

## Lesson 1

### Introductions and Seminar Overview

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## Seminar Overview

8:30 AM – 9:00 AM	Introductions and Seminar Overview
9:00 AM – 10:15 AM	Utility Conflict Concepts and SHRP 2 R15(B) Research Findings
10:15 AM – 10:30 AM	Morning Break
10:30 AM – 11:45 AM	Utility Conflict Identification and Management
11:45 AM – 1:00 PM	Lunch Break
1:00 PM – 2:30 PM	Hands-On Utility Conflict Management Exercise
2:30 PM – 2:45 PM	Afternoon break
2:45 PM – 3:30 PM	Use of Database Approach to Manage Utility Conflicts
3:30 PM – 3:45 PM	Wrap-Up

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## Lesson 1 Overview

- Introductions
- Seminar overview
- Housekeeping

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## Housekeeping

- Participant workbook
- Handouts
- Sign-in sheet
- Seminar feedback form
- Miscellaneous

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## Lesson 2

Utility Conflict Concepts and  
SHRP 2 R15(B) Research Findings

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## Seminar Overview

8:30 AM – 9:00 AM Introductions and Seminar Overview

9:00 AM – 10:15 AM Utility Conflict Concepts and SHRP 2 R15(B)  
Research Findings

10:15 AM – 10:30 AM Morning Break

10:30 AM – 11:45 AM Utility Conflict Identification and Management

11:45 AM – 1:00 PM Lunch Break

1:00 PM – 2:30 PM Hands-On Utility Conflict Management Exercise

2:30 PM – 2:45 PM Afternoon break

2:45 PM – 3:30 PM Use of Database Approach to Manage Utility  
Conflicts

3:30 PM – 3:45 PM Wrap-Up

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## Lesson 2 Overview

- Utility conflict concepts
- SHRP2 R15(B) Research findings
- Questions and answers

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## 2.1

### Utility Conflict Concepts

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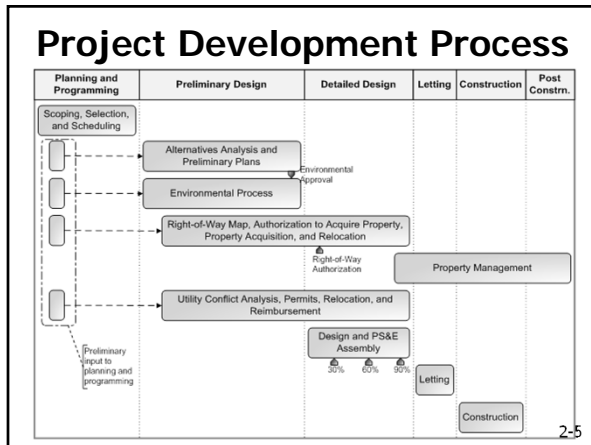
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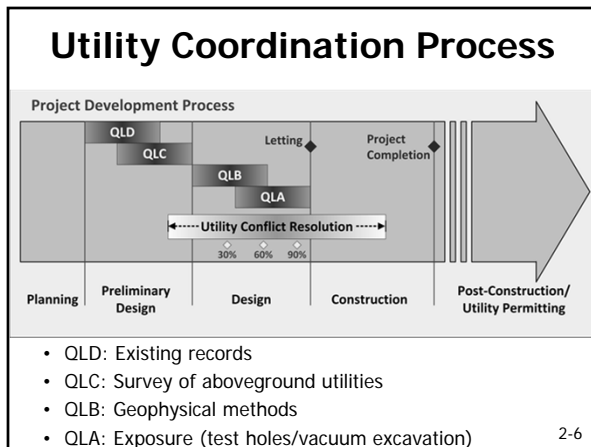
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## Reality Check ...

- Frequently cited reasons for project delays (DOT perspective):
  - Short timeframe for developing projects
  - Project design changes
  - Environmental process delays
  - Inefficiencies in utility coordination
    - Inaccurate location and marking of existing utility facilities
    - Identifying utility conflicts late in the design phase
    - Disagreements on recommended utility-related solutions
    - Utility relocation costs not handled properly
    - ...

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## Reality Check ...

- Frequently cited reasons for project delays (utility owner perspective):
  - Limited resources (financial and personnel)
  - Utility owner's project development process protocols
  - Coordination with other stakeholders during design
  - Coordination with other stakeholders during construction
  - Changes in DOT design and schedules
  - Unrealistic schedule by DOT for utility relocations
  - Internal demands (maintenance, service upgrades)

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## Consequences of Bad Utility Information

- Incomplete/inaccurate utility data = BAD data
- Negative impacts:
  - Disruptions during construction
  - Unplanned environmental corrective actions
  - Damage to utility installations
  - Delays and project overruns

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## Utility Conflict Scenarios

- Utility facility vs. transportation design feature (existing or proposed)
- Utility facility vs. transportation construction activity or phasing
- Planned utility facility vs. existing utility facility
- Noncompliance with:
  - Utility accommodation statutes, regulations, and policies
  - Safety or accessibility regulations

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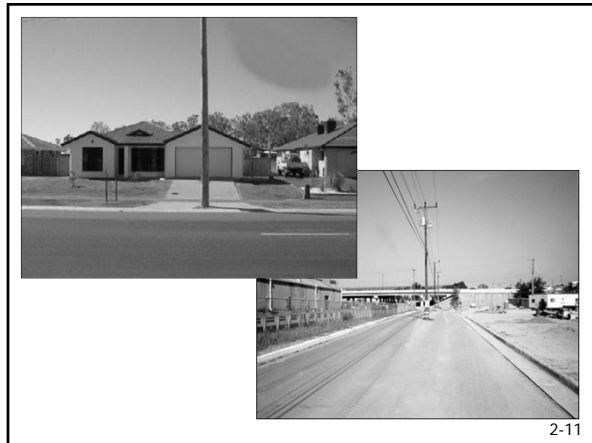
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## Solution Strategies

- Remove, abandon, or relocate utilities in conflict
  - Relocating utilities NOT NECESSARILY OR ALWAYS the best or most cost-effective solution
- Modify transportation facility
- Protect-in-place utility installation
- Accept an exception to policy

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## Transportation Design Changes

- Geometric alignment (horizontal/vertical):
  - Change grade
  - Offset centerline, widen one side of highway
  - Move ramps, driveways
- Structure dimensions, other characteristics:
  - Change embankment slope
  - Add/modify retaining wall to reduce slope encroachment
  - Redesign bridge footings and abutments, move pilings
  - Redesign drainage structures

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## Example: Widening Both Sides vs. One side of Highway

- Issues to consider:
  - Widening both sides of highway impacts everyone (no one is spared!)
  - Widening one side can reduce utility impacts
  - Depends on what kind of utilities are affected

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### Example: Embankment

- Due to interstate widening, embankment had to be raised 50-60 feet
- Major gas and water facilities in the area
- Large soil settlement expected
- Modified project to protect-in-place utilities:
  - Foam layer
  - Thin concrete cap
- Costly utility relocation was avoided

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### Example: Bridge

- Bridge project affected multiple utilities (power, water, sewer, etc.)
- Modifying horizontal bridge alignment slightly
  - Would have avoided any utility impact
  - Would not have impacted right-of-way
  - Would not have compromised bridge construction
- Discovered during construction... too late!
- Utility relocation costs = \$5,000,000

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### Example: Power Pole

- Rapid City, South Dakota
- Conflict discovered at 30% detailed design
- Redesign avoided utility adjustment
- Additional costs were paid by utility

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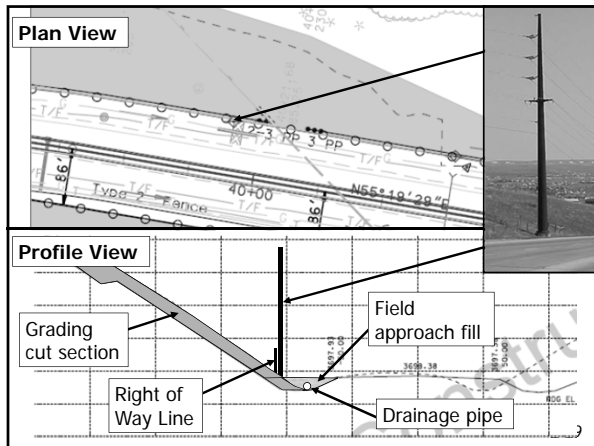
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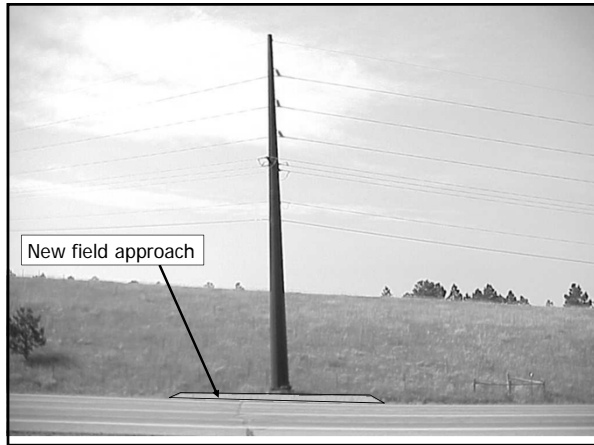
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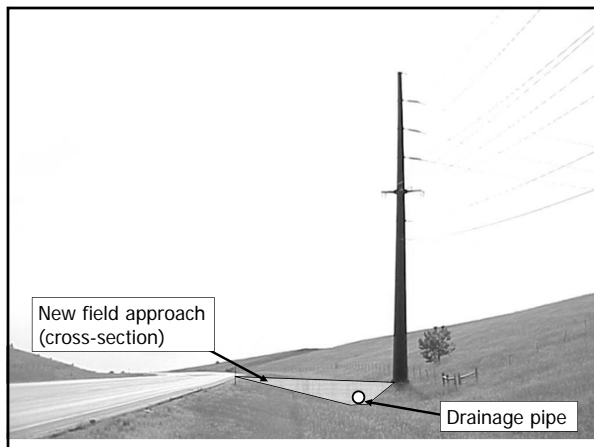
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## Summary of Cost Savings

- BHP&L estimate to relocate 69-kV corner structure \$60,000
  - Additional cost to add field approach - \$3,000
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- Cost savings to the BHP&L consumers/ taxpayers \$57,000

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## Example: Drainage Channel

- Rapid City, South Dakota
- Impact discovered during preliminary project scoping inspection
- Typical concrete lined drainage ditch would have impacted electrical cabinet and cables
- Recommendation: redesign sloped ditch to vertical wall
- Additional benefit: elimination of some right of way acquisition

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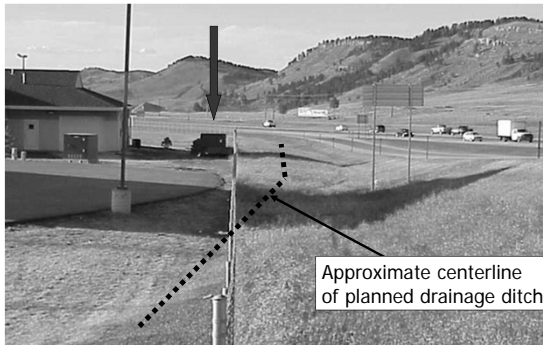
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## Example: Drainage Channel



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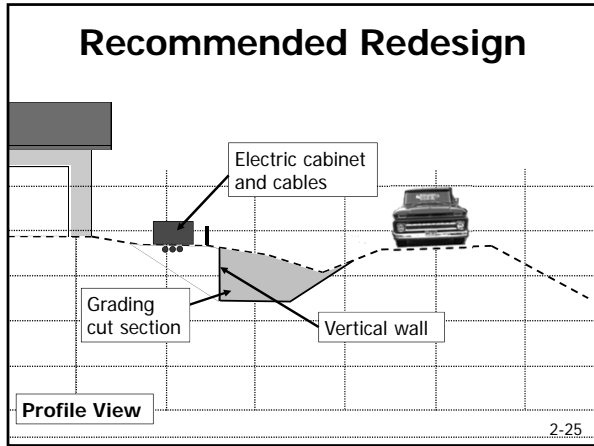
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### Summary of Cost Savings

• Qwest estimate to relocate 9-Way duct system	\$750,000
• Additional cost to re-design storm sewer	- \$37,270
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• Cost savings to the consumers/ taxpayers	\$712,730

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### Example: Storm Sewer and Communication Duct System

- Aberdeen, South Dakota
- 5 blocks of communication ducts
- 5 vaults (5 feet x 7 feet x 12 feet) connected with 9 4-inch ducts encased in concrete
- In conflict with planned storm sewer

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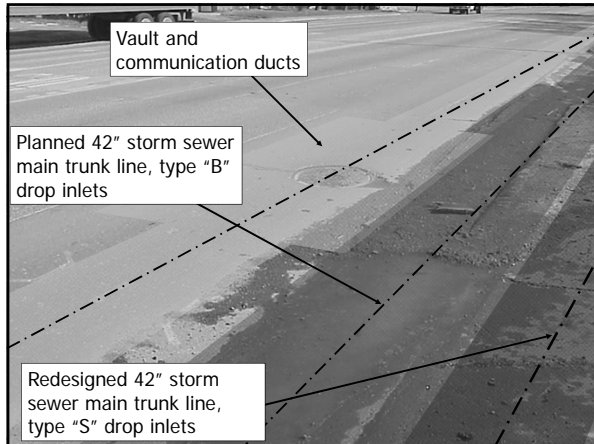
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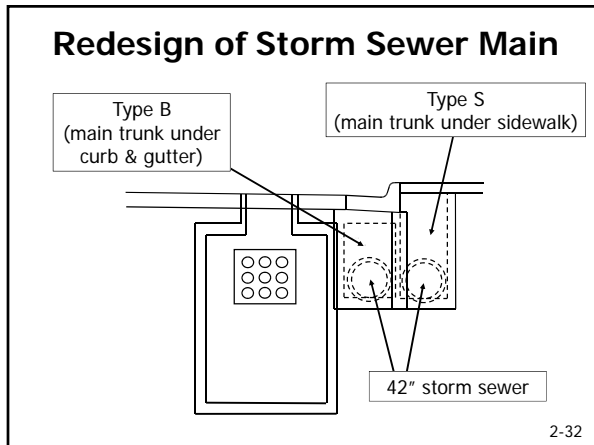
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### Summary of Cost Savings

• Qwest estimate to relocate 9-way duct system	\$750,000
• Additional cost to re-design storm sewer	- \$37,270
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• Cost savings to the consumers taxpayers	\$712,730

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## Example: Traffic Signal Footing

- Deadwood, South Dakota
- Pole to be placed in close proximity to existing utilities
- Pole location surveyed on ground by DOT
- Utilities in vicinity identified by One Call
- High cost to relocate existing utilities
- QLA utility investigation
- Recommendation: Reduce pole footing diameter from 36" to 30"

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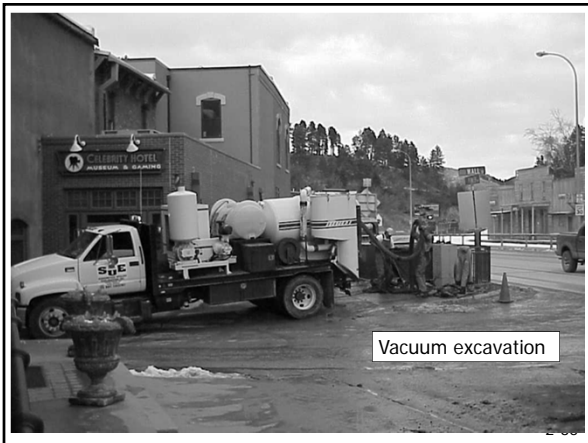
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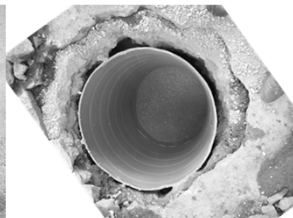
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## Example: Traffic Signal Footing



3 conduits interfere with 36" pole footing diameter



Redesign using 30" sonotube (longer, narrower footing)

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## Summary of Cost Savings

• Cost to relocate power facilities	\$95,000
• Cost to collect QLA data	- \$5,785
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• Cost savings to taxpayers	\$89,215

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## Key Concepts

- Utility conflict management:
  - Does not start at 60% design
  - Does not end at letting
- Not all projects or locations need QLB/QLA data
- Goal: Avoid or minimize utility impacts
- Strategies:
  - Avoid unnecessary utility relocations
  - Evaluate design alternatives
  - Conduct utility conflict analysis

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## General References

- ASCE Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data (CI/ASCE 38-02)
- AASHTO Guide for Accommodating Utilities Within Highway Right-of-Way (2005)
- AASHTO Policy on the Accommodation of Utilities Within Freeway Right-of-Way (2005)
- AASHTO Right of Way and Utilities Guidelines and Best Practices (2004)
- FHWA Program Guide (2003)

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## 2.2

### SHRP 2 R15(B) Research Findings

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## Background and Objectives

- Utility conflict matrix (UCM) an important tool for managing utility conflicts
- Objectives:
  - Review trends and identify best practices for the use of UCMs
  - Develop a recommended UCM approach and document related processes
  - Develop training materials for implementing prototype UCM

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## Research Team

- Texas Transportation Institute
  - Cesar Quiroga (PI), Edgar Kraus
- Cardno TBE
  - Paul Scott, Nick Zembillas, Vinnie LaVallette
- Utility Mapping Services
  - Phil Meis, Tom Swafford
- Ash Engineering
  - Janice Sands Ash, Gary Monday

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## Project Phases

- Phase I (03/09 – 02/10)
  - Surveys and interviews
  - Review of national trends
  - Prototype UCM development
- Phase II (03/10 – 10/10)
  - Work sessions (California, Georgia, Texas)
  - Training material development
- Phase III (11/10 – 07/11)
  - Training material testing
  - Implementation guideline development
  - Final report

