

# Geotechnical Investigation Execution for the Durham Orange Light Rail

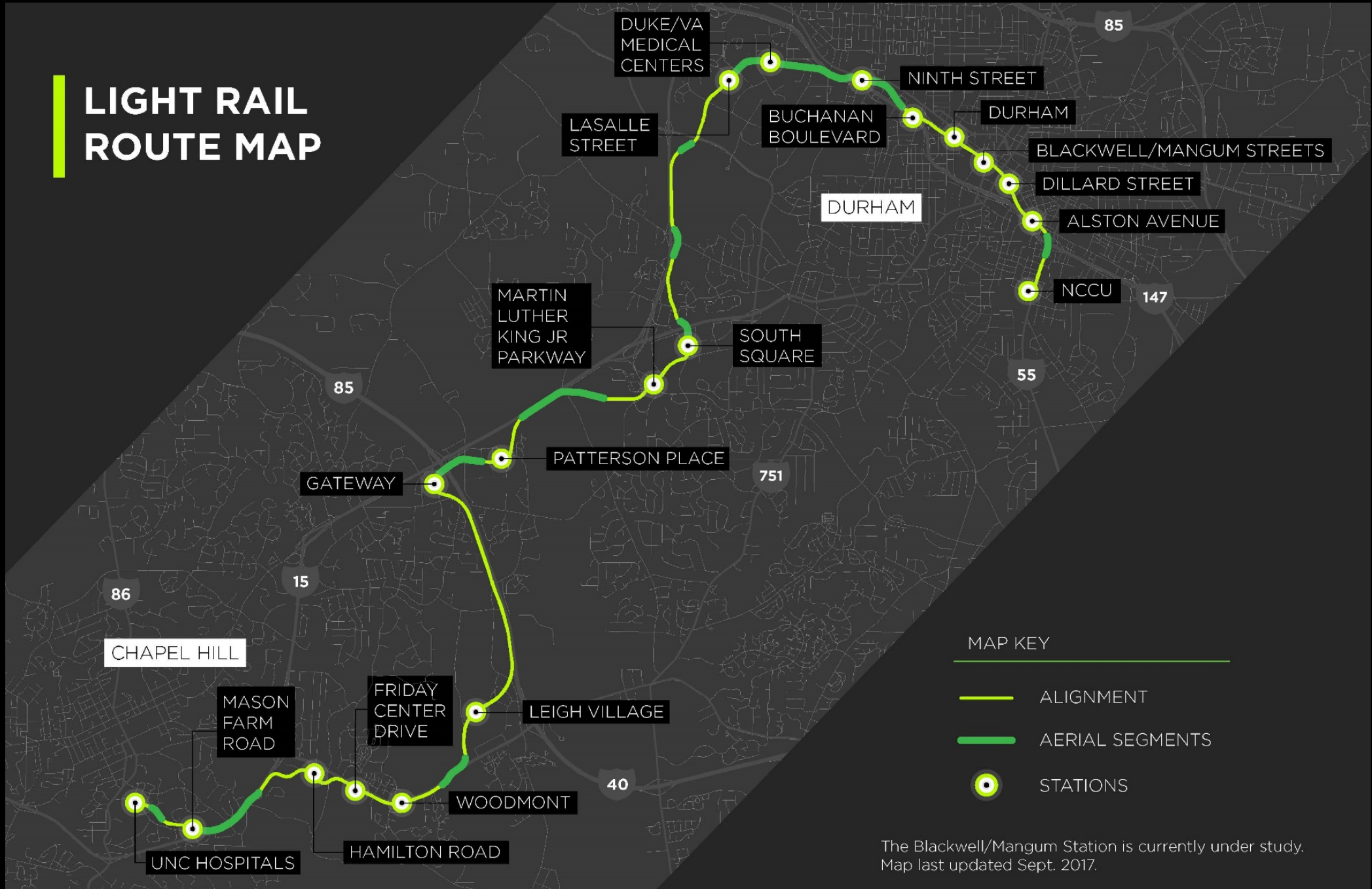
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HDR Engineering



# Topics

- Introduction to project
- Discuss geologic conditions
- Discuss HDR's method for boring layout and lab testing
- Coordination between HDR and stakeholders
- Lessons learned

# LIGHT RAIL ROUTE MAP



The Blackwell/Mangum Station is currently under study.  
Map last updated Sept. 2017.

