# SOUTHEAST KANSAS
**Bioeconomy Development Opportunity Zone**

# RATING GRADE: 'BBB'
**Date of Issue: March 12, 2025**

**BBB**
**Good Quality**

## Rating Parameters:

| Category | Rated Quantity | Delivered Price | Supply Zone Size |
|---|---|---|---|
| **Corn Stover** | **154,000/bdt** | **$86-$124/bdt** | **75-mi drive distance from the City of Parsons, KS** |

## BDO ZONE ASSETS

- Strong support for new biomass ventures and rural economic development by local crop growers.
- No significant competing uses for corn stover.
- An industrial park with Class 1 rail availability, extensive highway access, and 6,800 acres of contiguous land available for Industrial development.

## BDO ZONE LIABILITIES

- Short harvesting and baling window requiring high degree of coordination and access to equipment
- Significant variation in year-to-year corn stover production due to erratic weather patterns in the last decade.
- Labor shortage due to short harvest window for corn-winter wheat rotation.

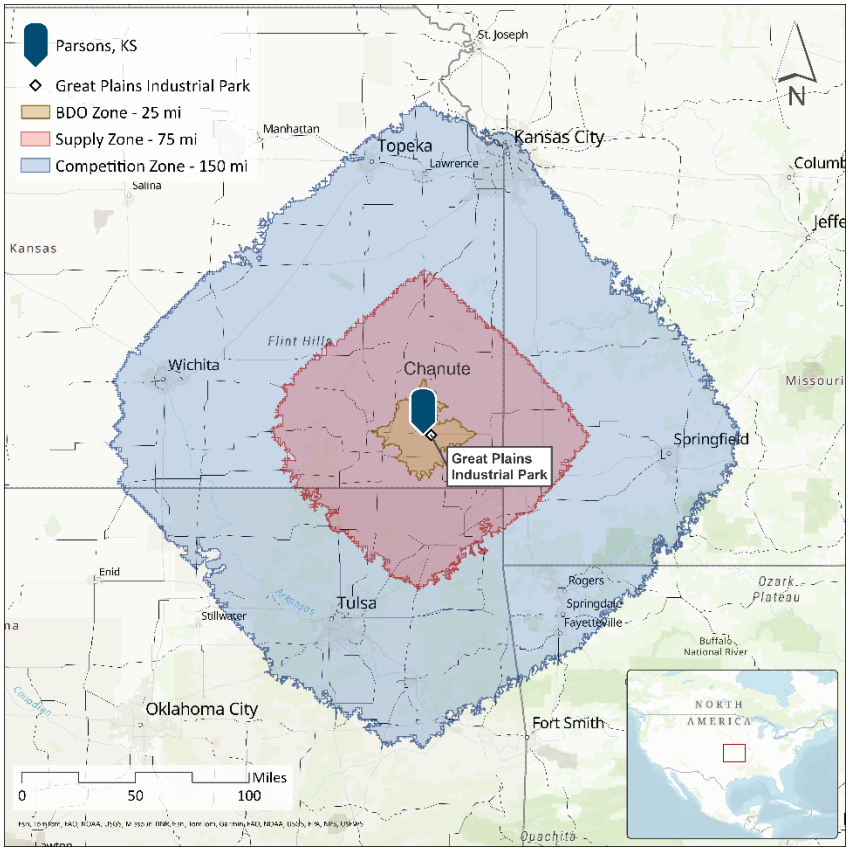
## RATING GRADE

**The Southeast Kansas, Bioeconomy Development Opportunity (BDO) Zone, is rated 'BBB', or 'low-moderate' risk.**

Risk Rating Grades are defined as follows: AAA (extremely low), AA (very low), A (low), BBB (low-moderate), BB (moderate), B (moderate-high), and C (high).

'BBB' ratings denote good prospective viability of Feedstock Supply and Infrastructure and expectations of default risk are currently low-medium. The capacity to support new biobased plant operations is considered adequate but it is vulnerable to low corn yield, high year-to-year variability of corn stover and adverse weather conditions.

## SOUTHEAST KANSAS BDO ZONE



## ANALYST NOTES

We project a potential of 154,000 bone dry tons per year (bdt/yr) of corn stover can be economically and technically sourced for a new project at low risk. We expect that the low-risk corn stover quantity would be available at a delivered price range of $86-$124/bdt. The low-risk quantity is estimated after considering corn stover production and competition, supply chain constraints (e.g., equipment and labor availability, road capacity), and data/model uncertainty. The rated pricing is the expected delivered price that future biomass projects are likely to pay to secure the rated quantity.

Among the 88 supply, competition, and infrastructure risk indicators evaluated, we found uncertainty with weather conditions, low corn yield, short harvest window, and supply chain scale-up as the medium to high risks that future biomass ventures need to mitigate. In contrast, support from local farm communities, insignificant demand for corn stover, and the availability of an industrial park with Class 1 rail access and large pieces of contiguous land available for development are the BDO Zone assets.

A summary of main assets (very low/low risks) and liability (medium/high risks) are discussed in the following sections.

### BDO ZONE ASSETS

There are about 10,000 farmers in the Supply Zone with 5.5 million acres of farmland. Approximately 45% of this farmland is cropland, being used mainly for soybean, corn, and wheat production. Corn has been produced for more than a century in the region, and it remains a major part of crop rotation. With the growing national and global demand for agricultural products as feedstocks for biofuel applications, the local farm communities expressed their strong support to attract new ventures that can use crop residue, such as corn stover, as feedstock. This is vital for crop growers to diversify their markets and create local employment.

There has not been any industrial use of corn stover in the Competition Zone on a large scale. Most crop growers use corn stover as soil cover for its nutrient value and for its soil erosion mitigation and moisture retention benefits. The only traditional users of corn stover are livestock producers, accounting for less than 5% of stover generated. They only use corn stover as a feed source when there is a temporary shortage of hay and other feed products. Low corn stover demand is a significant advantage for future biomass projects to secure the rated quantity and pricing while working with local crop growers to leave a portion of corn stover in the field.

### BDO ZONE LIABILITIES

The primary risks to future biomass projects are low corn yield and interannual variability in corn stover production. Corn yield in the Supply Zone is in a range of 65-145 bu/acre with an average of 110 bu/acre. This is 38% lower than the average corn grain yield in the US (177 bu/acre). Low corn yield results in lower production of corn stover and can discourage crop growers from removing it from their fields. Harvesting corn stover from north and east of the Supply Zone, where high-yield corn counties are located, can mitigate this risk.

The window to harvest and bale dry stover in Southeast Kansas is short. Harvesting and baling operations have to be conducted concurrently on large spans of land, requiring access to equipment and sophisticated coordination. Any disturbances in harvesting and baling operations pose risk to feedstock availability and quality.

A trend that has been observed in recent years is the excessive rain/drought in Southeast Kansas, which tends to come in cycles. The region has been in a drought cycle for the past 2-3 years while it was experiencing excessive rains prior to 2021. Significant economic impacts occurred in 2022 due to severe drought and a very low crop yield. We expect that the excessive rain/drought cycle will continue to have negative effects on corn production in the Supply Zone. That being said, drought mainly impacts the production of grain. Corn stover availability is only slightly affected as growers can harvest stover even if grain is affected by drought.

To harvest, collect, and store the rated quantity during the harvest season, about 40 operators are needed. Due to presently low demands for corn stover, the labor needed to harvest corn grain, and the preparation of land for the next cropping season, the number of experienced equipment operators is currently low. This is a significant challenge for crop growers who are on corn-wheat

rotation, as they have a few weeks after harvesting corn to prepare their lands for winter wheat planting.

Although the low competing uses of corn stover is an advantage for future biomass projects, it comes with its own challenges. With the lack of history of large-scale uses of corn stover, most crop growers have limited knowledge of corn stover harvesting, collection, storage, and transportation at scale. In addition, in our outreach to the local farmers, some of them did not know what the price of corn stover would be as they have not sold their corn stover in the past.

Hiring experienced custom harvest groups with a fleet of harvest and collection equipment and skilled operators and close collaboration with the crop growers is vital to mitigate the short harvest window, labor availability, and production scale-up.

### INFRASTRUCTURE PROFILE

The focus on green industries and sustainability at Great Plains Industrial Park (GPIP) makes this area highly attractive for businesses prioritizing eco-friendly practices. Its location, just five miles southwest of Parsons, offers over 6,800 acres of industrial and commercial space.

The GPIP's designation as a *Foreign Trade Zone* offers substantial economic advantages. International companies benefit from deferred or reduced tariffs and duties. The BDO Zone offers cost of living and housing expenses that are well below both State and National levels.

Many essential utilities are already in place, with electric capacity set to triple by 2026. The Union Pacific Railroad service enhances logistics, making the area well-suited for industrial operations. However, the industrial park does not have access to natural gas. Currently, businesses must depend on propane, which is likely less efficient and more costly than natural gas.

## SCORING & RATING METHODOLOGY

In assessing the biomass supply chain risk for the Southeast Kansas BDO Zone, 88 Risk Indicators from the US Standards for Biomass Supply Chain Risk (BSCR) were applied. These BDO Zone Risk Indicators are the subset of BSCR Risk Indicators applicable to evaluating feedstock risk within a BDO Zone. The risk indicators include

- Twenty physical and social infrastructure risks were assessed for an industrial park located in the BDO Zone. The BDO Zone is a 25-mile drive distance from Parsons, which represents the Siting Zone for future biomass projects and is where the industrial park is located.
- Ten supplier risks, 46 supply chain risks, and 2 feedstock scale-up risks were assessed in the Supply Zone. The Supply Zone is a 75-mile drive distance from Parsons, where corn stover availability was assessed.
- Ten competition risks were evaluated in the Competition Zone. The Competition Zone is a 150-mile drive from the center point, where consumers can compete for corn stover generated in the Supply Zone.

Corn stover quantities are expressed in bone-dry tons per year (bdt/yr). A bone-dry ton is a ton of corn stover with a moisture content of 0% (wet basis). Corn stover prices are expressed in United States dollars (USD). Maximum transport distance is based on a 75-mile driving distance from the center point of the BDO Zone, Parsons, Kansas.

The BDO Zone rating is based on an aggregation of the scores assigned to each BDO Zone Risk Indicator (RI) assessed in this report. First, each BDO Zone Risk Indicator is given a **Raw Risk Likelihood (RRL)** score, which denotes the likelihood of a risk to future BDO Zone projects due to the Risk Indicator. RRL Scores are scaled as either very low (2), low (4), medium (6), high (8), or very high (10).

Each BDO Zone Risk Indicator is given a **Raw Risk Impact (RRI)** score, which denotes the impact on a future BDO Zone project due to the Risk Indicator. RRI scores are scaled as either very low (2), low (4), medium (6), high (8), or very high (10). Impact level scores are based on the impact level of a risk on the successful development and deployment of a BDO Zone project with no mitigation measures.

The **Gross Risk Indicator (GRI)** score is then calculated as the product of the RRL and the RRI scores. For example, if the 'Competitor Price and Price Sensitivity' is scored at an RRL of 2 and an RRI of 8, then the GRI for this risk indicator is 2 X 8 = 16.

If the analyst deems that a typical bio-based project could implement economically reasonable measures or best practices that mitigate the likelihood (RRL), the impact (RRI), or both, then the GRI will be notched accordingly.

The **Loaded RI** score for each Risk Indicator is the product of the GRI score and any notched scores. Loaded RIs are the final score for a Risk Indicator.

Loaded RI scores of 4 or less are deemed very low risk; scores between 5 and 16 are deemed low risk; scores between 17 and 36 are deemed medium risk; scores between 37 and 64 are deemed high risk; and scores of 65 and greater are deemed very high risk.

The total risk rating for the BDO Zone is the average of all Loaded RI scores and Infrastructure Indicators. The BDO Zone score for Southeast Kansas is ***23.01 out of 100, resulting in a 'BBB' designation.***

All scoring and rationale for each Risk Indicator are provided in Section D.

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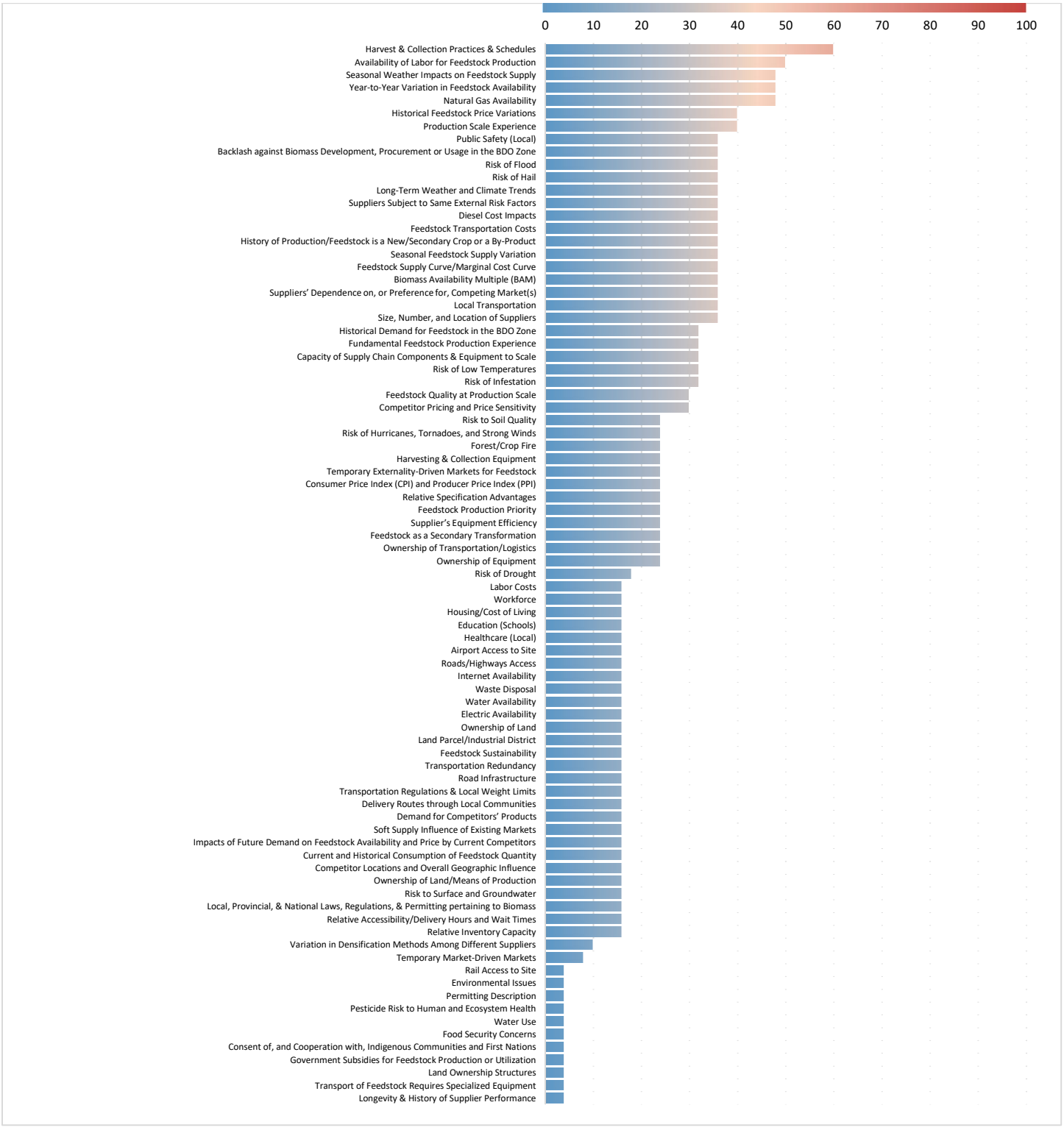
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# SECTION A: RISK INDICATOR SUMMARY