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## Surveys, Interviews, Trends, Prototype UCM

- Online survey of 50 states:
  - 103 responses from 34 states
  - 82 responses from utility staff, 21 design staff
  - Headquarters and district level
- Follow-up interviews to obtain additional information from DOTs:
  - 38 interviews with representatives from 23 states

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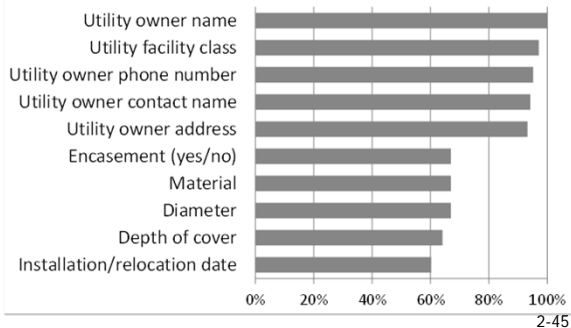
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## State of the Practice: Utility Facility Data Tracking



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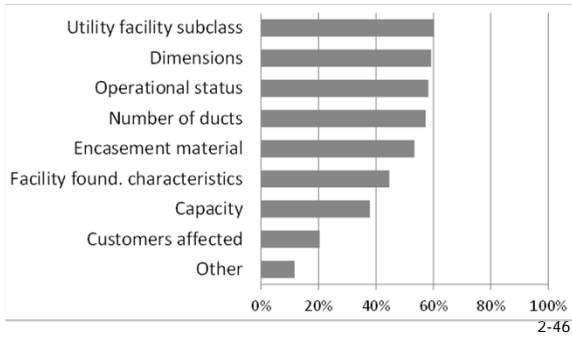
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### State of the Practice: Utility Facility Data Tracking




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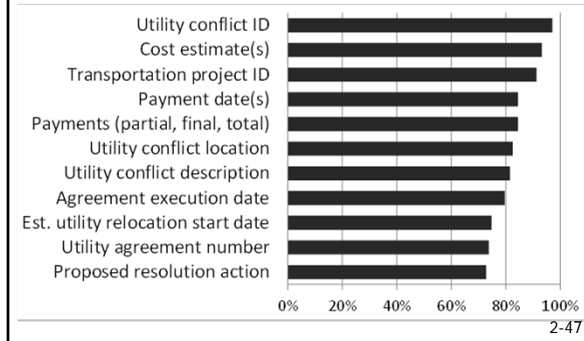
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### State of the Practice: Utility Conflict Data Tracking




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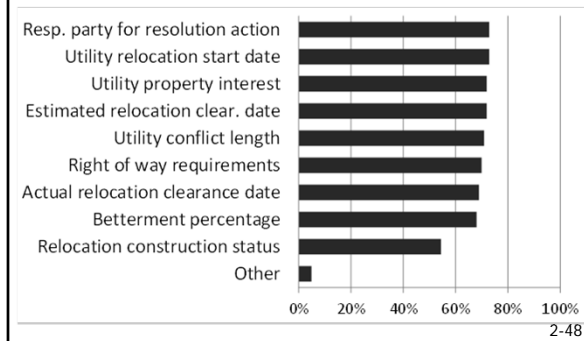
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### State of the Practice: Utility Conflict Data Tracking




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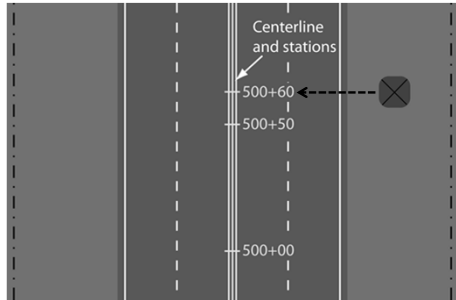
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### State of the Practice: Utility Conflict Referencing



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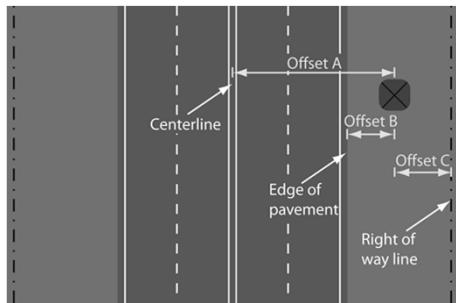
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### State of the Practice: Utility Conflict Referencing



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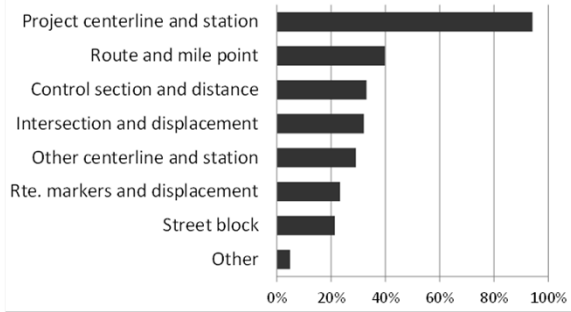
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### Utility Conflict Referencing: Longitudinal Alignments



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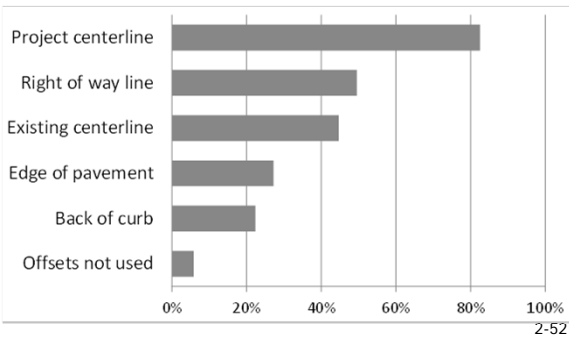
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## Utility Conflict Referencing: Offsets with Respect to




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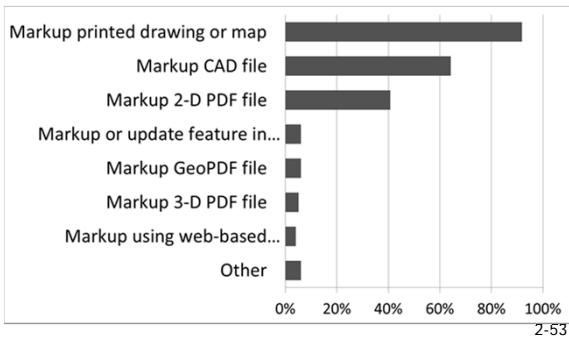
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## State of the Practice: Utility Conflict Tracking




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## Sample (Alaska)

DRAFT Utility Conflict Report  
West Dowling Road Phase I

Anchorage, Alaska  
DOT&PFF No. 50898

**Table 2: Chugach Electric Association, Incorporated, Conflicts Summary**

Station	Offset	Station	Offset	Size/Type	Length	Conflict	ADJ.REL	Cost	PE.CE Cost	Total Cost
<b>CEA Distribution Relocation Costs</b>										
9+00	150' RT	200' LT		30 UG	350	FG	REL	52,500	15,750	68,250
16+00	100' LT	42+30	80' LT	30 UG	2630	FG	REL	394,500	118,350	512,850
16+00	100' LT	15+50	100' RT	30 UG	250	FG	REL	37,500	11,250	48,750
16+00	100' LT	29+00	78' LT	10 UG	1650	FG	REL	165,000	49,500	214,500
36+40	80' LT	35+80	350' RT	30 UG	430	FG	REL	64,500	19,350	83,850
36+60	80' LT	36+70	380' LT	30 UG	300	FG	REL	45,000	13,500	58,500
	UG Loop to the North			30 UG	1000	FG	REL	150,000	45,000	195,000
							Subtotal	909,000	272,700	1,181,700
<b>CEA Transmission Relocation Costs</b>										
14+75	55' RT			138 kV OH	1	PWY	REL	30,000	9,000	39,000
32+75	55' RT			138 kV OH	1	EX	REL	50,000	15,000	65,000
36+38	45' RT			138 kV OH	1	EX	REL	50,000	15,000	65,000
							Subtotal	130,000	39,000	169,000
							<b>Total CEA Relocation Costs</b>	<b>1,039,000</b>	<b>311,700</b>	<b>1,350,700</b>

10' Underground (UG) loop to extend across Dowling Road and along the south side to reconnect existing services.  
UG loop provided to the north of the project to accommodate undergrounding.  
Removal of existing swing lanes removed and steel piling added, down pipe replaced with overhead span pipe and down pipe.

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# Sample (California)

**10-CA 123456789 Conflict Status**

Item #	Station	Utility	Identified Conflict	Testhole Needed	Utility Impact with Cost ("As-Designed")	Recommended Resolution	Benefit of Resolution
1	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	No	Relocate 1500' of BFO-DUCT into street. Use DVA that drain toward driveway.	Relocate proposed storm drainage into street. Use DVA that drain toward driveway.	Save Cost to Relocate BFO-DUCT (\$91,000)
2	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	No	See C1		
3	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 1	Relocate unknown type and location utility	TH to identify utility and conflict	Eliminate possible delay during construction
4	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 2	Relocate 8'W (\$7,500)	TH on 8'W about depth of proposed storm drainage	Save Cost to Relocate 8'W (\$6,000)
5	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 3	Relocate 8'W (\$7,500)	TH on 8'W about depth of proposed storm drainage	Save Cost to Relocate 8'W (\$6,000)
6	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 4	Relocate 20' LF of 4" (\$5,000)	TH on 4" about depth of proposed storm drainage	Save Cost to Relocate 4" (\$4,500)
7	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 5	Relocate 2' of 8" (\$1,000)	TH on 8" about depth of proposed storm structure	Save Cost to Relocate 8" (\$1,000)
8	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 6	Relocate 18'W (\$4,000)	TH on 18'W about depth of proposed storm structure	Save Cost to Relocate 18'W (\$3,500)
9	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 7	Relocate BFO-DUCT 8'W (\$11,000)	TH on BFO-DUCT 8'W about depth of proposed storm structure	Save Cost to Relocate BFO-DUCT 8'W (\$10,500)
10	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 8	Relocate 8'W (\$5,000)	TH on 8'W about depth of proposed storm drainage	Save Cost to Relocate 8'W (\$3,500)
11	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 9	Relocate 18'W (\$10,000)	TH on 18'W about depth of proposed storm structure	Save Cost to Relocate 18'W (\$8,500)
12	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	No	See C1		
13	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	No	See C1		
14	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	No	Relocate 4" (\$4,500)	Relocate 4"	Eliminate conflict with proposed C2
15	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	No	See C1		

*\*Please include all benefits incurred including time, costs, and safety improvements.*

**Key:** AC - Asphalt Concrete; BE - Buried Electric; BFO - Buried Fiber Optic; BT - Buried Telephone; C - Gas; L - Left; MEE - Meters End Section; OE - Overhead Electric; OT - Overhead Telephone; R - Right; RCP - Riser Concrete Pipe; W - Water; W-1 - Water Main; W-2 - Water Main, verify vent and hazard; W-3 - Water Main, verify vent and hazard; SAN - Sanitary Sewer; ADL - Atlanta Gas Light; BE - Georgia Power; BT - Bell South; L3 - Level 3 Communications; MFW - Metropolitan Fiber Network; SAN - Fulton County Public Works; W - City of Atlanta; UNK - Unknown Owner

# Sample (Florida)

**10-FL 123456789 Conflict Status**

Item #	Station	Utility	Identified Conflict	Testhole Needed	Utility Impact with Cost ("As-Designed")	Recommended Resolution	Benefit of Resolution
1	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	No	Relocate 1500' of BFO-DUCT into street. Use DVA that drain toward driveway.	Relocate proposed storm drainage into street. Use DVA that drain toward driveway.	Save Cost to Relocate BFO-DUCT (\$91,000)
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4	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 2	Relocate 8'W (\$7,500)	TH on 8'W about depth of proposed storm drainage	Save Cost to Relocate 8'W (\$6,000)
5	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 3	Relocate 8'W (\$7,500)	TH on 8'W about depth of proposed storm drainage	Save Cost to Relocate 8'W (\$6,000)
6	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 4	Relocate 20' LF of 4" (\$5,000)	TH on 4" about depth of proposed storm drainage	Save Cost to Relocate 4" (\$4,500)
7	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 5	Relocate 2' of 8" (\$1,000)	TH on 8" about depth of proposed storm structure	Save Cost to Relocate 8" (\$1,000)
8	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 6	Relocate 18'W (\$4,000)	TH on 18'W about depth of proposed storm structure	Save Cost to Relocate 18'W (\$3,500)
9	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 7	Relocate BFO-DUCT 8'W (\$11,000)	TH on BFO-DUCT 8'W about depth of proposed storm structure	Save Cost to Relocate BFO-DUCT 8'W (\$10,500)
10	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 8	Relocate 8'W (\$5,000)	TH on 8'W about depth of proposed storm drainage	Save Cost to Relocate 8'W (\$3,500)
11	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 9	Relocate 18'W (\$10,000)	TH on 18'W about depth of proposed storm structure	Save Cost to Relocate 18'W (\$8,500)
12	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	No	See C1		
13	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	No	See C1		
14	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	No	Relocate 4" (\$4,500)	Relocate 4"	Eliminate conflict with proposed C2
15	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	No	See C1		

*\*Please include all benefits incurred including time, costs, and safety improvements.*

**Key:** AC - Asphalt Concrete; BE - Buried Electric; BFO - Buried Fiber Optic; BT - Buried Telephone; C - Gas; L - Left; MEE - Meters End Section; OE - Overhead Electric; OT - Overhead Telephone; R - Right; RCP - Riser Concrete Pipe; W - Water; W-1 - Water Main; W-2 - Water Main, verify vent and hazard; W-3 - Water Main, verify vent and hazard; SAN - Sanitary Sewer; ADL - Atlanta Gas Light; BE - Georgia Power; BT - Bell South; L3 - Level 3 Communications; MFW - Metropolitan Fiber Network; SAN - Fulton County Public Works; W - City of Atlanta; UNK - Unknown Owner

# Sample (Georgia)

**10-GE 123456789 Conflict Status**

Item #	Station	Utility	Identified Conflict	Testhole Needed	Utility Impact with Cost ("As-Designed")	Recommended Resolution	Benefit of Resolution
1	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	No	Relocate 1500' of BFO-DUCT into street. Use DVA that drain toward driveway.	Relocate proposed storm drainage into street. Use DVA that drain toward driveway.	Save Cost to Relocate BFO-DUCT (\$91,000)
2	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	No	See C1		
3	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 1	Relocate unknown type and location utility	TH to identify utility and conflict	Eliminate possible delay during construction
4	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 2	Relocate 8'W (\$7,500)	TH on 8'W about depth of proposed storm drainage	Save Cost to Relocate 8'W (\$6,000)
5	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 3	Relocate 8'W (\$7,500)	TH on 8'W about depth of proposed storm drainage	Save Cost to Relocate 8'W (\$6,000)
6	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 4	Relocate 20' LF of 4" (\$5,000)	TH on 4" about depth of proposed storm drainage	Save Cost to Relocate 4" (\$4,500)
7	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 5	Relocate 2' of 8" (\$1,000)	TH on 8" about depth of proposed storm structure	Save Cost to Relocate 8" (\$1,000)
8	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 6	Relocate 18'W (\$4,000)	TH on 18'W about depth of proposed storm structure	Save Cost to Relocate 18'W (\$3,500)
9	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 7	Relocate BFO-DUCT 8'W (\$11,000)	TH on BFO-DUCT 8'W about depth of proposed storm structure	Save Cost to Relocate BFO-DUCT 8'W (\$10,500)
10	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 8	Relocate 8'W (\$5,000)	TH on 8'W about depth of proposed storm drainage	Save Cost to Relocate 8'W (\$3,500)
11	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	TH 9	Relocate 18'W (\$10,000)	TH on 18'W about depth of proposed storm structure	Save Cost to Relocate 18'W (\$8,500)
12	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	No	See C1		
13	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	No	See C1		
14	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	No	Relocate 4" (\$4,500)	Relocate 4"	Eliminate conflict with proposed C2
15	100-46 211	ADL-BFO	Proposed storm structure and existing BFO	No	See C1		

*\*Please include all benefits incurred including time, costs, and safety improvements.*

**Key:** AC - Asphalt Concrete; BE - Buried Electric; BFO - Buried Fiber Optic; BT - Buried Telephone; C - Gas; L - Left; MEE - Meters End Section; OE - Overhead Electric; OT - Overhead Telephone; R - Right; RCP - Riser Concrete Pipe; W - Water; W-1 - Water Main; W-2 - Water Main, verify vent and hazard; W-3 - Water Main, verify vent and hazard; SAN - Sanitary Sewer; ADL - Atlanta Gas Light; BE - Georgia Power; BT - Bell South; L3 - Level 3 Communications; MFW - Metropolitan Fiber Network; SAN - Fulton County Public Works; W - City of Atlanta; UNK - Unknown Owner



**Recommendations from State DOTs**

- Utility conflict matrix:
  - Track utility conflicts at facility level
  - Maintain and update UCM regularly
  - Develop UCM reports for utility companies
  - Keep UCMs simple
  - Use 11x17-inch page size for UCM
  - Start UCM during preliminary design phase
  - Include data from UCM in PS&E assembly

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**Recommendations from State DOTs**

- Utility conflict management:
  - Use document management systems to support utility conflict management process
  - Conduct “plan-in-hand” field trips with utilities
  - Use One-Call to identify utilities early in the PDP
  - Use RFID tags for damage prevention during construction
  - Provide 3-D design details to utility owners early in the design phase

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**Recommendations from State DOTs**

- Other:
  - Involve stakeholders in review of utility conflicts and solutions
  - Develop effective communications with utility owners regardless of reimbursement eligibility
  - Provide training to utility coordination stakeholders

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## Prototype UCM Development

