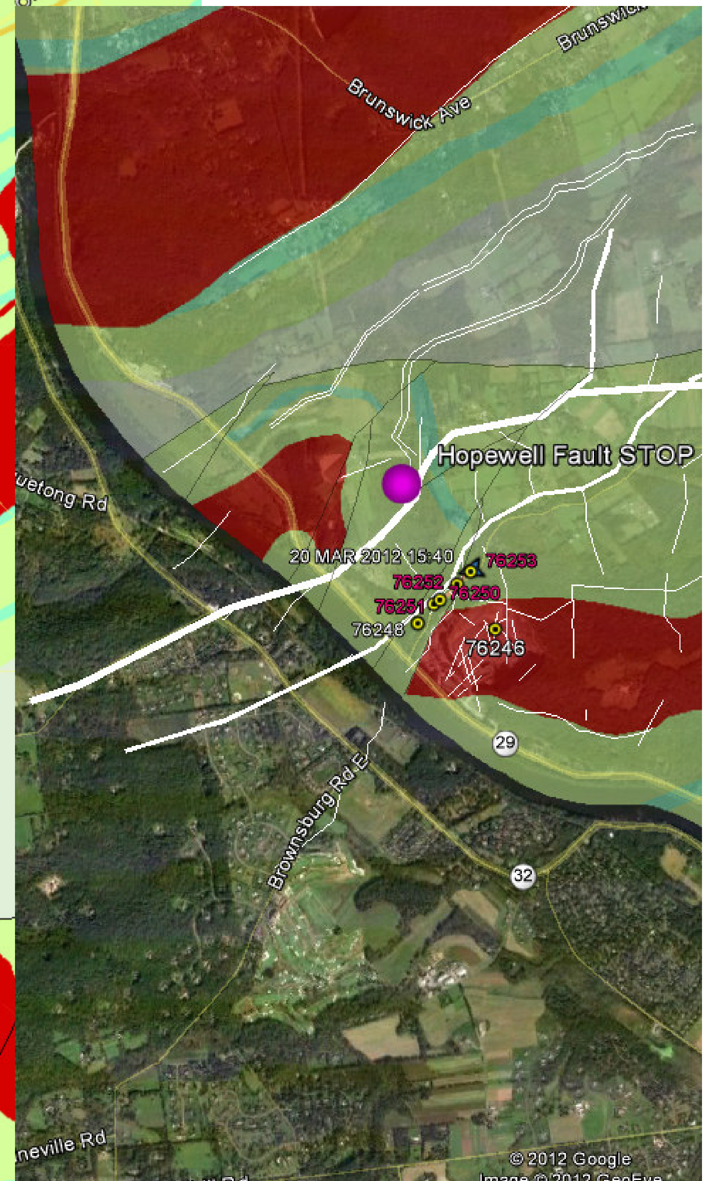
