“The quality of your decisions is only as good as the quality of your information”
AGENDA

• Overview
  – Gateway Project
  – Design-Build
  – Subsurface Utility Engineering

• Weeds
  – SUE Benefits
  – Design-Build Utility Strategies
AGENDA

• Overview
  – Gateway Project
  – Design-Build
  – Subsurface Utility Engineering

• Weeds
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CONTRACTED SCOPE OF WORK
CONTRACTED SCOPE OF WORK

- 27 New or Rehabilitated Bridges
- 68 New Retaining Walls
- 56 New Lane-Miles
- 230,000 Vehicles per Day
- 750,000 SY of New Pavement
- 4,700,000 CY of Earth Moved
- 1,000,000,000 $$ of Economic Benefit
AGENDA

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WHAT IS DESIGN-BUILD

An alternative delivery method to design-bid-build in which a design-build team works under a single contract with the project owner to provide design and construction services.
WHAT IS DESIGN-BUILD

An alternative delivery method to design-bid-build in which a design-build team works under a single contract with the project owner to provide design and construction services.
WHAT IS DESIGN-BUILD
(DESIGN-BUILD PROCESS)

Design — Build
- Concept study
- Preliminary design
- Select contractor/designer
- Final design
- Construction

Open to traffic
Potential time savings

Design — Bid — Build
- Concept study
- Preliminary design/final design
- Select contractor
- Construction

Open to traffic
WHY DESIGN-BUILD
(FROM THE OWNER’S PERSPECTIVE)

• Faster delivery
• Predictable costs
• Innovations
• Single-point responsibility
• Decreased administration burden
WHY DESIGN-BUILD
(FROM INDUSTRY’S PERSPECTIVE)

- Innovation
- Constructability / design to strengths
- Better scheduling
- Shorter decision time
AGENDA

• Overview
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• Weeds
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WHAT IS SUE?

Data Collection:

- Review of Existing Records & Verbal Recollection (Quality Level "D")
- Surveying & Plotting Visible Above-Ground Features (Quality Level "C")
- Surface Geophysical Tech. to Identify the Existence and Horizontal Position of Subsurface Utilities (Quality Level "B")
- Nondestructive Excavation Methods to Determine Precise Horizontal and Vertical Positions of Subsurface Utilities (Quality Level "A")

Figure 2-1. Quality Levels of SUE.
WHAT IS SUE?

Subsurface Utility Engineering:
A branch of engineering practice that involves managing risks associated with utility...

- Mapping
- Condition Assessment
- Coordination
- Relocation Design

- Communication
- Cost Estimates
- Agency Policy
- Schedule
WHAT IS SUE?

Subsurface Utility Engineering:
A branch of engineering practice that involves managing risks associated with utility…

• Mapping
• Condition Assessment
• Coordination
• Relocation Design

• Communication
• Cost Estimates
• Agency Policy
• Schedule
GATEWAY SUE (PRE-PROPOSAL)

- 28 Utility Owners
- 43 Coordination Meetings
- 9808 Survey Shots
- 409,955 LF of Utilities = 78 Miles
SUE STANDARDS

National Data Standards

ASCE STANDARD

American Society of Civil Engineers
Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data
This document uses both System International (SI) units and customary units.

Local Coordination Standards

DIVISION V
SECTION 5900
UTILITY COORDINATION FOR CAPITAL IMPROVEMENTS PROJECTS

Best Management Practices
(March 17, 2010)
SUE STANDARDS

SUBSURFACE UTILITY ENGINEERING

Over the decades, highway designers have had a difficult time obtaining reliable subsurface utility information. Now, this information is available through the use of an engineering process called Subsurface Utility Engineering.

**MAJOR SUE ACTIVITIES:**

- **Scope of Work** — The process of developing a written project-specific work plan package that consists of scope of work, levels of service vs. risk allocation, project schedule, and desired project delivery method. This SUE work plan package is agreed upon by the SUE provider and the client, describing the SUE work to be performed.

