Lesson 1

Introductions and Seminar Overview

1-1

This section of the training is Lesson 1, which provides an introduction and overview of the seminar.

Lesson 1 Overview

- Introductions
- Seminar overview
- Housekeeping

1-3

Housekeeping

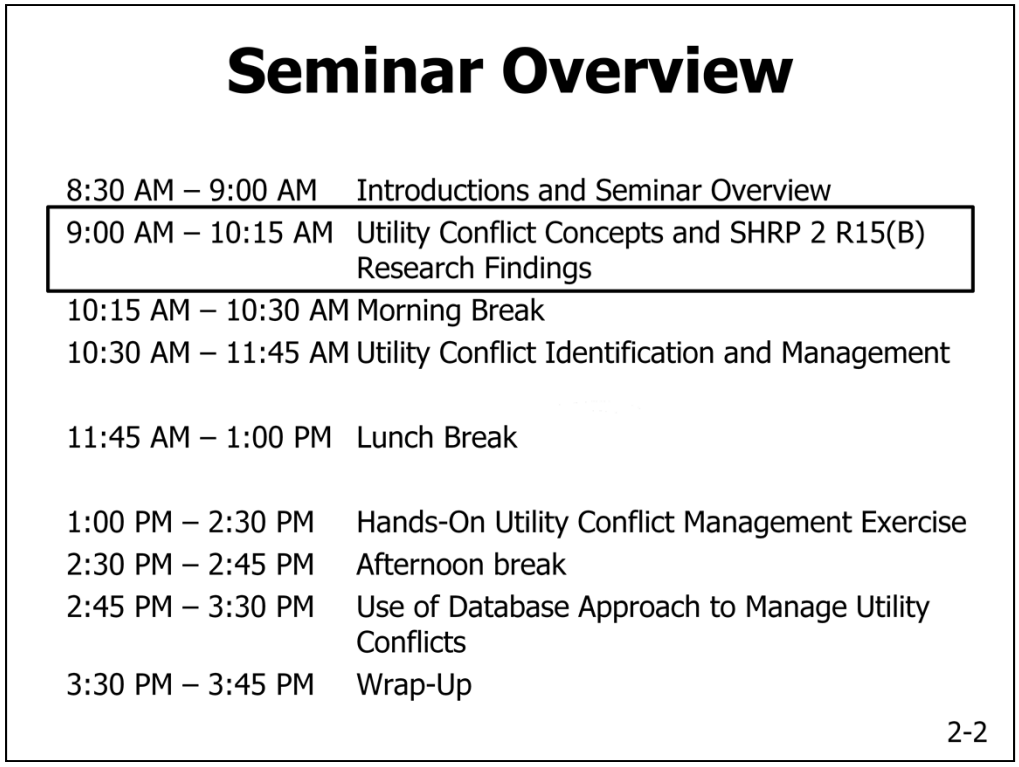
- Participant workbook
- Handouts
- Sign-in sheet
- Seminar feedback form
- Miscellaneous

1-4

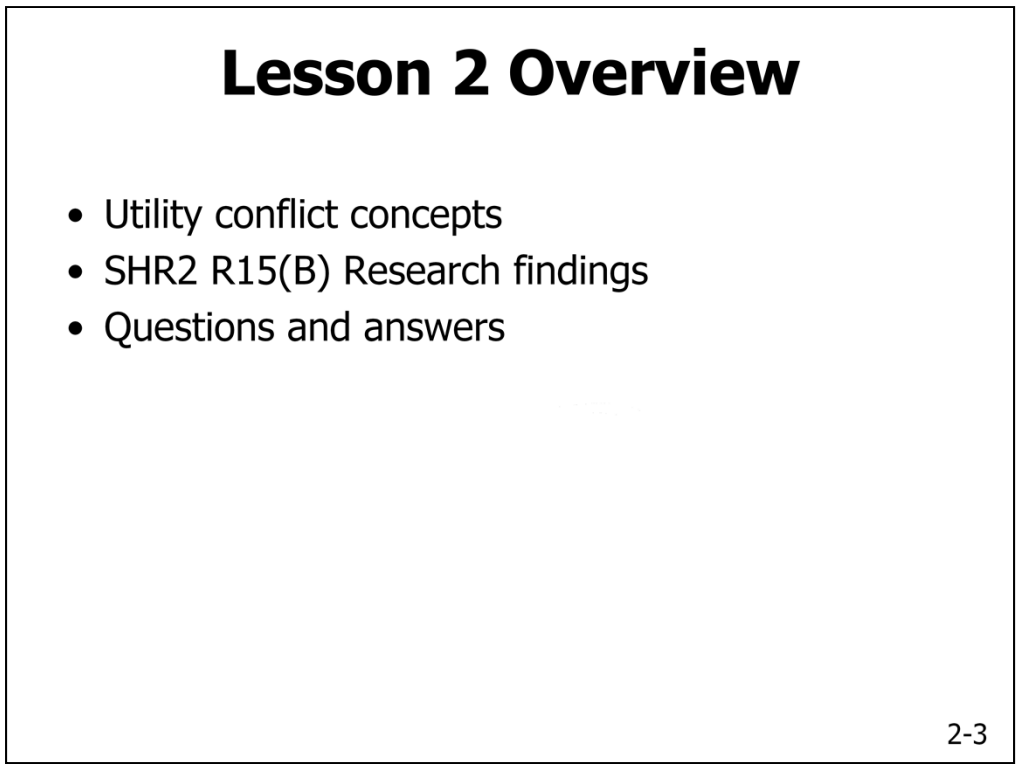
Lesson 2

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

2-1



This section of the training is Lesson 2, which deals with basic utility conflict concepts and a summary of lessons learned from research project SHRP 2 R15(B).



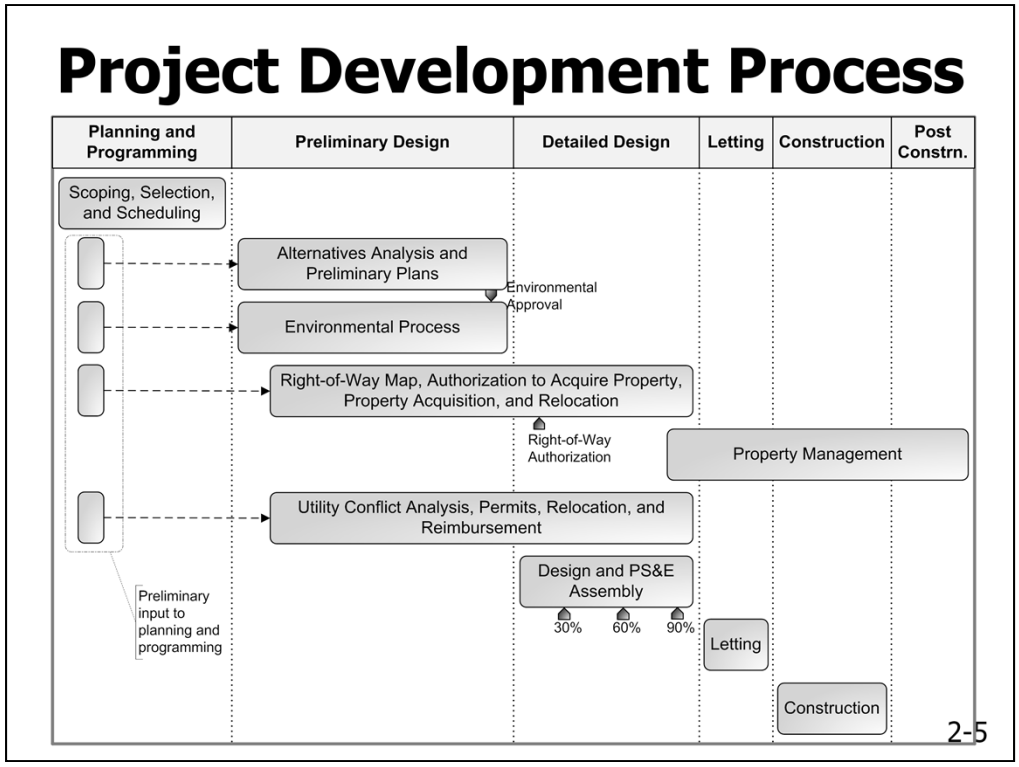
Purpose of Lesson 2:

• Provide an understanding of relevant concepts related to the management of utility conflicts within the project development process.

• Provide an understanding of the findings of the SHRP 2 R15(B) project.

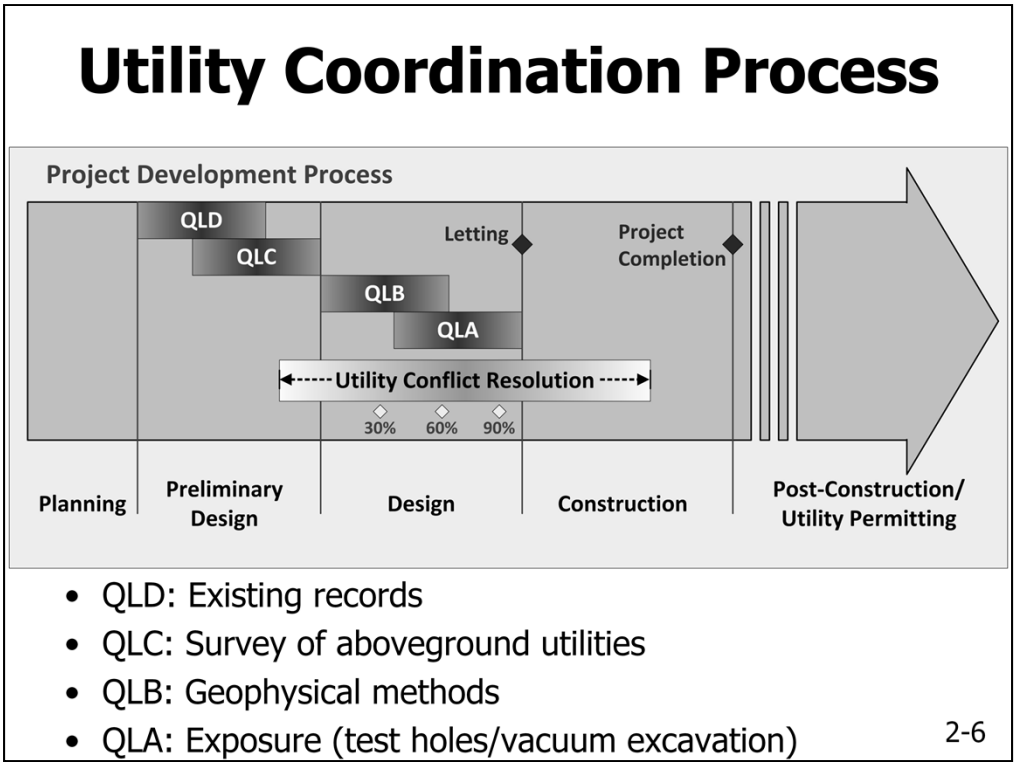
2.1
Utility Conflict Concepts

2-4



Utility coordination does not exist in the vacuum. It exists within the context of a project development process, which might involve many different phases.

This slide shows a typical representation of the traditional project development process at most state DOTs. Utility-related activities can start early in the process, and many state DOTs have a goal to complete utility relocations before the project goes to construction. A key element associated with the success of utility activities is Communication, Cooperation, and Coordination between the state DOT and utility owners. In practice, the 3 Cs do not always happen.



This slide focuses on a portion of the project development process, the utility coordination process, which may span the entire project development process from planning to post-construction. Utility conflict resolution is a portion of the utility coordination process that typically occurs at the end of preliminary design and should complete before the begin of construction.

To function properly, the utility coordination process needs utility data input, which occurs at different times of the process. Typically, as time progresses, the utility information becomes more detailed and precise. Although any type of utility data can be collected at any time of the project development process, it is typical to collect QLD and QLC data during preliminary design, and QLB and QLA data during the detailed design phase.

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
    - …

2-7

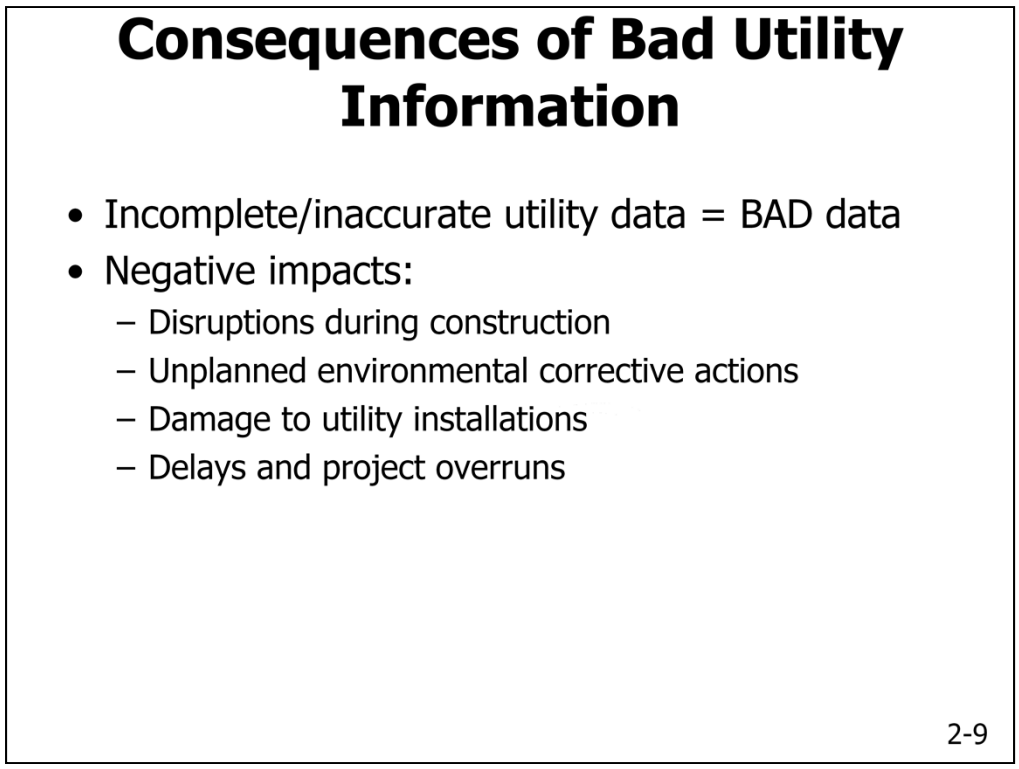
Inefficiencies in the utility coordination process are frequently blamed for delays in the project development process. The slide shows examples of situations that produce utility coordination inefficiencies. The list is not exhaustive.

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)

2-8

State DOTs are not the only party affected by inefficiencies. This problem also affects other stakeholders, e.g., utility companies. Utility companies have a host of challenges of their own, including operating under tight financial conditions (frequently, utility relocation is a low priority to utilities since it is not a revenue generating activity). They also have their own plans and schedules and need to accommodate requests from a third party (i.e., the DOT). In addition, there are issues related to the coordination with the DOT.



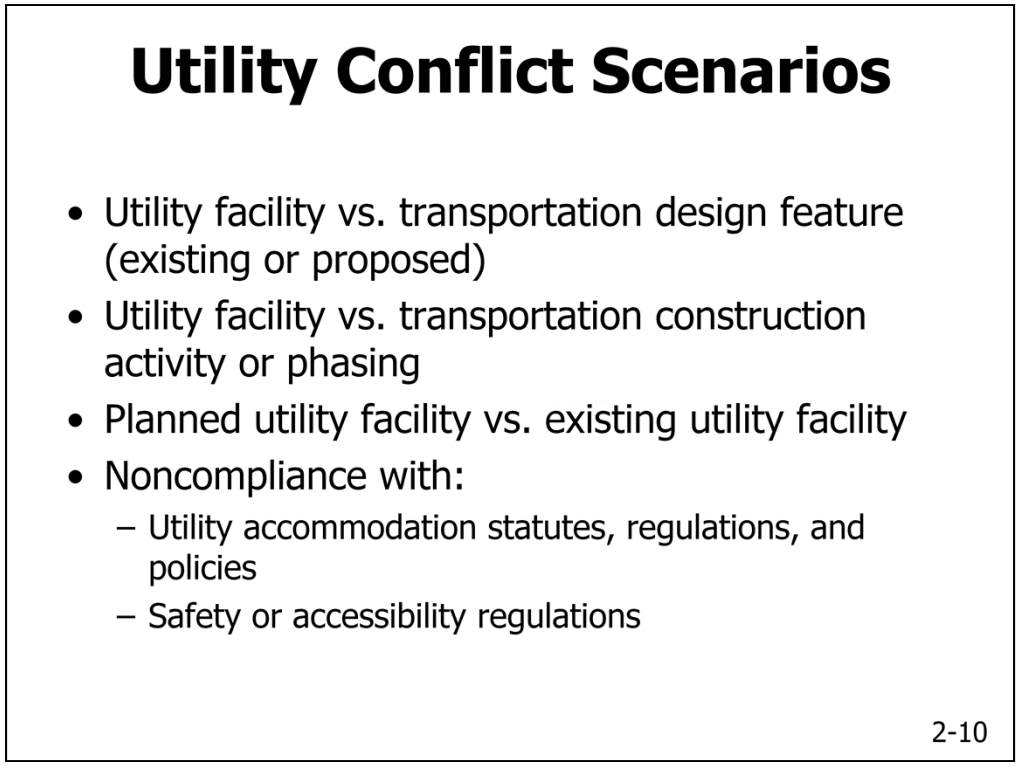
Inaccurate and/or incomplete utility information can result in problems such as:

• disruptions when utility installations are encountered unexpectedly during construction, either because there was no previous information about those installations or because their stated location on the construction plans was incorrect;

• unplanned environmental corrective actions;

• damage to utility installations, which can lead to disruptions in utility service, environmental damage, and increased risk to the health and safety of construction workers and the public; and

• delays that can extend the period of project development and/or delivery and increase total project costs.



Potential for utility conflicts exists at most transportation projects, including the following:

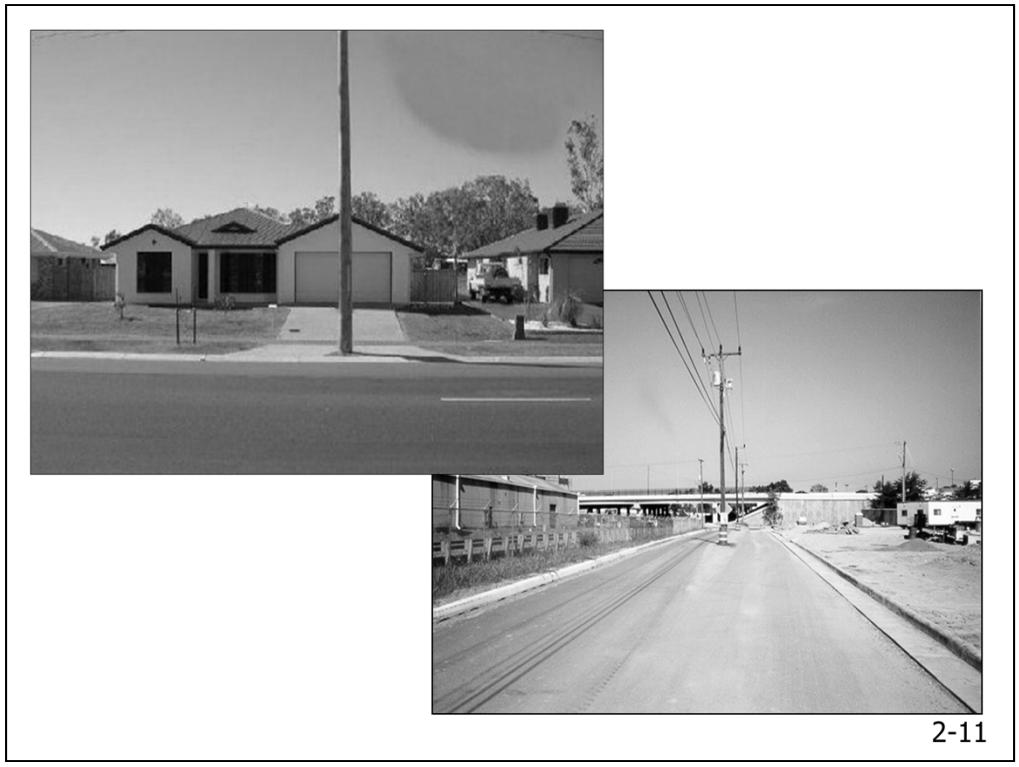
• interference between utility facilities and transportation design features (existing or proposed);

• interference between utility facilities and transportation construction activities or phasing;

• interference between planned utility facilities and existing utility facilities;

• noncompliance of utility facilities with utility accommodation statutes, regulations, and policies; and

• noncompliance of utility facilities with safety regulations.

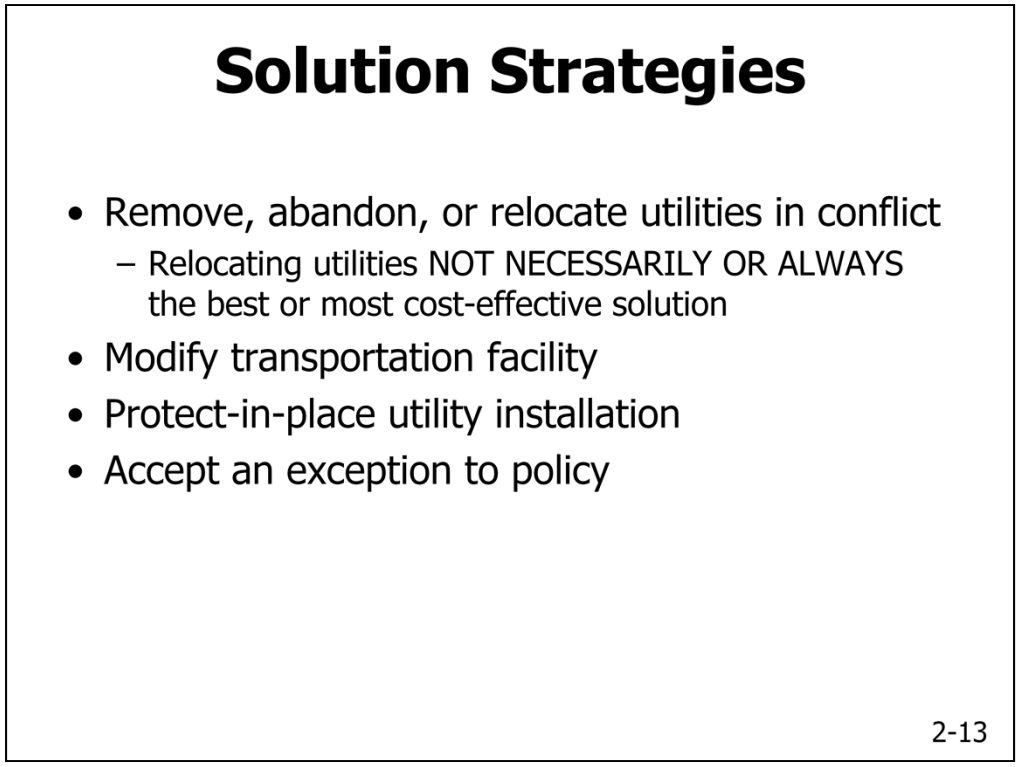


2-11

Examples of situations where a utility facility is in conflict with a transportation facility.

Picture on the left: Potential conflict of utility facility with a construction phase.

Picture on the right (courtesy of Ray Sterling): Street in Shanghai. Road construction in preparation for the Shanghai Expo. The sign on the pole warns about construction (and congestion) ahead and directs drivers to take a detour to the right (not clear what drivers; presumably those who may be driving on the same lane as where the pole is located). Both poles and attached utility lines appear to be old and waiting to be relocated.



Strategies available to address utility challenges at state DOTs normally include one or more of the following options:

• remove, abandon, or relocate the utilities in conflict (this is the traditional approach; however, it is not necessarily or always the best solution for the project);

• change the horizontal and/or vertical alignment of the proposed transportation facility;

• implement an engineering (protect-in-place) countermeasure that does not involve utility relocation or changes to the transportation project alignment; and

• accept an exception to policy.

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

2-14

This slide shows potential examples of transportation project design changes that could be implemented to help avoid unnecessary utility relocations.

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

2-15

In this example, a project is looking at adding lanes to a corridor, and the question is whether to widen the corridor on both sides (potentially affecting everyone) or only on one side. Widening on one side can reduce utility impacts. However, the decision should be taken after taking into consideration factors such as what kind of utilities would be affected and the total estimated cost.

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

2-16

In this example from Georgia, widening an interstate highway required raising the embankment by 50-60 feet. There were major utilities in the area, and significant soil settlement was expected because of the additional weight. The DOT was able to avoid costly utility relocations by using a foam layer and a concrete cap to protect the existing utilities in-place.

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

2-17

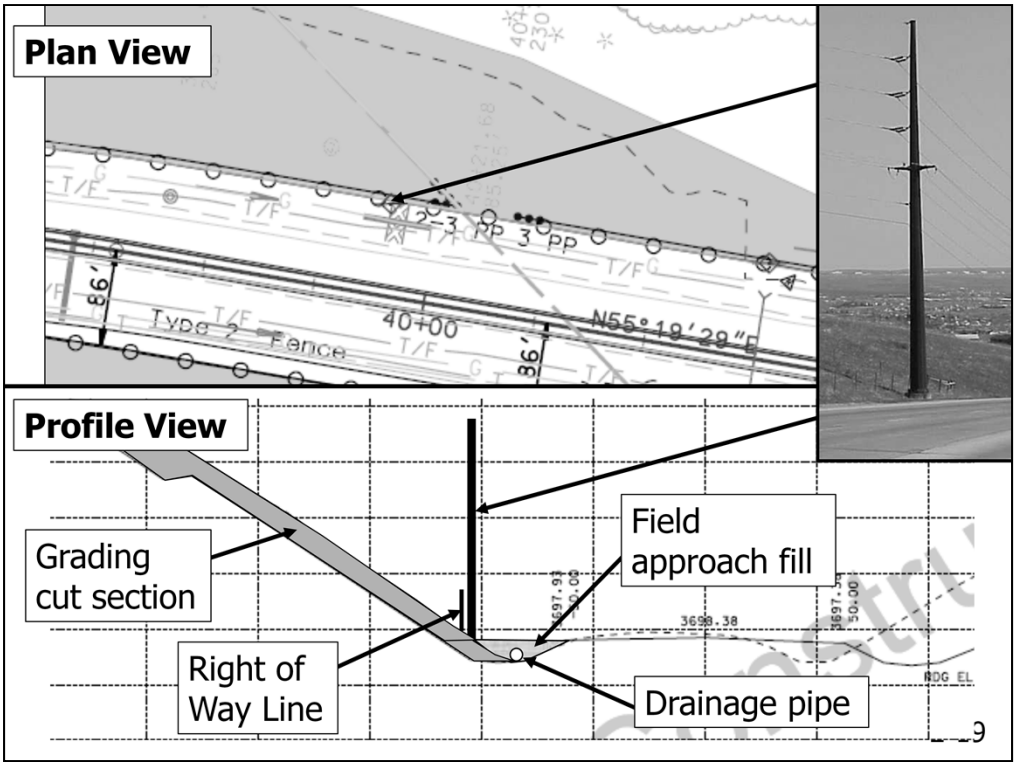
In this example from Georgia, there was a bridge project that affected many utilities. Unfortunately, only during construction it became evident that modifying the horizontal bridge alignment slightly would have avoided utility impacts without affecting the right-of-way or the construction phase. The affected utilities were relocated at a cost of $5 million, which could have been avoided.

Example: Power Pole

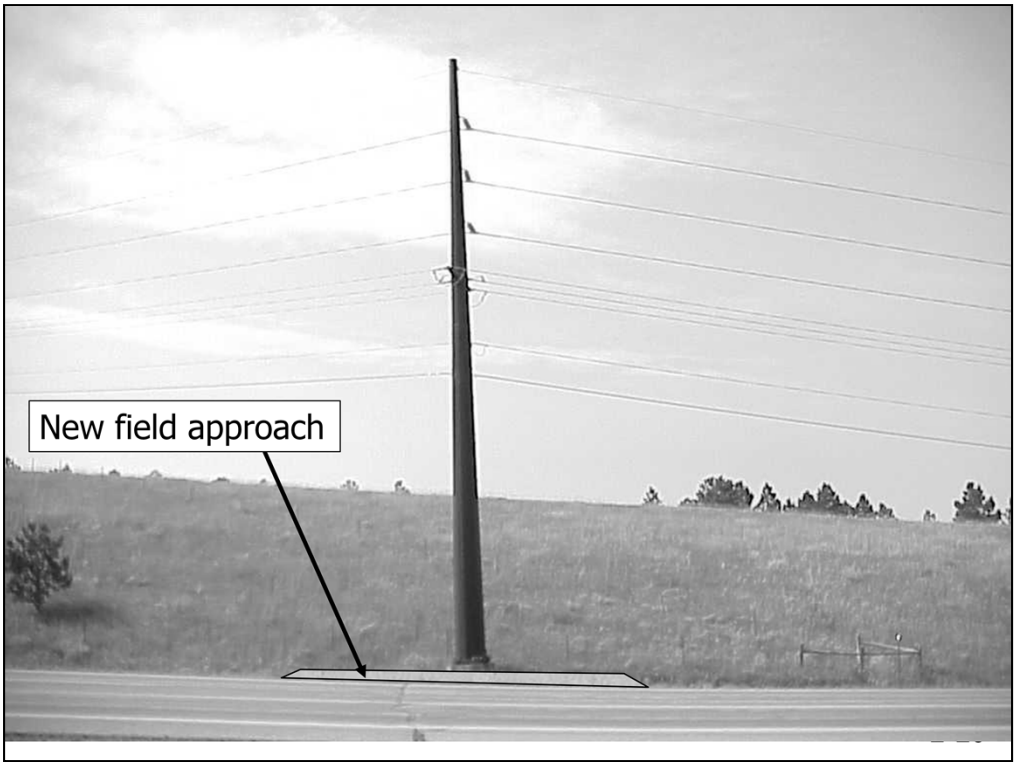
- Rapid City, South Dakota
- Conflict discovered at 30% detailed design
- Redesign avoided utility adjustment
- Additional costs were paid by utility

2-18

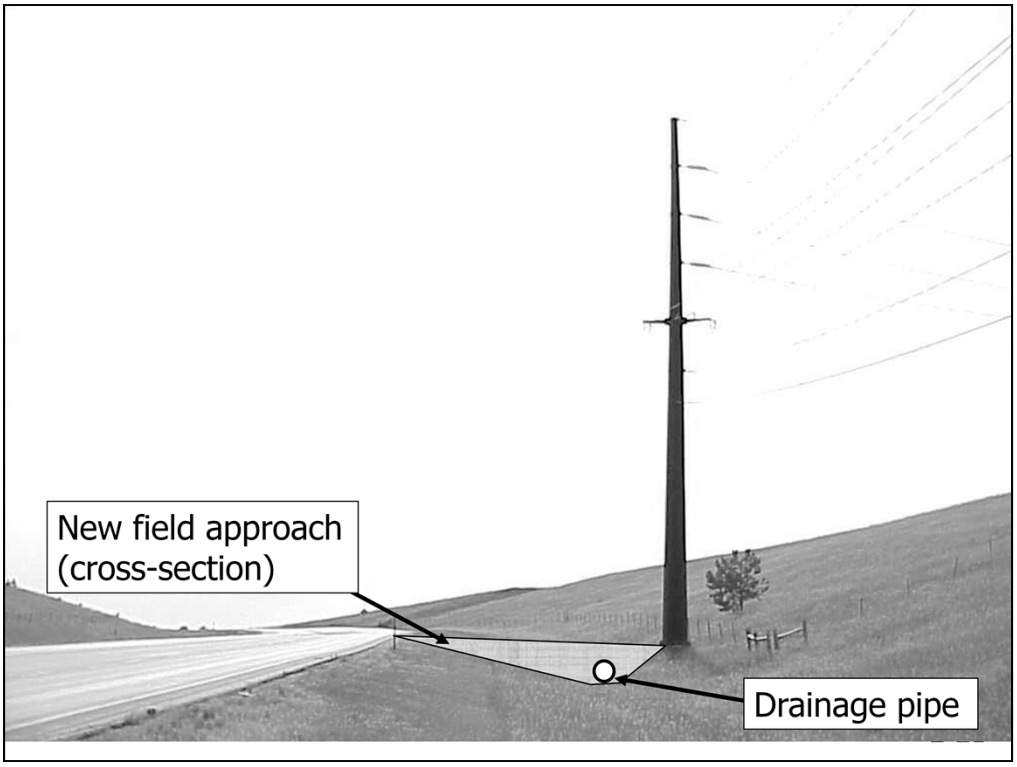
Steel power pole on Catron Blvd. in Rapid City, South Dakota. The impacts to this pole were discussed in a meeting involving SDDOT and utility owner at 30% detailed design. The power company reimbursed SDDOT for the additional cost to install a small "field approach," which allowed the pole to remain in place. Black Hills Power and Light also felt that having a flat area to park their maintenance equipment (boom truck) was a bonus.



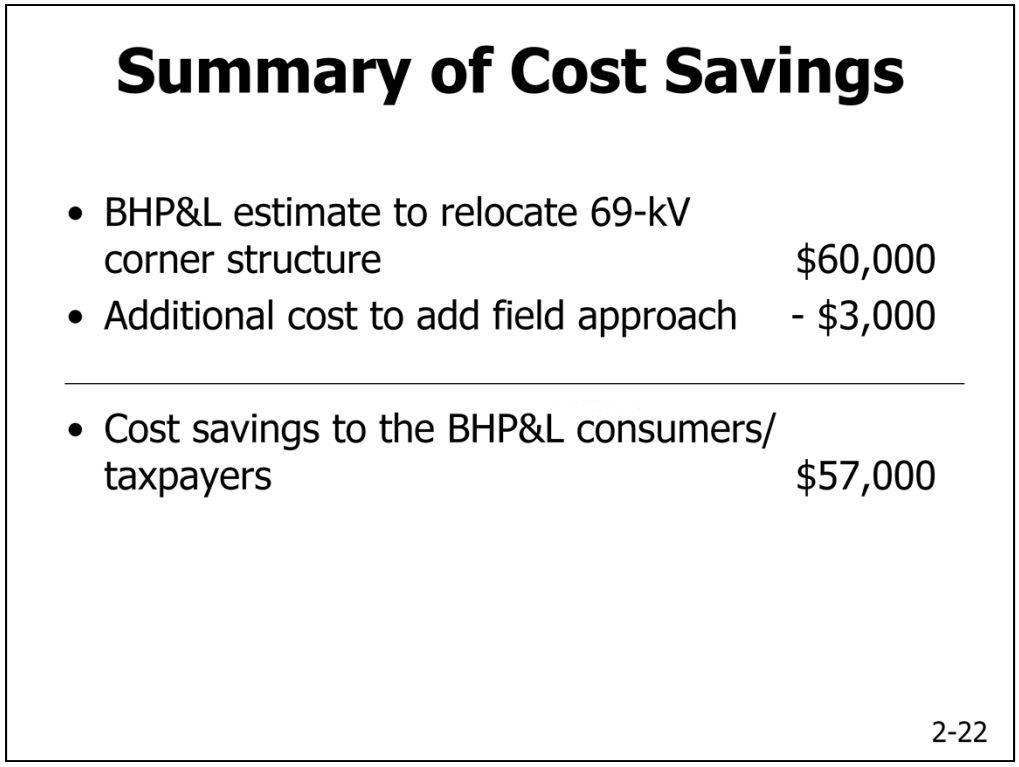
The vertical green line, shown in the cross section view, is depicting the existing right of way line. The shaded area is showing the dirt removed using the typical grading cut section.



The field approach was designed to be small enough so that regular road drivers would not mistake it for an area to pull off the road.



SDDOT added a pipe under the field approach for drainage purposes.



The power company reimbursed SDDOT, which provided substantial savings to the company at no extra cost to the DOT.

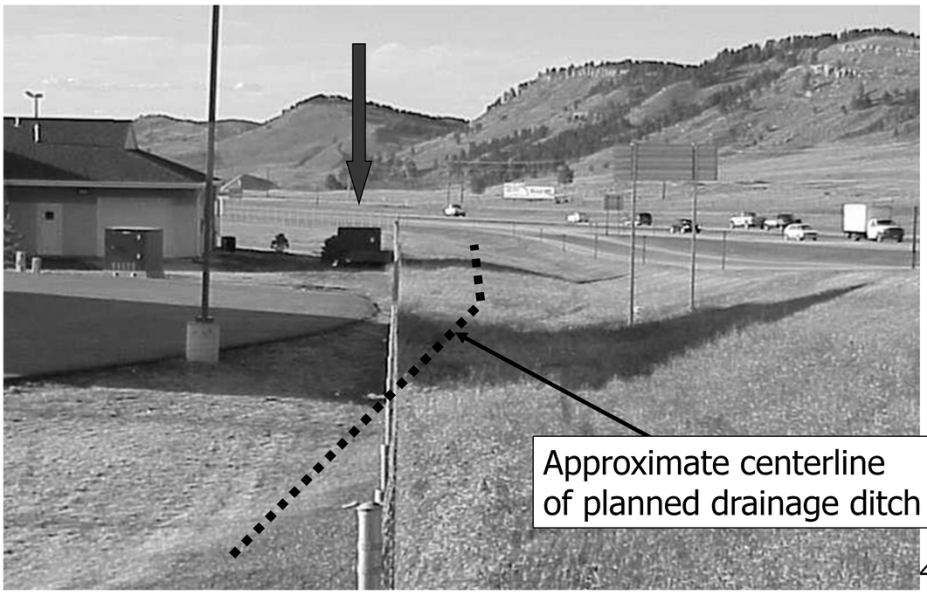
Example: Drainage Channel

- 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

2-23

The impact to existing electrical cabinets and cables was discovered during a preliminary project scoping inspection. After some discussion, the DOT recommended to construct a vertical wall to avoid the utility conflict.

Example: Drainage Channel



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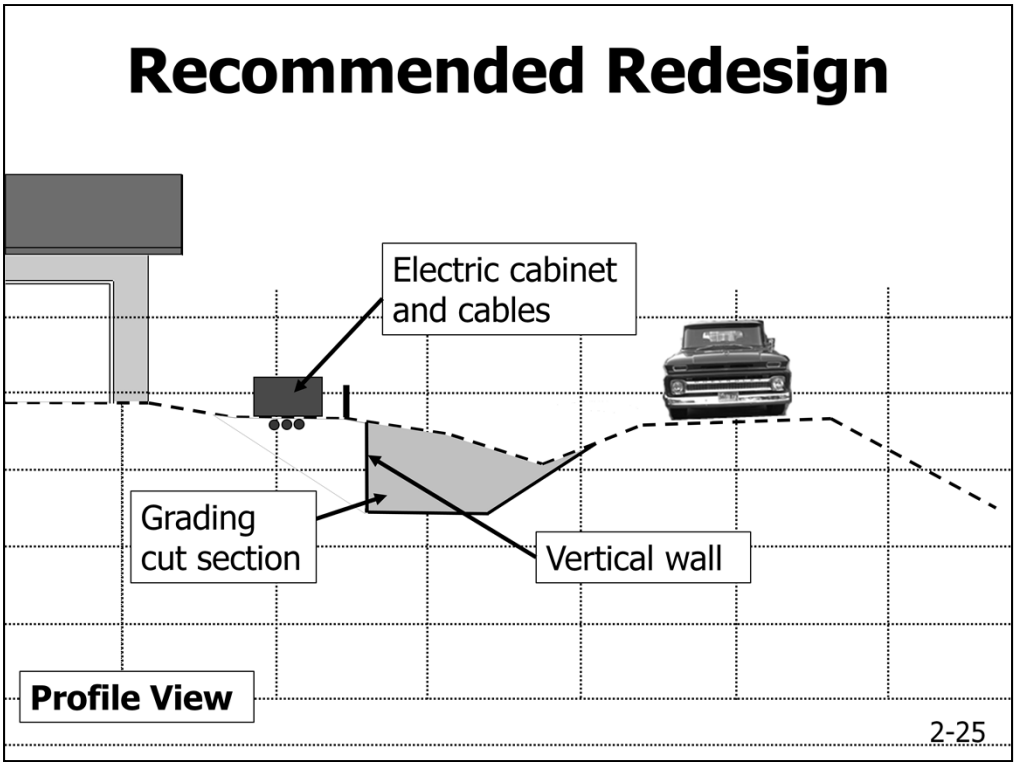

The vertical wall reduced the channel cross-section, but a hydraulic analysis found that the cross-section would be adequate if the length of the concrete lining on the sloped side could be increased slightly.

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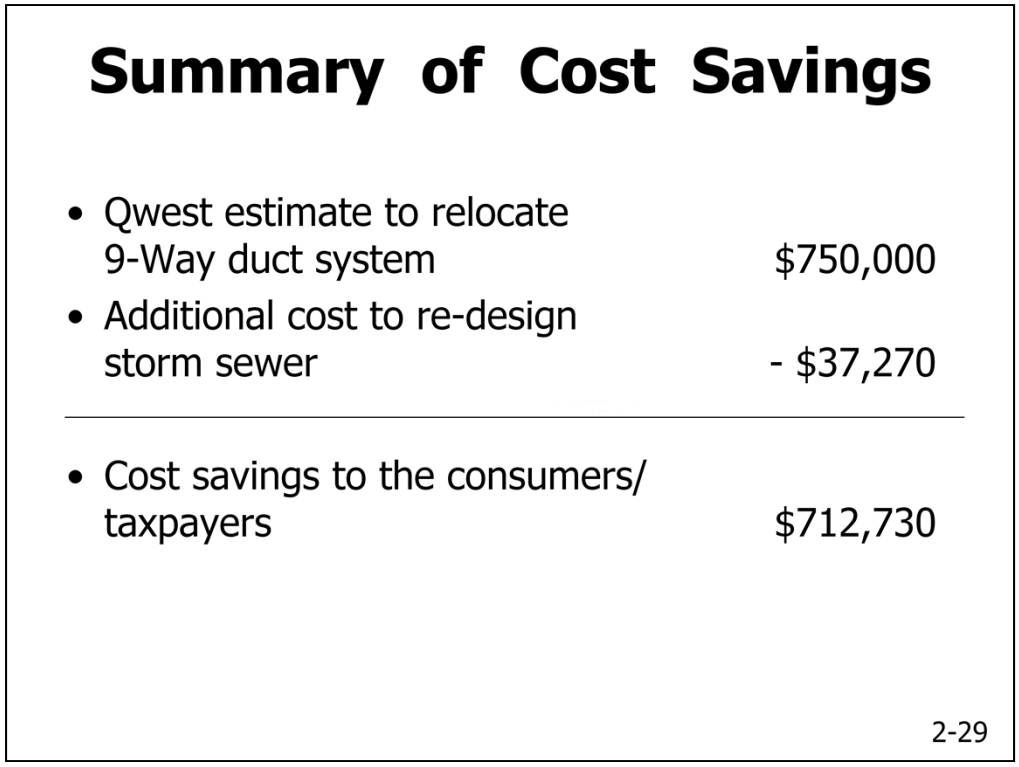


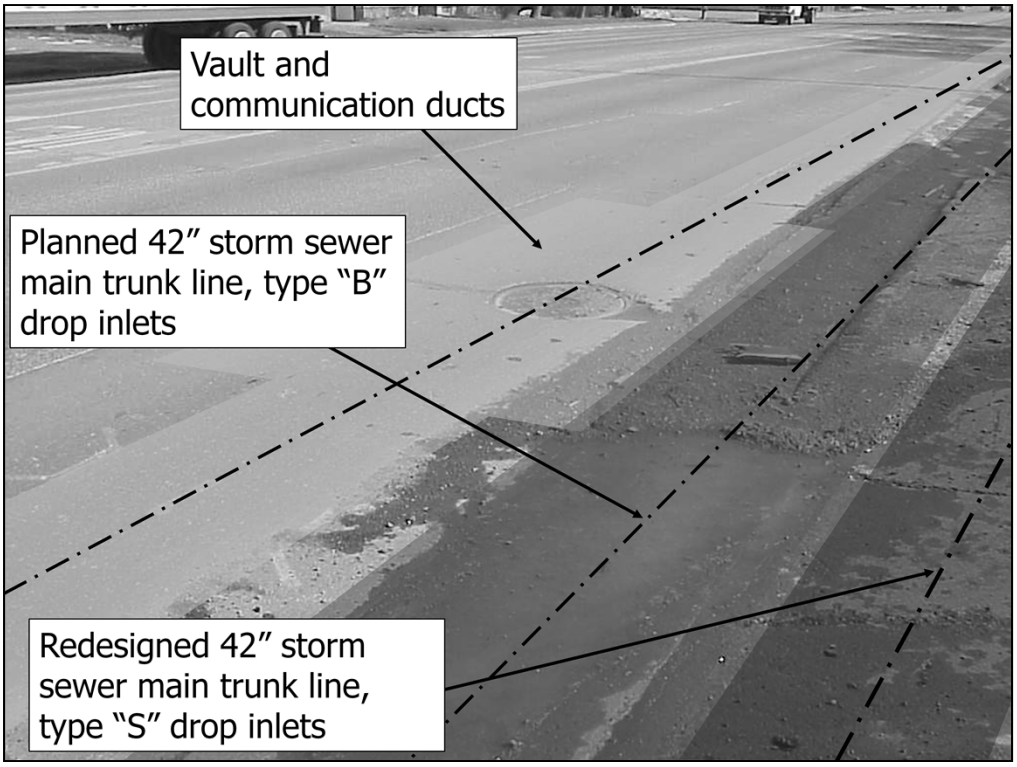
The additional cost to redesign the storm sewer was minimal compared to the cost to relocate the electrical facilities.

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

2-30

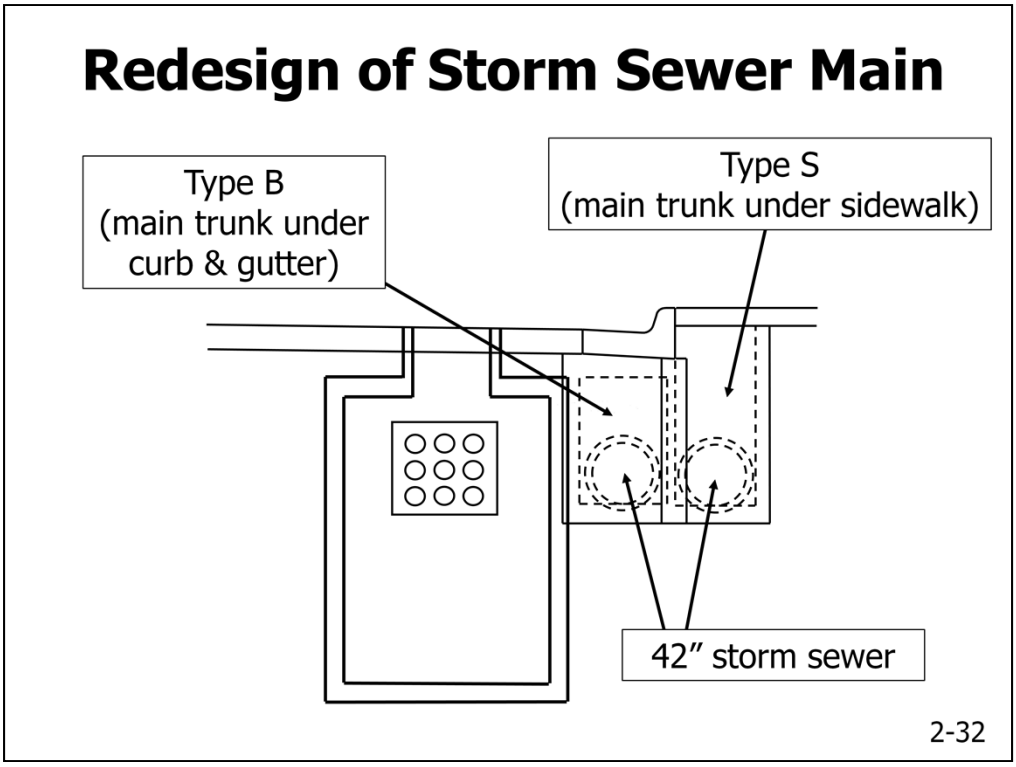
In this example, several vaults connected by a communication duct system were found to be in conflict with a planned sewer trunk line.



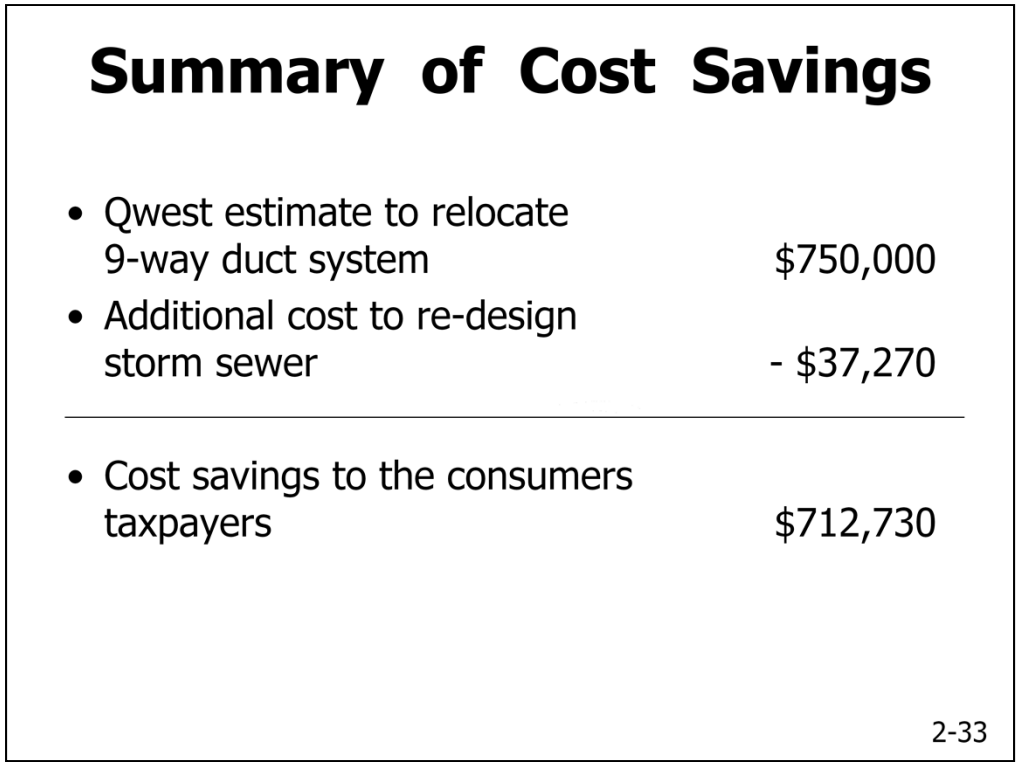
In this slide:

- Yellow shows the approximate footprint of a vault and communication ducts.
- Red shows the approximate footprint of the planned 42" storm sewer trunk line with type "B" drop inlets.
- Blue shows the approximate footprint of the redesigned 42" storm sewer trunk line with type "S" drop inlets.