## Figure A-1. All Risk Indicators Sorted by Risk Level



## Table A-1. Risk Indicators and Associated Scores

| Feedstock Supply Chain Risk Indicators | Raw Risk Likelihood | Raw Risk Impact | Gross Risk Indicator | Mitigation /Notching | Loaded RI Score |
|---|---|---|---|---|---|
| **Category 1.0: Supplier Risk** | | | | | |
| *1.1 Risk Factor: Credit-Worthiness/Future Solvency of Suppliers* | | | | | |
| 1.1.1 Longevity & History of Supplier Performance | 2 | 2 | 4 | NN | 4 |
| *1.2 Risk Factor: Conflicts of Interest/Vested Interest with Competing Market(s)* | | | | | |
| 1.2.1 Suppliers' Dependence on, or Preference for, Competing Market(s) | 6 | 6 | 36 | NN | 36 |
| *1.3 Risk Factor: Supplier Control Over Production and Transportation* | | | | | |
| 1.3.1 Ownership of Land/Means of Production | 4 | 4 | 16 | NN | 16 |
| 1.3.2 Ownership of Equipment | 6 | 4 | 24 | NN | 24 |
| 1.3.3 Ownership of Transportation/Logistics | 6 | 4 | 24 | NN | 24 |
| 1.3.4 Feedstock as a Secondary Transformation | 6 | 4 | 24 | NN | 24 |
| *1.4 Risk Factor: Supplier Experience* | | | | | |
| 1.4.1 Fundamental Feedstock Production Experience | 8 | 8 | 64 | 50% | 32 |
| 1.4.2 Production Scale Experience | 10 | 8 | 80 | 50% | 40 |
| *1.5 Risk Factor: Supplier Harvesting/Collection/Processing Capacity* | | | | | |
| 1.5.1 Supplier's Equipment Efficiency | 6 | 8 | 48 | 50% | 24 |
| *1.6 Risk Factor: Supplier Motivation* | | | | | |
| 1.6.1 Feedstock Production Priority | 6 | 8 | 48 | 50% | 24 |
| **Category 2.0: Competitor Risk** | | | | | |
| *2.1 Risk Factor: Influence on Feedstock Supply of Existing Markets* | | | | | |
| 2.1.1 Competitor Locations and Overall Geographic Influence | 4 | 4 | 16 | NN | 16 |
| 2.1.2 Current and Historical Consumption of Feedstock Quantity | 4 | 4 | 16 | NN | 16 |
| 2.1.3 Competitor Pricing and Price Sensitivity | 6 | 10 | 60 | 50% | 30 |
| 2.1.4 Impacts of Future Demand on Feedstock Availability and Price by Current Competitors | 4 | 4 | 16 | NN | 16 |
| 2.1.5 Soft Supply Influence of Existing Markets | 4 | 4 | 16 | NN | 16 |
| 2.1.6 Temporary Market-Driven Markets | 2 | 4 | 8 | NN | 8 |
| *2.2 Risk Factor: Specific Competitors' Competitive Advantage* | | | | | |
| 2.2.1 Relative Inventory Capacity | 4 | 4 | 16 | NN | 16 |
| 2.2.2 Relative Accessibility/Delivery Hours and Wait Times | 4 | 4 | 16 | NN | 16 |
| 2.2.3 Relative Specification Advantages | 6 | 4 | 24 | NN | 24 |
| 2.2.4 Demand for Competitors' Products | 4 | 4 | 16 | NN | 16 |
| **Category 3.0: Supply Chain Risk** | | | | | |
| *3.1 Risk Factor: Feedstock Availability* | | | | | |
| 3.1.1 Biomass Availability Multiple (BAM) | 6 | 6 | 36 | NN | 36 |
| 3.1.2 Feedstock Supply Curve/Marginal Cost Curve | 6 | 6 | 36 | NN | 36 |
| 3.1.3 Seasonal Feedstock Supply Variation | 6 | 6 | 36 | NN | 36 |
| 3.1.4 Year-to-Year Variation in Feedstock Availability | 8 | 6 | 48 | NN | 48 |
| *3.2 Risk Factor: Historical Issues* | | | | | |
| 3.2.1 Historical Feedstock Price Variations | 8 | 10 | 80 | 50% | 40 |
| 3.2.2 Low Historical Demand for Feedstock in the BDO Zone | 8 | 8 | 64 | 50% | 32 |
| 3.2.3 History of Production/Feedstock is a New/Secondary Crop or a By-Product | 6 | 6 | 36 | NN | 36 |
| *3.3 Risk Factor: Non-Weather Based Externalities* | | | | | |
| 3.3.1 Consumer Price Index (CPI) and Producer Price Index (PPI) | 6 | 4 | 24 | NN | 24 |
| 3.3.2 Currency Risk | NR | NR | NR | NR | NR |
| 3.3.3 Border Risk | NR | NR | NR | NR | NR |
| 3.3.4 Temporary Externality-Driven Markets for Feedstock | 6 | 4 | 24 | NN | 24 |
| *3.4 Risk Factor: Risks Related to Feedstock Production, Harvest, and Collection* | | | | | |
| 3.4.1 Harvest & Collection Practices & Schedules | 10 | 8 | 80 | 25% | 60 |
| 3.4.2 Harvesting & Collection Equipment | 6 | 4 | 24 | NN | 24 |
| 3.4.3 Variation in Densification Methods Among Different Suppliers | 2 | 10 | 20 | 50% | 10 |
| 3.4.4 Availability of Labor for Feedstock Production | 10 | 10 | 100 | 50% | 50 |
| *3.5 Risk Factor: Transportation* | | | | | |
| 3.5.1 Feedstock Transportation Costs | 6 | 6 | 36 | NN | 36 |
| 3.5.2 Diesel Cost Impacts | 8 | 6 | 48 | 25% | 36 |
| 3.5.3 Transport of Feedstock Requires Specialized Equipment | 2 | 2 | 4 | NN | 4 |
| 3.5.4 Delivery Routes through Local Communities | 4 | 4 | 16 | NN | 16 |
| 3.5.5 Transportation Regulations & Local Weight Limits | 4 | 4 | 16 | NN | 16 |
| 3.5.6 Road Infrastructure | 4 | 4 | 16 | NN | 16 |
| 3.5.7 Transportation Redundancy | 4 | 4 | 16 | NN | 16 |
| *3.6 Risk Factor: Supply Chain Resiliency* | | | | | |

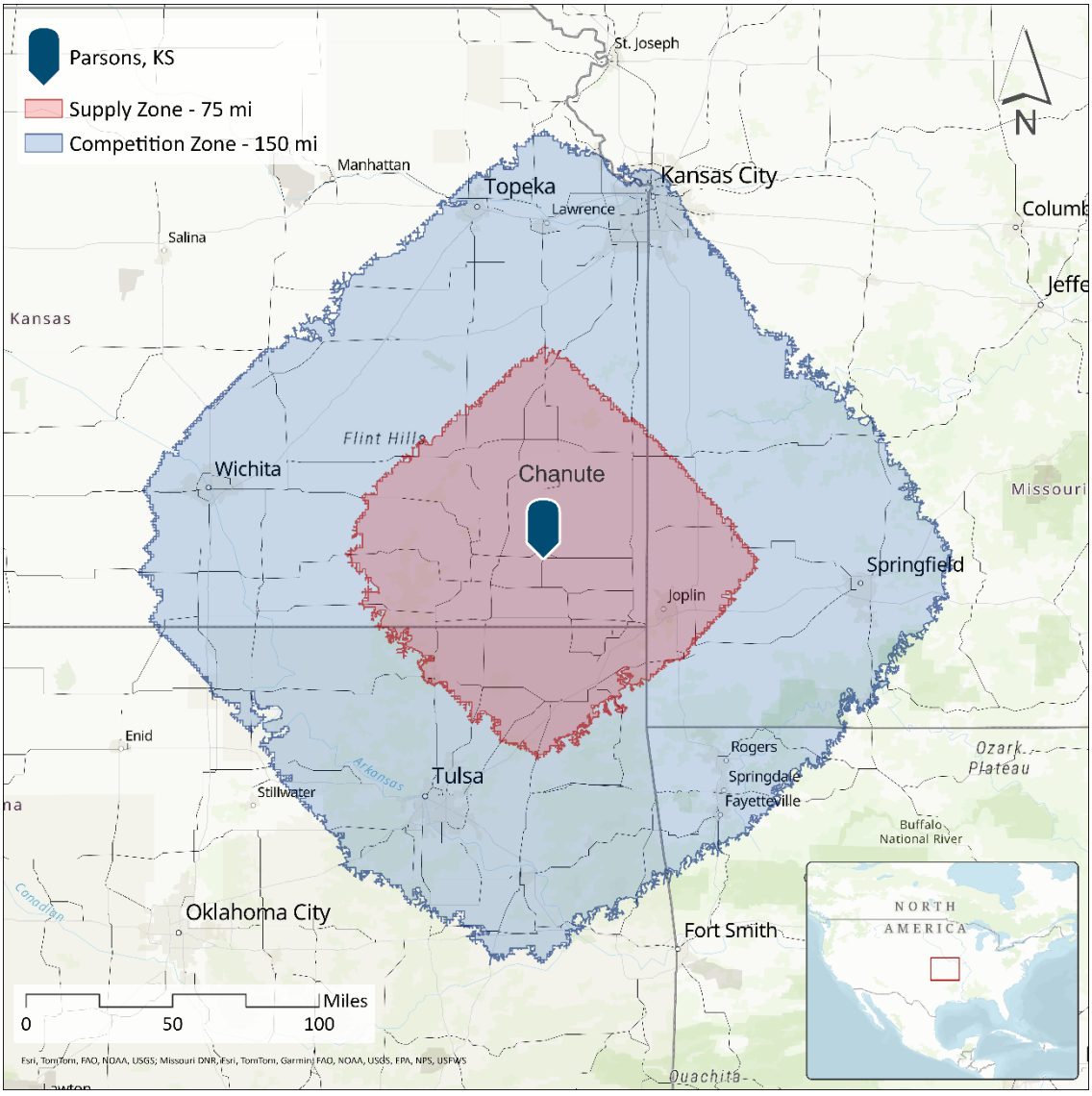
| | | | | | |
|---|---|---|---|---|---|
| 3.6.1 Size, Number, and Location of Suppliers | 6 | 6 | 36 | NN | 36 |
| 3.6.2 Suppliers Subject to Same External Risk Factors | 6 | 6 | 36 | NN | 36 |
| 3.6.3 Land Ownership Structures | 2 | 2 | 4 | NN | 4 |
| ***3.7 Risk Factor: Climate and Natural Risks*** | | | | | |
| 3.7.1 Seasonal Weather Impacts on Feedstock Supply | 6 | 8 | 48 | NN | 48 |
| 3.7.2 Long-Term Weather and Climate Trends | 6 | 6 | 36 | NN | 36 |
| 3.7.3 Forest/Crop Fire | 4 | 6 | 24 | NN | 24 |
| 3.7.4 Risk of Infestation | 8 | 4 | 32 | NN | 32 |
| 3.7.5 Risk of Hail | 6 | 6 | 36 | NN | 36 |
| 3.7.6 Risk of Flood | 6 | 6 | 36 | NN | 36 |
| 3.7.7 Risk of Drought | 6 | 4 | 24 | 25% | 18 |
| 3.7.8 Risk of Hurricanes, Tornadoes, and Strong Winds | 6 | 4 | 24 | NN | 24 |
| 3.7.9 Risk of Low Temperatures | 4 | 8 | 32 | NN | 32 |
| ***3.8 Risk Factor: Political and Social*** | | | | | |
| 3.8.1 Government Subsidies for Feedstock Production or Utilization | 2 | 2 | 4 | NN | 4 |
| 3.8.2 Local, Provincial, & National Laws, Regulations, & Permitting pertaining to Biomass | 4 | 4 | 16 | NN | 16 |
| 3.8.3 Backlash against Biomass Development, Procurement or Usage in the BDO Zone | 6 | 6 | 36 | NN | 36 |
| 3.8.4 Consent of, and Cooperation with, Indigenous Communities and First Nations | 2 | 2 | 4 | NN | 4 |
| 3.8.5 Food Security Concerns | 2 | 2 | 4 | NN | 4 |
| ***3.9 Risk Factor: Sustainability and Environmental Concern*** | | | | | |
| 3.9.1 Feedstock Sustainability | 4 | 4 | 16 | NN | 16 |
| 3.9.2 Risk to Soil Quality | 4 | 6 | 24 | NN | 24 |
| 3.9.3 Risk to Surface and Groundwater | 4 | 4 | 16 | NN | 16 |
| 3.9.4 Water Use | 2 | 2 | 4 | NN | 4 |
| 3.9.5 Pesticide Risk to Human and Ecosystem Health | 2 | 2 | 4 | NN | 4 |
| 3.9.6 Risk to Wildlife and Landscape | NR | NR | NR | NR | NR |
| 3.9.7 Biomass Classified as Genetically Modified Organism (GMO) | NR | NR | NR | NN | NR |
| **Category 4.0: Feedstock Scale-up Risk** | | | | | |
| ***4.1 Risk Factor: Feedstock Scale-Up*** | | | | | |
| 4.1.1 Feedstock Quality at Production Scale | 6 | 10 | 60 | 50% | 30 |
| 4.1.2 Capacity of Supply Chain Components & Equipment to Scale | 8 | 4 | 32 | NN | 32 |
| **Category 5.0: Infrastructure** | | | | | |
| ***5.1 Risk Factor: Physical Infrastructure*** | | | | | |
| 5.1.1 Land Parcel/Industrial District | 4 | 4 | 16 | NN | 16 |
| 5.1.2 Ownership of Land | 4 | 4 | 16 | NN | 16 |
| 5.1.3 Permitting Description | 2 | 2 | 4 | NN | 4 |
| 5.1.4 Environmental Issues | 2 | 2 | 4 | NN | 4 |
| ***5.2 Risk Factor: Utilities*** | | | | | |
| 5.2.1 Natural Gas Availability | 8 | 6 | 48 | NN | 48 |
| 5.2.2 Electric Availability | 4 | 4 | 16 | NN | 16 |
| 5.2.3 Water Availability | 4 | 4 | 16 | NN | 16 |
| 5.2.4 Waste Disposal | 4 | 4 | 16 | NN | 16 |
| 5.2.5 Internet Availability | 4 | 4 | 16 | NN | 16 |
| ***5.3 Risk Factor: Transportation/Logistics*** | | | | | |
| 5.3.1 Roads/Highways Access | 4 | 4 | 16 | NN | 16 |
| 5.3.2 Rail Access to Site | 2 | 2 | 4 | NN | 4 |
| 5.3.3 Airport Access to Site | 4 | 4 | 16 | NN | 16 |
| 5.3.4 Water Freight Access | NR | NR | NR | NR | NR |
| ***5.4 Risk Factor: Social Infrastructure*** | | | | | |
| 5.4.1 Healthcare (Local) | 4 | 4 | 16 | NN | 16 |
| 5.4.2 Education (Schools) | 4 | 4 | 16 | NN | 16 |
| 5.4.3 Local Transportation | 6 | 6 | 36 | NN | 36 |
| 5.4.4 Public Safety (Local) | 6 | 6 | 36 | NN | 36 |
| 5.4.5 Housing/Cost of Living | 4 | 4 | 16 | NN | 16 |
| ***5.5 Risk Factor: Labor*** | | | | | |
| 5.5.1 Workforce | 4 | 4 | 16 | NN | 16 |
| 5.5.2 Labor Costs | 4 | 4 | 16 | NN | 16 |
| | | | | ***Average*** | **23.01** |

# SECTION B: BIOMASS AVAILABILITY AND PRICING

## OVERVIEW

In this section, we evaluate the rated quantity and pricing of corn stover for the Southeast Kansas Supply Zone, with the center point of Parsons, Kansas. We estimate the rated quantity for future biomass projects in the Supply Zone to be the low-risk quantity. This estimation takes into account current supply and competition, supply chain constraints (e.g., operational, accessibility, and market dynamics), and data/model uncertainty. The rated pricing is the expected price that future biomass projects are likely to pay to secure the rated quantity.

