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Project/File: 193710917 - Mountain Peak BESS      Date: April 3, 2025

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**Reference: Traffic and Road Maintenance Plan**

**Table of Contents**

|           |  |           |
|-----------|--|-----------|
| <b>1.</b> | <b>Purpose and Background .....</b>          | <b>1</b>  |
| <b>2.</b> | <b>Road Survey .....</b>                     | <b>3</b>  |
| <b>3.</b> | <b>Structural Survey .....</b>               | <b>17</b> |
| <b>4.</b> | <b>Site Traffic.....</b>                     | <b>21</b> |
| <b>5.</b> | <b>Conclusions and Recommendations .....</b> | <b>23</b> |

## **1. Purpose and Background**

This memo summarizes the data collection and roadway/structural observations conducted along two probable transportation corridors between Interstate 135 (I-135) and the proposed Mountain Peak Battery Energy Storage System (BESS) site in Saline County, approximately ten miles from Salina, Kansas. The analysis performed in this study will help determine actions necessary to address road user safety while developing a strategy to mitigate and minimize costs to correct any damage to the existing transportation corridors. A site visit to the study area was conducted as part of this analysis on November 20, 2024. The memo includes apparent issues or deficiencies, traffic projections for both the construction phase and the normal operational phase, and conclusions with recommendations.

### **Proposed Development**

The Mountain Peak BESS is a planned battery energy storage facility that will cover approximately 12 acres of undeveloped land (Property ID: 085128280000001010) located on South Simpson Road, just south of East McReynolds Road in Saline County, Kansas. It includes a new commercial access point on the west side of S Simpson Rd.

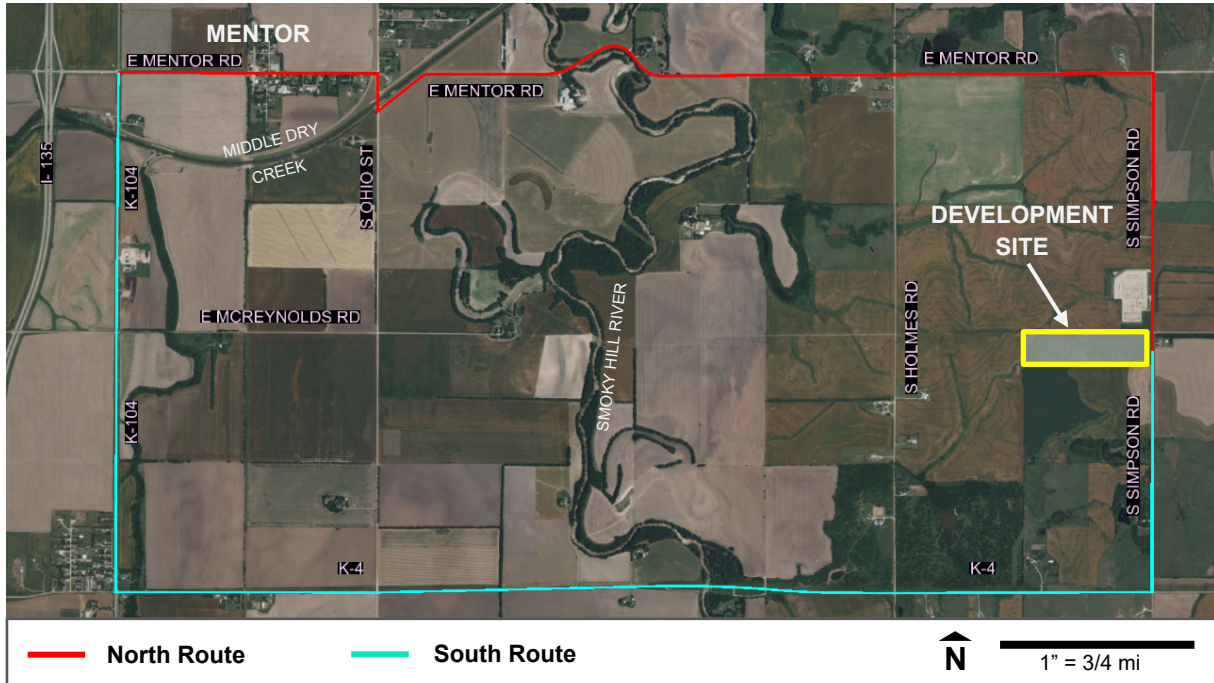
### **Study Area**

The BESS site is located in Saline County, approximately ten miles southeast of Salina, Kansas. This study assessed two potential site access routes, a North Route and a South Route, between the I-135 interchange at West Smolan Road and the BESS site, as shown in **Figure 1**.

- **North Route** - From Exit 86 of I-135, the North Route follows W Smolan Rd/E Mentor Rd, S Ohio St, E Mentor Rd, and S Simpson Rd. The route is approximately 5.3 miles long.

Reference: Traffic and Road Maintenance Plan

- **South Route** - From Exit 86 of I-135, the South Route follows W Smolan Rd, Kansas Highway 104 (K-104), Kansas Highway 4 (K-4), and S Simpson Rd. The route is approximately 6.9 miles long.



**Figure 1 – Proposed Routes**

**Existing Construction/Rehabilitation Plans**

Existing plans for construction or rehabilitation of roadways, structures, or culverts were identified.

1. The Kansas Department of Transportation (KDOT) plans to reconstruct a portion of K-4 included in the South Route. K-4 will be realigned and reconstructed starting 400 feet west of the Smoky Hill River Bridge and extending eastward beyond S Simpson Rd (Project KA-3230-02). The new alignment, north of the existing roadway, will address safety concerns, flatten the profile, improve intersection sight distance, and install paved shoulders. Traffic will be maintained on the existing roadway during construction, the contract for which was let in April 2025.
2. KDOT plans for the replacement of Bridge #108 (170) on K-4 over Dry Creek, 400 feet east of K-104 (Project KA-5719-01). The project was set for construction in December 2023 and awarded in February 2024, however construction began in March 2025 and is scheduled to be completed in October 2025.

Reference: Traffic and Road Maintenance Plan

## 2. Road Survey

### Roadway Details

#### Roadway Widths, Types, and Conditions

The roadway widths were estimated using aerial imagery. The surface types and conditions were determined during the site visit and are summarized in **Table**. Additionally, photos of the roadway surface are included in **Figure 2** and depict its condition.

