S.R. 30 Landslide
East Pittsburgh/North Braddock Boroughs
Allegheny County

Brian Heinzl, P.E.-
Gannett Fleming, Inc.

Eric Klimas, P.E. –
Golden Triangle
Construction, Inc.

Cheryl Moon-Sirianni, P.E.-
PennDOT District 11
• Electric Avenue is in East Pittsburgh Borough
• 25,000 ADT
• Major Artery from eastern communities to Parkway East and City of Pittsburgh
Investigation

Timeline

- Paved “Dip” thought to be caused by drainage
- Settlement within 2 weeks
- Landslide 1 week after settlement
Engineering Investigation

April 4th – ‘Subsidence’ Evaluation
- Roadway displacement vertical – not lateral
1934 Record Plan

- Crosspipe
- Wall
- Drainage configuration not accurate
- Foundation Remnants
- Could not find MH
- Beech St removed
- Apartment Complex

Route 30
Engineering Investigation

April 4th – ‘Subsidence’ Evaluation

- Possible soil piping away into broken drain pipe
Engineering Investigation

April 4th – ‘Subsidence’ Evaluation
• Recent Waterline break
Engineering Investigation

April 4th – ‘Subsidence’ Evaluation

• Locals suggest collapsing Tunnels under Roadway
Engineering Investigation

April 4th – ‘Subsidence’ Evaluation

• 15’ high midslope Concrete cantilever wall
Wall constructed to fill steep valley between 2 cut sections along the proposed Route 30 grade.

1934 Record Profile
Engineering Investigation

April 4\textsuperscript{th} – ‘Subsidence’ Evaluation
• Apartment Complex replaced Beech St.

End Beech St.
Engineering Investigation

April 4\textsuperscript{th} – Immediate Action- reroute drainage; video sewers; begin drilling to look for voids; monitor wall
Engineering Investigation

April 6th – movement accelerating vertically & laterally
Engineering Investigation

April 6th—wall moving; breaking foundation remnants

[Images of wall and foundation remnants]
April 6th – slope also moving below wall
April 6th – Conclusions

• This is no longer a subsidence issue
• The slope is failing
• Stop all work within the roadway
• Close Road
• Evacuate Residents
• Begin removing material above wall
Friday (4/6/18) – Landslide Developing

- Ordered evacuation of two apartment buildings and residential house
- Duquesne Light at site ahead of major landslide relocating lines
Friday (4/6/2018) – Emergency

- Deputy Secretary issues Verbal Emergency Declaration
Saturday (4/7/18) – Major Landslide

Directly Affected
• 25,000 vehicles/day
• 2 Municipalities

• 15’ high concrete wall, 80’ downhill failed
• 300’ Long x 50’ Depth landslide
Saturday (4/7/18) – Major Landslide
Displacements

• Displaced 34 People
  • 8 Permanently Displaced Tenants
  • 2 Homeowners (1 House)
  • 21 Temporarily Displaced Tenants
  • 1 Daughter/Caregiver
  • 2 Children

• Subsidized Low Income Housing
• Left with the clothes on their back and whatever they could carry
Property Damage

Destroyed

- Two apartment buildings
- One residential house

- Displaced 31 people
Utility Impacts

- Multiple utilities affected
• Evacuated five additional apartment buildings and one warehouse
Sunday (4/8/18) – Emergency Work

• Began working around the clock (Allison Park Contractors)
• Demo of apartment buildings
• Excavation of landslide
• Prep for drilling operations
Three Emergency Contracts

- Landslide Remediation/Cleanup (APC)
- Culvert Repair (Michael Facchiano Contracting)
- Drilling (Armstrong Drilling)
Three Emergency Contracts

- Backing into Federal Procedures for three emergency contracts
Monday (4/9/18) – Emergency Contract

- Emergency Contract design and development
- Daily internal meetings and daily conference calls with ACES
Governor Wolf’s Visit
Mr. Wolf called the collapse and slide “devastating” and “scary” and marveled that there were no injuries.

State Transportation Secretary Leslie S. Richards stressed the road is so important that it has to reopened regardless of cost.

Gov. Tom Wolf watched them work, saying, “That’s courageous stuff that they are doing right now, and I was just amazed.”