- **Designating** — The process of using a surface geophysical method or methods to interpret the presence of a subsurface utility and mark its horizontal position on the ground surface or on above-ground surface markers.

- **Locating** — The process of exposing and recording the precise vertical and horizontal location and providing utility size and configuration of a utility.

- **Data Management** — The process of surveying, designing, and locating information to project center and transferring it into the client’s CAD system, GIS files, or project plans.

- **Conflict Analysis** — The engineering process of using a conflict matrix to evaluate and compare depicted designating information with proposed plans (highway, bridge, drainage, and other) in order to inform all stakeholders of potential conflicts, potential resolutions, and costs to our.

**STANDARD OF CARE**

The American Society of Civil Engineers (ASCE) has developed an important standard of care guideline, Standard Guidelines for the Collection and Design of Existing Subsurface Utility Data, CIASCE 38-02.

This standard guideline describes four quality levels of utility depiction:

- **Quality Level D** — Information derived from existing records or oral recollections.

- **Quality Level C** — Information obtained by surveying and plotting visible above-ground utility features and by using professional judgment in correlating this information to Quality Level D.

- **Quality Level B** — Information obtained through the application of appropriate surface geophysical methods to determine the existence and approximate horizontal position of subsurface utilities.

- **Quality Level A** — Precise horizontal and vertical location of utilities obtained by the actual exposure and subsequent measurement of subsurface utilities, usually at a specific point.

To order a copy of ASCE Standard 38-02, please go to the ASCE Bookstore: [http://www.niba.asce.org](http://www.niba.asce.org) or call 1-800-548-2723.

**SUE EXPERTISE**

- **Competence** — SUE providers should be able to demonstrate a thorough knowledge and understanding of the major SUE activities and should be able to provide these services to the extent desired by the contracting agency.

- **Experience** — Individuals assigned by the SUE provider to carry out the work should be well-trained, experienced, and capable. Those in responsible charge of the work and responsible for certifying deliverables should be engineers, geologists, and land surveyors employed by the SUE provider in accordance with state professional registration requirements.

- **Equipment** — A wide range of equipment is necessary to detect the variety of subsurface utilities that may be present. Equipment available for utilization by the provider should include, but not be limited to, state-of-the-art locating equipment, vacuum excavation or comparable non-destructive locating equipment, state-of-the-art surveying and data recording equipment; and software systems compatible with those of the contracting agency.

- **Timeliness** — Resources of the provider should be adequate to carry out the SUE work in a timely manner, considering other possible commitments of work and the contracting agency’s anticipated needs.

- **Financial Capacity** — SUE providers should have the financial capacity to provide the required services.

- **Insurance** — SUE providers should have adequate insurance covering all aspects of work. Minimum amounts should be in accordance with the contracting agency’s requirements.
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Figure 2-1. Quality Levels of SUE.
PFLUMM & LENEXA DRIVE

Traditional Locates:
PFLUMM & LENEXA DRIVE

SUE Level B:
95\textsuperscript{TH} EAST OF I-35

Traditional Locates:
SUE LEVEL B

• Locates
  – Limited time & money
  – Low expectation
  – Low accountability

• SUE Level B
  – Best Equipment
  – Professional Training
  – Sufficient Time
  – High Accountability
SUE QUALITY LEVELS

Review of Existing Records & Verbal Recollection

Quality Level “D”

Surveying & Plotting Visible Above-Ground Features

Quality Level “C”

Surface Geophysical Tech. to Identify the Existence and Horizontal Position of Subsurface Utilities

Quality Level “B”

Nondestructive Excavation Methods to Determine Precise Horizontal and Vertical Positions of Subsurface Utilities

Quality Level “A”