# Owner – GoTriangle

- Expected cost \$2.5 billion
- 17.8 miles
- Stations, park and ride
- Duke University, UNC, and NCCU
- Construction set for 2020

- HDR won contract in 2016
- Subcontracted with
  - Mid-Atlantic Drilling - Drilling
  - ECS Southeast – Geologists and Laboratory
  - McKim & Creed – Survey and Utility Locating
  - Pyramid Environmental and Engineering – MASW Testing
- Timeline – 1 year
- Reality – April 2017 – August 2018 (16 months)



# Drill Equipment

- Rubber-tracked CME 45C and Diedrich D-25
- Mud rotary and hollow stem auger

# Utility Locating Equipment

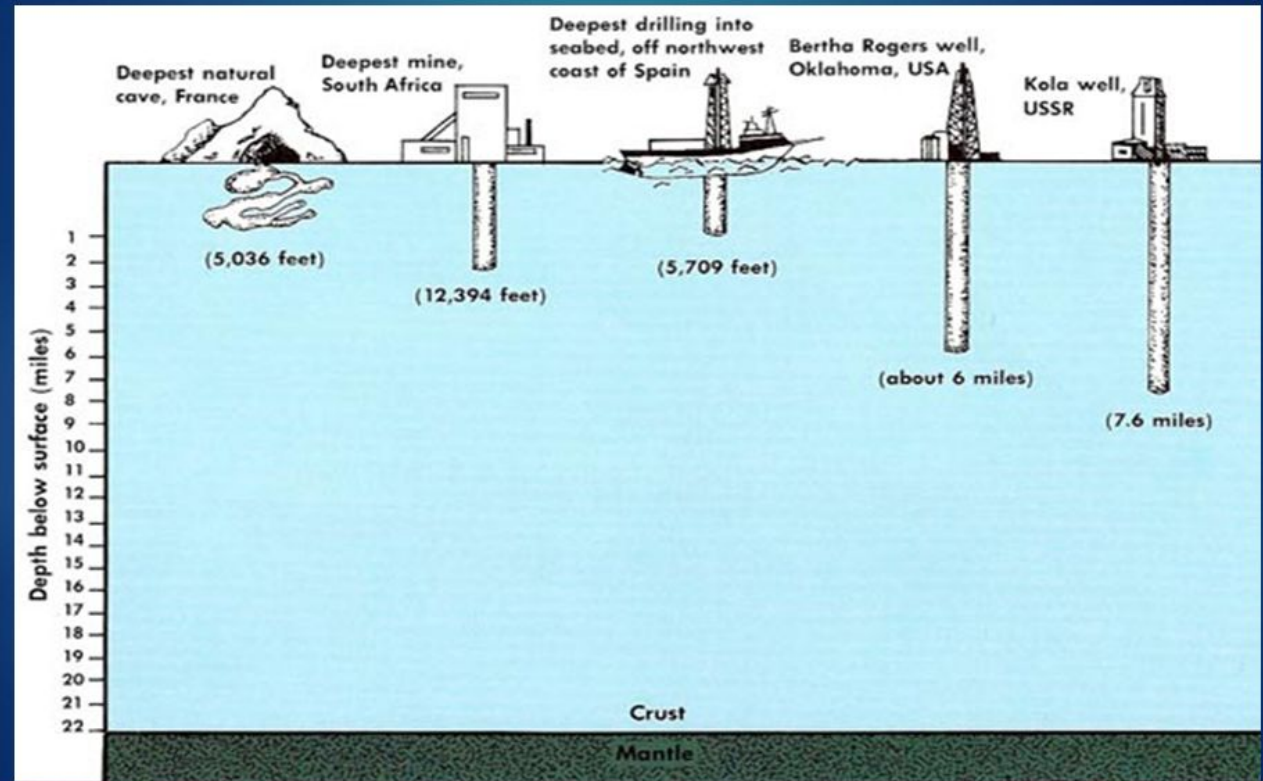
- Ground Penetrating Radar
- Vacuum truck



- Total of 1006 borings
- 25,000 feet of drilling
- 3,600 feet of rock core

TP: "To analyze the layers of Earth's interior."