**Table 1 – Roadway Information**

| Roadway  | Average Width | Surface Type | Surface Condition   |
|--|---------------|--------------|---|
| <i>North Route</i>   |               |              |   |
| E Mentor Rd<br>(K-104 to S Ohio St)<br>(Photo #1)              | 20'           | Paved        | Fair, but evidence of raveling; uneven slopes/depressions; no rutting; normal transverse expansion cracking; pavement-to-gravel transition at Ohio St has potholes and fatigue cracking |
| S Ohio St<br>(E Mentor Rd to E Mentor Rd)<br>(Photo #2)        | 24'           | Gravel       | Fair; well-graded; no ruts; evidence of minor wash boarding; pavement-to-gravel transition at the northern intersection with E Mentor Rd has potholes                                   |
| E Mentor Rd<br>(S Ohio St to S Simpson Rd)<br>(Photo #3)       | 24'           | Gravel       | Good; well-graded; no ruts/potholes; minor wash boarding near Smoky Hill River Bridge; 2' gravel piles from grading Holmes Rd to S Simpson Rd   |
| S Simpson Rd<br>(E Mentor Rd to E McReynolds Rd)<br>(Photo #4) | 21'           | Gravel       | Good; well-graded; no ruts/potholes/wash boarding   |
| <i>South Route</i>   |               |              |   |
| K-104<br>(E Mentor Rd to K-4)<br>(Photo #5)                    | 24'           | Paved        | Good; minimal defects; normal transverse expansion cracking   |
| K-4<br>(K-104 to S Simpson Rd)<br>(Photo #6)                   | 23'           | Paved        | Good; minimal defects; normal transverse expansion cracking   |
| S Simpson Rd<br>(K-4 to E McReynolds Rd)<br>(Photo #4)         | 21'           | Gravel       | Good; well-graded; no ruts/potholes/wash boarding   |

Reference: Traffic and Road Maintenance Plan



**Figure 2 – Surface Condition Photos**

### Roadway Load Limits

The typical maximum load on state routes that does not require a permit is 90,000 pounds. No additional load limits are posted. Oversize/overweight (OSOW) permits are required for larger loads and can be purchased through KDOT's K-Trips program. An OSOW permit will also be required from Saline County.

### Shoulder Widths, Types, and Conditions

The shoulder widths from edge of traveled-way to the point of intersection of the in-slope, surface types, and general condition were measured and recorded during the site visit. **Table** contains the shoulder information. Additionally, photos of the shoulder are included in **Figure 3** and depict its condition.

Reference: Traffic and Road Maintenance Plan

**Table 2 – Shoulder Information**

| Roadway  | Shoulder Width | Surface Type      | Shoulder Condition   |
|--|----------------|-------------------|--|
| <i>North Route</i>                               |                |                   |  |
| E Mentor Rd<br>(K-104 to S Ohio St)              | 0'             | N/A               | No Shoulder  |
| S Ohio St<br>(E Mentor Rd to E Mentor Rd)        | 0'             | N/A               | No Shoulder  |
| E Mentor Rd<br>(S Ohio St to S Simpson Rd)       | 0'             | N/A               | No Shoulder  |
| S Simpson Rd<br>(E Mentor Rd to E McReynolds Rd) | 0'             | N/A               | No Shoulder  |
| <i>South Route</i>                               |                |                   |  |
| K-104<br>(E Mentor Rd to K-4)<br>(Photo #1)      | 2' + 2'        | Paved +<br>Gravel | Good; minimal defects; smooth<br>transition between shoulder types           |
| K-4<br>(K-104 to S Simpson Rd)<br>(Photo #2)     | 2'             | Gravel            | Good; minimal defects; smooth<br>transition between pavement and<br>shoulder |
| S Simpson Rd<br>(K-4 to E McReynolds Rd)         | 0'             | N/A               | No Shoulder  |



**Figure 3 – Shoulder Condition Photos**

**In-Slope Angles/Steep Slope Grades**

The North Route has steep slope grades at the northern intersection of E Mentor Rd and S Ohio St (Photo #1). In both the northwest and southwest quadrants, slopes are approximately 1:3 along E Mentor Rd that steepen to approximately 1:2 at the centers of the radii, continuing south along S Ohio St to the Middle Dry Creek bridge. Steep slopes flank E Mentor Rd at the intersection with S Mattson Rd (Photo #2). The northwest quadrant ditch steeply slopes for about 600 feet along E Mentor Rd at approximately 1:4 at the

**Reference: Traffic and Road Maintenance Plan**

intersection, while the northeast quadrant ditch slopes at about 1:3 for nearly 130 feet. Steep slopes are also present 530 feet southeast of this intersection on the south side of E Mentor Rd, sloping at approximately 1:3 for 350 feet around the curve. Additionally, at several locations along both the North and South Routes, steep slope grades are found where culverts cross the road, with slopes up to approximately 1:2 are found where the slope transitions into and meets the end sections or wingwall/headwalls (Photo #3). Photos of these steep slopes are shown in **Figure 4**.



**Figure 4 – Steep In-slope Photos**

**Additional Information**

Additional information about the roadways including right-of-way width, traffic volumes as annual average daily traffic (AADT), and posted speed limits were gathered from the site visit and online sources. These are included in **Table**.

Reference: Traffic and Road Maintenance Plan

**Table 3 – Additional Information**

| Roadway  | Right-of-Way Width*   | AADT (year)**<br>vehicles/day | Posted Speed Limit   |
|--|---|-------------------------------|--|
| <i>North Route</i>                               |   |                               |  |
| E Mentor Rd<br>(K-104 to Washington Ave)         | 80'   | 483 (2023)                    | 55 mph west of Mentor<br>30 mph within and east<br>of Mentor |
| E Mentor Rd<br>(Washington Ave to S Ohio St)     | 70'<br>(60' through Mentor)   | 1,115 (2023)                  |  |
| S Ohio St<br>(E Mentor Rd to E Mentor Rd)        | Varies  | 1,115 (2023)                  | 45 mph   |
| E Mentor Rd<br>(S Ohio St to S Simpson Rd)       | 49.5'   | 98 (2023)                     | 55 mph by statute<br>40 mph advisory for<br>curves           |
| S Simpson Rd<br>(E Mentor Rd to E McReynolds Rd) | 50'   | 127 (2023)                    | 55 mph by statute  |
| <i>South Route</i>                               |   |                               |  |
| K-104<br>(E Mentor Rd to K-4)                    | 120'-125'   | 2,327 (2023)                  | 55 mph   |
| K-4<br>(K-104 to S Simpson Rd)                   | 110'-190'<br>(Widens >190' near<br>Dry Creek, Stony Hill<br>River, Holmes Rd) | 1,141 (2023)                  | 55 mph   |
| S Simpson Rd<br>(K-4 to E McReynolds Rd)         | 50'-55'   | 127 (2023)                    | 55 mph by statute  |

Sources:

\*Saline County GIS Mapping - <https://www.salinecountyks.gov/gis-mapping>

\*\*Kansas Geoportal - <https://hub.kansasgis.org/search?q=aadt>

### **Intersection Details**

Six intersections were reviewed as part of the North and South Route analysis focusing on geometric and control issues. Intersections were selected if turning, stopping, or yielding for major road traffic is expected on the North and South Routes. The locations of these intersections are shown in **Figure 4**.