Note: The three color bands are schematic and are only intended to provide an approximate view of the facilities involved. For an accurate footprint depiction, it would be necessary to use engineering drawings.



The storm sewer inlets were planned at the beginning and end of the trunk system, which interfered with the location of the vaults. Moving the inlets may have avoided the vaults but would have caused other problems. The type S inlets allowed the inlets to remain at the same location along the trunk line as planned initially and avoided the conflict with the vaults and duct system.



Cost of the redesign were minimal in comparison to the cost savings by allowing the duct system to remain in place.

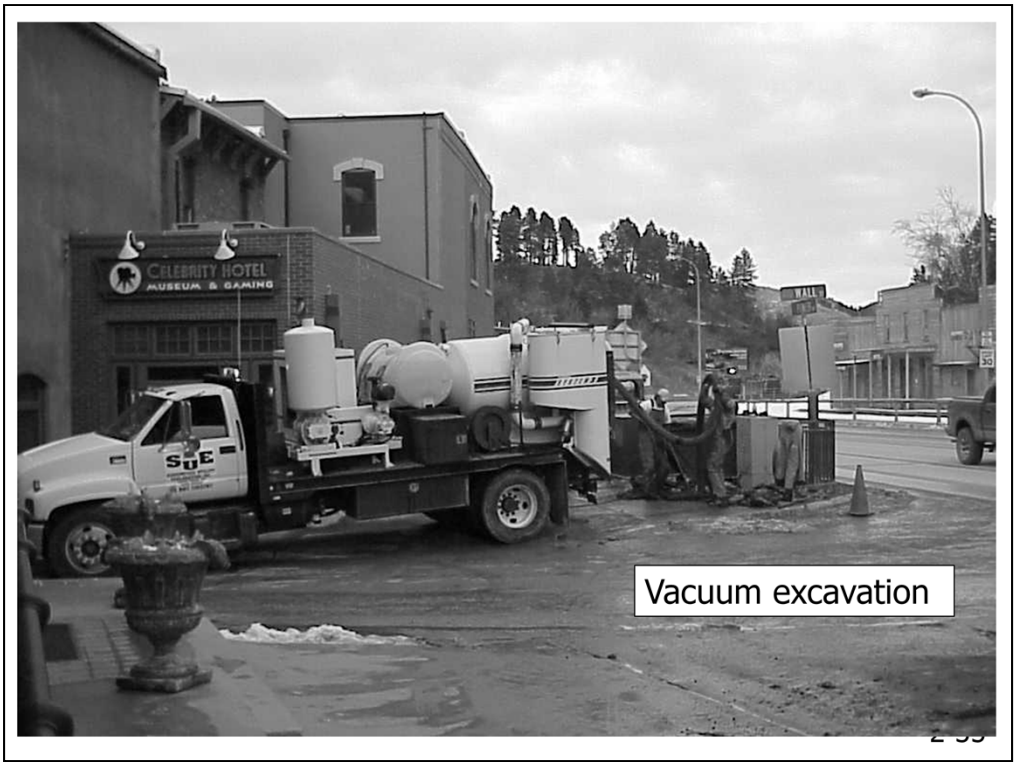
Example: Traffic Signal Footing

- 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″

2-34

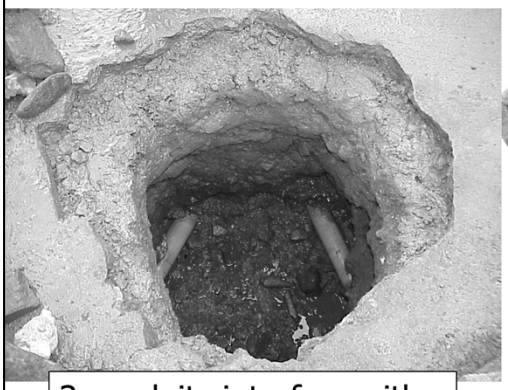
Utilities were identified by the South Dakota One Call ticket process in the immediate vicinity of a proposed signal location. The power company informed the DOT that there were 3 underground conduits coming from a transformer in the area of the proposed signal footing. The proposed signal location was surveyed on the ground by the DOT, markings were reviewed in the field, and vacuum excavation was used to confirm the location of the utilities.

The estimated cost to relocate the utilities was $95,000. At the same time, the town of Deadwood is a legalized gambling community and loss of power would have greatly affected the revenue generated by the casinos. Therefore, it was of interest to determine whether the footing could fit with the existing utilities. The typical footing diameter on a signal pole is 36." However, at this location, this diameter would not fit between the 3 conduits. The recommendation was to decrease the footing diameter to 30" and increase the depth to equal the designed required lateral support.

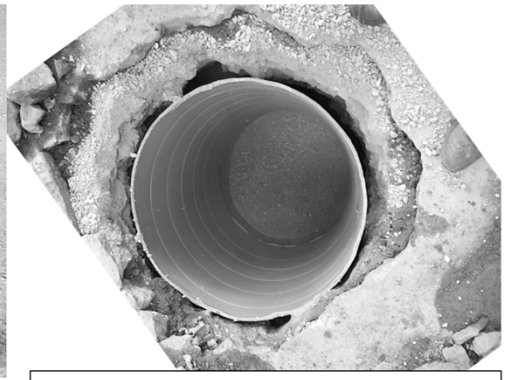


This picture shows the vacuum excavation to expose the utilities.

Example: Traffic Signal Footing



3 conduits interfere with 36” pole footing diameter

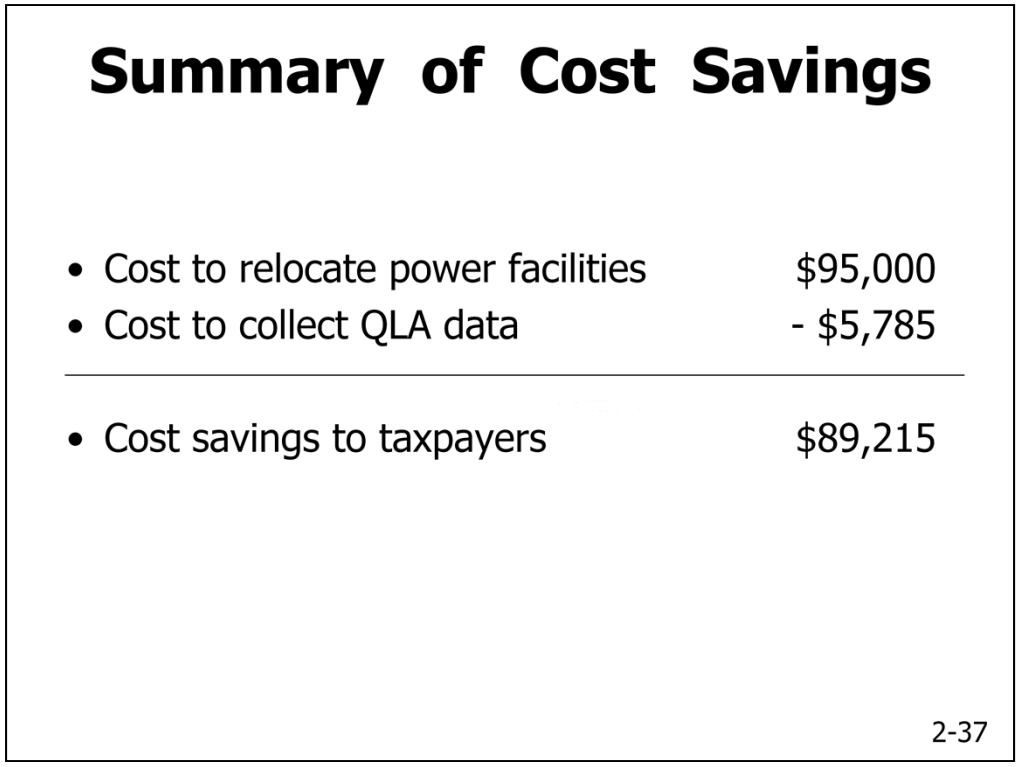


Redesign using 30” sonotube (longer, narrower footing)

2-36

In the picture on the left, the third conduit is not visible. The conduit is located toward the front of the picture.

The 30” sonotube fit in between the existing conduits.



The cost to redesign the signal footing were negligible. The cost for the vacuum excavation were only a fraction of the estimated cost to relocate the utilities.

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

2-38

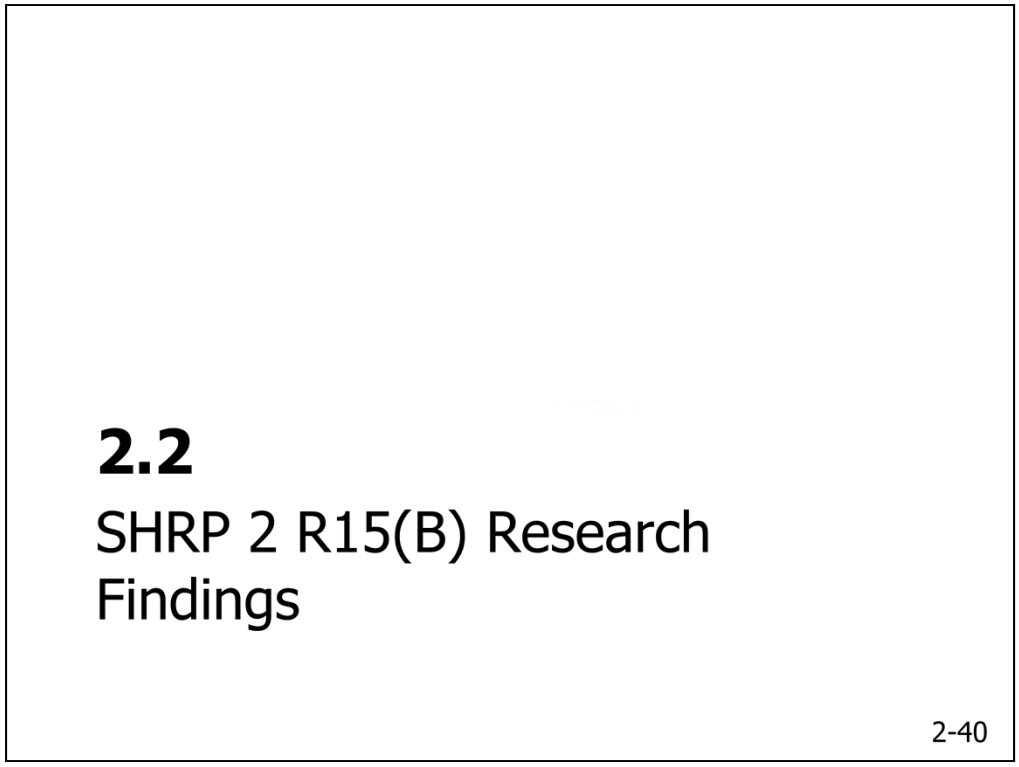
This slide shows key concepts to keep in mind when addressing utility conflicts.

General References

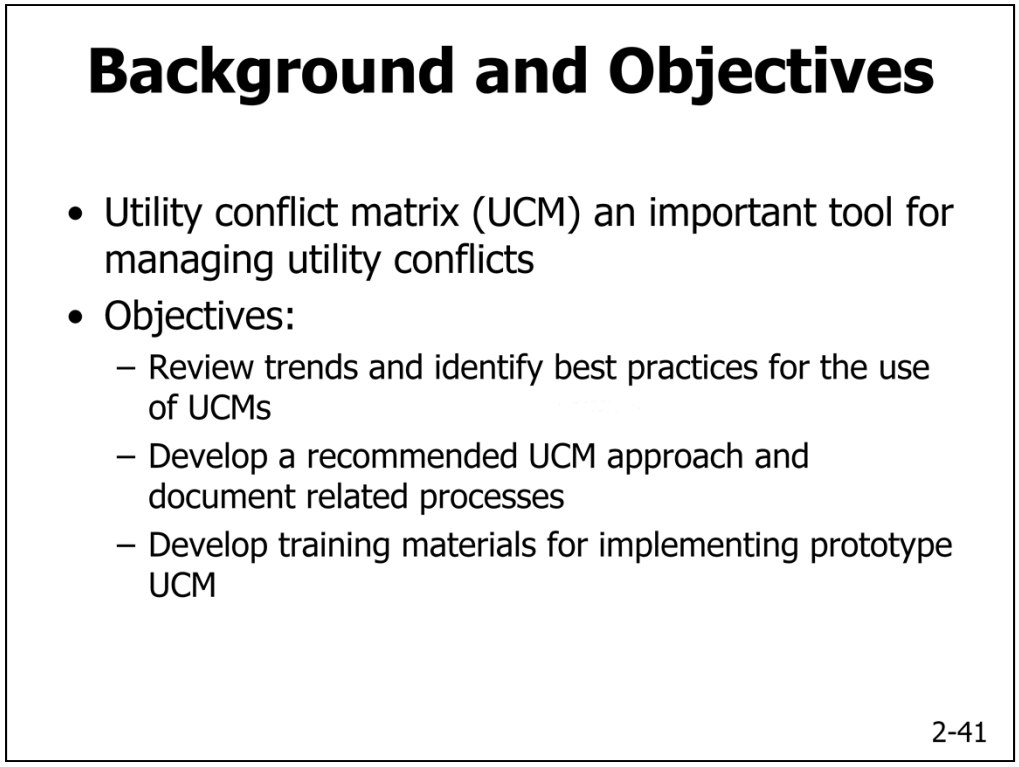
- ASCE Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data (CI/ASCE 38-02)
- AASHTO Guide for Accommodating Utilities Within Highway Right-of-Way (2005)
- AASHTO Policy on the Accommodation of Utilities Within Freeway Right-of-Way (2005)
- AASHTO Right of Way and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

2-39

A number of references are available, which discuss utility accommodation and relocation issues (although not necessarily utility conflicts or utility conflict resolution matters).

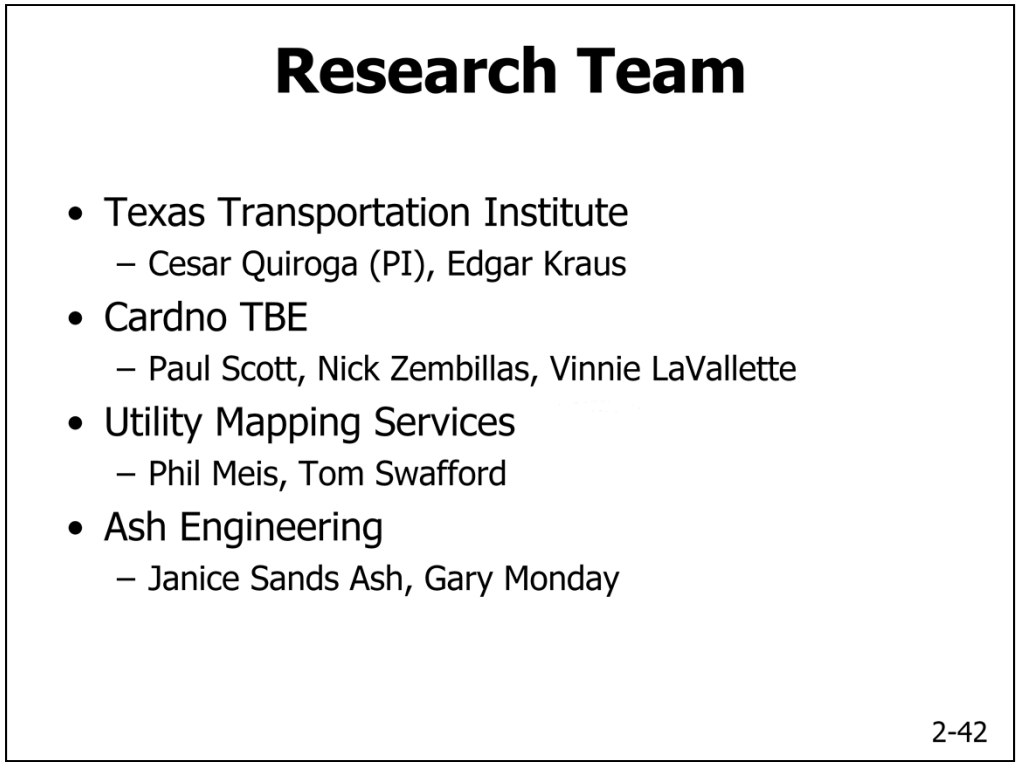


This part of Lesson 2 provides a summary of the main findings of project SHRP 2 R15(B) “Identification of Utility Conflicts and Solutions.”



As mentioned previously, utility conflicts are frequently blamed for unnecessary project delays and cost overruns. Utility-related activities in the project development process involves the production and exchange of enormous amount of data and supporting documents, including schematics, design files, agreements, and certifications. A critical component of this process is how to document and manage utility conflict data effectively. Utility conflict tables, also known as utility conflict matrices (UCMs) or utility conflict lists, enable users to organize and track utility conflict data. In practice, these tables or matrices support a wide range of related processes, including conflict analyses, utility agreement development, construction letting, as well as utility relocation scheduling, billings, and payments.

Practices involving the use of UCMs vary widely throughout the country, not just among states but also within states. There is a need to document these practices and develop optimized UCM concepts and techniques that can contribute to standardization and optimization of utility-related activities in the project development process. SHRP 2 Research Project R15(B) addressed this need by reviewing the state-of-the-practice around the country, identifying recommendations for best practices, developing and testing a prototype UCM concept, and developing training materials and implementation guidelines.

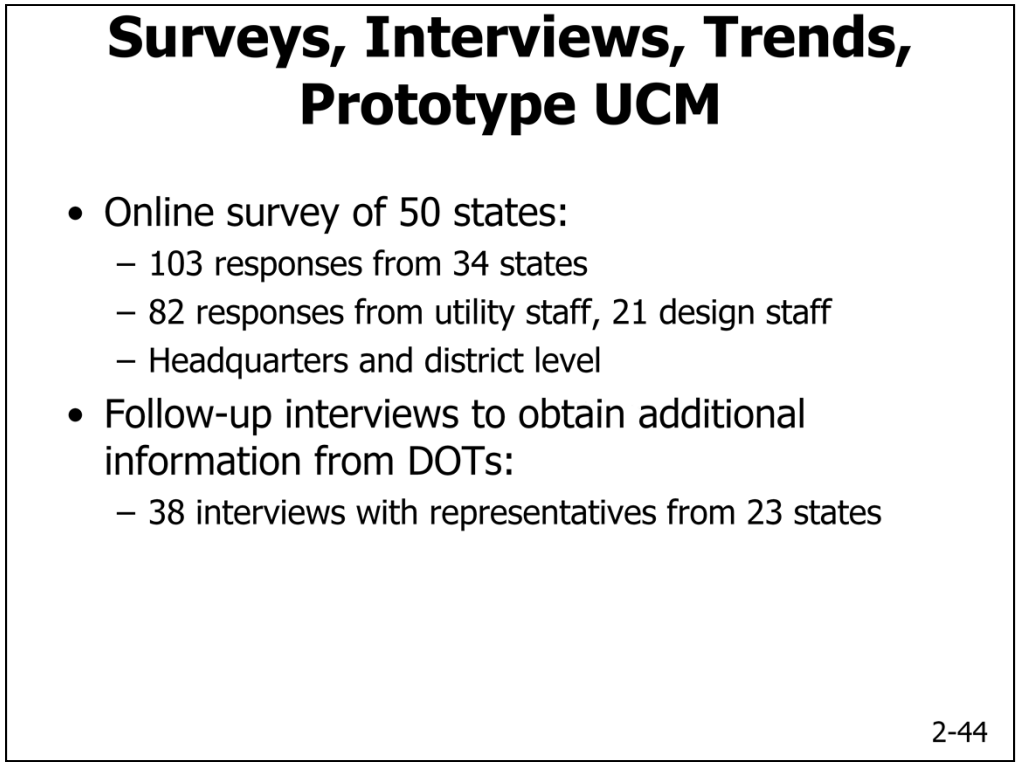


The research was led by researchers at the Texas Transportation Institute (which is part of the Texas A&M University System) with the help of three private-sector firms: Cardno TBE, Utility Mapping Services (UMS), and Ash Engineering. Cardno TBE and UMS are SUE providers, while Ash Engineering is a firm out of Tampa, Florida, which provides consulting services primarily to the utility industry.

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

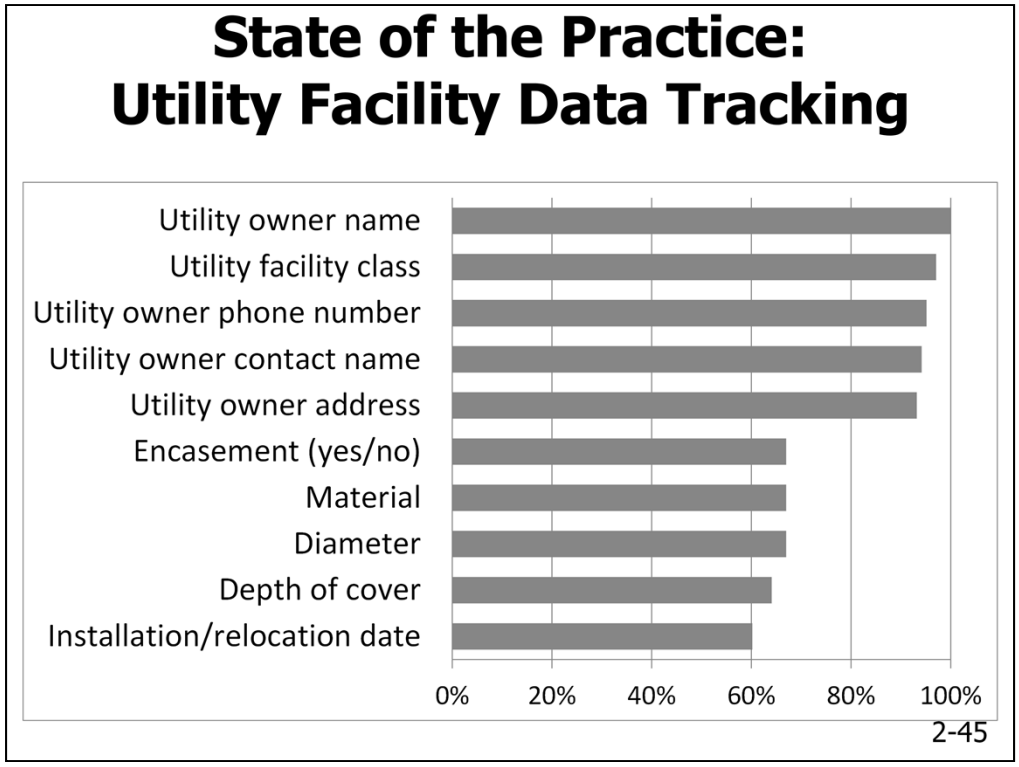
2-43



The project included an online survey of all 50 states to identify trends and practices in utility conflict management. The survey resulted in 103 responses from 34 states. Of the 103 responses, 82 responses were from utility staff. The remaining 21 responses were from design staff. The survey involved both state DOT headquarters and district level personnel.

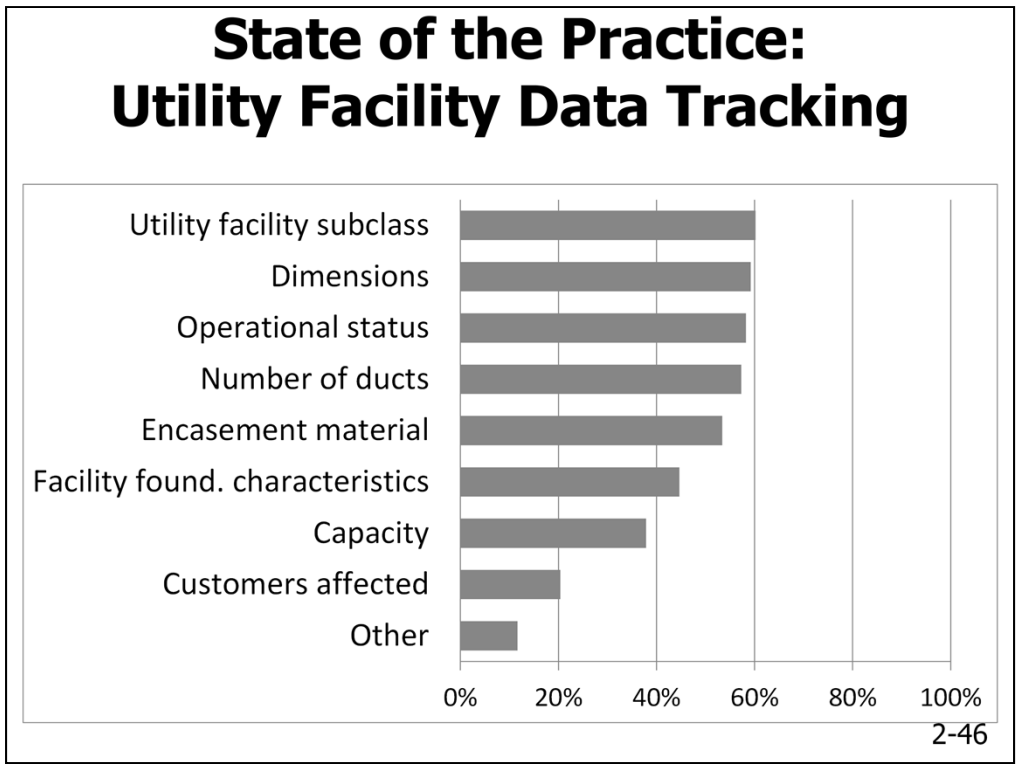
The research team also conducted follow-up interviews. In total, there were 38 interviews with representatives from 23 states.

State DOTs provided 26 sample utility conflict tables that further illustrated current practices (as well as "schools of thought" as to how to structure a UCM) around the country.



The research report provides a comprehensive description of the trends captured through the surveys, interviews, and sample data. These slides highlight on some of the main trends observed.

This slide summarizes the type of utility *facility* data that states normally track. Notice the substantial drop (from 93% to about 67%) after utility owner address, suggesting that most state DOTs tend to capture fairly basic information about who owns a specific facility, but less frequently physical characteristics such as material, encasement, diameter, or depth of cover (although these characteristics are still important to most state DOTs).


State of the Practice:
Utility Facility Data Tracking
Utility facility subclass
Dimensions
Operational status
Number of ducts
Encasement material
Facility found. characteristics
Capacity
Customers affected
Other
0%
20%
40%
60%
80%
100%
2-46

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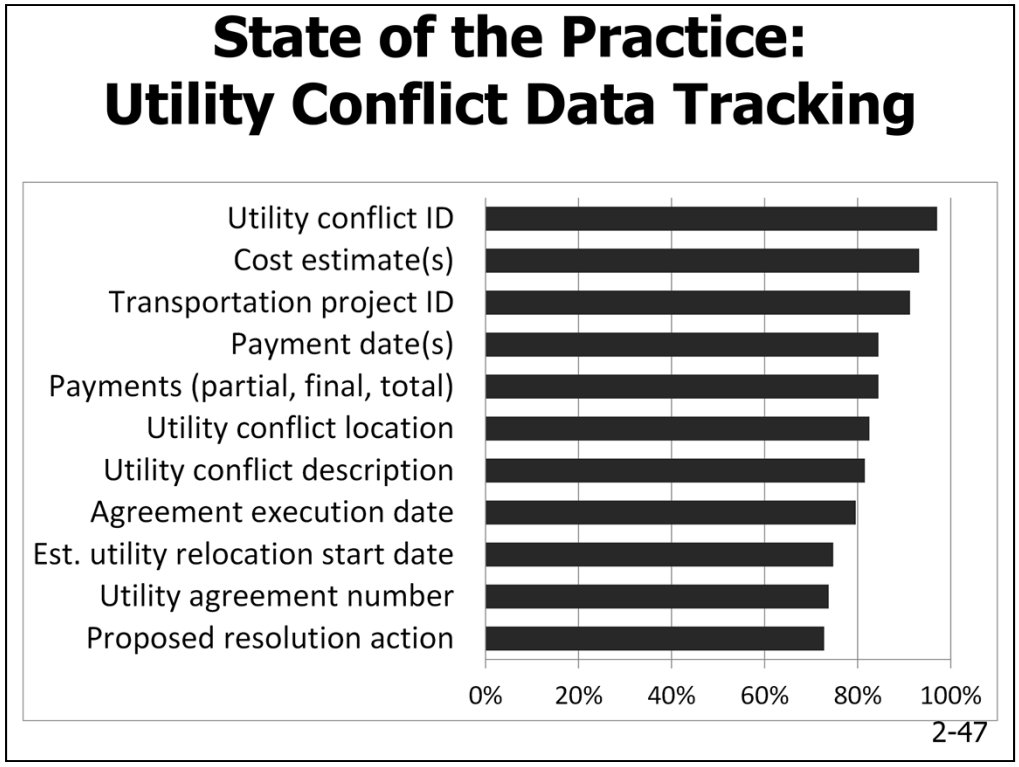
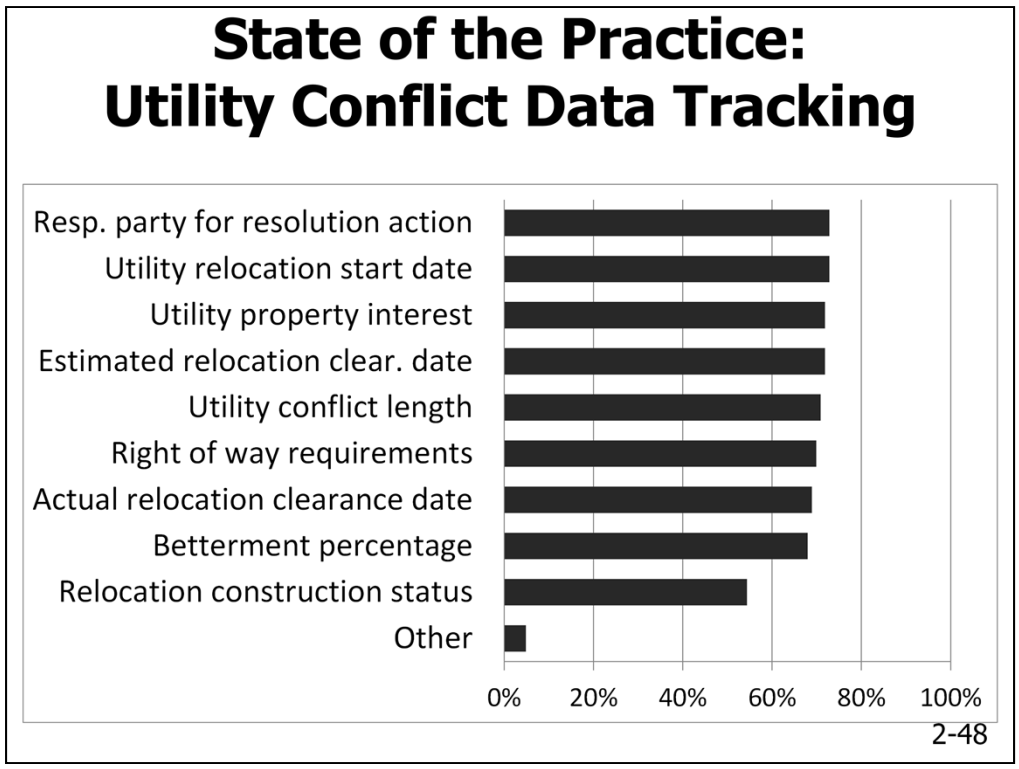
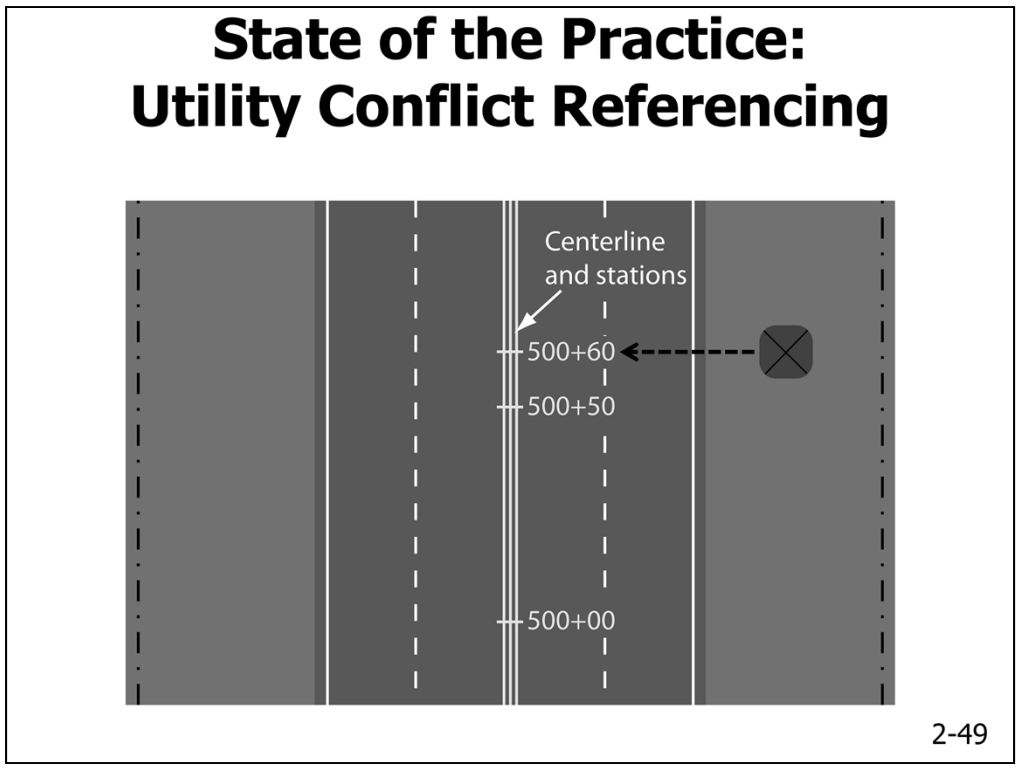


This slide shows trends regarding the tracking of utility *conflict* data.

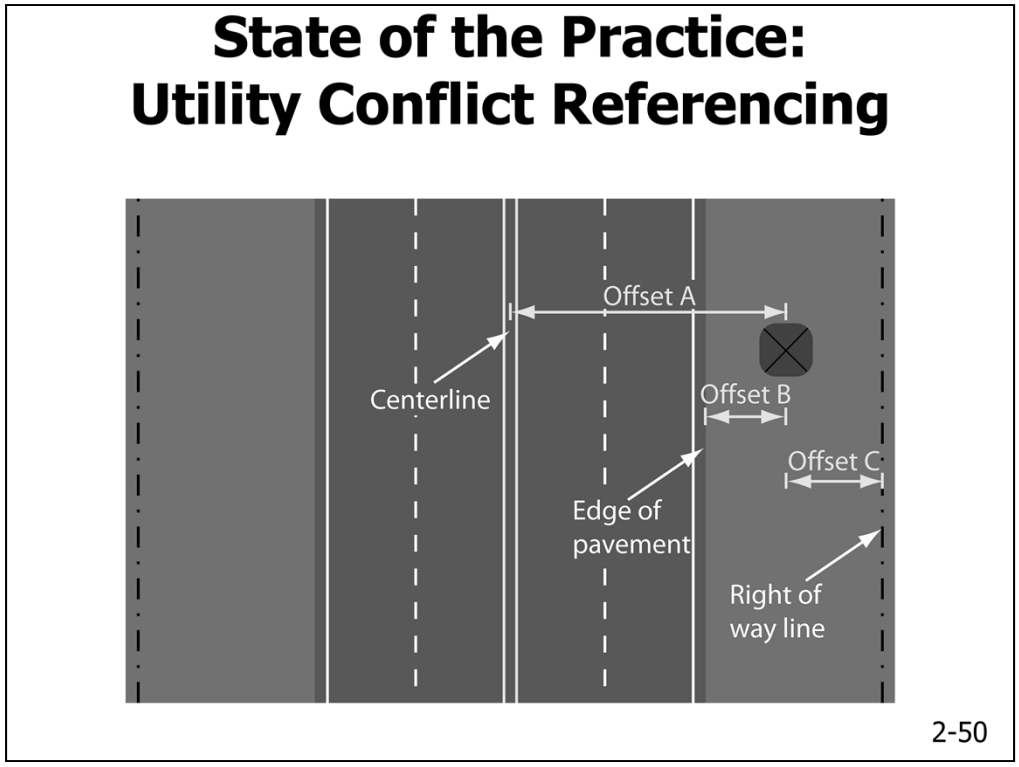

State of the Practice:
Utility Conflict Data Tracking
Resp. party for resolution action
Utility relocation start date
Utility property interest
Estimated relocation clear. date
Utility conflict length
Right of way requirements
Actual relocation clearance date
Betterment percentage
Relocation construction status
Other
0%
20%
40%
60%
80%
100%
2-48

(continued).



Respondents were asked to provide information about the methods they use to identify utility conflict locations using alignments and offsets.

Project centerline and station is the most popular method for referencing utility conflicts along transportation project alignments. Similarly, the most common method for referencing utility conflict offsets is with respect to the project centerline. However, other offset methods mentioned were right-of-way line and edge of pavement (frequently, these methods are not reliable).



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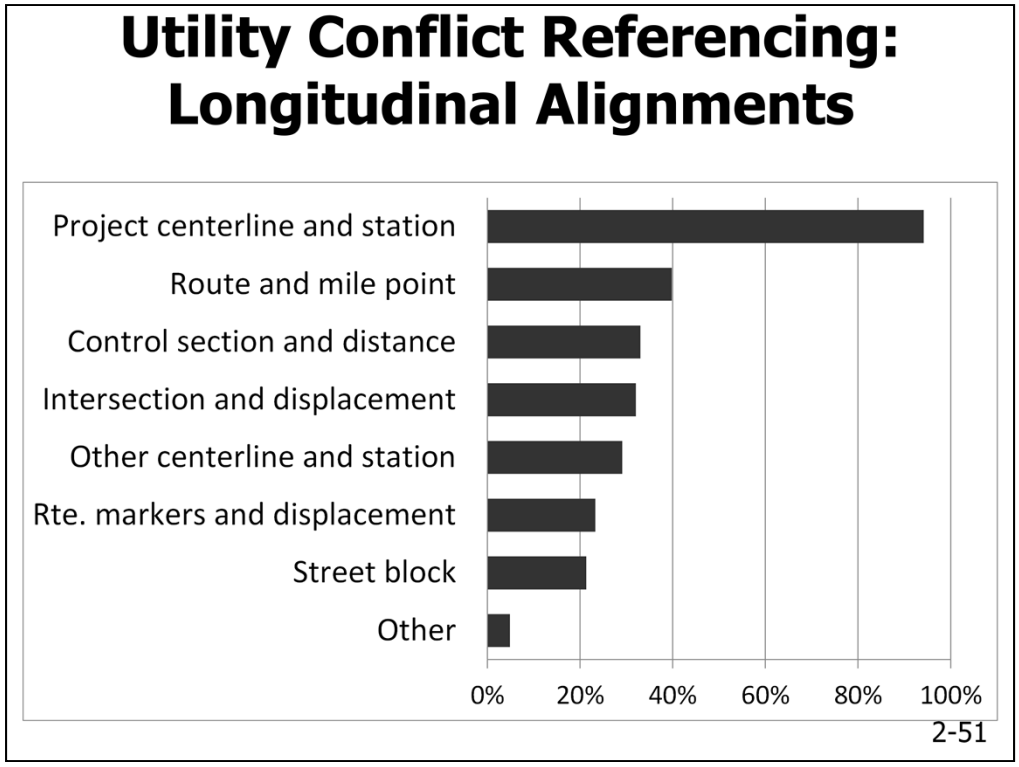
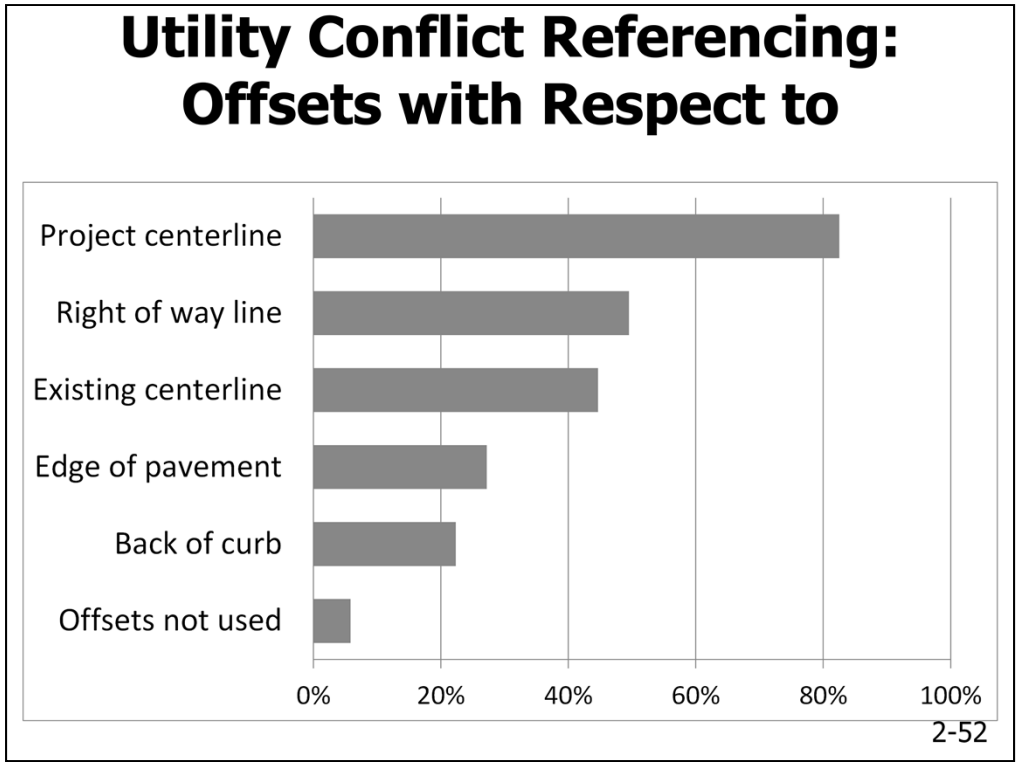
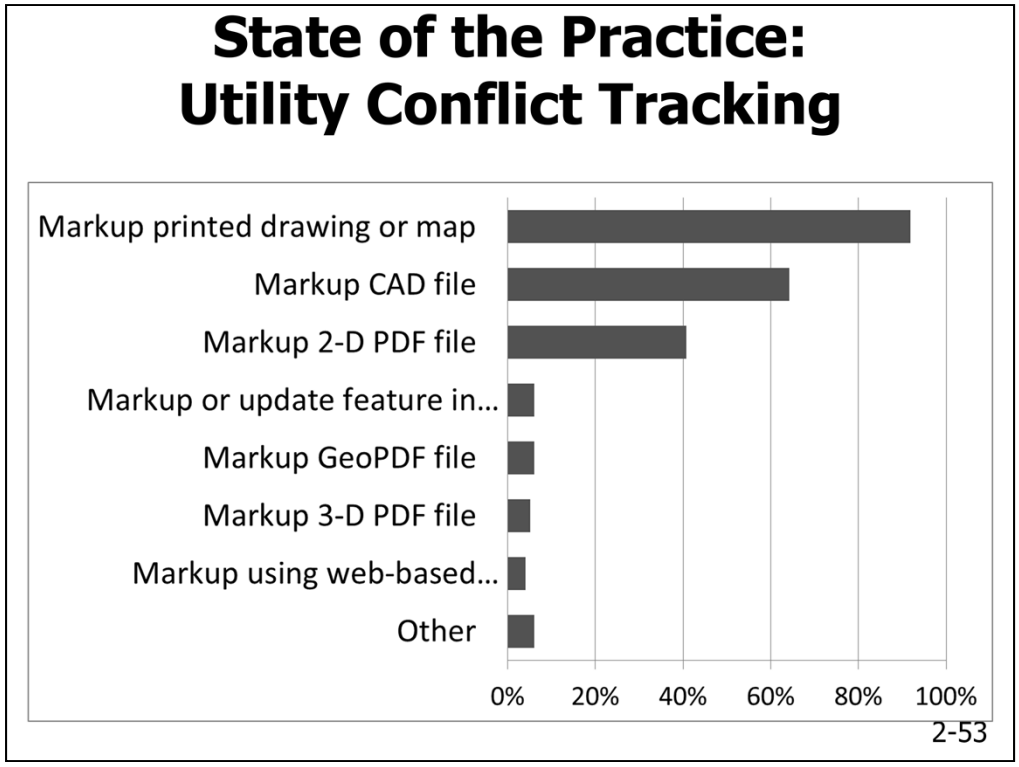


Project centerline and station is the most popular method for referencing utility conflicts along transportation project alignments. However, respondents also indicated they use a variety of other longitudinal referencing methods, including route and mile point, control section and distance, intersection and displacement, route markers and displacement, and street blocks.



Similarly, the most common method for referencing utility conflict offsets is with respect to the project centerline. Other offset methods mentioned were right-of-way line, existing centerline, edge of pavement, and back of curb.

Individual table cell entries in the report indicate a specific combination of longitudinal alignment referencing system and offset referencing system.



State DOTs use a variety of methods to track and update utility conflict locations on project drawings. There is a clear preference for traditional paper-based approaches to mark up printed drawings or maps. Marking up CAD files is also common. Interestingly, more than 40 percent of respondents indicated they mark up 2-D portable document format (PDF) files, clearly indicating the increasing acceptance of the PDF file format for document editing and updating purposes. In general, state DOTs only rarely use other markup methods such as GeoPDF, 3-D GeoPDF, or web-based viewers.

Sample (Alaska)

DRAFT Utility Conflict Report
West Dowling Road Phase I

Anchorage, Alaska
DOT&PF 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
CEA Distribution Relocation Costs										
9+00	150' RT		200' LT	3φ UG	350	FG	REL	52,500	15,750	68,250
16+00	100' LT	42+30	80' LT	3φ UG	2630	FG	REL	394,500	118,350	512,850
16+00	100' LT	15+50	100' RT	3φ UG	250	FG	REL	37,500	11,250	48,750
16+00	100' LT	29+00	75' LT	1φ UG	1650	FG	REL	165,000	49,500	214,500
36+40	80' LT	35+80	350' RT	3φ UG	430	FG	REL	64,500	19,350	83,850
36+60	80' LT	36+70	380' LT	3φ UG	300	FG	REL	45,000	13,500	58,500
	UG Loop to the North			3φ UG	1000	FG	REL	150,000	45,000	195,000
							Subtotal	909,000	272,700	1,181,700
CEA Transmission Relocation Costs										
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
							Total CEA Relocation Costs	**1,039,000**	**311,700**	**1,350,700**

1φ 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 swamp braces removed and steel piling added, down guys replaced with overhead span guy and down guys.

2-54

This utility conflict matrix was provided by the Alaska DOT. Note the emphasis on cost items (three columns plus total), and that there are separate tables for each utility involved in the project.

[handout]

Sample (California)

I-10-EA 122401-Utilities Conflict Status

date of last revision May 30, 2000
this document was prepared by

Conflict No.	Utility Sheet No.	Pothole No. (On Exhibit)	Owner	Utility Description	Pothole/Manhole Location	Conflict Location	Utility Conflict/ Work Description	Investigation			Depth	Impact?		Action			Util. Reloc. A-Abandon RD-Relocate/Delay P-Protect in place NC-No conflict	Resp. Party U-Utility Co C-Contractor	Required Completion Date	Comments
								Pothole	Manhole	Overhead	(ft)	Y	N	Remove	Relocate	Other				
1	**U-2**	**1**	**PACBELL**	**40 DU Telephone**	**62 m Rt of I-405 Sta 160+55**	**49 m Rt and 57 m Rt of I-405 Sta 160+55**	**conflict with Retaining Walls No. 166 & No. 168**	X			**4.55 14.40**		**N**				***P***			
2	**U-2**	**2**	**PACBELL**	**40 DU Telephone**	**45 m Lt of I-405 Sta 165+55**	**49 m Rt and 57 m Rt of I-405 Sta 160+55**	**conflict with Retaining Walls No. 166 & No. 168**				-		**N**				***P***			
3	**U-3**	**3**	**SCE**	**25 mm DU**	**30 m Rt of I-405 Sta 165+01**	43 m Rt of I-405 Sta 165+01	**conflict with Retaining Wall No. 165**				-		**N**				***P***			**Located in Bristol OC**
4	**U-3**	**4**	**SCE**	**25 mm DU**	**46 m Lt of I-405 Sta 165+01**	43 m Rt of I-405 Sta 165+01	**conflict with Retaining Wall No. 165**				-		**N**				***P***			**Located in Bristol OC**
5	U-3	5	MWD	900 mm WSP Water in 380 mL ENC	50 m Rt of I-405 Sta 164+96	44 m Rt of I-405 Sta 164+95	conflict with Retaining Wall No. 166	X			6.70		N				***P***			
6	U-3	6	MWD	900 mm WSP Water in 380 mL ENC	50 m Lt of I-405 Sta 164+96	44 m Rt of I-405 Sta 164+95	conflict with Retaining Wall No. 166	X			6.50		N				***P***			
7	U-3	7	Caltrans	600 mm RCP	53 m Rt of I-405 Sta 163+42	53 m Rt of I-405 from Sta 163+29 to Sta 163+42	conflict with Delhi Channel Bridge	X			6.00		N				***P***			
8	U-3	8	Caltrans	600 mm RCP	53 m Rt of I-405 Sta 163+29	53 m Rt of I-405 from Sta 163+29 to Sta 163+42	conflict with Delhi Channel Bridge	X			9.00		N				***P***			
9	**U-3**	**9**	**MCWD**	**300 mm ACP Water in** 119mL, 500mm STL Casing	**32 m Rt of I-405 Sta 163+25**	**30 m Rt of I-405 Sta 163+25**	**conflict with** I-405 Widening & BR1 Line	X			**10.30**		**N**				***P***			
10	**U-3**	**10**	**MCWD**	300 mm ACP Water 119mL, 500mm STL Casing	32 m Lt of I-405 Sta 163+25	33 m Lt of I-405 Sta 163+25	conflict with I-405 Widening & BR1 Line	X			**8.75**		**N**				***P***			
11	**U-3**	**MH 11**	**CSDOC**	Manhole	81 m Rt of I-405 Sta 162+92	35 m Rt of I-405 Sta 162+92	conflict with I-405 Widening & BR1 Line		**X**		**10.40**		**N**				***P***			
12	**U-3**	**12**	**CSDOC**	380 mm VCP Sewer	36 m Lt of I-405 Sta 162+91	32 m Lt of I-405 Sta 162+90	conflict with I-405 Widening & BR1 Line				-		**N**				***P***			
13	U-4	13	MCWD	600mm CCP Water in 94m L 900mm Dia Stl Casing	67 m Rt of I-405 Sta 161+44	56 m Rt of I-405 Sta 161+44	Conflict with Airport Channel	X			4.55	Y			X	X	***RB***			600 mm Waterline to be Lowered Extend Encasement
14	U-4	14	MCWD	600mm CCP Water in 94m L 900mm Dia Stl Casing	38 m Lt of I-405 Sta 161+40	32 m Lt of I-405 Sta 161+42	conflict with I-405 Widening				-		N				***P***			
15	U-4	15	MCWD	300 mm ACP Water	70 m Rt of I-405 Sta 160+29	72 m Rt of I-405 from Sta 157+20 to Sta 160+29	Conflict with AOA Line and Retaining Wall No. 268	X			-	Y			X		***RD***			Encroachment CT R/W and Private Owner Encased under Roadway
16	U-4	16	MCWD	300 mm ACP Water	70 m Rt of I-405 Sta 159+07	72 m Rt of I-405 from Sta 157+20 to Sta 160+29	Conflict with AOA Line and Retaining Wall No. 268	X			-	Y			X		***RD***			Encroachment CT R/W and Private Owner Encased under Roadway
17	**U-5**	**17**	**MCWD**	**300 mm ACP Water**	**70 m Rt of I-405 Sta 156+87**	72 m Rt of I-405 from Sta 157+20 to Sta 160+29	conflict with AOA Line and Retaining Wall No. 268	X			**4.35**		**N**				***P***			
18	U-5	MH 18	CSDOC	Manhole	60 m Rt of I-405 Sta 156+65	28 m Rt of I-405 Sta 156+65	conflict with I-405 Widening		X		16.20		N				***P***			
19	U-5	19	CSDOC	380 mm VCP Sewer	46 m Lt of I-405 Sta 156+65	25 m Rt of I-405 Sta 156+65	conflict with I-405 Widening	X			18.40		N				***P***			
20	U-5	20	CSDOC	830 mm VCP Sewer	14 m Rt of B2 Sta 24+96		conflict with construction of B2 Line						N				***P***			
21	U-5	21	CSDOC	830 mm VCP Sewer	6 m Lt of B2 Sta 25+54		conflict with construction of B2 Line						N				***P***			
22	U-8	MH 22	CSDOC	Manhole	9m Rt of Main St Sta 102+78				X			Y				X	***RB***			MH to be Lowered New Top MH Elev= 9.588
23	U-8	MH 23 SCE MH 4503	SCE	Manhole No. 4503	9m Rt of Main St Sta 102+87				X			Y				X	***RB***			MH to be Lowered New Top MH Elev= 9.583 m
24	U-8	MH 24 SCE MH 4502	SCE	Manhole No. 4502	9m Rt of Main St Sta 104+17				X			Y				X	***RB***			MH to be Lowered New Top MH Elev= 9.728 m

2-55

This utility conflict matrix was provided by the California DOT. Note the large number of columns and detail provided in the utility conflict matrix.