**Map B-1. Map of Supply Zone and Competition Zone**



The Southeast Kansas is comprised of 14 counties with 5,402,000 acres of farmland. The average farm size is 548 acres for the 9,851 farms. Farmland is comprised of 44% cropland and 49% pasture (see Figure B-1). The main row crops in this region are soybean, corn, and wheat.

**Figure B-1. Farmland use in the Supply Zone[1]**

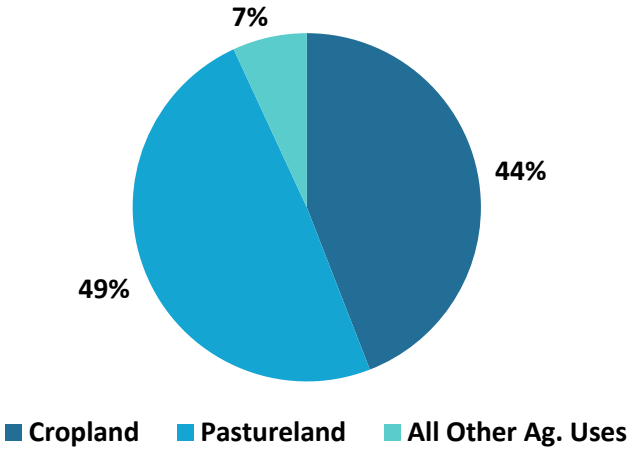
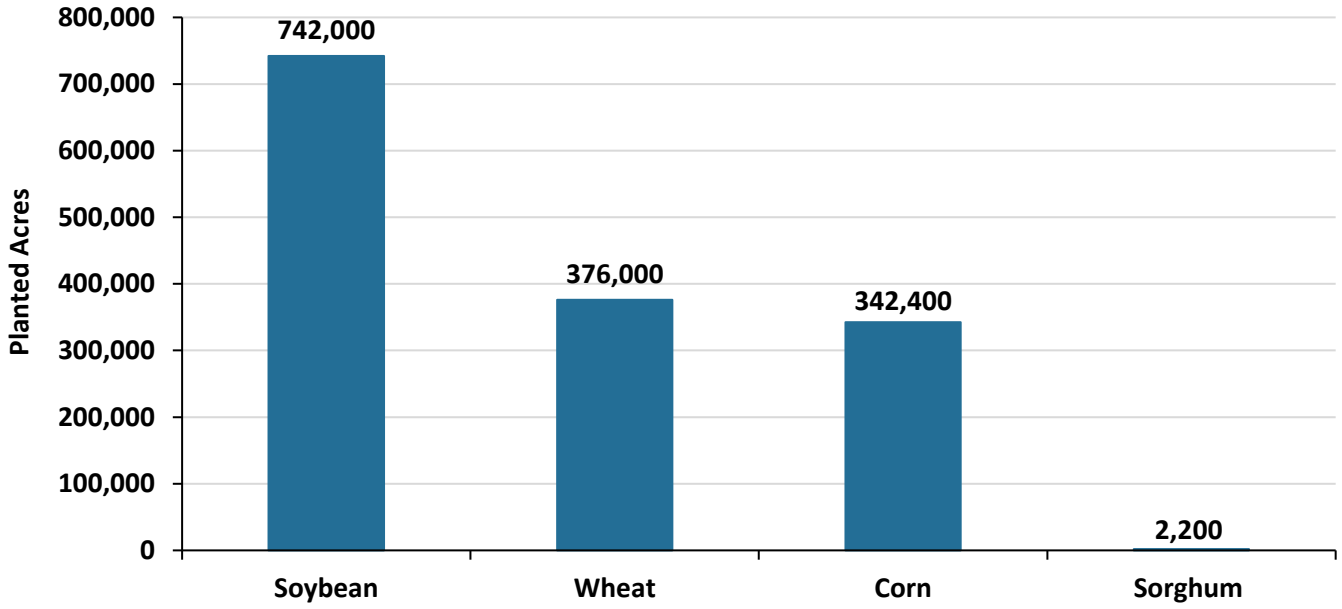


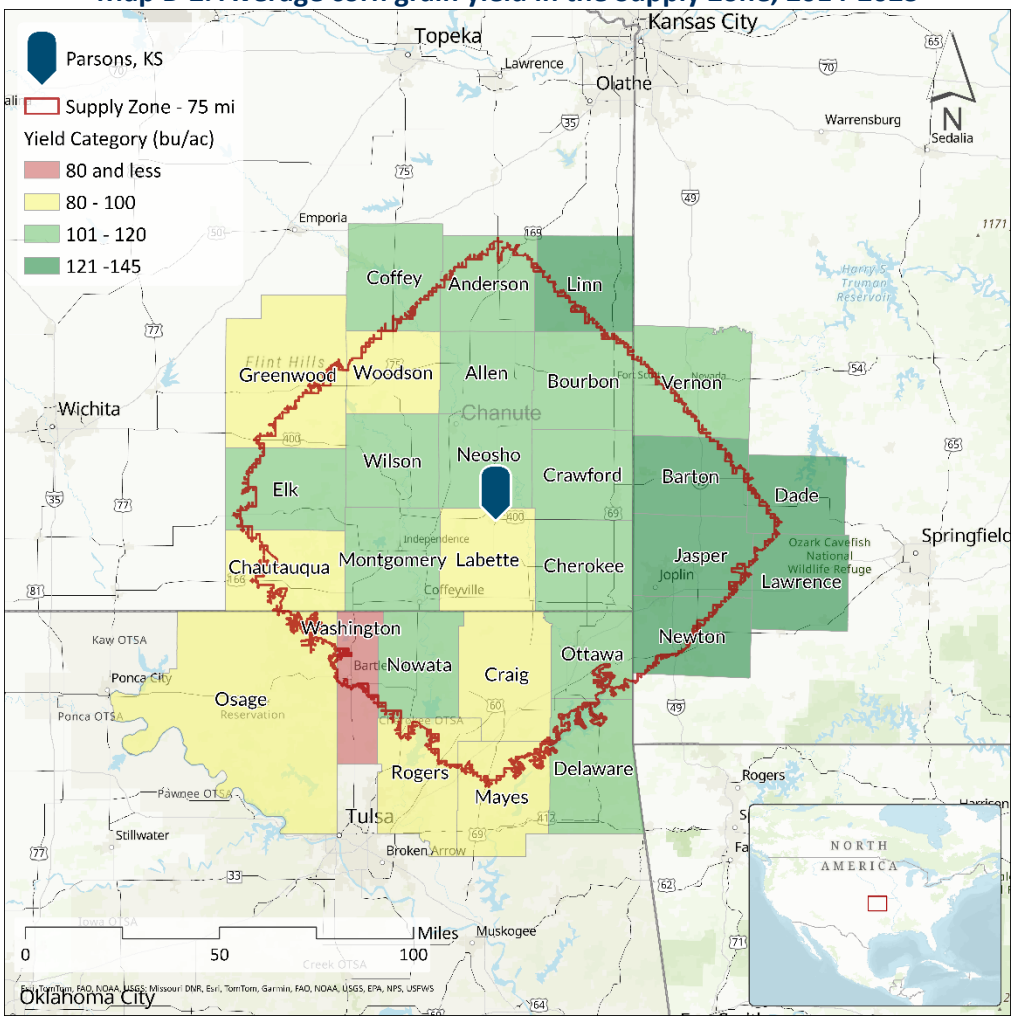

Figure B-2 shows the planted acres in 2022, with soybean being the main crop, followed by wheat and corn. Corn yield in the Supply Zone is in a range of 65-145 bu/acre with an average of 110 bu/acre (see Map B-2), which is 38% lower than the average corn grain yield in the US (177 bu/acre). Hay production is also important to this region, as more than 452,900 acres were harvested in 2018. Farmland in Southeast Kansas is comprised of a large amount of pasture acres, and thus, beef cattle is the main livestock enterprise.

**Figure B-2. Planted areas of primary row crops produced in the Supply Zone in 2022[2]**




[1] Kansas State University- Agricultural Economics, 2023. Kansas Agricultural Land Values and Trends 2023
[2] Ibid

**Map B-2. Average corn grain yield in the Supply Zone, 2014-2023**




## EVALUATED FEEDSTOCK

The evaluated feedstock is corn stover, which is a mix of stalks, leaves, and husks that remain in the field after corn harvest.

To estimate the rated quantity of corn stover, we have developed a five-step methodology that accounts for factors such as competition, logistics, sustainability, farmer participation rate, and operational constraints. This serves as a conservative estimate of biomass availability for future ventures:

(1) **Average annual corn grain production**: This parameter relies on the historical corn planted, harvested, and yield data in the last 10 years (2014-2023) collected from the USDA National Agricultural Statistics Service (USDA NASS).[3]

(2) **Average annual corn stover production**: This parameter is estimated based on the average corn yield and the stover/grain ratio.

[3] USDA/NASS QuickStats Ad-hoc Query Tool

(3) **Current corn stover uses:** This parameter is estimated based on outreach to local crop growers and experts and published documents. This quantity is subtracted from the total corn stover generation to determine the surplus, potentially available for other uses.

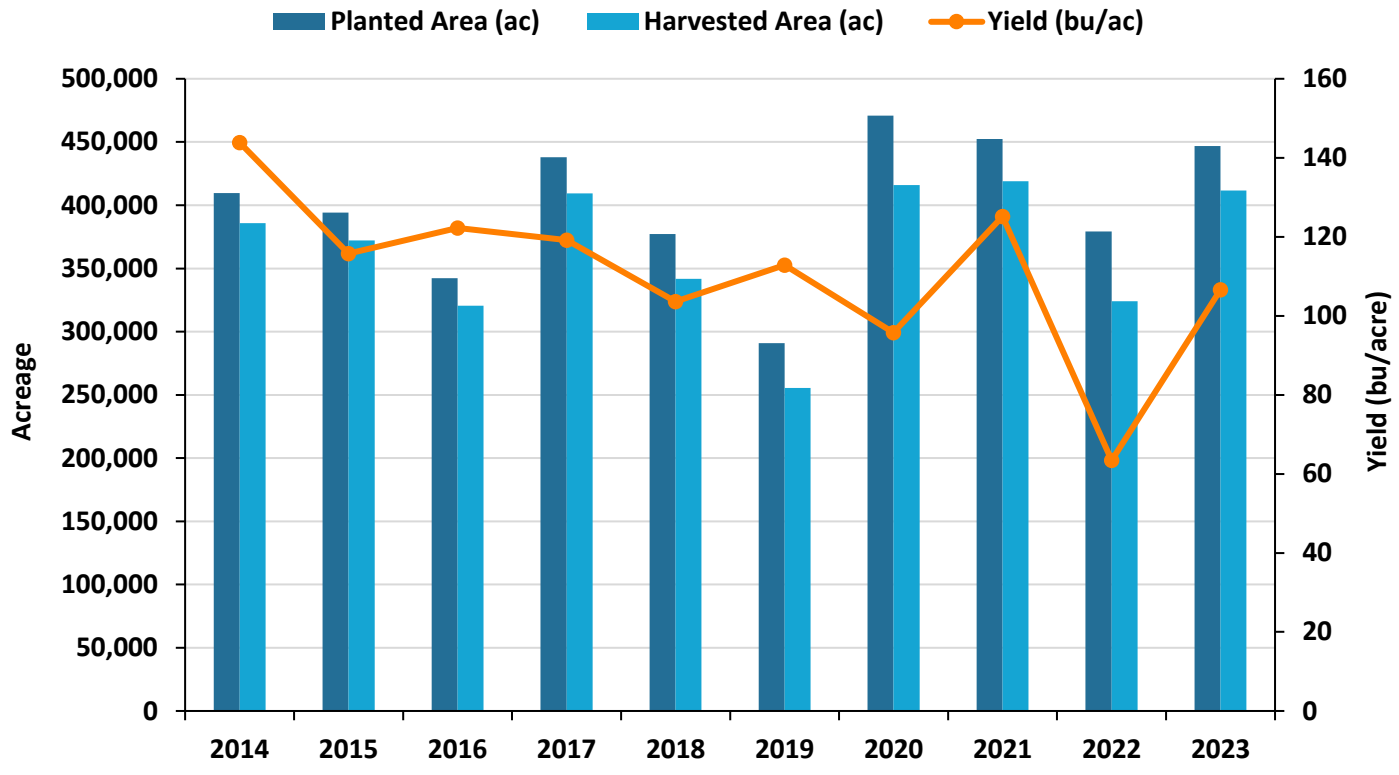
(4) **Collection Efficiency:** Collection Efficiency is the ratio of stover collected to the total above-ground stover. Not all produced crop residue can be technically harvested by the baling machine. Part of that is to avoid the soil pickup by adjusting the baler pickup height. In addition, the operator's experience and the baler configuration impact the collection efficiency.

(5) **Biomass Availability Multiple (BAM):** The BAM serves as a mechanism to account for uncertainties related to the future corn stover availability by discounting the available stover estimated in Step 4. It ensures a low-risk rated quantity, providing a more conservative estimate of available corn stover for future biomass ventures. BAM indicates the degree of redundancy in biomass availability in relation to the rated quantity. The rated quantity is estimated by dividing the amount available to new projects (step 4) by BAM.