Reference: Traffic and Road Maintenance Plan

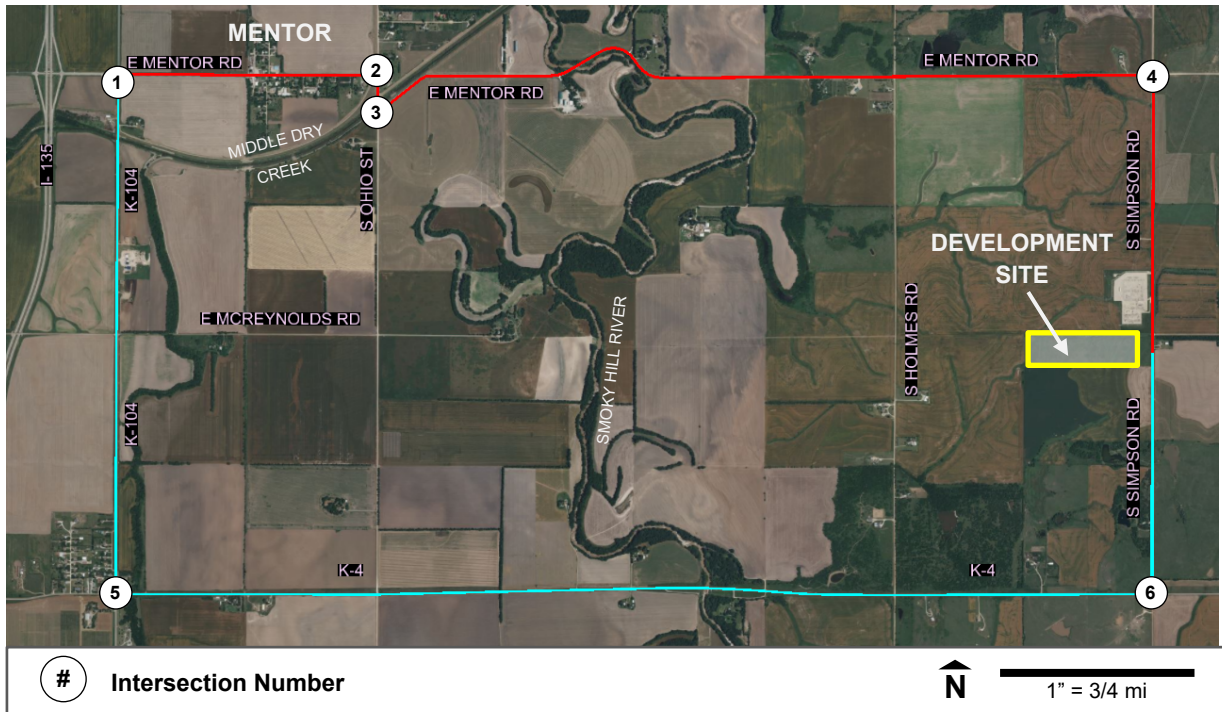


Figure 4 – Intersections Reviewed

**Intersection Configuration**

The intersection configuration, including turn lanes and control type, were estimated using aerial imagery and confirmed during the site visit. **Table** contains the details on intersection configuration.

**Table 4 – Intersection Configuration**

| Intersection                   | Configuration                              | Control Type                              | Turn Lanes   |
|--------------------------------|--|---|--|
| <i>North Route</i>             |  |   |  |
| 1. E Mentor Rd & K-104         | 4-leg, K-104 is major                      | Two-way stop control on Mentor (TWSC)     | Unmarked wide pavement, NB K-104 for right turning vehicles, 230' deceleration lane + 190' taper |
| 2. E Mentor Rd & S Ohio St (N) | 3-leg, S Ohio is major                     | Side-street stop control on Mentor (SSSC) | N/A  |
| 3. E Mentor Rd & S Ohio St (S) | 3-leg, S Ohio is major, skewed approx. 35° | SSSC on Mentor                            | N/A  |
| 4. E Mentor Rd & S Simpson Rd  | 4-leg, S Simpson is major                  | TWSC on Mentor                            | N/A  |
| <i>South Route</i>             |  |   |  |

**Reference: Traffic and Road Maintenance Plan**

|                        |                       |                 |   |
|------------------------|-----------------------|-----------------|---|
| 1. E Mentor Rd & K-104 | 4-leg, K-104 is major | TWSC on Mentor  | Unmarked wide pavement, NB K-104 for right turning vehicles, 230' deceleration lane + 190' taper                        |
| 5. K-4 & K-104         | 4-leg, K-104 is major | TWSC on K-4     | Unmarked wide pavement, NB & SB K-104 for right turning vehicles, NB 190' taper, SB 250' deceleration lane + 190' taper |
| 6. K-4 & S Simpson Rd  | 4-leg, K-4 is major   | TWSC on Simpson | N/A   |

**Intersection Radii**

The intersection radii for each quadrant of the intersections above were estimated using aerial imagery. **Table** contains the quadrant and radius information.

**Table 5 – Intersection Radii**

| Intersection                   | NE Quadrant | NW Quadrant | SE Quadrant | SW Quadrant |
|--------------------------------|-------------|-------------|-------------|-------------|
| <i>North Route</i>             |             |             |             |             |
| 1. E Mentor Rd & K-104         | 60'         | 60'         | 40'         | 65'         |
| 2. E Mentor Rd & S Ohio St (N) | N/A         | 45'         | N/A         | 50'         |
| 3. E Mentor Rd & S Ohio St (S) | 35'         | N/A         | 90'         | N/A         |
| 4. E Mentor Rd & S Simpson Rd  | 30'         | 45'         | 25'         | 45'         |
| <i>South Route</i>             |             |             |             |             |
| 1. E Mentor Rd & K-104         | 60'         | 60'         | 40'         | 65'         |
| 5. K-4 & K-104                 | 65'         | 35'         | 50'         | 45'         |
| 6. K-4 & S Simpson Rd          | 45'         | 35'         | 30'         | 25'         |

**Safety Information**

**Crash Data**

Crash data for the five-year period between 1/1/2019 and 12/31/2023 was obtained through the Kansas Open Roads Act (KORA) from KDOT along the north and south haul routes and at the intersections of I-135 and W Smolan Rd accessing these routes. **Table 6** shows the total number of reported crashes and severity along the north and south routes. Note that crash data at the intersection of K-104 and E Mentor Rd appears in the analysis of both routes as both routes include this intersection.