[handout]

Sample (Florida)

FPID: 1		Description: 2				This matrix was created by _____3_____ to assist the UAO's in identifying conflicts between the UAO's facilities and proposed roadway construction. _____ accepts no liability for conflicts overlooked for this report. Each UAO or designee is responsible to perform a detailed and comprehensive plans review for conflict analysis.		
Phase #: 4		Plans Date: 5						
Reviewer: 6								
Date: 7								
Conflict #	Utility Agency/ Owner (UAO)	Station/Offset (From C/L)	Facility Description (Material, Type, Number, Size)	Conflict Description (Possible or Actual)	VVH (Y/N)	VVH #	Recommended Conflict Resolution	Resolved Status
8	9	10	11	12	13	14	15	16

Consider using the form from the beginning of a project as a tool for monitoring areas of concern with UAO facilities. That is the reason for the Phase Number space. The form is set up to: 1. Print legal size and have the header information on each page. 2. The cells where the conflicts are listed are set to word wrap automatically. 3. The footer is set to number the pages 1 of ??.

1	Project number.
2	Project description.
3	Disclaimer that the reviewer and their firm is not responsible for any missed conflicts. The blanks are for the name of the design firm.
4	Phase that the plans represent.
5	The date should be on the plans Key Sheet. The phase and plans date should keep everyone working on the same plans.
6	That would be you, the person that wrote the conflict matrix.
7	The date the matrix was completed.
8	For ease of discussion the conflicts are numbered, plan sheet numbers are not used because they change from Phase to Phase which has caused confusion in the past.
9	Owner of the underground line.
10	The standard reference used on FDOT plans is the Centerline of Construction, it is used for all components of the proposed roadway construction.
11	Describe the facility. What is it? Water main? Force main? Cable? Conduit? Overhead electric? Overhead cable? Manhole? Handhold? What's the size? How many? What's it made of?
12	What is it the facility perceived to be in conflict with? It a possible conflict or actually in conflict with proposed work. Consider the trench and hole size required to place pipe and drainage structures. Don't forget aerial facilities when there are signals and large signs in the project.
13	SUE work can be used to if a conflict is considered a possibility. This entry area is a tool to determine areas where test holes should be taken for confirmation or exclusion of a conflict.
14	Entry area for the test hole number. Test holes should be numbered consecutively to avoid confusion.
15	What can be done to remove the conflict? Don't forget to consult with the Designer for alternatives to the proposed construction.
16	Examples of entries could be "Cleared", "Pending", "No Conflict". It's suggested to keep the entries determined as "No Conflict" in the matrix so other reviewers will know a perceived conflict has been noted and determined to not be an issue.

2-56

This utility conflict matrix was provided by the Florida DOT. This matrix contains 8 columns, which is a relatively small number of columns.

[handout]

Sample (Georgia)

Conflic	Station and Offset	Utility	Identified Conflict	Testhole Needed	Utility Impact with Cost ("As-designed")	Recommended Resolution	*Benefit of Resolution
C1	100+05, 21'L 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO	No	Relocate 1150LF of BFO-DUCT ($91,000)	Relocate proposed storm drainage into street. Use DI's that drain toward roadway.	Save Cost to Relocate BFO-DUCT ($91,000)
C2	100+66, 21'L 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO	No	See C1		
C3	100+38, 24'R 14th St Constr. BL	UNK@Tee	Proposed 18" storm and unknown utility tee	TH 1	Relocate unknown type and function utility	TH to identify utility and conflict	Eliminate possible delay during construction
C4	100+56, 25'R 14th St Constr. BL	8"W	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 ($6,000)
C5	100+81, 25R 14th St Constr. BL	8"W	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 ($6,000)
C6	100+82, 28R 14th St Constr. BL	4"G	Proposed storm structure and existing 4"G	TH 4	Relocate 20 LF of 4"G ($6,000)	TH on 4"G, adjust depth of proposed storm structure	Save Cost to Relocate 4"G ($4,500)
C7	101+22 27"R 14th St Constr. BL	4"G	Proposed 18" storm and existing 4"x2" gas tee	TH 5	Relocate 2"G & 4"G Tee ($12,500)	TH on G lines, adjust depth of proposed storm structure	Save Cost to Relocate G lines ($11,000)
C8	101+01 28'L 14th St Constr. BL	16"G	Proposed 18" storm and existing 16"G	TH 6	Relocate 16"G ($10,000)	TH on 16"G, adjust depth of proposed storm structure	Save Cost to Relocate 16"G ($8,500)
C9	101+25 41'L 14th St Constr. BL	BT-DUCT 2"G	Proposed storm structure and two BT-ducts	TH 7	Relocate BT-DUCT & 2"G ($11,000)	TH on BT-DUCT & 2"G, adjust depth of proposed storm structure	Save Cost to Relocate BT-DUCT & 2"G ($10,500)
C10	101+37, 41'L 14th St Constr. BL	6"W	Proposed 18" storm and existing 6"W	TH 8	Relocate 6"W ($5,000)	TH on 6"W, adjust depth of proposed storm drainage	Save Cost to Relocate 6"W ($3,500)
C11	101+57, 27'L 14th St Constr. BL	16"G	Proposed 18" storm and existing 16"G	TH 9	Relocate 16"G ($10,000)	TH on 16"G, adjust depth of proposed storm structure	Save Cost to Relocate 16"G ($8,500)
C12	101+58, 22'L 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO	No	See C1		
C13	101+90, 22'L 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO	No	See C1		
C14	102+20, 27'R 14th St Constr. BL	4"G	Proposed storm structure and existing 4"G	No	Relocate 4"G ($4,500)	Relocate 4"G	Elimnate conflict with proposed DI
C15	102+36, 24'L 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO	No	See C1		

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

Key:

AC - Asbestos Concrete
BE - Buried Electric
BFO - Buried Fiber Optic
BT - Buried Telephone
G - Gas
L - Left
MES - Mitered End Section
OE - Overhead Electric
OT - Overhead Telephone
R - Right
RCP - Reinforce Concrete Pipe
W - Water
WM - Water Main
TH - Test Hole, verify vert. and horiz
UNK - Unknown Type
SAN - Sanitary Sewer

Utility Owner:

AGL Atlanta Gas Light
BE Georgia Power
BT Bell South
L3 Level 3 Communications
MFN Metromedia Fiber Network
SAN Fulton County Public Works
W City of Atlanta
UNK Unknown Owner

2-57

This utility conflict matrix was provided by the Georgia DOT. This utility conflict matrix has 7 columns, which is also an example of a utility conflict matrix with a small number of columns. However, some of the columns contain multiple data items that other states include in separate columns.

[handout]

Sample (Michigan)

M-6 (South Beltline) from I-196 to West of Eastern Avenue
South of Grand Rapids, Michigan

Utility Log - Electric

CS 70025 - JN 33330

Item #	Utility Owner / Operator	Conflict Location	Segment	Date Relocation Plan must be submitted	Relocation Plan submitted to Design Team	Design Team Review / Comment / Approval	Permit Application Submitted to MDOT	MDOT Permit Number / Approval Date	Relocation Scheduled	Action Items
1	Consumers Energy Transmission	Consumers Power Transmission Overhead – 8th Ave	1			7/6/2000	7/27/00 rev.	41064-0125-00-0174	4/1/2001	Final permit approval from MDOT.
2	Consumers Energy Transmission	West of Kenowa Ave.	1			7/6/2000	7/27/00 rev.	41064-0125-00-0174	4/1/2001	Final permit approval from MDOT.
3	Consumers Energy Distribution	Aerial Lines at Jackson and Angling Road	1							Design in process.
4	Consumers Energy Distribution	Aerial Lines at Kenowa and 64th St.	2							Design in process.
5	Consumers Energy Transmission	64th at Wilson and East and West of Wilson– Overhead	2			7/6/2000	7/27/00 rev.	41064-0125-00-0174	4/1/2001	Final permit approval from MDOT.
6	Consumers Energy Transmission	East and West of Ivanrest	2			7/6/2000	7/27/00 rev.	41064-0125-00-0174	10/15/2000	Final permit approval from MDOT.
7	**Consumers Energy Distribution**	**along Ivanrest**	**2**							**Permit to be submitted the week of August 14, 2000.**
8	Consumers Energy Transmission	East and West of Byron Center - overhead	3			7/6/2000	7/27/00 rev.	41064-0125-00-0174	4/1/2001	Final permit approval from MDOT. Schedule Relocation

This utility conflict matrix was provided by the Michigan DOT. Note the emphasis on the business process and tracking of critical dates.

[handout]

Sample (South Dakota)

Picture No.	PCN	Picture Looking	City or Town	Hwy. No.	Description
6.JPG	02BF	N	Platte	44	Water valve in the SE quadrant of Hwy 44 & Indiana
7.JPG	02BF	W	Platte	44	Power Pole in the SW quadrant of Hwy 44 & Indiana
8.JPG	02BF	N	Platte	44	Power Pole in the SW quadrant of Hwy 44 & Indiana
9.JPG	02BF	N	Platte	44	Power Pole in the SW quadrant of Hwy 44 & Indiana
10.JPG	02BF	E	Platte	44	Power Pole (Transmission w/ riser) in the SE quadrant of Hwy 44 & Ohio
11.JPG	02BF	E	Platte	44	Power Pole (Transmission w/ riser) in the SE quadrant of Hwy 44 & Ohio
12.JPG	02BF	N	Platte	44	Power Pole, Fire hydrant & water valve in the SE quadrant of Hwy 44 & Ohio
13.JPG	02BG	S	Platte	45	Light Pole in the SW quadrant of Hwy 45 & 4th St
14.JPG	02BG	E	Platte	45	Light Pole in the NE quadrant of Hwy 45 & 4th St
15.JPG	02BG	S	Platte	45	Light Pole in the SW quadrant of Hwy 45 & 6th St
16.JPG	02BG	E	Platte	45	Power Pole in the NE quadrant of Hwy 45 & 6th St
17.JPG	02BG	E	Platte	45	Power Pole in the NE quadrant of Hwy 45 & 6th St
18.JPG	02BG	W	Platte	45	Power Pole & Fire hydrant in the NW quadrant of Hwy 45 & 6th St
19.JPG	02BG	W	Platte	45	Power Pole w/ riser in the NW quadrant of Hwy 45 & 6th St

59

This utility conflict matrix was provided by the South Dakota DOT. This table only has 6 columns. Note a link to a picture is included for each utility conflict.

[handout]

Sample (Texas)

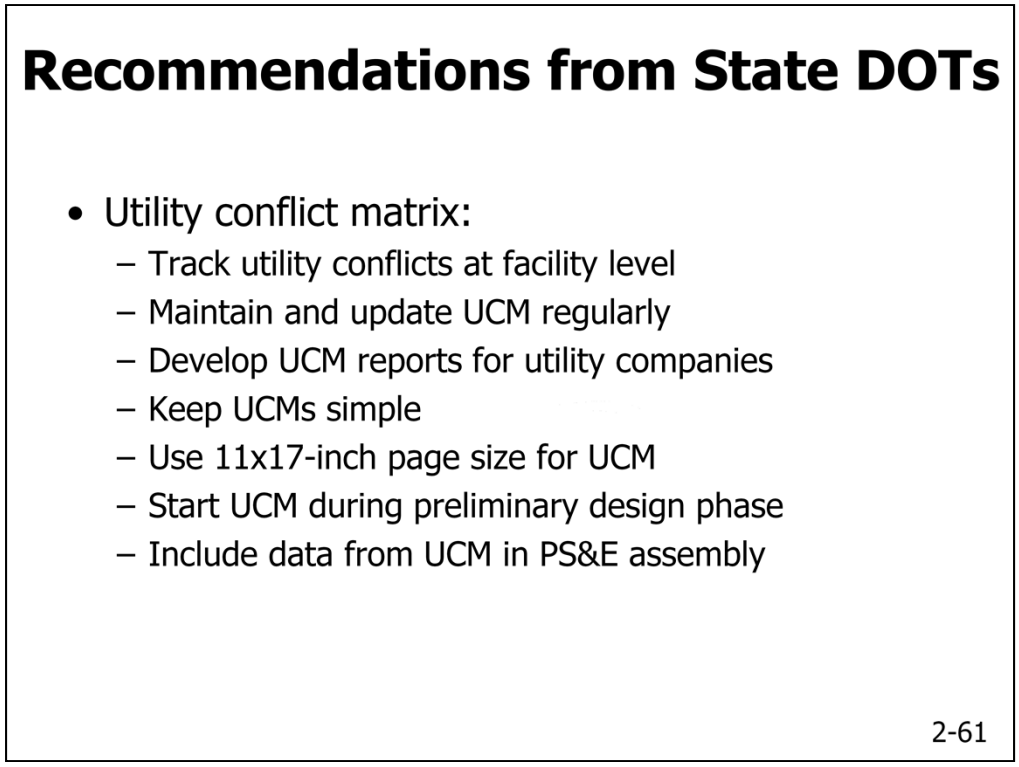
PARIS DISTRICT
UTILITY ADJUSTMENT REPORT

As Of August 19, 2009
Changes since last update in RED

County Highway ROW CSJ	Name of Utility	Reimbursable?	Location of Agreement Package	Packet Status?	Current Action	Adjustment Status	Responsible TxDOT Employee	Amount Approved	Amount Billed	90% Payment	Audit Exceptions	10% Retainage	Outstanding Balance
HOPKINS SH 11 ROW CSJ 0083-03-046 SH 19 0108-09-039	Verizon	No	ROW	Approved	U11114: Relocation is complete. NR	Complete	Keith Hollje						
	TXU Electric	Yes	ROW	Approved	U11655: Relocation & Reimbursement is complete	Complete	Keith Hollje	$ 74,397.96	$ 62,850.69	$ 56,565.62	$ -	$ 6,285.07	$ -
	Atmos Energy (Trans)	Yes	ROW	Approved	U12208: Relocation & Reimbursement is complete	Complete	Mike Powers	$ 235,912.59	$ 184,436.76	$ 165,993.08	$ -	$ 18,443.68	$ -
	Atmos Energy (Distribution)	No	ROW	Approved	U12446: Relocation is complete. NR	Complete	Mike Powers						
	SS Water & Sewer	No	ROW	Approved	U12450: Relocation is complete. NR	Complete	Mike Powers						
	TXU Distribution	No	ROW	Approved	U12614: Relocation is complete. NR	Complete	Mike Powers						
	Sudden Link Communication	No	AO	Approved	Relocation is complete by Permit. NR	Complete	Tim Taylor						
	People's Telephone	No	AO	Approved	Relocation is complete by Permit. NR	Complete	Tim Taylor						
	Shady Grove WSC	No	AO	Approved	Relocation is complete by Permit. NR	Complete	Tim Taylor						
								$ 310,310.55	$ 247,287.45	$ 222,558.70	$ -	$ 24,728.75	$ -
HUNT US 380 ROW CSJ 0135-06-022	Caddo Basin	Yes	ROW	Approved	U11423: Relocation & Reimbursement is complete.	Complete	Mike Powers	$ 853,746.47	$ 783,618.01	$ 705,256.21	$ -	$ 78,361.80	$ -
	Verizon	No	ROW	Approved	U11450: Relocation is complete. NR	Complete	Mike Powers						
	One OK Pipeline	Yes	ROW	Approved	U11523: Relocation is complete. Reimbursement has not been submitted.	Complete	Keith Hollje	$ 229,170.00	$ -	$ -	$ -	$ -	$ 229,170.00
	Cap Rock Energy	Yes	ROW	Approved	U11524: Relocation & Reimbursement is complete.	Complete	Mike Powers	$ 741,668.69	$ 741,668.69	$ 667,388.42	$(27,771.80)	$ 46,508.47	$ -
	AT&T	No	ROW	Approved	U11526: Relocation is complete. NR	Complete	Mike Powers						
	Explorer	Yes	ROW	Approved	U11534: Relocation & Reimbursement is complete.	Complete	Keith Hollje	$ 191,805.22	$ 201,206.44	$ 181,085.80	$ -	$ 20,120.64	$ -
	Energy Transfer (Gas)	Yes	ROW	Approved	U11695: Relocation is complete. Reimbursement returned to Utility 4/29/09. No Coorespondence!	Complete	Mike Powers	$ 370,006.39	$ 420,136.25	$ -	$ -	$ -	$ 370,006.39
	GEUS	No	ROW	Approved	U11850: Relocation is complete. NR	Complete	Mike Powers						
	AT&T	No	ROW	Approved	U12358: Relocation is complete. NR	Complete	Mike Powers						
	TMPA	No	n/a	n/a	No effect (no adjustment required)	n/a	Mike Powers						
	Comcast	No	n/a	n/a	No effect (no adjustment required)	n/a	Mike Powers						
	Kinder-Morgan	No	n/a	n/a	No effect (no adjustment required)	n/a	Mike Powers						
								$ 2,386,396.77	$2,146,629.39	$ 1,553,730.43	$(27,771.80)	$144,990.91	$ 599,176.39
HUNT US 380 ROW CSJ 0135-07-037	AT&T	No	ROW	Approved	U11525: Relocation is complete. NR	Complete	Mike Powers						
	Atmos Energy (Pipeline)	Yes	ROW	Approved	U12012: Relocation & Reimbursement is complete.	Complete	Mike Powers	$ 193,912.59	$ 73,187.29	$ 65,868.56	$ -	$ 7,318.73	$ -
	Atmos Energy (Distribution)	No	ROW	Approved	U12013: Relocation is complete. NR	Complete	Mike Powers						
	Caddo Basin	Yes	ROW	Approved	U12026: Relocation & Reimbursement is complete.	Complete	Mike Powers	$ 851,005.00	$ 383,518.60	$ 345,166.74	$ -	$ 38,351.86	$ -
	TMPA	Yes	ROW	Approved	U12076: Relocation is complete. Supplemental Agreement approved 8/06/09.	Complete	Mike Powers	$ 514,097.06	$ 516,702.66	$ 462,196.85	$ -	$ 51,355.21	$ 51,355.21
	GEUS	No	ROW	Approved	U12077: Relocation is complete. NR	Complete	Mike Powers						
	TXU Electric(Transmission)	No	ROW	Approved	U12079: Relocation is complete. NR	Complete	Mike Powers						
	GEUS	Yes	ROW	No	U12445: Utility Package approved 5/19/09. Utility working on relocation.	35%	Mike Powers	$ 88,073.29	$ -	$ -			$ 88,073.29
	City of Greenville (Water)	No	AO	n/a	City has already moved utility on private easement. (no agreement required)	n/a	Mike Powers						
	City of Greenville (Sewer)	No	AO	n/a	City has already moved utility on private easement. (no agreement required)	n/a	Mike Powers						
	Cap Rock Energy	No	AO	n/a	No effect (no adjustment required)	n/a	Mike Powers						
								$ 1,447,087.94	$ 973,408.55	$ 873,232.15	$ -	$ 97,025.80	$ 139,428.50

This utility conflict matrix was provided by the Texas DOT. This utility conflict matrix contains a large number of data items. Note the emphasis on business process tracking and tracking of cost items.

[handout]



Part of the research effort was to gather information from state DOTs about ideas that worked in relation to utility conflict management (in general) and utility conflict matrices (in particular).

Recommendations for best practices from state DOTs were grouped into three general categories: UCM, utility conflict management, and other. This slide focuses on UCM-level recommendations.

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

2-62

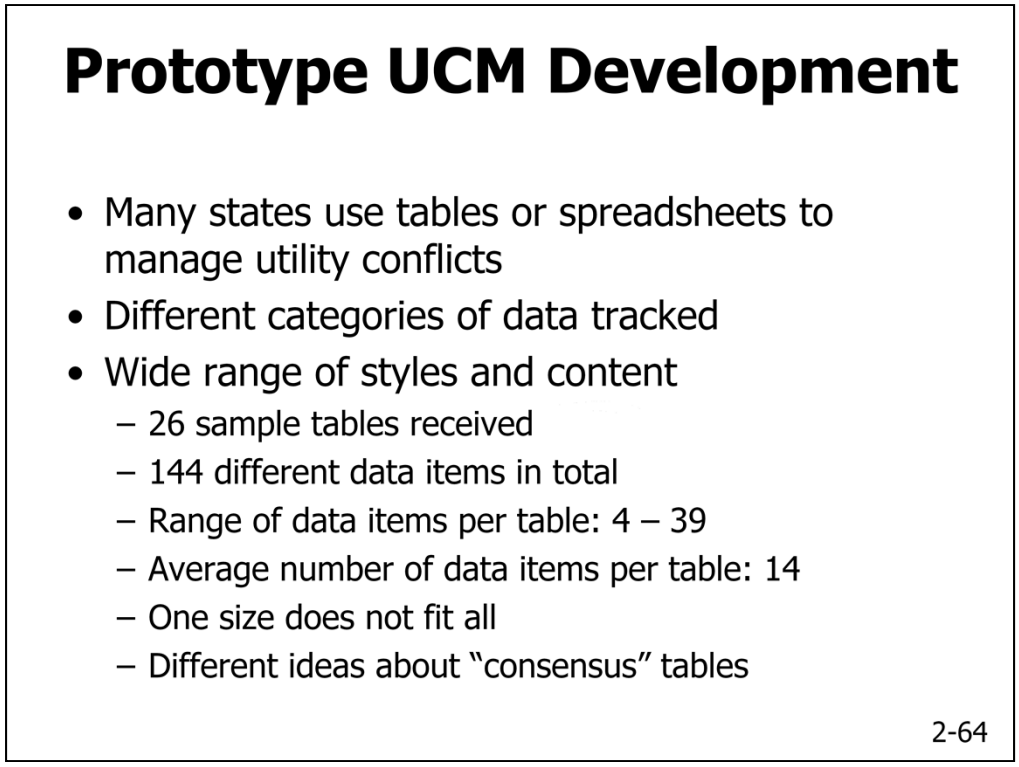
This slide focuses on recommendations dealing with utility conflict management activities.

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

2-63

This slide focuses on other general recommendations for optimization of business practices.

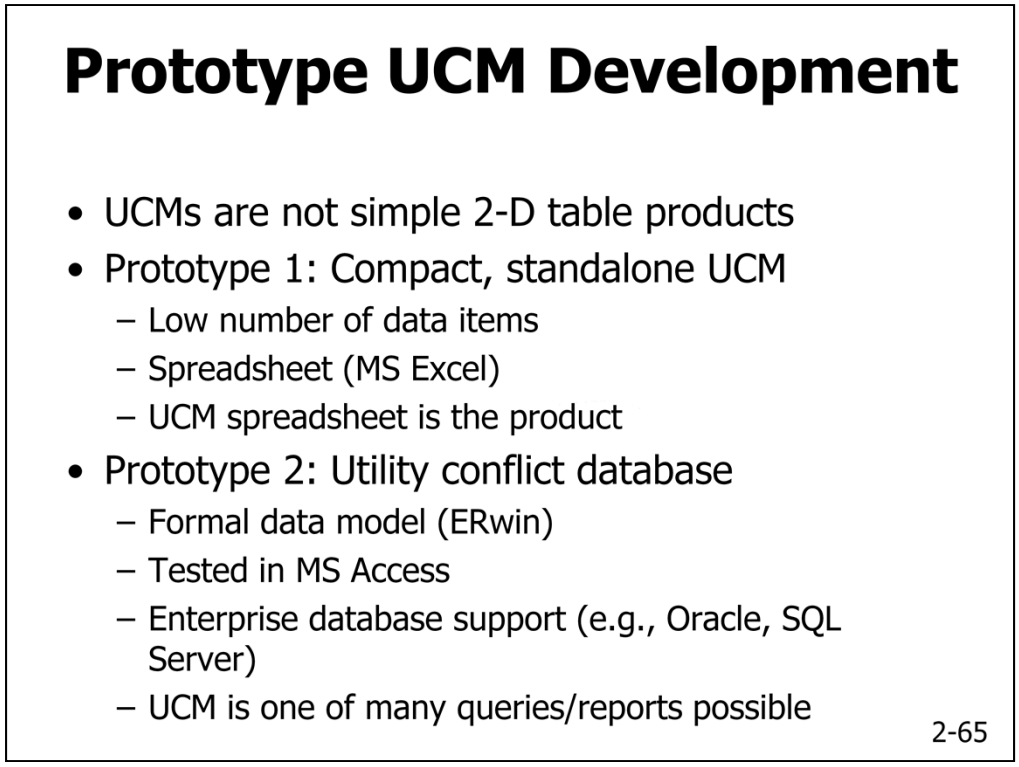


Feedback from state DOTs revealed the common use of UCMs to manage utility conflicts, although practices differ widely.

Two critical observations are:

• One size DOES NOT fit all

• Very different ideas about "consensus" tables. A "consensus" table was developed in Florida by an interagency committee composed of utility representatives, FDOT representatives, and consultants. Another "consensus" table was developed in California by a committee composed of California DOT representatives. Although the purpose of both tables was the same (to help manage utility conflicts effectively), the decision making process (and the final products) were quite different.



Once the information from the states was received and processed, the next step was to develop a prototype UCM concept.

From the information provided, it became immediately evident that UCMs were not simple 2-D table products (Note: 2-D in a "tabular" sense, not in a "geographic" sense). To take this reality into consideration, the research team developed two UCM prototypes:

• Prototype 1 (Compact, standalone UCM). This is a template in Excel that contains a limited number of columns (i.e., the minimum number of columns for a UCM to provide meaningful information). In this case, the UCM spreadsheet is the product.

• Prototype 2 (Database-level UCM). This is a data model for managing utility conflicts and prototype Access database that provides a physical representation of the data model. The data model is generic and was built using industry standard procedures. The data model is in ERwin Data Modeler format, and can be easily exported to a variety of database environments (e.g., Oracle, SQL Server). In this case, the UCM is actually one of many queries or reports possible.

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

2-66

This slide summarizes the steps to select the data items for the standalone UCM. In essence, the process involved analyzing the sample data received; analyzing survey conflict and facility data; consolidating, rating, and ranking data; and identifying which data items to include in the UCM.

The composite list of data items resulted from ranking data items according to use in the sample documents, ranking data items according to the frequency reported in the survey, and by combining the rankings from these data sources.

The research team then chose 25 data items to include in the standalone UCM, based on group discussions and the ranking of the data items.

Prototype 1: Utility Conflict Matrix

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

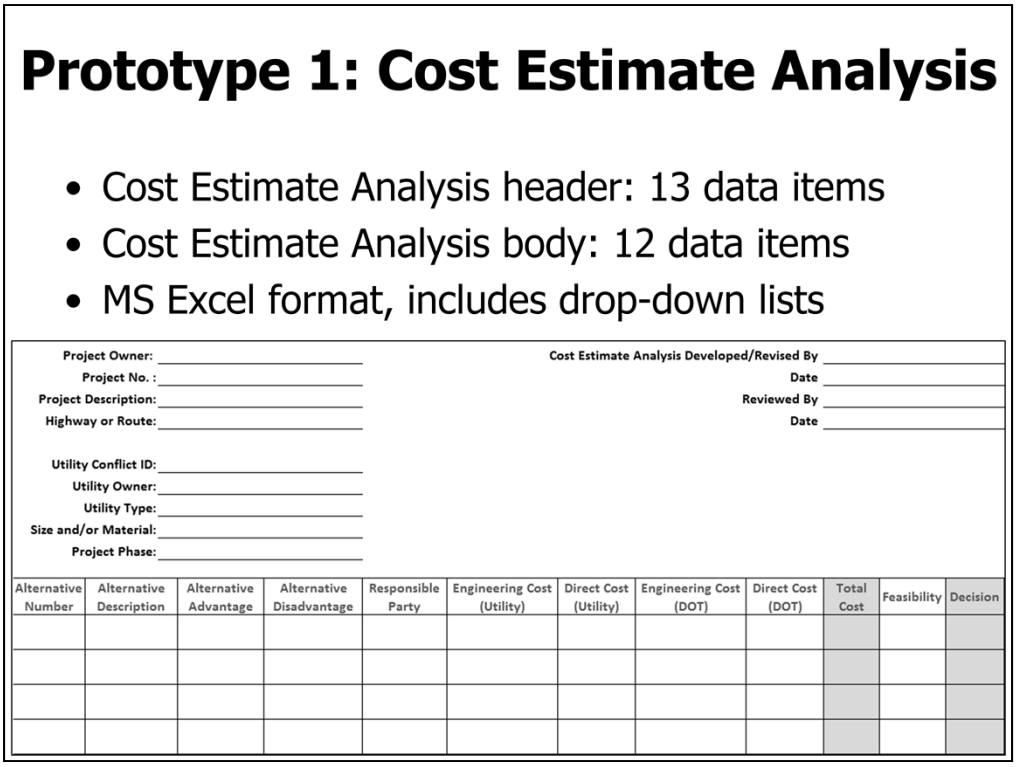
Project Owner: _____ Utility Conflict Matrix Developed/Revised By: _____
Project No. : _____ Date: _____
Project Description: _____ Reviewed By: _____
Highway or Route: _____ Note: refer to subsheet for utility conflict cost analysis. Date: _____

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

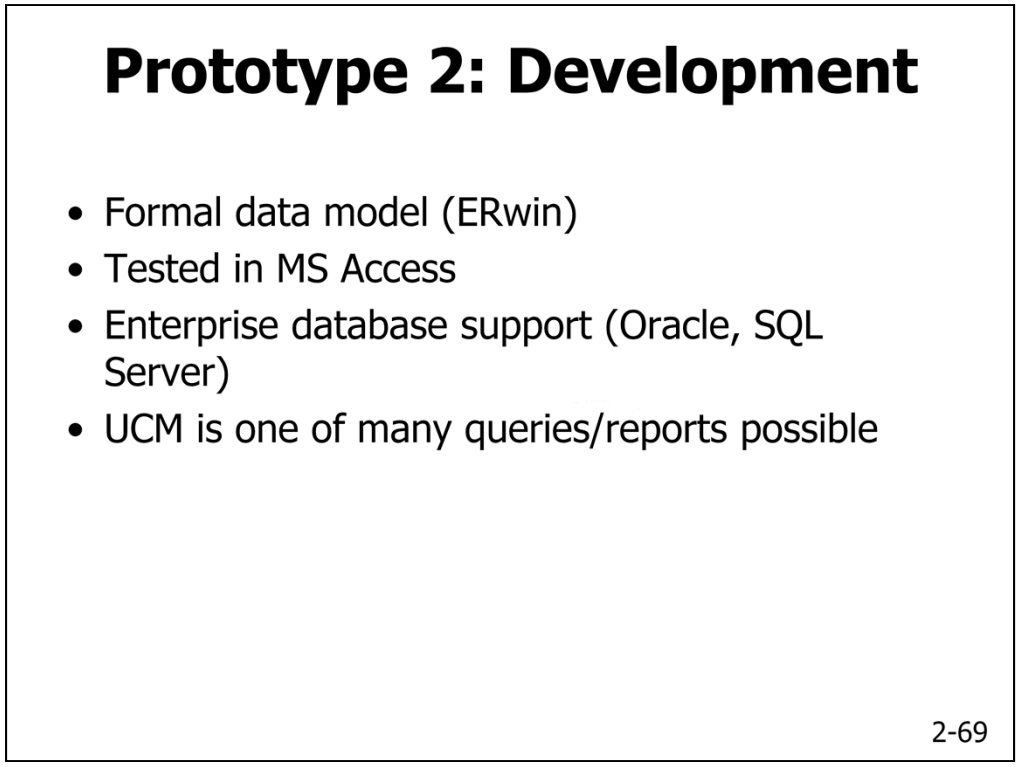
2-67

This slide shows the template UCM as developed by the research team.

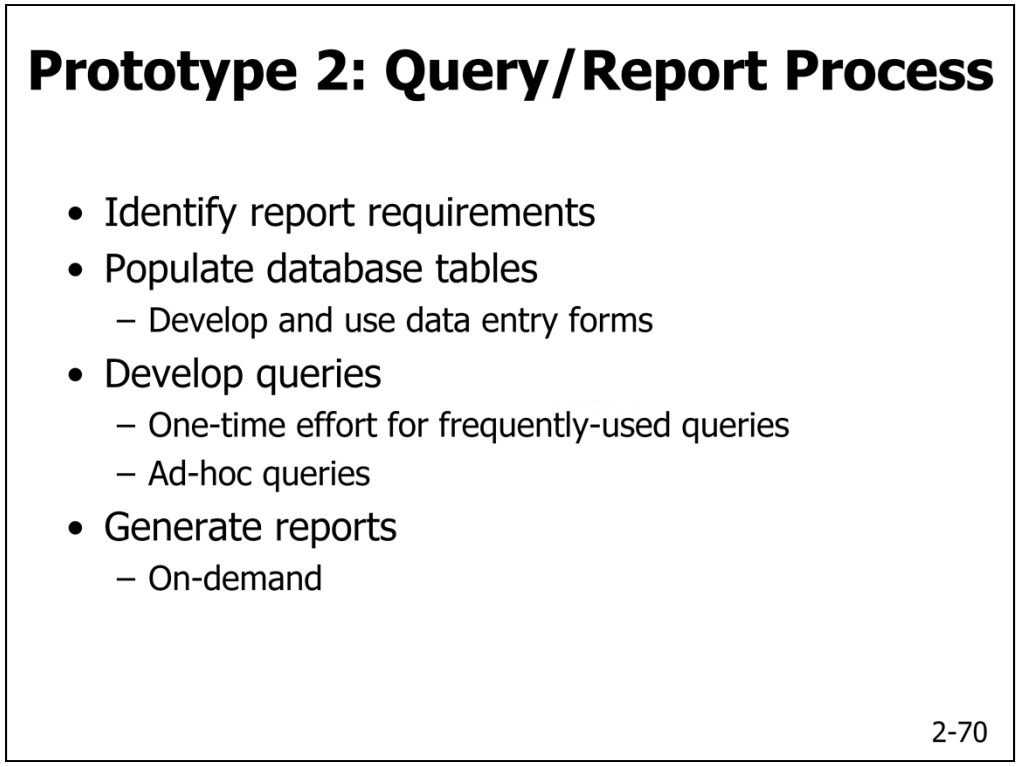
The prototype UCM includes 8 header data items and 15 main body data items. It also includes several drop-down lists to provide some automation to the process of populating the UCM.



One of the data items in the initial version of the prototype standalone UCM was cost estimate. During work sessions with a sample of states to discuss properties and features of the prototype UCM, it became clear that having just one field to capture costs was not adequate. For example, this field would not enable an accurate depiction of which agency would be responsible for which costs. It would also not document the process used to select a utility conflict resolution strategy. This realization resulted in the need to use a second table to analyze costs and other elements associated with each utility conflict resolution strategy. This slide shows the design of the prototype sub-table developed as part of the research.



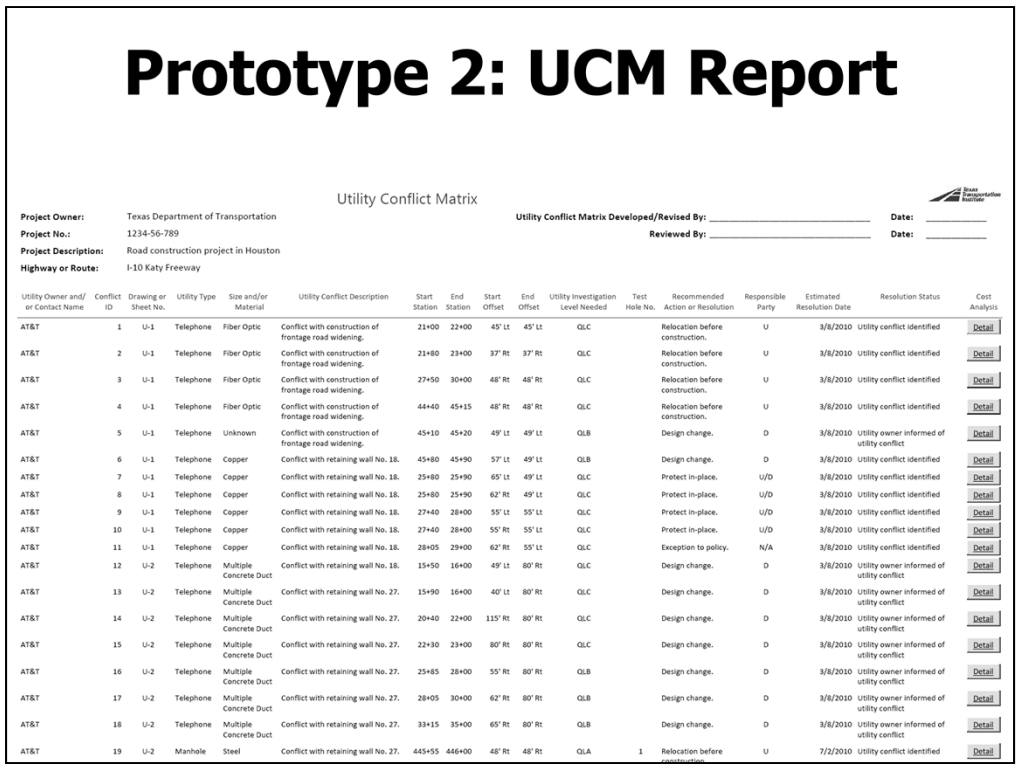
As mentioned previously, Prototype 2 is a data model for managing utility conflicts and a prototype Access database that provides a physical representation of the data model. The data model is generic and was built using industry standard procedures. The data model is in ERwin Data Modeler format, and can be easily exported to a variety of database environments (e.g., Oracle, SQL Server). In this case, the UCM is actually one of many queries or reports possible.



The next step after developing the logical model was to develop a physical representation in Access, and then develop queries and reports to produce UCMs.

This slide summarizes the main steps for the physical implementation of the prototype database.

Prototype 2: UCM Report



Utility Conflict Matrix

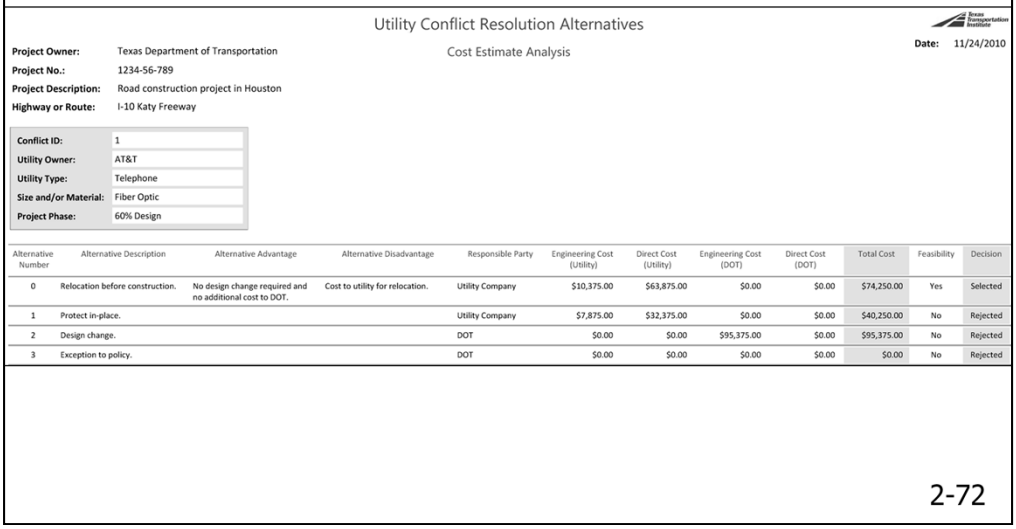
Project Owner: Texas Department of Transportation
Project No.: 1234-56-789
Project Description: Road construction project in Houston
Highway or Route: I-10 Katy Freeway

Utility Conflict Matrix Developed/Revised By: _____ **Date:** _____
Reviewed By: _____ **Date:** _____

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 No.	Recommended Action or Resolution	Responsible Party	Estimated Resolution Date	Resolution Status	Cost Analysis
AT&T	1	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	21+00	22+00	45' Lt	45' Lt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	2	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	21+80	23+00	37' Rt	37' Rt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	3	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	27+50	30+00	48' Rt	48' Rt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	4	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	44+40	45+15	48' Rt	48' Rt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	5	U-1	Telephone	Unknown	Conflict with construction of frontage road widening.	45+10	45+20	49' Lt	49' Lt	QLB		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	6	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	45+80	45+90	57' Lt	49' Lt	QLB		Design change.	D	3/8/2010	Utility conflict identified	Detail
AT&T	7	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	25+80	25+90	65' Lt	49' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	8	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	25+80	25+90	62' Rt	49' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	9	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	27+40	28+00	55' Lt	55' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	10	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	27+40	28+00	55' Rt	55' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	11	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	28+05	29+00	62' Rt	55' Lt	QLC		Exception to policy.	N/A	3/8/2010	Utility conflict identified	Detail
AT&T	12	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 18.	15+50	16+00	49' Lt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	13	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	15+90	16+00	40' Lt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	14	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	20+40	22+00	115' Rt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	15	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	22+30	23+00	80' Rt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	16	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	25+85	28+00	55' Rt	80' Rt	QLB		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	17	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	28+05	30+00	62' Rt	80' Rt	QLB		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	18	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	33+15	35+00	65' Rt	80' Rt	QLB		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	19	U-2	Manhole	Steel	Conflict with retaining wall No. 27.	445+55	446+00	48' Rt	48' Rt	QLA	1	Relocation before construction.	U	7/2/2010	Utility conflict identified	Detail

The final outcome of this example is the utility conflict matrix report as shown here in report view. Note the buttons on the right labeled “Detail”, which are placeholders to provide a link to cost estimate analysis sub reports.

Prototype 2: Sub Report



Utility Conflict Resolution Alternatives

Cost Estimate Analysis

Date: 11/24/2010

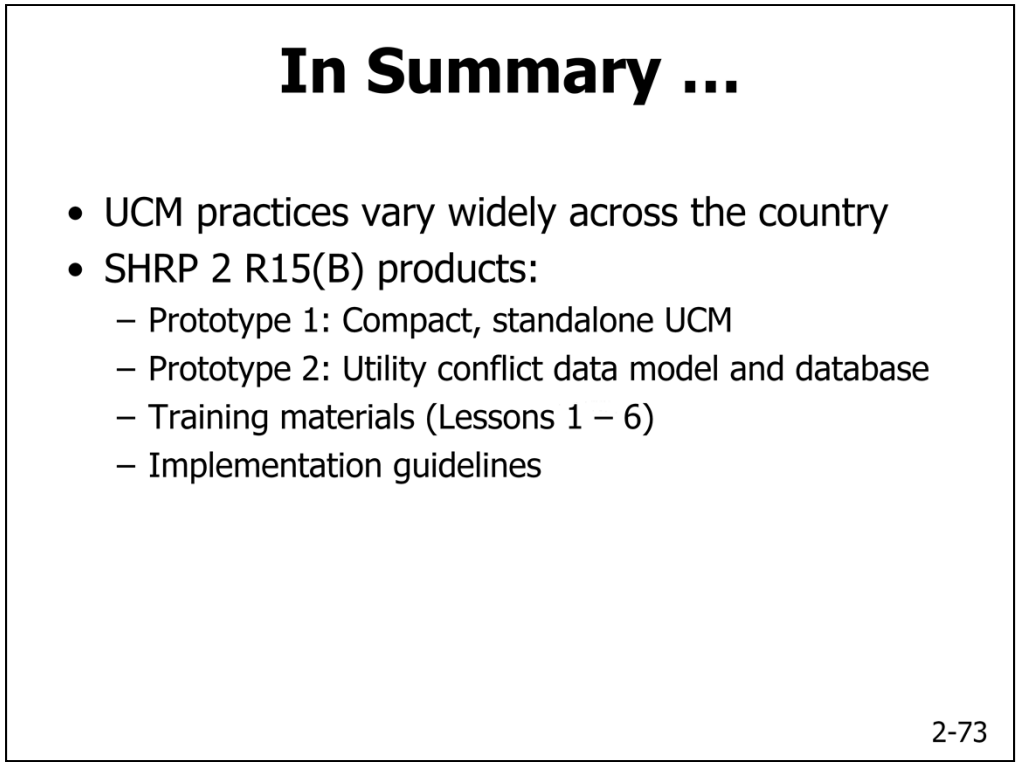
Project Owner: Texas Department of Transportation
Project No.: 1234-56-789
Project Description: Road construction project in Houston
Highway or Route: I-10 Katy Freeway

Conflict ID:	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 (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision
0	Relocation before construction.	No design change required and no additional cost to DOT.	Cost to utility for relocation.	Utility Company	$10,375.00	$63,875.00	$0.00	$0.00	$74,250.00	Yes	Selected
1	Protect in-place.			Utility Company	$7,875.00	$32,375.00	$0.00	$0.00	$40,250.00	No	Rejected
2	Design change.			DOT	$0.00	$0.00	$95,375.00	$0.00	$95,375.00	No	Rejected
3	Exception to policy.			DOT	$0.00	$0.00	$0.00	$0.00	$0.00	No	Rejected

2-72

This slide shows sample records for the cost estimate analysis in connection with the first utility conflict from the previous slide.



In response to the varying use of UCMs across the country, the research team developed two products:

- Prototype 1 is a compact standalone UCM in Excel format that uses 23 data items and can be immediately used.
- Prototype 2 is an flexible, scalable data model and database that can accommodate a large number of UCMs. Depending on the level of implementation, involvement by IT personnel at the DOT may be necessary.
- Training materials for this course.
- Guidelines for the implementation of the prototypes and training.

2.3
Questions and Answers

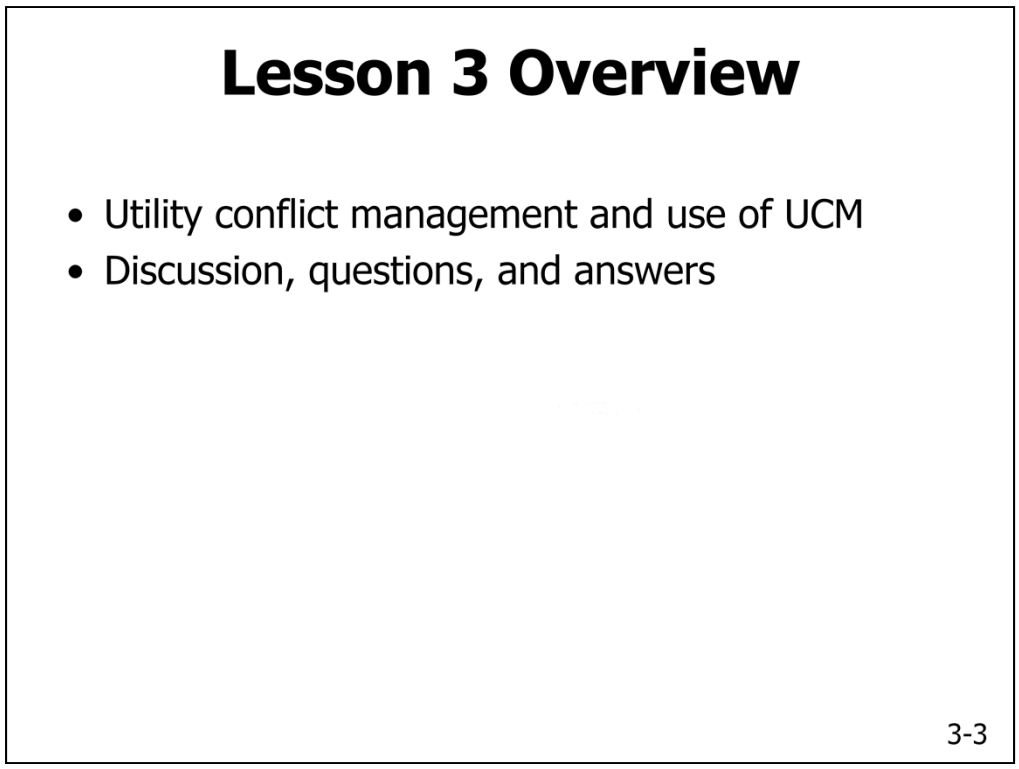
2-74

Lesson 3

Utility Conflict Identification and Management

3-1

This section of the training is Lesson 3, which deals with the identification and management of utility conflicts.