- Many states use tables or spreadsheets to manage utility conflicts
- Different categories of data tracked
- Wide range of styles and content
  - 26 sample tables received
  - 144 different data items in total
  - Range of data items per table: 4 – 39
  - Average number of data items per table: 14
  - One size does not fit all
  - Different ideas about “consensus” tables

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## Prototype UCM Development

- UCMs are not simple 2-D table products
- Prototype 1: Compact, standalone UCM
  - Low number of data items
  - Spreadsheet (MS Excel)
  - UCM spreadsheet is the product
- Prototype 2: Utility conflict database
  - Formal data model (ERwin)
  - Tested in MS Access
  - Enterprise database support (e.g., Oracle, SQL Server)
  - UCM is one of many queries/reports possible

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## Prototype 1: Development

- Steps to select data items for standalone UCM
  - Analyze sample UCM data items
  - Analyze survey results (conflict data)
  - Analyze survey results (facility data)
  - Consolidate/rank data items
  - Identify data items to include in UCM
- Result: reduced data items from 144 to 25

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# Prototype 1: Utility Conflict Matrix

- UCM header: 8 data items
- UCM body: 15 data items
- MS Excel format
- Includes drop-down lists

Project Owner:		Utility Conflict Matrix Developed/Reviewed By:												
Project No.:		Date:												
Project Description:		Reviewed By:												
Highway or Route:		Date:												
<i>Note: refer to subsheet for utility conflict cost analysis.</i>														
Utility Owner and/or Contact Name	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station	End Station	Start Offset	End Offset	Utility Investigation Level/Needed	Text Note	Recommended Action or Resolution	Estimated Resolution Date	Resolution Status

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# Prototype 1: Cost Estimate Analysis

- Cost Estimate Analysis header: 13 data items
- Cost Estimate Analysis body: 12 data items
- MS Excel format, includes drop-down lists

Project Owner:		Cost Estimate Analysis Developed/Reviewed By:										
Project No.:		Date:										
Project Description:		Reviewed By:										
Highway or Route:		Date:										
Utility Conflict ID:												
Utility Owner:												
Utility Type:												
Size and/or Material:												
Project Phase:												
Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Responsible Party	Engineering Cost (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision	

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# Prototype 2: Development

- Formal data model (ERwin)
- Tested in MS Access
- Enterprise database support (Oracle, SQL Server)
- UCM is one of many queries/reports possible

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## Prototype 2: Query/Report Process

- Identify report requirements
- Populate database tables
  - Develop and use data entry forms
- Develop queries
  - One-time effort for frequently-used queries
  - Ad-hoc queries
- Generate reports
  - On-demand

2-70

## Prototype 2: UCM Report

Utility Conflict Matrix

Project Owner: Texas Department of Transportation  
 Project No.: 1314-56-709  
 Project Description: Road construction project in Houston  
 Highway or Route: I-59 Early Feasibility

Utility Conflict Matrix Download/Refresh By: \_\_\_\_\_ Date: \_\_\_\_\_  
 Refresh By: \_\_\_\_\_ Date: \_\_\_\_\_

Utility Owner and Contact Name	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station	End Station	Start Date	End Date	Utility Investigation Lead/Investigator	Team	Resolution Status	Responsible Party	Estimated Resolution Date	Resolution Status	Cost Estimate
AT&T	1	1-1	Telephone	Fiber Optic	Conflict with construction of bridge road widening	21+00	23+00	4/7/12	6/1/12	SLC	Resolution before construction	U	SLC/2012	Utility conflict identified	Revised	
AT&T	2	1-1	Telephone	Fiber Optic	Conflict with construction of bridge road widening	21+00	23+00	4/7/12	6/1/12	SLC	Resolution before construction	U	SLC/2012	Utility conflict identified	Revised	
AT&T	3	1-1	Telephone	Fiber Optic	Conflict with construction of bridge road widening	21+00	23+00	4/7/12	6/1/12	SLC	Resolution before construction	U	SLC/2012	Utility conflict identified	Revised	
AT&T	4	1-1	Telephone	Fiber Optic	Conflict with construction of bridge road widening	44+00	45+00	4/7/12	6/1/12	SLC	Resolution before construction	U	SLC/2012	Utility conflict identified	Revised	
AT&T	5	1-1	Telephone	Unknown	Conflict with construction of bridge road widening	44+00	45+00	4/7/12	6/1/12	SLC	Design change	D	SLC/2012	Utility owner informed of utility conflict	Revised	
AT&T	6	1-1	Telephone	Unknown	Conflict with existing wall No. 18	44+00	45+00	4/7/12	6/1/12	SLC	Design change	D	SLC/2012	Utility owner informed of utility conflict	Revised	
AT&T	7	1-1	Telephone	Unknown	Conflict with existing wall No. 18	47+00	24+00	4/7/12	6/1/12	SLC	Project in place	U/R	SLC/2012	Utility conflict identified	Revised	
AT&T	8	1-1	Telephone	Unknown	Conflict with existing wall No. 18	21+00	23+00	4/7/12	6/1/12	SLC	Project in place	U/R	SLC/2012	Utility conflict identified	Revised	
AT&T	9	1-1	Telephone	Unknown	Conflict with existing wall No. 18	21+00	23+00	4/7/12	6/1/12	SLC	Project in place	U/R	SLC/2012	Utility conflict identified	Revised	
AT&T	10	1-1	Telephone	Unknown	Conflict with existing wall No. 18	21+00	23+00	4/7/12	6/1/12	SLC	Project in place	U/R	SLC/2012	Utility conflict identified	Revised	
AT&T	11	1-1	Telephone	Unknown	Conflict with existing wall No. 18	21+00	23+00	4/7/12	6/1/12	SLC	Exception to policy	N/A	SLC/2012	Utility conflict identified	Revised	
AT&T	12	1-1	Telephone	Unknown	Conflict with existing wall No. 18	21+00	23+00	4/7/12	6/1/12	SLC	Design change	D	SLC/2012	Utility owner informed of utility conflict	Revised	
AT&T	13	1-1	Telephone	Unknown	Conflict with existing wall No. 17	34+00	34+00	4/7/12	6/1/12	SLC	Design change	D	SLC/2012	Utility owner informed of utility conflict	Revised	
AT&T	14	1-1	Telephone	Unknown	Conflict with existing wall No. 17	22+00	23+00	4/7/12	6/1/12	SLC	Design change	D	SLC/2012	Utility owner informed of utility conflict	Revised	
AT&T	15	1-1	Telephone	Unknown	Conflict with existing wall No. 17	22+00	23+00	4/7/12	6/1/12	SLC	Design change	D	SLC/2012	Utility owner informed of utility conflict	Revised	
AT&T	16	1-1	Telephone	Unknown	Conflict with existing wall No. 17	24+00	24+00	4/7/12	6/1/12	SLC	Design change	D	SLC/2012	Utility owner informed of utility conflict	Revised	
AT&T	17	1-1	Telephone	Unknown	Conflict with existing wall No. 17	24+00	24+00	4/7/12	6/1/12	SLC	Design change	D	SLC/2012	Utility owner informed of utility conflict	Revised	
AT&T	18	1-1	Telephone	Unknown	Conflict with existing wall No. 17	34+00	34+00	4/7/12	6/1/12	SLC	Design change	D	SLC/2012	Utility owner informed of utility conflict	Revised	
AT&T	19	1-1	Telephone	Unknown	Conflict with existing wall No. 17	34+00	34+00	4/7/12	6/1/12	SLC	Design change	D	SLC/2012	Utility owner informed of utility conflict	Revised	
AT&T	20	1-1	Telephone	Unknown	Conflict with existing wall No. 17	34+00	34+00	4/7/12	6/1/12	SLC	Design change	D	SLC/2012	Utility owner informed of utility conflict	Revised	
AT&T	21	1-1	Telephone	Unknown	Conflict with existing wall No. 17	34+00	34+00	4/7/12	6/1/12	SLC	Design change	D	SLC/2012	Utility owner informed of utility conflict	Revised	

2-72

## Prototype 2: Sub Report

Utility Conflict Resolution Alternatives  
 Cost Estimate Analysis

Project Owner: Texas Department of Transportation  
 Project No.: 1314-56-709  
 Project Description: Road construction project in Houston  
 Highway or Route: I-59 Early Feasibility

Conflict ID: 1  
 Utility Owner: AT&T  
 Utility Type: Telephone  
 Size and/or Material: Fiber Optic  
 Project Phase: 60% Design

Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Responsible Party	Engineering Cost (2007)	Direct Cost (2007)	Engineering Cost (2012)	Direct Cost (2012)	Total Cost	Probability	Selected
0	Resolution before construction. No design change required and no additional cost to DOT.	Cost to utility for relocation.	Utility Company	\$18,875.00	\$63,875.00	\$0.00	\$0.00	\$82,750.00	Yes	Selected	
1	Project in place.		Utility Company	\$7,875.00	\$12,375.00	\$0.00	\$0.00	\$20,250.00	No	Rejected	
2	Design change		DOT	\$0.00	\$0.00	\$18,375.00	\$0.00	\$18,375.00	No	Rejected	
3	Exception to policy		DOT	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	No	Rejected	

2-72

## In Summary ...

- UCM practices vary widely across the country
- SHRP 2 R15(B) products:
  - Prototype 1: Compact, standalone UCM
  - Prototype 2: Utility conflict data model and database
  - Training materials (Lessons 1 – 6)
  - Implementation guidelines

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## 2.3

### Questions and Answers

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### Lesson 3

#### Utility Conflict Identification and Management

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### Seminar Overview

8:30 AM – 9:00 AM Introductions and Seminar Overview  
9:00 AM – 10:15 AM Utility Conflict Concepts and SHRP 2 R15(B) Research Findings  
10:15 AM – 10:30 AM Morning Break  
10:30 AM – 11:45 AM Utility Conflict Identification and Management  
11:45 AM – 1:00 PM Lunch Break  
1:00 PM – 2:30 PM Hands-On Utility Conflict Management Exercise  
2:30 PM – 2:45 PM Afternoon break  
2:45 PM – 3:30 PM Use of Database Approach to Manage Utility Conflicts  
3:30 PM – 3:45 PM Wrap-Up

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### Lesson 3 Overview

- Utility conflict management and use of UCM
- Discussion, questions, and answers

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### 3.1

## Utility Conflict Management and Use of UCM

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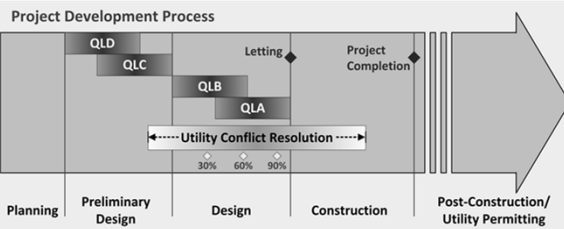
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## Utility Coordination Process



- QLD: Existing records
- QLC: Survey of aboveground utilities
- QLB: Geophysical methods
- QLA: Exposure (test holes/vacuum excavation)

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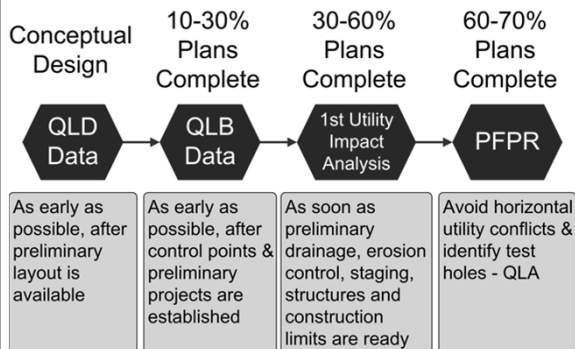
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## Georgia DOT Implementation



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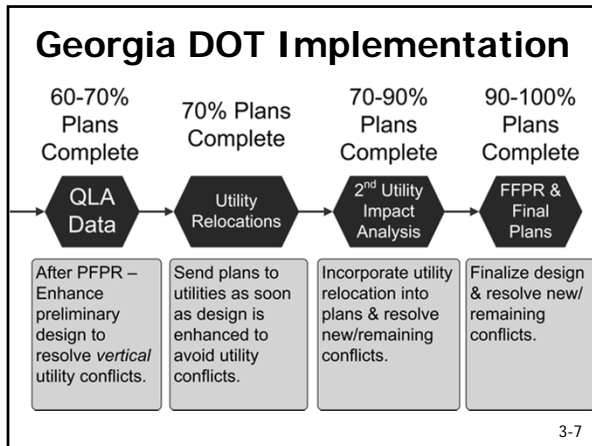
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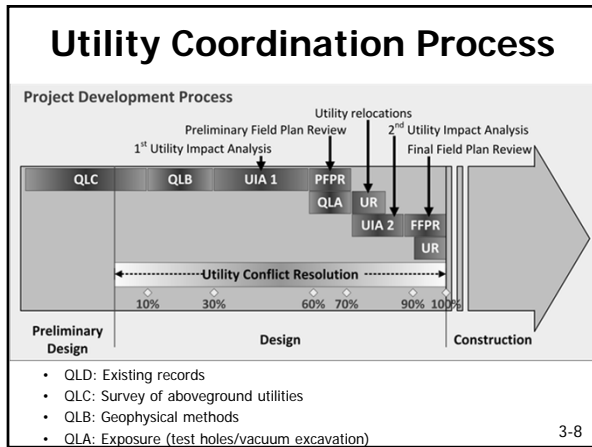
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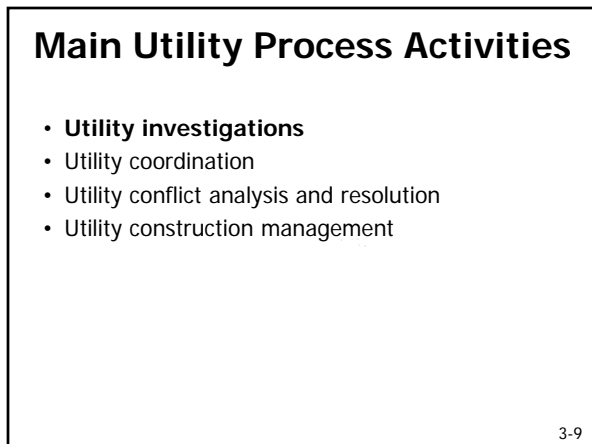
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## Utility Investigations

- Characterization of subsurface and above ground utility installations
- Quality levels of utility information
  - QLD
  - QLC
  - QLB
  - QLA
- ASCE Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data (ASCE/CI 38-02)

3-10

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## Quality Level D (QLD)

- Data collection from existing records or oral recollections
  - Utility owner records (marked up drawings, cable records, service records, as-builts), GIS databases, oral histories, one call markings, field notes
  - Information sources (Utility owners, County Clerk's office, visual site inspections, one-call notification centers, public service commissions, land owners, and database searches)
  - Deliverables: Composite drawing depicting QLD facilities

3-11

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## Quality Level C (QLC)

- Surveying and plotting visible utility appurtenances and making inferences about underground linear utility facilities that connect those appurtenances
  - Survey using project datum and specifications (e.g., valve covers, junction boxes, and manhole covers)
  - Correlate utility records to surveyed features
  - Resolve discrepancies
  - Deliverables: Composite drawings (QLC and QLD)

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## Quality Level B (QLB)

- Surface geophysical methods to determine the approximate horizontal position of subsurface utilities
  - Mark indications of utilities on the ground surface
  - Accuracy depends on geophysical method, soil conditions
  - Survey markings using project datum and specifications
  - No vertical positions measured
  - Correlate utility records to surveyed features
  - Resolve discrepancies
  - Deliverables: Composite drawings (QLB, QLC, QLD)

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## Quality Level A (QLA)

- Accurate *horizontal* and *vertical* utility locations through exposure of underground utility facilities at certain locations
  - Test hole excavation (minimally intrusive)
  - Data gathered during construction (in some cases)
  - Survey exposed facilities using project datum (*horizontal* and *vertical*) and specifications
  - Resolve discrepancies
  - Deliverables: Composite drawings (QLA, QLB, QLC, QLD), test hole reports

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<u>COLOR/LINE CODES</u>		<u>SYMBOLS</u>	
---CW---	CITY WATER	○	MANHOLE
---FP---	FIRE PROTECTION	●	DROP INLET
---RW---	RESERVOIR WATER	□	UTILITY POLE
---DW---	DEIONIZED WATER	□	LIGHT POLE
---CHW---	CHILLED WATER		
---PWS---	WATER (QL-D)		ANT D POINT
---W(C)---	WATER (QL-C)		
---W(B)---	WATER (QL-B)		BOX
---O---	OXYGEN	⊗	PEDESTAL TRANSFORMER
---CD---	CARBON DIOXIDE	●	BOLLARD
---T---	TELEPHONE	■	SIGN
---E---	ELECTRIC	□	HOUSE TRAP
---CS---	CHEMICAL SEWER	⊙	"QUALITY LEVEL A" DATA POINT
---UNK---	UNKNOWN FUNCTION		
---ST---	STORM		
.....	LINE CODE FOR QLC OR QLD INFORMATION		

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<u>ABBREVIATIONS</u>	
F.O.	FIBER OPTIC
EOI	END OF SURFACE GEOPHYSICAL INFORMATION
EORI	END OF RECORD INFORMATION
AATUR	UTILITY ABANDONED ACCORDING TO UTILITY RECORDS
AATFI	UTILITY ABANDONED ACCORDING TO FIELD INSPECTION
EATUR	EMPTY ACCORDING TO UTILITY RECORDS
NAP	NO ASSOCIATED PIPING FOUND FROM STRUCTURE
NAC	NO ASSOCIATED CABLES FOUND FROM STRUCTURE

<u>NOTES</u>	
NOTE 1:	"QUALITY LEVEL A" DATA POINTS INDICATED BY SYMBOL ⊙. SEE QLA SUPPLEMENTAL DATA FORM FOR ADDITIONAL UTILITY INFORMATION.
NOTE 2:	ALL "QUALITY LEVEL A" ELEVATIONS ARE FOR THE TOP OF THE UTILITY UNLESS OTHERWISE NOTED.
NOTE 3:	ALL UTILITIES DEPICTED AT "QUALITY LEVEL B" UNLESS INDICATED BY DOTTED LINE CODE (.....) AND LABELED "QLC" OR "QLD".