Reference: Traffic and Road Maintenance Plan

**Table 6 – Intersection Crash Number and Severity 2019-2023**

| Route       | Number of Crashes |                 |                 |               |
|-------------|-------------------|-----------------|-----------------|---------------|
|             | Fatal             | Personal Injury | Property Damage | Total Crashes |
| North Route | 0                 | 4               | 1               | 5             |
| South Route | 0                 | 9               | 23              | 32            |

The predominant crash patterns identified along the North Route are summarized in the following section.

**North Route Crash Patterns:**

- 3 crashes were angle crashes involving two vehicles colliding at the intersection of K-104 and E Mentor Rd. The angle crashes resulted in 3 personal injury crashes and occurred in mostly clear conditions with 1 occurring at dawn and 2 occurring in daylight.
- 2 crashes were single vehicle crashes with fixed objects, with 1 resulting in a personal injury.

The crash patterns are typical of high-speed rural roads with no fatalities recorded.

The predominant crash patterns identified along the South Route are summarized in the following section.

**South Route Crash Patterns:**

- 6 crashes were rear-end crashes: 2 involving two vehicles at the intersection of K-4 and S Simpson Rd, 2 involving two vehicles on S Simpson Rd, 1 involving two vehicles on K-4, and 1 involving four vehicles at the intersection of K-4 and K-104. The rear-end crashes resulted in 3 personal injury crashes and 3 property damage crashes. The crashes all occurred in daylight and in clear conditions.
- 1 crash was a sideswipe same direction crash involving two vehicles at the intersection of K-4 and S Ohio St. This crash resulted only in property damage and occurred in daylight and in clear conditions.
- 3 crashes were angle crashes involving two vehicles colliding at the intersection of K-104 and E Mentor Rd. The angle crashes resulted in 3 personal injury crashes and occurred in mostly clear conditions with 1 occurring at dawn and 2 occurring in daylight.
- 22 crashes were single vehicle crashes with objects. 14 of these crashes were collisions with animals, and 3 resulted in an injury.

The crash patterns are typical of high-speed rural roads with no fatalities recorded. KDOT plans to realign and reconstruct K-4 starting 400 feet west of the Smoky Hill River Bridge and extending eastward beyond S Simpson Rd. The new alignment, north of the existing roadway, will address safety concerns, flatten the profile, improve intersection sight distance, and install paved shoulders.

The crash rate per vehicle miles traveled (VMT) for each route was calculated using crash and AADT data. The crash rate for the north route is 203.6 crashes per 100,000,000 VMT, and the crash rate for the south route is 187.0 crashes per 100,000,000 VMT. The north route following exclusively county roads produces a larger crash rate than the south route that largely remains on state highways.

**Reference: Traffic and Road Maintenance Plan**

### **Intersection Sight Triangles**

Sight lines at the intersections listed above and the proposed site access were measured and examined to determine if sight obstructions are present. Intersection sight distance guidance from the American Association of State Highway and Transportation Officials' (AASHTO) *A Policy on Geometric Design of Highways and Streets – Chapter 9* was used. Relevant calculation parameters include a 3.5-foot eye height, a 2.0-foot object height, design speeds at 5 mph over the posted speed, a necessary time gap for maneuvers (crossing, left turns, right turns) based on combination trucks, and a stopping point 14.5 feet behind the crossing road's traveled way. The resultant sight triangles were plotted on aerial imagery and used along with observations from the site visit to identify sight obstructions. These sight triangles are shown in **Figure 5**.

Reference: Traffic and Road Maintenance Plan



**Figure 5 – Intersection Sight Triangles**

Most intersections and the site access were found to have clear sight lines without obstructions. Although there are power line poles in the northwest quadrant at E Mentor Rd & S Simpson Rd (Photo #1 below) and there is vertical curvature looking south from the site access location (Photo #2) and looking west from S Simpson Rd at K-4 (Photo #3), these were not found to create obstruction. At the E Mentor Rd & K-104 and K-4 & K-104 intersections, small road signs in the southeast quadrants were within the sight triangles for the respective movements (Photo #4) and could create obstruction; however small signage is of minimal

**Reference: Traffic and Road Maintenance Plan**

concern because drivers can easily look around them and/or adjust their position slightly. Existing and potential obstructions are shown in **Figure 7**.



**Figure 6 – Photos of Sight Obstructions**

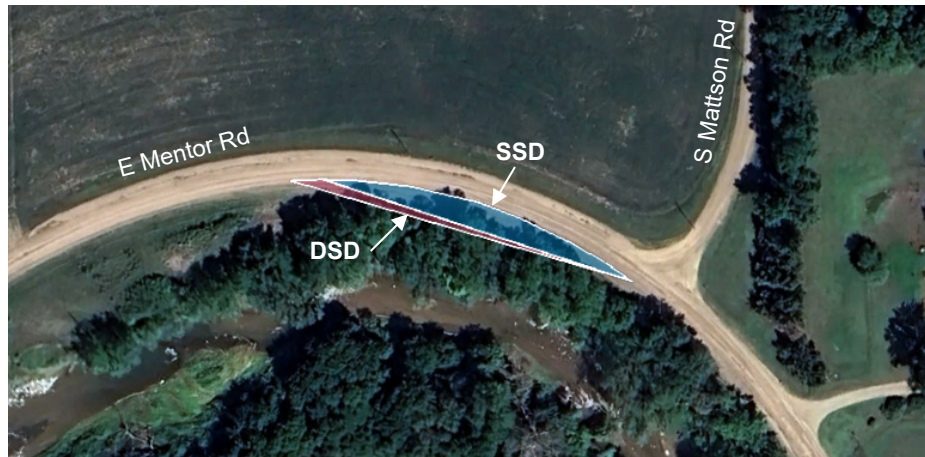
**Existing Safety Deficiencies/Concerns**

Additional safety deficiencies and concerns observed along the routes are discussed below:

- On the South Route, an 1,800-foot crest vertical curve is present immediately west of the K-4 & S Simpson Rd intersection on K-4. This curve obstructs sight of the intersection, which creates a risk for rear-end crashes with eastbound vehicles colliding with stopped left turning vehicles, and for angle crashes with eastbound vehicles and vehicles crossing or turning from S Simpson Rd. The stopping sight distance on this curve is 1,037 feet. An intersection ahead warning sign is present ahead of the curve with a 45-mph advisory speed.
- On the North Route, the horizontal curvature of E Mentor Rd and foliage near the Smoky Hill River Bridge obstructs the horizontal sight offset (HSO). This increases the risk of crashes with oncoming vehicles or vehicles stopped to turn left onto S Mattson Rd. Curve ahead warning signs are present with a 40-mph advisory speed. From AASHTO's *A Policy on Geometric Design of Highways and Streets – Chapter 3*, the stopping sight distance (SSD) for 40 mph is 305 feet, while decision sight

**Reference: Traffic and Road Maintenance Plan**

distance (DSD) for 40 mph is slightly longer at 330 feet. The HSO at the most critical location was plotted on aerial imagery and is shown in **Figure 7**.



**Figure 7 – Horizontal Sight Offset**

- On the North Route, stop ahead warning signs are absent on E Mentor Rd approaching its southern intersection with S Ohio St westbound and its intersection with S Simpson Rd eastbound. On the South Route, the stop ahead sign southbound on S Simpson Rd approaching its intersection with K-4 is partially obstructed by foliage.
- Upon visual observation, clear zone along both routes appears generally adequate with shallow ditch slopes and no rigid objects present. However, there are a few locations with clear zone concerns and they are shown in Figure 9:
  - On the North Route through Mentor, some buildings and overhead power line poles along the south side of E Mentor Rd are close to the edge of traveled way (Photo #1).
  - On the North Route on S Ohio St, overhead power line poles along the west side are close to the edge of traveled way (Photo #2).
  - On the North Route on E Mentor Rd from S Ohio St to S Simpson Rd, overhead power line poles along the south side and foliage/trees near the Smoky Hill River are close to the edge of traveled way (Photo #3).
  - On the South Route on S Simpson Rd north of K-4, foliage/trees are close to the edge of traveled way (Photo #4).
  - Clear zones are limited or absent around culverts due to steep slopes or obstructions. See **Section 3** for more details on these clear zone concerns (Photo #5).

**Reference: Traffic and Road Maintenance Plan**



**Figure 9 – Photos of Clear Zone Concerns**

**Pedestrian/Bicycle Facilities**

Except for a small portion of sidewalk in Mentor on the south side of E Mentor Rd at Washington Ave, there are no existing pedestrian or bicycle facilities in the study area. Pedestrian activity may be expected within Mentor and around the subdivision in the northwest quadrant of the K-4 & K-104 intersection.

**Reference: Traffic and Road Maintenance Plan**

Planning documents from the City of Salina and Saline County were reviewed and no planned pedestrian and bicycle facilities were identified in the study area.

### **Utilities**

Utilities along the two routes are generally underground or would not be impacted by travelling along the roadway; however at several locations along both routes, overhead power lines are present and cross the roadway, primarily to service individual properties. The minimum permitted clearance of these lines is 18 feet assuming no significant sagging over time. Clearance height can be confirmed by making accommodations with the utility owner to measure or move overhead power lines. The lines crossing the routes are listed below:

#### **North Route (14 crossings)**

- E Mentor Rd & K-104 – East leg
- E Mentor Rd through Mentor at 2 locations
- E Mentor Rd & S Ohio St (N) – South leg
- E Mentor Rd from S Ohio St to S Holmes Rd at 8 locations
- E Mentor Rd & S Simpson Rd – West leg
- S Simpson Rd north of Site Access near McReynolds Rd

#### **South Route (16 crossings)**

- E Mentor Rd & K-104 – South leg
- K-104 between E Mentor Rd and K-4 at 2 locations
- K-4 & K-104 – East leg
- K-4 between K-104 and S Simpson Rd at 9 locations
- K-4 & S Simpson Rd – Diagonally across intersection and West leg
- S Simpson Rd south of Site Access

### **Wetlands**

Using the U.S. Fish & Wildlife Service's (USFWS) National Wetlands Inventory (NWI) mapper, wetlands were identified within the right-of-way of the two routes. The Smoky Hill River, Dry Creek, Middle Dry Creek, and several wet ditches and swales cross underneath or run alongside the routes. The only areas of concern are locations with potential for work needed to widen the existing roads to accommodate construction vehicles, such as intersections or horizontal curves. The Smoky Hill River, classified as a riverine, crosses E Mentor Road adjacent to horizontal curvature, and Middle Dry Creek, also a riverine, crosses S Ohio St adjacent to intersections that could require widening work. No other riverine or freshwater emergent wetlands lie in areas with potential for widening work.