Figure 2-1. Quality Levels of SUE.
SUE LEVEL A
### SUE LEVEL A

<table>
<thead>
<tr>
<th>Test Hole Date</th>
<th>Man Hole No.</th>
<th>Utility Type</th>
<th>Utility Material</th>
<th>Utility Size (Nom.)</th>
<th>Approx. Station</th>
<th>Approx. Offset Distance</th>
<th>Offset From</th>
<th>Manual Depth (Top)</th>
<th>Cross Sectional View</th>
<th>ID'd By</th>
<th>Surface Type</th>
<th>Pvmnt. Thickness</th>
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<tr>
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<td>21</td>
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<td>4.0</td>
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<td>2.44</td>
<td></td>
<td>24</td>
<td>NG</td>
<td>N/A</td>
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<tr>
<td>7/24/12</td>
<td>22</td>
<td>G</td>
<td>14</td>
<td>10&quot;</td>
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<td>2.6</td>
<td>39</td>
<td>3.47</td>
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<td>24</td>
<td>NG</td>
<td>N/A</td>
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<tr>
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<td>23</td>
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<td>14</td>
<td>12&quot;</td>
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<td>2.8</td>
<td>39</td>
<td>3.52</td>
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<td>24</td>
<td>NG</td>
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<tr>
<td>7/26/12</td>
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<td>PL</td>
<td>SEE NOTE</td>
<td>SEE NOTE</td>
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<td>24</td>
<td>NG</td>
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<tr>
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<td>PL</td>
<td>1</td>
<td>16&quot;</td>
<td>N/A</td>
<td>1.8</td>
<td>39</td>
<td>3.30</td>
<td></td>
<td>24</td>
<td>NG</td>
<td>N/A</td>
</tr>
<tr>
<td>8/16/12</td>
<td>26</td>
<td>PL</td>
<td>1</td>
<td>16&quot;</td>
<td>N/A</td>
<td>4.1</td>
<td>39</td>
<td>3.48</td>
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<td>24</td>
<td>NG</td>
<td>N/A</td>
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<tr>
<td>8/15/12</td>
<td>27</td>
<td>FOC</td>
<td>1</td>
<td>12&quot;</td>
<td>N/A</td>
<td>4.6</td>
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<td>3.75</td>
<td></td>
<td>24</td>
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<tr>
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<td>2.7</td>
<td>39</td>
<td>3.26</td>
<td></td>
<td>24</td>
<td>NG</td>
<td>N/A</td>
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<tr>
<td>8/17/12</td>
<td>29</td>
<td>FOC</td>
<td>1</td>
<td>12&quot;</td>
<td>N/A</td>
<td>3.1</td>
<td>39</td>
<td>3.32</td>
<td></td>
<td>24</td>
<td>NG</td>
<td>N/A</td>
</tr>
</tbody>
</table>
## SUE LEVEL A

<table>
<thead>
<tr>
<th>Test Hole No.</th>
<th>Top of Utility</th>
<th>Reference Point</th>
<th>Manual Depth (FT)</th>
<th>Utility Quality</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>8.73</td>
<td>6.29</td>
<td>2.44</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>9.33</td>
<td>5.86</td>
<td>3.47</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>9.94</td>
<td>6.42</td>
<td>3.52</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>MANUAL DEPTH</td>
<td></td>
<td>8.15</td>
<td>B</td>
<td>UNABLE TO EXPOSE DUE TO GROUND CONDITIONS. 16&quot; CASING IS PER RECORDS FROM BRIAN WITH PHILLIPS 66.</td>
</tr>
<tr>
<td>25</td>
<td>MANUAL DEPTH</td>
<td></td>
<td>3.30</td>
<td>A</td>
<td>COULD NOT FULLY EXPOSE PIPE. SIZE IS 16&quot; CASING AS PER ALLEN WITH MAGELLAN.</td>
</tr>
<tr>
<td>26</td>
<td>8.60</td>
<td>5.12</td>
<td>3.48</td>
<td>A</td>
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<tr>
<td>27</td>
<td>8.45</td>
<td>4.70</td>
<td>3.75</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>8.48</td>
<td>5.22</td>
<td>3.26</td>
<td>A</td>
<td>FOUND END OF 12&quot; METALLIC CASING HOUSING 10&quot; CONCRETE CASING. END OF 12&quot; CASING IS 1.1' FROM REFERENCE PIN TOWARDS ROW FENCE.</td>
</tr>
<tr>
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<td>FOUND END OF 12&quot; METALLIC CASING HOUSING 10&quot; CONCRETE CASING. END OF 12&quot; CASING IS 2' FROM REFERENCE PIN TOWARDS ROW FENCE.</td>
</tr>
</tbody>
</table>
SUE LEVEL A