## SUPPLY ANALYSIS

We estimate the average corn stover generation in the Supply Zone based on the historical corn harvested area and yield data over the period of 2014-2023. As illustrated in Figure B-3, the corn harvested area has averaged 366,000 acres with an average yield of 110 bu/ac in the last 10 years, resulting in average corn grain production of 40,260,000 bu/yr (1,023,000 tons/yr).[4]

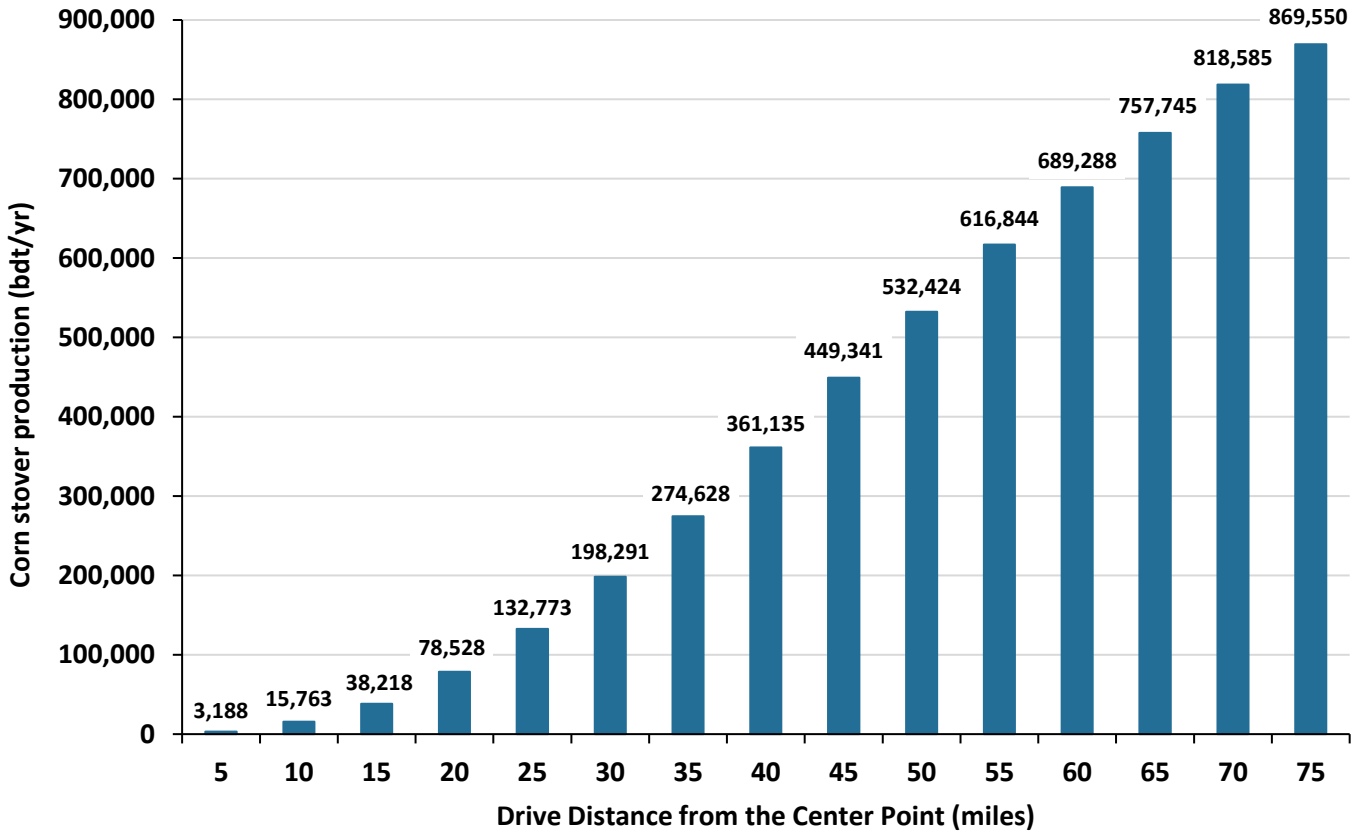
**Figure B-3. Historical corn grain planted and harvested area and yield in the Supply Zone**




[4] Calculated by: avg harvested area (366,000 acres) x 110 (bu/acre) / (39.368 bu/ton) = 1,023,000 tons/year

The average ratio of corn stover to grain is typically 1:1 (one lb. of stover per one lb. of corn grain harvested).[5] Thus, the average annual corn stover generation is estimated to be 1,023,000 tons, equivalent to 869,550 bone-dry tons (bdt), by adjusting for an average moisture content of 15%. Figure B-4 presents the supply curve for corn stover generated in the Supply Zone. Over 60% of the total generated corn stover (532,000 bdt) is available within a driving distance of less than 50 miles. The other 40% (337,550 bdt) is generated in a driving distance range of 50-75 miles. As shown in Map B-2, Missouri's high crop yield areas are within a 50-75 driving distance range.

**Figure B-4. Corn stover supply curve in the Supply Zone**




### *Competition Analysis*

There are two current uses of corn stover:

**Fertilizer/Soil Cover:** When left in the field, stover degrades over time, cycling nutrients back into the soil, adding to the soil's organic matter, maintaining soil moisture, and accommodating beneficial microbes. Corn residue left in the field over winter can also help prevent soil erosion by protecting the soil from wind and rain. Therefore, crop lands require retaining a certain amount of residue to maintain soil quality. On the other hand, excessive residue, which could occur with improved crop yields, would lead to slower soil warming in the planting season, difficulties in operating planting machinery, and increased emissions of greenhouse gases from the decay of residue. The optimum removal of crop residue is site-specific, depending on crop rotation and the soil management practices of individual farmers. For crop growers in

[5] US Department of Energy. 2016 Billion-Ton Report

the Supply Zone, this is the priority use of their corn stover. However, many farmers we interviewed indicated that they are willing to harvest and sell a portion of their corn stover at the right price.

The published literature in North America suggests that 40-60% of crop residue be left behind in the field as ground cover.[6,7] The average corn yield in the Supply Zone is 110 bu/acre, 38% lower than the average corn grain yield in the US (177 bu/acre). In addition, the dryland farming in the Supply Zone encourages leaving a large portion of corn stover in the field. Thus, we assume 60% of corn stover would be retained for soil cover and nutrients, while 40% would be available for other uses.

**Animal feeds for ruminants and livestock bedding:** The region is divided into half row crops and half pasture lands (grassland for cows). Harvesting corn stover is not common as there are enough pasture lands that provide feed for the animals. Corn stover is mainly used in years with seasonal shortages and rising prices of primary animal feed products such as hay and corn silage. Cow-calf farming is a common practice in Southeast Kansas, and when these calves reach maturity, they are shipped to the west side of the state, where most animal rendering facilities are located. The nutritional profile of stover does not meet the dietary requirements of cow-calves and thus, is not a preferred feedstock for such application. In our outreach to the local crop growers, they estimated on average, around 5% of the produced corn stover in the Supply Zone is used annually for animal feed and bedding applications.

**Industrial uses:** There are no large-scale industrial facilities consuming corn stover within the Competition Zone.

Deducting 60% from the total corn stover generation to maintain soil quality and 5% consumed by the livestock, we estimate about 305,000 bdt/yr would be available annually for future biomass projects.

**Collection Efficiency**: The reported collection efficiency in the literature is 30-95%.[8,9] This wide range is due to the type of baling equipment, the quality requirement (e.g., minimal ash introduction in the bales), combine equipment setting (which impacts the produced windrow), the operator's experience, and weather conditions at the harvest time. With proper preparation at harvest time, as a result of the coordination between the biomass project developer, crop growers, and custom harvest groups, the average collection efficiency is expected to reach 75%.[10] Such collection efficiency rate reduces the technical and sustainable corn stover availability to 230,000 bdt/yr.

## RATED QUANTITIES AND PRICING

BAM is the last parameter used to estimate the rated quantity of corn stover. As explained before, BAM accounts for uncertainties related to future corn stover availability, such as new competition from existing users, farmer participation rate, and year-to-year variability due to weather conditions in planting, growing, and harvest seasons. We used an average corn harvested area and yield in the estimation of total corn stover generation, which captures the year-to-year variability. In addition, it is very unlikely that the stover demand by the existing users (livestock producers) will increase in the future due to the availability of hay, corn silage, and wheat straw in the Supply Zone. We considered 5% of the total generated stover to be used for livestock bedding and feed, which is higher than what we found in the outreach.

Among these factors, the farmer participation rate is the major unknown parameter. A review of the literature reveals that several factors, including stover price, supply contract terms, past experience with stover harvesting, removal rate (nutrient loss and soil erosion risk), distance from the biomass processing facility, harvest timeliness, and crop rotation,

[6] Massey Ferguson- Utilizing corn stover as an alternative forage
[7] Government of Saskatchewan- Harvesting Surplus Cereal Straw
[8] University of Kentucky- Corn stover availability and collection efficiency using typical hay equipment
[9] US Department of Energy. 2023 Billion-Ton Report
[10] University of Kentucky- Corn stover availability and collection efficiency using typical hay equipment

impact farmers' decisions on whether to supply their corn stover to a new biomass project.[11,12,13,14,15] Among these factors, sustainable removal rate and stover price appeared to have the highest impact on farmers' decisions. Our rated quantity and pricing calculation account for the soil protection (40% removal rate) and fertilizer replacement prices paid to the farmers (see Table B-2).

Thus, we assume a low BAM of 1.5, meaning that 67% of available quantity after collection efficiency is expected to be available at low risk for future biomass projects (154,000 bdt/yr). That is equivalent to 18% of the total produced corn stover in the Supply Zone (869,550 bdt/yr).

Table B-1 summarizes the calculations for the rated quantity of corn stover in the Supply Zone.

**Table B-1. Corn stover rated quantity calculation**

| Parameter | Value |
|---|---|
| **Average annual harvested area (ac)** | 366,000 |
| **Average annual grain yield (bu/ac)** | 110 |
| **Average annual grain production (green tons)** | 1,023,000 |
| **Stover/Grain Ratio** | 1:1 |
| **Average corn stover moisture content (wet basis)** | 15% |
| **Average annual corn stover production (bdt)** | **869,550** |
| **Competing uses** | 65% |
| **Average annual corn stover available after competing uses (bdt)** | **305,000** |
| **Collection Efficiency** | 75% |
| **Available annual quantity after collection efficiency (bdt)** | **230,000** |
| **BAM** | 1.5 |
| **Annual Rated Quantity (bdt)** | **154,000** |
| **Rated Quantity/Annual corn stover production** | **18%** |

**Note that corn stover quantities are rounded.**

The delivered price of corn stover to a biomass processing facility is comprised of 8 components:

**(1) Fertilizer replacement cost**: With the input from the Southeast Research and Extension Center, we estimated the fertilizer replacement cost for corn stover. The two main chemicals that need to be replaced are Phosphorus (P) and potassium (K). As shown in Table B-2, the estimated fertilizer replacement cost for corn stover is $12/bdt.

**Table B-2. Fertilizer replacement cost calculation for corn stover**

| Nutrient Type | lb/ton of corn stover[16] | Price ($/lb)[17] | $/ton of corn stover | $/bdt of corn stover |
|---|---|---|---|---|
| **Phosphorus (P)** | 4.8 | 0.53 | 2.55 | 3.00 |
| **Potassium (K)** | 18 | 0.43 | 7.75 | 9.12 |
| | | **Total fertilizer replacement cost** | **10.30** | **12.12** |

[11] Corn stover as a biofuel feedstock in Iowa's bio-economy: An Iowa farmer survey
[12] Corn stover for bioenergy production: Cost estimates and farmer supply response
[13] Is Corn Stover Harvest Predictable Using Farm Operation, Technology, and Management Variables?
[14] Survey indicates farmers can supply corn stover biomass, but questions remain
[15] The "Stover Availability versus Supply" Puzzle and Contracting Options for Cellulosic Biomass
[16] Iowa State University Extension and Outreach Program: Remove the stover, Replace the nutrients
[17] USDA, Agricultural Marketing Services

The Russia-Ukraine war, the COVID-19 pandemic, and the global supply chain disruptions resulted in increased fertilizer prices from mid-2020 to mid-2022. However, similar to other commodities, these prices have been experiencing a downward trend in the last two years, approaching the prices in pre-COVID pandemic times. Our estimated fertilizer replacement cost in Table B-2 is based on the fertilizer prices in August 2024. These prices are almost half of the 2022-2023 fertilizer prices. [18] To capture the volatility in the price of fertilizers, we assume a price range of $12-$24/bdt for corn stover removal paid to the crop growers.

**(2) Chopping cost:** The standing stalks, leaves, and husks need to be chopped and windrowed prior to baling. This cost is estimated to be $3.50-$4.50/bale.

**(3) Baling cost**: Baling cost varies depending on the type and size of bale (square vs. round; large vs. small bales) and the baling machine used. 3×4×8ft square bales and 4×6ft and 5×6ft round bales are the most common types of bale produced in the Supply Zone. Based on the outreach with local farmers and custom harvest companies, the bale weight is in the range of 1100-1300 lb with an average weight of 1100 lb or 0.47 bdt. This cost is estimated to be $15-$20/bale.

**(4) Bale collection and stacking cost**: Pull-type and self-propelled bale collectors are used to collect bales from the field and stack them on the roadside of the crop field. This cost is estimated to be $15-$20/bale.

**(5) Farmer/custom harvest group profit**: 15-20% profit markup is usually added to the operating costs by equipment owners (either farmers or custom harvest groups).

**(6) Bale handling cost**: It takes about one hour to load and unload bales from a flatbed trailer truck with a loader/telehandler. This operation costs $1.50-$1.65/bale.

**(7) Transportation cost**: 53ft flatbed trailer trucks are common in the Supply Zone to transport both square and round bales. The transportation rate was reported to be $6/loaded mile within a 100-mile radius. Assuming an average payload of 19 bdt for square bales and 15 bdt for round bales (see Table B-3 and Figure B-5) and an average transportation distance of 50 miles, the estimated transportation cost is $16-$20/bdt ($7.50-$9.50/bale). This cost does not include the cost of loading and unloading bales.

**Table B-3. 53-ft flat-bed trailers truck configuration[19]**

| Truck Type | Length (ft) | GVW (ton) | Maximum payload (ton) | Number of bales per truckload | Expected payload (bdt) |
|---|---|---|---|---|---|
| **53ft flatbed trailer** | 53 | 40 | 25.4 | 3×4×8ft square bales: 39-42<br>4×6 and 5×6ft round Bales: 30-34 | 18.5-20.00<br>14.00-16.00 |

[18] YCharts, 2024. Work Bank's Fertilizers Price Index
[19] US Department of Energy (USDA), 2009. Commodity-scale production of an infrastructure-compatible bulk solid from herbaceous lignocellulosic biomass

**Figure B-5. Square and round Bale stack configuration on a 53-ft flatbed trailer truck**




**(8) Bale storage cost**: Large quantities of bales need to be stored after the harvest season to meet the annual demand of the biomass processing plant. The storage cost depends on the storage method, such as open storage vs. tarp vs. building. Due to the dry harvest season in the Supply Zone (low moisture content of corn stover at the harvest season, 13-15%), low temperature in late fall and winter, and low value of corn stover compared to animal feed such as hay, the open storage is the most common storage method in the region, resulting in a low storage cost of $3-$5/bdt.[20]

Table B-4 summarizes the corn stover logistics costs. We estimate that the rated price for corn stover would be in the range of $41-$59/bale or $86-$124/bdt. Our estimated farm-gate price range is comparable with the data collected from our farm outreach, as some of the local farmers indicated that they have been selling their corn stover bales at $30-$50/bale, stacked at their farm-side (farm-gate price). In addition, the Hay Price Reports prepared by USDA and published by Kansan Forage and Grassland Council[21] show a price range of $80-$150/bdt.