# Deepest Holes in the World



# Geologic conditions

- Piedmont Province
- Straddles the Carolina Slate Belt/Triassic Basin
- Boundary between soil and rock not sharply defined in Triassic





# Lab Testing

- AASHTO classification (ASTM D 422, D 4318)
- Moisture content (ASTM D 2216)
- Corrosivity/resistivity
- UCS compressive strength on rock (ASTM D 7012)
- Slake durability (ASTM D 4644)

# Environmental Permitting

- Nationwide 6 Permit
  - Clean Water Act, Section 401 Certification
- Land outgrant application for USACE property

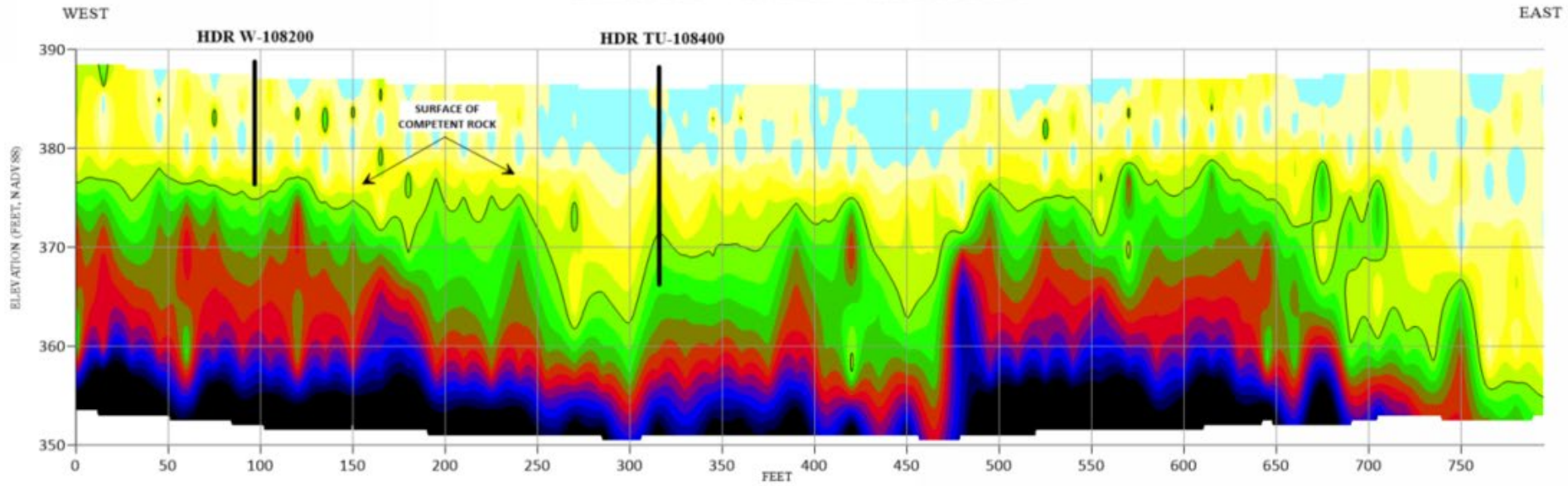


# Utility Coordination

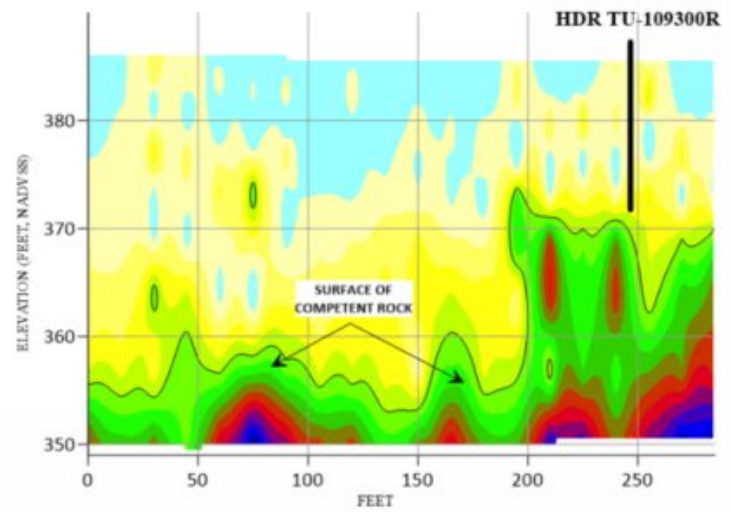
- NC811
- Duke University, UNC
- Private Utility locating



