

A photograph of the Walter Reed National Military Medical Center building, a tall, white, Art Deco-style skyscraper with a central tower and multiple wings. The building is surrounded by trees and a paved plaza. The sky is overcast with grey clouds.

Constructing a New Utility Tunnel on an Active Medical Campus

Walter Reed National Military Medical Center
Bethesda, Maryland



Darren Morton
Whiting-Turner



Mark Johnson
Whiting-Turner



Ken Balenske
RMF Engineering

Description of Walter Reed

- **History**
 - National Naval Medical Center 1939
 - Expanded During WW2
 - Walter Reed Scheduled to Close in 2005
 - Combined with National Naval Medical Center In 2011
 - Currently Serves as Medical Facility for Wounded Vets, Congress and President
 - 243 Acre Campus
 - Located In Bethesda, MD
 - Now Known as the Walter Reed National Military Medical Center



Current Complex

- **Nearly
8,500
Employees**
- **2.4 Million
SF**
- **Serves over
One Million
patients per
year**
- **288 Beds**

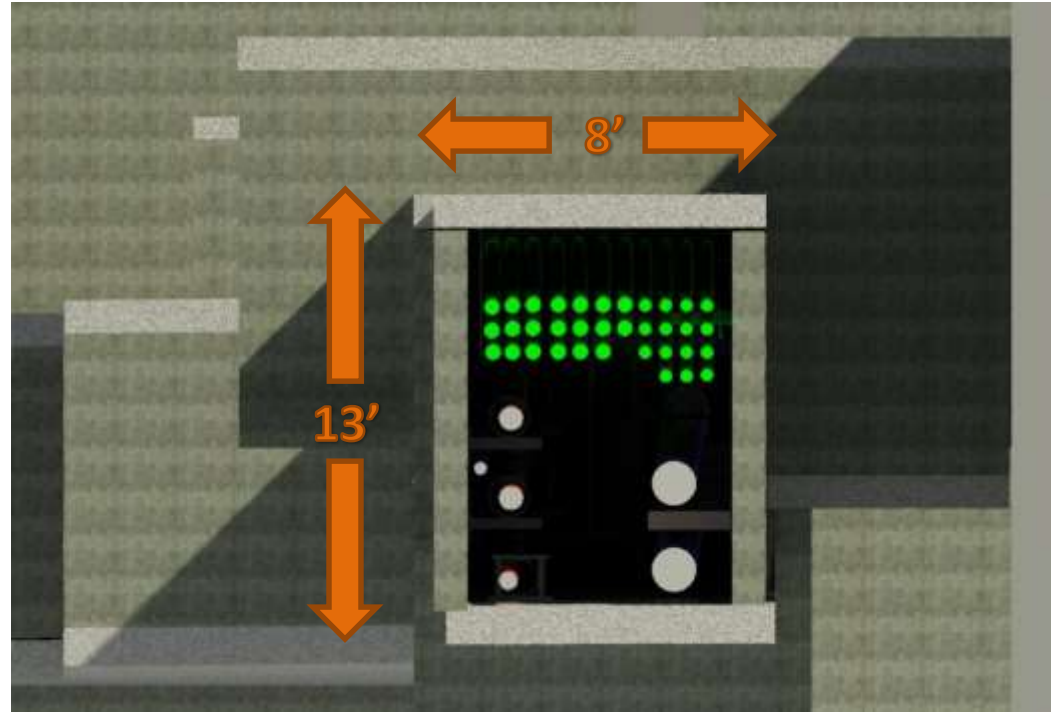


- **Site Enabling for a New 600,000 sf Hospital Facility Includes Demolishing Buildings 2, 4, 7, & 8**
- **Construct New Modern Medical Facility**
 - Two Phase Construction
 - Temporary Medical Facility
 - 500 ft. Pedestrian Tunnel
- **Relocate Utilities to Enable Demolition**
 - Base Wide Communications Hub
 - Primary Medium Voltage Electrical Feeds to Most of the Campus
 - Demolished 2 Major Sewer and Storm Drain Pipes
 - Chilled Water and Steam to Serve Several Buildings
 - Total Construction Cost \$38,490,000

- **Contractor Support During Design**
 - **Constructability Reviews**
 - **Cost Control**
- **Engineer Support During Construction**
 - **UFC/Code Requirement Compliance**
 - **Timely and Cost Effective Resolutions**
 - **Designer on Board for Owner Coordination**

Project Requirements - Tunnel

- 1200 Feet of Tunnel
- Up to 20 - 5" Medium Voltage Ducts
- Up to 36 - 4" Communications Ducts
- 2 – 8" Redundant Steam Pipes
- 6" Condensate Pipe
- 6" Fire Suppression
- 4 – 4" PEVCO