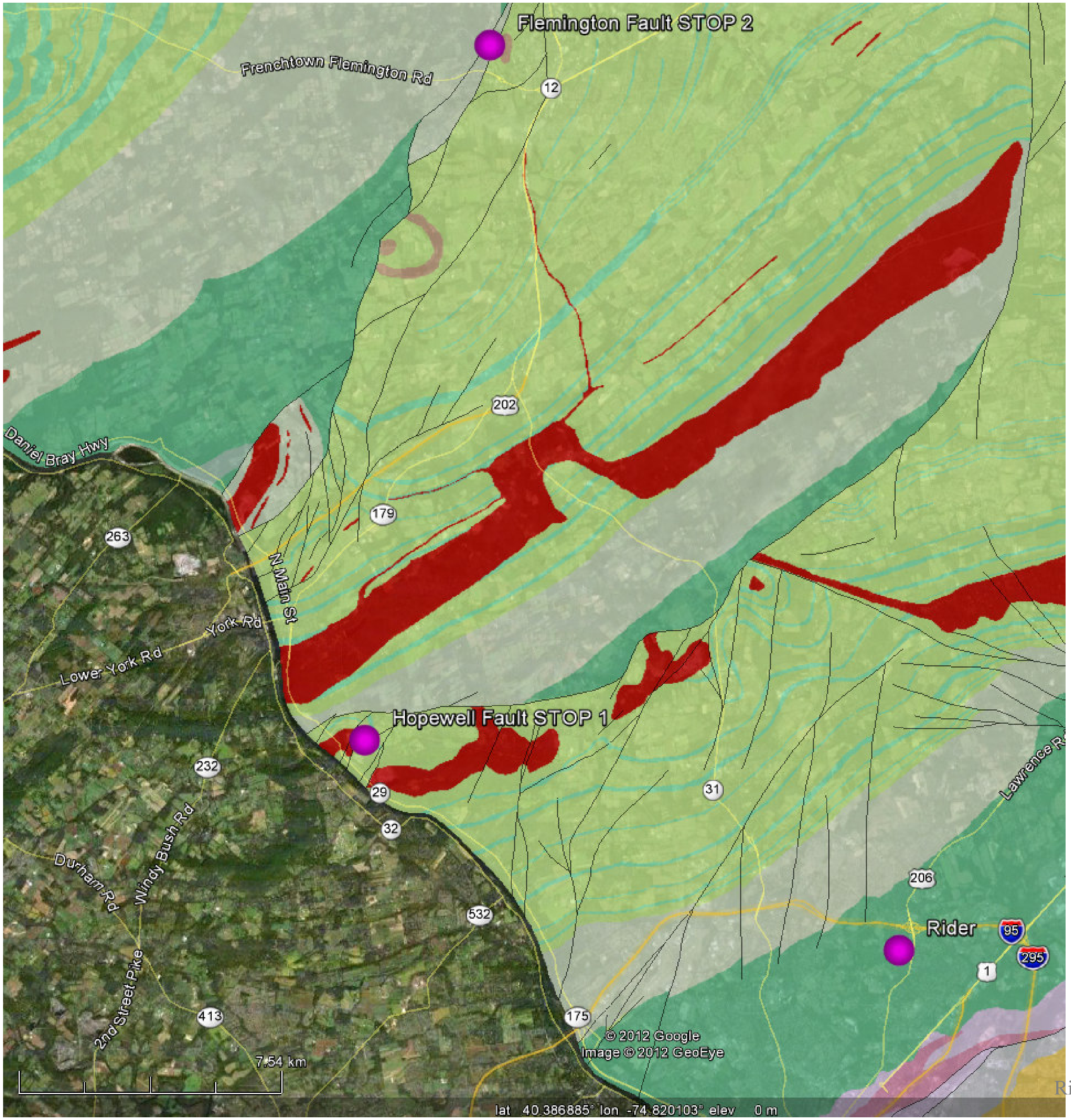
