Birmingham CBD Interstate Project

Utility Coordination Issues and Innovative Measures

Robert G. Lee, P.E.
ALDOT State Utilities Engineer
I Was Co-Acting ROW Engineer
What Do You Know About Alabama?

• College Football?
• Civil War?
• Civil Rights?
• Alabama Roadtrip
Project History

• Original Concept Proposed 1959
• Constructed in 1978 (Described as the “Miracle Mile”)
• 2 Mile Urban Section on Structure between Route Interchange I-65 / I-59 & I-20 and Freeway Interchange at Red Mountain Expressway.
  • Road has a bend due to Civic Center Property and a Cemetery.
Magnificent mile combines transportation and recreation in complimentary design.
I-20 Bridge Section

• Had a piece of the bridge deck break loose leaving a hole!

2017 ROWUOAC Conference
THIS IS BIG, REALLY BIG!!!!
Bridge Could Not Just Be Repaired

• The Entirety of the Bridges Between the Interchanges Would Need to Be Replaced.
From: Dunlavy, Dean
Sent: Friday, March 17, 2017 10:16 AM
To: Harris, Anna <harrisa@dot.state.al.us>
Subject: NH-0003(609), Shelby

Anna,

I am reviewing the above referenced project, and need to know if there will be any utility conflicts.

Thanks,
D
From: Harris, Anna
Sent: Friday, March 17, 2017 3:30 PM
To: Dunlavy, Dean <dunlavyd@dot.state.al.us>
Cc: Ramey, Larry <rameyl@dot.state.al.us>
Subject: FW: NH-0003(609), Shelby

Based on the description, I would guess not, but we don’t have any information on this one.
Anna,

I don’t have any information either. Best I could tell from Google view, I only saw one fan belt, one glove and one Walmart bag. There are a couple of inlets that will be tricky to work around, but that isn’t a utility 😊

Should be no conflict.

Thanks,

Larry
(205) 581-5630
ShoreTel Extension 30054
Birmingham CBD
Project Overview
Project Expanded

- Difficult Weaving Sections Exist on I-20
  - In One Section – 5-Lane Weave to Exit Ramp
- One of the highest accident sites in the State is near Red Mountain Expressway Interchange.
- Highest Traffic Volume in the State – 165,000 ADT
Improving Traffic flow on I-20

• Entrance/Exit Ramps will be removed to make it more of a through route.
  • One way in and out of downtown from each interchange.

• Modifications to Route Interchange
  • All ramps pull away from mainline, eliminating intermediate weaving.
  • Direct flyovers used, with tallest almost 90’ high.
  • Goal is to remove the “Malfunction Junction” moniker from interchange.
PHASES OF CONSTRUCTION

Phase 1

Phase 2

Phase 3

Phase A
Schedule

• We need the work to be done quickly
  • Safety Issues & Traffic Flow
• Rapid Construction – Matchcast Segmental Bridge
• Incentive/Disincentive
• World Games 2021
11\textsuperscript{th} Annual World Games

- 10 Days of Competition in Non-Olympic Sports
- 3500 Athletes
- Over 100 Countries Represented
- Over 30 Different Sports
I-59/20 Construction Timeline

Phase A
- 2014: Design
- 2016: Construction

Phase 1
- 2016: Design
- 2018: Construction

Phase 2
- 2018: Design
- 2020: Construction

Phase 3
- 2020: Design
- 2022: Construction
Critical Path Method Schedule

• Special Provision 12-1610
  • Primavera P6 Software
  • Submitted within 10 Days of Execution or Pre-Con (whichever earlier)
  • Submittal is to include electronic files
  • ALL activities are to be shown separately
    • Limit of one contractor per activity
    • Limit of 20 days per activity
    • Resource Loaded (Labor and Equipment)
    • Cost loaded as a resource (Pay Item, Quantity, Unit Price)
  • Logic is to be maintained
  • Key milestones are to be highlighted
  • Updated Monthly (prior to estimate generation)
  • Weekly meetings with two week look ahead
  • Subsidiary obligation of Mobilization
### Project Schedule

**I-59/20 CBD Bridge**  
**Phase 3 Design Schedule**  
**Jefferson County, Alabama**

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**Project: I-59 Phase 3 Schedule ALDOT**  
**Date: Mon 11/30/15**
Segmental Bridge Section – Phase 3
The Plan is to

• Replace Bridges on the edges of the project.
• Modify Route Interchange I-65 & I-59/I-20
• Modify Interchange at Red Mountain Expressway (Elton B. Stephens/US-31).
• Cast Segmental Bridge Sections & Store.
• Finish Entrance/Exit from Downtown Birmingham @ Both Interchanges.
• Close I-20 Between the Interchanges and take down existing bridge.
• Rebuild CBD Bridge Section & Reopen.
Utility Challenges

• Evolving Design – Plans went from 7 Phases to 4.
  • Can’t determine and address conflicts until design is final.