3-18

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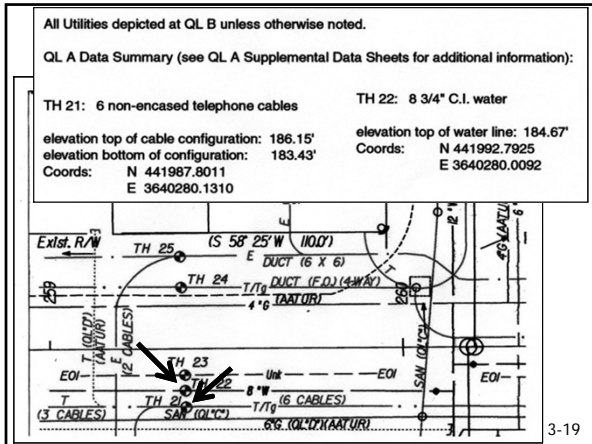
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Test Hole Form									
Utility Type	Utility Material	Offset Measured From				Identified By			
E Electrical	1 Steel	30 Edge of Pavement				20 Sleeve			
G Gas Line	2 PVC (Polyvinyl Chloride)	31 Baseline				21 Hub/Latha			
BT Buried Telephone	3 DIP (Ductile Iron Pipe)	32 Right-of-Way				22 Nail/Disk			
FOC Fiber Optic Cable	4 VCP (Vitrified Clay Pipe)	33 Centerline				23 7" In Concrete			
W Water	5 PE (Polyethylene Pipe)	34 Back of Curb				24 Set Iron Rod and Cap 5/8"			
SSN Sanitary Sewer	6 ACI (Cast Iron)	35 Survey Hub				25			
STM Storm Sewer	7 CI (Cast Iron)	36 7" In Concrete				26			
CATV Cable TV	8 DBC (Direct Buried Cable)	37 Swing Ties							
FM1 Force Main	9 Concrete Pipe	38 Ref. Point in Driveway							
RW Reclaimed Water	10 Corrugated Metal Pipe	39							
SL Street Light	11 Duct	Surface Type							
TS Traffic Signal	12 Fiberglass	A Asphalt							
FL Fuel Line	13 Unknown	C Concrete							
EKP Exploratory	14 Corrugated Plastic	NG Natural Ground							
UNK Unknown	15 Concrete Duct								
IRR Irrigation									

Conflict No.	Test Hole No.	Utility Type	Utility Material	Utility Size (D.I.)	Approx. Station	Approx. Offset Distance	Manual From (Top)	Manual Depth (Top)	Cross Sectional View	Utility Direction	ID'd By	Surface Type	Perm. Thickness
				in. [ ] / mm. [ ]		ft. [ ] / m. [ ]	L / R	ft. [ ] / m. [ ]					in. [ ] / mm. [ ]
C60	19	BE	2	6"	37+00	42.0		31	3.16'	↖		22	NG
C62	20	BE	2	6"	37+00	57.0		31	3.33'	↖		22	NG
C63	21	W	6	12"	37+00	53.0		31	4.21'	↖		22	NG
C64	22	G	1	6"	37+00	48.0		31	3.56'	↖		22	NG
C18	23	BE	2	6"	37+40	60.0		31	3.19'	↖		22	NG
C19	24	BT	8	1"	37+90	43.0		31	4.52'	↖		22	NG
C23	25	W	2	6"	39+00	130		31	3.83'	↖		22	NG
C24	26	CATV	8	1"	35+30	105		31	4.12'	↖		22	NG

Notes:

Sheet 1 of 1 Prepared By: VL Date: 10/13/08 Checked By: RMP Date: 10/14/08

3-20

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## Main Utility Process Activities

- Utility investigations
- **Utility coordination**
- Utility conflict analysis and resolution
- Utility construction management

3-21

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## Utility Coordination

- Coordination and liaison with utility owners, consultants, designers, other stakeholders
- Scope of work could include:
  - Coordination of utility relocations
  - Notifications, meetings, and work plans
  - Permits and rights of entry
  - Utility agreement assemblies
  - Funding and escrow agreements
  - Processing of as-built information

3-22

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## Main Utility Process Activities

- Utility investigations
- Utility coordination
- **Utility conflict analysis and resolution**
- Utility construction management

3-23

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## Utility Conflict Analysis and Resolution

- Processes:
  - Utility impact analysis
  - Evaluation of alternatives (utility and project)
  - Meetings, discussions with stakeholders
- Tools:
  - Utility layouts (plan sheets, cross sections, details)
  - Utility conflict matrix
- Outcomes:
  - Constructability and traffic control plan
  - Plans, schedules, and estimates
  - Certifications/special provisions in PS&E assembly

3-24

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## Main Utility Process Activities

- Utility investigations
- Utility coordination
- Utility conflict analysis and resolution
- **Utility construction management**

3-25

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## Utility Construction Management

- Coordination of utility construction
  - Pre and post letting
- Inspection and verification
- Compliance with policies (e.g., utility accommodation policy, traffic control, SW3P, OSHA, etc.)
- Payment request reviews
- Gathering of as-built drawings



3-26

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## Important Utility Conflict Events

0 Utility conflict identified	15 Required adjustment completion
1 Comment created	16 Estimated adjustment completion
2 Utility owner informed	17 Scheduled adjustment completion
3 Utility conflict resolved	18 Notice to proceed to utility owner
4 Utility owner acknowledge document	19 Adjustment construction start
5 Document requested	20 Adjustment construction end
6 Document sent	21 Permit application
7 Document received	22 Permit approved
8 Document reviewed	23 Exception requested
9 Document certified	24 Exception approved
10 Document approved	25 Plans sufficient sent to utility owner
11 Document uploaded	26 30-day notice submitted
12 Document review, complete	27 90-day notice submitted
13 Utility coordination meeting	28 Utility conflict resolution strategy selected
14 ROW cleared for adjustment	29 Utility relocation under construction
	30 Utility conflict archived

3-27

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## UCM Sample Applications

- Georgia DOT
- California DOT

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## Sample Application No. 1

- Roswell Road Project, Georgia
  - NW of Atlanta, Cobb County
  - Widening of SR 120/Roswell Road from SR 120 ALT to Bridgegate Drive
  - Project length: 1.8 miles
  - 13 utility owners
  - 135,000 linear feet of underground utilities

3-29

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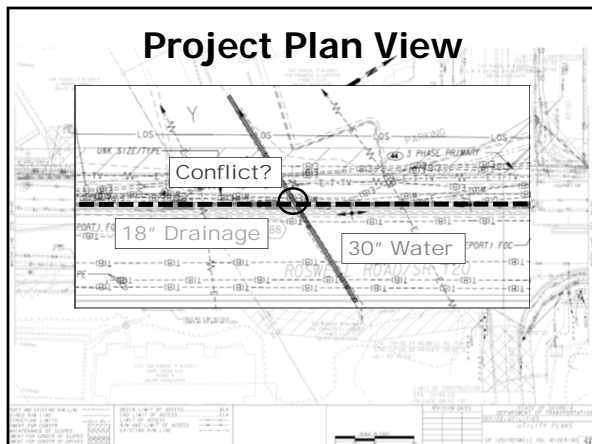
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## Project Plan View



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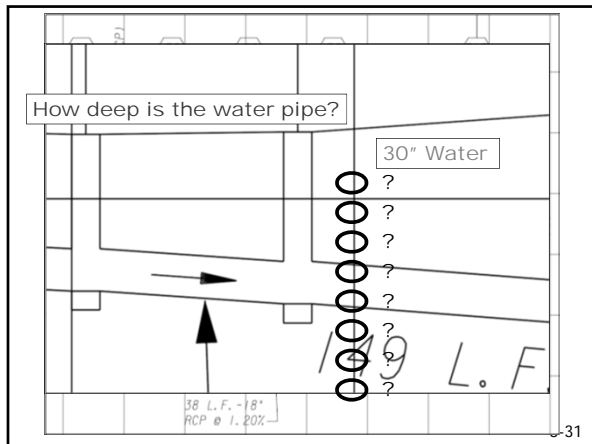
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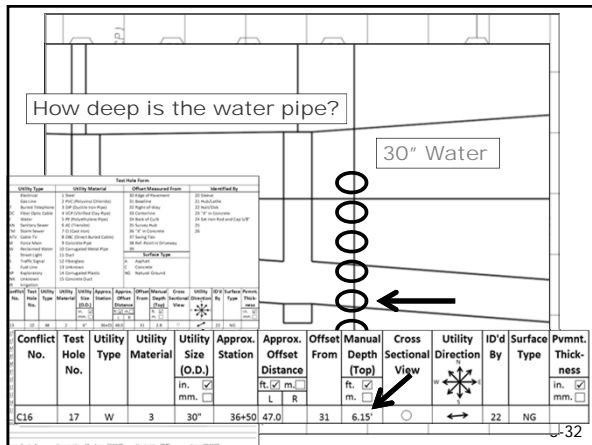
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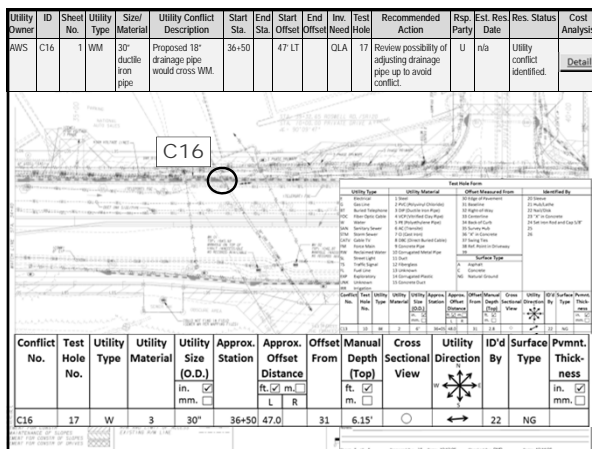
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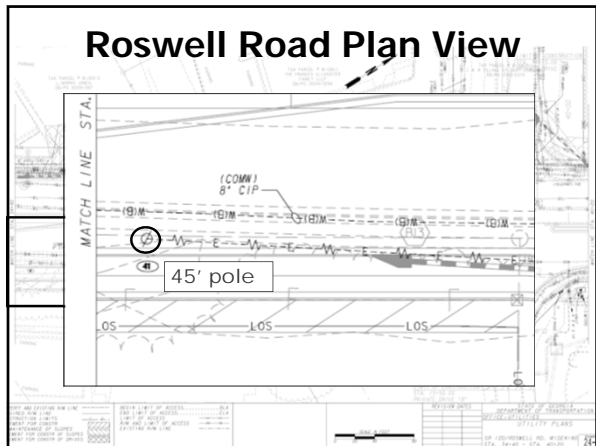
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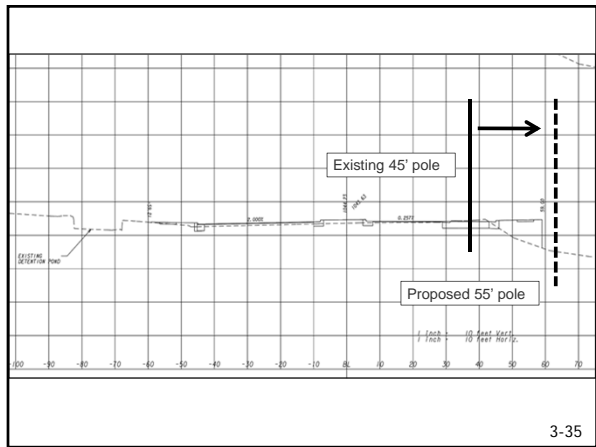
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Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action	Resp. Party	Est. Res. Date	Res. Status	Cost Analysis
AWS	C16	1	WM	30" ductile iron pipe	Proposed 18" drainage pipe would cross WM.	36+50	47	LT	CLA	17		Review possibility of adjusting drainage pipe up to avoid conflict.	U	nta	Utility conflict identified.	<a href="#">Detail</a>
CPS	C32	1	OE	45' pole	Existing pole in proposed roadway	34+55	40	RT	CLC			Pole to be relocated.	U	nta	Utility conflict identified.	<a href="#">Detail</a>

The plan view below the table shows the locations of utility conflicts C16 and C32 on Roswell Road. C16 is marked with a circled '16' and C32 with a circled '32'.

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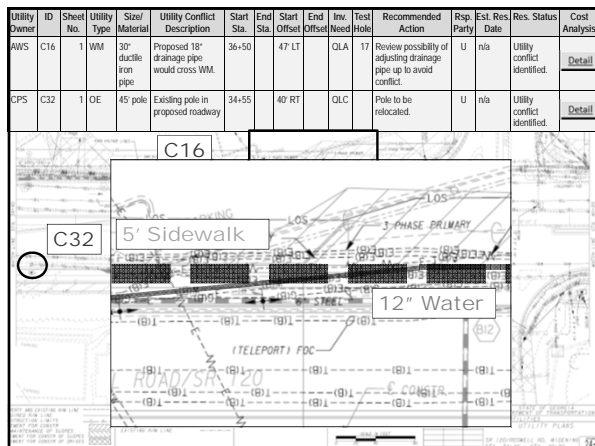
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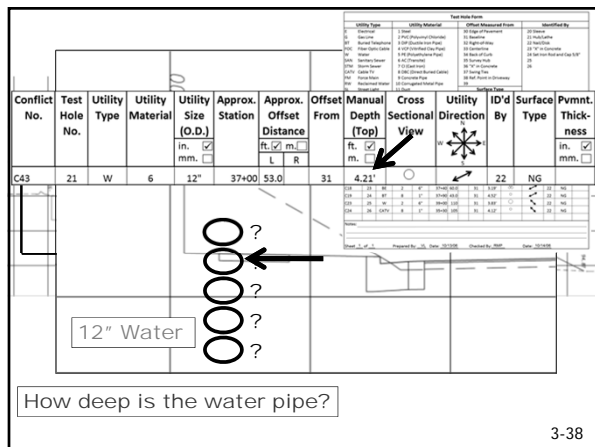
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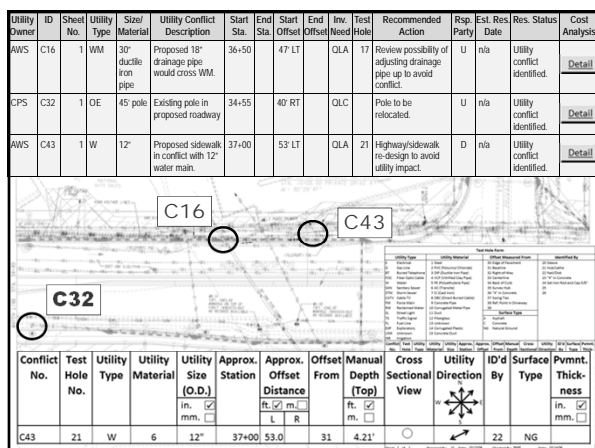




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### Utility Conflict Matrix

Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action	Rsp. Party	Est. Res. Date	Res. Status	Cost Analysis
AWS	C16	1	WM	30" ductile iron pipe	Proposed 18" drainage pipe would cross WM.	36+50		47' LT		OLA	17	Review possibility of adjusting drainage pipe up to avoid conflict.	U	n/a	Utility conflict identified.	<a href="#">Detail</a>
CPS	C32	1	OE	45' pole	Existing pole in proposed roadway	34+55		49' RT		OLC		Pole to be relocated.	U	n/a	Utility conflict identified.	<a href="#">Detail</a>
AWS	C43	1	W	12"	Proposed sidewalk in conflict with 12" water main.	37+00		53' LT		OLA	21	Highway/sidewalk re-design to avoid utility impact.	D	n/a	Utility conflict identified.	<a href="#">Detail</a>
CPS	C54	1	OE	45' pole	Existing pole in proposed curb line	38+30		57' RT		OLC		Pole to be relocated.	U	n/a	Utility conflict identified.	<a href="#">Detail</a>
CPS	C55	1	OE	45' pole	Existing pole in area of grade cut	38+50		63' RT		OLC		Pole may need to be supported or replaced with taller pole.	U	n/a	Utility conflict identified.	<a href="#">Detail</a>
CPS	C61	1	OE	45' pole	Existing pole in proposed curb line	40+00		52' RT		OLC		Pole to be relocated.	U	n/a	Utility conflict identified.	<a href="#">Detail</a>
ATT	C28	1	OTV	45' pole	Existing pole in conflict with proposed drainage	40+15		65' LT		OLC		Pole to be relocated.	U	n/a	Utility conflict identified.	<a href="#">Detail</a>
3-40																

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### Cost Estimate Analysis

- Detailed analysis of utility conflict resolution alternatives
  - Cost (both utility and DOT)
  - Feasibility
- Analysis varies from simple to extremely detailed
  - Up to four estimates for each alternative
  - Many alternatives for each utility conflict
  - Many analyses throughout project development process

3-41

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### Cost Estimate Analysis

Conflict ID:	1
Utility Owner:	AT&T
Utility Type:	Telephone
Size and/or Material:	Fiber Optic
Project Phase:	60% Design

Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Engineering Cost (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision
0	Relocation before construction.	No design change required, no additional cost to DOT.	Cost to utility for relocation.	\$10,375	\$63,875	\$0	\$0	\$74,250	Yes	Selected
1	Protect in-place.	Utility can remain in place.	Access to utility for maintenance problematic.	\$7,875	\$32,375	\$0	\$0	\$40,250	No	Rejected
2	Change highway design.	Utility can remain in place.	High cost and project delay.	\$0	\$0	\$95,375	\$0	\$95,375	Yes	Rejected
3	Exception to policy.	No cost to utility or DOT.	High risk of damage to utility and maintenance problems.	\$0	\$0	\$0	\$0	\$0	No	Rejected