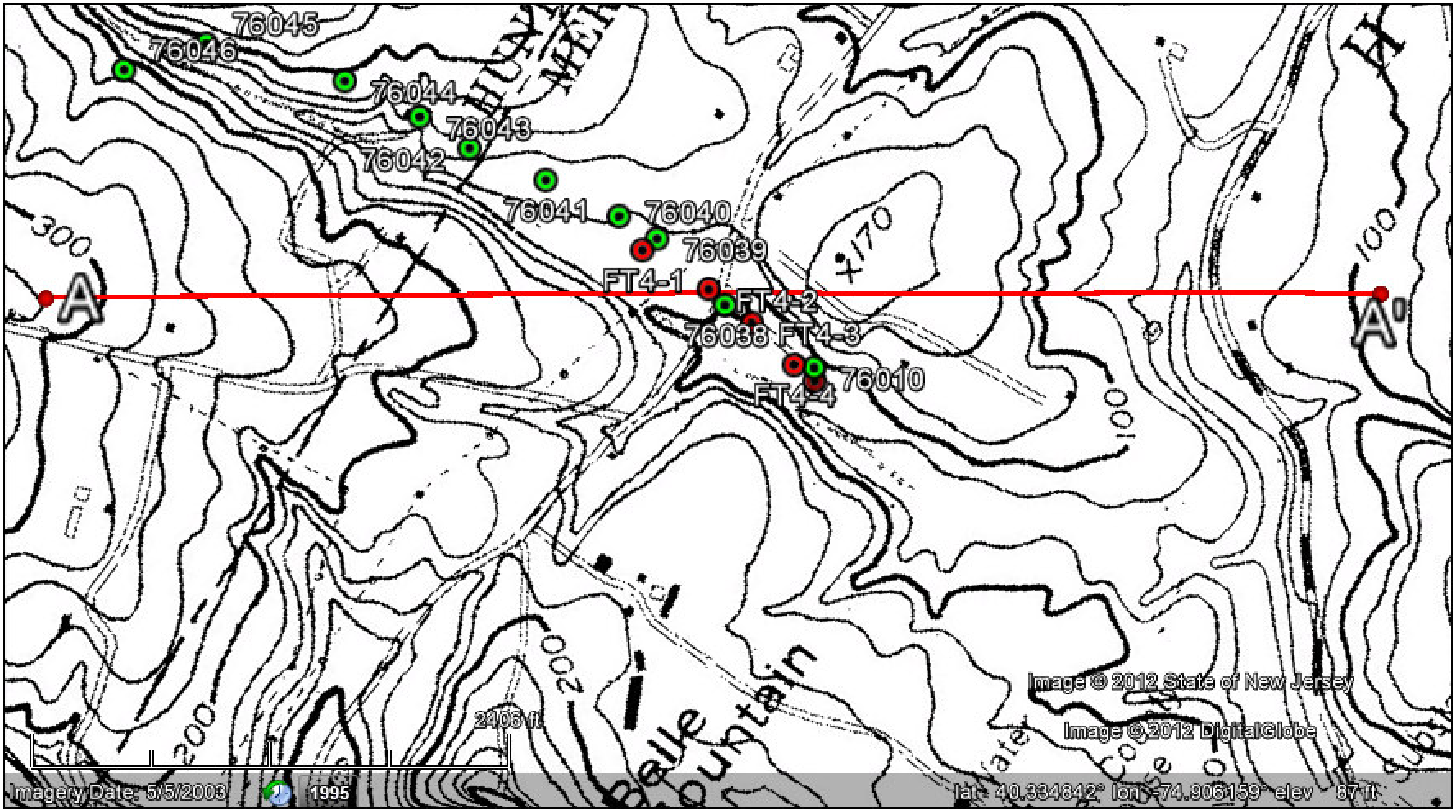