It is noted that the reported prices by USDA are spot prices and corn stover is usually baled and sold when there is a shortage of hay and other animal feed products. Thus, we expect that future biomass projects should be able to procure corn stover bales at our estimated rated price as they need corn stover year-round and for many years, allowing them to negotiate the prices with local crop growers and logistics companies.

**Table B-4. Corn stover logistics costs and delivery price range**

| Price Component [22,23, 24,25,26] | $/bale | $/bdt |
|---|---|---|
| **Fertilizer replacement** | 5.50-11.50 | 12.00-24.00 |
| **Chopping and Windrowing** | 3.50-4.50 | 7.00-9.50 |
| **Baling** | 15.00-20.00 | 32.00-43.00 |
| **Bale collection and stacking** | 3.00-4.50 | 6.00-9.00 |
| **Farmer/custom harvest group profit** | 3.50-4.50 | 7.00-9.50 |
| **Farm-gate Price** | **30.50-45.00** | **64.00-95.00** |
| **Bale transportation** | 7.50-9.50 | 16.00-20.00 |
| **Bale Loading and Unloading** | 1.50-1.65 | 3.00-3.50 |
| **Bale storage** | 1.40-2.50 | 3.00-5.00 |
| **Delivered Price*** | **41.00-59.00** | **86.00-124.00** |

*** Delivered prices are rounded.**

[20] Evaluating the Economic Viability of Agricultural Pellets to Supplement the Current Global Wood Pellets Supply for Bioenergy Production (2021)
[21] Kansas Direct Hay Report- August 2024 & Kansas Direct Hay Report- June 2024
[22] Iowa State University Extension and Outreach. Estimating a Value for Corn stover
[23] A novel risk analysis methodology to evaluate the economic performance of a biorefinery and to quantify the economic incentives for participating biomass producers (2018)
[24] US Department of Energy, 2016 Billion Ton Study
[25] Farmer Outreach
[26] Evaluating the Economic Viability of Agricultural Pellets to Supplement the Current Global Wood Pellets Supply for Bioenergy Production (2021)

## OPERATIONAL CONSIDERATIONS

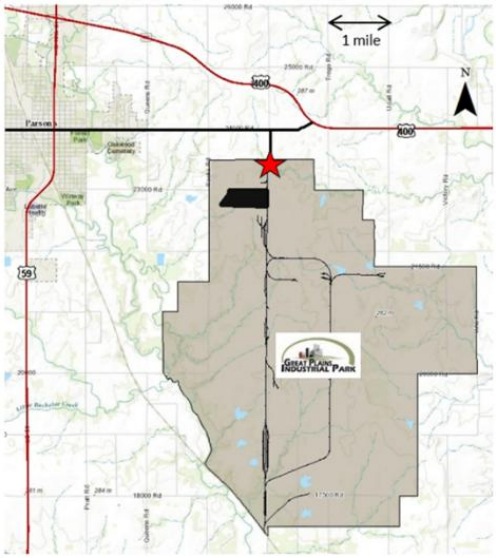
To harvest, collect, and store the rated quantity during the harvest season (154,000 bdt/yr), about 23 balers, 16 bale collectors, 39 tractors, and 39 operators are needed.[27] Due to the limited historical market for corn stover, the current supply chain capacity is likely not sufficient to handle the rated quantity in the short term. Some crop growers have experience with harvesting and collection of hay and corn stover. In addition, a few small custom harvest groups indicated that with the establishment of a solid demand for corn stover, they have the capability to scale up their harvesting and collection operations.

To transport the rated quantity year-round, 10 flatbed trucks are needed, each delivers three truckloads of corn stover per day (30 truckloads delivered to the biomass processing site per day).[28] Such volume of daily truckloads is manageable without burdening the existing roads in the local communities. The Supply Zone is an active agricultural area with commercial quantities of corn, soybean and wheat being transported to regional and national markets.

Overall, we expect that the existing corn stover supply chain can be scaled up in a close collaboration between the future biomass facilities, crop growers and the existing custom harvest groups after 3-5 years of commissioning these facilities. The rated quantity is not as large as the annual demand by previous corn stover projects in the Midwest that needed 300,000-350,000 bdt/yr (>3 times more than the rated quantity).

[27] Assuming 40 working days in the harvest season, 10 working hours/day, 35 bales/hr and a crew size of 3 balers, 2 bale collectors and 5 tractors
[28] Assuming 330 days/year, average 4 hr cycle time including loading/unloading, and a payload of 15-19 bdt/truckload and 10 hours/working day

# SECTION C: INFRASTRUCTURE




## PROPERTY OVERVIEW

| | |
|---|---|
| **Address:** | 23050 Scott Rd. |
| **City:** | Parsons, Kansas |
| **County:** | Labette |
| **Acres:** | 6,800 Total 1500+ available for development |
| **Pricing Note:** | Open |
| **Lease Available:** | Yes |
| **Topography:** | Gently rolling hills |
| **Zoning:** | Industrial-Light, Industrial - heavy, Commercial |

## SITE CONTACT

Brad Reams
Great Plains Development Authority
21101 Scott Road
Parsons, KS 67357
P: 620-421-1228
breams@parsonsks.com

## ADDITIONAL NON-RATED SITES

*Infrastructure Sites Contact*
Bob Buckingham
BDO Zone Infrastructure
bob@ecostrat.com

## PROPERTY PROFILE

**Great Plains Industrial Park** is an approved Foreign Trade Zone with 33 buildings and 625,000 sq ft of storage and warehousing. It offers single-owner and large-acre development, with more than 6,800 acres of contiguous land, and most of the infrastructure already in place. The industrial park is 90 miles from Tulsa's Port of Catoosa and 130 miles from the intermodal facility at Kansas City's Logistics Park.

### *Transportation / Logistics*

**Nearest Highway:** U.S. Highway 400 (1 mile)
**Nearest Interstate:** I-44 (50 Miles)
**Nearest Airport:** Parsons Tri-City (20 miles)
**Nearest Commercial Airport:** Joplin Regional Airport (50 miles)
**Rail Served**: Yes, Union Pacific
**Rail Accessible**: Yes
**Rail Infrastructure in Place**: Yes

### *Electric Service*

**Supplier:** Evergy Kansas Central Inc.
**Ownership:** Investor Owned
**Phone:** 888-471-5275
**Website:** www.evergy.com
**All Utilities Extend to Site:** Yes
**Nearest Substation:** 2 miles
**Capability:** Currently 3-Phase overhead, 12.5kv distribution lines, 69kv med voltage Capacity. Available capacity 7 MWs, expanding to 25MWs in 2026.

### *Natural Gas*

**Supplier**: Kansas Gas Services
**Ownership:** Investor Owned
**Phone:** 800-794-4780
**Website:** www.kansasgasservice.com
**Size of Proposed Main:** 12"
**Pressure:** 50 psi
**Capability**: Currently only propane is available. Gas service can be provided within 18 months.

### *Water*

**Supplier:** Great Plains Development Authority
**Ownership:** Municipal
**Phone:** 620-421-1228
**Website:** www.greatplainsindustrialpark.com
**Size of Main:** 12"
**Peak Capacity**: 1.000.000 gals/day
**Capability**: Three 250,000-gallon water tower storage capacity spread throughout the industrial park; senior water rights on the Neosho River

### *Wastewater*

**Supplier:** Great Plains Development Authority
**Ownership:** Municipal
**Phone:** 620-421-1228
**Website:** www.greatplainsindustrialpark.com
**Size of Main:** 12"
**Capability**: Trickling filter system with a capacity to treat 1 million gallons of wastewater per day

### *Telecommunications*

**Supplier:** AT&T
**Ownership:** Investor Owned
**Website**:www.att.com/internet/fiber/
**Platforms:** Fiber, wireless
**Capability:** Primary wireless and fiber optics available.

# SECTION D: RISK INDICATOR SCORING METRICS

## CATEGORY 1.0: SUPPLIER RISK

### *1.1 Risk Factor: Credit-Worthiness/Future Solvency of Suppliers*

#### *1.1.1 Longevity & History of Supplier Performance*

**Rationale:** Number of years in business is a positive indicator of future solvency. Historical performance is an indicator of future performance.

**Risk Information:** There are about 10,000 farmers in the Supply Zone with 5.5 million acres of farmland. Approximately 45% of this farmland is cropland, being used mainly for soybean, corn, and wheat production. Corn has been produced for more than a century in the Supply Zone, and it remains a prime part of crop rotation in the region.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed very low, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed very low, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100. | **4** |

### *1.2 Risk Factor: Conflicts of Interest/Vested Interest with Competing Market(s)*

#### *1.2.1 Suppliers' Dependence on, or Preference for, Competing Markets*

**Rationale:** Suppliers may have a vested interest or preference in supplying specific competitors with biomass feedstock. Preferences may be due to historical, long-term, or personal relationships, less stringent feedstock quality requirements, more flexible operating hours by competing markets, or suppliers' dependence on competing markets to accept or purchase other products/by-products. During periods of feedstock shortage, such suppliers may be more likely to allocate the scarce supply to competitors, resulting in supply disruptions for the Issuer.

**Risk Information:** There are no established large-scale corn stover consumers in the Supply Zone. Corn stover is periodically used by cattle producers when there is a shortage of feed products such as hay and corn silage, and it is mainly used as ground cover and fertilizers. The rated quantity estimate accounts for the current use of stover as animal feed and fertilizer/ground cover.

Overall, crop growers' primary preference is ground cover and fertilizers due to the low corn yield, but as long as the future biomass projects fairly compensate them for the loss of nutrients as a result of removing stover from their fields, our outreach confirmed that they will consider selling a portion of their corn stover. This risk is deemed to be medium.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |

| **Gross Risk Indicator (GRI)** | **Score** |
|---|---|
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **36** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

### *1.3 Risk Factor: Supplier Control Over Production and Transportation*

#### *1.3.1 Ownership of Land/Means of Production*

**Rationale:** Suppliers that own land or a production facility where feedstock is produced tend to have better control of supply chains and present lower degrees of supply risk.

**Risk Information:** Crop lands are either owned by crop growers/farmers (individuals or family businesses) or by private owners (individuals or investment companies) who rent out croplands to dozens of farmers. Regardless of the land ownership, due to the value of the land for cash crop production such as corn, soybean, and wheat, the land ownership is deemed to be a low risk in the Supply Zone.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

#### *1.3.2 Ownership of Equipment*

**Rationale:** In most cases, suppliers that own or lease equipment for harvest, collection, and processing feedstock are at lower risk than those that are not. For example, third-party harvesting equipment may not be available when required. Short harvest windows may be missed if a farmer and contractor cannot schedule convenient harvest times, and quantity shortages can result. However, in some circumstances, reliance on third-party equipment to harvest or produce feedstock can decrease supply chain risk. For example, when harvesting agricultural residue such as corn stover, using a third-party company with standard equipment specializing in harvesting, collection, and transportation may decrease quality variations (e.g., ash content) of the final feedstock.

| |
|---|
| **Risk Information:** The existing field equipment in the Supply Zone is either owned by farmers, particularly cattle producers, or owned by custom harvest groups. Regardless of ownership type, this equipment can be made available for corn stover collection if timing allows. Many of these pieces of equipment are currently underutilized. Farmers only use their machinery to harvest their own hay or corn stover or their neighbors'. A baler can harvest stover from 3500 acres of land during a harvest season. While in our outreach, farmers who own the field equipment, such as balers, indicated only 1000-1500 acres. Overall, this risk is deemed to be low to medium, as the ownership of the equipment may impact the timeliness of the harvesting operation. |
| **Raw Risk Likelihood (RRL)** **Score**<br>The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. **6** |
| **Raw Risk Impact (RRI)** **Score**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. **4** |
| **Gross Risk Indicator (GRI)** **Score**<br>The Gross Risk Indicator (RRL X RRI) is 24 out of 100. **24** |
| **Mitigation/Notching** **Notch**<br>*RRL Mitigation (Notch)* **NN**<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** **Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100. **24** |

### *1.3.3 Ownership of Transportation/Logistics*

| |
|---|
| **Rationale:** In most cases, suppliers that own or lease transportation equipment necessary to transport biomass from forests or fields are at lower risk than those that do not. However, in some circumstances, reliance on third parties to transport biomass is common practice and does not contribute to risk. |
| **Risk Information:** Our outreach to local farmers indicated that a small portion of farmers have trucks to deliver corn stover bales to the future biomass facilities in the Supply Zone. Most trucks are owned by local transportation and logistics companies that provide bale transportation services not only to the farmers in the Supply Zone but also across the state. Regardless of who owns the transportation equipment, the ownership structure does not impose a risk on future biomass projects as long as proper communications take place between the biomass project proponents, farmers, and logistics companies. |
| **Raw Risk Likelihood (RRL)** **Score**<br>The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. **6** |
| **Raw Risk Impact (RRI)** **Score**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. **4** |
| **Gross Risk Indicator (GRI)** **Score**<br>The Gross Risk Indicator (RRL X RRI) is 24 out of 100. **24** |
| **Mitigation/Notching** **Notch**<br>*RRL Mitigation (Notch)* **NN**<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment. |

| |
|---|
| The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100. **24** |

### *1.3.4 Feedstock as a Secondary Transformation*

**Rationale:** Secondary transformation is dependent upon the production of primary products. Forest residues, corn stover, bark, and sawmill chips (unless from a dedicated chip mill) are all secondary transformations of a primary product.

Risks are higher if the feedstock is a secondary transformation of a primary, more valuable product. In the absence of markets for the primary product, it may not be economical for suppliers to produce biomass on their own. For example, a supplier may produce dimensional lumber as its primary product and wood chips as a by-product, therefore relying on the health of the housing market for production levels. If the demand for dimensional lumber drops, so can the availability of sawmill residues.

In the case of agricultural feedstocks, such as corn stover, the feedstock is a by-product of a primary crop. Since the primary crop is significantly more lucrative than the residue, it will be a priority for the producer. If the production of the primary crop requires resources to be taken away from the production of the secondary crop (e.g., shorter harvesting windows due to weather), the secondary feedstock supply will suffer. In times of stretched resources, suppliers may also perceive the harvest and collection of the feedstock as a nuisance, potentially decreasing production levels.

Understanding the economic drivers for suppliers' primary products can help gauge risk levels for secondary transformation biomass products.

**Risk Information:** Corn stover is the by-product of corn grain production. Whether there is a market for corn stover or not, large quantities of corn have been planted and harvested in the Supply Zone. Corn is one of the primary row crops in the Supply Zone.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)** | **Score** |
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 24 out of 100. | **24** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment. | **NN** |
| *RRI Mitigation (Notch)*<br>No adjustment. | |
| The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100. | **24** |

### *1.4 Risk Factor: Supplier Experience*

#### *1.4.1 Fundamental Feedstock Production Experience*

**Rationale:** Risk is higher when suppliers have limited experience with planting, growing, harvesting, processing, and/or collecting biomass. Limited experience may be common for stover or forest residue supply chains where farmers or forestry producers may have no previous experience.