Project Requirements – Other Utilities mmf

- **1500 ft. Storm Drain**
 - 600 Jack & Bore
- **1300 ft. Sanitary**
 - 600 ft. Jack and Bore
- **250 ft. Water Main**
- **900 ft. of Gas**
- **220 ft. Electric Ducts**
- **1100 ft. Communications Ducts**





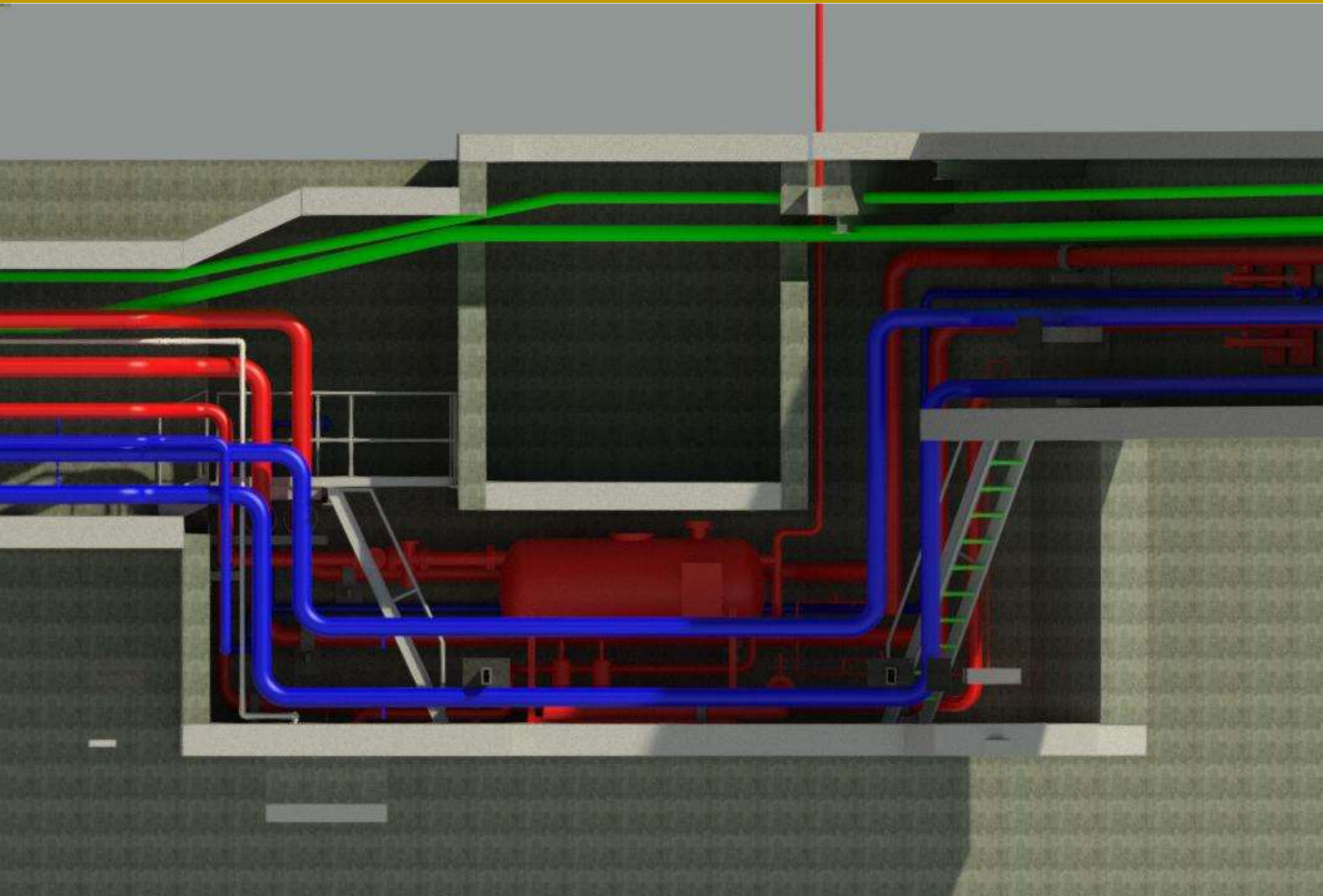
- **Trench in Crawl Space of STEM**
 - **Medium Voltage Feeders**
 - **Over 80 Communications Cables**
 - **New Tunnel Will Cut Trench in Half**



