“Pushing the Limits of Constructability Pushes the Limits of Project Planning”

Case Study: Myrtle-Morehead SDIP
City of Charlotte, North Carolina

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Presentation Outline

• Overview of Charlotte’s Flood Control Program
• Myrtle-Morehead Project History
• Phase 1 Constructability Issues Realized
• Phase 2 Constructability Issues Under Design
• Lessons Learned
• Questions and Answers
City Flood Control Projects

• Drainage system improvements for watersheds up to one square mile

• Typical planning, design and construction duration – 5 to 7 years

• Typical costs range from $500,000 - $10 million

• Annual Funding of $17.3 million
Flood Control Project Types

Problems:
• Roadway flooding
• Structural flooding
• Stream erosion
• Deteriorating infrastructure
Problems:
- Road Flooding - 6 Roads
- Structure Flooding - 20 structures
- Deteriorating Infrastructure
Project History/Existing System Problems

• Project initiated in 2000 due to chronic flooding of Myrtle Square Apartments, Euclid Avenue, Myrtle Avenue, and Lexington Avenue

• Dilworth area was developed around a creek that was piped with various undersized culverts

• Existing culvert is located underneath and behind numerous houses and apartments

• Dilworth area is a designated Historic Area with homes exceeding $1M in value
Project Study Area – Urban & Residential

McDowell Avenue

Oriole Avenue
Project Study Area - Residential

- Narrow Tree Lined Streets
- OH Utilities
- On-Street Parking

Myrtle Avenue

Lexington Avenue
Project Study Area - Residential

Existing Culvert in Courtyard

Low Area

Myrtle Square Condominiums
Alternatives Considered

• Rehabilitation of Existing System
  – Results in Less than 2 Year LOS

• Upstream Detention for 10 Year LOS
  – Required 37 Ac-Ft of Storage

• Numerous Alignments for New Culvert

• Other Potential Solutions
  – Linear Storage
  – Storm Water Pump Station
Alternatives Considered

Charlotte Housing Authority

Alternative Alignments

37 Ac-Ft Pond
Project Design & Constructability
Challenges

• Routing a 78” to 90” by-pass culvert through the Dilworth neighborhood streets at depths between 20 and 30 feet

• Tunneling under Morehead Street and replacing 80’ of the 54” water main (NCDOT Encroachment)

• Installing 90” culvert by open cut in McDowell Street (NCDOT Encroachment)

• Installing box culvert by squeezing it between a Public Relations firm and a Duke Over Head Transmission Line

Results in a monumental challenge of project planning & stakeholder involvement!
Impact of Constructability Challenges on Construction Costs

• Only 2 Bidders: $12.15M & $13.04M
  • 150 LF of Tunnel 30 feet deep: $3.15M
  • Sheeting and Shoring for Deep Open Cut: $600K
  • Contaminated Soils and Groundwater: $520K
  • 80 LF 54-inch Water Main Replacement: $300K
  • Slow construction – 18 months for 1,400 LF: $7.58M
Phase 1 – Under Construction

Duke Endowment HQ
Morehead Properties
Dialysis Center
Wray Ward
Arts BBQ
Townhouses

Woolpert
Stakeholders

- Property Owner and Businesses
- Charlotte Water – 54-inch WM Replacement and sewer relocation
- CDOT - Multiphase Traffic Control Plans
- Department of Water Quality
- Duke Energy – OH & Duct Banks
- AT&T – Duct Bank Crossing
- Piedmont Natural Gas – Existing & Abandoned Gas Mains
- NCDOT – Encroachment Permit & Design Approval
Existing 9’x6’ RCBC

New 10’x6’ RCBC
Adjacent to Existing 9’x6’ RCBC

Existing 9’x6’ RCBC
removed to install 2-9’x6’ RCBCs

Duke Energy OH Transmission Line

Duke & AT&T Duct Banks

Existing 9’x6’ RCBC

Wray Ward

New 10’x6’ RCBC
Adjacent to Existing 9’x6’ RCBC
New 10’x6’ RCBC Connection @ Sta. 0+00
Required Nighttime/Weekend Work
Existing 9’x6’ RCBC

New 10’x6’ RCBC

Adjacent to Existing 9’x6’ RCBC

Existing 9’x6’ RCBC

Duke Energy OH Transmission Line

Duke & AT&T Duct Banks

Existing 9’x6’ RCBC

Wray Ward

Existing 9’x6’ RCBC

New 10’x6’ RCBC

Adjacent to Existing 9’x6’ RCBC
Duke Energy Duct Bank Crossing
McDowell Street Junction Box

Existing Culvert C/L

New Culvert C/L

New 12 FT x 12 FT Junction Box
McDowell Street

New Culvert C/L

09.19.2014
Oh No! Another Utility Coordination

New Fiber Optic Line

New Culvert C/L
McDowell Street – Parking Garage Entrance
Tunneling & Water Main Replacement

- No Blasting within 10 feet of Water Main
- Tunneling Stopped for W.M Replacement
- WM Replacement Between Dec. and March
- NCDOT Encroachment
- No Blasting within 10 feet of Water Main
12’ SEM Tunnel
54-Inch Water Main Replacement
54-Inch Water Main Replacement
Duke Endowment, Arts BBQ, H&R Block

Duke Endowment HQ & Parking Garage

Tunnel Shaft ~ 33 Feet Deep

Only Access

Arts BBQ

H&R Block
Duke Endowment; Arts BBQ; & H&R Block
Duke Endowment; Arts BBQ; & H&R Block
Oriole Avenue Townhouses
Phase 2 – Final Design

Location Based on Preliminary Re-Development Plans

- 78-Inch Pipe ~ 25 Feet Deep
- 90-Inch Pipe ~ 30 Feet Deep

Interconnections

Main Driveway

Myrtle Square Apts

New Apts

CHA Redevelopment

Main Driveway
Phase 2 – Sequence of Construction Prior to 90” & 78” Pipe Installation

1. Relocate Existing Private Utilities to New Location
2. Remove and Replace Existing Sanitary Sewer Mains in conflict with 90” & 78” Pipe
3. Re-instate Sewer Service Laterals to maintain sewer service during construction
4. Install temporary water main to remove existing water main in conflict with 90” & 78” Pipe
Stakeholders

- Property Owners and Businesses
- Duke Energy – Overhead Power Service
- Cable TV & Telephone – Overhead Service
- Piedmont Natural Gas – Existing & Abandoned Gas Mains
- Charlotte Water – Water and Sewer Service to Customers
- CDOT - Traffic Control Plans
Phase 2 – Sequence of Construction For 90” & 78” Pipe Installation

1. Setup 200’ max road closure
2. Trim tree branches to prevent damage
3. Install “active” shoring for open cut installation
4. Install 90” & 78” Pipe, MH’s, and Street Drainage
5. Install Temporary Pavement Restoration
6. At Completion of City Block – Install New Water System and Final Pavement Restoration
Lessons Learned

1. Improve Bid Advertising for Phase 2
   – Increase Number of Bidders

2. Additional Construction Location Restrictions
   – Oriole Street Started Earlier Than Expected
   – Construction Vehicle Parking, Material Deliveries

3. Stakeholder Involvement Increases During Construction
   – Significant Utility Coordination During Design – “Tip of Iceberg”
   – Property Owner Coordination - Unrealistic Requests
   – Day-to-Day Activities – Garbage Collection; Mail Delivery

4. Costs of “Handcuffing” Contractor
   – Unrealistic weekend closures

All These Lessons Learned Will Be Applied to Phase 2!
We Are Confident There Will Be Others to Overcome!
Questions ??