3-42

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## Utility Conflict Matrix Uses

- Management report during project development
- Utility information for highway project bidders included in letting documents
  - Certification of known utility facilities within project limits
  - Special provision for utility relocations
- Management report during construction
- Cost savings report after construction

3-43

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## Sample Application No. 2

- California DOT project

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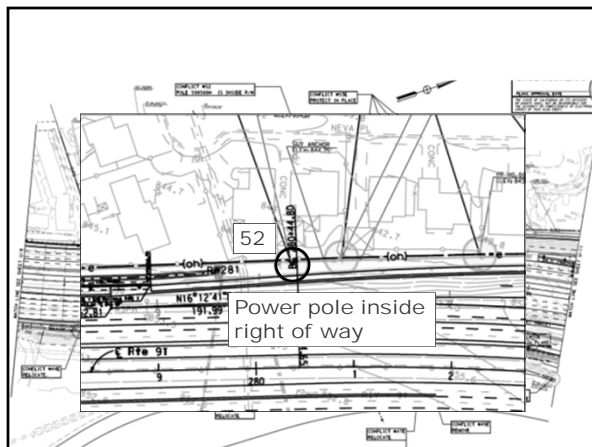
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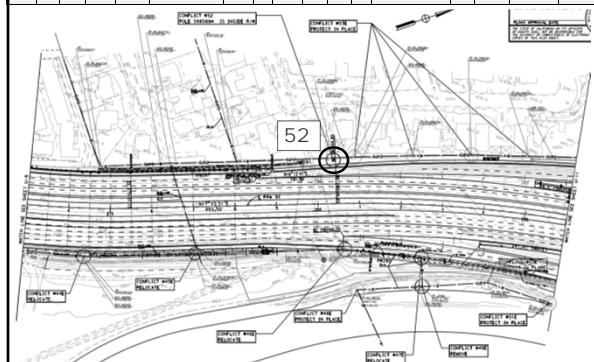
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Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inw./Need/Note	Test Hole	Recommended Action	Resp. Party	Est. Res. Date	Res. Status	Cost Analysis
CP	52	U-10	OE pole		Pole is in conflict with retaining wall.	280 +50		80	LT	CLC		Review possibility of modifying retaining wall 281 to avoid conflict.	D	n/a	Utility conflict identified.	Detail




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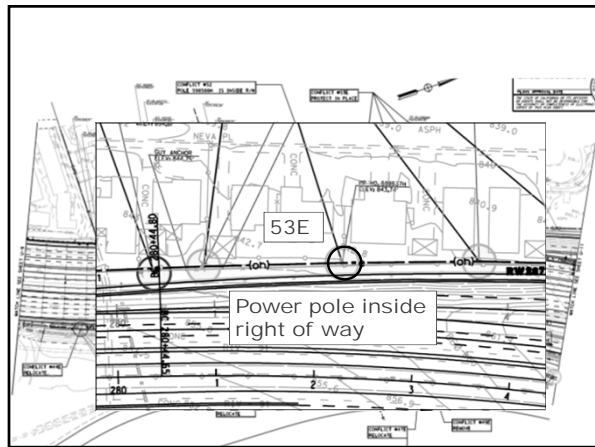
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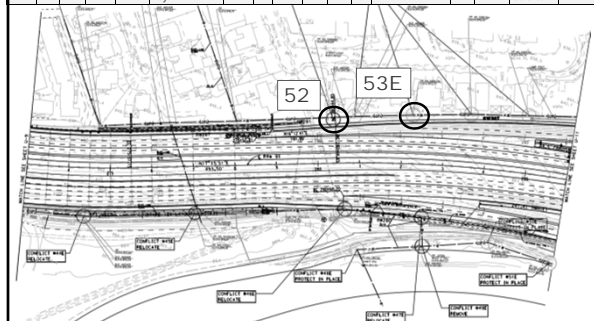
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CP	52	U-10	OE pole		Pole is in conflict with retaining wall.	280 +50		80	LT	CLC		Review possibility of modifying retaining wall 281 to avoid conflict.	D	n/a	Utility conflict identified.	Detail
CP	53E	U-10	OE pole		Pole is within the proposed right of way.	282 + 50		80	LT	CLC		Protect in place.	U	n/a	Utility conflict identified.	Detail




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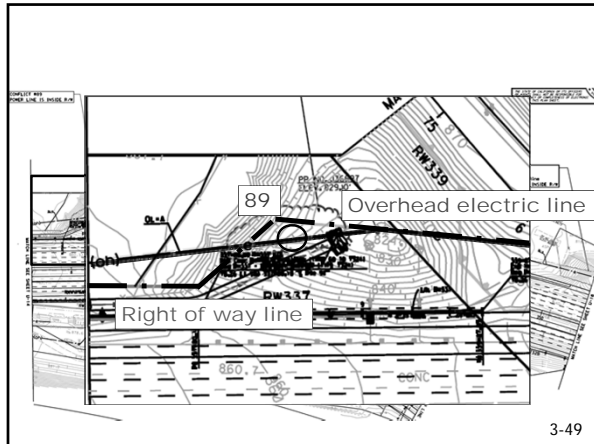
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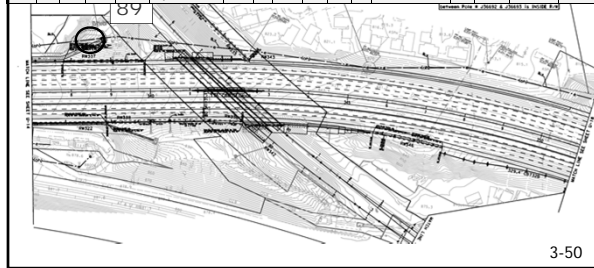
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Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action	Resp. Party	Est. Res. Date	Res. Status	Cost Analysis			
CP	52	U-10	OE pole		Pole is in conflict with retaining wall.	280	+50	80	LT	CLC		Review possibility of modifying retaining wall 281 to avoid conflict	D	n/a	Utility conflict identified.	Detail			
CP	53E	U-10	OE pole		Pole is within the proposed right of way	282	+50	80	LT	CLC		Protect in place	U	n/a	Utility conflict identified.	Detail			
CP	89	U-15	OE line		Power line is within the proposed right of way	348	+00	349	75	LT	85	LT	CLC		Relocate utility line	U	n/a	Utility conflict identified.	Detail




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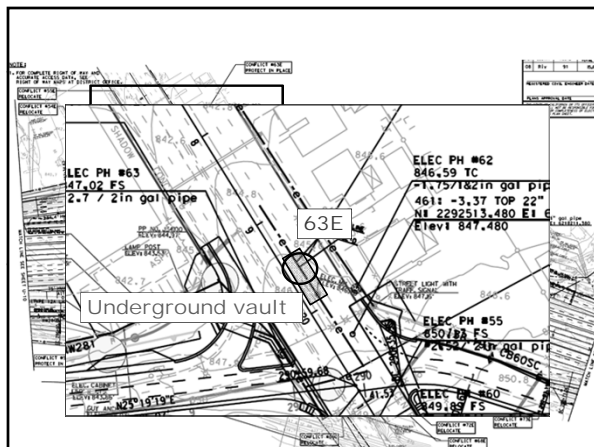
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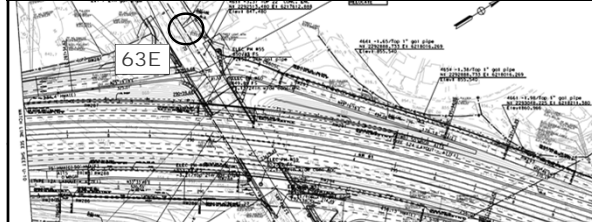
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Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need/Note	Recommended Action	Resp. Party	Est. Res. Date	Res. Status	Cost Analysis
CP	52	U-10	OE pole		Pole is in conflict with retaining wall.	280+50		80 LT		OLC	Review possibility of modifying retaining wall 281 to avoid conflict	D	n/a	Utility conflict identified.	<a href="#">Detail</a>
CP	53E	U-10	OE pole		Pole is within the proposed right of way	282+50		80 LT		OLC	Protect in place	U	n/a	Utility conflict identified.	<a href="#">Detail</a>
CP	89	U-15	OE line		Power line is within the proposed right of way	348+00	349+00	75 LT	85 LT	OLC	Rebate utility line	U	n/a	Utility conflict identified.	<a href="#">Detail</a>
EPP	63E	U-11	UG Vault		Vault is within the proposed right of way	19+50		0		OLA	Protect in place	U	n/a	Utility conflict identified.	<a href="#">Detail</a>




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### In Summary ...

- Gather available info
- Identify potential utility conflicts
- Prepare utility conflict matrix
- Evaluate alternatives (both utility and project)
- Conduct utility impact analysis
- Coordinate with stakeholders
- Iterative process (pending design progression)
- Goal: minimize unnecessary utility relocations

3-53

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## 3.2

### Discussion, questions, and answers

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## Lesson 4

### Hands-on Utility Conflict Management Exercise

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## Seminar Overview

8:30 AM – 9:00 AM Introductions and Seminar Overview  
9:00 AM – 10:15 AM Utility Conflict Concepts and SHRP 2 R15(B) Research Findings  
10:15 AM – 10:30 AM Morning Break  
10:30 AM – 11:45 AM Utility Conflict Identification and Management  
11:45 AM – 1:00 PM Lunch Break  
1:00 PM – 2:30 PM Hands-On Utility Conflict Management Exercise  
2:30 PM – 2:45 PM Afternoon break  
2:45 PM – 3:30 PM Use of Database Approach to Manage Utility Conflicts  
3:30 PM – 3:45 PM Wrap-Up

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## Lesson 4 Overview

1. Individual/Small Group Hands-on Exercise
2. Discussion

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## 4.1

### Individual/Small Group Hands-on Exercise

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## Example Project Overview

- Roswell Road widening (Atlanta, Georgia)
- Actual project with QLB and QLA data
- 13 plan sheets
  - Legend
  - Pole data
  - Typical sections
  - 1 plan, 3 stages, 5 cross sections, 1 drainage profile
- Test hole data sheets
- Blank utility conflict matrix and cost estimate analysis sheet

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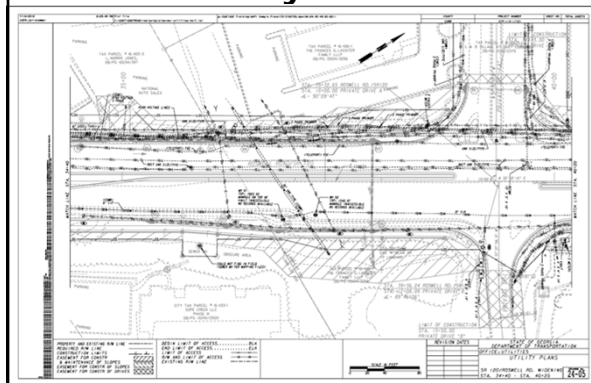
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## Utility Plans



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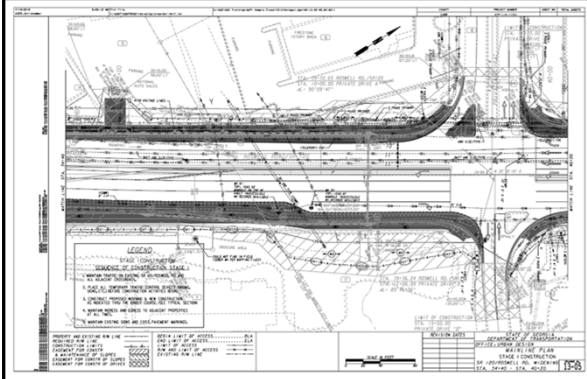
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## Stage 1 Construction



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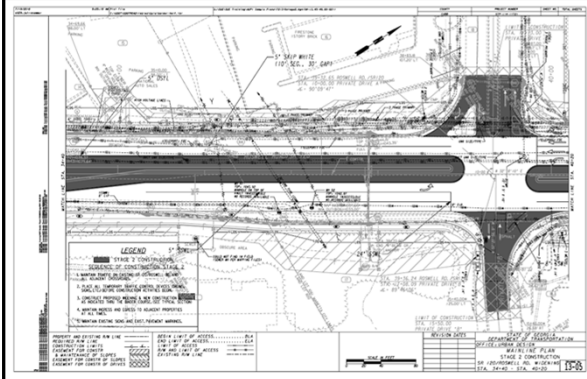
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## Stage 2 Construction



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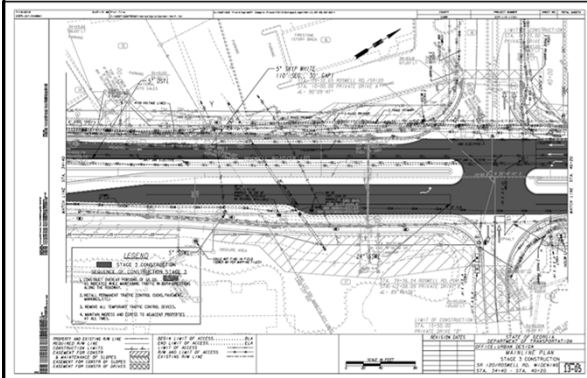
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## Stage 3 Construction



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## Hands-on Exercise

- Break into groups of 4 to 5
- Part A: Identify all “potential” conflicts using QLB data (30 min)
  - Focus on area indicated on plan sheets
  - Populate UCM with as much information as possible
  - Examine potential resolution strategies
  - Examine utility investigation levels needed
  - Determine need for QLA data

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## Hands-on Exercise

- Part B: Evaluate utility conflicts using QLA test hole data sheets (20 min)
- Part C: Prepare alternative and cost analysis for one or more utility conflicts (20 min)
  - Develop and compare 4-5 resolution alternatives
  - Outline potential costs
  - Select most appropriate resolution alternative
  - Give two-minute presentation at end of exercise

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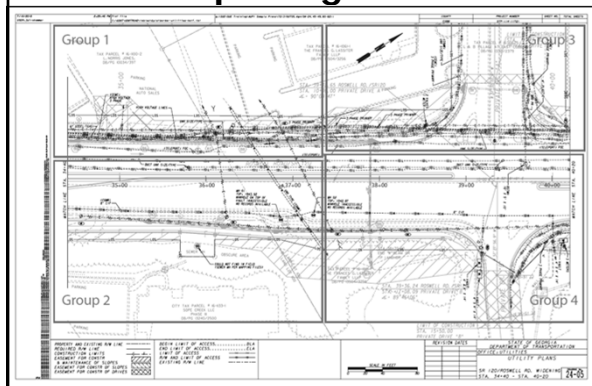
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## Group Assignments



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# Begin Conflict Analysis...

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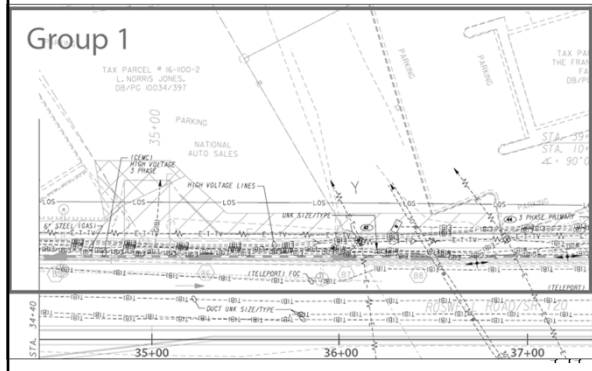
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## Group 1



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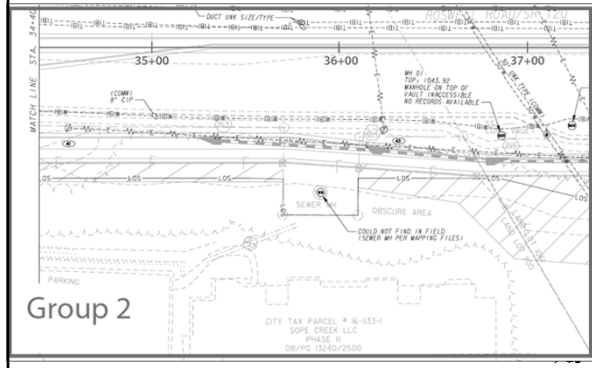
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## Group 2



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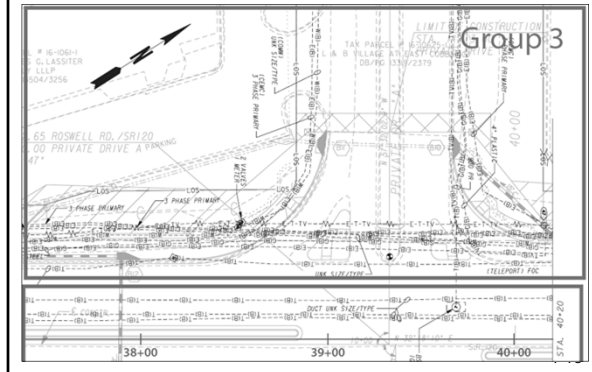
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### Group 3



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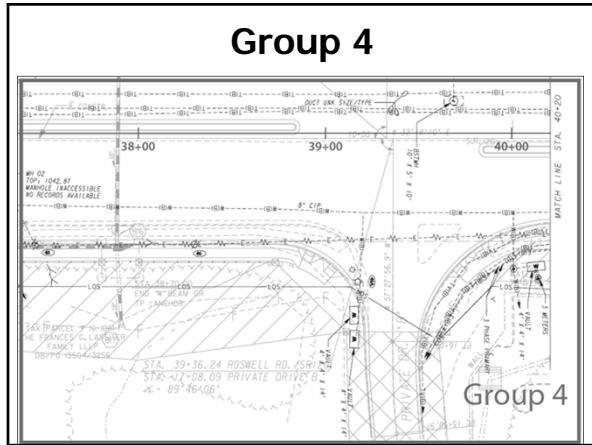
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### Group 4



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### Test Hole Data Sheets

Blank area for Test Hole Data Sheets.