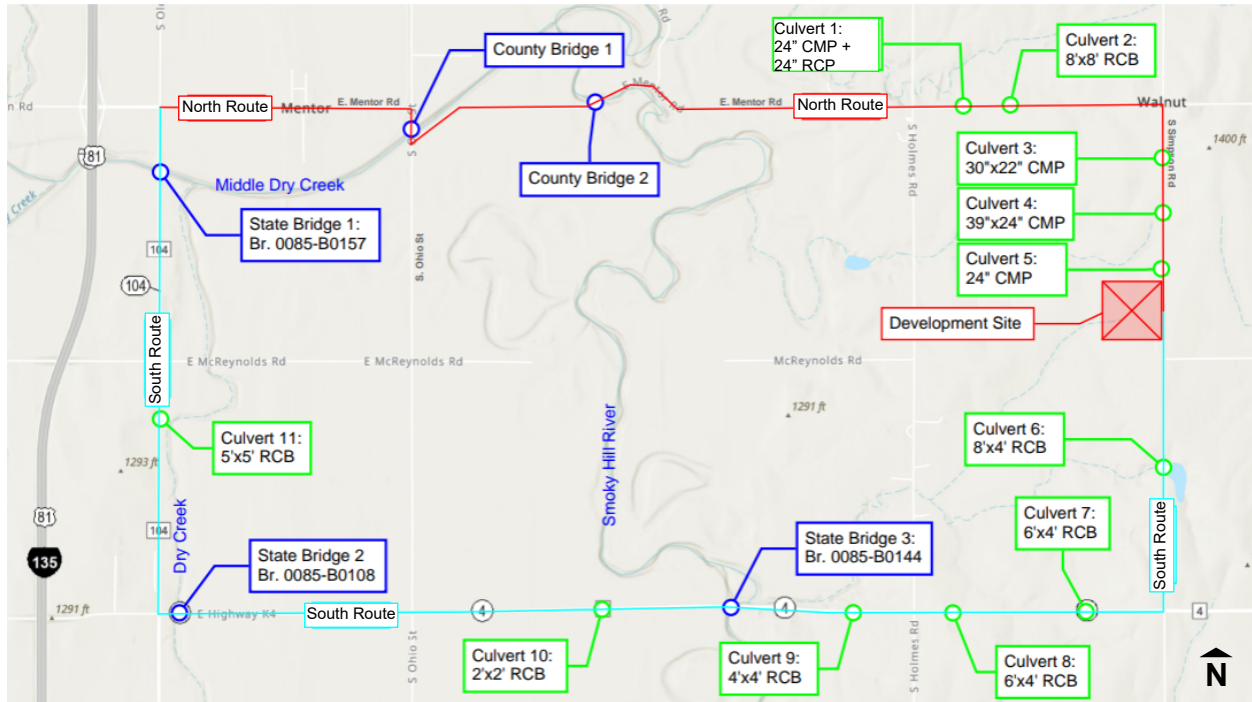
### **Transportation Agency Concerns**

KDOT District 2 has no additional traffic concerns.

Reference: Traffic and Road Maintenance Plan

### 3. Structural Survey

The site visit included an inventory and assessment of bridges and roadway culverts, including their conditions and any load restrictions. **Figure 10** shows the locations of the bridges and culverts identified.



**Figure 10 – Bridge and Culvert Locations**

#### Bridge Inventory and Preliminary Inspections

##### North Route

The North Route crosses over two County bridges. County Bridge 1 is load posted as described below and County Bridge 2 is not load restricted.

**County Bridge 1** is located on S Ohio St and crosses over the Middle Dry Creek. The bridge is a three-span, reinforced concrete box structure. The bridge is approximately 175 feet long and 24 feet wide. The reinforced concrete deck has a thin, integral overlay which is generally in good condition with shallow spalls. The bridge deck is covered with gravel along the shoulders. The concrete curb and steel rail is generally in good condition with minor wearing along the entire length. The approach guardrails on the north and south ends are in fair condition with minor impact damage and faded and deteriorating reflective decals on the end terminals. The bridge superstructure is in good condition with no significant defects observed. The bridge is currently load posted at 27 tons Gross Vehicle Weight (GVW) for a two-axle truck and 43 tons for a three and four axle truck. There are two load posting signs, one at each end of the bridge. The signs are in good condition. There are four reflective posts attached to the bridge, one at each corner, which are in good condition.



**Load Posting Sign at County Bridge 1**

**Reference: Traffic and Road Maintenance Plan**

**County Bridge 2** is located on E Mentor Rd and crosses over the Smoky Hill River. The bridge is a four-span, prestressed concrete beam bridge, approximately 330 feet long and 24 feet wide. It has a reinforced concrete bridge deck and reinforced concrete railing. The reinforced concrete deck has a thin, integral overlay which is generally in good condition with shallow spalls. The concrete curb and rail are in good condition with no significant defects observed. The approach guardrail on the west and east sides consists of a steel, W-beam rail with timber posts and is generally in good condition. The bridge has eight reflective markers, one at each bridge corner and one at the end of each guardrail terminal. All markers are in good condition. The bridge is not load posted.

### **South Route**

The South Route crosses over three State bridges. No bridges are load restricted along this route.

**State Bridge 1 (Br. 0085-B0157)** is located on K-104 and crosses over the Middle Dry Creek approximately 1,330 feet south of the intersection of E Mentor Rd & K-104. The bridge is a three-span, prestressed concrete beam bridge, approximately 200 feet long and 40 feet wide. The reinforced concrete deck is in good condition with minor abrasion and spalling. The reinforced concrete railing is in good condition with no significant defects. The approach guardrail on the north and south sides consists of a steel three-beam rail with steel posts and is in good condition. The bridge has four reflective markers, one at each bridge corner, which are in good condition. The bridge is not load posted.

**State Bridge 2 (Br. 0085-B0108 (170))** is located on K-4 and crosses over the Dry Creek approximately 400 feet east of the intersection of K-4 & K-104. The bridge is a reinforced concrete arch beam bridge with reinforced concrete deck and railing. The bridge deck is in poor condition with many transverse cracks and multiple large spalls. Many of the spalls have been patched with asphalt, but the patches are deteriorating. The bridge superstructure and piers are in fair condition with minor cracks and spalling observed. The approach guardrail at each corner is in fair condition with minor impact damage to the northwest end terminal. There are eight reflective marker signs: three at the southwest and northeast corners and one at the northwest and southeast corners. The signs are in good condition. The bridge is not load posted. According to the KDOT Transportation Planning web map and to the KDOT construction engineer on project KA-5719-01, this bridge is scheduled to be replaced in 2025 with construction beginning in March and ending in October. A 13 to 14-foot width restriction will apply to the new bridge.

**State Bridge 3 (Br. 0085-B0144)** is located on K-4 and crosses the Smoky Hill River approximately 2.25 miles east of the intersection of K-4 & K-104. The bridge is a three-span, steel beam bridge, approximately 300 feet long and 44 feet wide. The bridge deck has a thin, integral overlay that is in poor condition. The reinforced concrete bridge deck is in fair condition with many transverse cracks and evidence of rust staining. The superstructure is in fair condition with sporadic areas of surface corrosion along the steel beams. The substructure is in good condition. The approach guardrail is a steel W-beam rail with timber posts and is in good condition. There is a reflective marker at each corner of the bridge which are all in good condition. The bridge is not load posted.

Reference: Traffic and Road Maintenance Plan

## **Culvert Inventory and Preliminary Inspections**

### **North Route**

The North Route crosses over five culverts. Aside from Culvert 1, these culvert end sections are located between 2 to 6 feet from the travel lane edges, limiting clear zone.

**Culvert 1** consists of one 24-inch corrugated metal culvert (CMP) and one 24-inch reinforced concrete culvert (RCP) with a concrete headwall and is located on E Mentor Rd approximately 1,200 feet east of Holmes Rd. The headwalls are located at the edges of the 12-foot travel lanes, providing no clear zone. The culverts are generally in good condition with minor surface corrosion along the inverts. The west culvert has approximately 1 foot of cover. The east culvert is set 6 inches lower than the west culvert and is clogged with dirt and debris. The concrete headwalls are in fair condition with minor impact damage and abrasion. There are two reflective markers, one at the southwest and northeast corners of the concrete headwalls. The markers are in good condition. The roadway over the culvert is well graded with no evidence of settlement over the culverts.