### PETTIGREW ST. MASW TRANSECT 1



### PETTIGREW ST. MASW TRANSECT 2



\*HDR BORING OVERLAYS SHOW DEPTH OF FIRST MAJOR REFUSAL IN COMPETENT ROCK



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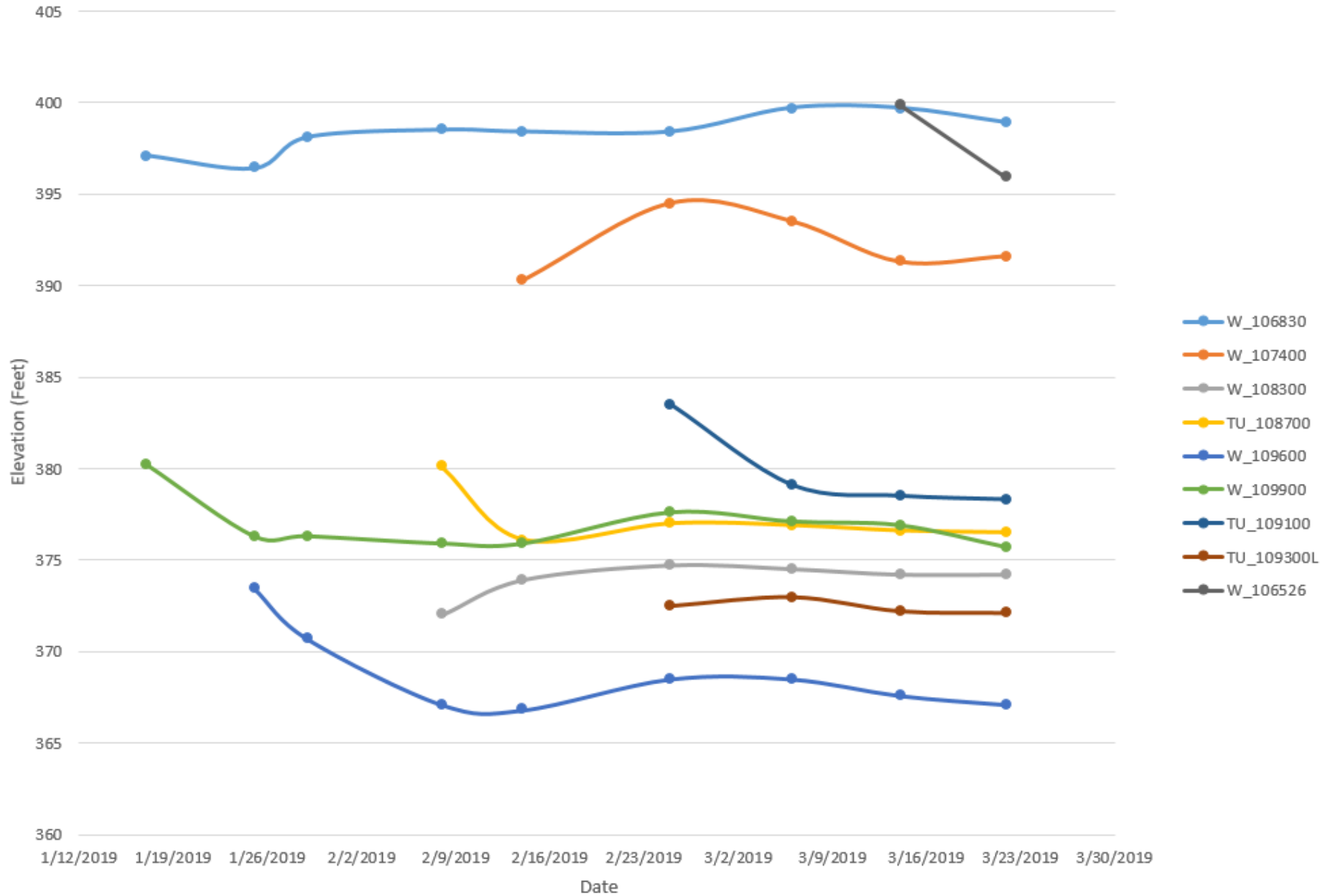
PROJECT DUKE ST./PETTIGREW ST. MASW  
DURHAM, NORTH CAROLINA

TITLE PETTIGREW ST. MASW  
SHEAR WAVE VELOCITY  
TRANSECTS 1 & 2

DATE 1/28/2019  
PYRAMID PROJECT # 2019-017

CLIENT HDR, INC.  
**FIGURE 4**

### Civil Line East Piezometer Summary



# Coordination with state and local government

- Project lies between two NCDOT divisions, 5 and 7
- City of Chapel Hill, City of Durham
- Traffic control hours 9AM-4PM
- Use same geotechnical standards and MUTCD as NCDOT
- Must contact all parties involved for drilling in roadway due to special events/holidays, etc.

- City of Durham storm water pollution
- All permits and safety practices in place





# QUESTIONS?

- [cjones@hdrinc.com](mailto:cjones@hdrinc.com)
- <https://gotriangle.org/lightrail>