Purpose of Lesson 3:

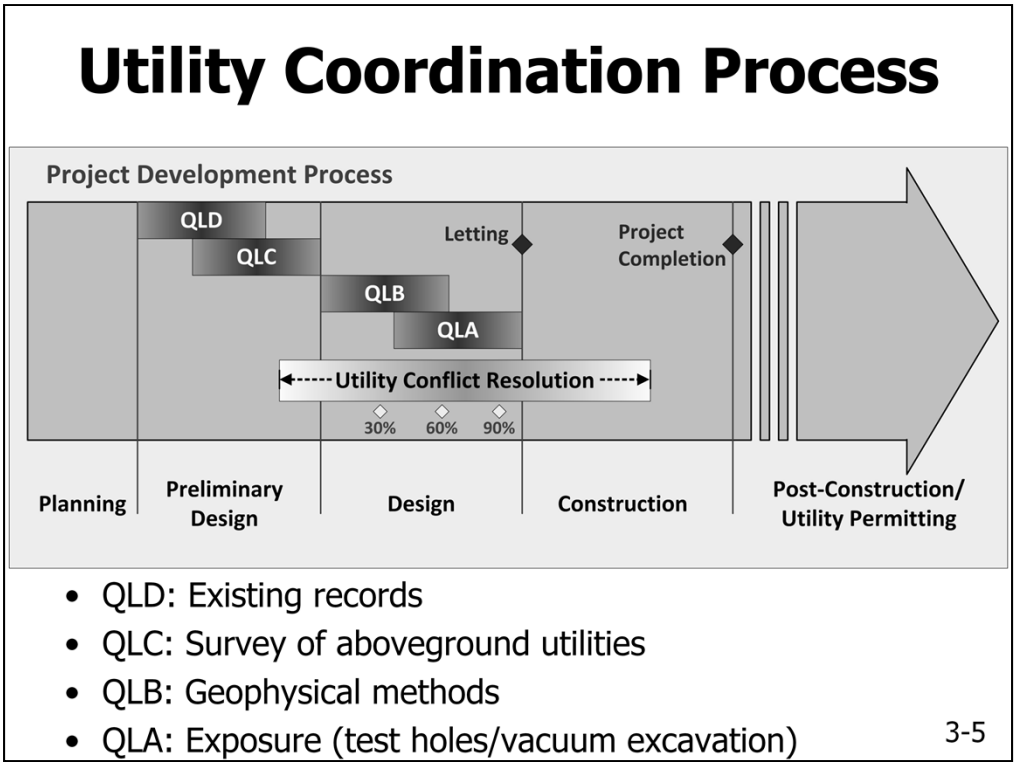
- Provide an overview of utility conflict management strategies and concepts, and the use of the utility conflict matrix to manage utility conflicts.

The lesson concludes with a brief discussion of questions and answers.

3.1

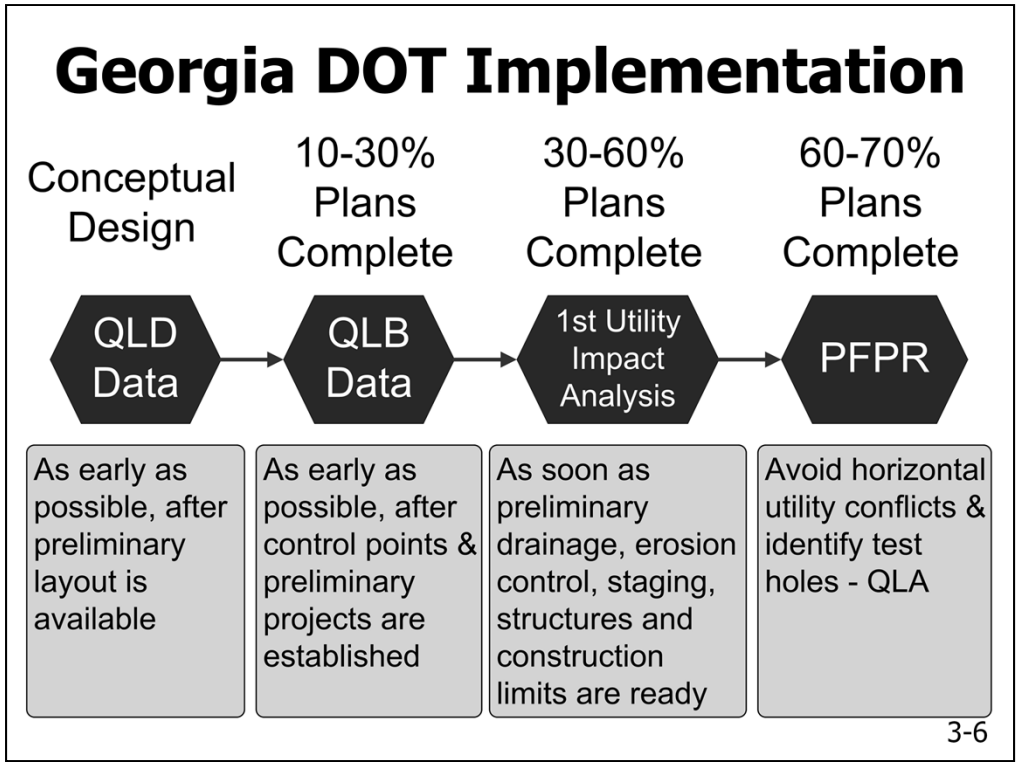
Utility Conflict Management and Use of UCM

3-4



This slide focuses on a portion of the project development process, the utility coordination process, which may span the entire project development process from planning to post-construction. Utility conflict resolution is a portion of the utility coordination process that typically occurs at the end of preliminary design and should complete before the begin of construction.

To function properly, the utility coordination process needs utility data input, which occurs at different times of the process. Typically, as time progresses, the utility information becomes more detailed and precise. Although any type of utility data can be collected at any time of the project development process, it is typical to collect QLD and QLC data during preliminary design, and QLB and QLA data during the detailed design phase.



The previous slide was a generic representation of the utility coordination process. Different states might have different implementations of this generic model. For example, this slide shows the Georgia DOT (GDOT) process, which focuses on conducting utility investigations systematically, conducting utility conflict analysis at critical points during the design phase, and resolving utility conflicts before projects go to letting.

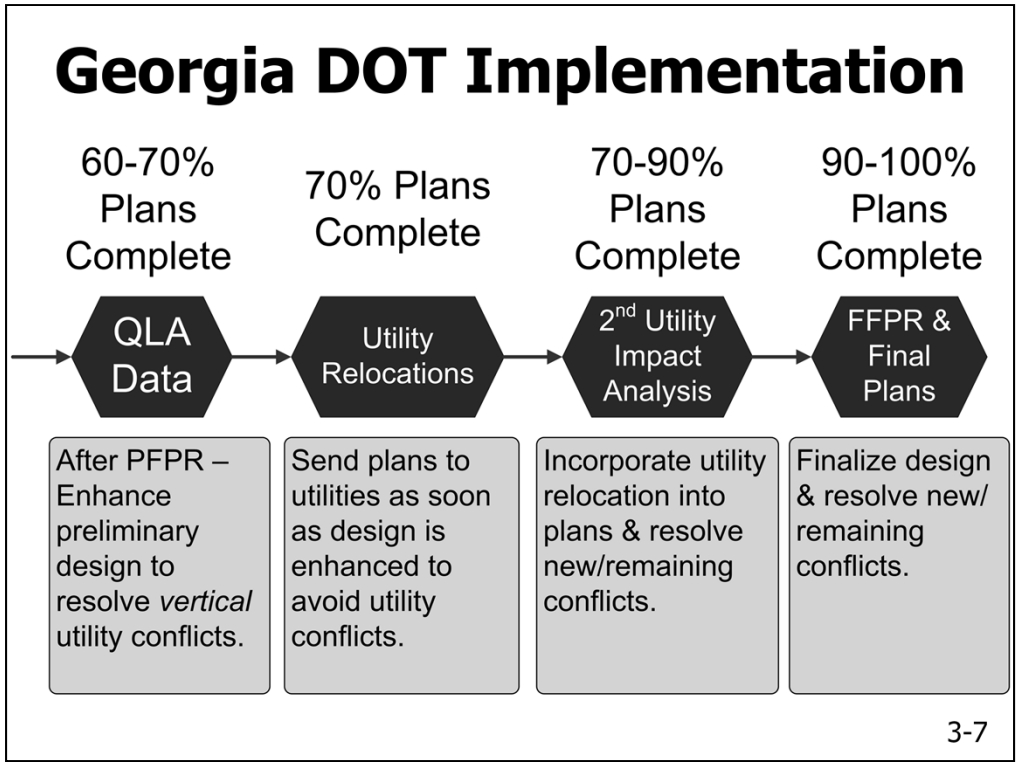
In the GDOT model:

• QLD data is collected as early as possible, once a preliminary layout (or conceptual design) is available.

• QLB data is collected after control points and preliminary project limits are established, typically when the design is about 10-30% complete.

• As soon as preliminary drainage, erosion control, staging, structures, and construction limits are established (30-60% design), the DOT conducts the first utility impact analysis.

• Once the design is 60-70% complete, GDOT conducts a preliminary field plan review (PFPR) to determine which horizontal utility conflicts are avoidable by changes to the design and which locations require test holes (QLA).



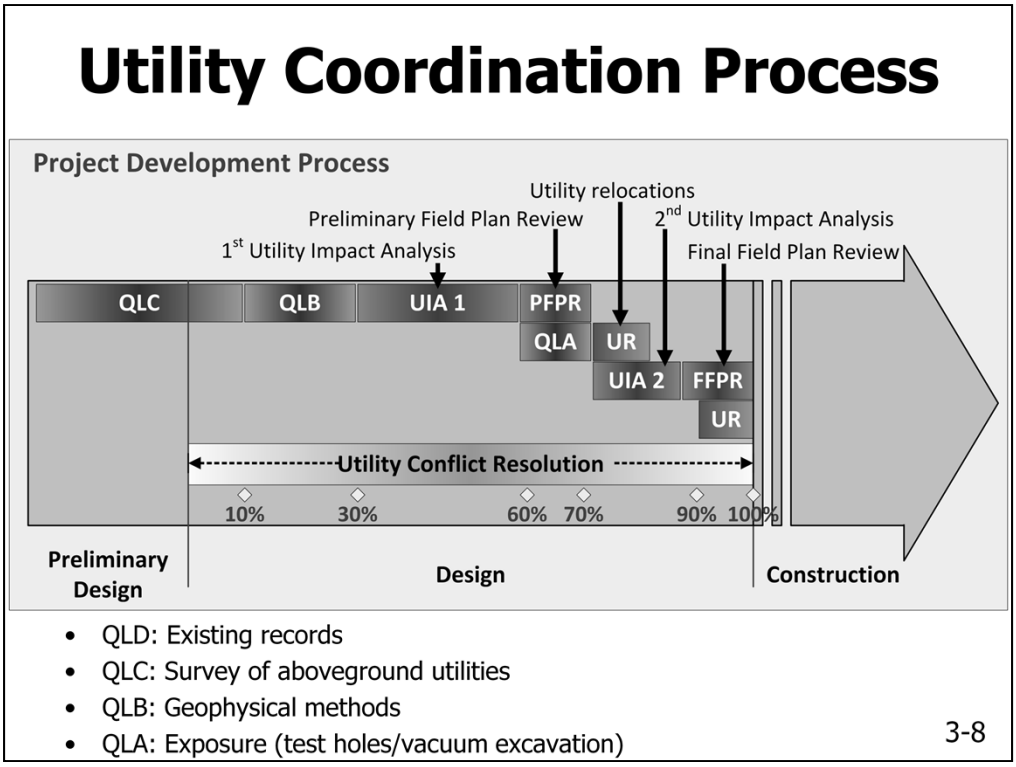
• After the preliminary field plan review is complete and QLA is collected, GDOT reviews the design to determine if any vertical utility conflicts can be resolved.

• When plans are 70% complete, GDOT sends plans to utilities to schedule utility relocations of remaining conflicts.

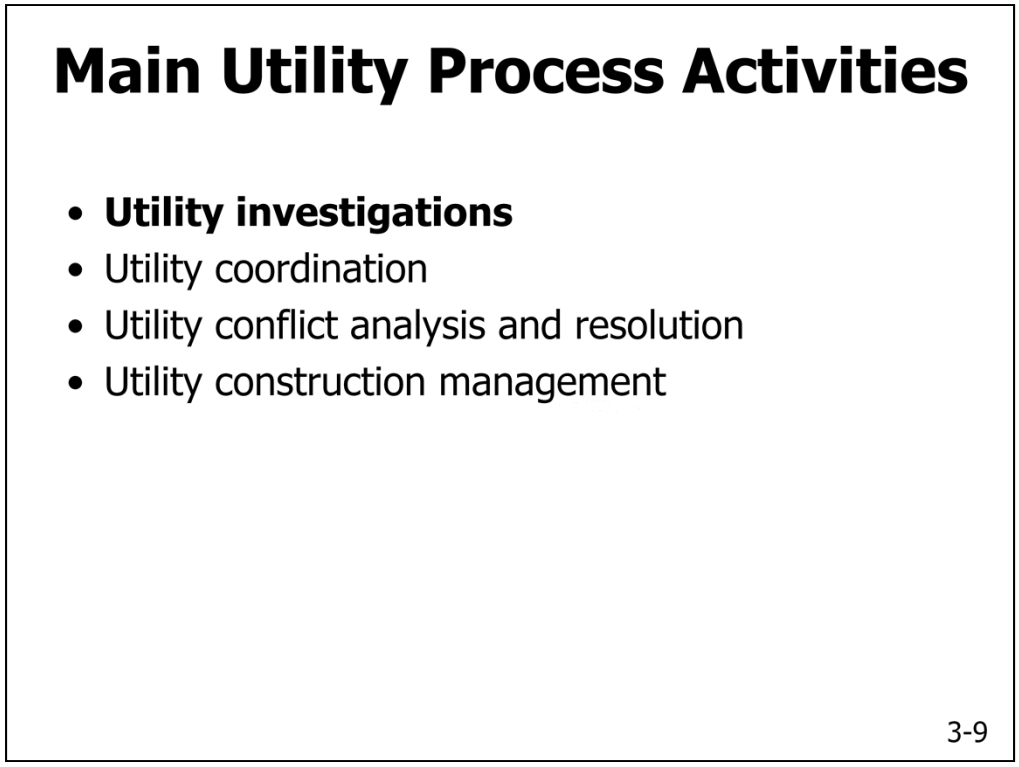
• At about 70-90% design, GDOT conducts a second utility impact analysis, which incorporates utility relocations into the design plans and resolves any new or remaining conflicts.

• At about 90-100% design, GDOT conducts the final field plan review, finalizes design, and resolves any new or remaining conflicts.

GDOT's goal is to have all conflicts resolved by the time the transportation project design is finalized.



This slide shows the GDOT implementation of the utility coordination process in a different view. Note that QLA data collection occurs concurrently with the preliminary field plan review (PFPR). Similarly, utility relocations occur concurrently with the second utility impact analysis and with the final field plan review (FFPR).



The utility process can be defined by the following main utility process activities:

• Utility investigations, including QLD, QLC, QLB, and QLA data collection.

• Utility coordination.

• Utility conflict analysis and resolution.

• Utility construction management, including construction inspections.

• Development of scopes of services, for both internal and external forces, including the benefits of standardization.

The following slides cover each main process activity in detail.

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

Utility investigations characterize subsurface and above ground utility installations at different quality levels. QLD (sometimes called a “records search”) and QLC are often performed by DOT staff, while QLB and QLA are typically performed by consultants.

The ASCE standard contains the following:

• Definitions

• Engineer and owner tasks

• Descriptions of actions necessary to achieve specific quality levels

• Formatting of deliverables

• Relative costs and benefits of various quality levels

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

QLD utility investigations collect data from existing records or oral recollections. This may include the following:

• 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 are composite drawing depicting QLD facilities.

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)

3-12

QLC utility investigations survey and plot visible utility appurtenances and make inferences about underground linear utility facilities that connect those appurtenances. QLC utility investigations may include the following activities:

• Survey using project datum and specifications (e.g., valve covers, junction boxes, and manhole covers)

• Correlate utility records to surveyed features

• Resolve discrepancies

Deliverables are composite drawings including QLC and QLD data.

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)

3-13

Positional inaccuracies in QLD data can range from several feet to several hundred feet. To avoid these problems, QLB utility investigations use a variety of noninvasive surface geophysical methods, including electromagnetic and radar techniques, to determine the approximate horizontal position of subsurface utilities. QLB utility investigations are characterized by the following:

• 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

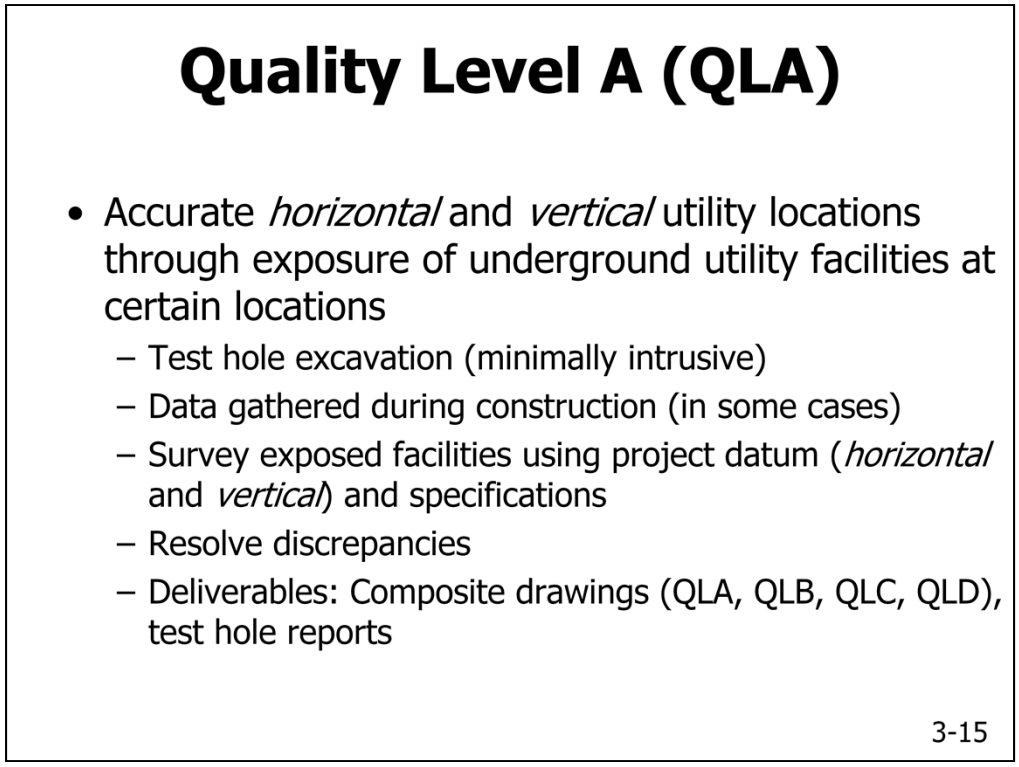
• Correlate utility records to surveyed features

• Resolve discrepancies

Deliverables are composite drawings including QLB, QLC, and QLD data.

These images provide a few examples of QLB data collections.

- Picture 1 shows a technician using a pipe and cable locator and painting marks on the ground to designate the approximate horizontal position of a subsurface utility.
- Picture 2 shows a technician tracing the location of utility lines using a hand-held device.
- Picture 3 shows a technician tracing the location of utility lines.
- Picture 4 shows a technician tracing the location of utility lines.



QLA utility investigations determine accurate horizontal and vertical utility locations through exposure of underground utility facilities at certain locations. QLA utility investigations may include the following activities:

• Test hole excavation (minimally intrusive)

• Data gathered during construction (in some cases)

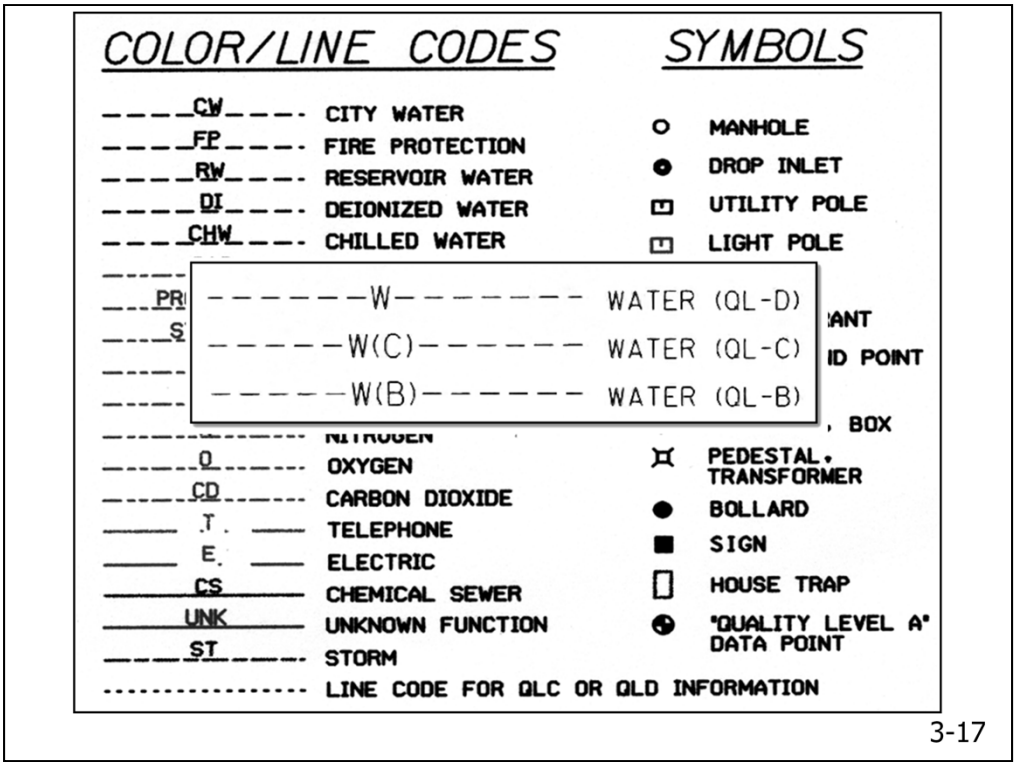
• Survey exposed facilities using project datum (horizontal and vertical) and specifications

• Resolve discrepancies

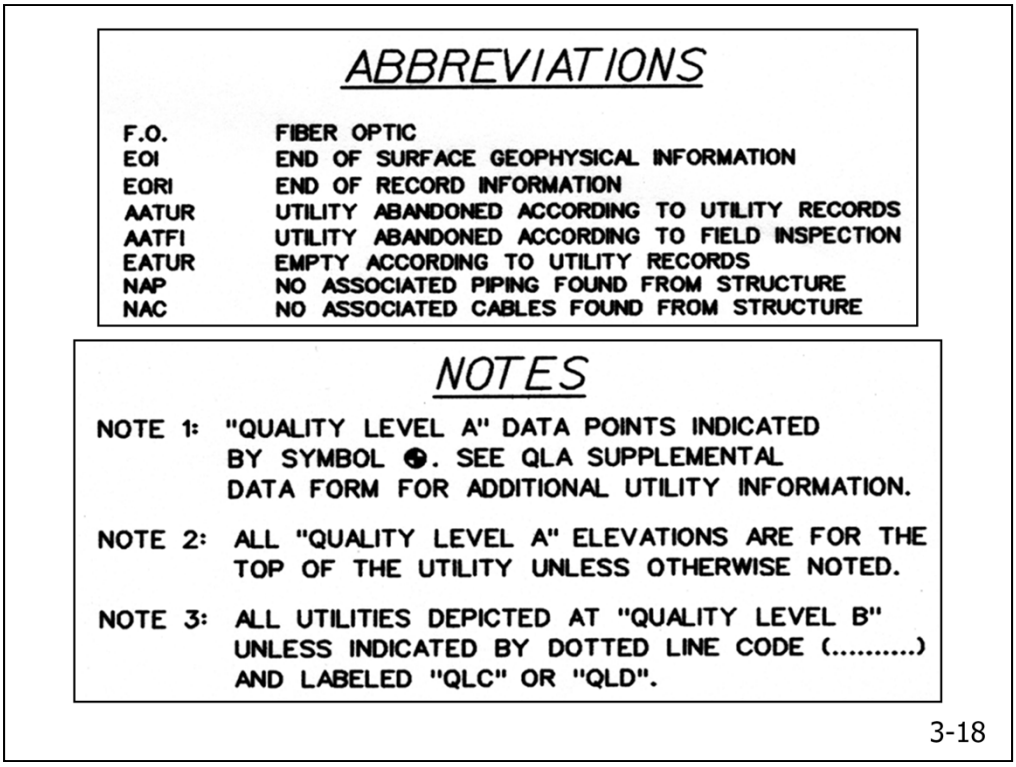
Deliverables are composite drawings including QLA, QLB, QLC, and QLD data, and test hole reports, which include information about the top/bottom of utilities, grade, outside diameter, material, pavement thickness, soil conditions, and other.

These images provide a few examples of QLA data collections.

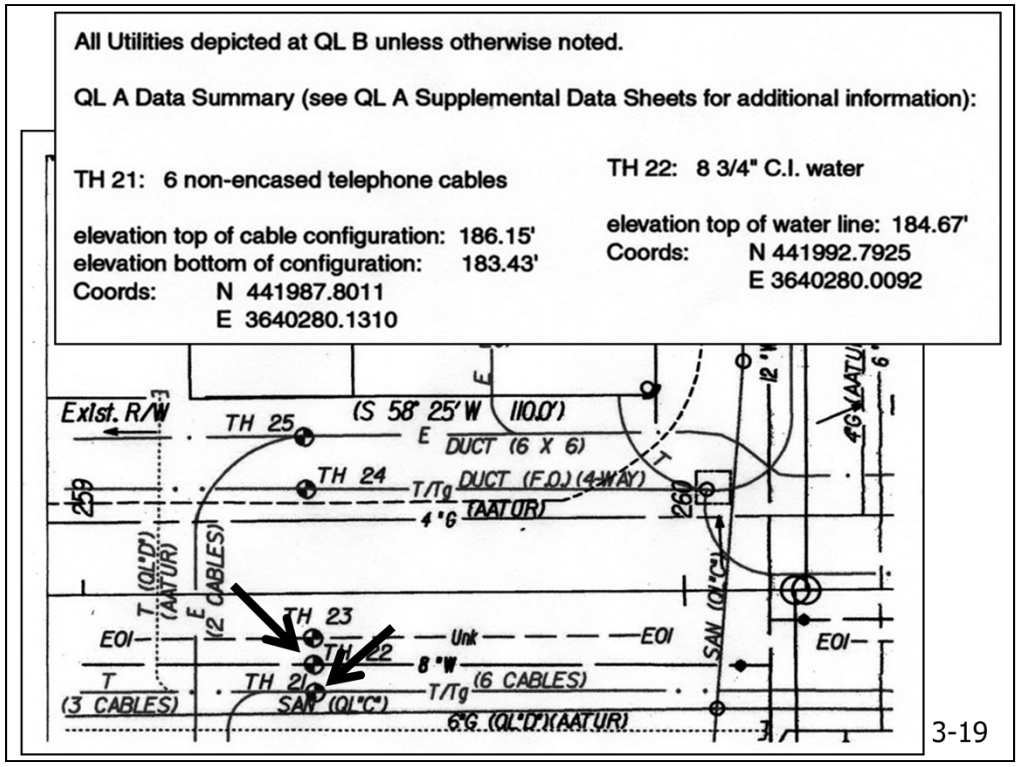
- Picture 1 shows a technician using an air lance and a nondestructive vacuum excavator to dig a test hole to locate an underground utility line along a road in Las Vegas, NV.
- Picture 2 shows a technician using an air lance to loosen soil during a project in Las Vegas, NV, in conjunction with a nondestructive vacuum excavation to locate an underground utility line.
- Picture 3 shows a technician measuring the top of the utility line from the surface.



Typical symbology for utility investigation data used on project design sheets. Notice the different line codes for QLB, QLC, and QLD data.



Abbreviations and notes block for utility investigation data used on design sheets.



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Example of test hole report that relates to data on design sheets. This excerpt from the test hole report provides information about test holes 21 and 22.

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.) in. ☑ mm. ☐	Approx. Station	Approx. Offset Distance ft. ☑ m. ☐ L	R	Offset From	Manual Depth (Top) ft. ☑ m. ☐	Cross Sectional View	Utility Direction (N/W/E/S)	ID'd By	Surface Type	Pvmnt. Thick-ness in. ☑ mm. ☐
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	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	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

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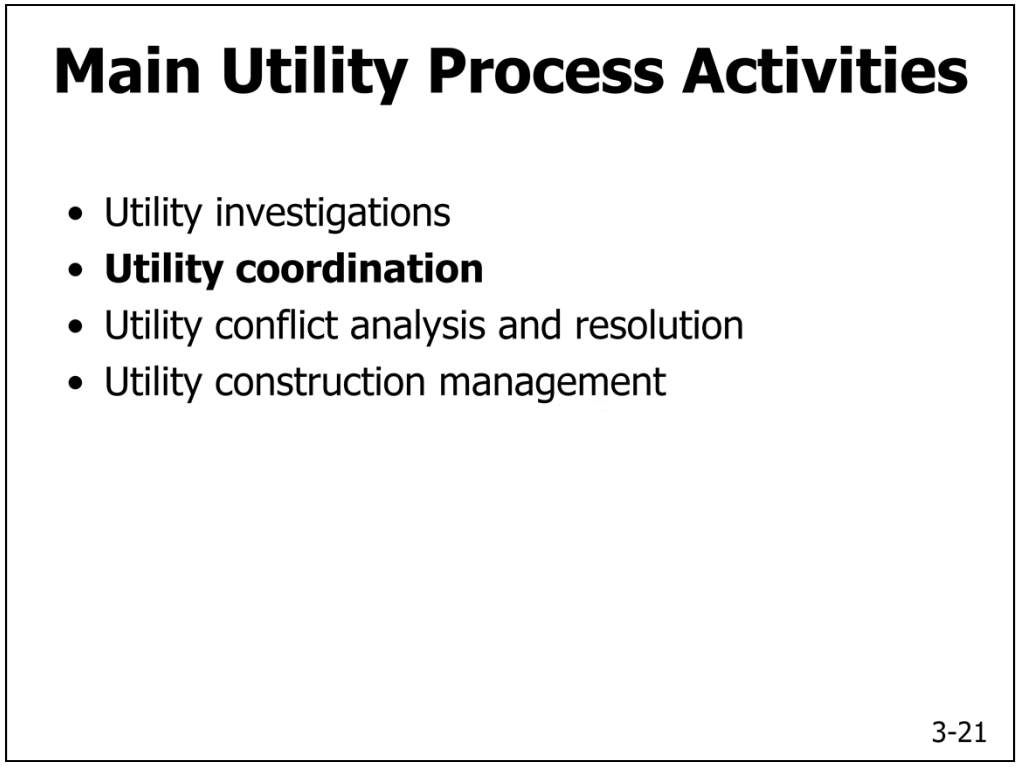
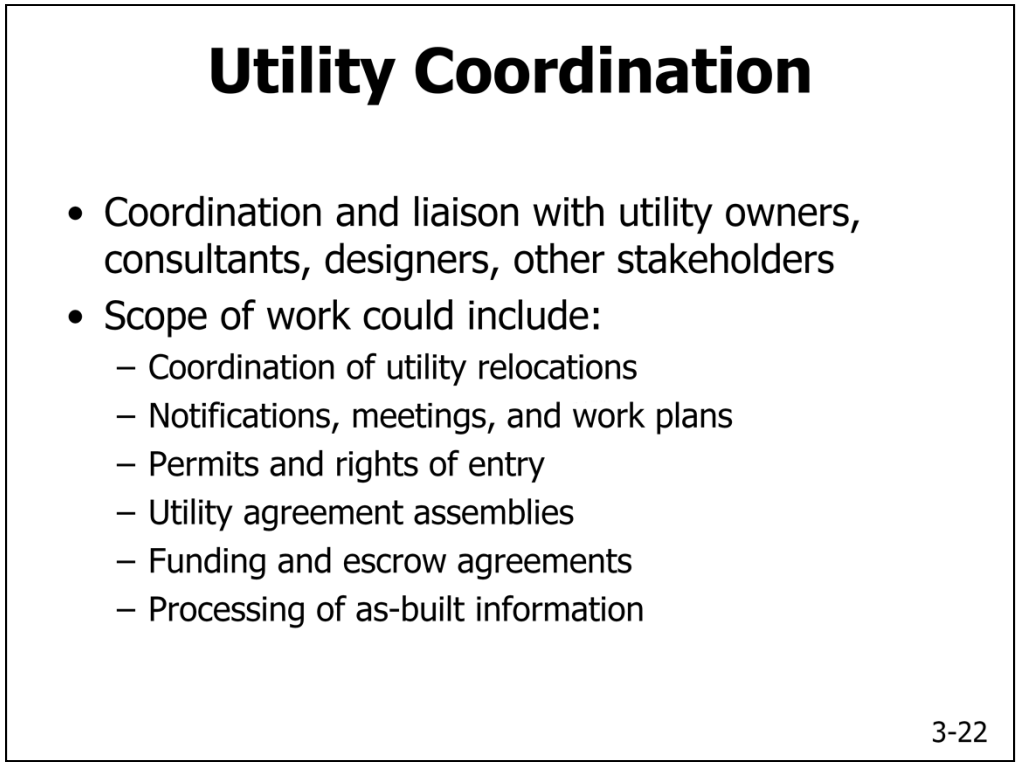
Example of test hole report

[handout]



The following slide focus on the utility coordination aspect of the utility process.



The main activities of utility coordination are coordination and liaison with utility owners, consultants, designers, other stakeholders. A scope of work could include the following:

• Coordination of utility relocations

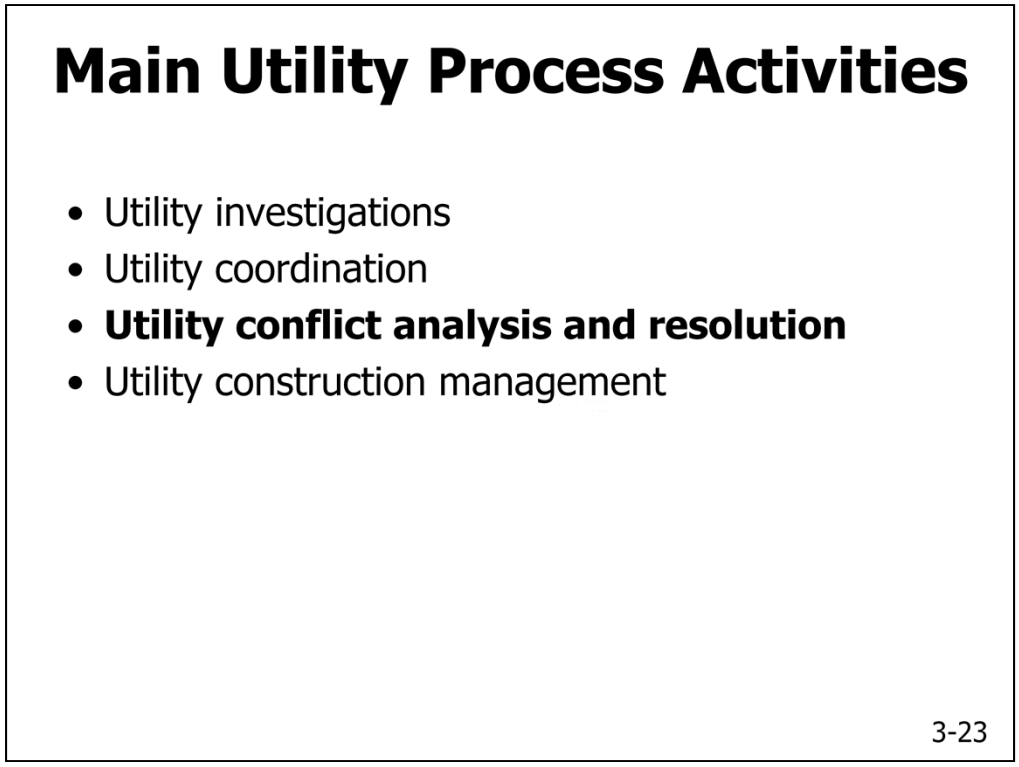
• Notifications, meetings, and work plans

• Permits and rights of entry

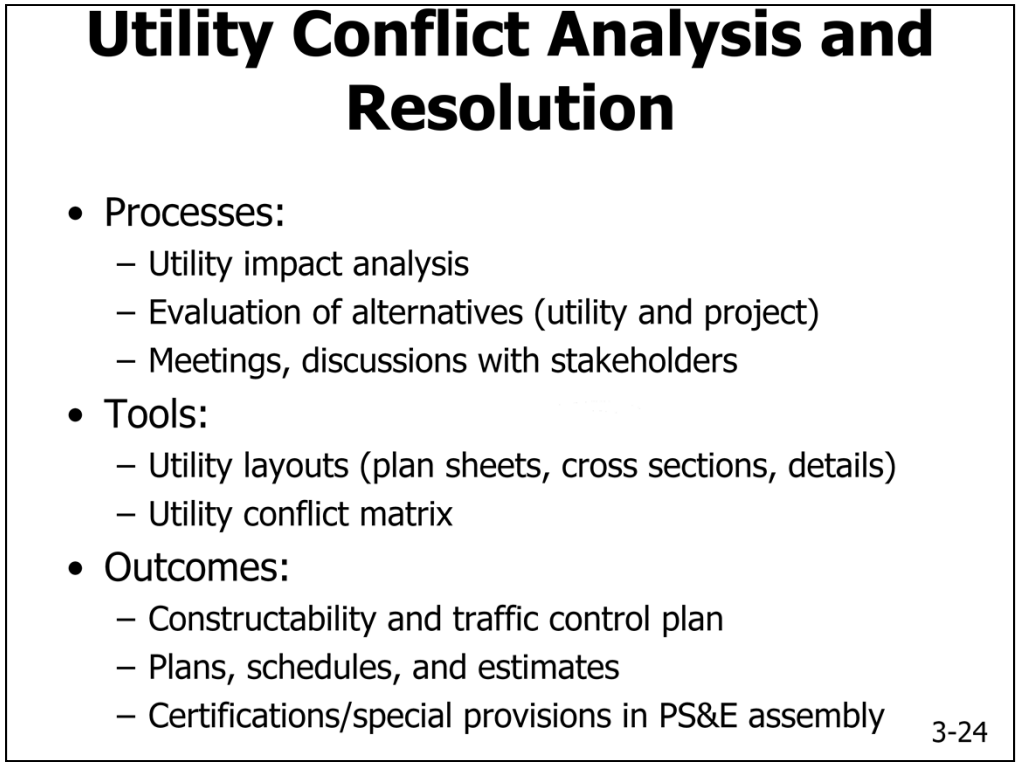
• Utility agreement assemblies

• Funding and escrow agreements

• Processing of as-built information



The following slide focuses on the utility conflict analysis and resolution aspect of the utility process.



The main processes of utility conflict analysis and resolution are the following:

• Utility impact analysis

• Evaluation of alternatives (utility and project)

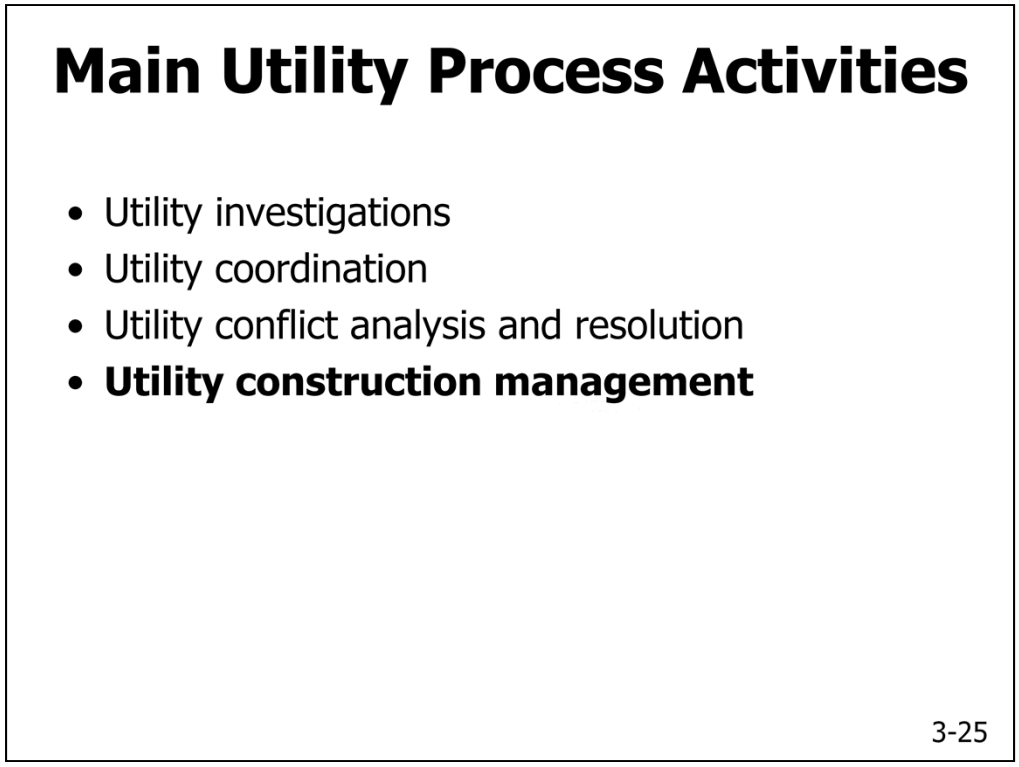
• Meetings, discussions with stakeholders

Utility conflict analysis and resolution uses the following tools:

• Utility layouts (plan sheets, cross sections, details)

• Utility conflict matrix

Outcomes of utility conflict analysis and resolution are constructability and traffic control plans; plans, schedules, and estimates; and certifications or special provisions for PS&E assembly documents.



The following slide focuses on the utility construction management aspect of the utility process.

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

The main activities of utility construction management are the following:

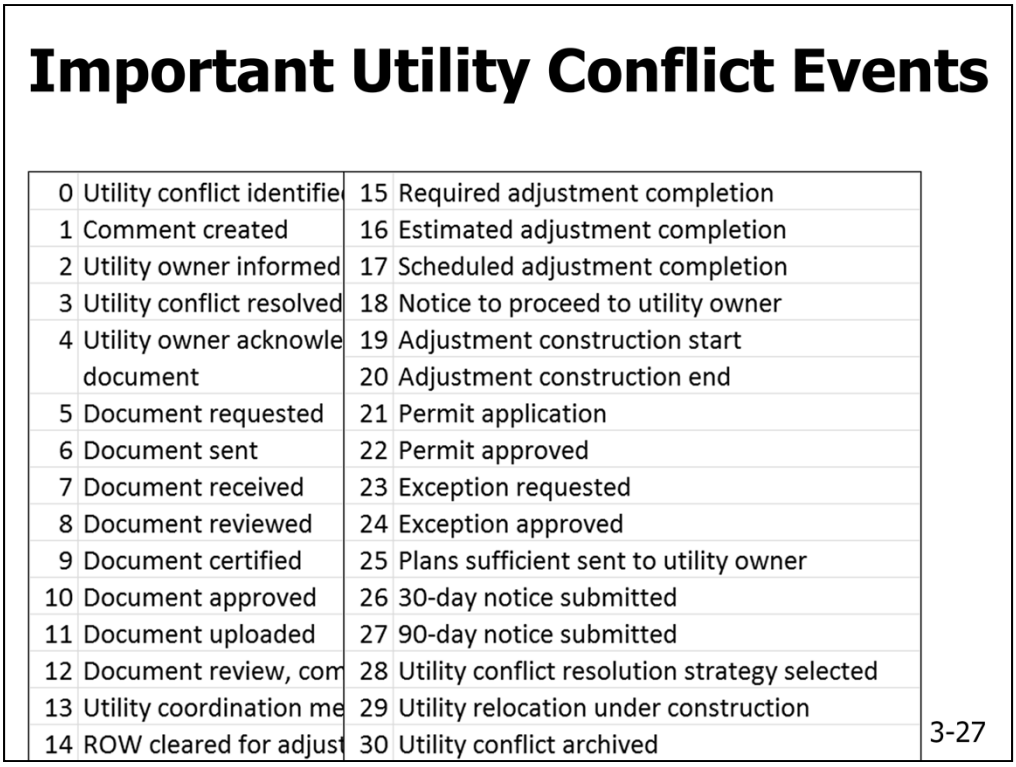
• Coordination of utility construction, including pre and post letting

• Inspection and verification

• Compliance with policies, e.g., utility accommodation policy, traffic control, storm water pollution prevention plans, Occupational Safety and Health Administration, etc.)

• Payment request reviews

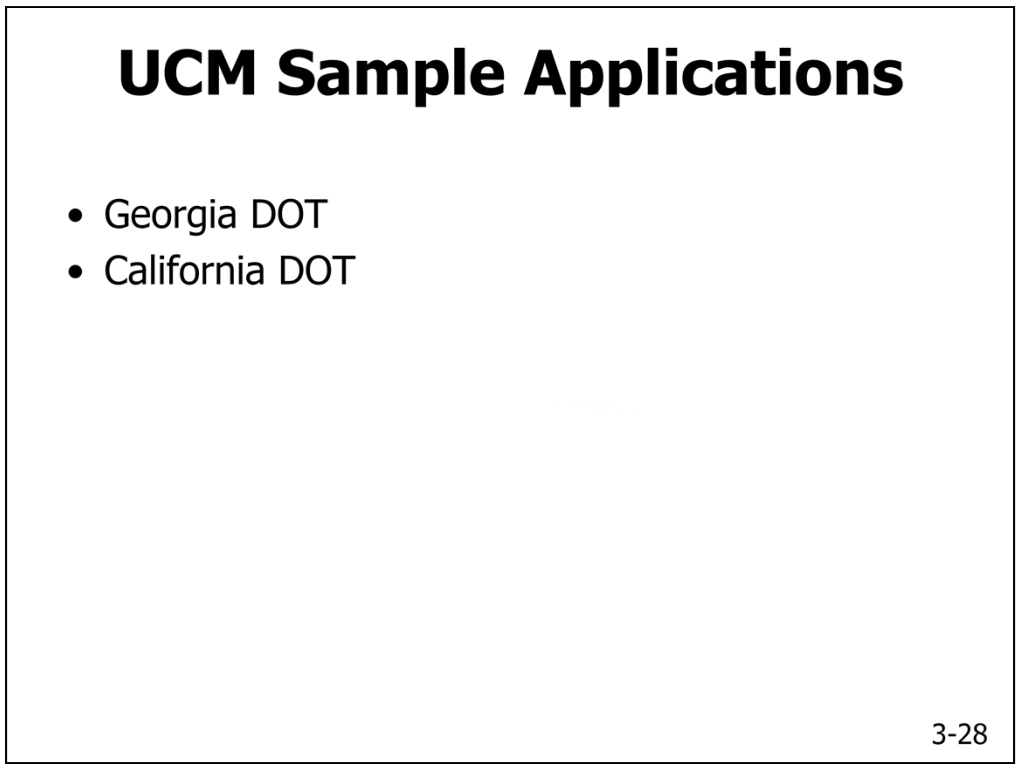
• Gathering of as-built drawings



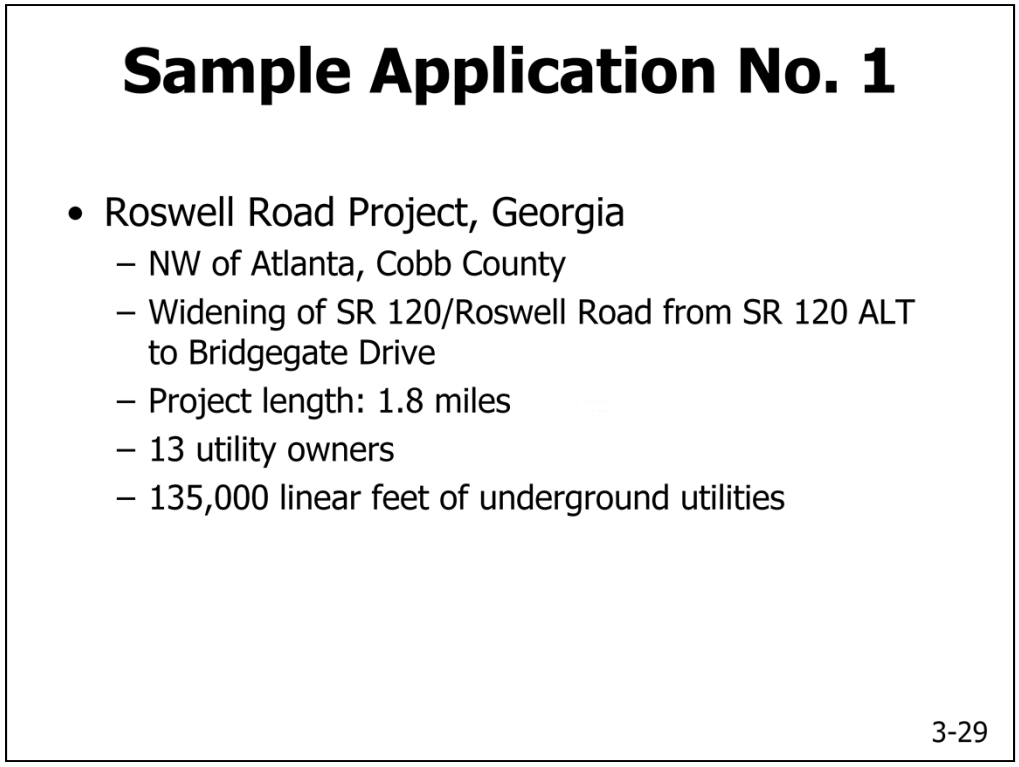
Important milestones of utility conflicts can be tracked by events that have timestamps. Which events are critical depends on the business process of the DOT. The following is a list of critical utility conflict events:

- Utility conflict created
- Utility owner informed of utility conflict
- Utility conflict resolution strategy selected
- Notice to proceed with utility relocation
- Utility relocation start
- Utility relocation end
- Utility conflict resolved

The database created for the management of utility conflicts contains a much larger number of utility conflict events.



The following slides provide two examples of states that use a UCM approach to manage utility conflicts.