**Risk Information:** Most crop growers use corn stover as a ground cover. The crop growers who have livestock have experience with corn stover harvesting, collection, and storage. Their experience with baling hay makes them familiar with harvesting, collection, and storage of bales. However, in comparison with hay, corn stover has a short harvest window.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed high, therefore the RRL is 8 out of 10. | **8** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed high, therefore the RRI is 8 out of 10. | **8** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 64 out of 100. | **64** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>Due to the existence of hay and cattle production in the Supply Zone, there are local custom harvest groups who have established knowledge of baling, bale collection, and bale transportation. However, their experience is mainly for hay rather than corn stover. Thus, the impact of the risk is notched down by 50%.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is 50%. | **50%** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 32 out of 100. | **32** |

#### *1.4.2 Production Scale Experience*

**Rationale:** Scale-up entails risk. Risk is higher when suppliers have limited experience producing the required quantity of feedstock.

**Risk Information:** As mentioned in the previous risk indicator, most crop growers have limited knowledge of corn stover harvesting, collection, storage, and transportation. In addition, the existing equipment has been used for harvesting hay and alfalfa, which is technically easier to bale and store than corn stover. Corn stover is a challenging material to harvest. Small-stem biomass feedstocks, such as hay and wheat straw, tend to form tighter, more uniform bales than large-stem feedstocks, such as corn stover. Due to their size and packing ability, the small-stem feedstocks also maintain their natural integrity during the baling process, which decreases the potential of small, broken pieces falling from the bales during handling or blowing away while in storage. In addition, there have not been any large-scale corn stover users in the region in the past.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed very high, therefore the RRL is 10 out of 10. | **10** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed high, therefore the RRI is 8 out of 10. | **8** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 80 out of 100. | **80** |
| **Mitigation/Notching** | **Notch** |

| | |
|---|---|
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>The engagement of custom harvest groups will likely mitigate the risk associated with the lack of farmers' experience in large-scale corn stover harvesting and collection operations. This risk impact is notched down by 50%.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is 50%. | **50%** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 40 out of 100. | **Score**<br>**40** |

### *1.5 Risk Factor: Supplier Harvesting/Collection/Processing Capacity*

#### *1.5.1 Supplier's Equipment Efficiency*

**Rationale:** Equipment efficiency significantly influences the supplier's feedstock production capacity. Understanding the supplier's equipment capability enables understanding of their ability to produce feedstock of suitable quality.

**Risk Information:** The historical use of corn stover has been for small applications and local markets, including animal bedding and feed. Due to the small capital investment required to purchase round balers, the existing harvesting, collection, and transportation equipment have been developed mainly for round bales. Thus, the existing harvesting equipment will likely need to be upgraded to meet the biomass quantity, quality, and price that large commercial biomass projects request. Depending on the size of the biomass project, this risk could be medium to high.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **Score**<br>**6** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed high, therefore the RRI is 8 out of 10. | **Score**<br>**8** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 48 out of 100. | **Score**<br>**48** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>The impact of this risk can be mitigated by hiring experienced custom harvest groups who have a fleet of harvest and collection equipment and skilled operators. The risk impact can be notched by 50% using this risk mitigation measure.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is 50%. | **Notch**<br>**50%** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100. | **Score**<br>**24** |

### *1.6 Risk Factor: Supplier Motivation*

#### *1.6.1 Feedstock Production Priority*

**Rationale:** When biomass feedstock is a secondary or non-core line of business, a by-product, or a residual from a more valuable product, suppliers may not put in sufficient effort for consistent production. The risk of breach increases when feedstock production and/or delivery compromise a supplier's ability to make a primary product.

When biomass feedstock is a by-product of another main higher margin or main product such as corn stover (e.g., corn) or forest residues (e.g., pulpwood), supply may not be a top priority for a supplier.

**Risk Information:** Whether there are markets for corn stover or not, it is produced as the byproduct of corn grain production. However, its harvesting and collection mainly depend on the price the future biomass projects are willing to pay for corn stover and the timeliness of harvesting operations. Thus, this risk is medium to high.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed high, therefore the RRI is 8 out of 10. | **8** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 48 out of 100. | **48** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>The timeliness of harvesting operations can be addressed through close communications with farmers. The use of an experienced custom harvest group can also help mitigate any possible delays in field operations. In addition, 3-5 year supply contracts with timely payment to farmers and compensation for corn stover removal can increase the participation of farmers in selling their stover. The risk impact is thus notched by 50%.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is 50%. | **50%** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100. | **24** |

## CATEGORY 2.0: COMPETITOR RISK

### *2.1 Risk Factor: Influence on Feedstock Supply of Existing Markets*

#### *2.1.1 Competitors' Locations and Overall Geographical Influence*

**Rationale:** Competitors' locations relative to siting locations within a BDO Zone can affect the viability of procuring feedstock and the cost of that feedstock. Accurate and detailed competitor mapping provides an understanding of a competitor's geographical influence on new plants within a BDO Zone, including competitive advantages such as short hauling.

**Risk Information:** There has not been any industrial use of corn stover in the Supply Zone at scale. Most crop growers use corn stover as soil cover for its nutrient value and for its soil erosion mitigation and moisture retention benefits. In addition, cattle producers have used corn stover as a feed source when there was a temporary shortage of hay and other feed products. We already deducted such uses from the rated quantity. Thus, we believe the risk of their geographical influence is low for future biomass projects.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)* | **NN** |

| |
|---|
| No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** — **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. — **16** |

### *2.1.2 Current and Historical Consumption of Feedstock Quantity*

**Rationale:** Clear understanding of feedstock consumption by key competitors for each rated feedstock type in the BDO Zone is essential to quantifying competitor risk.

Understanding current consumption and historical trends of feedstock utilization can provide valuable information about feedstock price elasticity during shortages and insight into events that may impact future supply conditions. It can enable more accurate estimates of the sensitivity of feedstock availability to potential future consumption levels or the impact of external events (e.g., weather events, structural economic changes, seasonality, or policy change).

**Risk Information:** The historical and current consumption of corn stover is limited to soil cover and fertilizer uses. Cattle producers consume less than 5% of the total corn stover generation in the Supply Zone with no indication of increasing demand for corn stover from the livestock industry.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)** | **Score** |
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

### *2.1.3 Competitor Pricing and Price Sensitivity*

**Rationale:** Understanding how much competitors pay (or receive) for different feedstock types is essential in determining the Issuer's competitiveness and accurately assessing the delivered cost range in the BDO Zone rating.

Current and historical prices paid/received by competitors provide insight into their procurement behaviors and exert pressure on suppliers in the BDO Zone, such as the ability/willingness to pay premiums for feedstock during times of feedstock shortage or reduce prices (or cut-off deliveries) during gluts. Competitors that have the ability to offer higher prices for feedstock during feedstock shortages can pose a significant risk to the Issuer.

Knowledge of competitor pricing and price sensitivity is also an essential prerequisite to formulating a feedstock cost curve, which can enable predictions of feedstock redundancy, i.e., how much feedstock could become available at different pricing levels (see Category 3–Supply Chain Risk 3.1.3).

**Risk Information:** Cattle producers rarely use corn stover for livestock feed, which is not a premium feed product. They only use corn stover when there is a shortage of feed products such as hay and wheat straw. We confirmed through outreach to livestock farmers that corn stover is a low-value livestock feed option, and they are not willing to pay a premium price for it.

On the other hand, crop growers in the Supply Zone see a high value in corn stover as a soil cover, and they expect fair compensation from a biomass project for its removal. There is no consensus among farmers and agronomists on the actual value of corn stover in $/bdt. We estimated the nutrient value of corn stover based on the literature, but some farmers assign more value to corn stover than its nutrient contents (e.g., moisture retention, soil organic matters, and soil erosion control) due to dryland farming and low corn yield in the region. This could be a high risk for a biomass project to reach an affordable price for securing corn stover in the Supply Zone.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed very high, therefore the RRI is 10 out of 10. | **10** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 60 out of 100. | **60** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>The biomass project should work with local agronomists, agricultural economists, and university and government labs that have a good reputation among farm communities and develop a methodology to estimate a fair compensation paid to farmers to remove corn stover. This mitigation measure can reduce the price sensitivity risk. Thus, the impact of this risk is notched by 50%.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is 50%. | **Notch**<br>**50%** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 30 out of 100 | **30** |

### *2.1.4 Impacts of Future Demand on Feedstock Availability and Price by Current Competitors*

**Rationale:** Feedstock utilization in a BDO Zone can change over time. Expansion of feedstock demand by current competitors can put additional pressure on feedstock and lead to higher prices, feedstock disruptions, shortages, supplier breaches, or other types of supply chain disruption.

If current markets for feedstock have been publicly signaling the potential for increased demand for feedstock (in the case of a sawmill adding a shift or pulp mill potentially expanding into the production of renewable chemicals, for example), high interest in a Supply Zone can make suppliers overconfident, leading to a supplier-controlled market where short-term contracting becomes the norm and supply chain reliability is compromised for the Issuer. If and when it occurs, increased demand on feedstock may decrease availability and increase cost for new plants within the BDO Zone.

| |
|---|
| **Risk Information:** Cattle producers only use corn stover in case of hay shortages. This competing use is not expected to change dramatically in the Competition Zone. However, changes in corn yield and fertilizer market price can have a significant impact on the fertilizer replacement cost. In our estimated rated pricing, we considered a price range to capture the volatility in corn yield and fertilizer market price to some extent. This risk is deemed to be low. |
| **Raw Risk Likelihood (RRL)** **Score**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. **4** |
| **Raw Risk Impact (RRI)** **Score**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. **4** |
| **Gross Risk Indicator (GRI)** **Score**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. **16** |
| **Mitigation/Notching** **Notch**<br>*RRL Mitigation (Notch)* **NN**<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** **Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. **16** |

### *2.1.5 Soft Supply Influence of Existing Markets*

| |
|---|
| **Rationale:** In some cases, existing markets for feedstock may be able to exert high degrees of pressure over local suppliers, effectively enabling control of feedstock, especially during times of shortage. This control can derive from qualitative or "soft" factors, such as long previous relationships between local suppliers and existing markets for feedstock. |
| **Risk Information:** The size of the existing market for corn stover (animal feed) compared to the total corn stover production in the Supply Zone is not significant (less than 5%), and it is not a premium feed product for livestock. Thus, we do not expect any soft supply influence from the existing markets on the rated quantity and pricing. |
| **Raw Risk Likelihood (RRL)** **Score**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. **4** |
| **Raw Risk Impact (RRI)** **Score**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. **4** |
| **Gross Risk Indicator (GRI)** **Score**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. **16** |
| **Mitigation/Notching** **Notch**<br>*RRL Mitigation (Notch)* **NN**<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** **Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. **16** |

### *2.1.6 Temporary Market-Driven Markets*

**Rationale:** Alternative, non-traditional, market-driven competitors for feedstock can drive feedstock demand in unusual circumstances. A BDO Zone Rating Issuer based on corn stover as a feedstock, for example, would not typically compete with higher-end animal feed markets due to quality issues. However, in times of significant hay shortage (e.g., during drought), farmers use corn stover in place of hay, driving the price of feedstock and decreasing availability for bio-projects.[29]

**Risk Information:** Our outreach confirmed that there has not been any alternative, non-traditional, market-driven competitors for corn stover that drive feedstock demand in unusual circumstances.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed very low, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 8 out of 100. | **8** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 8 out of 100. | **8** |

## *2.2 Risk Factor: Specific Competitors' Competitive Advantage*

### *2.2.1 Relative Inventory Capacity*

**Rationale:** The more inventory a competing biomass facility is able to store, the more competitive pressure it can exert on supply. Ability to store large inventories allows competitors to purchase inventory when the prices are low, potentially giving it an economic advantage. Additionally, the ability to store inventory during feedstock supply surpluses can enable competitors to continue to intake feedstock when the Issuer's plant (with lesser inventory capacity) may be forced to put suppliers on quota. Larger inventory capacity on the part of competing markets creates supplier loyalty and can make it more difficult for new projects to secure supply without paying a significant premium.

**Risk Information:** Due to the large space required and the risk of spoilage, rodents, and fire, the current consumers of corn stover purchase bales only when they need it. So, there is no need to build an inventory of corn stover bales by cattle producers.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)* | **NN** |

[29] Bergtold, 2018.

| |
|---|
| No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** **Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. **16** |

### *2.2.2 Relative Accessibility/Delivery Hours and Wait Times*

| |
|---|
| **Rationale:** The value attributed by suppliers to local competing markets for biomass is often directly related to the degree of flexibility the market provides in terms of delivery hours, and the more efficient discharge can occur. |
| **Risk Information:** Once corn stover is harvested and stored on the field side, biomass project procurement managers or associated logistics companies are expected to transport the bales. Thus, the local growers do not need to worry about the delivery hours and wait times. |
| **Raw Risk Likelihood (RRL)** **Score**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. **4** |
| **Raw Risk Impact (RRI)** **Score**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. **4** |
| **Gross Risk Indicator (GRI)** **Score**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. **16** |
| **Mitigation/Notching** **Notch**<br>*RRL Mitigation (Notch)* **NN**<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** **Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. **16** |

### *2.2.3 Relative Specification Advantages*

| |
|---|
| **Rationale:** When choosing a market for biomass feedstock, suppliers not only look at price, but also at relative quality requirements or specifications. It is important to understand feedstock quality specifications for competing markets within the BDO Zone, in order to accurately quantify the risk that competitors can exert on the Issuer's supply chain. |
| **Risk Information:** Similar to cattle producers, soil contamination in stover bales is also a major concern for future biomass projects. The main advantage of the existing markets could be their flexibility in accepting both round and square bales. In contrast, large-scale biomass projects will likely need large square bales to reduce logistics costs. This depends on the size of the biomass project (their annual corn stover demand) and their technology, as they may be able to handle and process both round and square bales. This risk is deemed to be low-medium. |
| **Raw Risk Likelihood (RRL)** **Score**<br>The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. **6** |
| **Raw Risk Impact (RRI)** **Score**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. **4** |
| **Gross Risk Indicator (GRI)** **Score**<br>The Gross Risk Indicator (RRL X RRI) is 24 out of 100. **24** |

| Mitigation/Notching | Notch |
|---|---|
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100. | **24** |

### *2.2.4 Demand for Competitors' Products*

**Rationale:** Increased demand for the competitor's final product can cause an increased demand for feedstock by the competitor. For example, an increased demand for wood pellets due to high energy prices in Europe or for biofuels due to a favorable clean fuels policy can cause increased pellet/biofuel production by competing markets. Thereby driving demand for feedstock within a BDO Zone.

**Risk Information:** Our outreach to local experts and farmers confirmed that corn stover demand from local cattle producers is not expected to grow. This risk is deemed to be low.

| Raw Risk Likelihood (RRL) | Score |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

## CATEGORY 3.0: SUPPLY CHAIN RISK

### *3.1 Risk Factor: Feedstock Availability*

#### *3.1.1 Biomass Availability Multiple (BAM)*

**Rationale:** Biomass Availability Multiple (BAM) indicates the degree of redundancy in an Issuer's supply chain in relation to the rated quantity in the BDO Zone. BAM is the mean ratio of biomass feedstock available to a project in relation to delivered cost, divided by the Issuer's mean rated quantity. BAM is a strong indicator of supply chain resilience when stressed by supply shortage and/or supplier breach. BAMs of 1.5 or higher are generally signals of lower feedstock risk for new projects in BDO Zones.