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Test Hole Form														
Utility Type			Utility Material			Offset Measured From				Identified By				
E	Electrical	1	Steel		30	Edge of Pavement			20	Sleeve				
G	Gas Line	2	PVC (Polyvinyl Chloride)		31	Baseline			21	Hub/Lathe				
BT	Buried Telephone	3	DIP (Ductile Iron Pipe)		32	Right-of-Way			22	Nail/Disk				
FOC	Fiber Optic Cable	4	VCP (Vitrified Clay Pipe)		33	Centerline			23	"X" in Concrete				
W	Water	5	PE (Polyethylene Pipe)		34	Back of Curb			24	Set Iron Rod and Cap 5/8"				
SAN	Sanitary Sewer	6	AC (Transite)		35	Survey Hub			25					
STM	Storm Sewer	7	CI (Cast Iron)		36	"X" in Concrete			26					
CATV	Cable TV	8	DBC (Direct Buried Cable)		37	Swing Ties								
FM	Force Main	9	Concrete Pipe		38	Ref. Point in Driveway								
RW	Reclaimed Water	10	Corrugated Metal Pipe		39									
SL	Street Light	11	Duct	Surface Type										
TS	Traffic Signal	12	Fiberglass				A	Asphalt						
FL	Fuel Line	13	Unknown	C	Concrete									
EXP	Exploratory	14	Corrugated Plastic	NG	Natural Ground									
UNK	Unknown	15	Concrete Duct											
IRR	Irrigation													
Conflict No.	Test Hole No.	Utility Type	Utility Material	Utility Size (O.D.)	Approx. Station	Approx. Offset Distance	Manual From (Top)	Cross Sectional View	Utility Direction	ID'd By	Surface Type	Pvmt. Thickness		
				(in. / mm.)		(ft. / m.)	(ft. / m.)	(ft. / m.)				(in. / mm.)		
							L R							
C18	1	W	7	8"	34+50	36.0	31	3.1'	↖		22	NG		
C45	2	W	7	8"	37+00	40.0	31	3.2'	↖		22	NG		
C3	3	W	3	30"	37+20	60.0	31	6.2'	↖		22	NG		
C6	4	W	7	8"	37+90	40.0	31	3.4'	↖		22	A	6.00	
C8	5	E	2	6"	34+50	50.0	31	3.5'	↖		22	NG		
C9	6	W	6	12"	34+50	55.0	31	3.75'	↖		22	NG		
C19	7	BT	3	4"	37+90	25.0	31	3.25'	↖		22	A	6.00	
C21	8	BT	15	unk	37+90	14.0	31	3.4'	↖		22	A	6.00	
C22	9	BT	15	unk	37+90	13.0		6.0'	↖		22	A	6.00	
Notes:														
Sheet 1 of 1 Prepared By: VL Date: 10/13/06 Checked By: RMP Date: 10/14/06														

4-19

Test Hole Form														
Utility Type			Utility Material			Offset Measured From				Identified By				
E	Electrical	1	Steel		30	Edge of Pavement			20	Sleeve				
G	Gas Line	2	PVC (Polyvinyl Chloride)		31	Baseline			21	Hub/Lathe				
BT	Buried Telephone	3	DIP (Ductile Iron Pipe)		32	Right-of-Way			22	Nail/Disk				
FOC	Fiber Optic Cable	4	VCP (Vitrified Clay Pipe)		33	Centerline			23	"X" in Concrete				
W	Water	5	PE (Polyethylene Pipe)		34	Back of Curb			24	Set Iron Rod and Cap 5/8"				
SAN	Sanitary Sewer	6	AC (Transite)		35	Survey Hub			25					
STM	Storm Sewer	7	CI (Cast Iron)		36	"X" in Concrete			26					
CATV	Cable TV	8	DBC (Direct Buried Cable)		37	Swing Ties								
FM	Force Main	9	Concrete Pipe		38	Ref. Point in Driveway								
RW	Reclaimed Water	10	Corrugated Metal Pipe		39									
SL	Street Light	11	Duct	Surface Type										
TS	Traffic Signal	12	Fiberglass				A	Asphalt						
FL	Fuel Line	13	Unknown	C	Concrete									
EXP	Exploratory	14	Corrugated Plastic	NG	Natural Ground									
UNK	Unknown	15	Concrete Duct											
IRR	Irrigation													
Conflict No.	Test Hole No.	Utility Type	Utility Material	Utility Size (O.D.)	Approx. Station	Approx. Offset Distance	Manual From (Top)	Cross Sectional View	Utility Direction	ID'd By	Surface Type	Pvmt. Thickness		
				(in. / mm.)		(ft. / m.)	(ft. / m.)	(ft. / m.)				(in. / mm.)		
							L R							
C13	10	BE	2	6"	36+25	48.0	31	2.8'	↖		22	NG		
C14	11	G	2	6"	36+35	50.0	31	4.2'	↖		22	NG		
C15	12	W	6	12"	36+55	53.0	31	3.5'	↖		22	NG		
C14	13	BE	2	6"	36+50	53.0	31	3.1'	↖		22	NG		
C15	14	W	6	12"	36+20	53.0								
C16	15	G	2	6"	36+30	50.0								
C17	16	W	6	12"	35+30	50.0								
C10	14	BE	2	6"	35+30	48.0	31	2.75'	↖		22	NG		
C11	15	G	2	6"	35+30	50.0	31	4.25'	↖		22	NG		
C12	16	W	6	12"	35+30	53.0	31	3.8'	↖		22	NG		
C16	17	W	3	30"	36+50	47.0	31	6.15'	↖		22	NG		
C17	18	BE	2	6"	36+55	60.0	31	3.42'	↖		22	NG		
Notes:														
Sheet 1 of 1 Prepared By: VL Date: 10/13/06 Checked By: RMP Date: 10/14/06														

4-20

Test Hole Form														
Utility Type			Utility Material			Offset Measured From				Identified By				
E	Electrical	1	Steel		30	Edge of Pavement			20	Sleeve				
G	Gas Line	2	PVC (Polyvinyl Chloride)		31	Baseline			21	Hub/Lathe				
BT	Buried Telephone	3	DIP (Ductile Iron Pipe)		32	Right-of-Way			22	Nail/Disk				
FOC	Fiber Optic Cable	4	VCP (Vitrified Clay Pipe)		33	Centerline			23	"X" in Concrete				
W	Water	5	PE (Polyethylene Pipe)		34	Back of Curb			24	Set Iron Rod and Cap 5/8"				
SAN	Sanitary Sewer	6	AC (Transite)		35	Survey Hub			25					
STM	Storm Sewer	7	CI (Cast Iron)		36	"X" in Concrete			26					
CATV	Cable TV	8	DBC (Direct Buried Cable)		37	Swing Ties								
FM	Force Main	9	Concrete Pipe		38	Ref. Point in Driveway								
RW	Reclaimed Water	10	Corrugated Metal Pipe		39									
SL	Street Light	11	Duct	Surface Type										
TS	Traffic Signal	12	Fiberglass				A	Asphalt						
FL	Fuel Line	13	Unknown	C	Concrete									
EXP	Exploratory	14	Corrugated Plastic	NG	Natural Ground									
UNK	Unknown	15	Concrete Duct											
IRR	Irrigation													
Conflict No.	Test Hole No.	Utility Type	Utility Material	Utility Size (O.D.)	Approx. Station	Approx. Offset Distance	Manual From (Top)	Cross Sectional View	Utility Direction	ID'd By	Surface Type	Pvmt. Thickness		
				(in. / mm.)		(ft. / m.)	(ft. / m.)	(ft. / m.)				(in. / mm.)		
							L R							
C40	19	BE	2	6"	37+00	62.0	31	3.16'	↖		22	NG		
C42	20	BE	2	6"	37+00	57.0	31	3.33'	↖		22	NG		
C43	21	W	6	12"	37+00	53.0	31	4.21'	↖		22	NG		
C44	22	G	2	6"	37+00	48.0	31	3.56'	↖		22	NG		
C18	23	BE	2	6"	37+40	60.0	31	3.19'	↖		22	NG		
C19	24	BT	8	1"	37+90	43.0	31	4.52'	↖		22	NG		
C23	25	W	2	6"	39+00	110	31	3.83'	↖		22	NG		
C24	26	CATV	8	1"	35+30	105	31	4.12'	↖		22	NG		
Notes:														
Sheet 1 of 1 Prepared By: VL Date: 10/13/06 Checked By: RMP Date: 10/14/06														

4-21

Test Hole Form									
Utility Type	Utility Material	Offset Measured From			Identified By				
E Electrical	1 Steel	30 Edge of Pavement	31 Baseline	32 Stave	33 Stave	34 Stave			
G Gas Line	2 PVC (Polyvinyl Chloride)	32 Right-of-Way	33 Gasline	34 Back of Curb	35 Survey Hub	36 Set Iron Rod and Cap 5/8"			
BT Buried Telephone	3 DIP (Ductile Iron Pipe)	34 Back of Curb	35 Survey Hub	36 "X" in Concrete	37 Swing Ties	38 Ref. Point in Driveway			
POC Fiber Optic Cable	4 VCP (Vitrified Clay Pipe)	36 "X" in Concrete	37 Swing Ties	38 Ref. Point in Driveway	39				
W Water	5 PE (Polyethylene Pipe)								
SAS Sanitary Sewer	6 AC (Cast Iron)								
STM Storm Sewer	7 CI (Cast Iron)								
CATV Cable TV	8 DBC (Direct Buried Cable)								
RM Force Main	9 Concrete Pipe								
RW Reclaimed Water	10 Corrugated Metal Pipe								
TL Street Light	11 Duct								
TS Traffic Signal	12 Fiberglass								
PL Fuel Line	13 Unknown								
RSP Exploratory	14 Corrugated Plastic								
UNK Unknown	15 Concrete Dust								
IBB Unknown									

Confid. No.	Test Hole No.	Utility Type	Utility Material	Utility Size (O.D.)	Approx. Station	Approx. Offset Distance	Manual From	Depth (Top)	Cross Sectional View	Utility Direction	By	Surface Type	Pvmt. Thick-ness
	C87	BE	2	6"	40+00	75.0	31	2.85'	○	↔	22	NG	
	C88	BE	2	6"	40+00	60.0	31	3.62'	○	↔	22	NG	
	C89	W	6	12"	40+00	55.0	31	3.96'	○	↔	22	NG	
	C90	G	1	6"	40+00	53.0	31	4.63'	○	↔	22	NG	
	C91	BE	2	6"	40+00	50.0	31	3.8'	○	↔	22	NG	
	C92	CATV	8	1"	40+00	48.0	31	4.8'	○	↔	22	NG	
	C93	BT	8	1"	40+00	44.0	31	4.61'	○	↔	22	NG	
	C94	BE	2	6"	39+50	52.0	31	3.65'	○	↔	22	NG	
	C95	G	1	6"	39+75	102.0	31	4.23'	○	↔	22	NG	
	C96	BT	2	4"	39+75	100.0	31	3.66'	○	↔	22	NG	
	C97	BE	2	6"	39+85	99.0	31	3.82'	○	↔	22	NG	

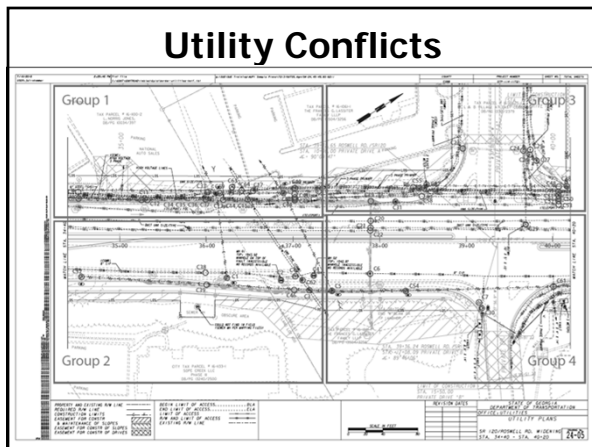
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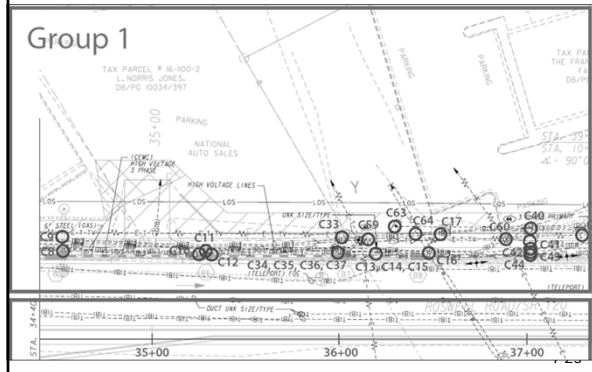
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## 4.2 Discussion

4-23



### Group 1 Utility Conflicts



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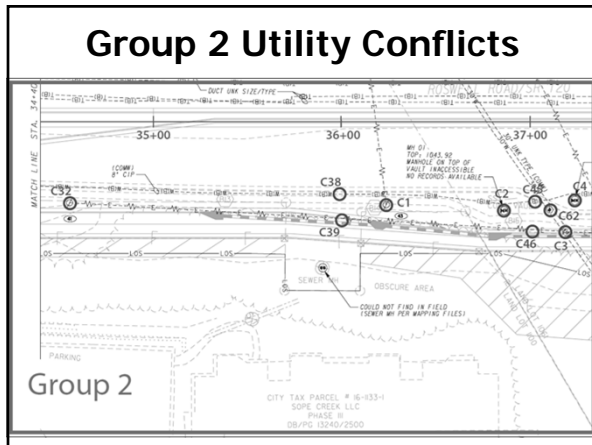
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### Group 2 Utility Conflicts



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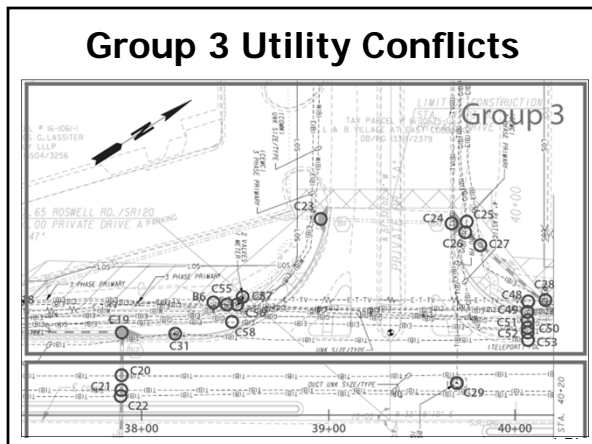
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### Group 3 Utility Conflicts



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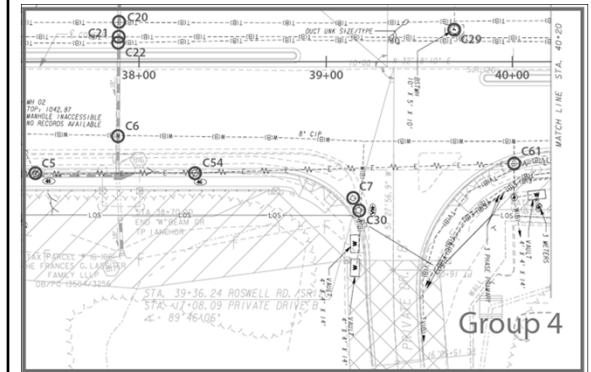
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## Group 4 Utility Conflicts




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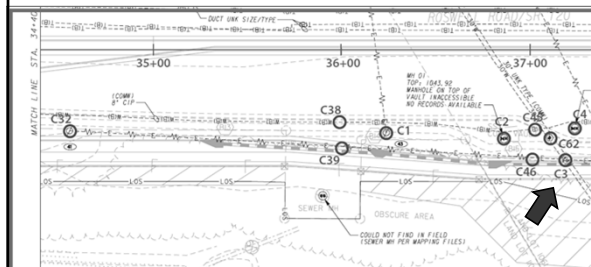
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## Group 2: Utility Conflict C3



Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action	Resp. Party	Est. Res. Date	Res. Status	Cost Analysis
	C3	1	WM	30"	Proposed 18" drainage pipe would cross WM.	37+20		60' R		DLA			D	na	Utility conflict identified.	Detail

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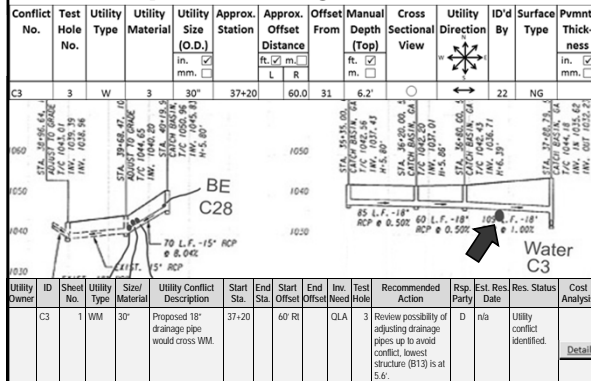
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## Group 2: Utility Conflict C3



Conflict No.	Test Hole No.	Utility Type	Utility Material	Utility Size (O.D.)	Approx. Station	Approx. Offset Distance	Offset From	Manual Depth (Top)	Cross Sectional View	Utility Direction	ID'd By	Surface Type	Pvmt. Thickness
C3	3	W	3	30"	37+20	60.0	31	6.2'		←	22	NG	in. <input checked="" type="checkbox"/> mm. <input type="checkbox"/>

Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action	Resp. Party	Est. Res. Date	Res. Status	Cost Analysis
	C3	1	WM	30"	Proposed 18" drainage pipe would cross WM.	37+20		60' R		DLA	3	Review possibility of adjusting drainage pipes up to avoid conflict, lowest structure (B13) is at 5.6.	D	na	Utility conflict identified.	Detail

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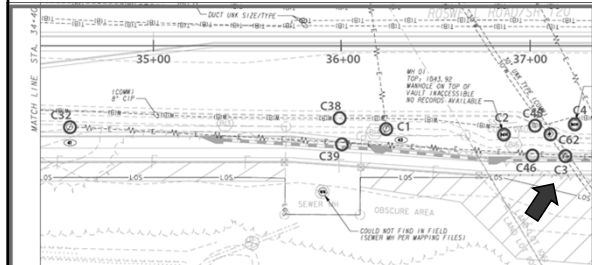
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## Group 2: Utility Conflict C3



Utility Owner	ID	Sheet No.	Utility Type	Size / Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action	Resp. Party	Est. Res. Date	Res. Status	Cost Analysis
	C3	1	WM	30"	Proposed 18" drainage pipe would cross WM.	37+20		60 R		OLA	3	Review possibility of adjusting drainage pipes up to avoid conflict, manhole structure (B13) is at S.G.	D	na	Utility conflict identified.	Detail

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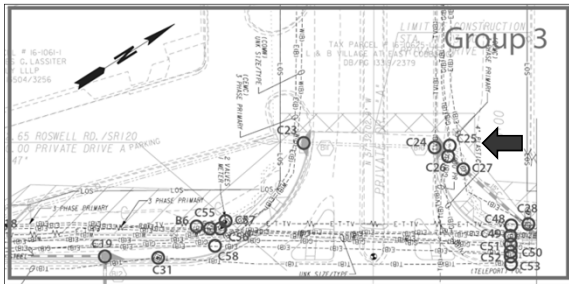
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## Group 3: Utility Conflict C25



Utility Owner	ID	Sheet No.	Utility Type	Size / Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action	Resp. Party	Est. Res. Date	Res. Status	Cost Analysis
	C25	1	G		Proposed 15" drainage pipe would cross gas line.	39+75		102 L		OLA			U	na	Utility conflict identified.	Detail

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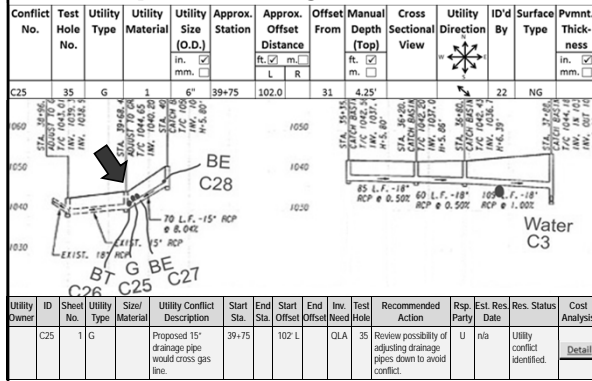
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## Group 3: Utility Conflict C25




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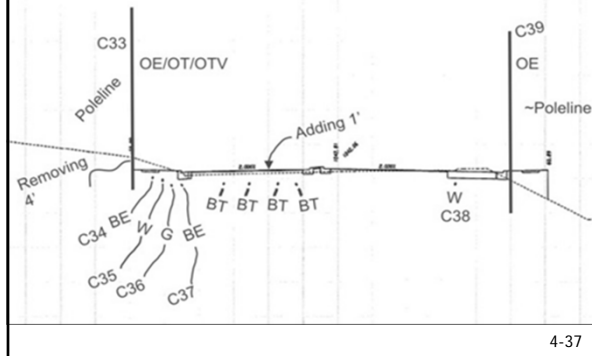
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### Station 36+00



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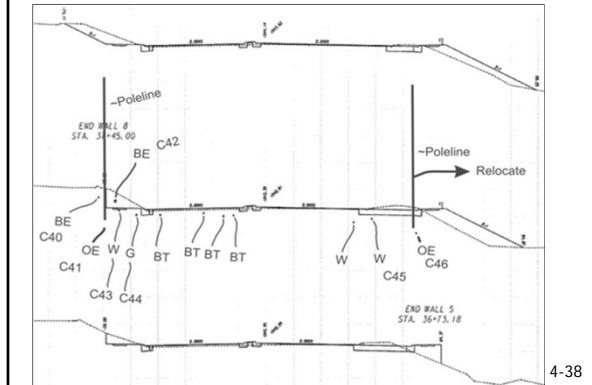
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### Station 37+00



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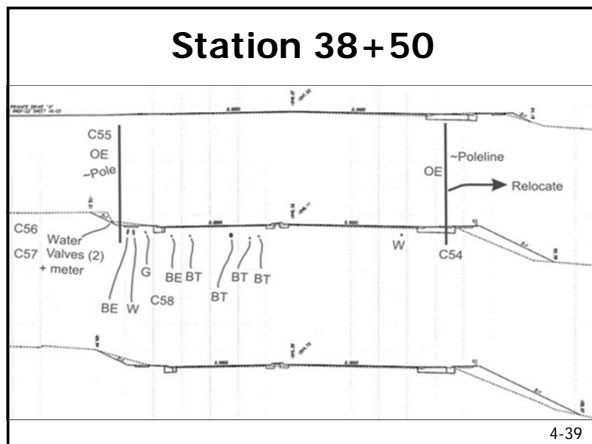
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### Station 38+50



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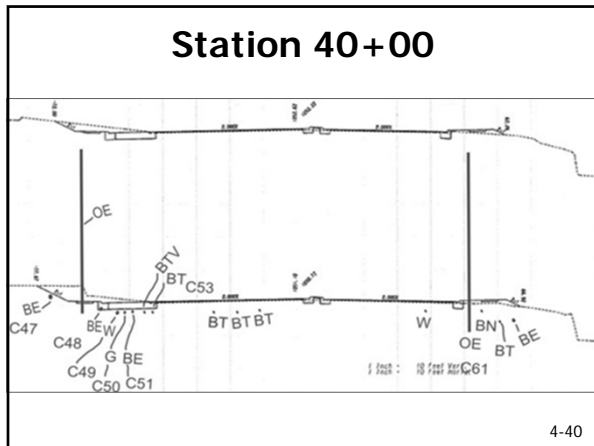
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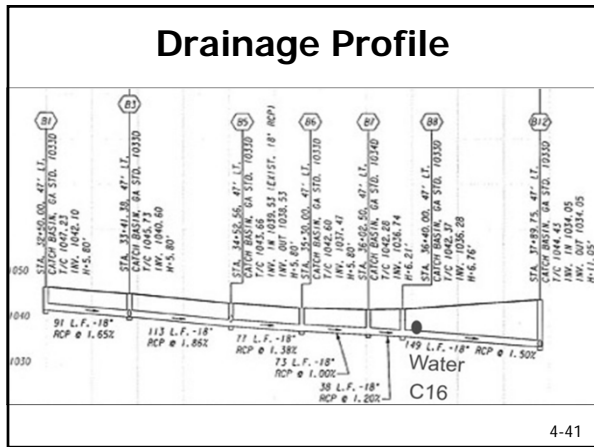
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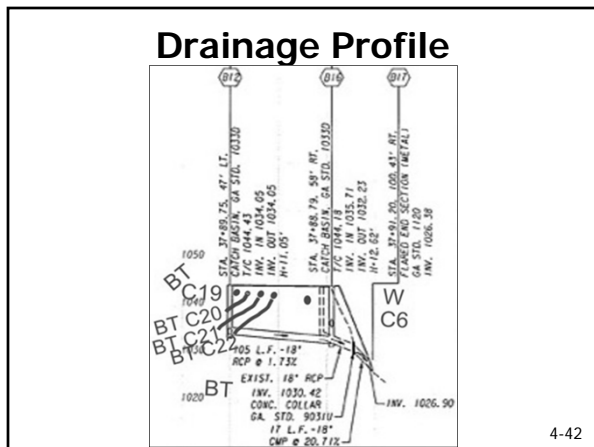
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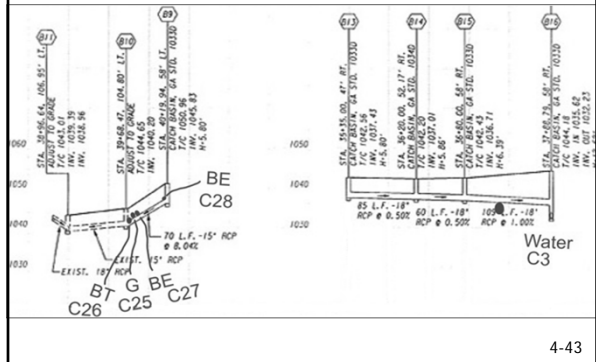
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# Drainage Profile




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## Lesson 5

### Use of Database Approach to Manage Utility Conflicts

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## Seminar Overview

8:30 AM – 9:00 AM Introductions and Seminar Overview  
9:00 AM – 10:15 AM Utility Conflict Concepts and SHRP 2 R15(B)  
Research Findings  
10:15 AM – 10:30 AM Morning Break  
10:30 AM – 11:45 AM Utility Conflict Identification and Management  
  
11:45 AM – 1:00 PM Lunch Break  
  
1:00 PM – 2:30 PM Hands-On Utility Conflict Management Exercise  
2:30 PM – 2:45 PM Afternoon break  
2:45 PM – 3:30 PM Use of Database Approach to Manage Utility  
Conflicts  
3:30 PM – 3:45 PM Wrap-Up

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## Lesson 5 Overview

1. Data Model Structure
2. Use of Access Database to Manage Utility Conflicts
3. Access Database Demonstration
4. Questions and Answers

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## 5.1

### Data Model Structure

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### Data Model Development

- Based on 26 UCMs in use nationwide
- Formal data model (ERwin format)
- Tested in MS Access environment
- Enterprise database support (Oracle, SQL Server)
- UCM is **one of many** queries/reports possible

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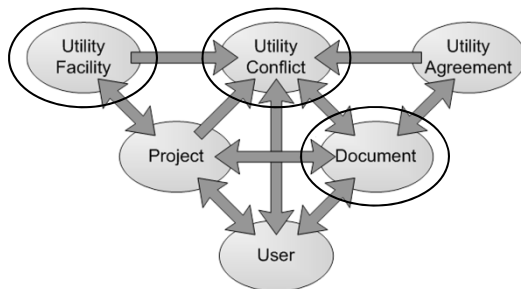
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### Conceptual Model



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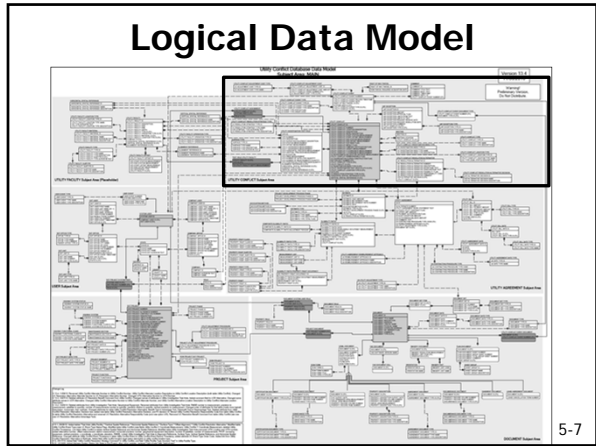
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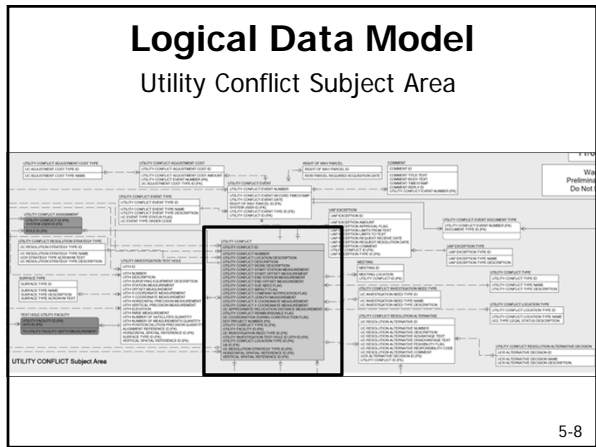
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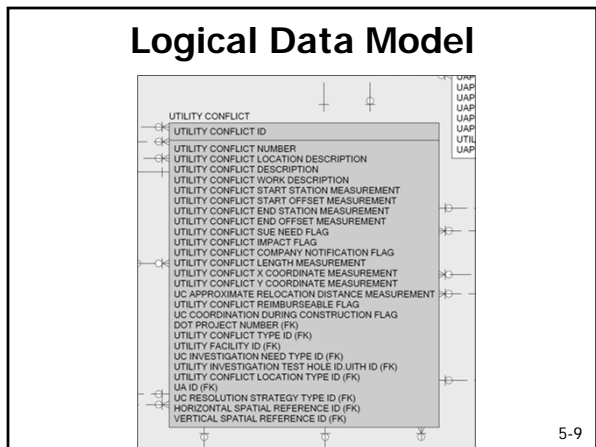
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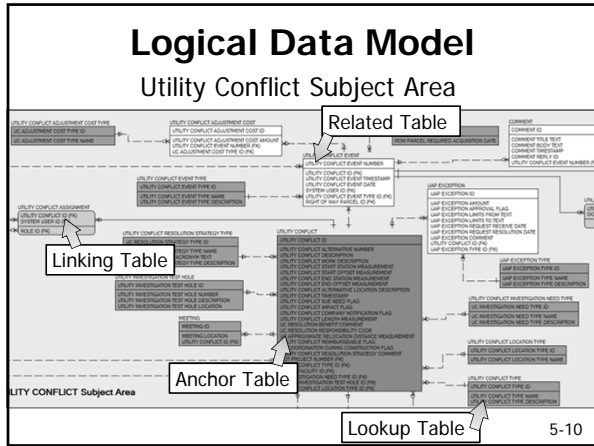
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## 5.2

### Use of Access Database to Manage Utility Conflicts

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- ## Developing Custom UCMs
- Review end product requirements
    - DOT UCM(s) and other related products
  - Develop and test queries
  - Develop and test report(s)
  - Develop and test data entry forms
    - Not included in scope of work of SHRP 2 R15(B)
  - Enter and manage data
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# 1. Review End Product Requirements

- UCM header: 8 data items
- UCM body: 15 data items
- MS Excel format
- Includes drop-down lists

Project Owner: _____				Utility Conflict Matrix Developed/Revised By: _____										
Project No.: _____				Date: _____										
Project Description: _____				Reviewed By: _____										
Highway or Route: _____				Date: _____										
Note: refer to subsheet for utility conflict cost analysis.														
Utility Owner and/or Contact Name	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station	End Station	Start Offset	End Offset	Utility Investigation Level Needed	Test Hole	Recommended Action or Resolution	Estimated Resolution Date	Resolution Status

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# 1. Review End Product Requirements

Utility Owner and/or Contact Name	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station
AT&T	1	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	21+00

End Station	Start Offset	End Offset	Utility Investigation Level Needed	Test Hole	Recommended Action or Resolution	Estimated Resolution Date	Resolution Status
22+00	45' Lt	45' Lt	QLC		Relocation before construction.	3/8/2010	Utility conflict identified.