Sample application 1 uses information from a project provided by the Georgia DOT. Relevant project information includes the following:

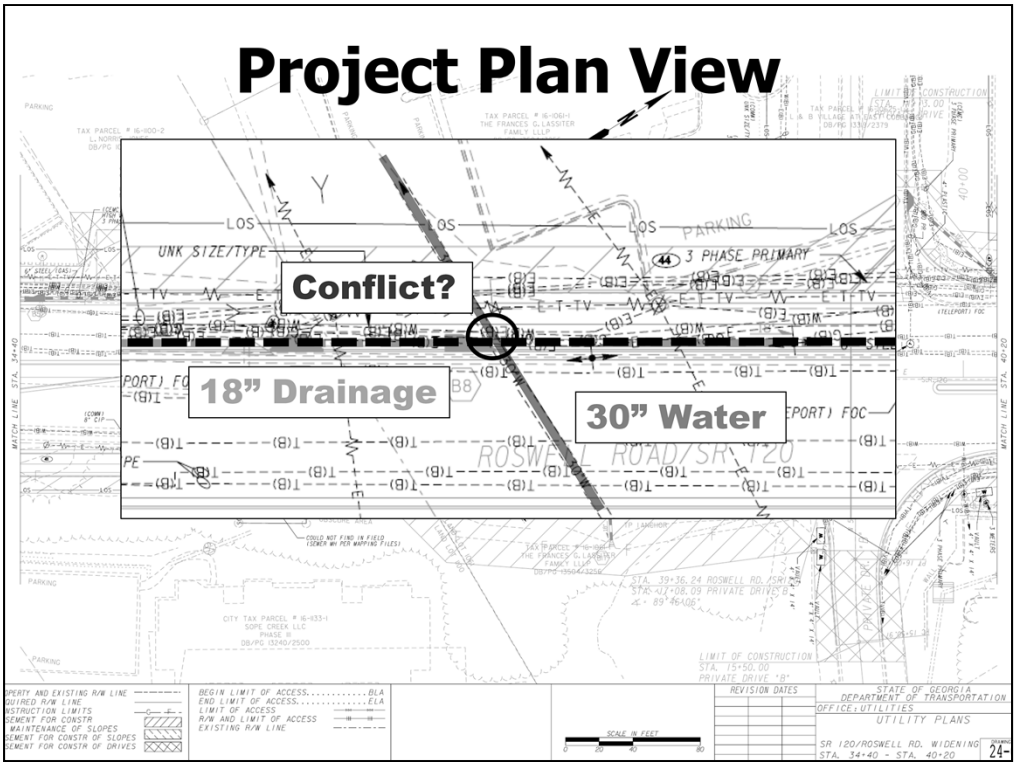
• Project location: Roswell Road Project, Georgia, NW of Atlanta, Cobb County

• Project scope: Widening of SR 120/Roswell Road from SR 120 ALT to Bridgegate Drive

• Project length: 1.8 miles

• Number of utility owners: 13

• Length of underground utilities: 135,000 linear feet



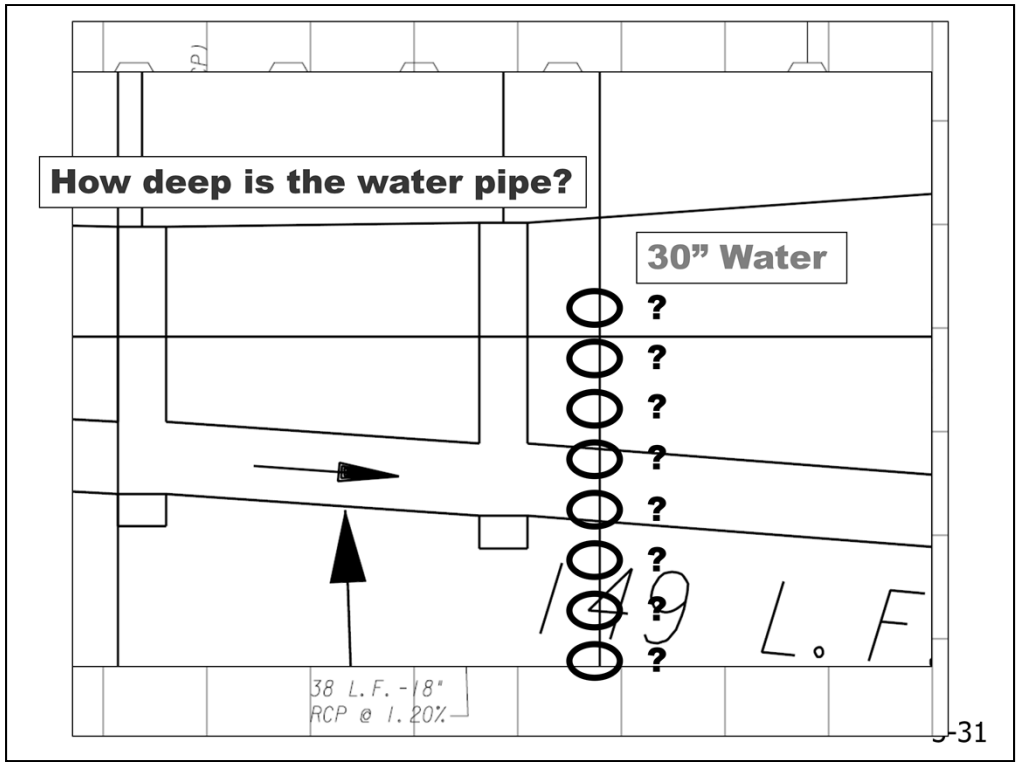
Plan view of the project.

Zoom into the area outlined by the red rectangle.

Zoom-in view of the project plans.

A 30" water line crosses an 18" drainage line.

At the crossing of the two lines could be a utility conflict.



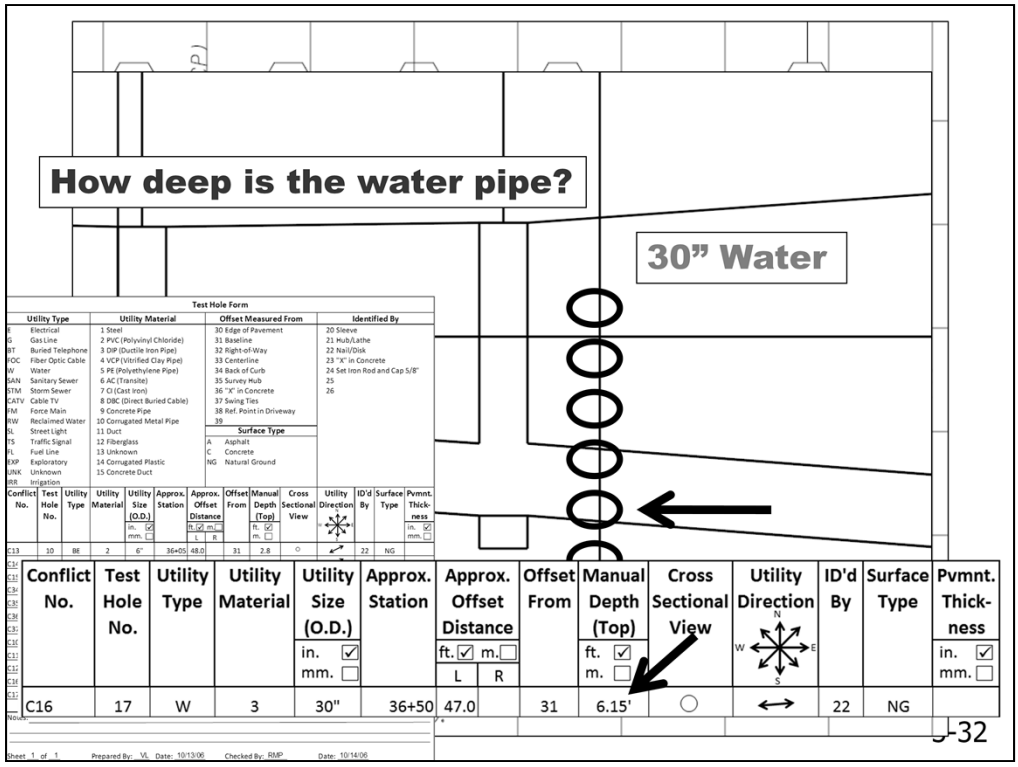
Project cross section. B5-B12 indicates the location of catch basins along the highway facility.

Zoom into the area outlined by the red rectangle.

Zoom-in view of the project cross section.

The question is, how deep is the water pipe?

- If it is located above the drainage line, there is no conflict.
- If it crosses the drainage line, there is a utility conflict.
- If it is located below the drainage line, there is no conflict.



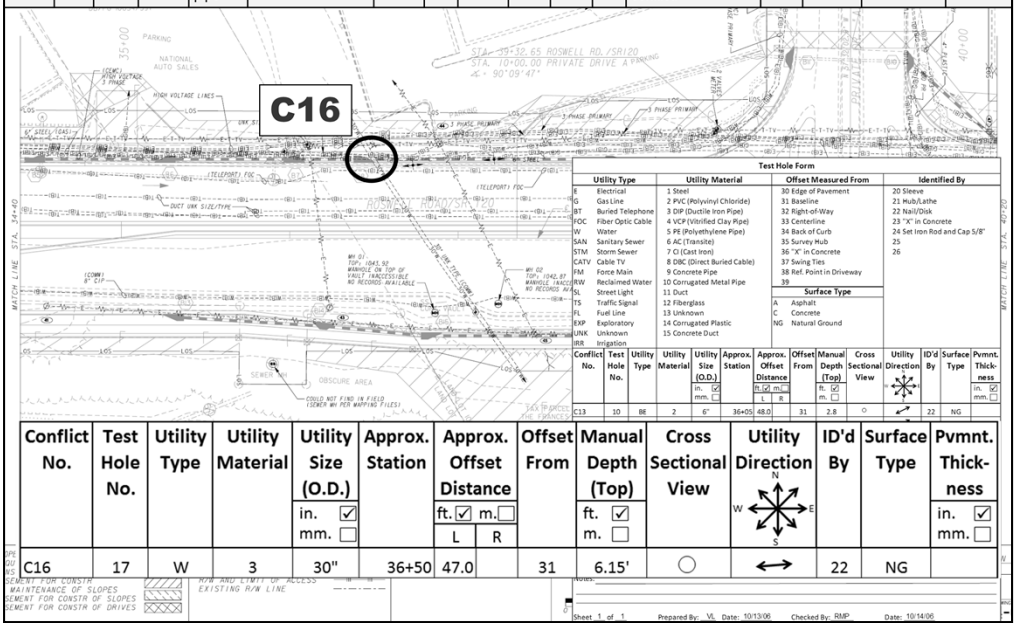
A test hole at this location provides information about the depth of the water pipe.

Zoom-in view of the test hole report record.

The depth at the top of the pipe is 6.15 feet.

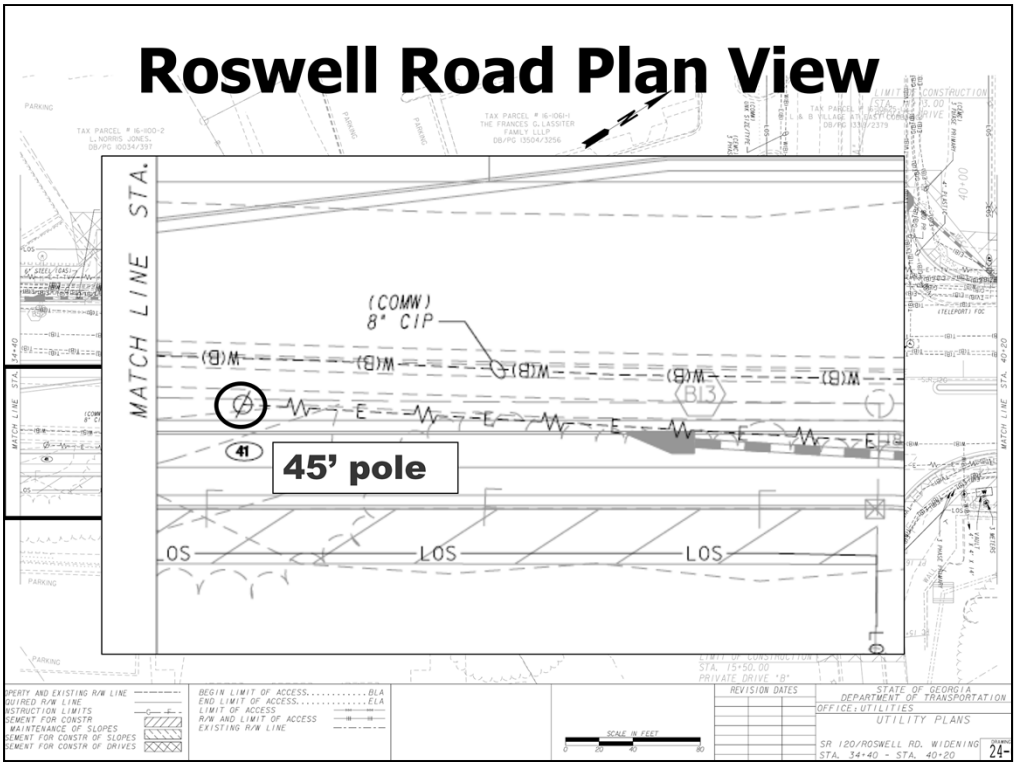
This places the water pipe at a depth where the drainage is located, the water pipe is a utility conflict.

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		QLA	17	Review possibility of adjusting drainage pipe up to avoid conflict.	U	n/a	Utility conflict identified.	Detail



Fill out the first record of the utility conflict matrix with as much information as possible.

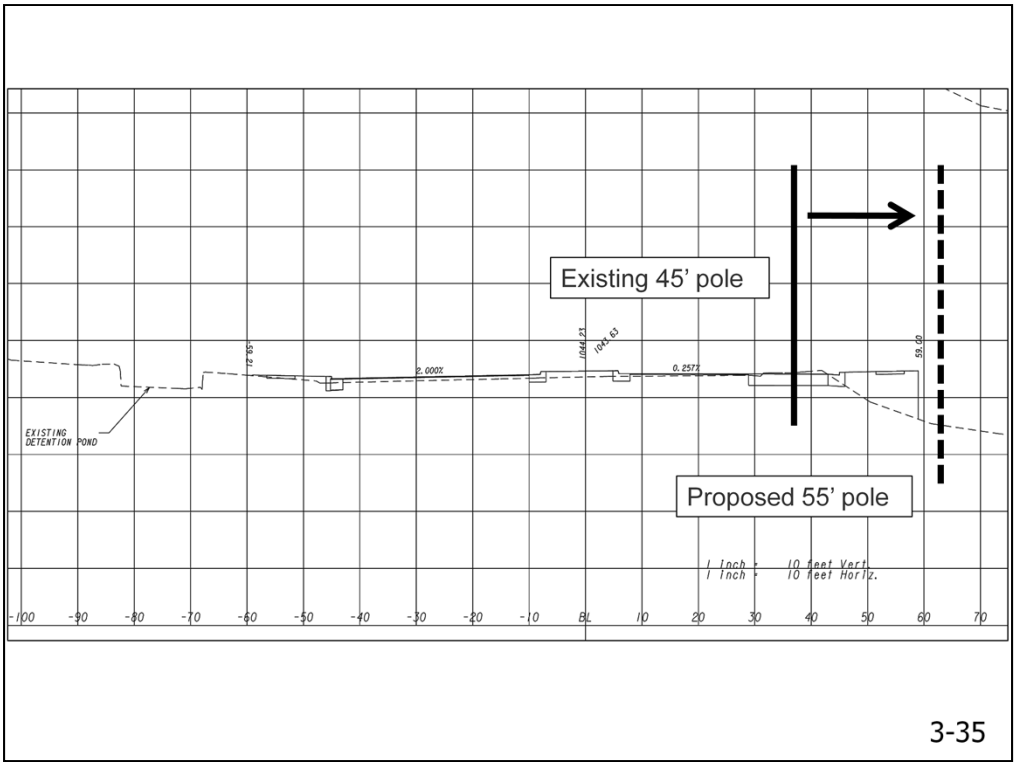
What happened to the conflict: This conflict is currently under review and no decision has been made by the Georgia DOT.



Zoom into the area outlined by the red rectangle.

Zoom-in view of the project cross section.

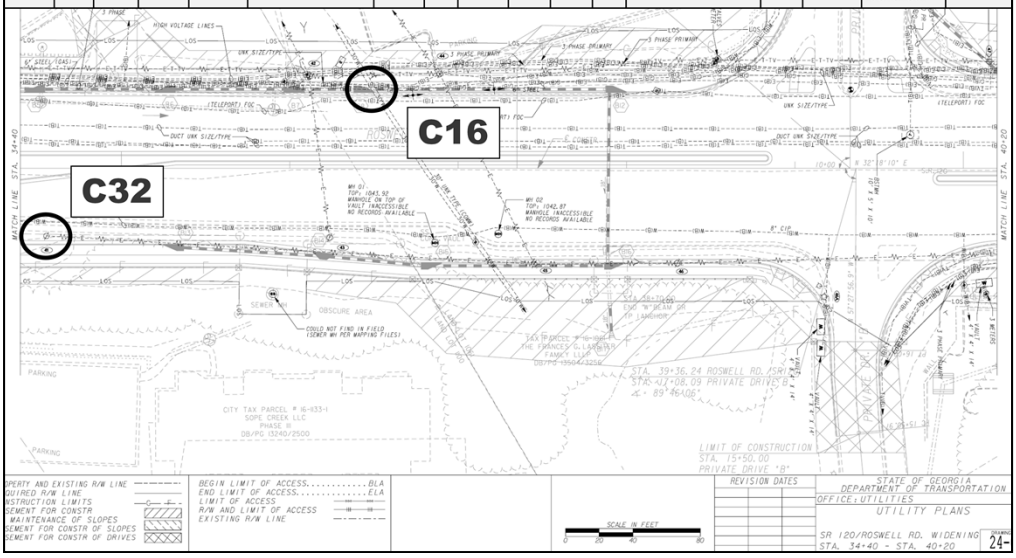
A 45-foot pole is located within the proposed right-of-way.



Project cross section. The pole is located within the sidewalk of the proposed highway.

Resolve the utility conflict by moving the pole to the edge of the right-of-way. Because of the grade, the pole must be upgraded to a 55-foot pole.

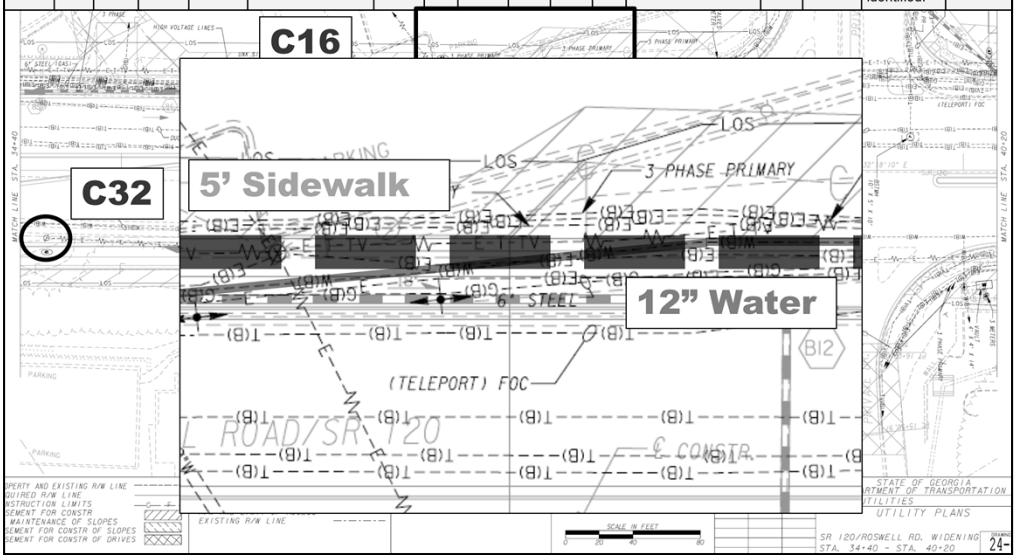
Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action	Rsp. Party	Est. Res. Date	Res. Status	Cost Analysis
AWS	C16	1	WM	30" ductile iron pipe	Proposed 18" drainage pipe would cross WM.	36+50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



Fill out the first record of the utility conflict matrix with as much information as possible.

What happened to the conflict: This conflict is currently under review and no decision has been made by the Georgia DOT.

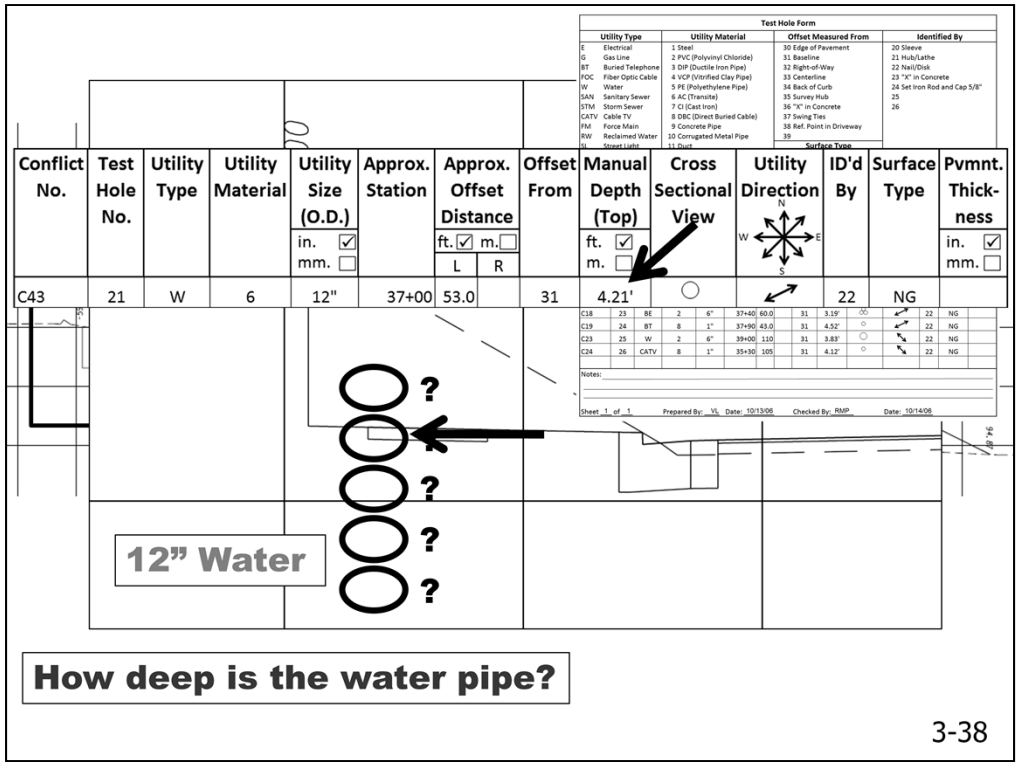
Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action	Rsp. Party	Est. Res. Date	Res. Status	Cost Analysis
AWS	C16	1	WM	30" ductile iron pipe	Proposed 18" drainage pipe would cross WM.	36+50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



Zoom into the area outlined by the red rectangle.

Zoom-in view of the project plan view.

A 12-inch water line overlaps the 5-foot sidewalk. This could be a utility conflict.



Project cross section.

Zoom into the area outlined by the red rectangle.

Zoom-in view of the project cross section.

The question is, how deep is the water pipe?

- If it is located below the sidewalk, there is no conflict.
- If it located to close or above the sidewalk, there is a utility conflict.

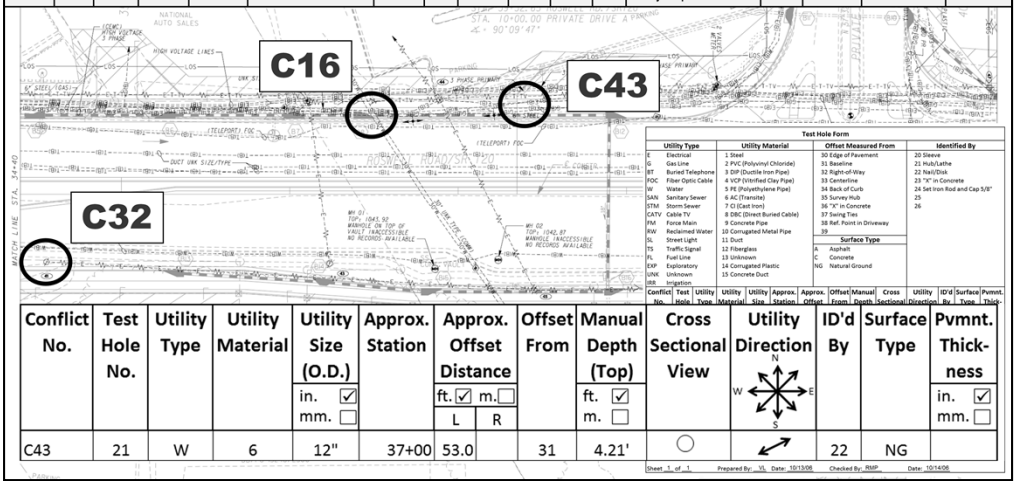
A test hole at this location provides information about the depth of the water pipe.

Zoom-in view of the test hole report record.

The depth at the top of the pipe is 4.21 feet.

This places the water pipe at a depth where the sidewalk is located. The water pipe is a utility conflict.

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		QLA	17	Review possibility of adjusting drainage pipe up to avoid conflict.	U	n/a	Utility conflict identified.	Detail
CPS	C32	1	OE	45' pole	Existing pole in proposed roadway	34+55		40' RT		QLC		Pole to be relocated.	U	n/a	Utility conflict identified.	Detail
AWS	C43	1	W	12"	Proposed sidewalk in conflict with 12" water main.	37+00		53' LT		QLA	21	Highway/sidewalk re-design to avoid utility impact.	D	n/a	Utility conflict identified.	Detail



Conflict No.	Test Hole No.	Utility Type	Utility Material	Utility Size (O.D.) in. ☑ mm. ☐	Approx. Station	Approx. Offset Distance ft. ☑ m. ☐ L	R	Offset From	Manual Depth (Top) ft. ☑ m. ☐	Cross Sectional View	Utility Direction	ID'd By	Surface Type	Pvmnt. Thick-ness in. ☑ mm. ☐
C43	21	W	6	12"	37+00	53.0		31	4.21'	○	↗	22	NG	

Fill out the first record of the utility conflict matrix with as much information as possible.

What happened to the conflict: The sidewalk design was modified to avoid the conflict.

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		QLA	17	Review possibility of adjusting drainage pipe up to avoid conflict.	U	n/a	Utility conflict identified.	Detail
CPS	C32	1	OE	45' pole	Existing pole in proposed roadway	34+55		40' RT		QLC		Pole to be relocated.	U	n/a	Utility conflict identified.	Detail
AWS	C43	1	W	12"	Proposed sidewalk in conflict with 12" water main.	37+00		53' LT		QLA	21	Highway/sidewalk re-design to avoid utility impact.	D	n/a	Utility conflict identified.	Detail
CPS	C54	1	OE	45' pole	Existing pole in proposed curb line	38+30		57' RT		QLC		Pole to be relocated	U	n/a	Utility conflict identified.	Detail
CPS	C55	1	OE	45' pole	Existing pole in area of grade cut	38+50		63' RT		QLC		Pole may need to be supported or replaced with taller pole	U	n/a	Utility conflict identified.	Detail
CPS	C61	1	OE	45' pole	Existing pole in proposed curb line	40+00		52' RT		QLC		Pole to be relocated	U	n/a	Utility conflict identified.	Detail
ATT	C28	1	OTV	45' pole	Existing pole in conflict with proposed drainage	40+15		65' LT		QLC		Pole to be relocated	U	n/a	Utility conflict identified.	Detail

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Final view of the utility conflict matrix.

An explanation of the button “Detail” in the column “Cost Analysis” follows.

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

There are often many ways to resolve a utility conflict. These alternatives can be analyzed in a subsheet that can be accessed by clicking on the "Detail" button.

The subsheet allows an analysis of costs and feasibility of different alternatives to resolve a utility conflict. Depending on the amount of information this analysis could be simple or extremely detailed.

The following slide shows a sample subreport for a utility conflict.

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

The header of the subsheet provides information about the utility conflict. The main table provides information about four alternatives to resolve the utility conflict. For each alternative, the table shows a description, advantages and disadvantages, engineering and direct cost to the utility company, engineering and direct cost to the DOT, a total of both utility and DOT costs, an indicator if the alternative is feasible, and an indicator about which alternative was selected.

Note that this subtable includes project phase information in the header (e.g., 60%). This structure makes it easy to use the table and update the analysis at several stages of the project development process.

A utility conflict matrix can be used in several different ways, including the following:

• As a tool to provide management reports during project development.

• To provide utility information for highway project bidders included in letting documents. This can either be in form of certification of known utility facilities within project limits, or as special provision for utility relocations.

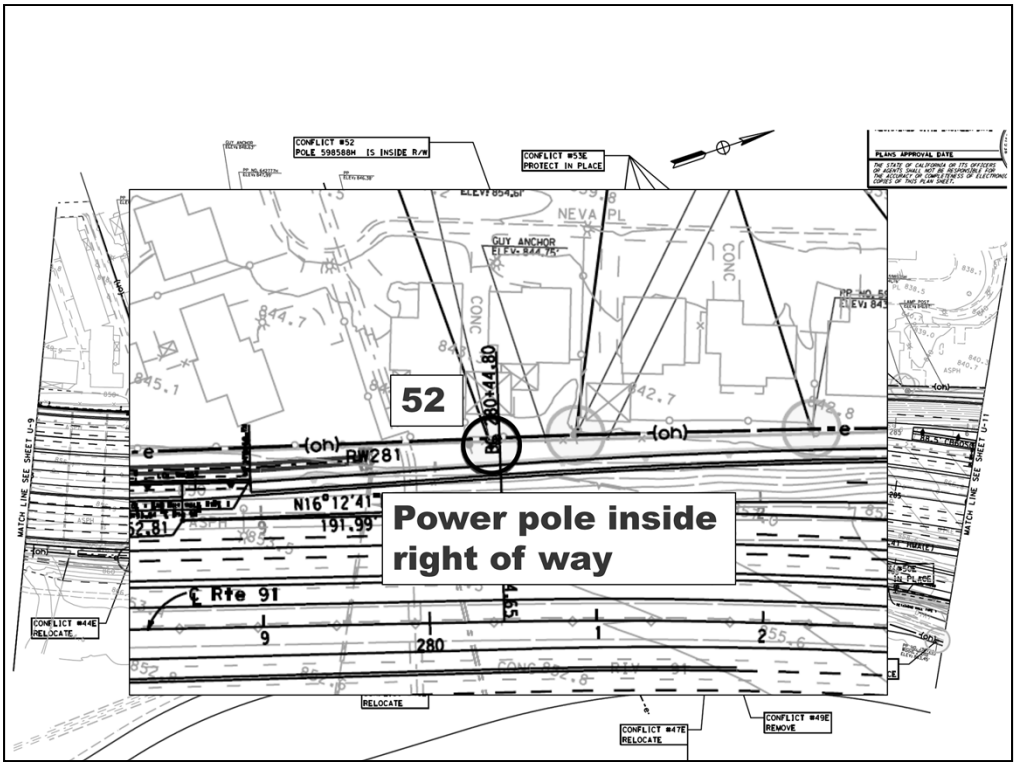
• As a management tool during construction.

• To develop cost savings reports after construction.

Sample Application No. 2

- California DOT project

3-44

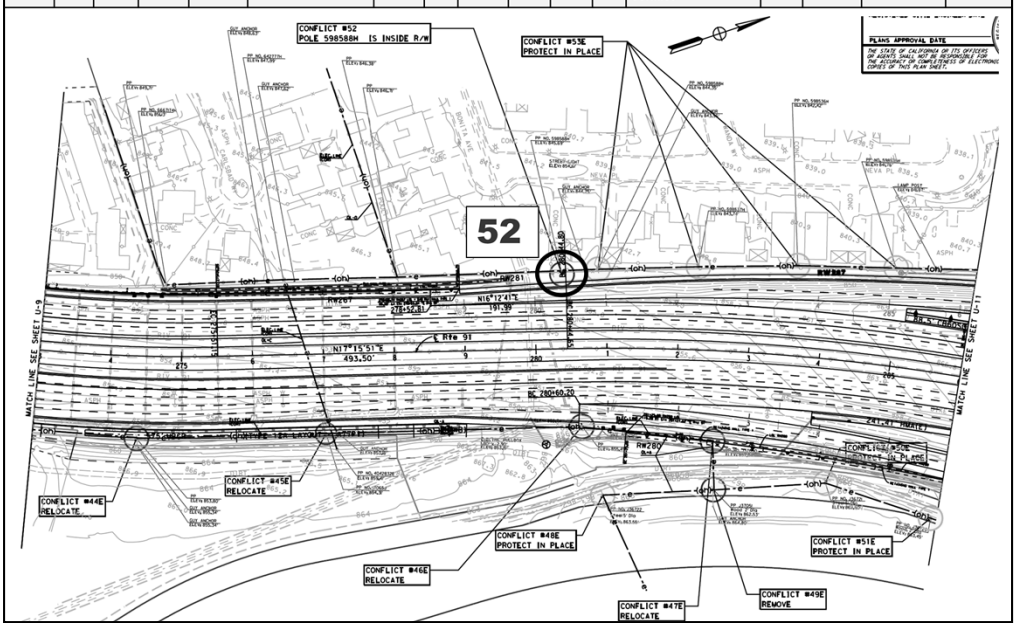


Plan view of the project.

Zoom into the area outlined by the red rectangle.
Zoom-in view of the project plans.

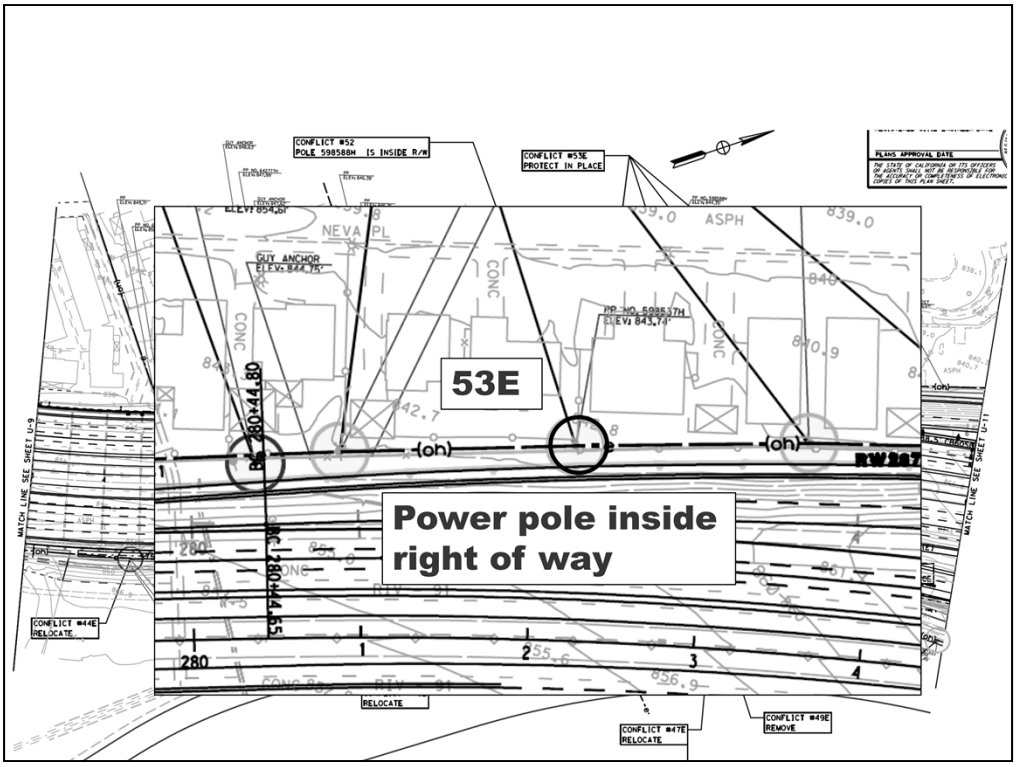
A power pole is within the right-of-way.

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
CP	52	U-10	OE pole		Pole is in conflict with retaining wall.	280 +50		80' LT		QLC		Review possibility of modifying retaining wall 281 to avoid conflict	D	n/a	Utility conflict identified.	Detail



Fill out the first record of the utility conflict matrix with as much information as possible.

Either the pole has to move or the design of the retaining wall has to be modified.

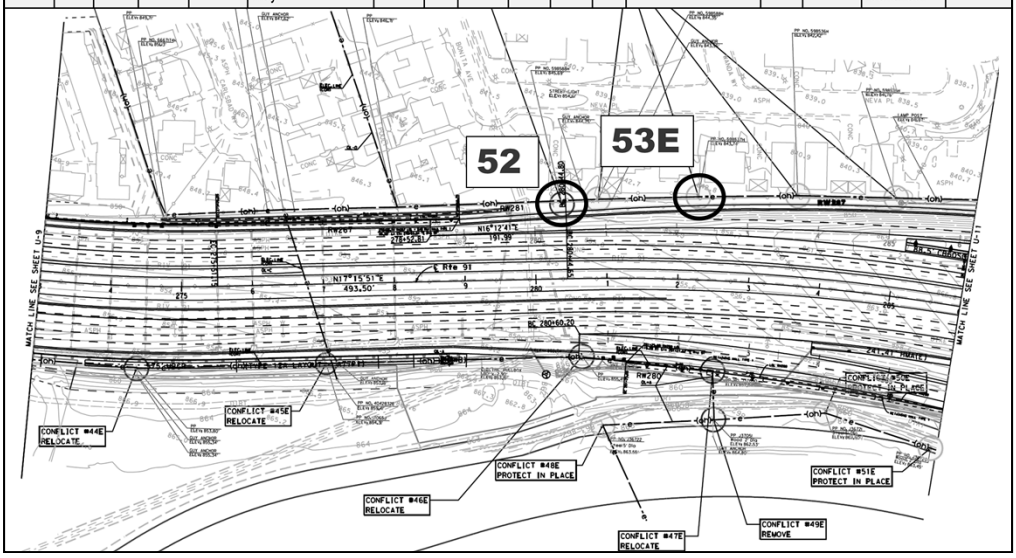


Plan view of the project.

Zoom into the area outlined by the red rectangle.
Zoom-in view of the project plans.

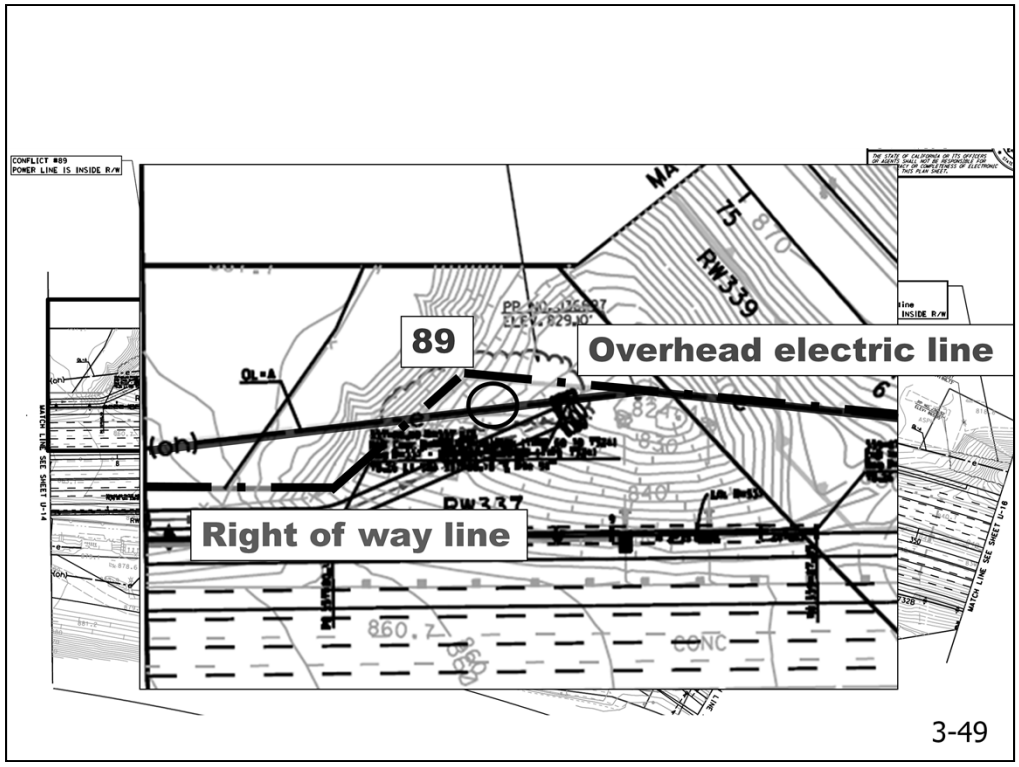
A power pole is within the right-of-way.

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
CP	52	U-10	OE pole		Pole is in conflict with retaining wall.	280 +50		80' LT		QLC		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		QLC		Protect in place	U	n/a	Utility conflict identified.	Detail



Fill out the second record of the utility conflict matrix with as much information as possible.

The pole can be protected in place and does not need to move.

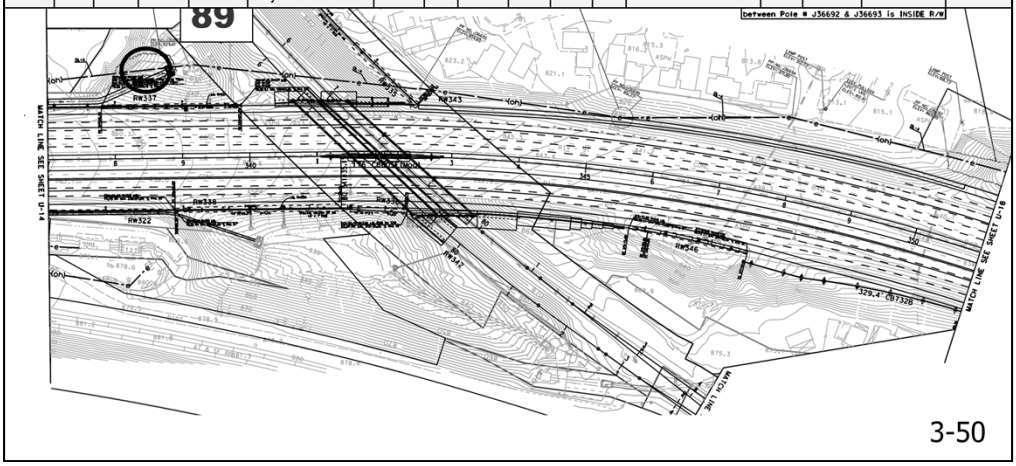


Plan view of the project.

Zoom into the area outlined by the red rectangle.
Zoom-in view of the project plans.

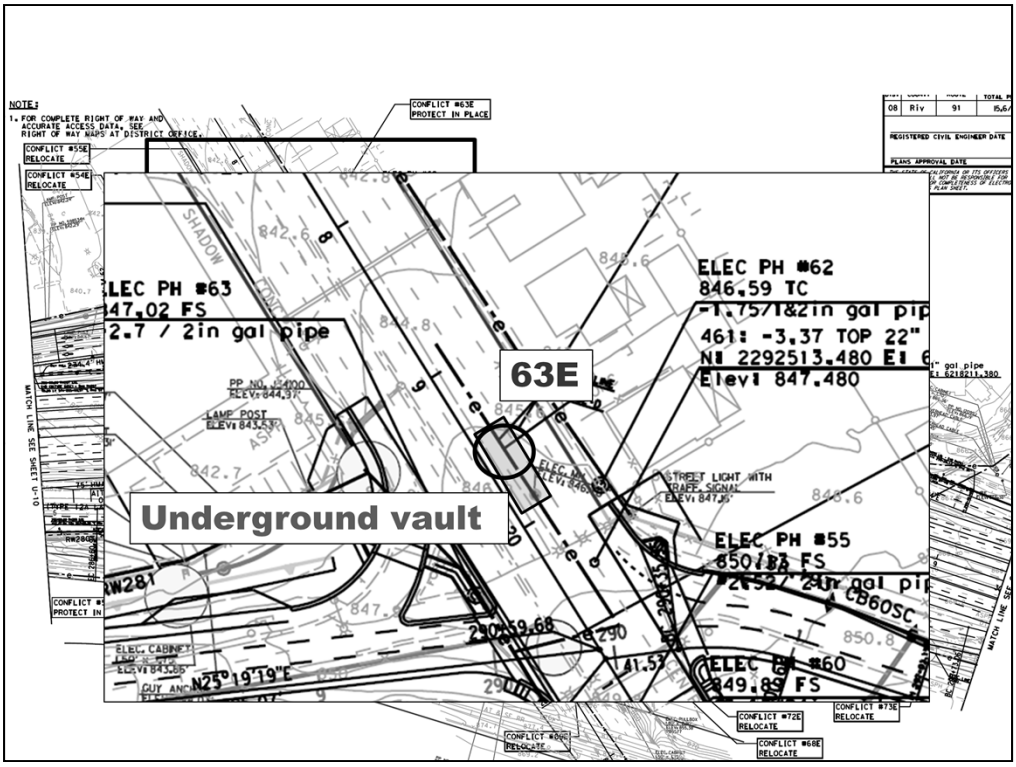
An overhead electric line crosses the right-of-way line and could be in conflict.

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
CP	52	U-10	OE pole		Pole is in conflict with retaining wall.	280 +50		80' LT		QLC		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		QLC		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 +00	75' LT	85' LT	QLC		Relocate utility line	U	n/a	Utility conflict identified.	Detail



Fill out the third record of the utility conflict matrix with as much information as possible.

The electric line must be relocated.



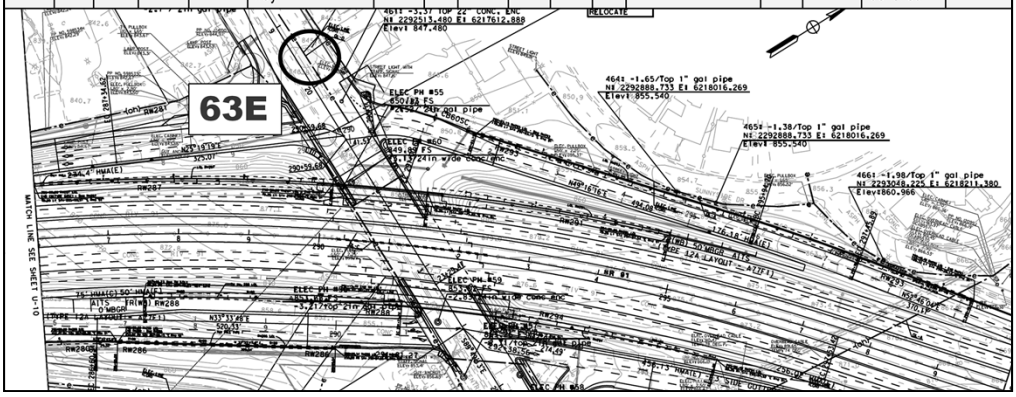
Plan view of the project.

Zoom into the area outlined by the red rectangle.

Zoom-in view of the project plans.

An underground vault is within the right-of-way line. This could be a utility conflict.

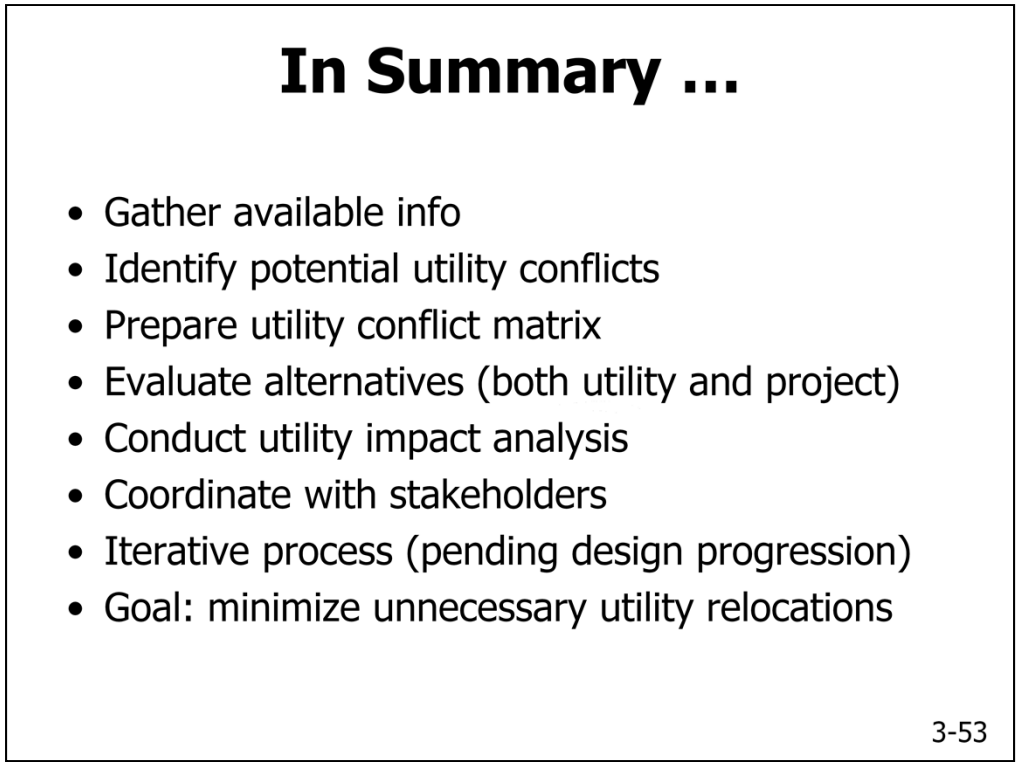
Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action	Rsp. Party	Est. Res. Date	Res. Status	Cost Analysis
CP	52	U-10	OE pole		Pole is in conflict with retaining wall.	280 +50		80' LT		QLC		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		QLC		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 +00	75' LT	85' LT	QLC		Relocate utility line	U	n/a	Utility conflict identified.	Detail
EPP	63E	U-11	UG Vault		Vault is within the proposed right of way	19+50		0		QLA	14	Protect in place	U	n/a	Utility conflict identified.	Detail



Fill out the fourth record of the utility conflict matrix with as much information as possible.

The vault may have to move or could be protected in place.

Note: These slides do not include an example of the cost estimate analysis. The slides (with different data) would be very similar to those used for the cost estimate analysis in connection with the Georgia DOT example.



