



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 18th century, many on sites created with artificial fill from tailings associated with chrome processing
- Artificial fill frequently contains Cr ^{VI} (nasty heavy metal), along with Pb, petroleum, BTEX, timber fragments, concrete block, metallic debris, etc.
- *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



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

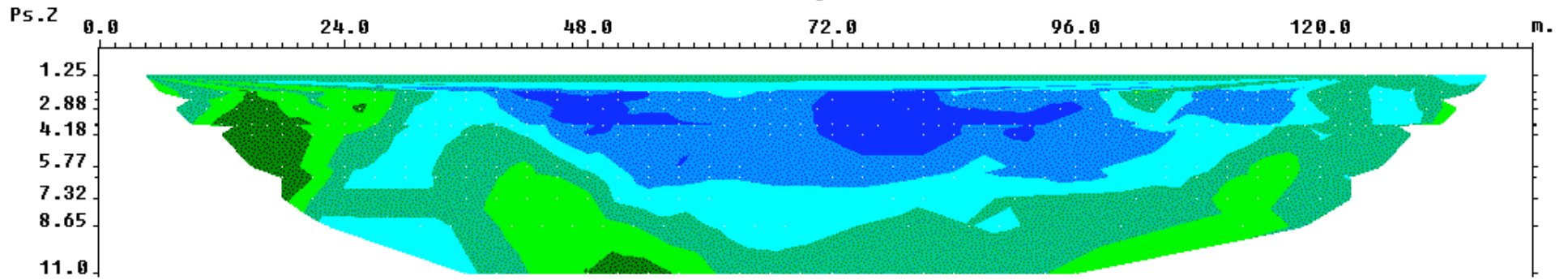
- One resistivity line (thus far), parallel & extended from Berry Road, 400+ feet long
 - Discernible differences in resistivity with depth
 - Suggestive of layering / stratigraphy
- 2 sets of well control, 500 & 1000 feet away
 - Shallow water table (~ 5 feet below grade)
 - No reliable “depth to bedrock”, 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

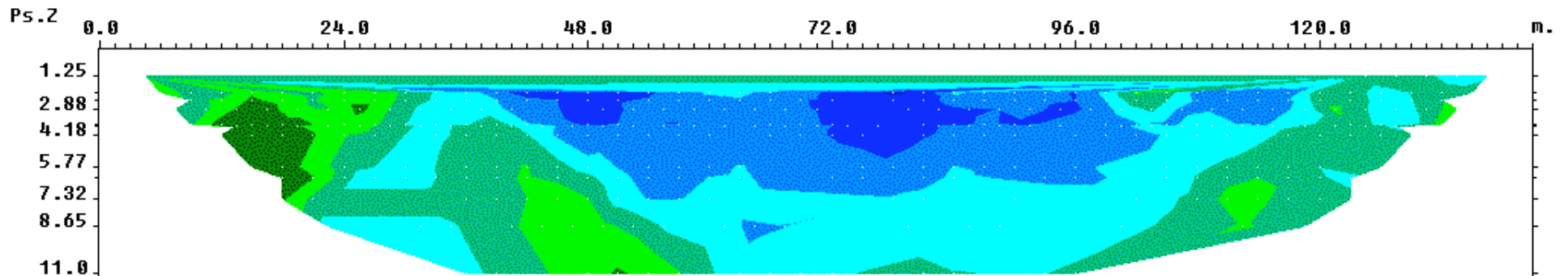
NE

SW

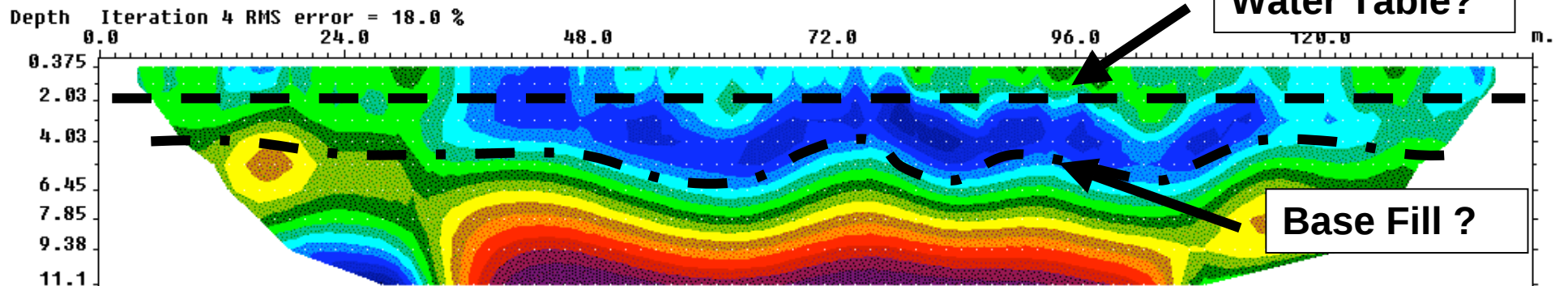
Berry.bin



Measured Apparent Resistivity Pseudosection



Calculated Apparent Resistivity Pseudosection



Inverse Model Resistivity Section



Unit electrode spacing 1.50 m.

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?