**Culvert 2** is an 8-foot by 8-foot reinforced concrete box culvert (RCB) located on E Mentor Rd approximately 3,230 feet east of Holmes Rd. The box culvert is in good condition with minor abrasion along the walls. There is evidence of water staining along the roof but no evidence of rust staining. There are two reflective markers, one at the southwest and northeast corners of the box culvert. The markers are in good condition. The roadway over the culvert is well graded with no evidence of settlement over the culverts.

**Culverts 3 through 5** are located along S Simpson Rd between the intersection of E Mentor Rd and the development site. The culverts are a 30-inch by 22-inch elliptical CMP, a 39-inch by 24-inch elliptical CMP, and a 24-inch CMP. Each culvert has approximately 2 feet of cover. The culverts are generally in good condition with minor surface corrosion along the inverts. The end sections have minor impact damage and scrapes. The roadway over each culvert is in good condition with no signs of settlement. There are reflective markers on each side of the roadway at each culvert which are in good condition.

### **South Route**

The South Route crosses over six culverts. These culvert end sections are located between 3 to 8 feet from the travel lane edges, limiting clear zone.

**Culvert 6** is an 8-foot by 8-foot RCB on Simpson Rd located 3,000 feet north of the S Simpson Rd & K-4 intersection. This culvert is in good condition with minor abrasion and deterioration. The culvert has over 5 feet of cover. The gravel roadway over the culvert is in good condition. There are no reflective markers or other signs.

**Culvert 7** is a 6-foot by 4-foot RCB on K-4 located 2,350 feet west of the S Simpson Rd & K-4 intersection. The culvert is in fair condition. There are multiple spalls in the roof with exposed reinforcement with surface corrosion. There is approximately 1 foot of cover to the top of roadway. The asphalt road has minor transverse settlement cracks over each end of the culvert. There are two reflective markers, one on each side, which are in good condition.

**Culvert 8** is a 6-foot by 4-foot RCB on K-4 located 3,300 feet west of the S Simpson Rd & K-4 intersection. The culvert is in fair condition. There are multiple spalls in the roof with exposed reinforcement with surface

**Reference: Traffic and Road Maintenance Plan**

corrosion. There is approximately 1 foot of cover to the top of roadway. The asphalt road has minor transverse settlement cracks over each end of the culvert. There are two reflective markers, one on each side, which are in good condition.

**Culvert 9** is a 4-foot by 4-foot RCB on K-4 located 4,270 feet west of the S Simpson Rd & K-4 intersection. The culvert is in fair condition. There are multiple spalls in the roof with exposed reinforcement with surface corrosion. There is approximately 1 foot of cover to the top of roadway. The asphalt road has minor transverse settlement cracks over each end of the culvert. There are two reflective markers, one on each side, which are in good condition.

**Culvert 10** is a 2-foot by 2-foot RCB on K-4 located 1.5 miles east of the K-4 & K-104 intersection. The culvert is in good condition with minor abrasion along the walls. There is approximately 1 foot of cover to the top of roadway. The asphalt road has one minor transverse settlement crack over the west side of the culvert. There are two reflective markers, one on each side, which are in good condition.

**Culvert 11** is a 5-foot by 5-foot RCB on K-104 located 2,160 feet north of the K-4 & K-104 intersection. The culvert is in good condition with minor abrasion along the walls. There is approximately 1 foot of cover to the top of roadway. The asphalt road has one minor transverse settlement crack over the south side of the culvert. There are two reflective markers, one on each side, which are in good condition.

## **Preliminary Recommendations**

### **North Route**

The structures and culverts along this route are generally in good condition. The load posting for County Bridge 1 is likely due to the design of the structure and not due to deterioration. There are no recommended initial improvements for the bridges or culverts along this route. The measured cover meets typical minimum thickness for highway traffic. KDOT's Utility Accommodation Policy requires 14-18 feet of clear zone on 55 mph roads under 750 Average Daily Traffic (ADT) with 1:5 to 1:4 foreslopes which conservatively applies to much of the North Route. However, inslopes of 1:3 and 1:2 are present at culverts and their end sections are located between 2 to 6 feet from the travel lane edges.

### **South Route**

The structures and culverts along this route are generally in fair to good condition. There are no recommended initial improvements for the bridges or culverts along this route. The culverts and bridges are expected to accommodate legal highway loads. OSOW permits from KDOT are required on K-4 and K-104 for loads over 90,000 pounds and exceeding standard size limits. OSOW permits from Saline County will also be required.

## **Transportation Agency Concerns**

KDOT District 2 has no additional traffic concerns.

Reference: Traffic and Road Maintenance Plan

## 4. Site Traffic

The vehicle traffic expected to be generated by the site during construction and operation was estimated based on information from the BESS site developer and details of the development.

### Construction Vehicle Types

The following construction vehicle types are expected to be transported to and present on the BESS site:

- Light-duty Pickup Truck
- Skid Steer Loader
- Dump Truck
- Road Roller
- Excavator
- Front Loader
- Bulldozer
- Fuel Truck
- Flat Bed Truck
- Concrete Trucks (approximately 800 cubic yards of concrete total)
- Telehandler
- Forklift
- Crane
  - Weight depends on work
  - Expect 110-ton and 300-ton cranes
- Combination Truck/Tractor-trailer
  - For equipment deliveries
  - BESS enclosures (battery packs, 84,000 pounds)
  - Main power transformers (230,000 to 270,000 pounds)
  - Medium voltage transformers (25,000 to 30,000 pounds)

The combination trucks delivering the battery packs are assumed to have the most restrictive turning radius of all vehicles expected for the site. The minimum turning radius for these trucks is 45 feet.

### Vehicle Access Patterns

One of the routes to the BESS site will be selected as the primary route via which construction vehicles will travel to access the site. Many of the construction vehicles listed above will arrive on site and leave the site one time prior to and after construction of the BESS site. The daily traffic during construction will consist of light-duty pickup trucks, fuel trucks, and combination trucks delivering equipment. **Table** shows the site generated trips for construction.