In summary utility conflict management involves the following activities:

• Gather available info
• Identify potential utility conflicts
• Prepare utility conflict matrix
• Evaluate alternatives (both utility and project)
• Conduct utility impact analysis
• Coordinate with stakeholders

Keep also in mind that

• It is an iterative process (pending design progression)
• The goal is to minimize unnecessary utility relocations

3.2

Discussion, questions, and answers

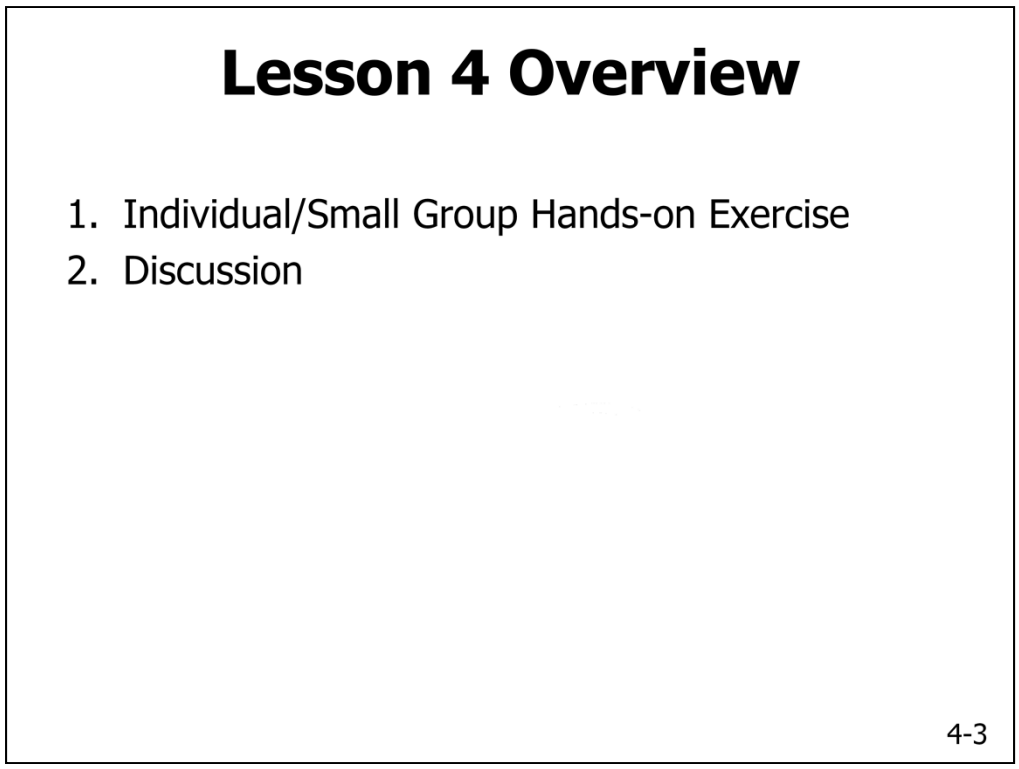
3-54

Lesson 4

Hands-on Utility Conflict Management Exercise

4-1

This section of the training is Lesson 4, which provides a hand-on experience to identify utility conflicts and store utility conflict information in a utility conflict matrix.



Purpose of Lesson 4:

- Provide a hands-on exercise for individuals or small groups that focuses on the identification of utility conflicts on plan sheets.

4.1

Individual/Small Group Hands-on Exercise

4-4

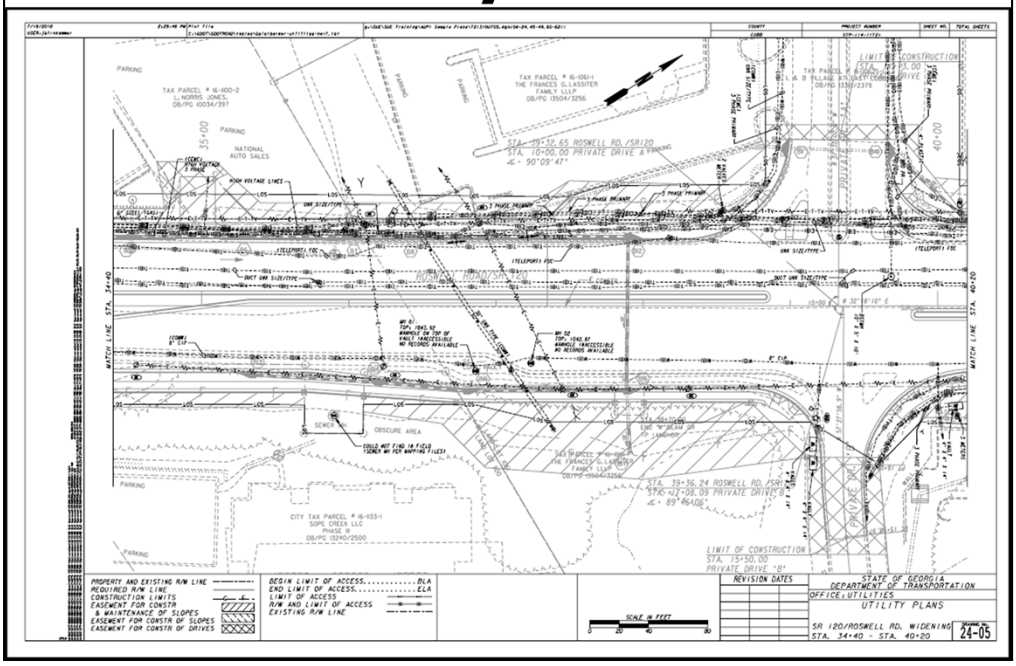
Example Project Overview

- 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

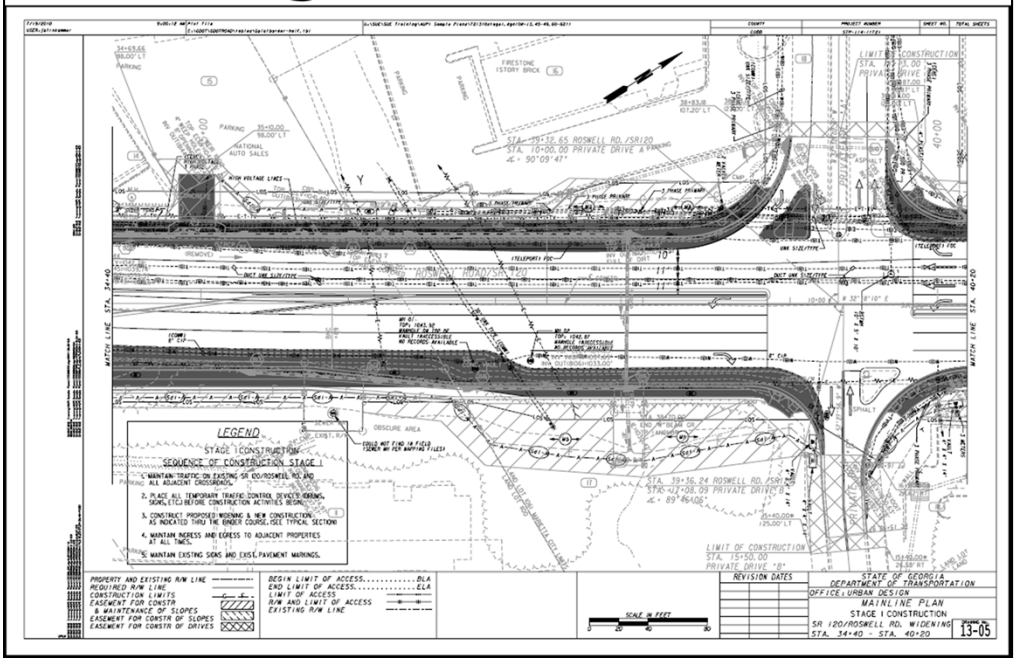
4-5

These plan sheets are from a project northwest of Atlanta, Georgia. The Georgia DOT used SUE on the project and received several data sheets with QLA information.

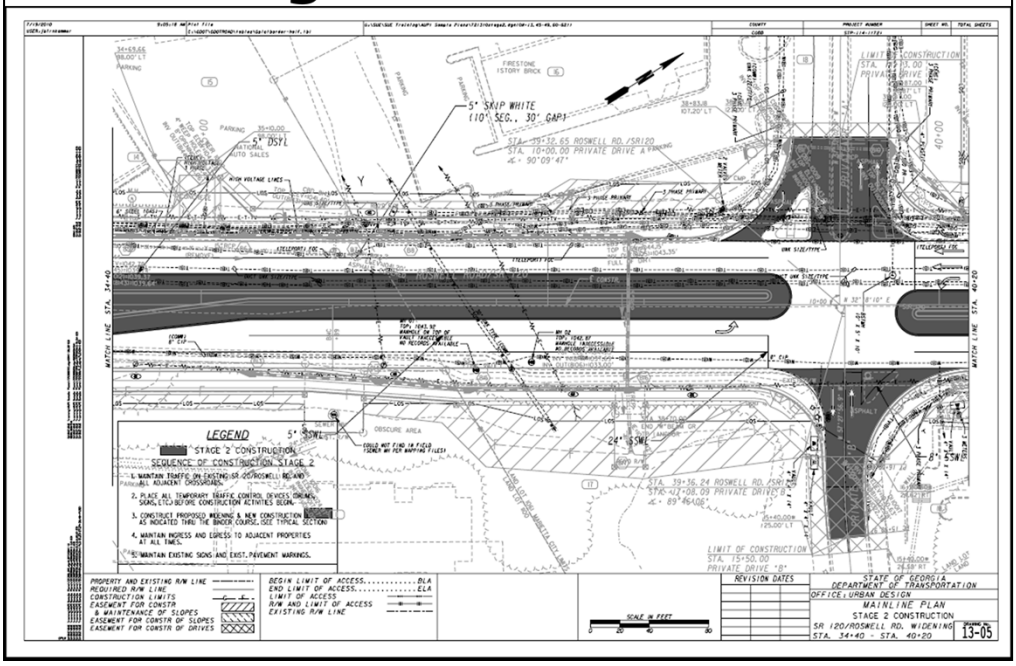
Utility Plans



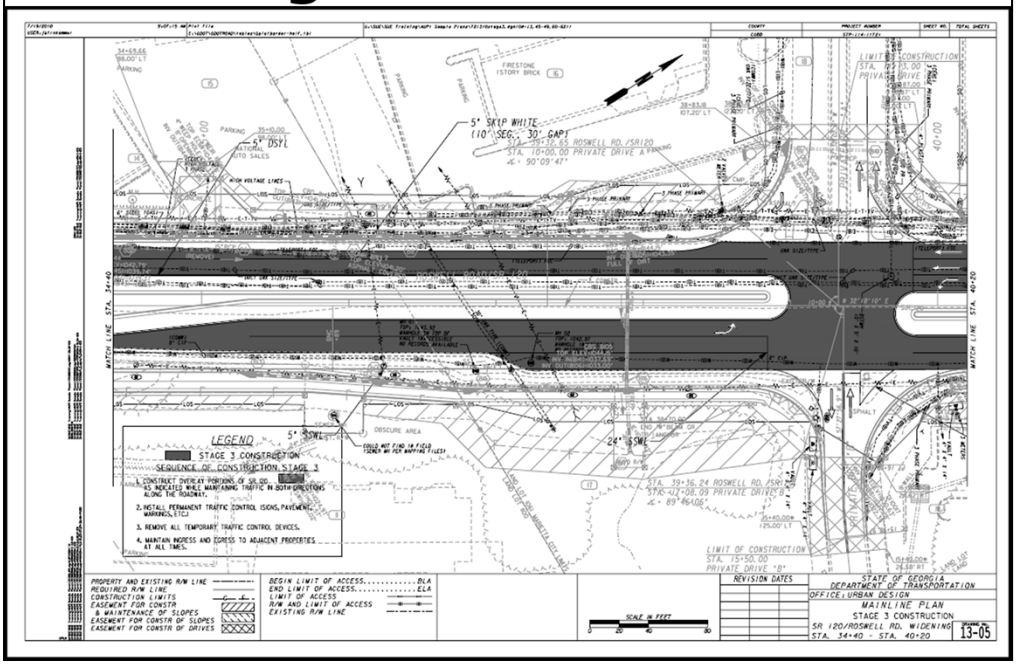
Stage 1 Construction



Stage 2 Construction



Stage 3 Construction



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

4-10

Break into groups of 4 to 5. Each group should receive one set of plans corresponding to one of the quadrants of the entire project.

The exercise has three parts.

Part A: The purpose of Part A is to identify all potential conflicts using QLB data.

Fill out the utility conflict matrix up to the column that identifies the type of utility investigation needed.

For each conflict, determine whether there is a need for QLA data.

At the conclusion of Part A, provide each group with the "solution" plan sheet that shows all the conflicts identified for the project.

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

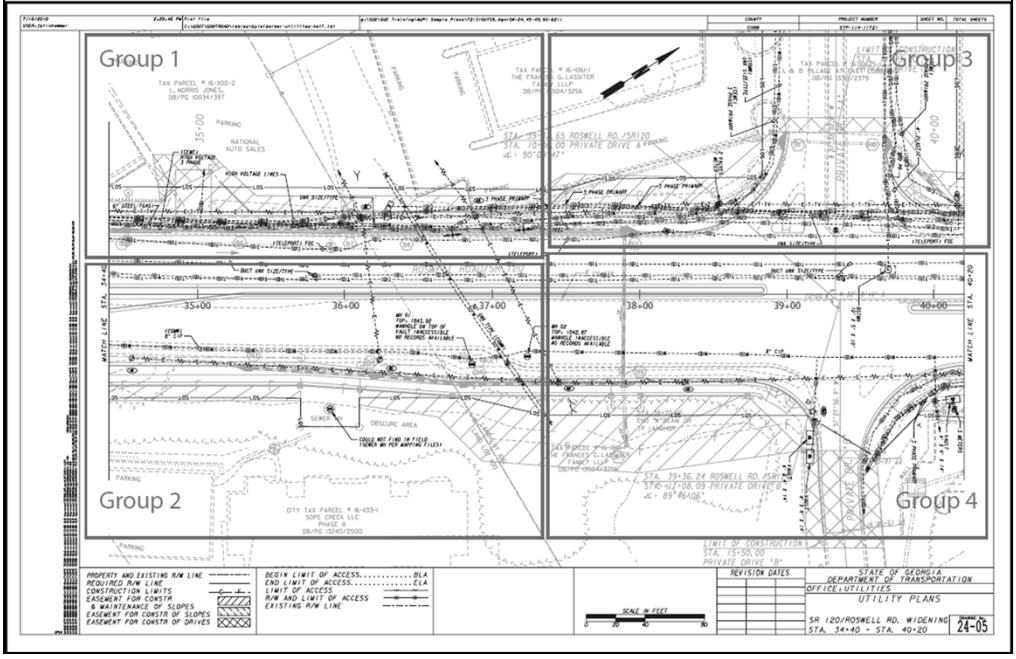
4-11

Part B: The purpose of Part B is to evaluate conflicts using QLA test hole data sheets. For this part, hand out a copy of the test hole reports to each group.

Part C: The purpose of Part C is to analyze resolution strategies for one or more utility conflicts (realistically, the time available is enough for one or two utility conflicts). The analysis should also include developing a cost analysis for the alternatives considered. Each group should come up with their own set of alternatives on how to resolve the conflict.

After completing Part C, ask one or more groups to give a short presentation describing their results. Hint: To encourage participation in the exercise, tell the audience (before starting Part A) that one or two groups might be selected at random to present their results at the completion of Part C.

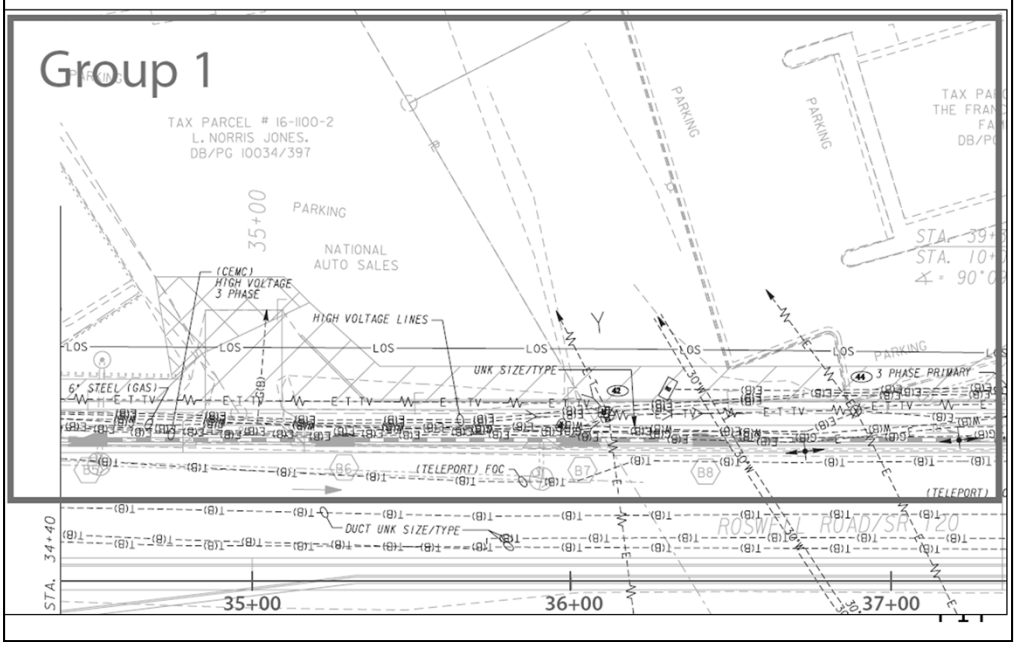
Group Assignments



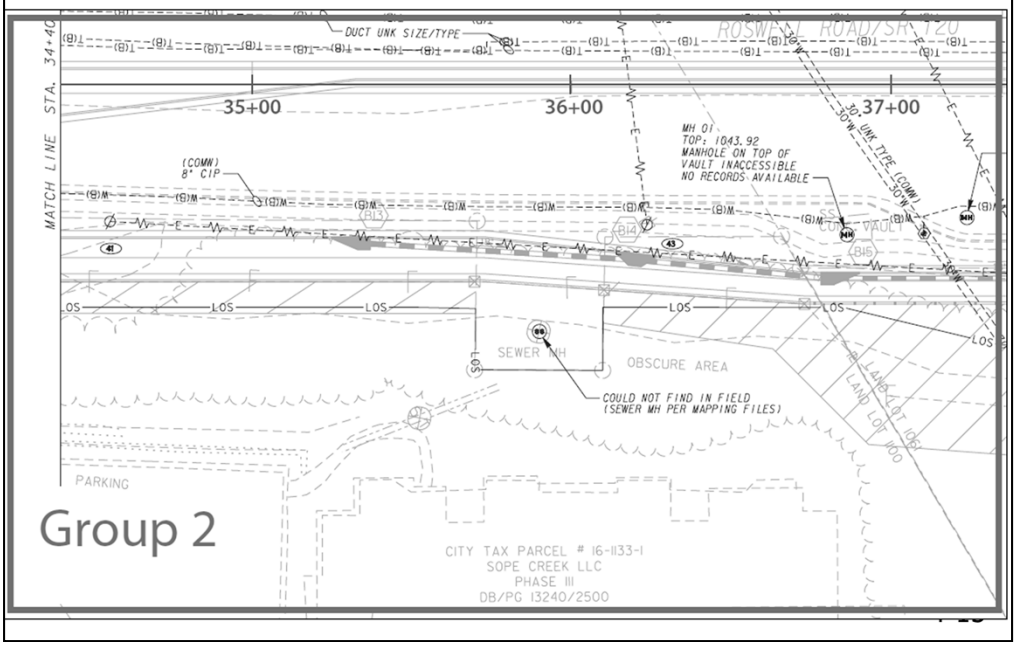
Begin Conflict Analysis…

4-13

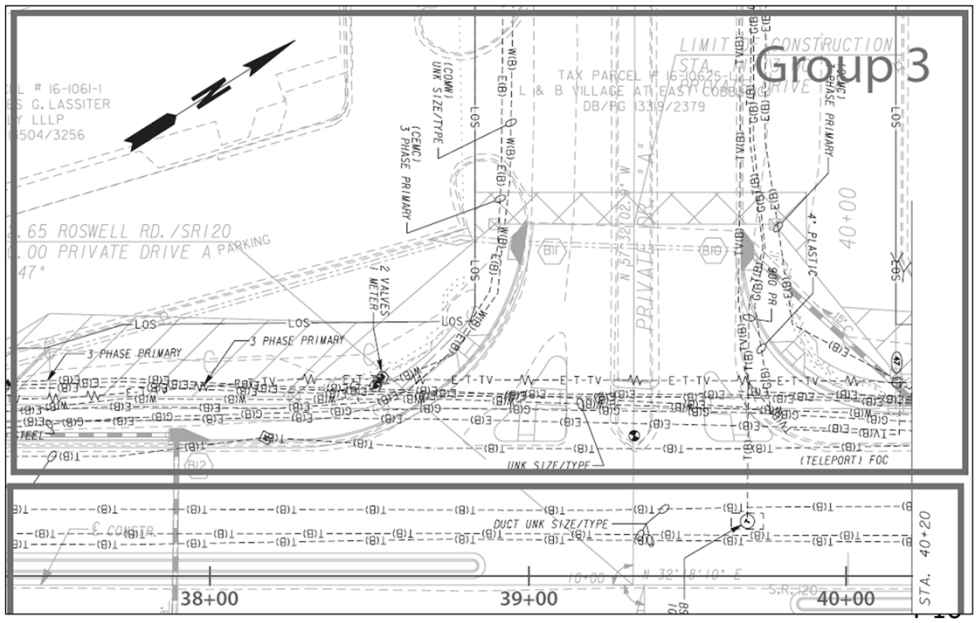
Group 1


Group 1
TAX PARCEL # 16-1100-2
L. NORRIS JONES.
DB/PG 10034/397
PARKING
NATIONAL
AUTO SALES
35+00
(CEMC)
HIGH VOLTAGE
3 PHASE
HIGH VOLTAGE LINES
LOS
UNK SIZE/TYPE
6" STEEL (GAS)
E-T-TV
3 PHASE PRIMARY
(TELEPORT) FOC
DUCT UNK SIZE/TYPE
STA. 34+40
35+00
36+00
37+00

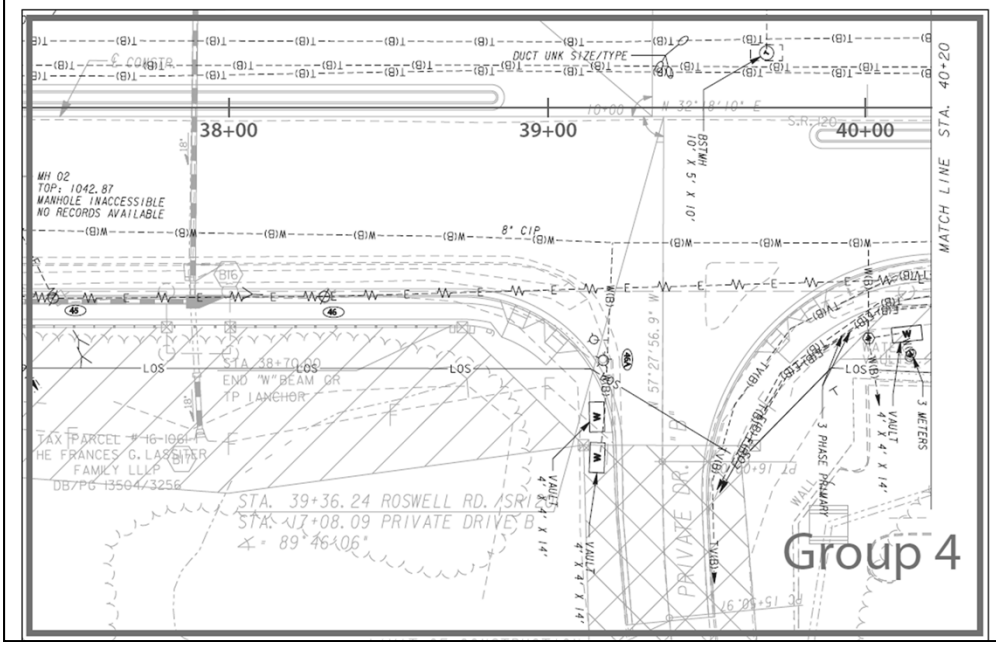
Group 2

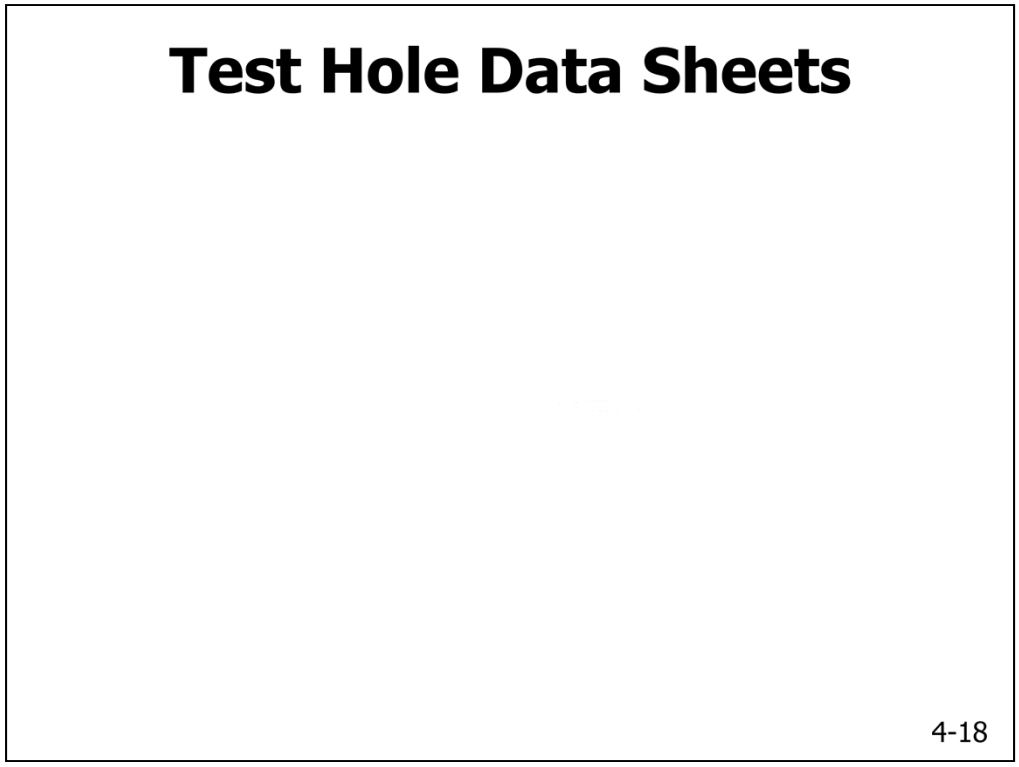

MATCH LINE STA. 34+40
35+00
36+00
37+00
DUCT UNK SIZE/TYPE
ROSWELL ROAD/SR 120
(COMM) 8" CIP
MH 01
TOP: 1043.92
MANHOLE ON TOP OF
VAULT INACCESSIBLE
NO RECORDS AVAILABLE
10"W UNK TYPE (COMM)
VAULT
LOS
SEWER MH
OBSCURE AREA
COULD NOT FIND IN FIELD
(SEWER MH PER MAPPING FILES)
LAND LOT 100
PARKING
Group 2
CITY TAX PARCEL # 16-1133-1
SOPE CREEK LLC
PHASE III
DB/PG 13240/2500

Group 3

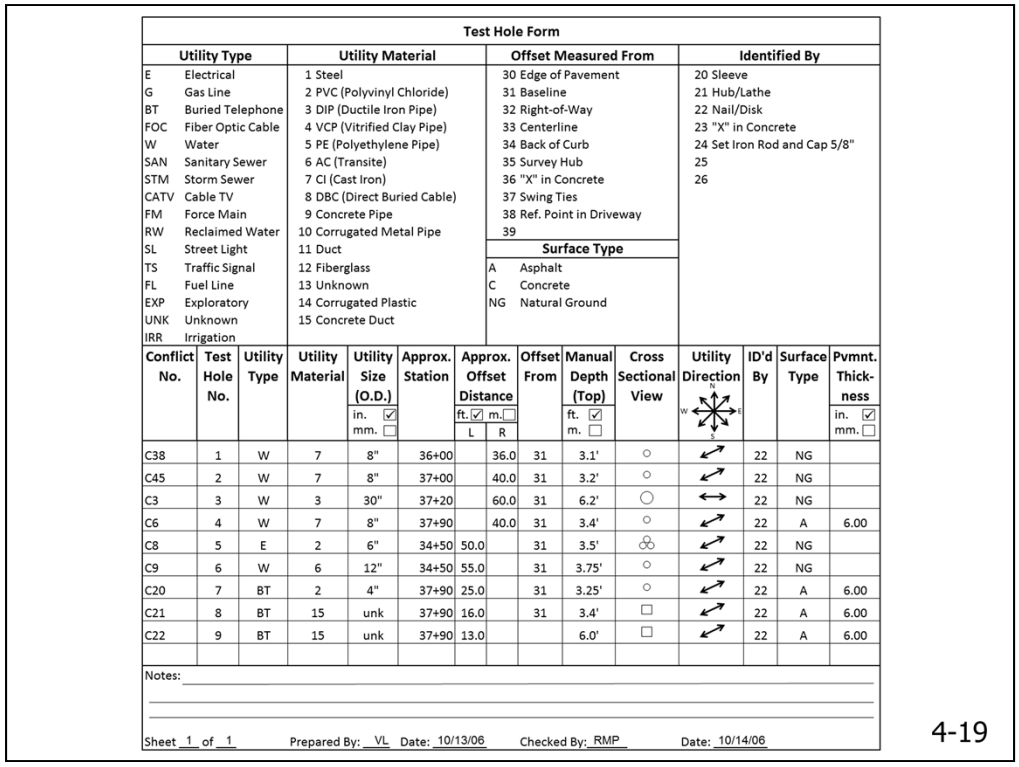

Group 3
LIMIT OF CONSTRUCTION
STA. 40+20
TAX PARCEL # 16-0625-LL-
L & B VILLAGE AT EAST COBB
DB/PG 13319/2379
65 ROSWELL RD./SR120
00 PRIVATE DRIVE A
PARKING
47"
3 PHASE PRIMARY
(COMM) UNK SIZE/TYPE
(CEMC) 3 PHASE PRIMARY
2 VALVES 1 METER
LOS
4" PLASTIC
40+00
PRIVATE DR.
N 57°32'02" W
(TELEPORT) FOC
UNK SIZE/TYPE
DUCT UNK SIZE/TYPE
E COMM
10+00
N 32°18'10" E
S.R. 120
38+00
39+00
40+00
STA. 40+20

Group 4


38+00
39+00
40+00
MATCH LINE STA. 40+20
MH 02
TOP: 1042.87
MANHOLE INACCESSIBLE
NO RECORDS AVAILABLE
8" CIP
DUCT UNK SIZE/TYPE
LOS
STA. 38+70.03
END "W" BEAM GR
TP ANCHOR
TAX PARCEL # 16-106
THE FRANCES G. LARSITER
FAMILY LLLP
DB7PG 13504/3256
STA. 39+36.24 ROSWELL RD. (SR9)
STA. 37+08.09 PRIVATE DRIVE B
Δ = 89°46'06"
PRIVATE DR.
3 PHASE PRIMARY
3 WIRES
Group 4



Test hole report for test holes 1 through 9.



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			

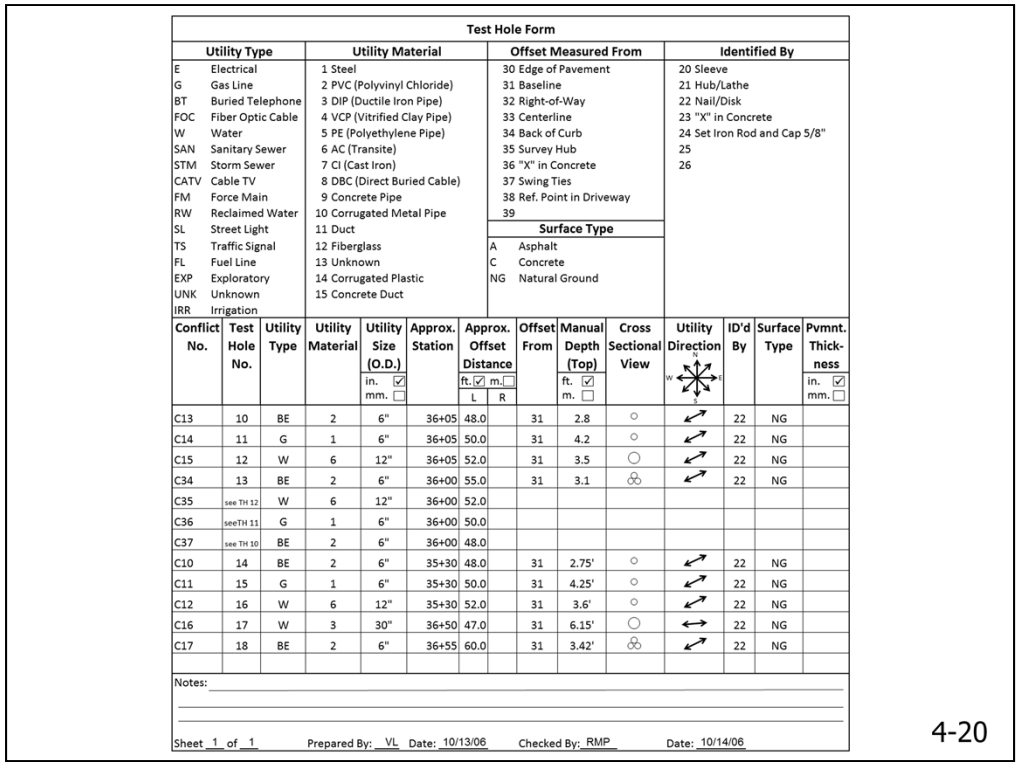
Conflict No.	Test Hole No.	Utility Type	Utility Material	Utility Size (O.D.) in. ☑ mm. ☐	Approx. Station	Approx. Offset Distance ft. ☑ m. ☐ L	R	Offset From	Manual Depth (Top) ft. ☑ m. ☐	Cross Sectional View	Utility Direction	ID'd By	Surface Type	Pvmnt. Thick-ness in. ☑ mm. ☐
C38	1	W	7	8"	36+00		36.0	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	
C20	7	BT	2	4"	37+90	25.0		31	3.25'	○	↙↗	22	A	6.00
C21	8	BT	15	unk	37+90	16.0		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 report for test holes 1 through 9.



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			

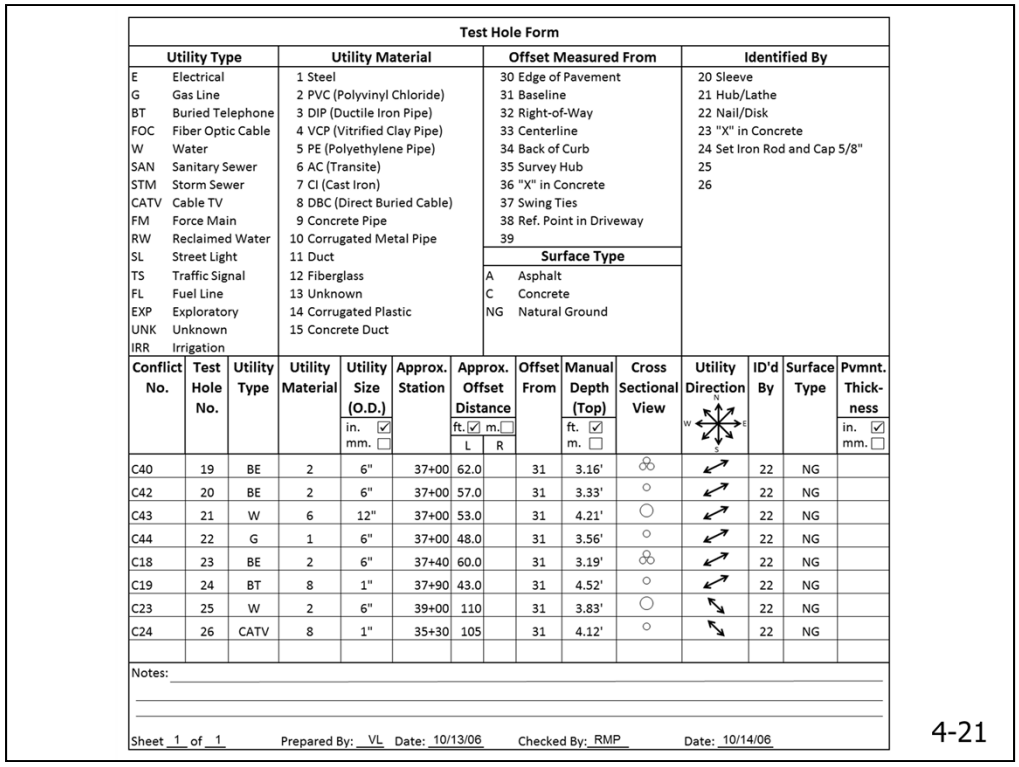
Conflict No.	Test Hole No.	Utility Type	Utility Material	Utility Size (O.D.) in. ☑ mm. ☐	Approx. Station	Approx. Offset Distance ft. ☑ m. ☐ L	R	Offset From	Manual Depth (Top) ft. ☑ m. ☐	Cross Sectional View	Utility Direction	ID'd By	Surface Type	Pvmnt. Thick-ness in. ☑ mm. ☐
C13	10	BE	2	6"	36+05	48.0		31	2.8	○	↙↗	22	NG	
C14	11	G	1	6"	36+05	50.0		31	4.2	○	↙↗	22	NG	
C15	12	W	6	12"	36+05	52.0		31	3.5	◯	↙↗	22	NG	
C34	13	BE	2	6"	36+00	55.0		31	3.1	⁂	↙↗	22	NG	
C35	see TH 12	W	6	12"	36+00	52.0								
C36	seeTH 11	G	1	6"	36+00	50.0								
C37	see TH 10	BE	2	6"	36+00	48.0								
C10	14	BE	2	6"	35+30	48.0		31	2.75'	○	↙↗	22	NG	
C11	15	G	1	6"	35+30	50.0		31	4.25'	○	↙↗	22	NG	
C12	16	W	6	12"	35+30	52.0		31	3.6'	○	↙↗	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 report for test holes 10 through 18.



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			

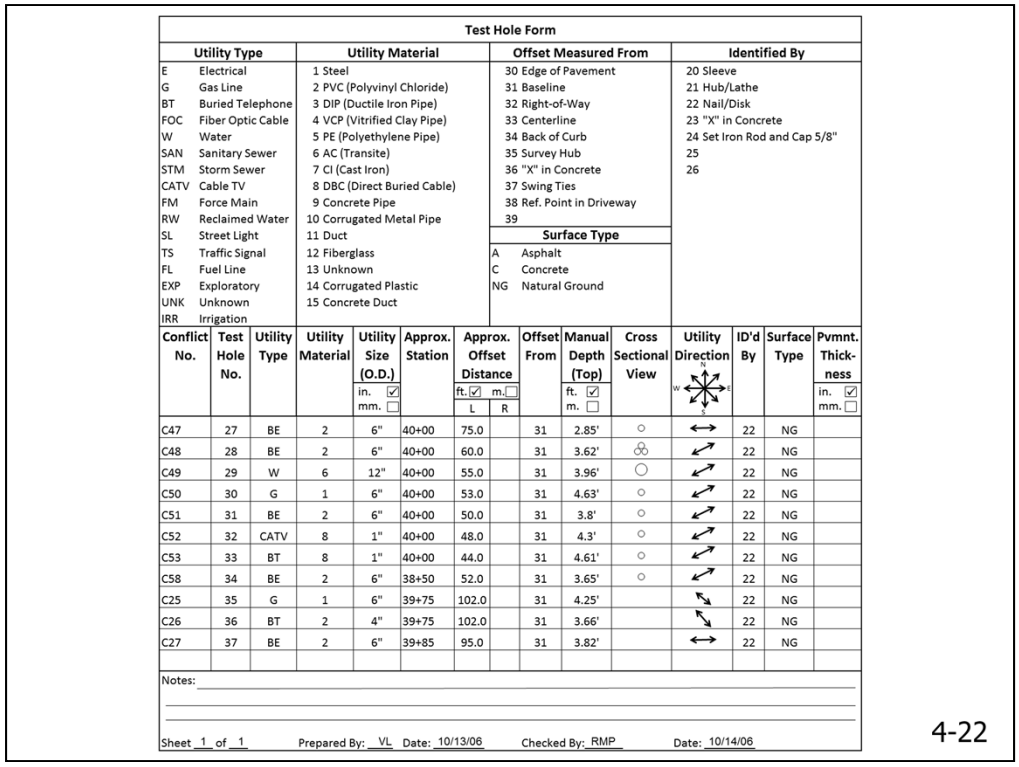
Conflict No.	Test Hole No.	Utility Type	Utility Material	Utility Size (O.D.) in. ☑ mm. ☐	Approx. Station	Approx. Offset Distance ft. ☑ m. ☐ L	R	Offset From	Manual Depth (Top) ft. ☑ m. ☐	Cross Sectional View	Utility Direction (N/W/E/S)	ID'd By	Surface Type	Pvmnt. Thick-ness in. ☑ mm. ☐
C40	19	BE	2	6"	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	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	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 report for test holes 19 through 26.



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.) in. ☑ mm. ☐	Approx. Station	Approx. Offset Distance ft. ☑ m. ☐ L	R	Offset From	Manual Depth (Top) ft. ☑ m. ☐	Cross Sectional View	Utility Direction	ID'd By	Surface Type	Pvmnt. Thick-ness in. ☑ mm. ☐
C47	27	BE	2	6"	40+00	75.0		31	2.85'	○	↔	22	NG	
C48	28	BE	2	6"	40+00	60.0		31	3.62'	⁂	⤢	22	NG	
C49	29	W	6	12"	40+00	55.0		31	3.96'	◯	⤢	22	NG	
C50	30	G	1	6"	40+00	53.0		31	4.63'	○	⤢	22	NG	
C51	31	BE	2	6"	40+00	50.0		31	3.8'	○	⤢	22	NG	
C52	32	CATV	8	1"	40+00	48.0		31	4.3'	○	⤢	22	NG	
C53	33	BT	8	1"	40+00	44.0		31	4.61'	○	⤢	22	NG	
C58	34	BE	2	6"	38+50	52.0		31	3.65'	○	⤢	22	NG	
C25	35	G	1	6"	39+75	102.0		31	4.25'		⤡	22	NG	
C26	36	BT	2	4"	39+75	102.0		31	3.66'		⤡	22	NG	
C27	37	BE	2	6"	39+85	95.0		31	3.82'		↔	22	NG	

Notes:

Sheet 1 of 1 Prepared By: VL Date: 10/13/06 Checked By: RMP Date: 10/14/06

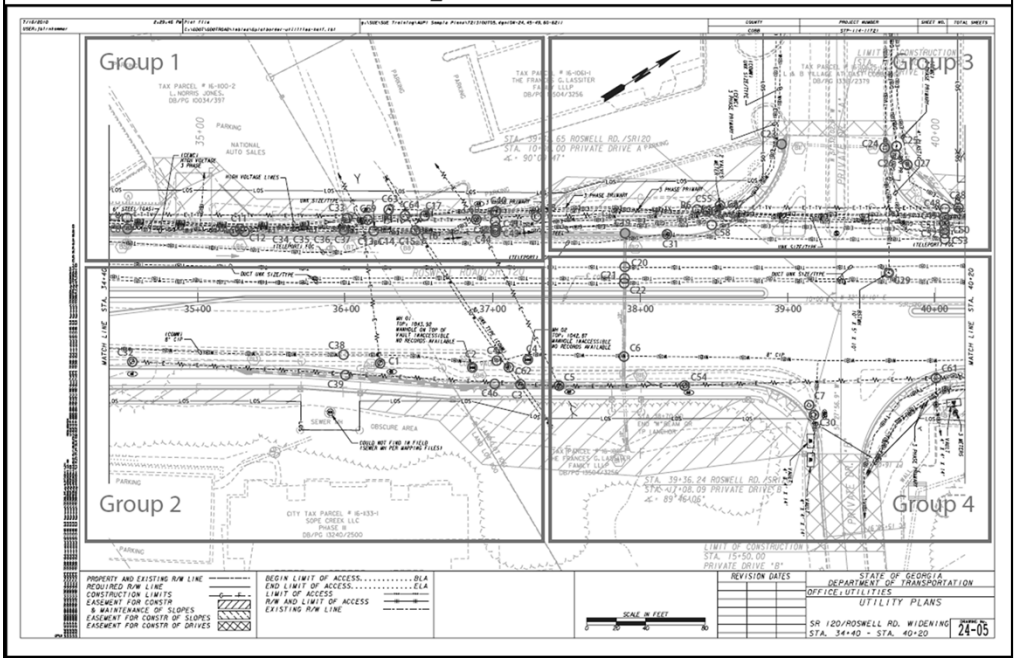
4-22

Test hole report for test holes 27 through 37.

4.2
Discussion

4-23

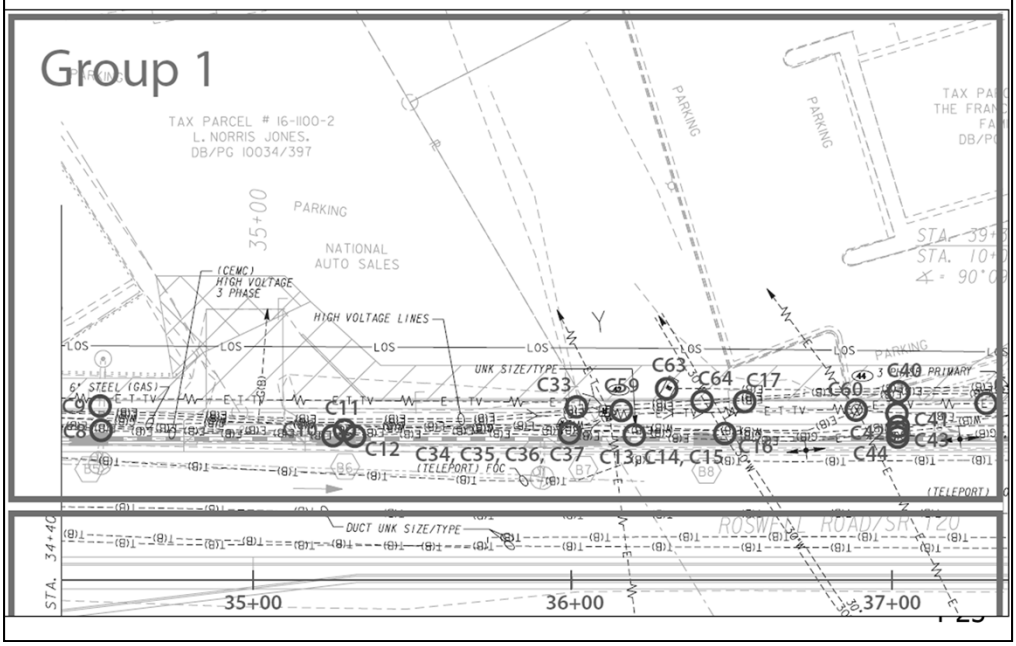
Utility Conflicts



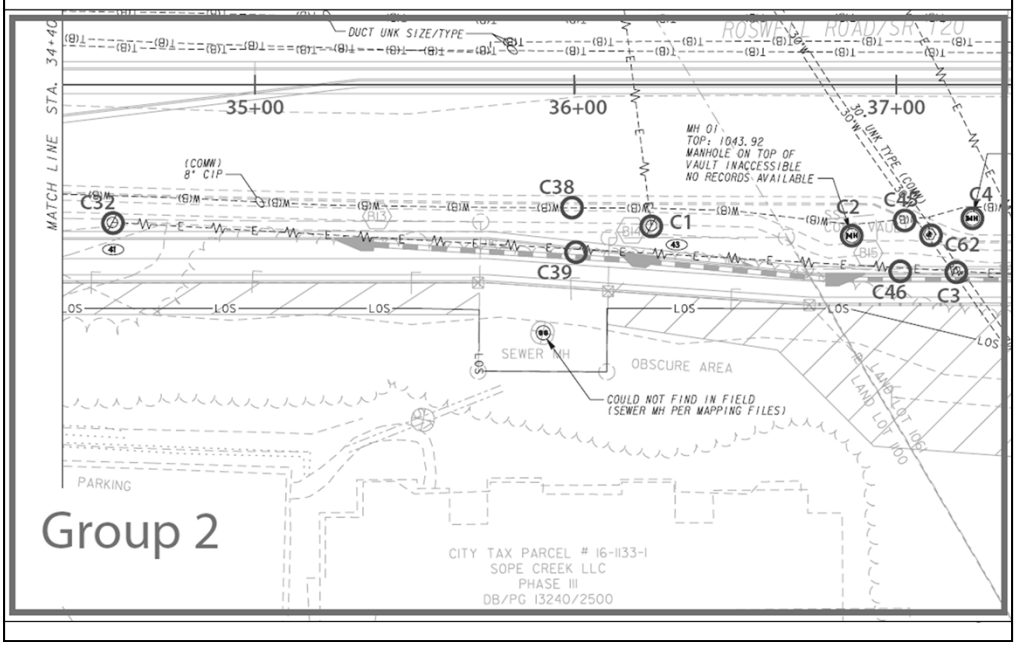
63 utility conflicts in this one plan sheet alone.

According to Georgia DOT officials, the anticipated utility impact cost was approximately $415K (as designed).