**Risk Information:** We developed and used a thorough methodology to estimate the rated quantity by considering factors including average corn production, sustainable removal rate, stover collection efficiency, and competing uses. Our rated quantity (154,000 bdt/yr) is 18% of total corn stover generation of 869,000 bdt/yr. However, there is still uncertainty in the data/model, future production of corn, and the farmer participation rate.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **Score**<br>**6** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **Score**<br>**6** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **Score**<br>**36** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **Score**<br>**36** |

### *3.1.2 Feedstock Supply Curve/Marginal Cost Curve*

**Rationale:** The greater the feasible transport distance, the more feedstock is accessible to the Issuer, but at a higher delivered cost. The feedstock supply curve, sometimes referred to as the marginal cost curve, is a function of feedstock availability over its cost, which is primarily, but not exclusively, a function of distance. The feedstock supply curve is used to determine the availability of redundant feedstock at various price points, and the cost of replacing feedstock with substitutes located at different distances.

Feedstock cost curves are useful in determining supply chain resilience; they provide information about the cost of feedstock availability in times of supply disturbance. Biomass supply chains are prone to supply disturbances over time; suppliers can become insolvent, or weather events can temporarily disrupt feedstock availability. When a disturbance occurs, the Issuer may need to source replacement feedstock from different suppliers at different locations and costs. A biomass supply curve indicates quantities of feedstock available at various price levels from suppliers generally located further away than the core supplier.

**Risk Information:** As shown in Figure B-4 (corn stover supply curve), corn stover availability in the Supply Zone increases gradually in 5-mile driving distance intervals. Cost increases resulting from a supply radius expansion are therefore expected to be gradual. In our estimated rated pricing, transportation cost contributes 20% to the total delivered cost. The average unit transportation cost is estimated to be $0.35/loaded mile/bdt. Thus, each 5-mile driving distance increase adds about $2/bdt to the delivered cost. Overall, the risk of marginal delivered cost is deemed to be medium depending on annual corn stover demand by the biomass project and the farm participation rate.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **Score**<br>**6** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **Score**<br>**6** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **Score**<br>**36** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)* | **Notch**<br>**NN** |

| |
|---|
| No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** **Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. **36** |

### *3.1.3 Seasonal Feedstock Supply Variation*

**Rationale:** Biomass supply can present significant seasonal supply variations. Seasonal supply variations combined with limitations associated with longer-distance transportation and storage can lead to BDO Zone biomass supply imbalances[30] and can manifest in shortages and higher costs for Issuers.

**Risk Information:** Many farmers in the Supply Zone plant corn early in the spring, either late March or early April. The seeds are treated so that even if they are planted too early, they sit in the ground without rotting. When the conditions are right, the seeds will sprout, and the corn plants will begin growing.

Farmers try to get an early start on planting, so they typically end up harvesting corn around Labor Day. The end of harvest season is usually 10 days prior to the average 32 degrees Fahrenheit freeze date (late October). Thus, corn producers have about a two-month window to harvest corn and corn stover.

However, farmers who are on corn-wheat rotation have a few weeks after harvesting corn to prepare their lands for winter wheat planting (see Figure E-1). This makes the timeliness of corn stover harvesting very challenging.

Overall, there is a medium risk to the seasonal supply if the harvesting operations are not carried out in a timely manner due to the limited access to the cropland after harvesting corn grain.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)** | **Score** |
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **36** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment. | **NN** |
| *RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

### *3.1.4 Year-to-Year Variation in Feedstock Availability*

**Rationale:** Biomass can have significant year-to-year supply variations due to variability in yield from biomass harvesting operations, particularly with agricultural biomass.

**Risk Information:** Corn and other agricultural crops experience year-to-year variability mainly due to the market dynamics (impacting farmers' decision to grow a certain crop depending on the projected future prices) and weather conditions in planting, growing, and harvest seasons (impacting the harvested area and crop yield).

[30] Golecha & Gan, 2016.

As shown in Figure B-3, both corn planted area and yield have experienced significant variability, resulting in corn production to as low as 522,000 tons and as high as 1,410,000 tons. In our rated quantity calculation, we used average crop production in the last 10 years to capture corn production variability to some extent. In addition, we used a BAM of 1.5 to account for future uncertainties such as crop planted area and yield.

Given the nature of agricultural practices, future biomass projects are expected to consider year-to-year variability factors in their corn stover supply system by storing additional bales and contracting more farmers than they need in case of temporary supply shortages.

Overall, this risk is thus deemed to be medium-high.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed high, therefore the RRL is 8 out of 10. | **8** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 48 out of 100. | **48** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 48 out of 100. | **48** |

## *3.2 Risk Factor: Historical Issues*

### *3.2.1 Historical Feedstock Price Variations*

**Rationale:** If the historical feedstock price shows volatility, then the risk of future price fluctuation is elevated. If feedstock prices have historically exceeded the price at which the Issuer would have to cease operations or breach a financial covenant (i.e., the "red line" feedstock cost), then mitigation measures should be put in place.

**Risk Information:** Due to the lack of established markets, there are no established historical prices for corn stover in the Supply Zone. In our outreach to the local farmers, some of them did not know what the price of corn stover would be as they have not sold their corn stover in the past.

Hay Price Reports prepared by USDA and published by Kansan Forage and Grassland Council show a price range of $80-150/bdt.[31] It is noted that the reported prices by USDA are spot prices and corn stover is usually baled and sold when there is a shortage of hay and other animal feed products. Thus, we expect that future biomass projects should be able to procure corn stover bales at our estimated rated price as they need corn stover year-round and for many years, allowing them to negotiate stover prices with local crop growers and logistics companies.

The main challenge for future biomass projects will be the fertilizer replacement price. Some farmers we talked to are expecting higher prices for corn stover removal than we estimated here due to the low corn yield and dryland cropping

[31] https://usda.library.cornell.edu/concern/publications/3j333228j?locale=en

conditions, which make corn stover important as a ground cover. This could impact the economics of a biomass project significantly. Thus, this risk indicator is deemed to be high.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed high, therefore the RRL is 8 out of 10. | **8** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed very high, therefore the RRI is 10 out of 10. | **10** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 80 out of 100. | **80** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>Early outreach and town hall meetings are effective mitigation measures to understand and manage farmers' expectations on corn stover prices. Offering 3-5 years supply contracts and timely payments to farmers as soon as they make and store bales on their fieldside can build trust among farmers and help in managing corn stover prices in the long term. We expect these mitigation measures can reduce the impact of this risk by 50%.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is 50%. | **50%** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 40 out of 100. | **40** |

### *3.2.2 Low Historical Demand for Feedstock in the BDO Zone*

**Rationale:** If Issuer BDO Zone does not have a history of developed large-scale feedstock procurement, suppliers may not have sufficient expertise in feedstock production to ensure reliable supply, especially in the early years. This can be particularly true for forest residues, where, typically, the infrastructure for collection, processing, and delivery is immature.

Where supply chains are not well-established, risk can be mitigated when new bio-based plants control a higher degree of feedstock processing. For example, if a BDO Zone rating is issued for clean wood chips and the historical demand in the Zone has been exclusively for pulpwood, then supply chain risk will be decreased for new bio-based plants that intake pulpwood and manage log debarking and chipping internally. Rather than requiring inexperienced suppliers to deliver debarked wood chips.

**Risk Information:** Historical demand for corn stover has been low and limited to local cattle producers. Our estimation is that less than 5% of corn stover has been consumed in the Supply Zone. Due to the existence of hay and cattle production, farmers are familiar with the fundamentals of corn stover harvesting, collection, and transportation. However, a biomass project likely needs to upgrade the existing supply chain to be able to deliver corn stover in a cost-efficient manner and with certain quality parameters.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed high, therefore the RRL is 8 out of 10. | **8** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed high, therefore the RRI is 8 out of 10. | **8** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 64 out of 100. | **64** |
| **Mitigation/Notching** | **Notch** |

| | |
|---|---|
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>As discussed in the previous risk indicator, early outreach and town hall meetings are an effective measure to communicate with crop growers on the timing of the field operations.<br><br>In addition, hiring experienced custom harvest groups that have a proven track record of building strong relationships with local farmers can mitigate the risks associated with supply chain scale-up. Thus, the risk impact can be notched by 50%.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is 50%. | **50%** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 32 out of 100. | **Score**<br>**32** |

### *3.2.3 History of Production/Feedstock is a New/Secondary Crop or By-Product*

**Rationale:** If feedstock is a new/secondary crop or a by-product, suppliers may either lack sufficient experience to mitigate risk or be unable to react to such risk. Secondary crop or by-product producers may be less likely to prioritize production.

For new crop types, inexperience in planting, harvest, collection, and yield data may pose higher levels of risk.

If feedstock is a secondary transformation (i.e., wheat straw, corn stover, or forest residue), then production can be subject to variables beyond suppliers' control (e.g., changing demand for sawtimber, or primary crop prices).

**Risk Information:** Corn grain is one of the major row crops in the Supply Zone. As a by-product of corn production, corn stover has been harvested, stored, and transported in the past to meet the demand of the cattle producers, though in small quantities.
However, stover annual availability depends on corn planted area, crop rotation, corn yield, and weather conditions in planting, growing, and harvest seasons. This risk is deemed to be medium.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **Score**<br>**6** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **Score**<br>**6** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **Score**<br>**36** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **Score**<br>**36** |

### *3.3 Risk Factor: Non-Weather Based Externalities*

#### *3.3.1 Consumer Price Index (CPI) and Producer Price Index (PPI)*

**Rationale:** CPI and PPI can impact feedstock cost of harvest and collection over time. Sensitivities to worst-case scenarios should be run.

**Risk Information:** Consumer Price Index for Midwest US is depicted in Figure E-2 for the last 10 years (2014-2024). Similar to other regions in the country, overall CPI has been gradually increasing due to rising annual inflation, but it is projected to decline in the near future. The likelihood of CPI volatility is expected to be medium, but its impact is deemed to be low-medium as biomass projects will consider inflation in their feedstock prices.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 24 out of 100. | **24** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100. | **24** |

#### *3.3.2 Currency Risk*

**Rationale:** Where feedstock is purchased in a currency different than that which a new bio-based plant will locate in a BDO Zone, currency exchange rates and volatility can constitute risk exposure. BDO Zones that cross the US-Canada border, for example, which intake feedstock from both countries, are exposed to such currency risk.

**Risk Information:** This risk is irrelevant as corn stover will be supplied domestically.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed not relevant, therefore the RRL is not rated (NR). | **NR** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed not relevant, therefore the RRI is not rated (NR). | **NR** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is not rated. | **NR** |
| **Mitigation/Notching** | **Notch** |
| The Total Notch (RRL Notch) X (RRI Notch) is NR (Not Rated). | **NR** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is not rated. | **NR** |

#### *3.3.3 Border Risk*

**Rationale:** Where feedstock is transported cross-border to another country, risk exposure to border closures and crossing delays becomes present. The availability of trucks willing to do cross-border runs is limited, which can decrease supply chain flexibility and resilience. Plants near the US-Canada border, which intake feedstock from both countries, are exposed to these risks.

| | |
|---|---|
| **Risk Information:** This risk is irrelevant as corn stover will be supplied domestically. | |
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed not relevant, therefore the RRL is not rated (NR). | **Score**<br>**NR** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed not relevant, therefore the RRI is not rated (NR). | **Score**<br>**NR** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is not rated. | **Score**<br>**NR** |
| **Mitigation/Notching**<br>The Total Notch (RRL Notch) X (RRI Notch) is NR (Not Rated). | **Notch**<br>**NR** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is not rated. | **Score**<br>**NR** |

### *3.3.4 Temporary Externality-Driven Markets for Feedstock*

| | |
|---|---|
| **Rationale:** Alternative, non-traditional, externality-driven competitors for feedstock can drive feedstock demand (and cost) in unusual circumstances. For example, an Issuer using corn stover as a feedstock would not typically compete with the higher-end animal feed market. However, in times of significant hay shortage (e.g., during drought), farmers may use corn stover as hay replacement, driving the price of stover feedstock and decreasing its availability for bio-projects.[32] | |
| **Risk Information:** Due to the small size of the existing market and no indication of growing demand in the region, we do not expect the existing markets would have a significant impact on corn stover availability, even in case of temporary supply shortage. Signing 3-5 supply agreements with local corn producers can mitigate the risks associated with temporary externality-driven markets. This risk is deemed to be low-medium. | |
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **Score**<br>**6** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 24 out of 100. | **Score**<br>**24** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100. | **Score**<br>**24** |

## *3.4 Risk Factor: Risks Related to Feedstock Production, Harvest, and Collection*

### *3.4.1 Harvest & Collection Practices & Schedules*

| |
|---|
| **Rationale:** Differences in harvest timing and practices used can create risk to both the quantity and quality of feedstock. For example, feedstock harvested by different suppliers in different windows can undergo varying levels of exposure to sun, wind, and moisture, leading to variations in delivered feedstock quality. |

[32] Bergtold, 2018.

For example, agricultural feedstocks and energy crops have optimal harvesting windows to ensure minimal moisture content. In certain BDO Zones, these harvesting windows may coincide with heightened weather risks, such as frost or rain.

**Risk Information:** The window to harvest and bale dry stover in Southeast Kansas is short. Harvesting and baling operations have to be conducted concurrently on large spans of land, requiring access to equipment and sophisticated coordination. Any disturbances in harvesting and baling operations pose risk to feedstock availability and quality.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **10** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **8** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **80** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>Employment of a third-party baling company with a large number of baling equipment would significantly improve coordination of harvesting and baling operations, and ensure the maximization of the quantity of stover that could be collected from the fields.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**25%** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 40 out of 100. | **60** |

### *3.4.2 Harvesting & Collection Equipment*

**Rationale:** Different types of harvesting and collection equipment used by suppliers in a BDO Zone can have a significant impact on the quality and availability of feedstock. Using different types and combinations of harvesting, collection, and processing equipment among suppliers can lead to non-homogeneous feedstock. Equipment that is not designed specifically for biomass cultivation, harvesting, and collection can increase feedstock quality risks.

Relevant equipment should be specified for the sake of product consistency and risk reduction.

**Risk Information:** Most farmers who own harvesting and collection equipment produce round bales due to the lower capital costs of round balers compared to square balers (2-4 times less expensive). In addition, the farmers who have a small amount of livestock purchase round balers for hay. Round bales of hay have a longer-lasting life than square bales if stored outside. As a result, most farmers do not buy a second baler just to bale their corn stover. Only commercial cattle producers and custom harvest groups usually own square balers to take advantage of the lower storage and transportation costs of square bales compared to round bales.

Depending on the biomass conversion technology and the annual biomass demand of future biomass projects, they may be capable of processing both round bales and square bales.

Overall, this is the case for almost every agricultural region in the US, and we do not see that as an advantage or a disadvantage for the BDO Zone but as a reality of the availability of round bales and square bales. We expect future projects to take this into consideration.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 24 out of 100. | **24** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100. | **24** |

### *3.4.3 Variation in Densification Methods Among Different Suppliers*

**Rationale:** The shape and density of the unit in which feedstock is supplied can impact feedstock cost and quality. Standard feedstock densification modes for biomass consist of round or square bales, pellets, cubes, chips, or grindings. The size of wood fiber processed in a grinder is less homogenous than if a chipper is used.

Bales of different densities can absorb moisture at different rates. In certain cases, round bales have been viewed as problematic due to their uneven moisture content distribution.