• Accelerated Construction Schedule

• ROW Issues.
  • Historical Areas – Civil Rights Era Homes
  • Limited space to relocate in urban setting.
    • Dictated where some utilities relocated.
    • Adjusted D/A line to accommodate relocation.
Utility Challenges

• Old Utilities
  • Unknown Age listed a P21
  • Cast Iron Pipe.

• Inaccurate Company Records.
  • Despite Utilities w/ GIS, significant number of utilities no longer there.

• Underground Electric Transmission Line
• Telecommunication Duct Bank Attached to Bridge
• Sanitary Sewer in Receivership.
Utility Challenges

• Traditionally Non-reimbursable Utilities would be reimbursable under Interstate Funding.
• Retaining Walls Designed Atop Utilities.
• Load Restrictions to Avoid Utility Damage.
• Vibration Issues that Could Damage Utilities.
b) LOAD RESTRICTIONS.

The Contractor shall comply with all legal load restrictions in the hauling of materials on public roads beyond the limits of the project. In the hauling of materials on city streets or county roads, it shall be the responsibility of the Contractor to regulate his loads so that damage does not occur, regardless of the legal or posted load limit.

Within the project limits, loads shall be so regulated that damage will not occur to base or pavement layers and structures, but in no case shall loads exceed the legal load limit unless permitted in writing by the Engineer under special conditions.
107.12 Protection and Restoration of Property, Landscape and Utility Facilities:

• (b) UTILITIES.

• 1. Where the Contractor's operations are adjacent to utilities or other property, damage to which might result in expense, loss, or inconvenience, work shall not be begun until all arrangements necessary for property protection has been made.

• The Contractor shall be responsible to the owners and operators of such property for any damage, loss, or inconvenience.
Reimbursement Policy

• On Interstate Projects – All Utilities Reimbursable
  • Utilities allowed to cross ROW, but not parallel highway.

• Federally Funded Projects
  • Utilities Grossing <$250 million per annum are reimbursable.
    • Exception – Prior Rights

• State Only Funding – No Utilities Reimbursable
  • Exceptions:
    • Prior Rights
    • Pauper
This will be the most expensive project in ALDOT history!
We Need a Plan
Closure Alert!

31st Bridge to Close.

On October 6th, the 31st Street bridge over I-59/20 will be closed. The map on the right shows the detour route using the 11th Avenue North Bridge and Vandiver Road. All of the ramps providing access to I-59/20 and 31st Street North will remain open, in both directions.

The Alabama Department of Transportation recently re-opened the 10th Street North bridge after repairs and is now closing the 31st Street Bridge to conduct similar work. The work being performed is one phase of the improvements to the bridges and interchanges along I-65 and I-56.

The closing of the 31st Street bridge is expected to last 12 months. Notifications will be posted on the

Road Closure Alert!

ALABAMA DEPARTMENT OF TRANSPORTATION
East Central Region
900 Corporate Parkway, Suite 450
Hoover, AL 35242

ADDRESS HERE

PUBLIC SERVICE ANNOUNCEMENT

Highway Beautification Agencies

2017 ROWUOAC Conference
Join us on live monthly updates

Media Briefing

December 21, 2016
2:00 PM

DeJarvis Leonard
East Central Region Engineer

**Message from Organizer**

Welcome to the 59/20 Bridge Media Briefing. During the presentation, all microphones will be muted. If you have any questions during the presentation, please use the chat feature. At the end of the presentation, each attendee will be unmuted individually and given the opportunity to ask questions.

**To improve audio quality, please call into the conference by phone.**

Please call into the conference using the instructions in the audio control panel.
When the Interstate System was first developed in the 1940s, the federal government specified that interstate highways weave through all American cities with populations greater than 100,000 people, at locations that could be easily accessed by a majority of the population. In practice, this meant the interstate was often run through the center of town, or alongside heavily populated residential areas. Because of age, the Alabama Department of Transportation has begun an effort to improve and replace the elevated portions of Interstate 59/20 through downtown Birmingham. Information on the scope of this project can be found at this site. In addition, it will be periodically updated to keep you informed of our progress.
Employed Best Practices

• 3 C’s of Utility Relocation Work
  • Communication
  • Coordination
  • Cooperation
Communication-Met with Bridge Designers

• Extra Consideration Given to Avoid UT Conflicts
  • Segmental Bridge Piers Placed Midway between cross streets.
  • Ramp Piers adjusted to miss utilities where possible.
    • Level B SUE data collected to determine some conflicts.
    • Drilled shafts used where UT in close proximity to piers.
  • UG 115kv Electrical Line had to be missed.
Pier/Span Adjustment
Met Monthly w/ Utilities

