**Concerns:**
- Backwaters of Lake Keystone
- Compensatory Storage Issues
- 35 Mile Detour Route

**Goals:**
- Minimize Traffic Disruption
- Reduce Detour Duration
- Evaluate ABC

SH-51 at Cottonwood Creek, Creek County
SH-51 at Cottonwood Creek, Creek County

**Concerns:**
- Backwaters of Lake Keystone
- Compensatory Storage Issues
- 35 Mile Detour Route

**Goals:**
- Minimize Traffic Disruption
- Reduce Detour Duration
- Evaluate ABC
Alternatives:
- Conventional Construction
- Staged Construction
- ABC (Construction)

Evaluate:
- Methods
- Risks/Benefits
- Site Constraints
- Size, Type and Layout of Bridge

SH-51 at Cottonwood Creek, Creek County
Structure Placement Methods:

- **Offsite Construction** – SPMT movement with longitudinal launch over creek.

- **Offsite Construction** – Truck and crane movement into place.

- **Adjacent Construction** – Transverse slide.

SH-51 at Cottonwood Creek, Creek County
Structure Placement Methods: *Offsite Construction* – SPMT movement with longitudinal launch over creek.

**Pro:**
- Reduced temporary support costs.
- Heavy movements and precise placement possible.

**Con:**
- Suitable construction area required nearby.
- Site not conducive to final placement by SPMT.
- Cost.

**Applicability:**
- Moderate. Not desired due to need for longitudinal launch.

SH-51 at Cottonwood Creek, Creek County
Structure Placement Methods: 
*Offsite Construction* – Truck and crane movement into place.

**Pro:**
- Construction can take place truly offsite.
- Reduced temporary support costs.

**Con:**
- Section or segment weight limited by capacity of crane.
- Requires additional joints.
- Cost

**Applicability:**
- Low. Crane placement locations limit pick weight making this option impractical.

SH-51 at Cottonwood Creek, Creek County
Structure Placement Methods: *Adjacent Construction* – Transverse slide.

**Pro:**
- Cost.
- Simplicity.

**Con:**
- Requires design and construction of temporary substructure.
- Construction in creek channel.

**Applicability:**
- High. Adequate R/W and adequate hydraulic capacity.

SH-51 at Cottonwood Creek, Creek County
SH-51 at Cottonwood Creek, Creek County

Summary:
Preferred Method = Transverse Slide

• SPMT and Longitudinal launch are expensive.
• Adequate room for temporary construction.
• “Outrigger” substructures are suitable for location.
• Required Hydraulic capacity maintained.
SH-51 at Cottonwood Creek, Creek County

**Summary:**
Preferred Method = **Transverse Slide**

- SPMT and Longitudinal launch are expensive.
- Adequate room for temporary construction.
- "Outrigger" substructures are suitable for location.
- Required Hydraulic capacity maintained.
SH-51 at Cottonwood Creek, Creek County

Construction Sequence:
- Existing Condition
SH-51 at Cottonwood Creek, Creek County

Construction Sequence:
- Existing Condition
- Soil Nail Walls and Piers under traffic
SH-51 at Cottonwood Creek, Creek County

**Construction Sequence:**
- Existing Condition
- Construct Soil Nail Walls and Piers
- Construct Abutments
Construction Sequence:

- Existing Condition
- Construct Soil Nail Walls and Piers
- Construct Abutments
- Construct Temporary Substructure

SH-51 at Cottonwood Creek, Creek County
SH-51 at Cottonwood Creek, Creek County

Construction Sequence:
• Existing Condition
• Construct Soil Nail Walls and Piers
• Construct Abutments
• Construct Temporary Substructure
• Construct Superstructure
SH-51 at Cottonwood Creek, Creek County

**Construction Sequence:**

- Existing Condition
- Construct Soil Nail Walls and Piers
- Construct Abutments
- Construct Temporary Substructure
- Construct Superstructure
- Slide Superstructure
Lessons and Suggestions for Future:

Design and Plan Preparation:
- Utilize available site characteristics to establish preferred method.
- Balance innovation with feasibility (site characteristics, cost etc.).
- Provide a concept to establish intent.
- Provide clear guidance on payment.

Specifications and Submittals:
- Provide design requirements for temporary works.
- Specialty equipment.
- Placement tolerances.
- Allow room for contractor innovation.

Bidding:
- Require qualifications and/or similar experience.
- Provide Incentive/Disincentive.