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# 1. Review End Product Requirements

Utility Conflict Resolution Alternatives Cost Estimate Analysis							
Engineering Cost (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision	
\$ 10,375.00	\$ 63,875.00	\$ -	\$ -	\$ 74,250.00	Yes	Selected	
\$ 7,875.00	\$ 32,375.00	\$ -	\$ -	\$ 40,250.00	No	Rejected	
\$ -	\$ -	\$ 95,375.00	\$ -	\$ 95,375.00	No	Rejected	
\$ -	\$ -	\$ -	\$ -	\$ -	No	Rejected	
\$ 10,375.00	\$ 63,875.00	\$ -	\$ -	\$ 74,250.00	No	Rejected	

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## 2. Develop and Test Queries

- One-time effort, basis for reports
- Report uses queries automatically
- Steps (for prototype UCM)
  - Retrieve estimated completion date
  - Retrieve utility conflict status
  - Retrieve plan document sheet number
  - Retrieve conflict resolution alternatives
  - Calculate estimate cost
  - Generate UCM and sub report

5-16

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## 3. Develop and Test Report(s)

- One-time effort
- Reports use queries automatically

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## Main Report: Report View

Utility Conflict Matrix													
Project Owner:		Texas Department of Transportation											
Project No.:		1226-02-700											
Project Description:		Road construction project in Houston											
Highway or Route:		I-25 Katy Freeway											
Utility Owner and/or Consultant:		Utility Name:		Plan Sheet:		Sheet Number:		Sheet Offset:		Utility Investigation Method:		Recommended Action or Resolution:	
Utility ID	Conflict ID	Sheet No.	Utility Description	Start Station	End Station	Start Offset	End Offset	Investigation Method	Resolution Status	Resolution Date	Cost Estimate	Resolution Status	Cost Estimate
UB1	1	1-1	Telephone	21400	21400	45' 0"	45' 0"	GC	Resolution before construction	12/20/12	100%	Identified	2000
UB1	2	1-1	Telephone	21400	21400	37' 6"	37' 6"	GC	Resolution before construction	12/20/12	100%	Identified	2000
UB1	3	1-1	Telephone	21400	21400	48' 6"	48' 6"	GC	Resolution before construction	12/20/12	100%	Identified	2000
UB1	4	1-1	Telephone	21400	21400	48' 6"	48' 6"	GC	Resolution before construction	12/20/12	100%	Identified	2000
UB1	5	1-1	Telephone	21400	21400	48' 6"	48' 6"	GC	Resolution before construction	12/20/12	100%	Identified	2000
UB1	6	1-1	Telephone	21400	21400	48' 6"	48' 6"	GC	Resolution before construction	12/20/12	100%	Identified	2000
UB1	7	1-1	Telephone	21400	21400	48' 6"	48' 6"	GC	Resolution before construction	12/20/12	100%	Identified	2000
UB1	8	1-1	Telephone	21400	21400	48' 6"	48' 6"	GC	Resolution before construction	12/20/12	100%	Identified	2000
UB1	9	1-1	Telephone	21400	21400	48' 6"	48' 6"	GC	Resolution before construction	12/20/12	100%	Identified	2000
UB1	10	1-1	Telephone	21400	21400	48' 6"	48' 6"	GC	Resolution before construction	12/20/12	100%	Identified	2000
UB1	11	1-1	Telephone	21400	21400	48' 6"	48' 6"	GC	Resolution before construction	12/20/12	100%	Identified	2000
UB1	12	1-1	Telephone	21400	21400	48' 6"	48' 6"	GC	Resolution before construction	12/20/12	100%	Identified	2000
UB1	13	1-1	Telephone	21400	21400	48' 6"	48' 6"	GC	Resolution before construction	12/20/12	100%	Identified	2000
UB1	14	1-1	Telephone	21400	21400	48' 6"	48' 6"	GC	Resolution before construction	12/20/12	100%	Identified	2000
UB1	15	1-1	Telephone	21400	21400	48' 6"	48' 6"	GC	Resolution before construction	12/20/12	100%	Identified	2000
UB1	16	1-1	Telephone	21400	21400	48' 6"	48' 6"	GC	Resolution before construction	12/20/12	100%	Identified	2000
UB1	17	1-1	Telephone	21400	21400	48' 6"	48' 6"	GC	Resolution before construction	12/20/12	100%	Identified	2000

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# Sub Report: Report View

Utility Conflict Resolution Alternatives  
Cost Estimate Analysis

Project Owner: Texas Department of Transportation  
 Project No.: 1234-56-789  
 Project Description: Road construction project in Houston  
 Highway or Route: I-10 Katy Freeway

Conflict ID: \_\_\_\_\_  
 Utility Owner: AT&T  
 Utility Type: Telephone  
 Size and/or Material: Fiber Optic  
 Project Phase: UG Design

Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Responsible Party	Engineering Cost (\$000)	Direct Cost (\$000)	Engineering Cost (\$000)	Direct Cost (\$000)	Total Cost (\$000)	Feasibility	Decision
0	Relocation before construction.	No design change required and no additional cost to DOT.	Cost to utility for relocation.	Utility Company	\$28,875.00	\$63,875.00	\$0.00	\$0.00	\$92,750.00	Yes	Selected
1	Protect in place.			Utility Company	\$7,875.00	\$32,875.00	\$0.00	\$0.00	\$40,750.00	No	Rejected
2	Design change.			DOT	\$0.00	\$0.00	\$93,875.00	\$0.00	\$93,875.00	No	Rejected
3	Exception to utility.			DOT	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	No	Rejected

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# Other Sample Reports

- Alaska DOT
- California DOT
- Georgia DOT

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# Alaska DOT: Sample Report

Anchorage, Alaska  
DOT&P No. 50898

DRAFT Utility Conflict Report  
West Dowling Road Phase I

**Table 2: Chugach Electric Association, Incorporated, Conflicts Summary**

Station	Offset	Station	Offset	Size/Type	Length	Conflict	ADJ.REL	Cost	PE.CE Cost	Total Cost
<b>CEA Distribution Relocation Costs</b>										
9+00	15' RT	200' LT		3" UG	350	FG	REL	52,500	15,750	68,250
16+00	10' LT	42+30	8' LT	3" UG	2630	FG	REL	394,500	118,350	512,850
16+00	10' LT	15+50	10' RT	3" UG	250	FG	REL	37,500	11,250	48,750
16+00	10' LT	29+00	7' LT	1" UG	1650	FG	REL	165,000	49,500	214,500
36+40	8' LT	15+80	3' RT	3" UG	430	FG	REL	64,500	19,350	83,850
36+60	8' LT	36+70	3' RT	3" UG	300	FG	REL	45,000	13,500	58,500
	UG Loop to the North			3" UG	1000	FG	REL	150,000	45,000	195,000
							Subtotal	909,000	272,700	1,181,700
<b>CEA Transmission Relocation Costs</b>										
14+75	5' RT			138 kV OH	1	PWY	REL	30,000	9,000	39,000
32+75	5' RT			138 kV OH	1	EX	REL	50,000	15,000	65,000
36+38	4' RT			138 kV OH	1	EX	REL	50,000	15,000	65,000
							Subtotal	130,000	39,000	169,000
							<b>Total CEA Relocation Costs</b>	<b>1,039,000</b>	<b>311,700</b>	<b>1,350,700</b>

UG Loop provided to the north of the project to accommodate undergrounding.  
 Removal of existing swing braces removed and steel piling added, down guys replaced with overhead span guy and down guys.

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## Alaska DOT: Query Steps

- Identify electric distribution facilities
- Identify electric transmission facilities
- Retrieve adjustment and engineering costs for distribution facilities
- Retrieve adjustment and engineering costs for transmission facilities
- Calculate totals
- Generate UCM

5-22

## Alaska DOT: Database Report

Alaska UCM

Anchorage, Alaska  
DCR&PF No. 50898

DIRAFT Utility Conflict Report  
West Dowling Road Phase 1

Start Station	Start Offset	End Station	End Offset	Size	Type	Length	Conflict	ADU/REL	Cost	PU/CC Cost	Total Cost
<b>CEA Distribution Relocation Costs</b>											
9+00	150' RT	200' LT	3 PHI	UG	350	FG	Relocation before construction		\$52,500	\$15,750	\$68,250
16+00	100' LT	42+30	80' LT	3 PHI	UG	2,630	FG	Relocation before construction	\$394,500	\$118,350	\$512,850
16+00	100' LT	15+50	100' RT	3 PHI	UG	250	FG	Relocation before construction	\$37,500	\$11,250	\$48,750
16+00	100' LT	29+00	75' LT	1 PHI	UG	1,650	FG	Relocation before construction	\$165,000	\$49,500	\$214,500
36+40	80' LT	35+80	35' RT	3 PHI	UG	450	FG	Relocation before construction	\$64,500	\$19,350	\$83,850
36+60	80' LT	36+70	80' LT	3 PHI	UG	300	FG	Relocation before construction	\$45,000	\$13,500	\$58,500
		UG Loop to the North		3 PHI	UG	1,000	FG	Relocation before construction	\$150,000	\$45,000	\$195,000
							Subtotal:		\$909,000	\$272,700	\$1,181,700
<b>CEA Transmission Relocation Costs</b>											
14+75	55' RT	138 IV	OH	1	PWY		Relocation before construction		\$30,000	\$9,000	\$39,000
32+75	55' RT	138 IV	OH	1	EX		Relocation before construction		\$60,000	\$15,000	\$75,000
36+38	40' RT	138 IV	OH	1	EX		Relocation before construction		\$60,000	\$15,000	\$75,000
							Subtotal:		\$150,000	\$39,000	\$189,000
							<b>Total Relocation Costs:</b>		<b>\$1,059,000</b>	<b>\$311,700</b>	<b>\$1,370,700</b>

## California DOT: Sample Report

10-EA 122404-UBRIVE Conflict Status

Map Date: 05/24/2011

Line No.	Line Name	Utility	Conflict	Start Station	End Station	Start Offset	End Offset	Length	Conflict	ADU/REL	Cost	PU/CC Cost	Total Cost
1	9+00	150' RT	200' LT	3 PHI	UG	350	FG	Relocation before construction			\$52,500	\$15,750	\$68,250
2	16+00	100' LT	42+30	80' LT	3 PHI	UG	2,630	FG	Relocation before construction		\$394,500	\$118,350	\$512,850
3	16+00	100' LT	15+50	100' RT	3 PHI	UG	250	FG	Relocation before construction		\$37,500	\$11,250	\$48,750
4	16+00	100' LT	29+00	75' LT	1 PHI	UG	1,650	FG	Relocation before construction		\$165,000	\$49,500	\$214,500
5	36+40	80' LT	35+80	35' RT	3 PHI	UG	450	FG	Relocation before construction		\$64,500	\$19,350	\$83,850
6	36+60	80' LT	36+70	80' LT	3 PHI	UG	300	FG	Relocation before construction		\$45,000	\$13,500	\$58,500
7			UG Loop to the North		3 PHI	UG	1,000	FG	Relocation before construction		\$150,000	\$45,000	\$195,000
							Subtotal:				\$909,000	\$272,700	\$1,181,700
							Subtotal:				\$150,000	\$39,000	\$189,000
							<b>Total Relocation Costs:</b>				<b>\$1,059,000</b>	<b>\$311,700</b>	<b>\$1,370,700</b>

5-24

# California DOT: Query Steps

- Retrieve date last revised
- Retrieve plan document sheet number
- Retrieve "required completion date"
- Retrieve utility conflicts with comments
- Create listing of utility conflicts with "required completion date" and comments
- Generate UCM

5-25

# California DOT: Database Rpt.

California UCM

1-10-CA 122401 - Utilities Conflict Status  
See at intersection: 12N/10W  
No structure map present for this

Conflict No.	Utility	Test	Owner	Utility Description	Test Method Location	Start Station	End Station	Offset	Utility Conflict Status Description	Utility Conflict ID	Utility Resolution	Utility Test	Required Completion Date	Comments		
1	1-10	1	PAES&L	Electric	SD	Telephone	42+00 to 42+05	350-145	42+00 to 42+05	No 300 and No. 308	GA	A-30	N	F	U	UC20030
2	1-10	2	PAES&L	Electric	SD	Telephone	42+05 to 42+10	350-145	42+05 to 42+10	No 300 and No. 308	GA	A-30	N	F	U	UC20030
3	1-10	3	SD	24-inch	SD	Telephone	42+05 to 42+10	350-145	42+05 to 42+10	Conflict with existing well	GA	N	F	U	UC20030	Save Cost to Relocate 8" W (54,000)
4	1-10	4	SD	24-inch	SD	Telephone	42+05 to 42+10	350-145	42+05 to 42+10	Conflict with existing well	GA	N	F	U	UC20030	Save Cost to Relocate 8" W (54,000)
5	1-10	5	WWD	800-mm	Water	W	380+00 to 380+05	350-145	380+00 to 380+05	Conflict with existing well	GA	0-70	N	F	U	
6	1-10	6	WWD	800-mm	Water	W	380+05 to 380+10	350-145	380+05 to 380+10	Conflict with existing well	GA	0-70	N	F	U	
7	1-10	7	Caltrans	800-mm	Water	W	42+05 to 42+10	350-145	42+05 to 42+10	Conflict with South Channel	GA	0-50	N	F	U	
8	1-10	8	Caltrans	800-mm	Water	W	42+10 to 42+15	350-145	42+10 to 42+15	Conflict with South Channel	GA	0-50	N	F	U	
9	1-10	9	MCHD	300-mm	Water	W	42+10 to 42+15	350-145	42+10 to 42+15	Conflict with 48" existing and 80" Line	GA	0-30	N	F	U	
10	1-10	10	MCHD	300-mm	Water	W	42+15 to 42+20	350-145	42+15 to 42+20	Conflict with 48" existing and 80" Line	GA	0-70	N	F	U	
11	1-10	11	W11	1000	Manhole	M	42+10 to 42+15	350-145	42+10 to 42+15	Conflict with 48" existing and 80" Line	GA	0-80	N	F	U	
12	1-10	12	1000	300-mm	Sewer	S	42+10 to 42+15	350-145	42+10 to 42+15	Conflict with 48" existing and 80" Line	GA	N	F	U		
13	1-10	13	MCHD	800-mm	Water	W	42+15 to 42+20	350-145	42+15 to 42+20	Conflict with 48" existing and 80" Line	GA	A-30	T	AB	U	800-mm structure to be located, extend placement
14	1-10	14	MCHD	800-mm	Water	W	42+20 to 42+25	350-145	42+20 to 42+25	Conflict with 48" existing and 80" Line	GA	N	F	U		
15	1-10	15	MCHD	300-mm	Water	W	42+25 to 42+30	350-145	42+25 to 42+30	Conflict with 48" existing and 80" Line	GA	T	AB	U	Encasement (8" structure) to be located, extend placement	
16	1-10	16	MCHD	300-mm	Water	W	42+30 to 42+35	350-145	42+30 to 42+35	Conflict with 48" existing and 80" Line	GA	T	AB	U	Encasement (8" structure) to be located, extend placement	
17	1-10	17	MCHD	300-mm	Water	W	42+35 to 42+40	350-145	42+35 to 42+40	Conflict with 48" existing and 80" Line	GA	A-30	N	F	U	
18	1-10	18	W18	1000	Manhole	M	42+35 to 42+40	350-145	42+35 to 42+40	Conflict with 48" existing and 80" Line	GA	0-20	N	F	U	

# Georgia DOT: Sample Report

Station and Offset	Utility	Identified Conflict	Testhole Needed	Utility Impact with Cost ("As-Designed")	Recommended Resolution	Benefit of Resolution
100+00.211 Lah St Corner, RL	AGL-BFO	Proposed storm structure and existing 48" storm	No	Relocate 1100' of BFO-DUCT into street. Use DVA that drain toward driveway.	Relocate proposed storm drainage into street. Use DVA that drain toward driveway.	Save Cost to Relocate BFO-DUCT (\$91,000)
100+00.211 Lah St Corner, RL	AGL-BFO	Proposed storm structure and existing 48" storm	No	See C1		
100+00.211 Lah St Corner, RL	AGL-BFO	Proposed 18" storm and unknown utility	TH 1	Relocate unknown type and location utility	TH to identify utility and conflict	Eliminate possible delay during construction
100+00.211 Lah St Corner, RL	BW	Proposed 18" storm and existing 8" W	TH 2	Relocate 8" W (\$7,500)	TH on 8" W, adjust depth of proposed storm drainage	Save Cost to Relocate 8" W (\$4,000)
100+00.211 Lah St Corner, RL	BW	Proposed 18" storm and existing 8" W	TH 3	Relocate 8" W (\$7,500)	TH on 8" W, adjust depth of proposed storm drainage	Save Cost to Relocate 8" W (\$4,000)
100+00.211 Lah St Corner, RL	4"O	Proposed storm structure and existing 4"O	TH 4	Relocate 20' LP of 4"O (\$6,500)	TH on 4"O, adjust depth of proposed storm structure	Save Cost to Relocate 4"O (\$4,500)
100+00.211 Lah St Corner, RL	4"O	Proposed 18" storm and existing 4"O	TH 5	Relocate 2' of 4"O Top (\$12,000)	TH on 4"O, adjust depth of proposed storm structure	Save Cost to Relocate 4"O (\$11,000)
100+00.211 Lah St Corner, RL	18"O	Proposed 18" storm and existing 18"O	TH 6	Relocate 18"O (\$10,000)	TH on 18"O, adjust depth of proposed storm structure	Save Cost to Relocate 18"O (\$8,500)
100+00.211 Lah St Corner, RL	18"O	Proposed storm structure and existing 18"O	TH 7	Relocate BFO-DUCT 8' (\$20,000)	TH on BFO-DUCT 8' (\$20,000) without depth of proposed storm structure	Save Cost to Relocate BFO-DUCT 8' (\$15,500)
100+00.211 Lah St Corner, RL	18"O	Proposed 18" storm and existing 18"O	TH 8	Relocate 18"O (\$10,000)	TH on 18"O, adjust depth of proposed storm structure	Save Cost to Relocate 18"O (\$8,500)
100+00.211 Lah St Corner, RL	AGL-BFO	Proposed storm structure and existing 48" storm	No	See C1		
100+00.211 Lah St Corner, RL	AGL-BFO	Proposed storm structure and existing 48" storm	No	Relocate 4"O (\$4,500)	Relocate 4"O	Eliminate conflict with proposed C2
100+00.211 Lah St Corner, RL	AGL-BFO	Proposed storm structure and existing 48" storm	No	See C1		

\*Please include all benefits incurred including time, costs, and safety improvements.

Key: AC - Asphalt Concrete    OT - Overhead Telephone  
 BE - Buried Electric       R - Right                    AGL - Atlanta Gas Light  
 BFO - Buried Fiber Optic    RCP - Rigid Concrete Pipe    BE - Georgia Power  
 BT - Buried Telephone      W - Water                    BT - Bell South  
 C - Gas                              W - Water Main              L3 - Level 3 Communications  
 L - Left                              TH - Test Hole, verify, vent, and haul    MFL - Metropolitan Fiber Network  
 MEE - Mixed End Section      UAC - Unknown Type        SAN - Fulton County Public Works  
 OE - Overhead Electric        SAN - Sanitary Sewer        W - City of Atlanta  
 UNK - Unknown Owner

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### 5.3

#### Access Database Demonstration

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### Advantages of a Database Approach

- Flexible structure
  - Based on large number of diverse state DOT UCMs
  - Based on large number of data items
- Adapts to DOT needs and business process
  - Choose which portions to implement
- Scalable
  - Add records in lookup tables as needed
- Can link to existing DOT data systems

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### 5.4

#### Questions and Answers

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## Lesson 6

### Wrap-Up

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## Seminar Overview

8:30 AM – 9:00 AM Introductions and Seminar Overview  
9:00 AM – 10:15 AM Utility Conflict Concepts and SHRP 2 R15(B)  
Research Findings  
10:15 AM – 10:30 AM Morning Break  
10:30 AM – 11:45 AM Utility Conflict Identification and Management  
11:45 PM – 1:00 PM Lunch Break  
1:00 PM – 2:30 PM Hands-On Utility Conflict Management Exercise  
2:30 PM – 2:45 PM Afternoon break  
2:45 PM – 3:30 PM Use of Database Approach to Manage Utility  
Conflicts  
3:30 PM – 3:45 PM Wrap-Up

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## Lesson 6 Overview

1. Final Questions and Closing Remarks

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