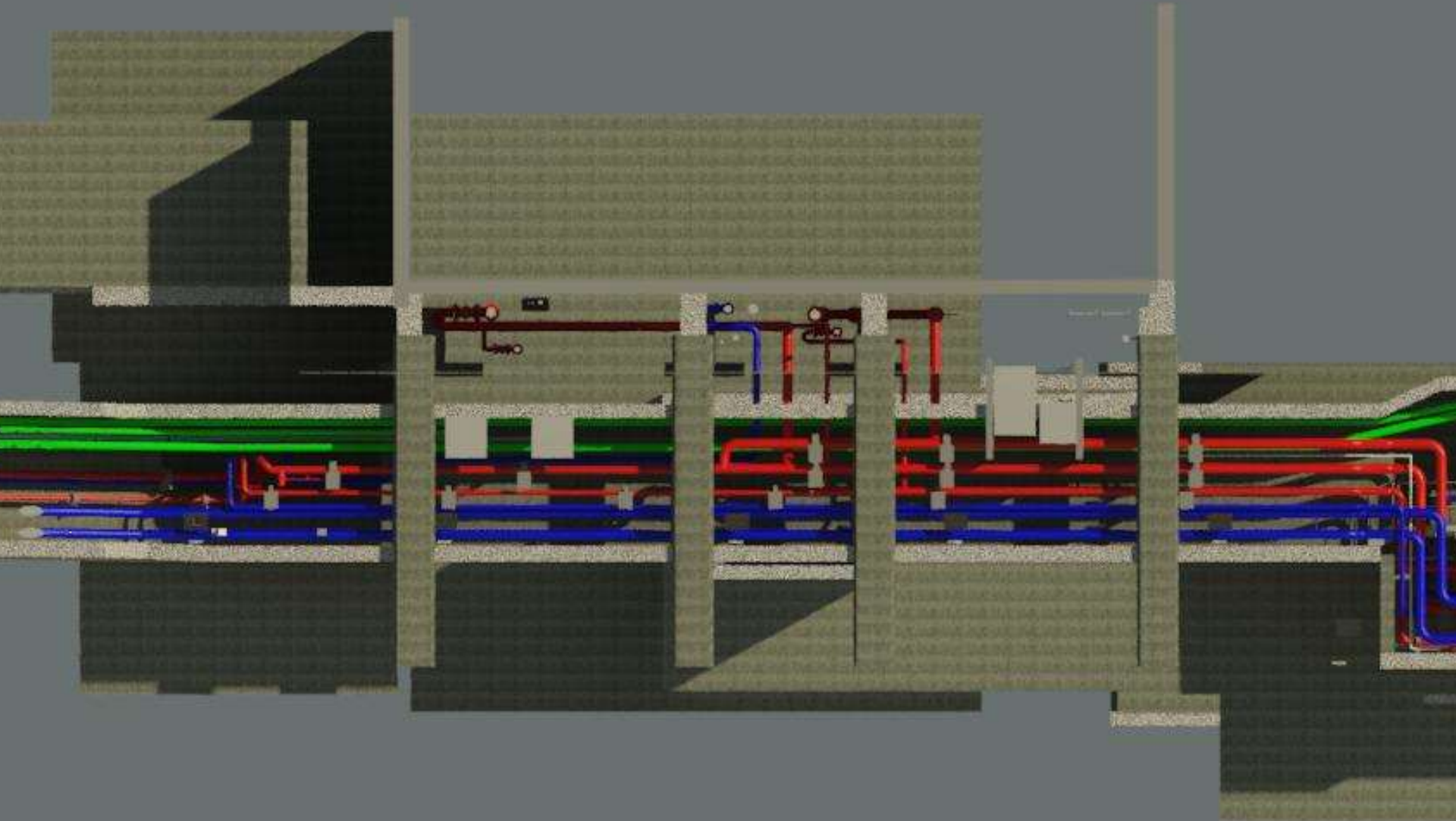
- **Pedestrians**
 - **3 Large Parking Garages Adjacent to Active Construction Area**
 - **Significant Nos. of Patients, Staff and Visitors**
- **Vehicular**
 - **Close Roads**
 - **Active Garage Entrances**



Future Pedestrian Tunnel Crossing



Under an Existing Building



Construction Challenges - Rock

- Extremely Hard - >20,000 psi
- Extensive in Excavation Below 20'
- 5 Months to Complete 775 Cubic Yards of Excavation