SH-51 at Cottonwood Creek, Creek County
SH-51 at Cottonwood Creek, Creek County
SH-51 at Cottonwood Creek, Creek County
SH-51 at Cottonwood Creek, Creek County

Construction Photos:

• Removal of Existing Bridge
SH-51 at Cottonwood Creek, Creek County
SH-51 at Cottonwood Creek, Creek County
SH-51 at Cottonwood Creek, Creek County
SH-51 at Cottonwood Creek, Creek County
SH-51 at Cottonwood Creek, Creek County
BNSF at Interstate 235, Oklahoma County

**Concerns:**
- 100,000 ADT
- Commuter Traffic
- BNSF: 49 trains/day
- Narrow Roadway
- Severe Skew
- Limited Profile Differential
- 50th Street
- Sump Conditions
- Deep Fork Creek
BNSF at Interstate 235, Oklahoma County

**Goals:**
- Achieve six through lanes
- Minimize Traffic Disruption
- Minimize Disruptions to Businesses
- Minimize R/W
- Maximize Available Vertical Clearance
- Safety

**Solution:**
- (2)-275’ Spans
BNSF at Interstate 235, Oklahoma County

Solution:
• (2)-275’ Spans
• Truss spans chosen for this location due to span length and superstructure depth below tracks.
Structure Placement Methods:

- **In-Place Construction** – Stick build over I-235.

- **Offsite Construction (ABC)** – Assemble trusses offsite, transport and place by SPMT.
Structure Placement Methods: **In-Place Construction** – Stick build over I-235.

**Pro:**
- Minimized reliance on specialty moving equipment.
- Reduced need for specialized sub-contractors.

**Con:**
- Lengthy road closure(s) required on I-235.
- I-235 traffic detoured to adjacent (aging) facilities.
- Lengthy construction duration.
- Reduced safety to public and contractor.

**Applicability:**
- Minimal. No desire to close I-235 for lengthy periods of time and/or have heavy construction over traffic.

BNSF at Interstate 235, Oklahoma County
Structure Placement Methods: **Offsite Construction** – Assemble trusses offsite, transport and place by SPMT.

**Pro:**
- Reduced impacts to traffic.
- Work-zone safety for traffic and contractors.
- Drastically reduced on-site construction duration.
- Improved quality of construction.

**Con:**
- Potential increase in up front cost.
- New methods for local construction community.
- Potential durability impacts.

**BNSF at Interstate 235, Oklahoma County**
Summary:
Preferred Method = Pre-assemble, SPMT movement.

- ADT Impacts reduced.
- Detour time/route impacts reduced.
- Worker and traffic safety increased.
- Economy of scale.
- Assembly/Staging area nearby.

BNSF at Interstate-235, Oklahoma County
## BNSF at Interstate-235, Oklahoma County

<table>
<thead>
<tr>
<th>Goal:</th>
<th>Minimize impact to highway traffic.</th>
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<tbody>
<tr>
<td><strong>Solutions:</strong></td>
<td>Allow two weekend closures.</td>
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<table>
<thead>
<tr>
<th>Goal:</th>
<th>Minimize impact to RR traffic.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Solutions:</strong></td>
<td>Offset alignment.</td>
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</table>
BNSF at Interstate-235, Oklahoma County

**Erection:**
- Center -> outward assembly.
- Vertical assembly.
- Both panels, floor system and bracing.
- Blocked for camber.
Move-In:
- Lifted 16 feet for transport.
- 18 inch vertical range hydraulic jacks.
- Lifted and supported near center span.
- Additional struts were added to support self weight and resist transportation forces.

BNSF at Interstate-235, Oklahoma County
Lessons and Suggestions for Future:

Design and Plan Preparation:
- Utilize available site characteristics to establish preferred method.
- Balance innovation with feasibility (site characteristics, cost etc.).
- Provide a concept to establish intent (or prohibited).
- Provide clear guidance on payment.

Specifications and Submittals:
- Provide design requirements for temporary works.
- Specialty equipment.
- Placement tolerances.
- Allow room for contractor innovation.

Bidding:
- Require qualifications and/or similar experience (pre-qualification).
- Provide Incentive/Disincentive.

BNSF at Interstate-235, Oklahoma County
Lessons and Suggestions for Future (cont.):

**Design and Plan Preparation:**
- Design team included an industry expert for design/review/inspection.

**Specifications and Submittals:**
- Electronic shop drawing process (submittals, reviews, stamps).

**Fabrication:**
- CNC machining of steel members.

**Construction:**
- Contractor teamed with expert erection contractor.
BNSF at Interstate-235, Oklahoma County
SH-99/US-377 at Lake Texoma, Marshall County

- 5462 foot long bridge
- Deep water
- Atypical construction methods for Oklahoma
- Barge construction required
Goals:

• Minimize construction duration.
• High quality, durable construction
• Simplified, repeatable construction processes/sequences
• Maintain placement/dimensional tolerances

SH-99/US-377 at Lake Texoma, Marshall County
Goals:
- Minimize construction duration.
- High quality, durable construction.
- Simplified, repeatable construction processes/sequences.
- Maintain placement/dimensional tolerances.

SH-99/US-377 at Lake Texoma, Marshall County

Summary:
Allow Contractor to choose combination of precast elements.

- Intent for ABC is shown in the plans.
- ABC adds value to the project.
- Multiple precast options for various elements detailed and specified.
- Leaves room for contractor innovation.
Thank You!