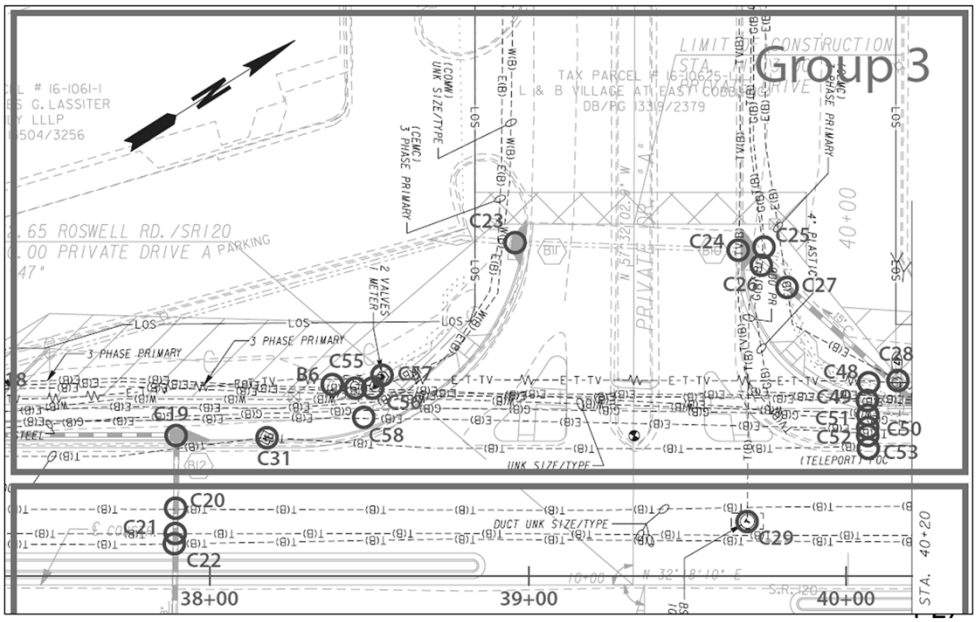
Group 1 Utility Conflicts



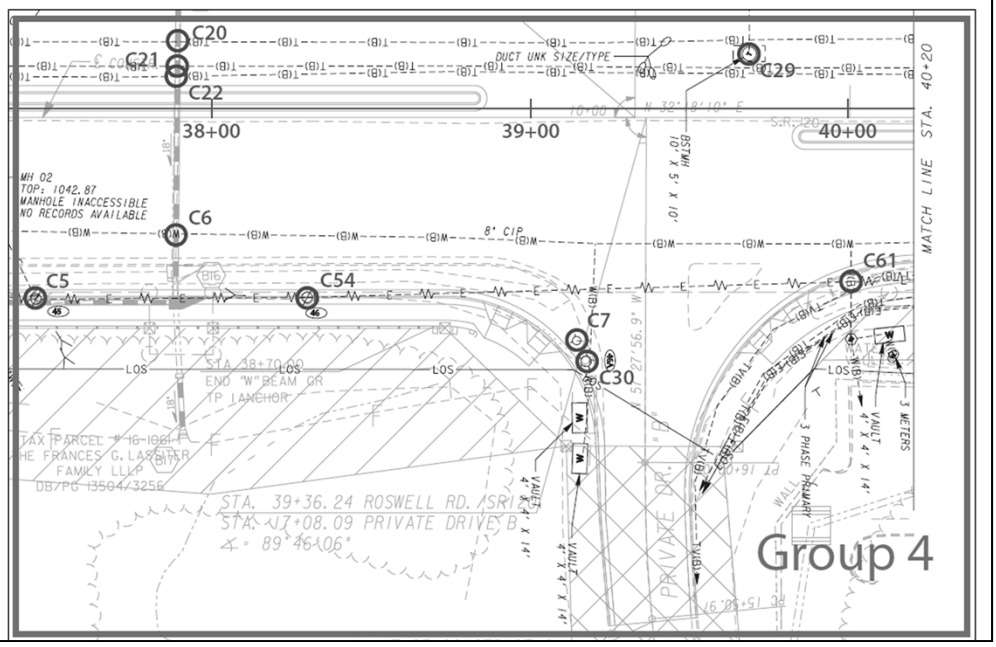
Group 2 Utility Conflicts



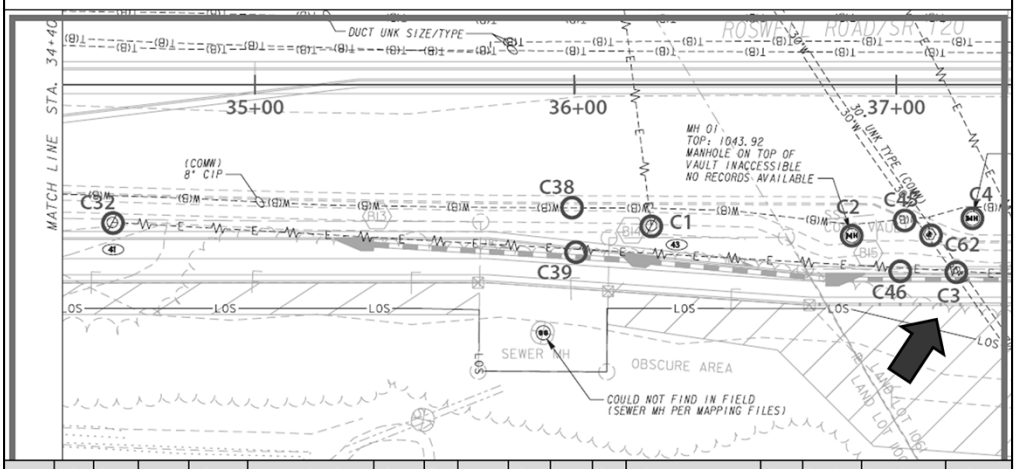
Group 3 Utility Conflicts



Group 4 Utility Conflicts



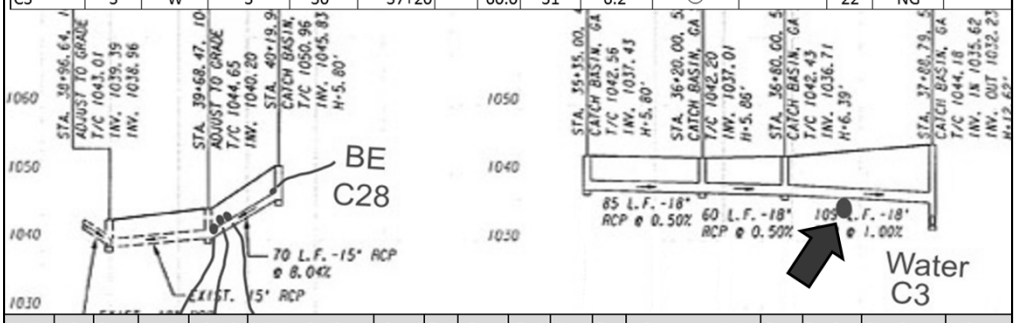
Group 2: Utility Conflict C3



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	Rsp. Party	Est. Res. Date	Res. Status	Cost Analysis
	C3	1	WM	30"	Proposed 18" drainage pipe would cross WM.	37+20		60' Rt		QLA			D	n/a	Utility conflict identified.	Detail

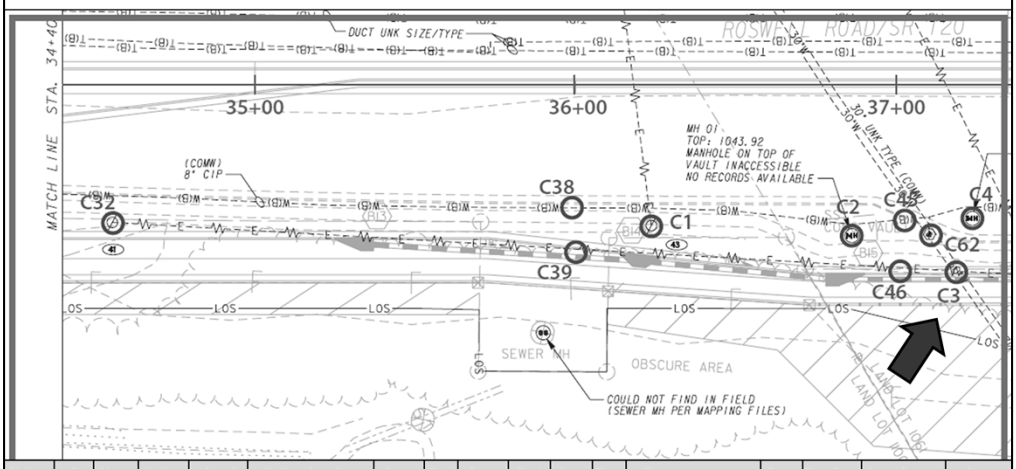
Group 2: Utility Conflict C3

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	Pvmnt. Thick-ness
				in. ☑ mm. ☐		ft. ☑ m. ☐ L	R		ft. ☑ m. ☐					in. ☑ mm. ☐
C3	3	W	3	30"	37+20		60.0	31	6.2'	○	↔	22	NG	



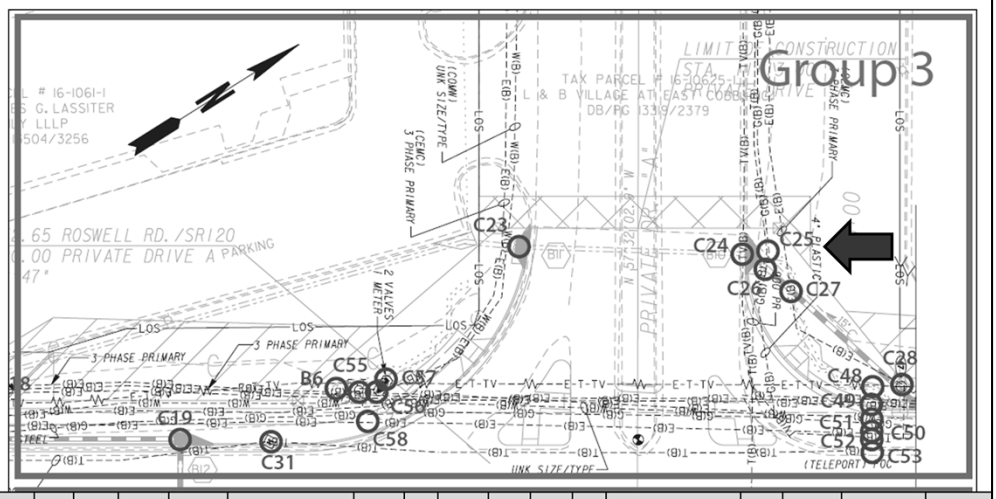
Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action	Rsp. Party	Est. Res. Date	Res. Status	Cost Analysis
	C3	1	WM	30"	Proposed 18" drainage pipe would cross WM.	37+20		60' Rt		QLA	3	Review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

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	Rsp. Party	Est. Res. Date	Res. Status	Cost Analysis
	C3	1	WM	30"	Proposed 18" drainage pipe would cross WM.	37+20		60' Rt		QLA	3	Review possibility of adjusting drainage pipes up to avoid conflict, lowest structure (B13) is at 5.6'.	D	n/a	Utility conflict identified.	Detail

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	Rsp. Party	Est. Res. Date	Res. Status	Cost Analysis
	C25	1	G		Proposed 15" drainage pipe would cross gas line.	39+75		102' L		QLA			U	n/a	Utility conflict identified.	Detail

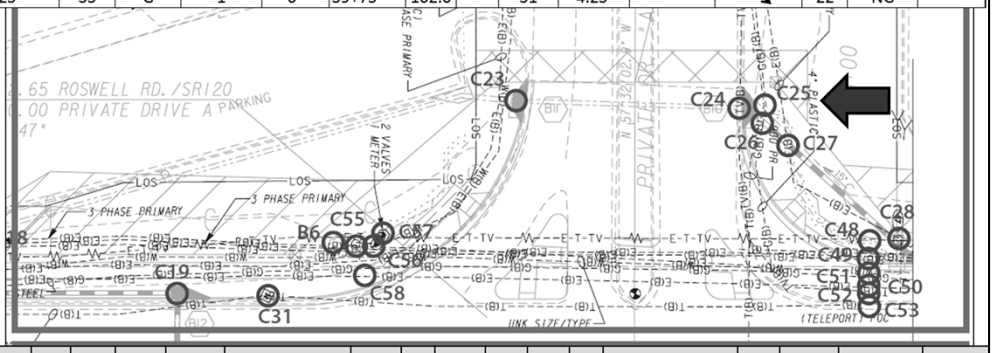
Group 3: Utility Conflict C25

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	Pvmnt. Thick-ness
				in. ☑ mm. ☐		ft. ☑ m. ☐ L	R		ft. ☑ m. ☐					in. ☑ mm. ☐
C25	35	G	1	6"	39+75	102.0		31	4.25'			22	NG	

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
	C25	1	G		Proposed 15" drainage pipe would cross gas line.	39+75		102' L		QLA	35	Review possibility of adjusting drainage pipes down to avoid conflict.	U	n/a	Utility conflict identified.	Detail

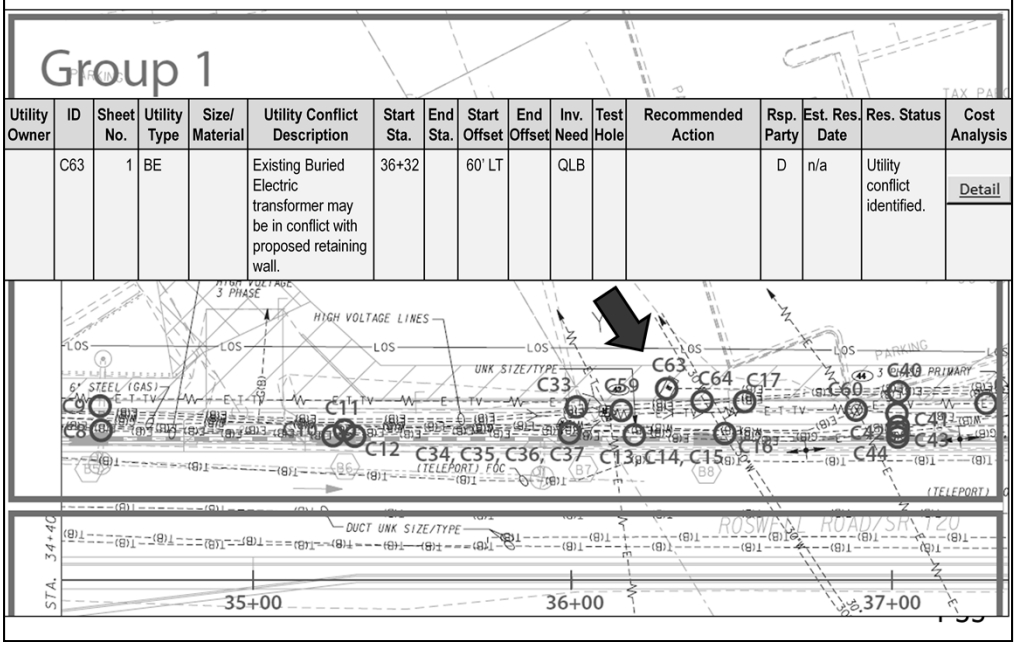
Group 3: Utility Conflict C25

Conflict No.	Test Hole No.	Utility Type	Utility Material	Utility Size (O.D.) in. ☑ mm. ☐	Approx. Station	Approx. Offset Distance ft. ☑ m. ☐ L	Approx. Offset Distance R	Offset From	Manual Depth (Top) ft. ☑ m. ☐	Cross Sectional View	Utility Direction	ID'd By	Surface Type	Pvmnt. Thick-ness in. ☑ mm. ☐
C25	35	G	1	6"	39+75	102.0		31	4.25'			22	NG	



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
	C25	1	G		Proposed 15" drainage pipe would cross gas line.	39+75		102' L		QLA	35	Review possibility of adjusting drainage pipes down to avoid conflict.	U	n/a	Utility conflict identified.	Detail

Group 1: Utility Conflict C63

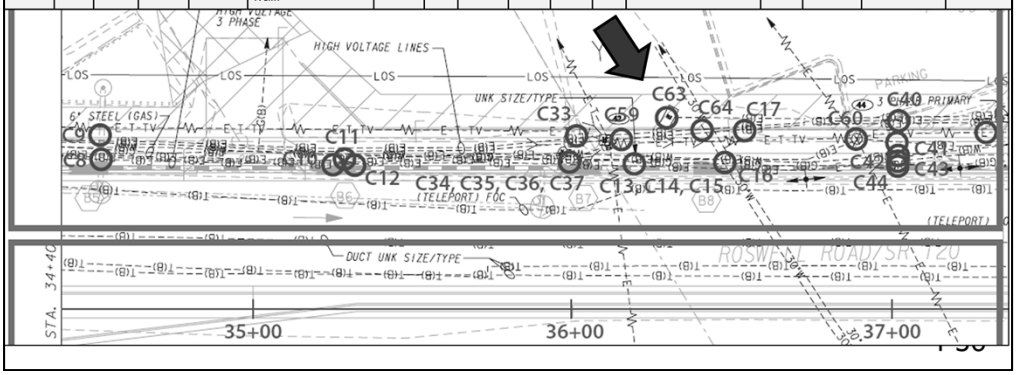


Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action	Rsp. Party	Est. Res. Date	Res. Status	Cost Analysis
	C63	1	BE		Existing Buried Electric transformer may be in conflict with proposed retaining wall.	36+32		60' LT		QLB			D	n/a	Utility conflict identified.	Detail

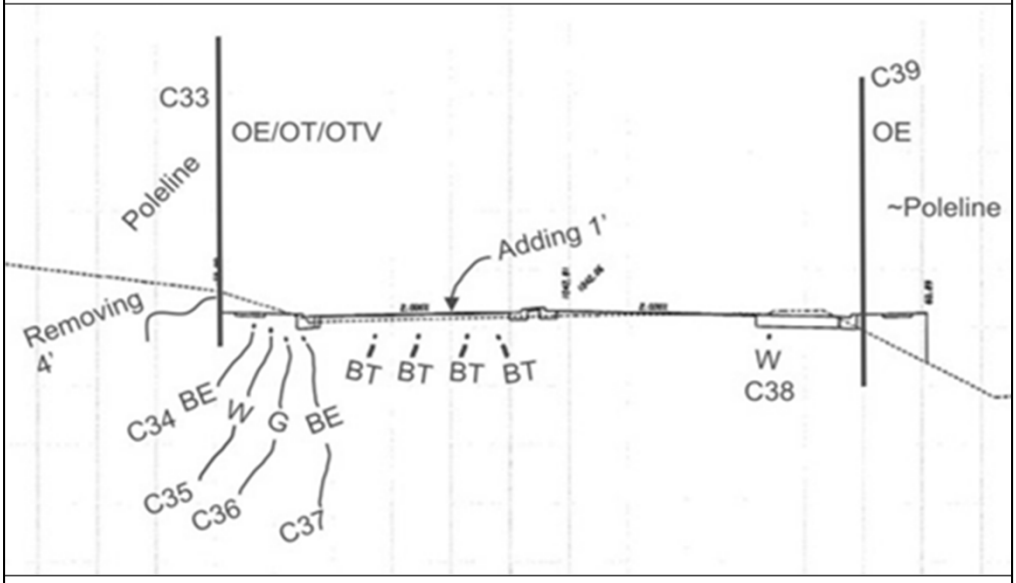
Group 1: Utility Conflict C63

Group 1

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
	C63	1	BE		Existing Buried Electric transformer may be in conflict with proposed retaining wall.	36+32		60' LT		QLB		Adjust wall at this site, or support transformer during construction of the wall.	D	n/a	Utility conflict identified.	Detail

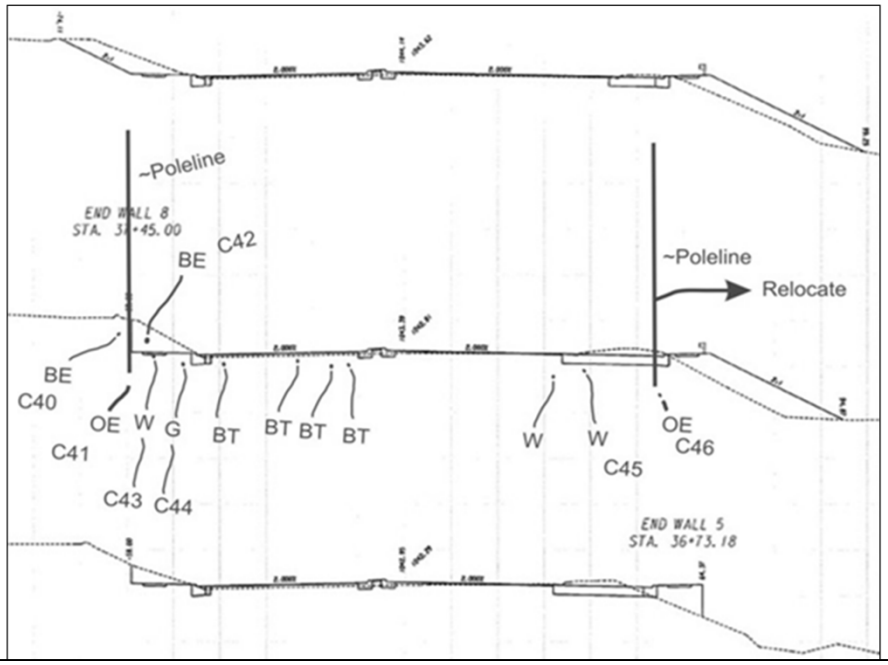


Station 36+00



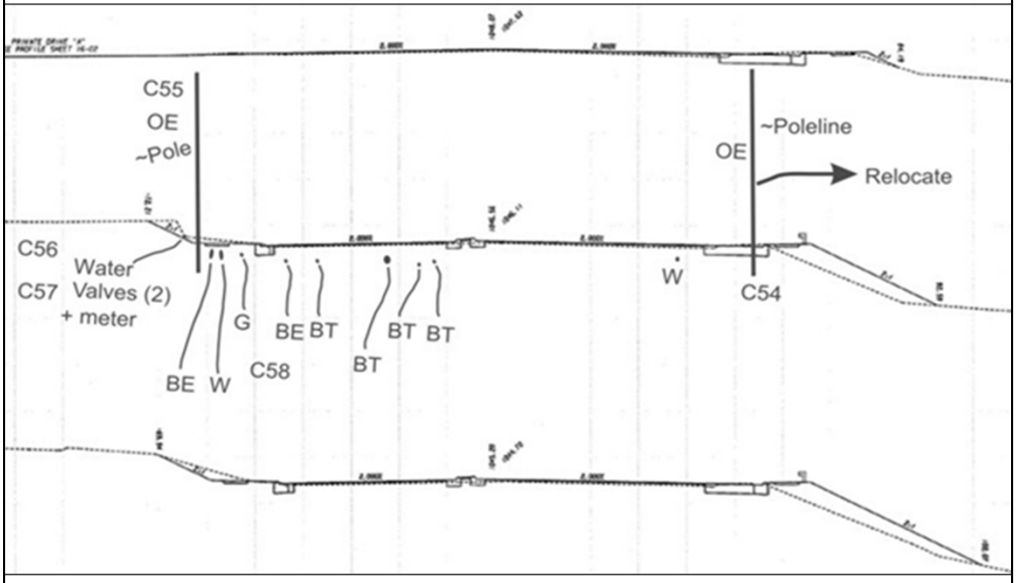
4-37

Station 37+00



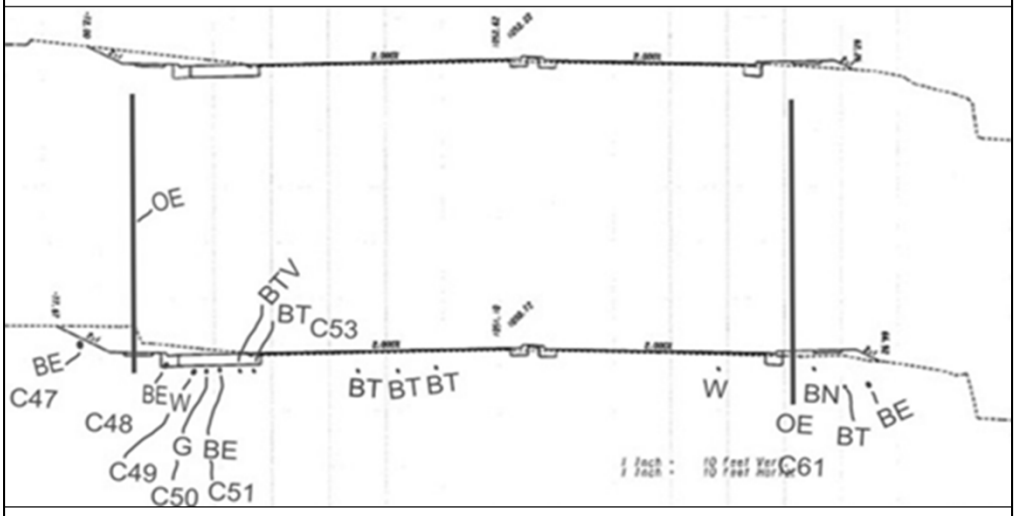
4-38

Station 38+50



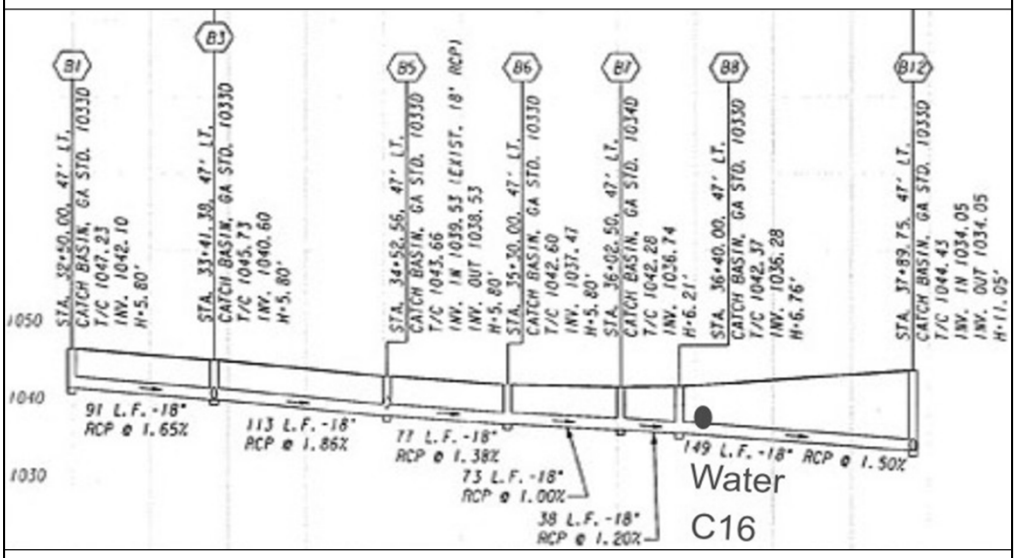
4-39

Station 40+00

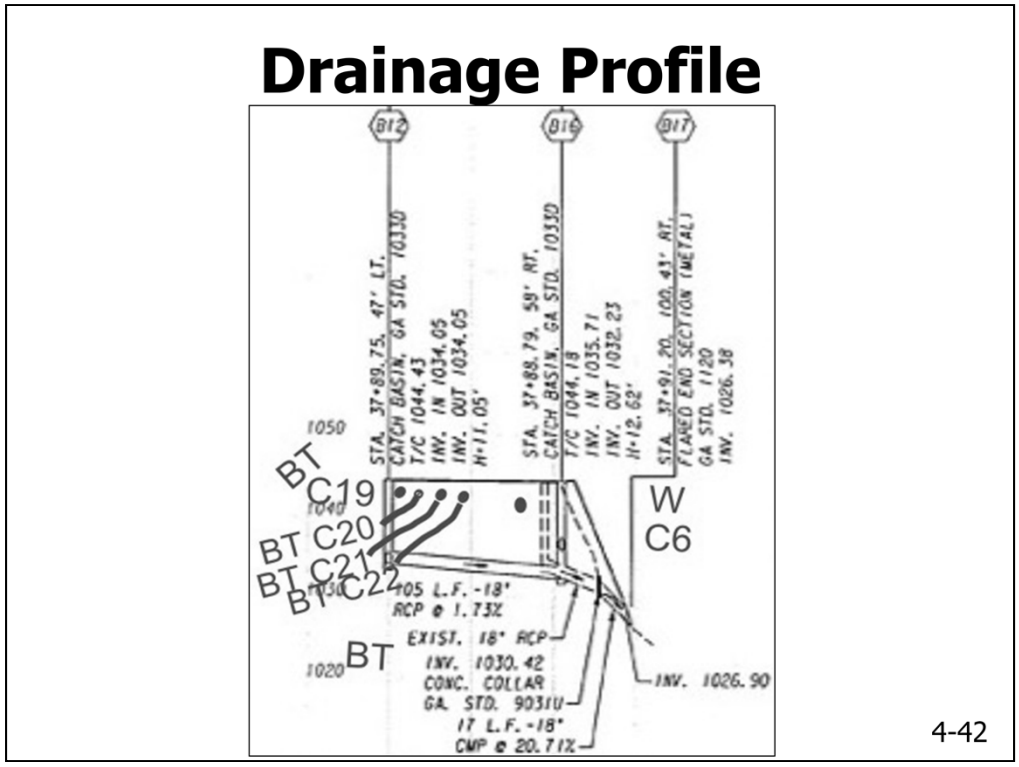


4-40

Drainage Profile



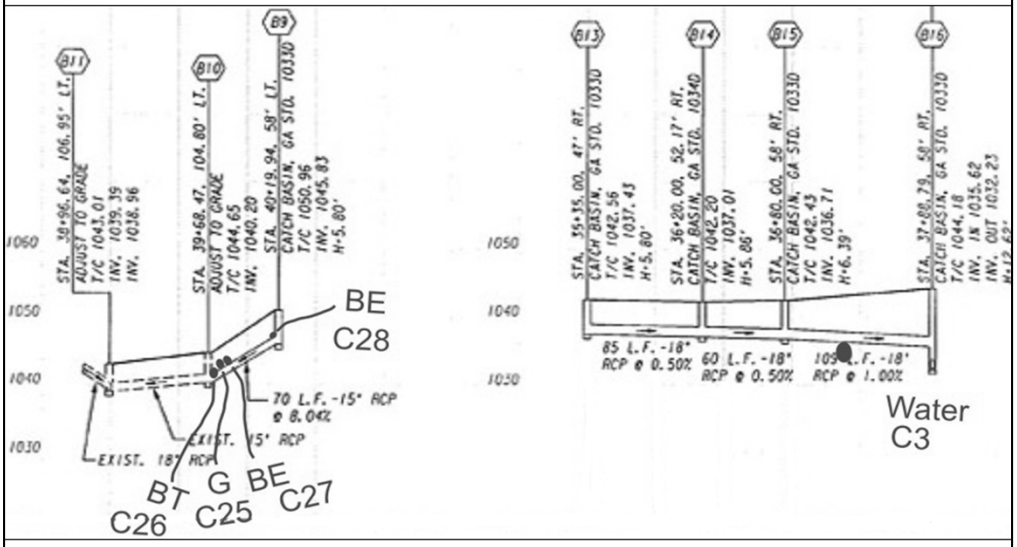
4-41



This is the profile of the drainage feature crossing the project at station 37+89. The hexagons indicate three catch basin structures.

The slide shows five utility conflicts of buried utility lines, including utility conflict C6 is a water line that crosses the drainage structure between catch basin B12 and B16.

Drainage Profile



4-43

This is cross section of the drainage features between stations 38+96 and 40+19 on the left, and drainage features between stations 35+50 and 37+88 on the right. The octagons indicate catch basin structures.

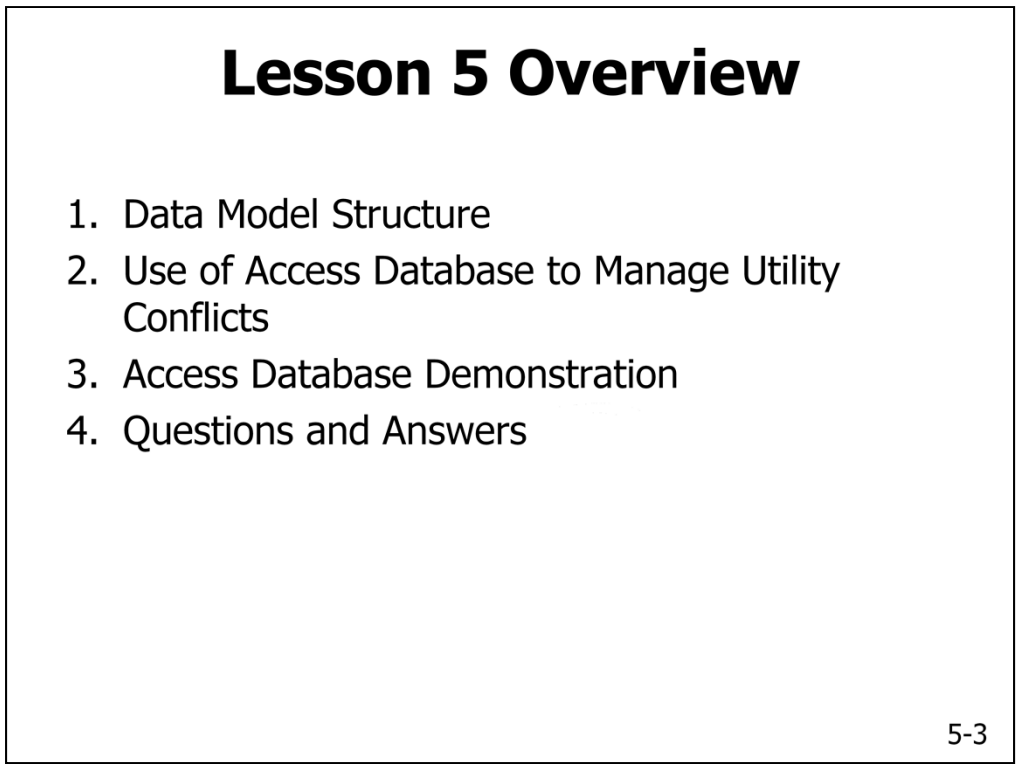
The cross sections show four utility conflicts on the left and utility conflict C3 on the right, which is a water line that crosses the drainage structure between catch basin B15 and B16.

Lesson 5

Use of Database Approach to Manage Utility Conflicts

5-1

This section of the training is Lesson 5, which provides an overview of the database product and use to manage utility conflicts.

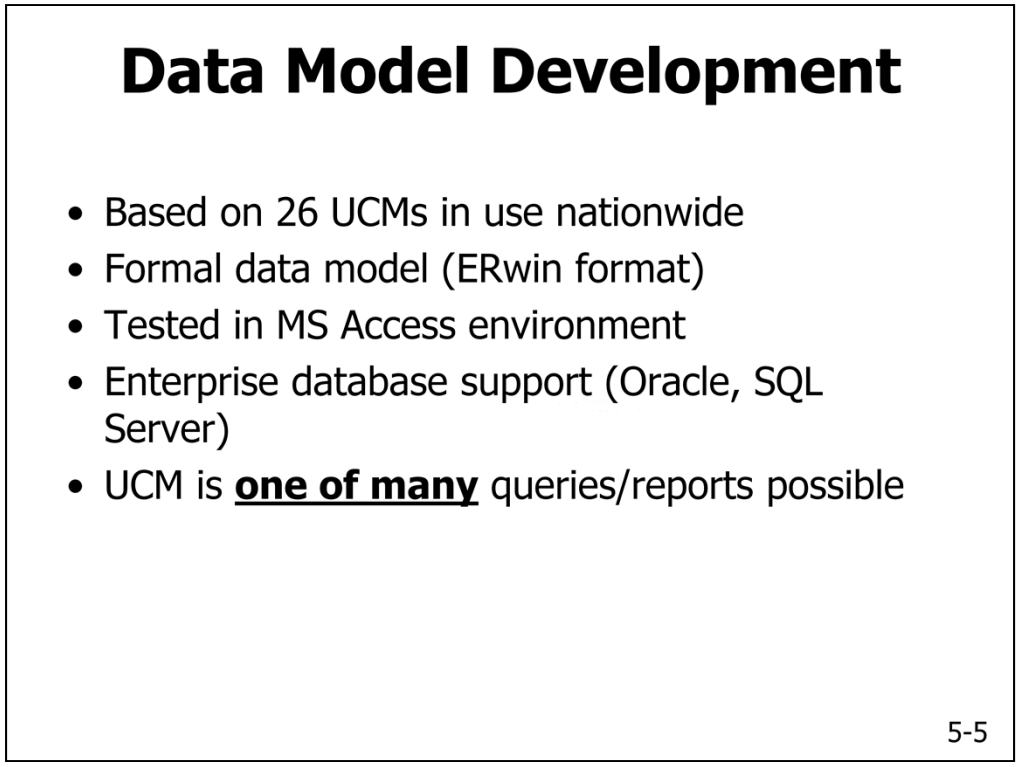


Purpose of Lesson 5:

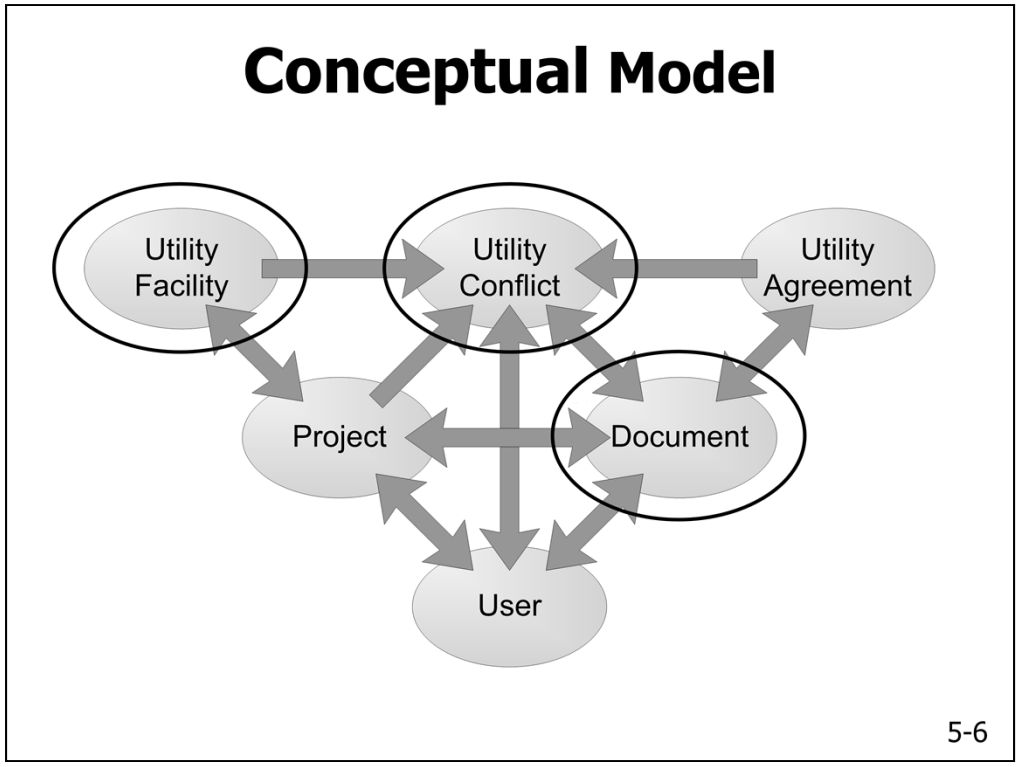
- Provide an overview of the data model structure and capabilities, how to use the database to manage utility conflicts, and provide a review of the access database including examples of data entry and queries.

5.1
Data Model Structure

5-4



The data model was based on 26 sample utility conflict matrices from around the nation. As mentioned previously, Prototype 2 (Database-level UCM) is a prototype Access database that represents a physical representation of the formal data model for the management of utility conflicts. The data model is generic and can be exported to a variety of database environments (e.g., Oracle, SQL Server). In this case, the UCM is actually one of many queries or reports possible.

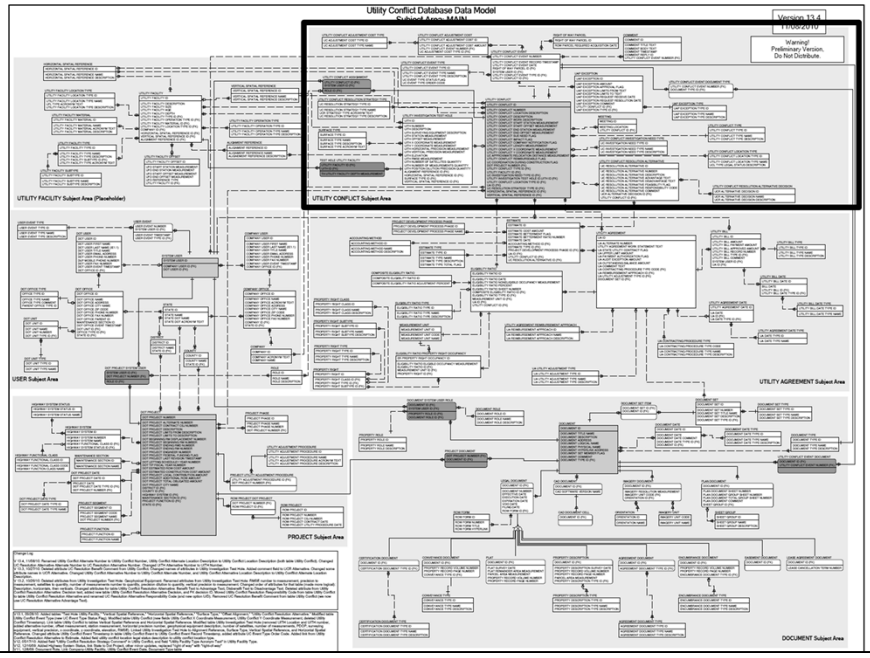


This conceptual model shows groups of data entities (or subject areas). For example, “Project” includes a series of tables related to project data, and “User” includes a series of tables related to system user data.

Some of these subject areas could be considered placeholders for existing systems. For example, “Project” could be a placeholder for a DOT system that manages project data. Prototype 2 focuses on three subject areas that are often not managed by existing DOT information systems: “Utility Facility,” “Utility Conflict,” and “Document.”

Note that there are different relationships between subject areas. Some subject areas only provide data, for example “Project” to “Utility Conflict,” while other subject areas provide and receive data, for example “Project” to “User.”

Logical Data Model



5-7

The data model covers six subject areas:

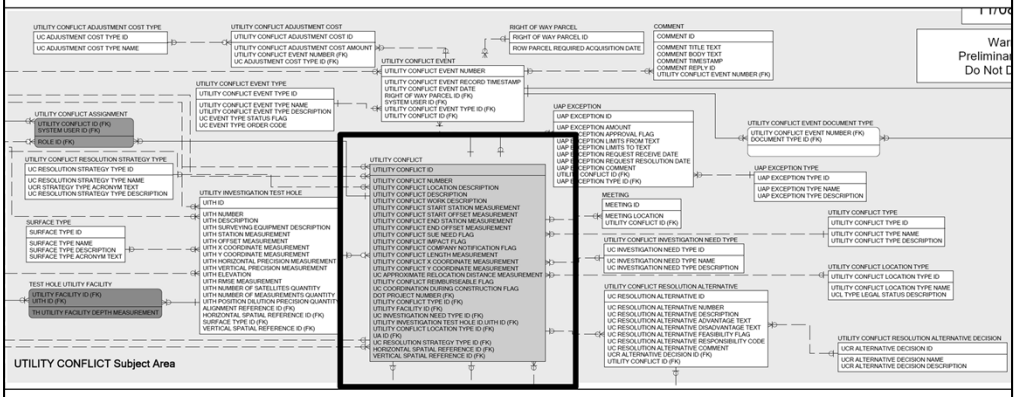
- Utility conflict
- Utility facility
- Utility agreement
- DOT project
- Document
- System user

It includes 478 attributes grouped into 111 entities. The logical data model is normalized.

This slide shows a view of the logical data model and a highlighted view of the utility conflict area.

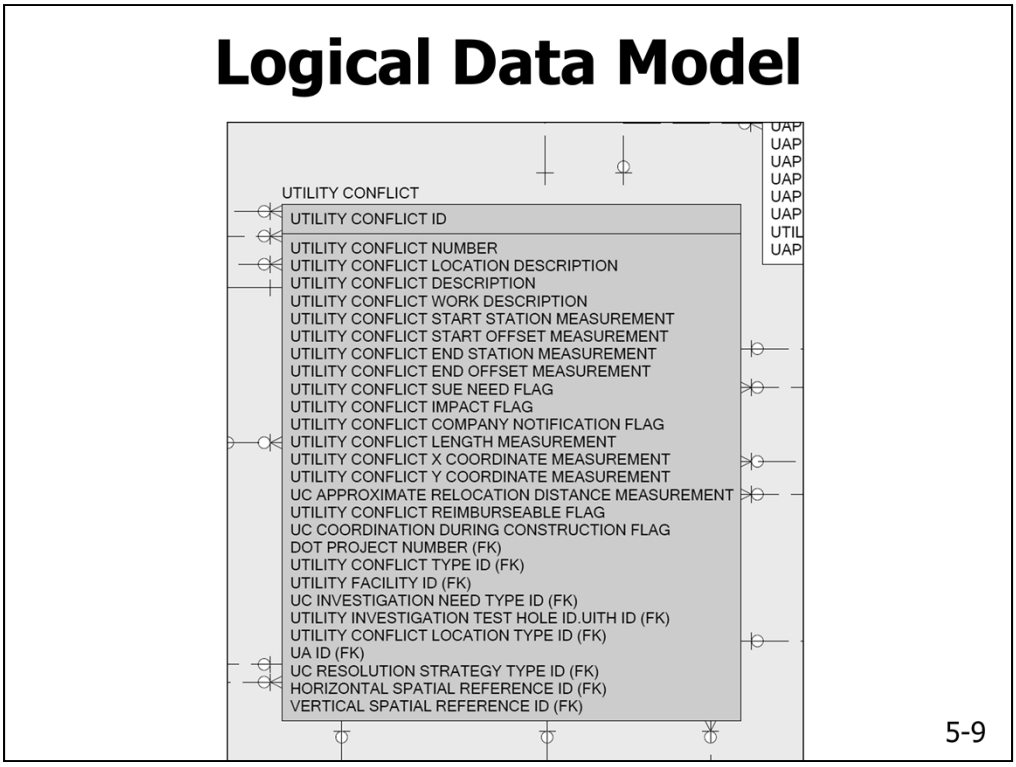
Logical Data Model

Utility Conflict Subject Area

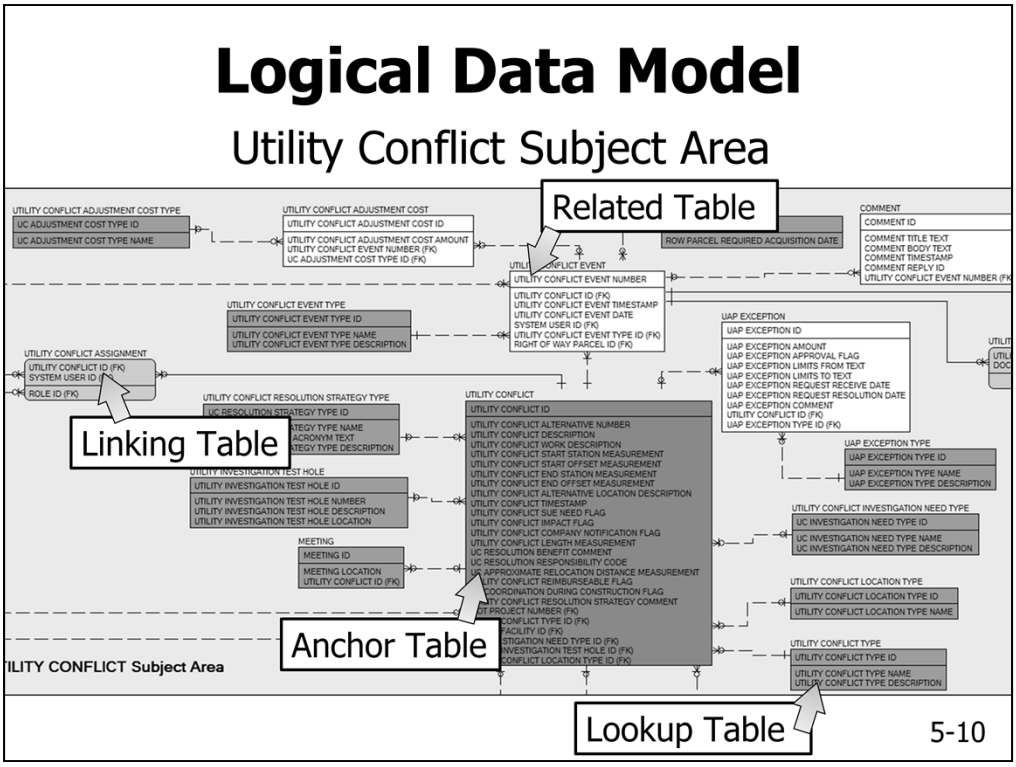


5-8

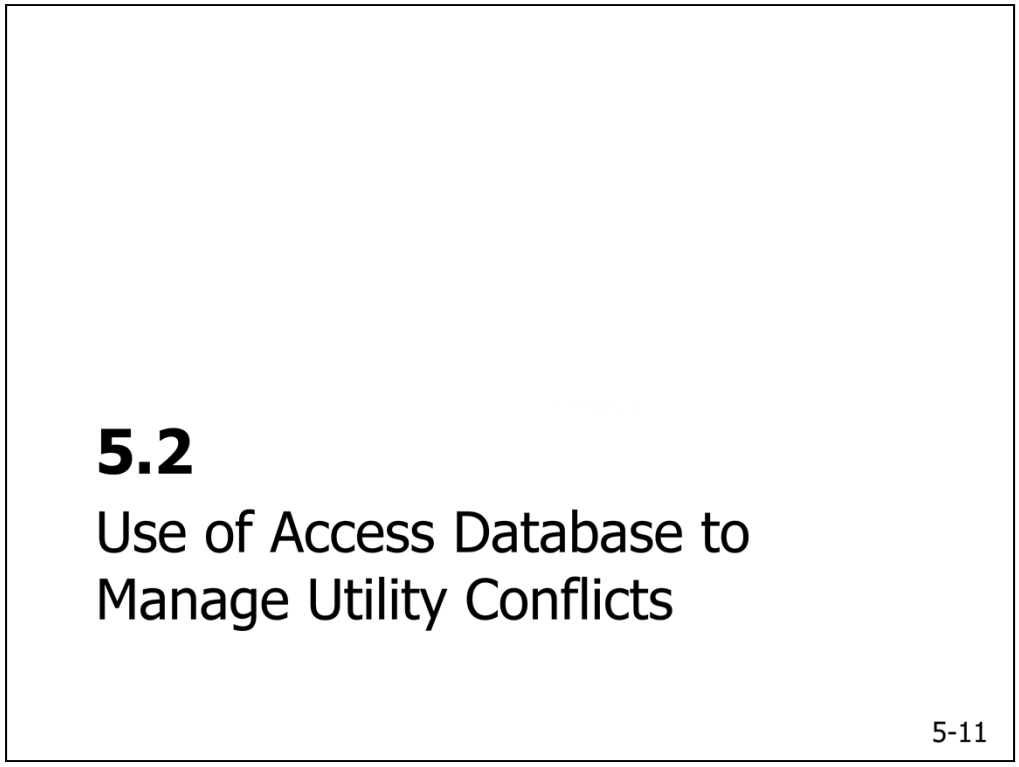
This slide shows a zoomed-in view of the utility conflict area, as well as a highlighted view of the main entity (Utility Conflict).



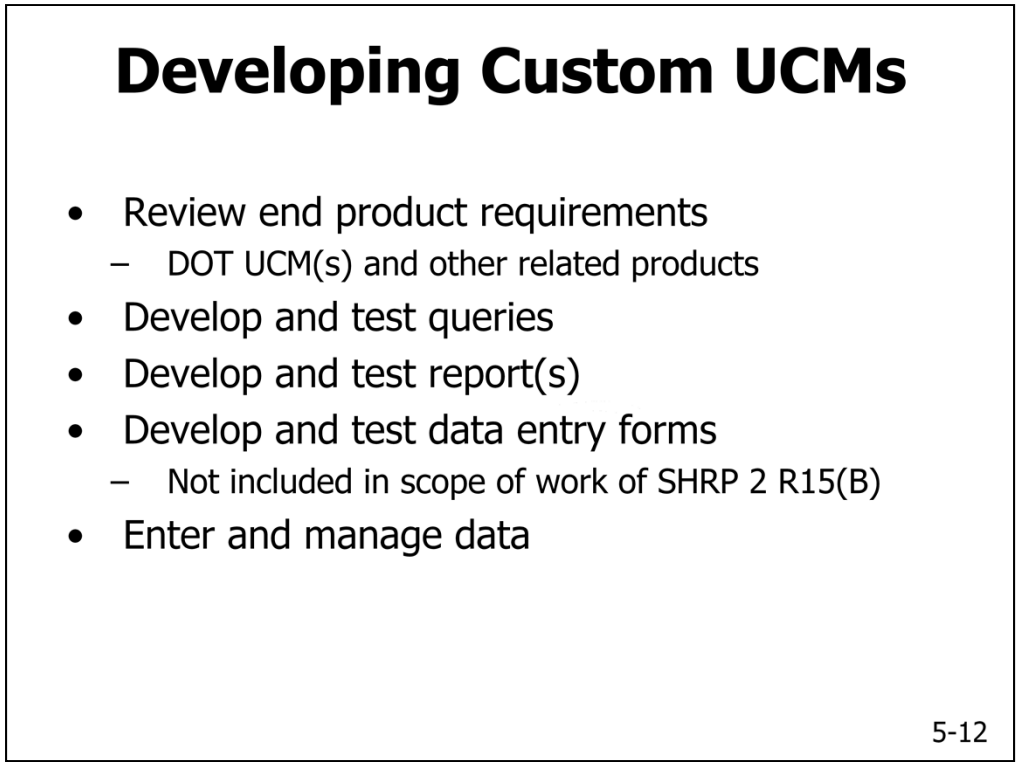
This slides shows a zoomed-in view of the Utility Conflict entity.