“Everyone is safe, all workers are safe and all traveling public is safe. That's our biggest concern right now is the safety of everyone,” Moon-Sirianni said.
Tuesday and Wed (4/10-11/18) – Drilling

- Geotechnical drilling commenced
Thursday (4/12/18) – Access to Buildings

- Coordinated site visit for evacuated individuals with ACES
Friday (4/13/18) – Benching Continued
Wed (4/18/18) – Mandatory Pre-Bid Meeting

54 Contractors
24 PennDOT Employees
Friday (4/20/18) – House Demolition
Golden Triangle Construction Company awarded emergency contract for $6,543,210.00
400’ Long by 20’ High pile/lagging wall to be constructed
TIMELINE

- April 4th – Gannett Fleming on site to assist PennDOT with evaluation of movement
- April 5th – Geotechnical Drilling begins
- April 6th – GF returns to site for update; Road Closure and Evacuation ordered
- April 7th – Slide Occurs; PennDOT requests GF to prepare plans to remediate within two weeks.
- April 7th – Design Begins
Engineering Investigation & Design Process

• April 12th – Geotechnical Drilling Complete
• April 12th – Draft Plans for Construction Schedule
• April 13th – TS&L and Foundation submission
• April 14th – Internal GF ISO Review
• April 15th – PS&E Package to PennDOT
• April 16th – Comments received, addressed, resubmitted, & Project Advertised
• April 18th – Mandatory Prebid meeting
• April 20th – Bids opened & NTP issued
Engineering Investigation & Design Process

April 6th – Begin Design
• Develop a plan using limited data
• Mapping – 2006 LiDAR imagery
• One boring (B-3) partially completed

Anticipate a wall – look for available beams
Potential slide surface along fill/claystone interface
Engineering Investigation & Design Process

April 6\textsuperscript{th} – Conceptual Option 2
Engineering Investigation & Design Process

April 7th – Slope fails
Design assumptions – Rock Outcrops along Rt 30
Geotech resource maps support GF assumptions

Stratigraphic units

Landslide susceptibility

Geologic Contacts
Design assumptions – stratigraphy developed based upon 2 borings completed prior to slide
25 feet of Schenley Redbeds

Weak landslide prone soils, degrades and loses strength upon exposure to water.
April 10th - Design Moves on:

GF uses drone technology to create final design mapping.
April 11th - Updated Mapping comparison:
April 10\textsuperscript{th} - 12\textsuperscript{th} : Stability Analysis

- Morgantown Sandstone EL 840
- Schenley Redbeds EL 810
- Birmingham Shale EL 775
- Duquesne Clay and Limestone EL 765
- Grafton Sandstone EL 755

Remove all slide material and replace with durable rock.

Assumed limit of slide material.
Engineering Investigation & Design Process

April 10\textsuperscript{th} - 12\textsuperscript{th} – Utility Locations
Due to slide condition, underground utilities were impossible to mark.
Duquesne Light on site dealing with downed wires
April 10\textsuperscript{th} - 12\textsuperscript{th} – Utility Locations

• Working through PennDOT Utility & Geotech Units & PA-1-Call for drilling, we located several lines.

• Others were located by Visual observation
Engineering Investigation & Design Process

April 12th – Final Boring Data Obtained
New Retaining Wall

April 13th – Wall Design Complete – TS&L Submission Approved
April 13th – Wall Design Complete – TS&L Submission Approved

Wall Statistics:
- 400’ Long
- 20’ High
- 51 steel piles@ 8’ CTC
- 42” Drilled Shafts
- 20-25’ Long
- 6’ into Sandstone
- 100 kip Anchors
- 15’ Bond in SS

Wait – there’s a problem
Engineering Investigation & Design Process

April 13th – Borings show last 75’ – Competent Sandstone Bedrock not present at Segment 1 foundation elevation
Segment 1 Typical Section adjustments

- Extend caisson an additional 10'
- Remove weak soil and replace with granular embankment in limited widths
Final Plans

April 14th – Items Included to Accelerate Construction

- **Roadway – Design/Build Components**
  - Survey existing ground due to ongoing excavation
  - Set SR30 Alignment verify roadway widths
  - Perform Drainage Design – verify inverts and routing; locate manhole for tie-in.
  - Prepare Final Grading – 5’ contours provided
  - Prepare Signing and Pavement Marking Plan
  - Prepare Erosion and Sedimentation Control Plan

- **PDA included for Sanitary Sewer Relocation** – to be designed during construction after Design/Build Plans submitted

- **PDA for Utility Location** – maps of locations attached in bid package

- **RULD of $30,000 / Day**
April 14\textsuperscript{th} – Items Included to Accelerate Construction

- **Structure**
  - Beams specified based upon supplier stock
  - **No alternates allows**
  - Wall location set by coordinates
  - Caissons oversized to allow alternate beam sizes
  - Anchor design provided
  - **Accelerated submission reviews (1 day)**
  - Sequence to build Segment 2 first

- **Geotechnical**
  - Verification of slide excavation limits during bench construction
Final Plans

April 14th – Items Included to Accelerate Construction

- Construction Schedule
  - Very Aggressive but achievable.
  - Requires 24/7 operations to meet Road Open milestone
  - No Holidays
  - Detailed to identify expectations

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<th>Task Description</th>
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<th>End Date 2</th>
<th>End Date 3</th>
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Final Plans

April 15th – Submit Final Plans
Mission Accomplished!