Figure 13. Schematic cross section looking NW of the braided and branching faults within the Flemington – Dilt's Corner fault system at the Lambertville Quarry, Delaware Twp., Hunterdon County, NJ. The fault geometry mapped in the quarry (bottom central) is probably similar to that in the larger fault system.

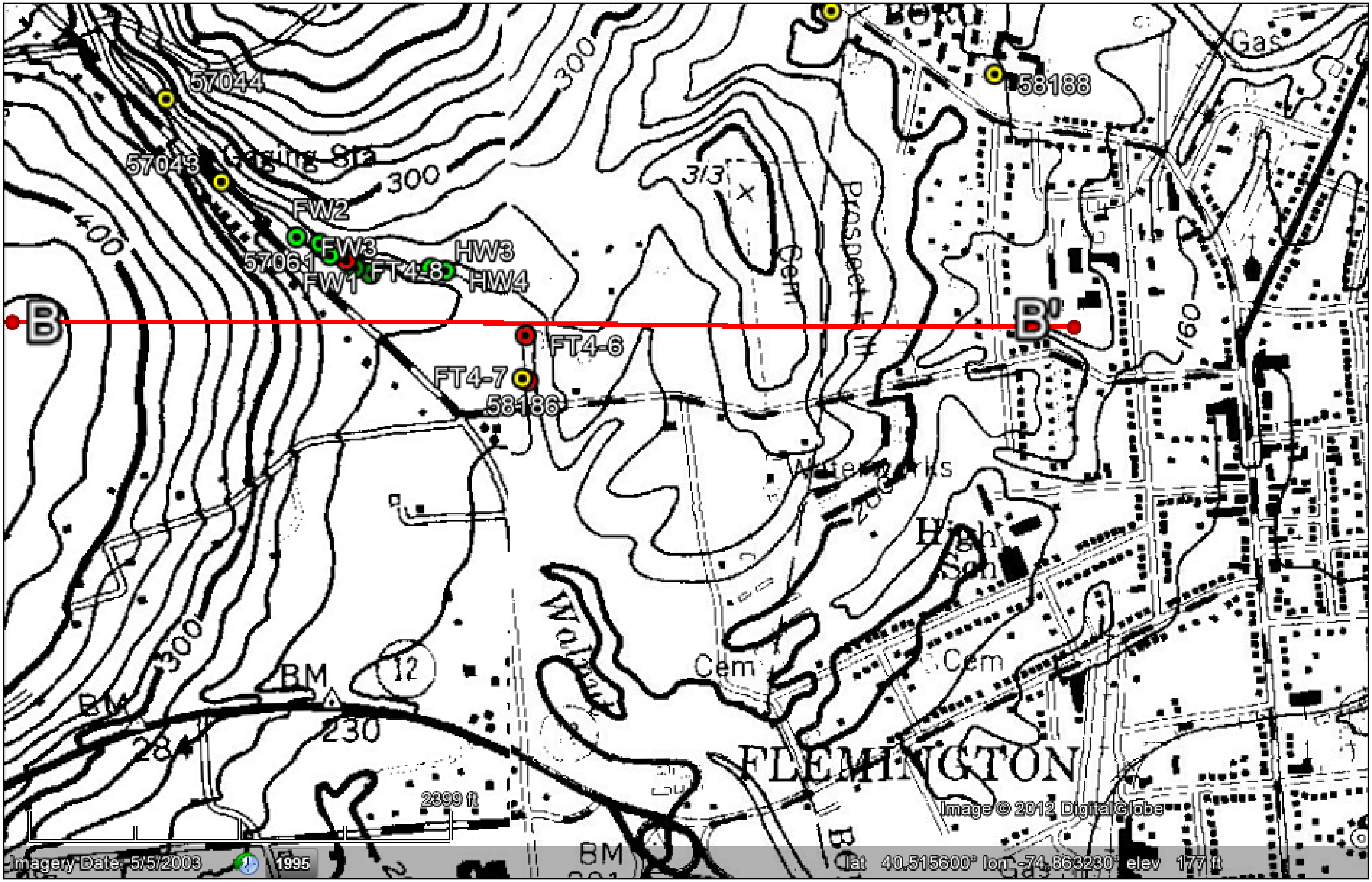

Old York Rd
Risler St
29
Lambertville TRQ
202
32
N Main St
Lower York Rd
York Rd
179
S Main St
S River Rd
232
Windy Bush Rd
Hopewell Fault STOP
River Rd
© 2012 Google
Image © 2012 GeoEye
3070 m
1995
lat 40.367646° lon -74.908355° elev 0 m


Brunswick Ave
Hopewell Fault STOP
20 MAR 2012 15:40
76253
76252
76250
76251
76248
76246
29
Brownsburg Rd E
32
© 2012 Google
Image © 2012 GeoEye


Flemington Fault STOP 2
Frenchtown Flemington Rd
12
202
Daniel Bray Hwy
179
263
N Main St
York Rd
Lower York Rd
Hopewell Fault STOP 1
232
29
32
31
Lawrence Rd
Durham Rd
Windy Bush Rd
532
206
Rider
95
295
1
2nd Street Pike
413
175
© 2012 Google
Image © 2012 GeoEye
7.54 km
lat 40.386885° lon -74.820103° elev 0 m



0 1000 2000 ft



0 1000 2000 ft