This is a view of the utility conflict subject area of the data model. Notice the relationships between anchor and lookup tables, the linking table, and related tables.



The purpose of this part of lesson 5 is to demonstrate the use of the data model for implementing a utility conflict matrix.



These are the steps to implement the UCM in the data model:

• Review end product requirements, i.e., understand and review the structure of the UCM and other related products.

• Develop and test queries.

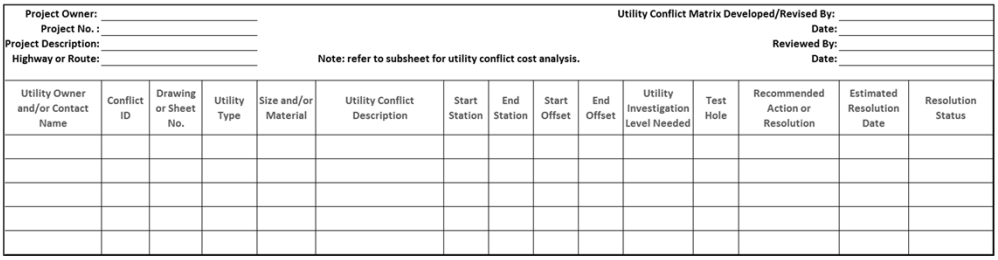
• Develop and test reports.

• Develop and test data entry forms. Note that this activity was not included in the scope of work of SHRP 2 R15(B).

• Enter and manage data in the database environment.

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: _____ Note: refer to subsheet for utility conflict cost analysis. Date: _____

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

5-13

Step 1 involves identifying the requirements of the final report. For example, this slide shows template UCM developed as part of the research. The prototype UCM includes 8 header data items and 15 main body data items.

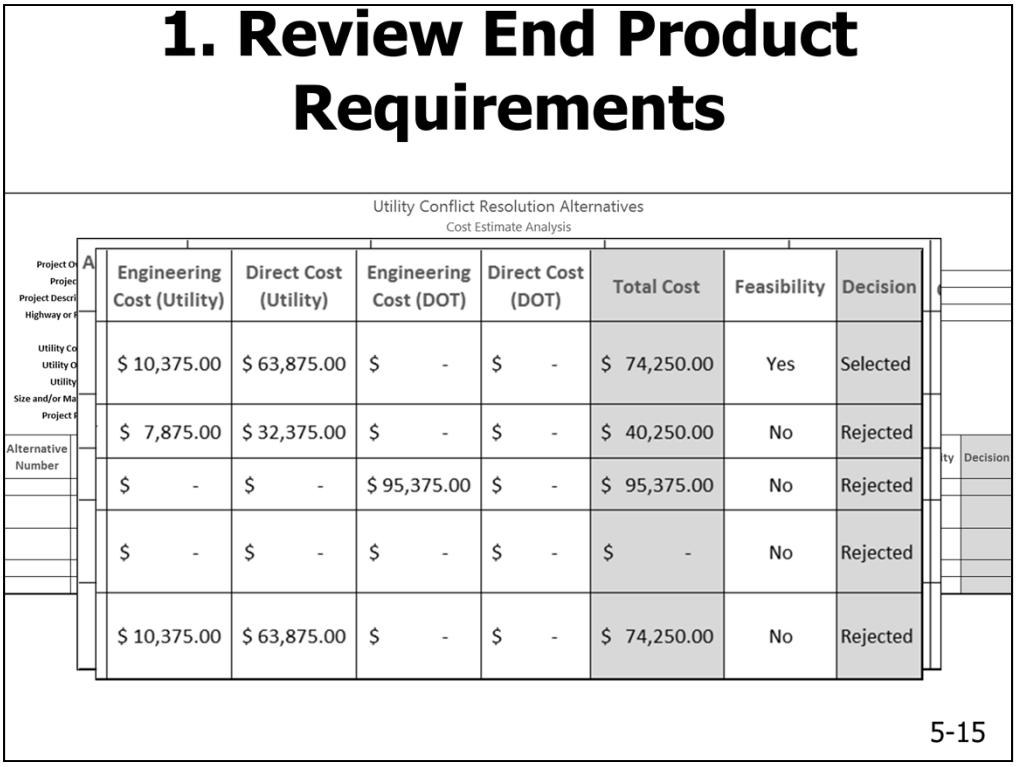
1. Review End Product Requirements

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.

5-14

This is an example of a record in the UCM.



This is an example of the prototype utility conflict resolution alternative sheet developed as part of the research. This sheet would also be part of the identification of the end product requirements.

The header information in this sheet is the same as that for a specific record on the main utility conflict matrix. In principle, there could be one analysis sheet for each record. Note that the header box has a field for the project phase. This field allows a DOT to produce additional sheets for each conflict as the project progresses and track the changes of the cost estimates over time.

The following steps show how the data is entered into the database and what queries are needed to develop database reports similar to this and the previous screenshot.

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

Step 2 involves developing queries to generate the UCM report. Keep in mind that generating queries, particularly in the case of reports that need to be created frequently, is a one-time effort: Once the queries are developed, reports can be created for each project once the project data is entered into the database.

For example, for the UCM displayed in the previous slides, it is necessary to develop the following queries:

• Create estimated completion date query

• Create multiple utility conflict status query

• Retrieve utility conflict status

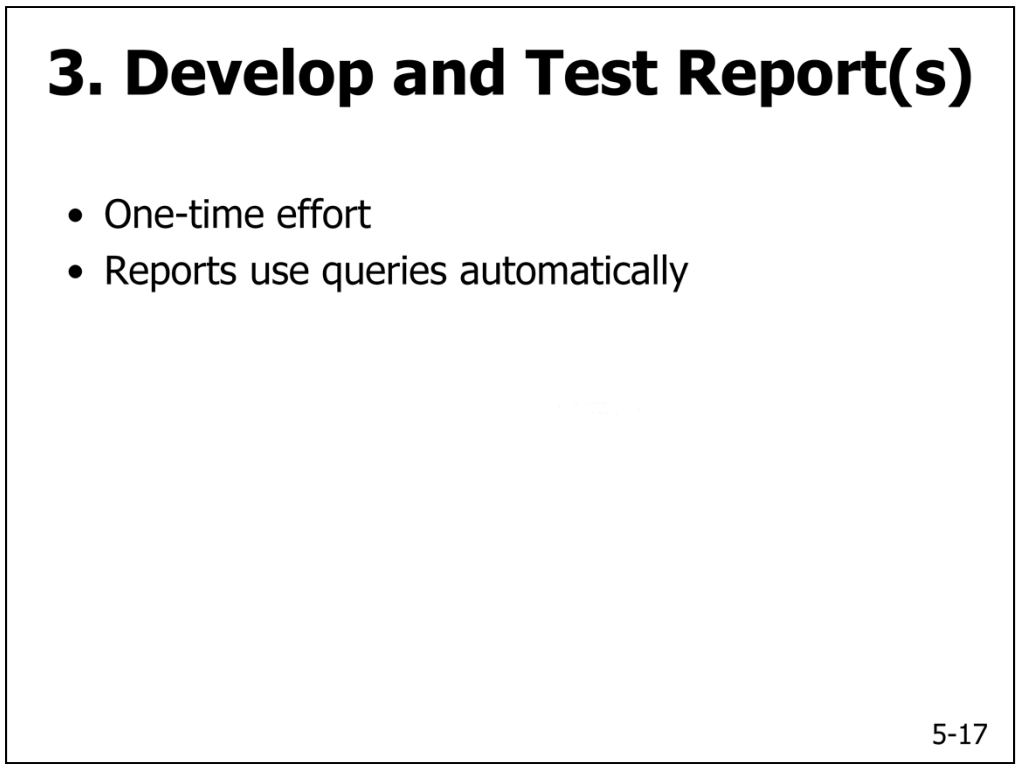
• Retrieve plan document sheet number

• Create total estimate amount query

• Create estimates crosstab query

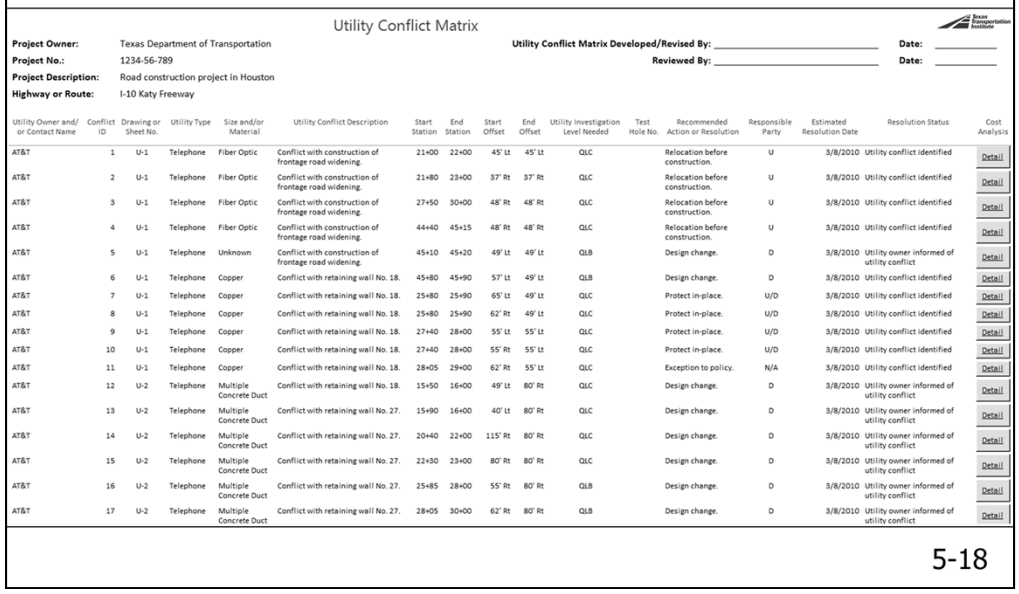
• Create alternative analysis sample query

• Create main query



Step 3 involves generating reports based on the queries described previously. Generating the report layout is a one-time effort. Once the layout is developed, reports can be created for each project once the project data is entered into the database.

Main Report: Report View



Utility Conflict Matrix

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

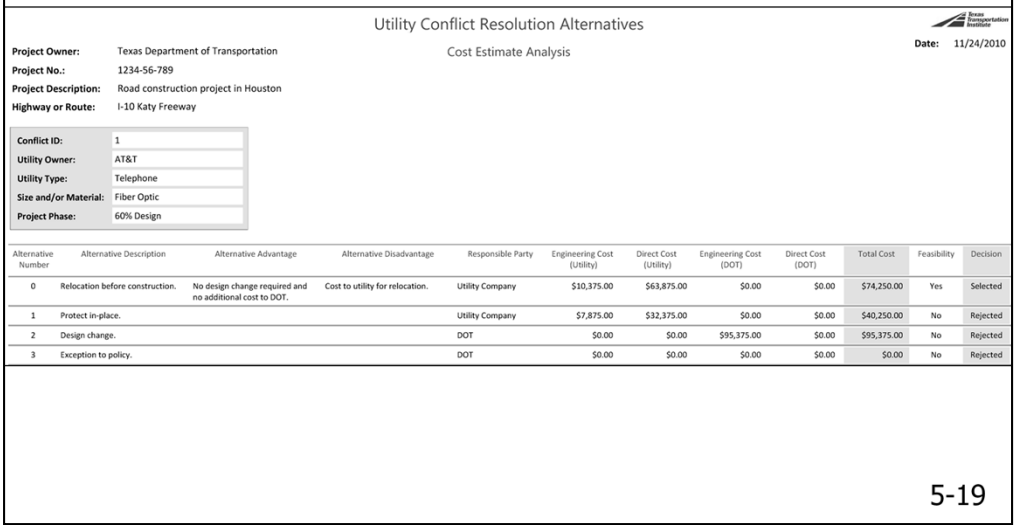
Utility Conflict Matrix Developed/Revised By: _____ **Date:** _____
Reviewed By: _____ **Date:** _____

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 No.	Recommended Action or Resolution	Responsible Party	Estimated Resolution Date	Resolution Status	Cost Analysis
AT&T	1	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	21+00	22+00	45' Lt	45' Lt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	2	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	21+80	23+00	37' Rt	37' Rt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	3	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	27+50	30+00	48' Rt	48' Rt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	4	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	44+40	45+15	48' Rt	48' Rt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	5	U-1	Telephone	Unknown	Conflict with construction of frontage road widening.	45+10	45+20	49' Lt	49' Lt	QLB		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	6	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	45+80	45+90	57' Lt	49' Lt	QLB		Design change.	D	3/8/2010	Utility conflict identified	Detail
AT&T	7	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	25+80	25+90	65' Lt	49' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	8	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	25+80	25+90	62' Rt	49' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	9	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	27+40	28+00	55' Lt	55' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	10	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	27+40	28+00	55' Rt	55' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	11	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	28+05	29+00	62' Rt	55' Lt	QLC		Exception to policy.	N/A	3/8/2010	Utility conflict identified	Detail
AT&T	12	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 18.	15+50	16+00	49' Lt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	13	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	15+90	16+00	40' Lt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	14	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	20+40	22+00	115' Rt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	15	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	22+30	23+00	80' Rt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	16	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	25+85	28+00	55' Rt	80' Rt	QLB		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	17	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	28+05	30+00	62' Rt	80' Rt	QLB		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail

5-18

This slide shows the database report that replicates the prototype UCM.

Sub Report: Report View



Utility Conflict Resolution Alternatives

Cost Estimate Analysis

Date: 11/24/2010

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:	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 (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision
0	Relocation before construction.	No design change required and no additional cost to DOT.	Cost to utility for relocation.	Utility Company	$10,375.00	$63,875.00	$0.00	$0.00	$74,250.00	Yes	Selected
1	Protect in-place.			Utility Company	$7,875.00	$32,375.00	$0.00	$0.00	$40,250.00	No	Rejected
2	Design change.			DOT	$0.00	$0.00	$95,375.00	$0.00	$95,375.00	No	Rejected
3	Exception to policy.			DOT	$0.00	$0.00	$0.00	$0.00	$0.00	No	Rejected

5-19

This slide shows the database report that replicates the cost estimate analysis subsheet.

Other Sample Reports

- Alaska DOT
- California DOT
- Georgia DOT

5-20

Alaska DOT: Sample Report

DRAFT Utility Conflict Report
West Dowling Road Phase I

Anchorage, Alaska
DOT&PF No. 50898

Table 2: Chugach Electric Association, Incorporated, Conflicts Summary

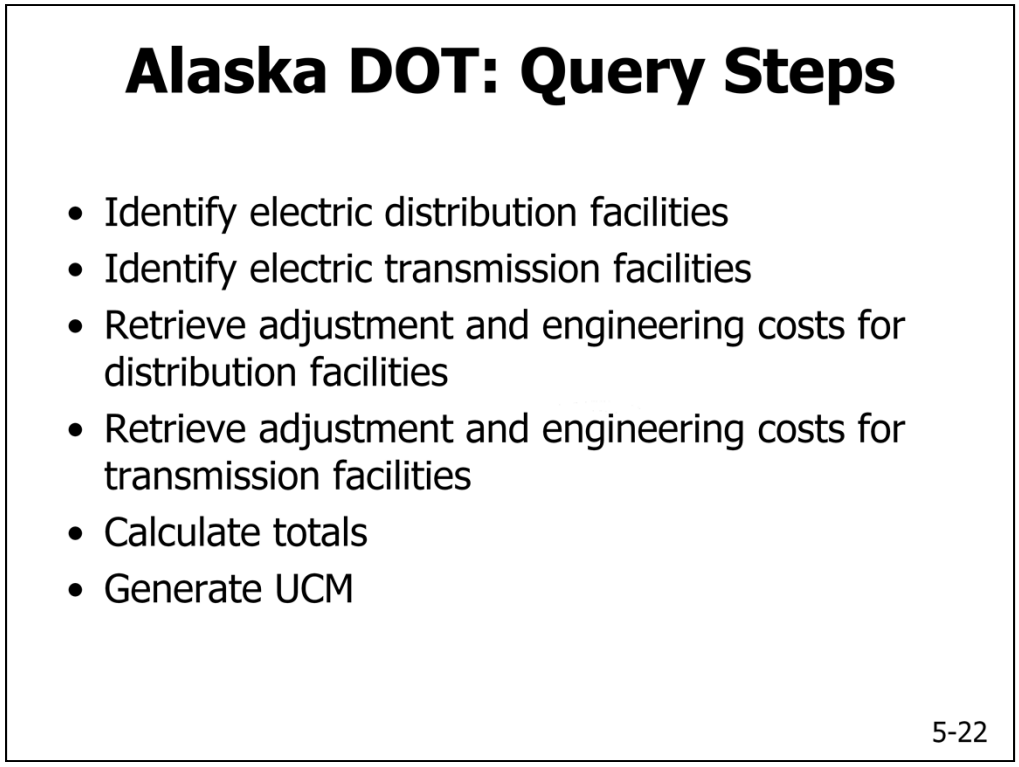
Station	Offset	Station	Offset	Size/Type	Length	Conflict	ADJ/REL	Cost	PE/CE Cost	Total Cost
CEA Distribution Relocation Costs										
9+00	150' RT		200' LT	3φ UG	350	FG	REL	52,500	15,750	68,250
16+00	100' LT	42+30	80' LT	3φ UG	2630	FG	REL	394,500	118,350	512,850
16+00	100' LT	15+50	100' RT	3φ UG	250	FG	REL	37,500	11,250	48,750
16+00	100' LT	29+00	75' LT	1φ UG	1650	FG	REL	165,000	49,500	214,500
36+40	80' LT	35+80	350' RT	3φ UG	430	FG	REL	64,500	19,350	83,850
36+60	80' LT	36+70	380' LT	3φ UG	300	FG	REL	45,000	13,500	58,500
	UG Loop to the North			3φ UG	1000	FG	REL	150,000	45,000	195,000
							Subtotal	909,000	272,700	1,181,700
CEA Transmission Relocation Costs										
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
							Total CEA Relocation Costs	**1,039,000**	**311,700**	**1,350,700**

1φ 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 swamp braces removed and steel piling added, down guys replaced with overhead span guy and down guys.

5-21

This utility conflict matrix was provided by the Alaska DOT. Note the emphasis on cost items (three columns plus total), and that there are separate tables for each utility involved in the project.

[handout]



This slide lists the main steps used to replicate the UCM provided by the Alaska DOT.

Alaska DOT: Database Report

Alaska UCM

DRAFT Utility Conflict Report
West Dowling Road Phase 1

Anchorage, Alaska
DOT&PF No. 50898

Start Station	Start Offset	End Station	End Offset	Size	Type	Length	Conflict	ADJ/REL	Cost	PE/CE Cost	Total Cost
CEA Distribution Relocation Costs											
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	350' RT	3 phi	UG	430	FG	Relocation before construction	$64,500	$19,350	$83,850
36+60	80' LT	36+70	380' 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
CEA Transmission Relocation Costs											
14+75	55' RT			138 kV	OH	1	PWY	Relocation before construction	$30,000	$9,000	$39,000
32+75	55' RT			138 kV	OH	1	EX	Relocation before construction	$50,000	$15,000	$65,000
36+38	45' RT			138 kV	OH	1	EX	Relocation before construction	$50,000	$15,000	$65,000
								Subtotal:	$130,000	$39,000	$169,000
								Total Relocation Costs:	**$1,039,000**	**$311,700**	**$1,350,700**

This is the database report that replicates the UCM provided by the Alaska DOT.

California DOT: Sample Report

I-10-EA 122401-Utilities Conflict Status

date of last revision May 30, 2000
this document was prepared by

Conflict No.	Utility Sheet No.	Pothole No. (On Ortho)	Owner	Utility Description	Pothole/Manhole Location	Conflict Location	Utility Conflict/ Work Description	Investigation			Depth	Impact?		Action			Util. Reloc. A-Abandon RD-Relocate/Reuse RD-Relocate/Dump P-Protect in place NC-No conflict	Resp. Party U-Utility Co C- Contractor	Required Completion Date	Comments
								Pothole	Manhole	Overhead	(ft)	Y	N	Remove	Relocate	Other				
1	**U-2**	**1**	**PACBELL**	**40 DU Telephone**	**62 m Rt of I-405 Sta 160+55**	**49 m Rt and 57 m Rt of I-405 Sta 160+55**	**conflict with Retaining Walls No. 166 & No. 168**	X			**4.55 14.40**		**N**				***P***			
2	**U-2**	**2**	**PACBELL**	**40 DU Telephone**	**45 m Lt of I-405 Sta 160+55**	**49 m Rt and 57 m Rt of I-405 Sta 160+55**	**conflict with Retaining Walls No. 166 & No. 168**				-		**N**				***P***			
3	**U-3**	**3**	**SCE**	**25 mm DU**	**30 m Rt of I-405 Sta 165+01**	43 m Rt of I-405 Sta 165+01	**conflict with Retaining Wall No. 165**				-		**N**				***P***			**Located in Bristol OC**
4	**U-3**	**4**	**SCE**	**25 mm DU**	**46 m Lt of I-405 Sta 165+01**	43 m Rt of I-405 Sta 165+01	**conflict with Retaining Wall No. 165**				-		**N**				***P***			**Located in Bristol OC**
5	U-3	5	MWD	900 mm WSP Water in 380 mL ENC	50 m Rt of I-405 Sta 164+96	44 m Rt of I-405 Sta 164+95	conflict with Retaining Wall No. 166	X			6.70		N				***P***			
6	U-3	6	MWD	900 mm WSP Water in 380 mL ENC	50 m Lt of I-405 Sta 164+96	44 m Rt of I-405 Sta 164+95	conflict with Retaining Wall No. 166	X			6.50		N				***P***			
7	U-3	7	Caltrans	600 mm RCP	53 m Rt of I-405 Sta 163+42	53 m Rt of I-405 from Sta 163+29 to Sta 163+42	conflict with Delhi Channel Bridge	X			6.00		N				***P***			
8	U-3	8	Caltrans	600 mm RCP	53 m Rt of I-405 Sta 163+29	53 m Rt of I-405 from Sta 163+29 to Sta 163+42	conflict with Delhi Channel Bridge	X			9.00		N				***P***			
9	**U-3**	**9**	**MCWD**	**300 mm ACP Water in** 119mL, 500mm STL Casing	**32 m Rt of I-405 Sta 163+25**	**30 m Rt of I-405 Sta 163+25**	**conflict with** I-405 Widening & BR1 Line	X			**10.30**		**N**				***P***			
10	**U-3**	**10**	**MCWD**	300 mm ACP Water 119mL, 500mm STL Casing	32 m Lt of I-405 Sta 163+25	33 m Lt of I-405 Sta 163+25	conflict with I-405 Widening & BR1 Line	X			**8.75**		**N**				***P***			
11	**U-3**	**MH 11**	**CSDOC**	Manhole	81 m Rt of I-405 Sta 162+92	35 m Rt of I-405 Sta 162+92	conflict with I-405 Widening & BR1 Line		**X**		**10.40**		**N**				***P***			
12	**U-3**	**12**	**CSDOC**	380 mm VCP Sewer	36 m Lt of I-405 Sta 162+91	32 m Lt of I-405 Sta 162+90	conflict with I-405 Widening & BR1 Line				-		**N**				***P***			
13	U-4	13	MCWD	600mm CCP Water in 94m L 900mm Dia Stl Casing	67 m Rt of I-405 Sta 161+44	56 m Rt of I-405 Sta 161+44	Conflict with Airport Channel	X			4.55	Y			X	X	***RB***			600 mm Waterline to be Lowered Extend Encasement
14	U-4	14	MCWD	600mm CCP Water in 94m L 900mm Dia Stl Casing	38 m Lt of I-405 Sta 161+40	32 m Lt of I-405 Sta 161+42	conflict with I-405 Widening				-		N				***P***			
15	U-4	15	MCWD	300 mm ACP Water	70 m Rt of I-405 Sta 160+29	72 m Rt of I-405 from Sta 157+20 to Sta 160+29	Conflict with AOA Line and Retaining Wall No. 268	X			-	Y			X		***RD***			Encroachment CT R/W and Private Owner Encased under Roadway
16	U-4	16	MCWD	300 mm ACP Water	70 m Rt of I-405 Sta 159+07	72 m Rt of I-405 from Sta 157+20 to Sta 160+29	Conflict with AOA Line and Retaining Wall No. 268	X			-	Y			X		***RD***			Encroachment CT R/W and Private Owner Encased under Roadway
17	**U-5**	**17**	**MCWD**	**300 mm ACP Water**	**75 m Rt of I-405 Sta 156+57**	72 m Rt of I-405 from Sta 157+20 to Sta 160+29	conflict with AOA Line and Retaining Wall No. 268	X			**4.35**		**N**				***P***			
18	U-5	MH 18	CSDOC	Manhole	60 m Rt of I-405 Sta 156+65	28 m Rt of I-405 Sta 156+65	conflict with I-405 Widening		X		16.20		N				***P***			
19	U-5	19	CSDOC	380 mm VCP Sewer	46 m Lt of I-405 Sta 156+65	25 m Rt of I-405 Sta 156+65	conflict with I-405 Widening	X			18.40		N				***P***			
20	U-5	20	CSDOC	830 mm VCP Sewer	14 m Rt of B2 Sta 24+96		conflict with construction of B2 Line						N				***P***			
21	U-5	21	CSDOC	830 mm VCP Sewer	6 m Lt of B2 Sta 25+54		conflict with construction of B2 Line						N				***P***			
22	U-8	MH 22	CSDOC	Manhole	9m Rt of Main St Sta 102+78				X			Y				X	***RB***			MH to be Lowered New Top MH Elev= 9.588
23	U-8	MH 23 SCE MH 4503	SCE	Manhole No. 4503	9m Rt of Main St Sta 102+87				X			Y				X	***RB***			MH to be Lowered New Top MH Elev= 9.583 m
24	U-8	MH 24 SCE MH 4502	SCE	Manhole No. 4502	9m Rt of Main St Sta 104+17				X			Y				X	***RB***			MH to be Lowered New Top MH Elev= 9.728 m

5-24

This utility conflict matrix was provided by the California DOT. Note the large number of columns and detail provided in the utility conflict matrix.

[handout]

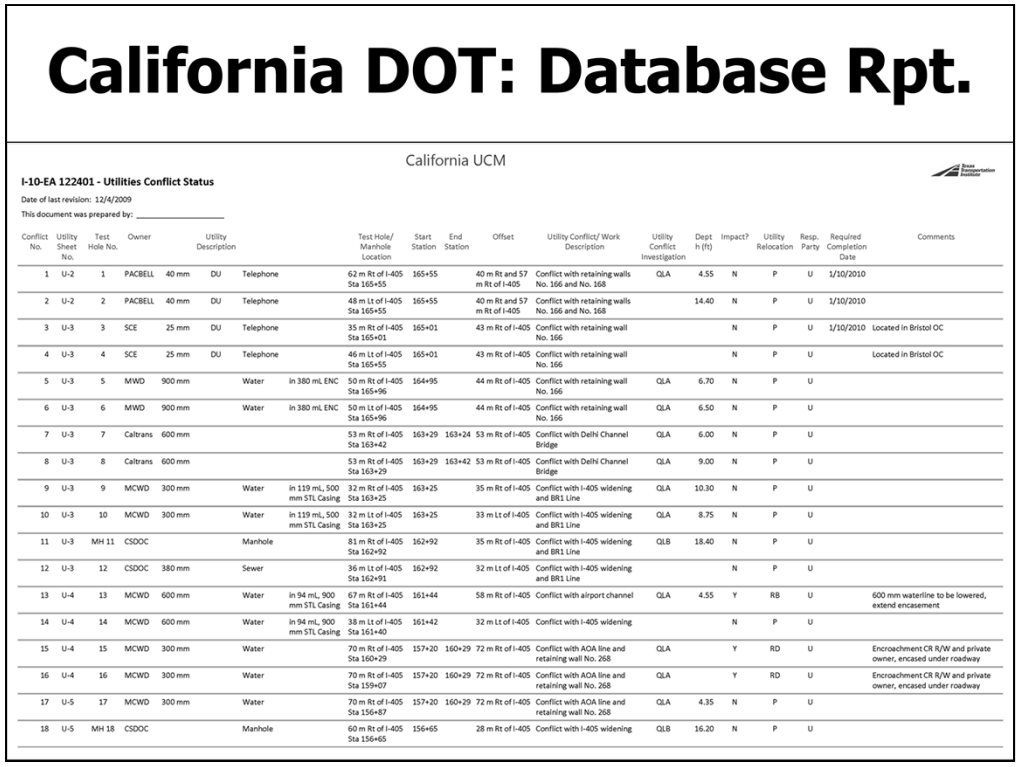
California DOT: Query Steps

- 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

This slide lists the main steps used to replicate the UCM provided by the California DOT.

California DOT: Database Rpt.



California UCM

I-10-EA 122401 - Utilities Conflict Status

Date of last revision: 12/4/2009

This document was prepared by: _____

Conflict No.	Utility Sheet No.	Test Hole No.	Owner	Utility Description				Test Hole/ Manhole Location	Start Station	End Station	Offset	Utility Conflict/ Work Description	Utility Conflict Investigation	Depth (ft)	Impact?	Utility Relocation	Resp. Party	Required Completion Date	Comments
1	U-2	1	PACBELL	40 mm	DU	Telephone		62 m Rt of I-405 Sta 165+55	165+55		40 m Rt and 57 m Rt of I-405	Conflict with retaining walls No. 166 and No. 168	QLA	4.55	N	P	U	1/10/2010	
2	U-2	2	PACBELL	40 mm	DU	Telephone		48 m Lt of I-405 Sta 165+55	165+55		40 m Rt and 57 m Rt of I-405	Conflict with retaining walls No. 166 and No. 168		14.40	N	P	U	1/10/2010	
3	U-3	3	SCE	25 mm	DU	Telephone		35 m Rt of I-405 Sta 165+01	165+01		43 m Rt of I-405	Conflict with retaining wall No. 166			N	P	U	1/10/2010	Located in Bristol OC
4	U-3	4	SCE	25 mm	DU	Telephone		46 m Lt of I-405 Sta 165+55	165+01		43 m Rt of I-405	Conflict with retaining wall No. 166			N	P	U		Located in Bristol OC
5	U-3	5	MWD	900 mm		Water	in 380 mL ENC	50 m Rt of I-405 Sta 165+96	164+95		44 m Rt of I-405	Conflict with retaining wall No. 166	QLA	6.70	N	P	U		
6	U-3	6	MWD	900 mm		Water	in 380 mL ENC	50 m Lt of I-405 Sta 165+96	164+95		44 m Rt of I-405	Conflict with retaining wall No. 166	QLA	6.50	N	P	U		
7	U-3	7	Caltrans	600 mm				53 m Rt of I-405 Sta 163+42	163+29	163+24	53 m Rt of I-405	Conflict with Delhi Channel Bridge	QLA	6.00	N	P	U		
8	U-3	8	Caltrans	600 mm				53 m Rt of I-405 Sta 163+29	163+29	163+42	53 m Rt of I-405	Conflict with Delhi Channel Bridge	QLA	9.00	N	P	U		
9	U-3	9	MCWD	300 mm		Water	in 119 mL, 500 mm STL Casing	32 m Rt of I-405 Sta 163+25	163+25		35 m Rt of I-405	Conflict with I-405 widening and BR1 Line	QLA	10.30	N	P	U		
10	U-3	10	MCWD	300 mm		Water	in 119 mL, 500 mm STL Casing	32 m Lt of I-405 Sta 163+25	163+25		33 m Lt of I-405	Conflict with I-405 widening and BR1 Line	QLA	8.75	N	P	U		
11	U-3	MH 11	CSDOC			Manhole		81 m Rt of I-405 Sta 162+92	162+92		35 m Rt of I-405	Conflict with I-405 widening and BR1 Line	QLB	18.40	N	P	U		
12	U-3	12	CSDOC	380 mm		Sewer		36 m Lt of I-405 Sta 162+91	162+92		32 m Lt of I-405	Conflict with I-405 widening and BR1 Line			N	P	U		
13	U-4	13	MCWD	600 mm		Water	in 94 mL, 900 mm STL Casing	67 m Rt of I-405 Sta 161+44	161+44		58 m Rt of I-405	Conflict with airport channel	QLA	4.55	Y	RB	U		600 mm waterline to be lowered, extend encasement
14	U-4	14	MCWD	600 mm		Water	in 94 mL, 900 mm STL Casing	38 m Lt of I-405 Sta 161+40	161+42		32 m Lt of I-405	Conflict with I-405 widening			N	P	U		
15	U-4	15	MCWD	300 mm		Water		70 m Rt of I-405 Sta 160+29	157+20	160+29	72 m Rt of I-405	Conflict with AOA line and retaining wall No. 268	QLA		Y	RD	U		Encroachment CR R/W and private owner, encased under roadway
16	U-4	16	MCWD	300 mm		Water		70 m Rt of I-405 Sta 159+07	157+20	160+29	72 m Rt of I-405	Conflict with AOA line and retaining wall No. 268	QLA		Y	RD	U		Encroachment CR R/W and private owner, encased under roadway
17	U-5	17	MCWD	300 mm		Water		70 m Rt of I-405 Sta 156+87	157+20	160+29	72 m Rt of I-405	Conflict with AOA line and retaining wall No. 268	QLA	4.35	N	P	U		
18	U-5	MH 18	CSDOC			Manhole		60 m Rt of I-405 Sta 156+65	156+65		28 m Rt of I-405	Conflict with I-405 widening	QLB	16.20	N	P	U		

This is the database report that replicates the UCM provided by the California DOT.

Georgia DOT: Sample Report

Conflic	Station and Offset	Utility	Identified Conflict	Testhole Needed	Utility Impact with Cost ("As-designed")	Recommended Resolution	*Benefit of Resolution
C1	100+05, 21'L 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO	No	Relocate 1150LF of BFO-DUCT ($91,000)	Relocate proposed storm drainage into street. Use DI's that drain toward roadway.	Save Cost to Relocate BFO-DUCT ($91,000)
C2	100+66, 21'L 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO	No	See C1		
C3	100+38, 24'R 14th St Constr. BL	UNK@Tee	Proposed 18" storm and unknown utility tee	TH 1	Relocate unknown type and function utility	TH to identify utility and conflict	Eliminate possible delay during construction
C4	100+56, 25'R 14th St Constr. BL	8"W	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 ($6,000)
C5	100+81, 25R 14th St Constr. BL	8"W	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 ($6,000)
C6	100+82, 28R 14th St Constr. BL	4"G	Proposed storm structure and existing 4"G	TH 4	Relocate 20 LF of 4"G ($6,000)	TH on 4"G, adjust depth of proposed storm structure	Save Cost to Relocate 4"G ($4,500)
C7	101+22 27"R 14th St Constr. BL	4"G	Proposed 18" storm and existing 4"x2" gas tee	TH 5	Relocate 2"G & 4"G Tee ($12,500)	TH on G lines, adjust depth of proposed storm structure	Save Cost to Relocate G lines ($11,000)
C8	101+01 28'L 14th St Constr. BL	16"G	Proposed 18" storm and existing 16"G	TH 6	Relocate 16"G ($10,000)	TH on 16"G, adjust depth of proposed storm structure	Save Cost to Relocate 16"G ($8,500)
C9	101+25 41'L 14th St Constr. BL	BT-DUCT 2"G	Proposed storm structure and two BT-ducts	TH 7	Relocate BT-DUCT & 2"G ($11,000)	TH on BT-DUCT & 2"G, adjust depth of proposed storm structure	Save Cost to Relocate BT-DUCT & 2"G ($10,500)
C10	101+37, 41'L 14th St Constr. BL	6"W	Proposed 18" storm and existing 6"W	TH 8	Relocate 6"W ($5,000)	TH on 6"W, adjust depth of proposed storm drainage	Save Cost to Relocate 6"W ($3,500)
C11	101+57, 27'L 14th St Constr. BL	16"G	Proposed 18" storm and existing 16"G	TH 9	Relocate 16"G ($10,000)	TH on 16"G, adjust depth of proposed storm structure	Save Cost to Relocate 16"G ($8,500)
C12	101+58, 22'L 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO	No	See C1		
C13	101+90, 22'L 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO	No	See C1		
C14	102+20, 27'R 14th St Constr. BL	4"G	Proposed storm structure and existing 4"G	No	Relocate 4"G ($4,500)	Relocate 4"G	Elimnate conflict with proposed DI
C15	102+36, 24'L 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO	No	See C1		

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

Key:

AC - Asbestos Concrete
BE - Buried Electric
BFO - Buried Fiber Optic
BT - Buried Telephone
G - Gas
L - Left
MES - Mitered End Section
OE - Overhead Electric
OT - Overhead Telephone
R - Right
RCP - Reinforce Concrete Pipe
W - Water
WM - Water Main
TH - Test Hole, verify vert. and horiz
UNK - Unknown Type
SAN - Sanitary Sewer

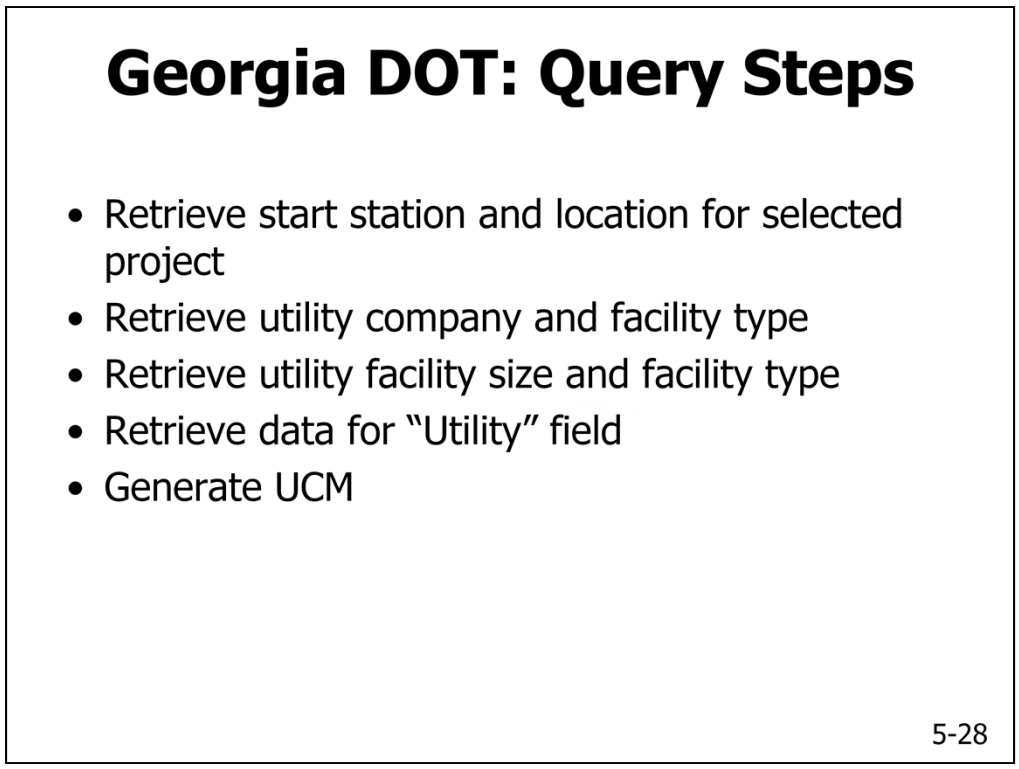
Utility Owner:

AGL Atlanta Gas Light
BE Georgia Power
BT Bell South
L3 Level 3 Communications
MFN Metromedia Fiber Network
SAN Fulton County Public Works
W City of Atlanta
UNK Unknown Owner

5-27

This utility conflict matrix was provided by the Georgia DOT. This utility conflict matrix has 7 columns, which is also an example of a utility conflict matrix with a small number of columns. However, some of the columns contain multiple data items that other states include in separate columns.

[handout]



This slide lists the main steps used to replicate the UCM provided by the Georgia DOT.

Georgia DOT: Database Report

Georgia DOT Utility Conflict Matrix

Tuesday, May 18, 2010
11:30:00 AM

GDOT Project Number: 987654321

Conflict	Station and Offset	Utility	Identified Conflict	Testhole Needed	Utility Impact with Cost ("As-designed")	Recommended Resolution	Benefit of Resolution*
C1	100+05, 21' L, 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO.		Relocate 1150 LF of BFO-DUCT ($91,000).	Relocate proposed storm drainage into street. Use DI's that drain toward roadway.	Save cost to relocate BFO-DUCT ($91,000).
C2	100+66, 21' L, 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO.		Relocate 1150 LF of BFO-DUCT ($91,000).	Relocate proposed storm drainage into street. Use DI's that drain toward roadway.	Save cost to relocate BFO-DUCT ($91,000).
C3	100+38, 24' R, 14th St Constr. BL	UNK-UNK	Proposed 18" storm and unknown utility tee.	TH 1	Relocate unknown type and function utility.	TH to identify utility and conflict.	Eliminate possible delay during construction.
C4	100+56, 25' R, 14th St Constr. BL	8"W	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 ($6,000).
C5	100+61, 25' R, 14th St Constr. BL	8"W	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 ($6,000).
C6	100+82, 28' R, 14th St Constr. BL	4"G	Proposed storm structure and existing 4" G.	TH 4	Relocate 20 LF of 4" G ($6,000).	TH on 4" G, adjust depth of proposed storm structure.	Save cost to relocate 4" G ($4,5000).
C7	101+22, 27' R, 14th St Constr. BL	4"G	Proposed 18" and existing 4" by 2" gas tee.	TH 5	Relocate 2" G and 4" G Tee ($12,500).	TH on G lines, adjust depth of proposed storm structure.	Save cost to relocate G lines ($11,000).
C8	101+01, 28' L, 14th St Constr. BL	16"G	Proposed storm structure and existing 16" G.	TH 6	Relocate 16" G ($10,000).	TH on 16" G, adjust depth of proposed storm structure.	Save cost to relocate 16" G ($8,5000).
C9	101+25, 41' L, 14th St Constr. BL	UNK-BT-DUCT	Proposed storm structure and two BT ducts.	TH 7	Relocate BT-DUCT and 2" G ($11,000).	TH on BT-DUCT and 2" G, adjust depth of proposed storm structure.	Save cost to relocate BT duct and 2" G ($10,500).
C10	101+37, 41' L, 14th St Constr. BL	6"W	Proposed 18" storm and existing 6" W.	TH 8	Relocate 6" W ($5,000).	TH on 6" W, adjust depth of proposed storm drainage.	Save cost to relocate 6" W ($3,500).
C11	101+57, 27' L, 14th St Constr. BL	16"G	Proposed 18" storm and existing 16" G.	TH 9	Relocate 16" G ($10,000).	TH on 16" G, adjust depth of proposed storm structure.	Save cost to relocate 16" G ($8,5000).
C12	101+58, 22' L, 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO.		Relocate 1150 LF of BFO-DUCT ($91,000).	Relocate proposed storm drainage into street. Use DI's that drain toward roadway.	Save cost to relocate BFO-DUCT ($91,000).
C13	101+90, 22' L, 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO.		Relocate 1150 LF of BFO-DUCT ($91,000).	Relocate proposed storm drainage into street. Use DI's that drain toward roadway.	Save cost to relocate BFO-DUCT ($91,000).
C14	102+20, 27' R, 14th St Constr. BL	4"G	Proposed storm structure and existing 4" G.		Relocate 4" G ($4,500).	Relocate 4" G.	Eliminate conflict with proposed DI.
C15	102+36, 24" L, 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO.		Relocate 1150 LF of BFO-DUCT ($91,000).	Relocate proposed storm drainage into street. Use DI's that drain toward roadway.	Save cost to relocate BFO-DUCT ($91,000).

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

Key:

AC - Asbestos Concrete
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BT - Buried Telephone
G - Gas
L - Left
MES - Mitered End Section
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R - Right
RCP - Reinforced Concrete Pipe
W - Water
WM - Water Main
TH - Test Hole
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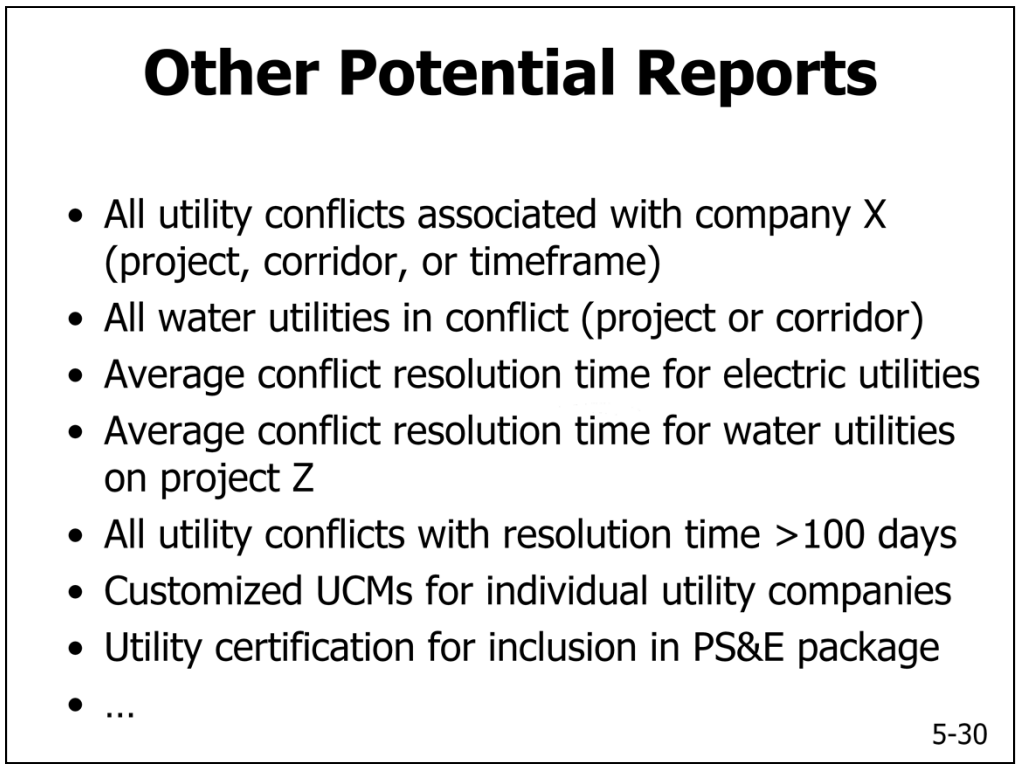
Utility Owner:

AGL Atlanta Gas Light
BE Georgia Power
BT Bell South
L3 Level 3 Communications
MFN Metromedia Fiber Network
SAN Fulton County Public Works
W City of Atlanta

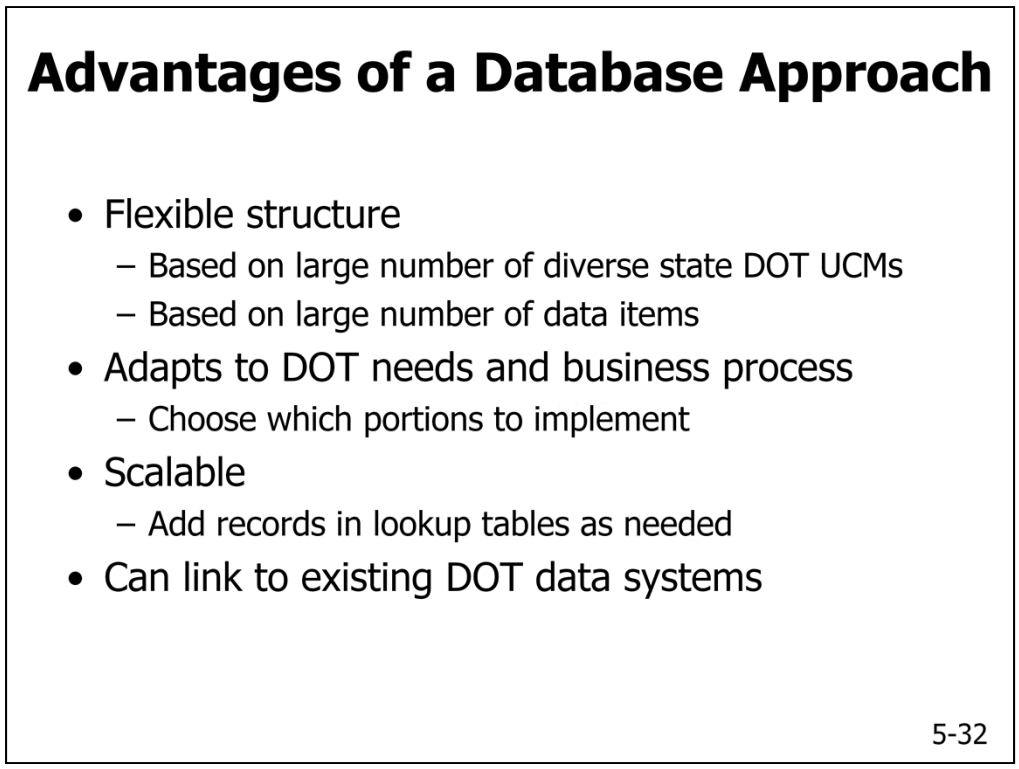
Page 1 of 1

This is the database report that replicates the UCM provided by the Georgia DOT.



One of the advantages of using a database approach for the management of utility conflicts is that it is possible to generate a wide range of reports. This slide shows a sample of additional reports that are possible with the prototype database design developed during the research.

[Refer to guideline for Access database demonstration]



The database structure is flexible and can accommodate all 26 state examples plus the prototype UCM version developed during the research. The database can be adapted to a state DOT's business process by choosing which portions of the database to implement. The database is scalable, and expansion is straightforward by adding records as needed to lookup tables. The database can also be linked to existing DOT data systems to avoid data redundancy.

5.4
Questions and Answers

5-33

Lesson 6

Wrap-Up

6-1

This section of the training is Lesson 6, which is intended to wrap-up the training session.

Lesson 6 Overview

1. Final Questions and Closing Remarks

6-3