Line Drill
3-31-2016



Hoe Ram
4-20-2016

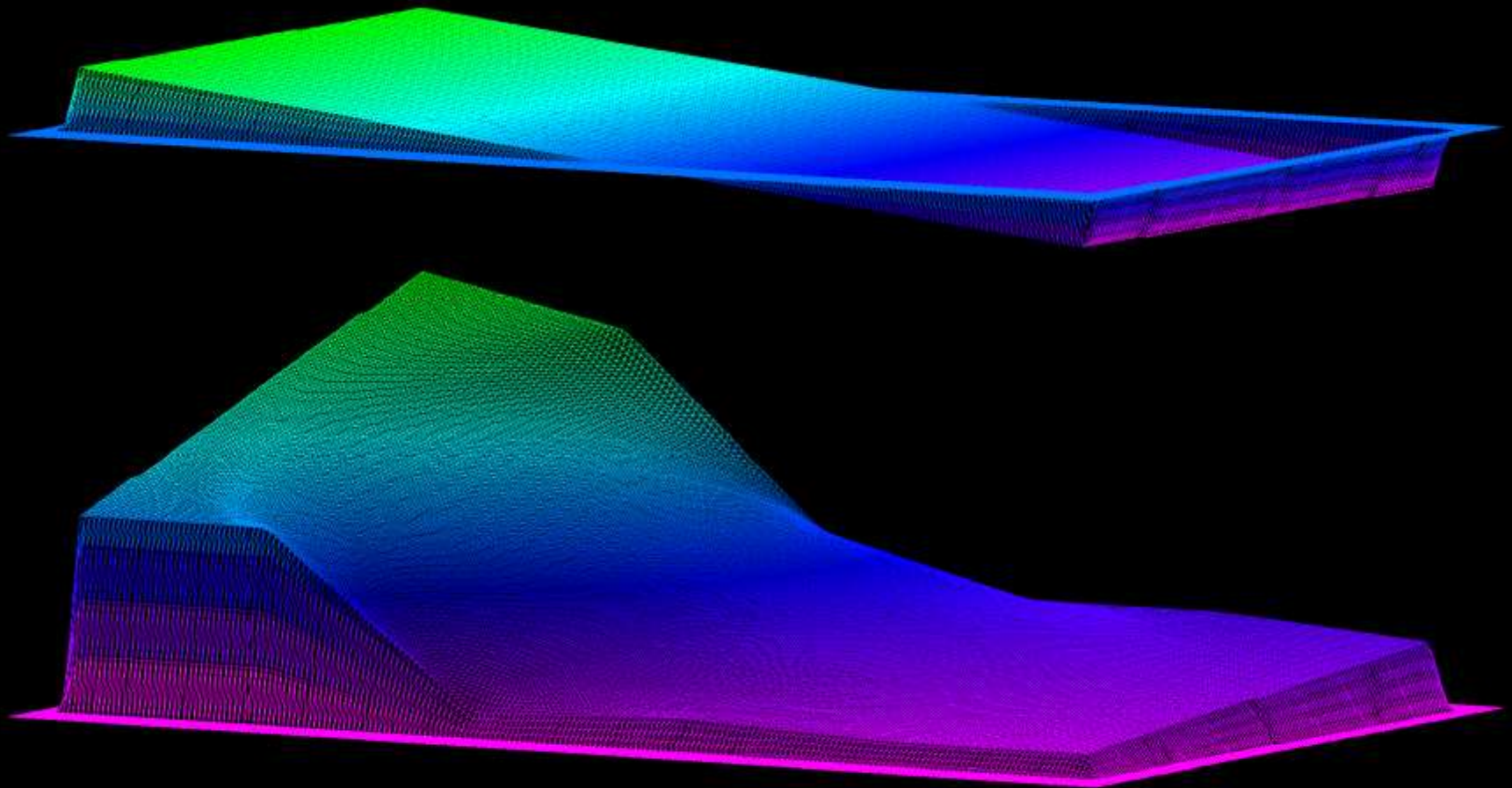


Hoe Ram
6-15-2016



Close!!
7-13-2016

Construction Challenges - Rock



Construction Challenges Jack and Bore

- Rock Boring – Multiple Breakdowns, 6 months to complete two (2) 270LF crossings
- Dewatering
- Shoring-of-Excavation (SOE) Conflicts



Construction Challenges – Site Logistics

- Boring & Tunneling Took Place Between Occupied Buildings
- Pedestrians and Vehicular Traffic
- Laydown Yard ½ Mile from Site
- Site broken up between 6 main areas and miscellaneous interior work



Construction Challenges - Groundwater mrf

- **Utility Tunnel designed to be completely enclosed (no exterior sumps)**
- **Multiple areas not able to be immediately enclosed resulted in waterproofing replacement**
- **Ground spring (or broken water line?) required fiberglass sump insertion and chemical grout injection along with multiple concrete re-pours.**