• Discussed Procedures with Traditionally Non-Reimbursable Utilities.
• Stressed Schedule and Status of Plans & Agreement.
I-59/20 CBD Bridge and 17th St Design
Project Nos.
ACIMF-I059 (383) (Phase 2)
ACIMF-I059 (385) (Phase 3) (CBD Bridge)
Jefferson County
MEETING AGENDA
December 4, 2015

1. Status of Lighting and ITS Plans (William Adams/Gary Moore) — PH 2 LIGHTING TO OE 11/12
   PH 3 - PS&E 12/11
   ITS - 11/20 TO OE — 2/24/16
   300 SHEETS REVISED (LET'S INCLUDED)

2. Phase 2 Project: ACIMF-I059 (383)
   A. Status of plans
      i. OE Submittal: 11/13/2015
      ii. Begin Advertising: 12/11/2015 — BY NEXT FRIDAY. CONDITIONAL APPROVAL
      iii. Pre-Bid Conference Date: Tentatively Scheduled for January 7th — LOCATION DETERMINED
          AGENDA IS BEING WORKED ON
          AGENDA IS BEING WORKED ON
          C BJCC
      iv. Letting: 1/22/2016
   B. Utility/ROW Update (Steve Walker/Robert Lee) — UTILITY AGREEMENTS TO FHWA TODAY.
      JLES — 12/17 MEETING

3. Phase 3 Project: ACIMF-I059 (385)
   A. Discussion of Critical Path Schedule (David Webber)
   B. Railroad (Randy Stroup & Evelyn Pao) — ALL TSBX NEXT WK. CLEARANCE ISSUE.

PHASE III ROW - NEED ROW FROM NORFOLK SOUTHERN

UTILITIES— WAS IN PHASE II

ALAGASCO
APCO

12/18 RFB WILL WANT A STATUS REPORT FROM ALL PARTIES,
MR LEONARD WILL CALL A MEETING ON PRE-BID CONF AGENDA.
Site Visits

- One Call
- Verify Locations with Utility Representatives
- Identified Locations to Collect SUE Data
Utilities Have an Added Interest in the Project

• In addition to being reimbursable.
• Most of the Utilities Have a Corporate Office in Downtown Birmingham.
  • Alabama Gas Corporation
  • Alabama Power Company (Distribution & Transmission)
  • AT & T
  • Birmingham Water Works Board
  • Jefferson County Environmental Services
Alabama Power Conference Room
Upper Management Might Use the Helipad.
Coordination

• Addressed Nearly all Utility Conflicts in advance of Phase III Project.
• Included Water & Sewer Relocations in Roadway Contract.
• Streamlined Outsourced Engineering – ALDOT directly hired engineer for W & S Design.
• Made extensive use of SUE data. Collected SUE data in areas for soil borings for bridge design to avoid utility damage.
Areas for SUE Data Collection
Alabama Power Company Buried 115kV Line

Multiple crossings by other utilities

Vibration requirements
Variety of Work Methods

• Work in the Roadway Contract
• Continuing Contract
• Company Forces
• Lump Sum
Creative Solutions Employed
Access DB to Track UT Approval Process

Replaces IM-009-389. RGL. We received 11 sets of plans and CD's 4/1/15. RGL. FHWA 6/2 - 6/5/15. RGL. P&SE July 13-17, 2015. RGL. The UCA's for Birmingham Water and Jefferson Co. Commission were submitted via email, rec'd 12/7/15; they were then submitted to External Audit. The audit report for Jefferson Co. Comm changes the amount of the engineering agreement, the records were adjusted to reflect that change (12/15/15 ahh)

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12th Avenue Bridge (Phase A)
12th Ave Water Line

- Retaining Wall Proposed on top of 8” water line.
- Water line will be attached to the bridge.
  - Difficult to bore under I-20.
  - More cost effective solution.
12th Court Bridge (Phase II)
12th Court Bridge over I-65
Duct Bank under 12th Court Bridge

2017 ROWUOAC Conference
12th Court Bridge – AT & T
WHY IS THE PIPE GREEN?
Here’s a Clue
ATT Line @ 17th St. Ramp (Phase II)

- Concrete Slab over clay duct.
- Under MSE wall.
I've been asked to give a presentation at the trade show.

I'd like you to put that together for me, Alice.

What's your topic?

Technology. They didn't say if I'm for it or against it.

I'll leave some wiggle room.