April 15th – Final Plans, Specifications, & Estimates were submitted in 9 – yes 9 DAYS.

A huge shout out goes to all of the GF Staff:

Babinski, Jenna M.  Koepka, Ryan S.
Bertin, Dylan G.  Kowatch, Gary T.
Chechak, Stephanie M.  Kozel, David M.
Dengler, Robert W. II  Krebs, Christopher D.
Downs, Terry L.  Nese, Francis P.
Edwards, Samuel C.  Onderko, Ron
Greenholt, Mark D.  Vargo, Jacob F.
Heinzl, Brian F.  Veydt, D. E.
Holland, Eric R.  Vlcek, Daniel P.
Huffman, Sarah E.  Vollmer, Christopher T.
Hunter, Daniel J.  Yauger, Robert H.
James, James R.

Extraordinary Geotech Efforts also performed by:

- Armstrong Drilling
- AGES, Inc
- PennDOT Geotech Unit

Monaloh Basin Engineers – prepared 3 different ROW plan sets
ACKNOWLEDGMENTS

Gannett Fleming could not have successfully completed the design for project without the complete dedication and teamwork provided by the folks at PennDOT District 11-0. I would like to thank:

- Cheryl Moon-Sirianni, Doug Seeley, Angelo Pampena, Jim Foringer, Jason Zang, Michael Adams, Michele Acitelli, Jonathan Moses, Greg Mumich, Lou Ruzzi, Dave Conrad, Kevin Lira, Bill Erstfeld, Shane Szalankiewz, Mark Young, Bob Byrnes, Doug Thompson, Jay Yusko, Tim Hann, Steve Cowen, Jim McKnight, Blank, Jackie Evans, Erik Porter, John Myler and others

- for trusting in Gannett Fleming; and
- for your tireless commitment to the community, working evenings and weekends right along with us.
Soldier Pile and Lagging Wall Construction

• Contract Execution: April 23, 2018
• Assembly of the “Team”
• Preconstruction Conference / Partnering Meeting
• Design / Build Roadway Element
• Construction Timeline for opening SR30 to Traffic
  – Weekly Schedule Updates in ASTA
• Major Items of work
• Challenges / Rocks in the Road
The Construction Team

• On Award GTC began selecting Subcontractors and Vendors
  – Subcontractors:
    • Mackin Engineering – D/B Roadway Engineer
    • Shelly Drilling – Drilled Shafts
    • Howard Concrete Pumping – Tie Back Anchors and Concrete Pumping
    • Terra-Mechanics – Seismic Surveys and Monitoring & Pre/Post Surveys
    • Green Acres Contracting – Guiderail Installation, RPM’s, Signs
    • Southpointe Construction Services - Flagging
    • Donegal Construction - SNAPS
    • Parking Lot Painting – Line Painting
    • Roadsafe – MPT Signs and Devices
    • Superior Painting – Anti-Graffiti Painting
The Construction Team

• On Award GTC began selecting Subcontractors and Vendors
  – Vendors:
    • Triad Metals International – Soldier Piles
      – Hall Industries
      – V&S Galvanizing
    • Bryan Materials Group
      – Frank Bryan, Inc.
      – Concrete Concepts, Inc.
      – Neville Aggregates, Inc.
    • Lafarge
    • Simpson Reinforcing
    • Lindy Paving
    • Jadell Minniefield Construction Services
Mackin Engineering worked with GTC on the conceptual plan during the bid phase.

Mackin was to design:
- Final Roadway Plans
  - Including Storm Sewer Drainage
- Final Cross Sections

Mackin began design work immediately upon NTP and had final plans by our Open to Traffic Date.
Class 1 Excavation: Start April 27, 2018

- 2 Shifts x 7 day week
- 2,400cy avg. per day
- GPS outfitted equipment used
- Machine files were developed to assist in benching excavation
Class 1 Excavation

Benching Excavation
• May 13, 2018 (Mother’s Day) Start
• 2 shifts x 7 day week
• Avg. Depth – 25’
• 5 Drilled Shafts per day Avg.
• ALL Soldier Piles installed in 11 DAYS!
Soldier Pile Fabrication and Delivery

April 27, 2018

May 11, 2018
Soldier Pile Journey
CONGESTION
510 ROCK and Tie-Back Window
• AASHTO #1 Slag Aggregate Tie-Back Window
• Used Temp. Wood Lagging as embankment support
• Precast Concrete Lagging and C-I-P Cap installed after SR30 was open to Traffic
Tie-Back Anchors