Construction Challenges – Existing Utilities

- Condition of existing utilities on a 80 year old installation was a major headache
- More utilities than not were missing from as-builts, and ended up being found the hard way!
- Tie-ins and shut-downs had to be carefully sequenced to allow operations to be maintained continuously



Construction Challenges - Scheduling rmf

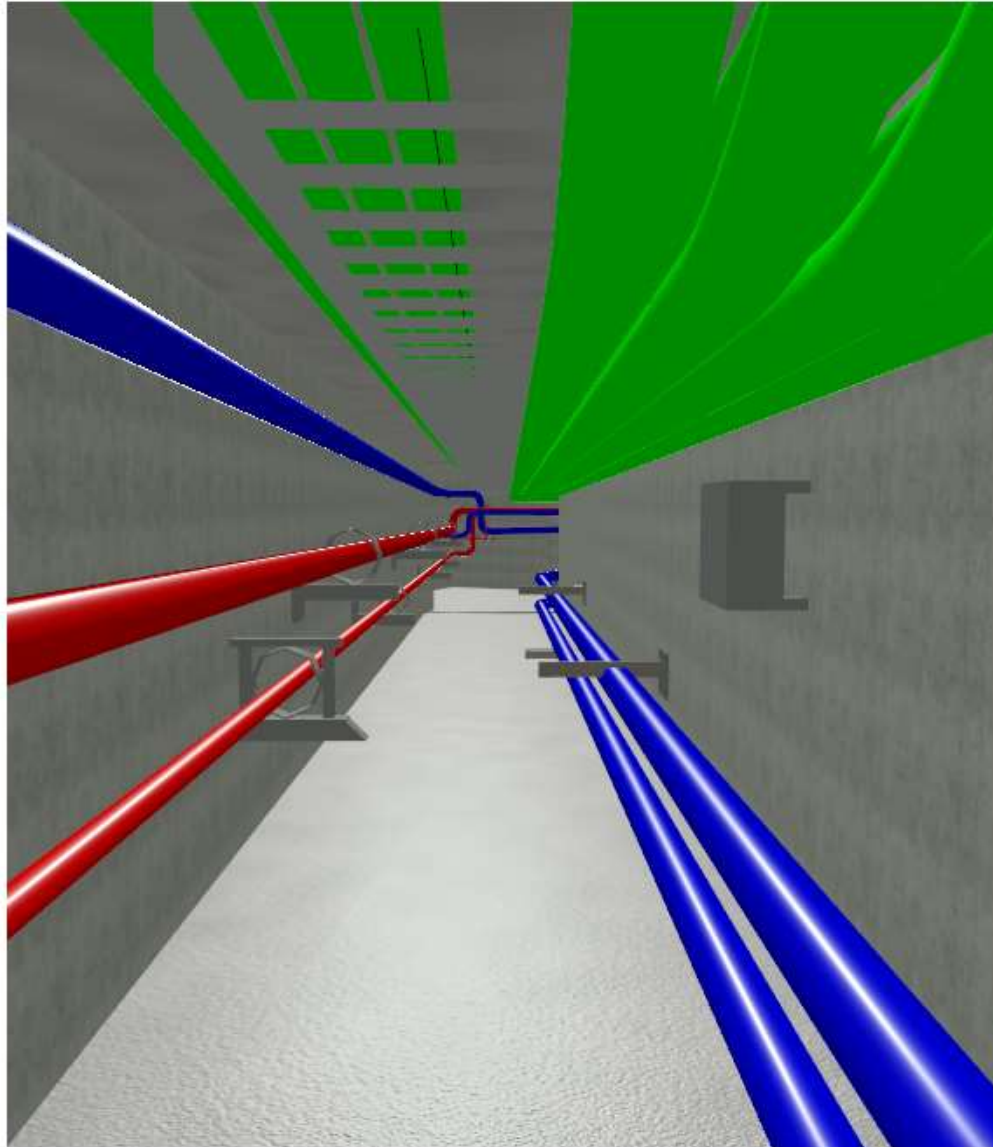
- Sequencing had to be well defined during preconstruction to identify the correct critical path
- “Domino” effect plagued the job for the duration of the project
- Quality control, labor management and safety inspections became challenging with so much going on



Construction Challenges Underpinning

- Building structural as-builts were not accurate, and required quick redesign of shoring system to allow the tunnel to continue on schedule
- Underpinning pits were required where tunnel traveled underneath existing buildings
- Innovative shoring solution required underneath connectors with turn-down slabs and caissons





Finished Project



Questions & Answers