Resistivity Profile in an Urban Setting

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Background

• NJCU is a Federally designated Minority and Hispanic – Serving Institution in Jersey City, NJ (near Miss Liberty)
• Approx 5000 students FTE, primarily undergraduate
• 40% Caucasian, 30% Hispanic, 20% Afr-American
• Feds (NSF et al.) screaming for more bodies & more diversity in STEM
• Need to expand inquiry & activity-based learning across the Science curriculum to attract more Science students
• Our GIS success at NJCU suggests that hands-on, student-centered learning improves outcomes, regardless of discipline
• Geophysics re-introduced in Sp 2006 after 7-yr hiatus, plan was to get the students into the field
• Enter Dr. Lee Slater from Rutgers-Newark (!)
Jersey City History

- Geologic backbone = tilted edge (hogback?) of the Palisades Sill, world-famous layered intrusion associated with opening of the current Atlantic Ocean
- Industrial sites dating back to 18\textsuperscript{th} century, many on sites created with \textit{artificial fill} from tailings associated with chrome processing
- Artificial fill frequently contains Cr\textsuperscript{VI} (nasty heavy metal), along with Pb, petroleum, BTEX, timber fragments, concrete block, metallic debris, etc.
- \textit{The shallow exploration geophysicist’s paradise (?)}
Site Location

- Former industrial site
- Part of a larger area designated to become largest park (8+ acres) in Jersey City
- Larger issue: area will experience massive redevelopment as part of residential housing boom (NYC spilling over into JC)
- NJDEP historic fill map shows no fill at the site, but nearby well control to NE and SW suggests otherwise:
  - Chromate waste
  - Wood & concrete fragments
  - Fly ash
  - Miscellaneous debris, including steel
Site Location Map

Berry_Lane_Resistivity_Line

Legend
- berry_in_resistivity
- ALLWELLS Events
- Instreets

0 m
149 m
Exercise Goals

• Reinforce student concepts:
  – Conductivity
  – Resistivity

• Introduce / reinforce use of multiple data sources (geological & geophysical) to analyze and solve problems

• Begin to familiarize students with modern equipment and field data collection techniques

• Embrace multiple working hypotheses to explain resistivity profile

• Reinforce student use of “cross-sectional view” of subsurface
Exercise

• One resistivity line (thus far), parallel & extended from Berry Road, 400+ feet long
  – Discernible differences in resistivity with depth
  – Suggestive of layering / stratigraphy

• 2 sets of well control, 500 & 1000 feet away
  – Shallow water table (~ 5 feet below grade)
  – No reliable “depth to bedrock”, perhaps because of:
    • Similarities between artificial fill and Pleistocene deposits (sand/silt)
    • Poor sample descriptions (hint: hire more geoscientists….)

• Students instructed to take available data & construct a hydrostratigraphic cross-section
The Profile

Water Table?  
Base Fill?
Student Learning Outcomes

• TBD (To Be Determined)
  – Initial use of line on Sp 2006 Exam w/o well control and instructor mention of possible metallic debris in fill led to student answer of “metal” when asked why the low resistivity….

• Initial results (get them out of the lecture room and into the field) encouraging in terms of student attitude

• Students clearly are interested in, and motivated by, local problems and community issues
Epilogue

• Stay tuned for further additions to the new “Geophysics in the NJ Urban Jungle” series
• Check out “Find the UST with GPR”
• Thanks to Lee Slater and all of you real geophysicists who are helping me help NJCU students
• Questions?