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3D MODELING PROCESS

LandAir created
Existing 3D model
• Descartes (LiDar)
• SUE Data
• Autodesk Revit
• 3D Reshaper
• MicroStation
• SS3 3D tools
ALDOT VIZ Group Created 3D of Proposed Design

- Modeled from 2D plans & design Files
- InRoads SS2
- MicroStation SS3
- Clash Analysis
Data Collected

- Conventional Survey
- GIS Data
- LiDAR Scans
  - Fixed wing
  - Helicopter
  - Terrestrial
- SUE Data
- Roadway & Bridge
  CADD Design Files
3D Utility Assumptions

- Unknown UT Depths Assumed to be 30 inches.
- Minimum Diameter of Utilities 6 inches.
- Unknown Connecting Utilities
  - Field Verification
  - Engineer Verify
Model is Scalable

• Allowed us to measure the vertical clearance of overhead utilities over Proposed Design
Alabama Power Clearance at 23rd St North
Alabama Power Overhead Transmission Line
CLASH DETECTION

Clash Detection
- Hard Clash
- Soft Clash
Clash Detection

• Produces Visual Representation
• Generates Spreadsheet Report.
• 3D Model – Under Development at Start of Utility Process.
HG TV Moment

- Drama in Home Improvement
- Mold
- Asbestos
- Aluminum Wiring
Relief Drainage Culvert
Clash Detection

• Would have run clash to determine conflict with highway design if model was ready.
• Ran to determine conflict with drainage design.
• Ran again after the culvert was added.
• Final run to determine conflicts with proposed location of utilities.
  • Adjusted sewer design to eliminate conflict with f.o. line.
I-59/20 & I-65 Interchange
South View
I-59/20 & I-65 Interchange
South View
I-59/20 & RME INTERCHANGE
EAST VIEW

PROPOSED

Uptown

BJCC/Sheraton Parking

Airport

59 20 31
I-59/20 DOWNTOWN SHERATON

EXISTING

AASHTO  2017 ROWUOAC Conference
Project Status

Phase A – Let 3/27/15

STPBH-I020(349)

$19,281,545
31st St. Bridge Complete, 12th Ave under construction
Project Status

Phase I – Let 6/25/15

STPBH-CMAQ-I065(457)

$7,416,165
I-65 Ramp Improvements
Complete
Phase I – I-65 Ramps, S of Interchange
Phase I – I-65 Looking North, S of Route Interchange
Project Status

Phase II – Let 1/22/16

ACIMF-I059(383)

$208,611,848

$10 million incentive to finish by 8/31/18. If not finished on time $200,000/day penalty
Underway
On Schedule
Project Status

Phase III – Let 11/4/16

ACIMF-I059(385)

$564 MILLION
Penalties
Mainline Bridge Reconstruction

| Single Lane Closure | $42,500/day per direction | $105,000/ Day per Direction | $125,000/day per direction |

- Contractor proposes number of days required for each type of closure
- This method will be used to determine any incentive or disincentives based on the contractor’s proposed schedule vs. actual completion time
No Award Yet

- Bids Greatly Exceeded Estimate.
- Looking for Ways to Value Engineer/Reduce Project Cost.
TOTAL COST $800 MILLION
# Utility Relocation Cost

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Utility Cost is Relatively Small

• <2% of Estimated Construction Cost
• Testament to Efforts to Avoid UT Conflicts
Utility Work is Underway

- Went to Construction w/o Two Utility Agreements.
  - Thought that we would have time to get it done while bridge segments were being cast.
  - Delay of award of contract on Phase III has allowed us to get all of the agreements approved.
Epilogue: Lessons Learned

• Collecting SUE Data was very valuable.
  • We now have 3 On Call SUE providers. Bhate Geosciences collected SUE data (local firm).
  • Strengthened 3-D Model
  • Eliminated utility facilities there are no longer there, but part of company records.
  • Avoided damage to existing utilities when boring for bridge foundations.
  • Helped refine the utility conflict identification.
  • We shared SUE data with utilities to update Company Records.
Epilogue: Lessons Learned

• Flexibility in Bridge Design greatly reduced the utility conflicts.
• Hiring the Design Engineer directly helped speed the process for water & sewer design.
• That engineer also produced the utility sheets for the contract plans.
Epilogue: Lessons Learned

• 3-D Model was a valuable tool.
  • Clash Detection helped identify subtle conflicts between drainage design and existing and proposed locations of utilities.
    • Sewer design was modified to avoid conflict with f.o. line.
  • Model would have been more valuable if developed sooner.
Design

- Segmental Bridge
  - Limited Competition for Bids
  - May have been necessary for Fast Track Construction.
- Scope of Work Required Collaboration Between Contractors.
Meeting with Utilities was Valuable

• We were provided LiDar Data that gave more detail to 3D Model.
• Training on Phase II made Phase III agreement process go more smoothly.
Special Thanks to ALDOT Employees

• Mr. Dejarvis Leonard, P.E. – East Central Region Engineer
• Mr. Steve Walker, P.E., State Design Engineer
• Mr. Zac Cooper, E.I., VIZ Group
Questions?

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“Mr. Osborne, may I be excused? My brain is full.”