- Potholes
  - Depth
  - Approximate location

- SUE Level A
  - Depth and Elevation
  - Surveyed Location
  - Size
  - Condition
  - Pictures
  - Dimensioned Manhole Sketches
  - Continuity w/ Level B Data
IDENTIFYING PROJECTS FOR SUE

• FHWA commissioned Purdue Study, 1999

Conclusions

The Federal Highway Administration (FHWA) commissioned Purdue University to study the effectiveness of subsurface utility engineering (SUE) as a means of reducing costs and delays on highway projects. From a study of 71 projects with a combined construction value in excess of $1 billion, the results indicated the effectiveness of the study was a total of every $1.00 spent on SUE.

The costs of obtaining QL B and QL A data on these 71 projects were 0.5 percent of the total construction costs, resulting in a construction savings of 1.9 percent by using SUE. Qualitative savings were non-measurable, but it is clear that those savings are also significant and may be many times more valuable than the quantifiable savings.

This is somewhat less than the $7.00 to $1.00 (previous VDOT study), $18.00 to $1.00 (previous MDSHA study), and $10.00 to $1.00 (Society of American Value Engineers) returns on investment that were previously reported in literature. However, the quantity of studied projects is much higher, the projects are more random in nature; and no qualitative costs were included in the total. Indeed, one individual project had a $206.00 to $1.00 return on investment (NCDOT). Only three of 71 projects had a negative return on investment. This leads to the conclusion that SUE is a viable technologic practice that reduces project costs related to the risks associated with existing subsurface utilities and should be used in a systemic manner. Using the SUE savings factor data from this study and a national expenditure in 1998 of $51 billion for highway construction that was provided by the FHWA, the use of SUE in a systemic manner should result in a minimum national savings of approximately $1 billion per year.
IDENTIFYING PROJECTS FOR SUE

• Study Results - SUE Level A & B
  – $4.62 saved per $1 invested in SUE
  – SUE cost = 0.5% of construction cost
  – SUE savings = 1.9% construction cost

• Applying Results to Theoretical Examples
  – $1M construction: $5k SUE = $19k savings
  – $100M construction: $500k SUE = $1.9M savings

• Gateway Example
  – $250M construction: $500k SUE = $4.75M savings?
IDENTIFYING PROJECTS FOR SUE

• Qualitative Considerations
  – Safety
  – Impacts to residents and businesses
  – Cost to utility owners
  – Utility owner relationships
  – Risk management
IDENTIFYING PROJECTS FOR SUE

- PennDOT Study, 2007
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• Weeds
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Decide for each... When? By Whom?
D-B UTILITY STRATEGIES

- Gateway Pre-Proposal Relocations
  - KCPL Transmission
  - Axon Duct Bank
  - Detour Route

- Gateway Post-Award Relocations
PRE-PROPOSAL RELOCATIONS
D-B UTILITY STRATEGIES

• Gateway Pre-Proposal Relocations
  – KCPL Transmission
  – Axon Duct Bank
  – Detour Route

• Gateway Post-Award Relocations
  – All Other Utilities
  – 2 Examples: AT&T I-35 Crossings
POST-AWARD RELOCATIONS
POST-AWARD RELOCATIONS
POST-AWARD RELOCATIONS
POST-AWARD RELOCATIONS
D-B UTILITIES STRATEGIES

• Contract Considerations?
  – Master Utility Agreement?
  – Relocation Agreements?
  – Utility Cost Structure?
  – Contract Language?
  – Billing & Invoicing?
  – Owner’s Rep?
“The quality of your decisions is only as good as the quality of your information”