Reference: Traffic and Road Maintenance Plan

**Table 7 – Site Generated Trips for Construction**

| Vehicle Type                            | Construction Phase       |                     |                   |
|---|--------------------------|---------------------|-------------------|
|   | Pre-Construction         | During Construction | Post-Construction |
| Light-duty Pickup Truck                 | 5                        | 12                  | 2                 |
| Skid Steer Loader                       | 2                        |                     | 2                 |
| Dump Truck                              | 2                        |                     | 2                 |
| Road Roller                             | 1*                       |                     | 1*                |
| Excavator                               | 1*                       |                     | 1*                |
| Front Loader                            | 1*                       |                     | 1*                |
| Bulldozer                               | 1*                       |                     | 1*                |
| Fuel Truck                              | 1                        | 3                   | 1                 |
| Concrete Truck                          |                          | 80                  |                   |
| Crane                                   | 2<br>(110 Ton + 300 Ton) |                     | 2                 |
| Telehandler                             | 2*                       |                     | 2*                |
| Forklift                                | 2*                       |                     | 2*                |
| Combination Truck<br>(Vehicle Delivery) | 8                        |                     | 8                 |
| Combination Truck<br>(Battery Packs)    |                          | 392<br>(12 per day) |                   |
| Combination Truck<br>(Transformers)     |                          | 98<br>(12 per day)  |                   |
| <b>Total</b>                            | <b>18</b>                | <b>585</b>          | <b>15</b>         |

\*Delivered on Combination Trucks

Pre- and post-construction trips were estimated based on the developer’s experience constructing similar facilities and consist of one or two of each construction vehicle type, many of which are delivered on combination trucks. This results in 15 to 18 vehicle trips. Regular trips made during construction were calculated based off site details. The BESS yard of the site consists of 98 energy stations with 4 BESS enclosures and 1 transformer per energy station. This amounts to the delivery of 392 BESS enclosures and 98 transformers to the site. Each combination truck is expected to deliver either 1 BESS enclosure or 1 transformer, resulting in 490 combination trucks. Including fuel trucks, concrete trucks and pickup trucks, this results in 585 vehicle trips.

Site traffic is expected to be minimal once the BESS site is operational. Daily maintenance traffic will consist of up to two light-duty pickup trucks entering and exiting the site via either of the routes.

## **North Route Impacts/Deficiencies**

### **Roadway**

While the measured cover meets typical minimum thickness for highway traffic, damage to the culverts could occur if overweight permit vehicles travel along this route.

Reference: Traffic and Road Maintenance Plan

## **Structural**

The load restrictions should be carefully considered in selecting a route.

## **South Route Impacts/Deficiencies**

### **Roadway**

The culverts along this route are expected to accommodate legal highway loads.

### **Structural**

The bridges along this route are expected to accommodate legal highway loads.

## **5. Conclusions and Recommendations**

### **Summary of Findings**

#### Deficiencies by Route

- North Route
  - This route follows county roads for its entire length that are surfaced with gravel in fair to good condition. There is evidence of raveling, uneven slopes and depressions, normal transverse expansion cracking, and locations with potholes and fatigue cracking on E Mentor Rd west of S Ohio St. On S Ohio St, there is evidence of minor wash boarding and potholes at the pavement-to-gravel transition.
  - No shoulders are present throughout the route. Steep slopes between 1:3 and 1:2 are present on E Mentor Rd adjacent to S Ohio St and to S Mattson Rd. Steep slopes also exist at culvert locations.
  - Stop ahead warning signs are absent on E Mentor Rd approaching its southern intersection with S Ohio St westbound and its intersection with S Simpson Rd eastbound.
  - Horizontal curvature of E Mentor Rd and foliage near the Smoky Hill River Bridge obstructs the horizontal sight offset. Curve ahead warning signs with a 40-mph advisory speed are present for these curves.
  - Overhead powerline poles are located close to the edge of traveled way through Mentor, on S Ohio Street, and on the south side of E Mentor Rd between S Ohio St and S Simpson Rd. Buildings in Mentor and culverts throughout the route also provide minimal clear zone.
  - The Smoky Hill River and Middle Dry Creek are classified as riverine features that cross the route adjacent to potential areas of widening work.
  - County Bridge 1 crosses Middle Dry Creek on S Ohio St and is currently load posted at 27 tons GVW for a two-axle truck and 43 tons for a three and four axle truck.
  - Damage to culverts could occur if overweight vehicles travel along this route.
- South Route
  - This route follows primarily state routes which support more consistent traffic flow.
  - No shoulders are present on S Simpson Rd.

**Reference: Traffic and Road Maintenance Plan**

- KDOT plans to reconstruct and realign K-4 starting 400 feet west of the Smoky Hill River Bridge and extending eastward beyond S Simpson Rd. This project will be let beginning in April 2025.
- Vertical curvature looking south from the site access location is present on S Simpson Rd but was not found to create obstruction. An 1,800-foot crest vertical curve is present immediately west of the K-4 & S Simpson Rd intersection on K-4 which obstructs sight of the intersection. An intersection ahead warning sign is present ahead of the curve with a 45-mph advisory speed.
- Foliage is close to the edge of travelled way on S Simpson Rd north of K-4. Culverts throughout the route also provide minimal clear zone.
- Bridge #144 over the Smoky Hill River on K-4 has an integral overlay in poor condition. The reinforced concrete bridge deck is in fair condition with many transverse cracks and evidence of rust staining. The superstructure is in fair condition with sporadic areas of surface corrosion along the steel beams.
- KDOT plans to replace Bridge #108 (170) on K-4 over Dry Creek, 400 feet east of K-104. Construction began in March 2025 and is scheduled to be completed in October 2025. It will have a 13 to 14-foot width restriction.

## **Recommendations**

Due to a larger range of deficiencies accompanying the North Route, the South Route is recommended for site access traffic. The South Route is almost entirely paved while the North Route is primarily gravel-surfaced. While the South Route lacks shoulders on S Simpson Rd, it includes shoulders on K-4 and K-104 whereas the North Route lacks shoulders throughout the entire route. The South Route does have vertical curvature on S Simpson Rd and K-4, but sightlines are not obstructed on S Simpson Rd, and KDOT plans to reconstruct K-4 to address safety concerns at this intersection. The North Route includes horizontal curvature that requires curve ahead warning signs and advisory speeds. Additionally, although no definitive needs for infrastructure improvements have been identified to accommodate this project, the North Route has areas of steep slopes and riverine features that lie adjacent to areas of generally increased potential for widening work (ex. Adjacent to right turns at intersections), while the South Route has no steep slopes and no wetlands near areas with increased potential for widening work. Clear zone issues near culverts persist on both routes, but the culverts and bridges along the South Route, primarily consisting of state roads, are expected to accommodate legal highway loads.

**Reference: Traffic and Road Maintenance Plan**

Regards,

**Stantec Consulting Services Inc.**



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Attachment: Appendices