- May 25, 2018 Start
- Memorial Day Decisions
- Consolidation Grout and Re-Drilling Eliminated
- 65’ Anchors, 15’ bond zone
- All Anchors Stressed Out June 12, 2018
A Different Perspective
510 Rock

- Started May 8, 2018
- Finished June 5, 2018
- 31,000cy
- Hauled from another GTC project
- Utilized Broken Concrete in lieu of PTM 510 Rock
Foreign Borrow: June 11, 2018

- Started June 7, 2018
- Finished June 19, 2018
- 14,400cy
- Hauled from Trafford, PA
- Utilized rock in lieu of soil
- Followed Pub. 408-2016/4 Sec. 206.
- Proctors identified material to be places as 206.3(d)1d Rock (non-movement).
June 16, 2018 – Hell Weekend

On This Postage Stamp:
- 3 Pipe Crews
- 1 Embankment Crew
- 6 Excavators
- 12 Triaxles
Protests: June 21, 2018

• The Transportation Construction Inspector said that the work on the project had to be stopped due to protests happening in the area.

• There were protesters climbing onto the machines.
Open to Traffic: June 27, 2018
• Original Contract Value: $6,543,210.00
• **62 DAYS** (Breakground to Open to Traffic)
  - Class 1 Excavation: 38,700 CY
  - PTM 510 Rock: 31,600 CY
  - Foreign Borrow: 14,400 CY
  - AASHTO #1’s: 1,700 CY
  - **86,400 CY of material OUT and IN**
    - 51 Galvanized Soldier Piles
    - 40 x 65’, 4-strand Rock Anchors
We were not done yet... Work Continues
The Finished Product
Right-of-Way Efforts

- Temporarily Displaced
- Permanently Displaced
  - Highest Priority: Finding replacement dwellings
- Assistance from Allegheny County Emergency Services – Human Services
- Central Office (C.O.) R/W and OCC assisted District 11 R/W in addressing issues
- C.O./CORA assistance greatly aiding District with various complex appraisal assignments
- Multi-Agency Resource Center (M.A.R.C.) Event
Interagency Coordination

- Central Office (C.O.) R/W and OCC assisted District 11 R/W in addressing issues
- CO Office of Chief Counsel and Western Regional OCC provided legal counsel on many issues
- C.O./CORA assistance greatly aiding District with various complex appraisal assignments
- Assistance from Allegheny County Emergency Services – Human Services
IV. Interagency Coordination

MARC - Multi Agency Resource Center Event
IV. Interagency Coordination

MARC - Multi Agency Resource Center Event
IV. Interagency Coordination - MARC Event
Right of Way Property Management

Parcel 1 – Electric Avenue Apartments

• On Monday April 9th, recovered items were moved to a Brandywine owned garage with the assistance of Allison Park Contractors and PennDOT Maintenance

• The items were photographed and inventoried

• The following day the items were moved to Guardian Storage in Monroeville
• On July 19th, the smaller items were taken to the Residence Inn for the displaced residents to identify and claim.

• Photographs of the larger items were taken and shown to the claimants to claim, but were returned to storage until replacement housing is found.
Right of Way Property Management

- On August 30th, the recovered clothing was taken to the Residence Inn for the displaced residents to identify and claim.
- Most items and clothing were taken back to Guardian Storage for continued storage and later disposal or distribution.
• Unfortunately, efforts to recover, store and distribute the permanently displaced people’s belongings resulted in more anger and accusations than it did gratefulness or appreciation
The Real Estate Specialists were tasked with providing advisory services to claimants to help them find apartments or other subsidized housing.

Often, The Real Estate Specialists were required to listen to long and hostile phone complaints.

Weekly visit and phone calls.

Many phone calls were made to multiple agencies, apartment complexes, and anybody that could help find a way to push ahead on the long wait lists or rent to claimants with bad credit.

The Specialists had to meet with claimants to deliver checks and also get them to sign documents and help them fill out forms and applications.

Rental Supplements and Rental Applications.
Relocation Assistance

- Six permanently displaced tenants have since been relocated
## Estimated Full Cost For Damages-FHWA

<table>
<thead>
<tr>
<th>Description of Work to Date (Equipment, Labor, and Materials)</th>
<th>Unit</th>
<th>Unit Price</th>
<th>Quantity</th>
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See Attached Detailed Estimates

* Eligibility of these activities will be determined by FHWA following verification of compliance with Federal-aid requirements and provisions.

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<th>Method</th>
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Thanks also to:
PennDOT Central Office R/W, Project Delivery and Emergency Management Staff
PennDOT Office of Chief Counsel
FHWA
A HUGE **THANK YOU** TO ALL WHO ASSISTED ON THE ROUTE 30 EMERGENCY SLIDE PROJECT!!!