**Risk Information:** Bales are the only method of densification for corn stover, but their size, density, and weight vary. Depending on the annual biomass demand of the future biomass project, the difference between bale size, density, and weight can have a significant impact on the delivered price and downstream stover processing operations.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed very low, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed very high, therefore the RRI is 10 out of 10. | **10** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 20 out of 100. | **20** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>Hiring an experienced custom harvest group with a fleet of baling and bale collection equipment can mitigate the risk of varying bale size, density, and weight. Thus, this risk is notched down by 50%.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is 50%. | **50%** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 10 out of 100. | **10** |

### *3.4.4 Availability of Labor for Feedstock Production*

**Rationale:** Skilled labor shortages can be difficult to remedy in the short term. The availability of suitable labor in an area can impact the ability to procure sufficient feedstock quantities on required schedules. Labor risks are higher where supply chains are not yet active or for Issuers for whom large feedstock requirements or the development of new (or expanded) supply chains demand significant additions to the local labor force.

**Risk Information:** As explained in Section B, we estimated that 23 balers, 16 bale collectors, 39 tractors, and 39 operators would be required to harvest, collect and stack the rated quantity (154,000 bdt/yr) at the field side of croplands during a 40-day harvest window. Securing this number of harvest operators would be challenging. Due to the low demand for corn stover, the availability of experienced operators for corn stover logistics operations is currently low. The existing labor pool is mainly engaged with harvesting corn grain and preparing the land for the next cropping season. Local farmers brought up this concern in our outreach. The availability of labor is challenging, in particular for crop growers on corn-winter wheat rotation as cropland must be prepared for winter wheat immediately following corn harvesting operations.

The impact of this risk depends on the annual biomass demand of future biomass projects and the type and size of the bales they need. This is a very high risk for a large-scale biomass project.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed very high, therefore the RRL is 10 out of 10. | **10** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed very high, therefore the RRI is 10 out of 10. | **10** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 100 out of 100. | **100** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>Hiring custom harvest groups from other regions to manage the entire or a portion of corn stover harvest and collection can mitigate the impact of this risk, but not every single farmer may be in support of having custom harvest groups in their fields. The risk impact is notched down by 50%.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is 50%. | **50%** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 50 out of 100. | **50** |

## *3.5 Risk Factor: Transportation*

### *3.5.1 Feedstock Transportation Costs*

**Rationale:** Transportation can be one of the most significant cost components of biomass supply chains. The average transport cost and percentage of total feedstock cost attributable to transport should be known.

Transport distances of 80-120 km for biomass feedstocks are typical, but larger distances can be common. Where the average transport distance from suppliers to Issuers is high, the supply chain is subject to greater sensitivities to risks, such as increases in diesel cost, weather impacts, mechanical breakdown, and the demand for scarce feedstock from competitors closer to the source.

Understanding average transport distance can help flag higher-risk BDO Zones where transport distance materially exceeds the average.

**Risk Information:** In our estimated rated pricing, transportation cost contributes 20% to the total delivered cost. In addition, corn stover availability in the Supply Zone increases gradually in 5-mile driving distance intervals (See Figure B-4). This can be an advantage for a biomass project to secure corn stover without facing a sharp increase in transportation costs as the supply area expands. We also estimated the transportation cost based on the average transportation distance of 50 miles. Thus, this risk indicator is deemed to be medium.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **36** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

### *3.5.2 Diesel Cost Impacts*

**Rationale:** Changes in diesel costs impact transport costs over time. Sensitivities to worst-case scenarios should be run.

**Risk Information:** Due to the relatively lower payload of trucks carrying corn stover bales (15-20 bdt) compared to other biomass resources such as sawmill residues (20-25 bdt), the transportation cost ($/bdt) are more sensitive to diesel price. However, this is not specific to corn stover and this BDO Zone and is the same case for agricultural biomass logistics in other agricultural regions.

As shown in Figure E-3, diesel prices in the Midwest US have been following the average national prices. Due to the COVID pandemic and the global supply chain interruption, which resulted in higher inflation, the price of diesel increased up to 200%. However, prices are now trending towards pre-COVID levels. In 2021-2022, when diesel prices were high, a fuel surcharge of 15-40% was observed, resulting in a $3-$8/bdt increase in biomass transportation costs.

Thus, the likelihood of this risk is high (volatility in diesel price), but its impact is medium as biomass projects will consider such volatility in their feedstock pricing.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed high, therefore the RRL is 8 out of 10. | **8** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 48 out of 100. | **48** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)* | **25%** |

| |
|---|
| No adjustment.<br><br>*RRI Mitigation (Notch)*<br>Securing corn stover from short driving distances can mitigate the impact of volatility in diesel prices to some extent. The risk impact is notched down by 25%.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is 25%. |
| **Loaded RI Score** **Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. **36** |

### *3.5.3 Transportation of Feedstock Requires Specialized Equipment*

| |
|---|
| **Rationale:** Requirements for specialized transport equipment (e.g., walking-floor trailers) can increase supply chain risk. Where there is low availability of required transportation equipment, equipment owners have increased leverage over transportation prices, and supply chain resiliency can be lower. |
| **Risk Information:** 53ft flatbed trailer trucks are used for the transportation of both round and square bales, and thus, no specialized equipment is required. |
| **Raw Risk Likelihood (RRL)** **Score**<br>The risk likelihood is deemed very low, therefore the RRL is 2 out of 10. **2** |
| **Raw Risk Impact (RRI)** **Score**<br>The risk impact is deemed very low, therefore the RRI is 2 out of 10. **2** |
| **Gross Risk Indicator (GRI)** **Score**<br>The Gross Risk Indicator (RRL X RRI) is 4 out of 100. **4** |
| **Mitigation/Notching** **Notch**<br>*RRL Mitigation (Notch)* **NN**<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** **Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100. **4** |

### *3.5.4 Delivery Routes through Local Communities*

| |
|---|
| **Rationale:** Transportation of biomass can become a nuisance to local communities, especially if a large number of trucks pass through residential and school areas. Local communities often have the power to force regulations regarding truck transport, impeding the ability of BDO Zone suppliers to transport feedstock. |
| **Risk Information:** As discussed in Section B, ten flatbed trucks are needed to transport the rated quantity year-round. Each truck can deliver three truckloads of corn stover per day (30 truckloads delivered to the biomass processing site per day). This number of daily truckloads is manageable without burdening the existing roads in the local communities. The Supply Zone is an active agricultural area with commercial quantities of corn, soybean, and wheat being transported to regional and national markets. |
| **Raw Risk Likelihood (RRL)** **Score**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. **4** |
| **Raw Risk Impact (RRI)** **Score**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. **4** |
| **Gross Risk Indicator (GRI)** **Score** |

| | |
|---|---|
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *3.5.5 Transportation Regulations & Local Weight Limits*

**Rationale:** In many BDO Zones, transportation is regulated based on seasonal road conditions. These regulations (e.g., "frost laws") often take the form of weight restrictions or limits on the number of trucks allowed on roads. Such regulations can impede the project's ability to source sufficient feedstock or increase the cost of doing so at certain times of the year.

**Risk Information**: Similar to other states, Kansas follows the Federal limits for Interstate Highways (up to 80,000 lb. GWV) with several revisions in State law that allow trucks to exceed some elements of the Federal limits.[33]

| | |
|---|---|
| Single Axle | 20,000 lbs. |
| Tandem Axle | 34,000 lbs. |
| Tridem Axle | 43,500 lbs. at 10ft spacing<br>42,000 lbs. at more than 8 feet spacing but less than 9 feet<br>42,500 lbs. at more than 9 feet spacing but less than 10 feet |
| Gross Weight | 80,000 lbs. on Interstate highways<br>85,500 lbs. on non-Interstate highways |
| Other | 10,000 lbs. per wheel |

We did not find any transportation regulations, which are a limiting factor for the consistent delivery of corn stover bales to a biomass facility using trucks. With the proper management of bale delivery via trucks to the biomass facilities year-round, this risk is considered a low risk.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)* | **Notch**<br>**NN** |

[33] US Department of Transportation- Compilation of Existing State Truck Size and Weight Limit Laws

| |
|---|
| No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** — **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. — **16** |

### *3.5.6 Road Infrastructure*

| |
|---|
| **Rationale:** Feedstock cost and availability can be a function of road infrastructure, in particular the accessibility the infrastructure provides to feedstock. Issues with road networks will translate directly to risks to feedstock supply. |
| **Risk Information:** Kansas is the nation's largest wheat producer and third largest livestock producer. With 200,000 agricultural jobs, mainly in rural Kansas, the state and local governments have been proactive in maintaining and improving the road network to support the growth of the agriculture industry. A recent Consumer Affairs study (2023)[34] ranked Kansas roads as the sixth best in the United States. Major roads are improved on a regular basis. About 1% of its rural roads and 10% of its urban roads are considered poor. This risk is deemed to be low. |
| **Raw Risk Likelihood (RRL)** — **Score** |
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. — **4** |
| **Raw Risk Impact (RRI)** — **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. — **4** |
| **Gross Risk Indicator (GRI)** — **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. — **16** |
| **Mitigation/Notching** — **Notch** |
| *RRL Mitigation (Notch)* — **NN**<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** — **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. — **16** |

### *3.5.7 Transportation Redundancy*

| |
|---|
| **Rationale:** Transport equipment redundancy is important for dealing with seasonally variable feedstock supplies as well as the risk of equipment breakdowns. |
| **Risk Information:** As discussed in Risk Indicator 3.5.4, to transport the rated quantity year-round, 10 trucks are required. In discussion with local transportation companies and local farmers who own trucks, they confirmed that this number of equipment is achievable to support future corn stover projects. |
| **Raw Risk Likelihood (RRL)** — **Score** |
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. — **4** |
| **Raw Risk Impact (RRI)** — **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. — **4** |
| **Gross Risk Indicator (GRI)** — **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. — **16** |
| **Mitigation/Notching** — **Notch** |
| *RRL Mitigation (Notch)* — **NN** |

[34] ConsumerAffairs- Journal of Consume Research

No adjustment.

*RRI Mitigation (Notch)*
No adjustment.

The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).

| **Loaded RI Score** | **Score** |
|---|---|
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

### *3.6 Risk Factor: Supply Chain Resiliency*

#### *3.6.1 Size, Number, and Location of Suppliers*

**Rationale:** In general, a supply portfolio involving multiple suppliers of various sizes (and from multiple BDO Zones) is important for ensuring steady and uninterrupted feedstock supply with minimal price fluctuations. If a small number of large suppliers provides a high proportion of total feedstock, a disruption or supplier breach will have greater impact on the supply chain. In such cases the risk of disruption is lower, but the impact of those disruptions is higher. Conversely, many small suppliers are less likely to have the capacity to withstand internal disruptions and thus may be more likely to breach. Here, risk of disruption is higher, but their likely impact is lower. The number of suppliers as well as the ratio of small to large suppliers should be optimized.

There is no pre-determined number or optimal ratio of suppliers, although having too many or too few can both pose higher degrees of risk.

**Risk Information:** The actual number and location of crop growers involved in the supply chain depends on the annual corn stover demand of the future biomass project and its offered price.

We estimated the rated pricing based on an average of a 50-mile transportation distance within a 75-mile Supply Zone.

Despite the logistical challenges of coordinating multiple supply sources, securing a larger number of growers will reduce the overall feedstock risk, as the unexpected failure of several growers to supply corn stover would have less significant impacts on the overall supply chain. However, due to the relatively small size of farms in the Supply Zone (the average farm size is 548 acres), this risk is deemed to be medium.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **36** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

### *3.6.2 Suppliers Subject to Same External Risk Factors*

**Rationale:** When a single risk event can impact the feedstock production ability of all (or most) suppliers, then feedstock risk is higher and supply chain resiliency is lower. Resilience is maximized when biomass supply chains exhibit diversity in spatial location (i.e., geography), production practices and other elements of supply chain structures such that the impact of single high-risk events have varying impacts on suppliers.

**Risk Information:** The external risks that can impact all suppliers in the Supply Zone are weather-related, including drought in planting and growing seasons and rainy conditions in the harvest season, impacting corn yield and harvested acreage. In 2022, Kansas experienced a prolonged drought, resulting in crop failures across the state. The third quarter of 2022 was the driest on record in southeast Kansas, resulting in low corn yield (see Figure B-3). The market price of corn also impacts farmers' decisions on how much of their cropland is allocated to corn.

Overall, the variability in corn stover production due to external risk factors is a known fact and we expect future biomass facilities would consider surplus bale inventory and contracting additional farmers to mitigate external risk factors. It is noted that we used the average corn harvested area and yield in the last 10 years to calculate the rated quantity, which captures the variability in corn production.

This risk is deemed to be medium.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **36** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

### *3.6.3 Land Ownership Structures*

**Rationale:** The ownership (or control) of the land base on which feedstock is produced can have a significant impact on the Issuer's feedstock risks. Risk of long-term variation in stumpage cost for wood fiber (i.e., the cost that one pays to a landowner for the right to cut and purchase their wood fiber), for example, is much higher in the US, where >90% of the land is private, and thus stumpage cost is determined on a competitive auction basis. Conversely, in Canada, >90% of the land is owned by the Crown, and stumpage is allocated by the government.

**Risk Information:** As explained in Risk Indicator 1.3.1, regardless of the land ownership (farmer or corporate ownership), due to the value of the farmland for row crop production such as corn, wheat, and soybean, the land ownership structure does not impact the corn production in the Supply Zone.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed very low, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |

| | |
|---|---|
| The risk impact is deemed very low, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100. | **Score**<br>**4** |

### *3.7 Risk Factor: Climate and Natural Risks*

#### *3.7.1 Seasonal Weather Impacts on Feedstock Supply*

**Rationale:** Seasonal weather impacts are defined as those deriving from natural weather variations (i.e., spring thaws, rainy seasons, or dry seasons – as opposed to from singular weather events like fires, droughts, or hurricanes). Seasonal weather changes can be a significant risk factor affecting feedstock availability, quality, and price.

Given the major influence that weather has on multiple aspects of growing, harvesting, and transporting biomass, it is difficult to predict the availability of biomass at a specific location at different points in the future with a high degree of certainty. However, it is still possible, using past data and statistical models, to generate reasonable upper/lower bound estimates of biomass production in any given year in a wider Supply Zone. Such estimates are important in assessing feedstock risk and enable accurate assessment of the efficacy of Issuer's mitigation methods.

**Risk Information:** Weather conditions at planting, growing, and harvest seasons always vary. Farmers, in consultation with local agronomists, try to plant at optimal planting dates to mitigate seasonal weather impacts on corn yield and harvesting. A lot of farmers plant corn early in the spring, either late March or early April. The seeds are treated so that even if they are planted too early, they sit in the ground without rotting. When the conditions are right, the seed will sprout, and the plant will begin growing. However, even with all preparations, there is always uncertainty about the impact of weather on the harvested areas and corn yield, as shown in Figure B-3. The variation in corn yield has been moderate to high.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **Score**<br>**6** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed high, therefore the RRI is 8 out of 10. | **Score**<br>**8** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 48 out of 100. | **Score**<br>**48** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score** | **Score** |

| | |
|---|---|
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 48 out of 100. | **48** |

### *3.7.2 Long-Term Weather and Climate Trends*

**Rationale:** In certain BDO Zones, climatic trends and significant potential changes to future weather patterns can create feedstock risk.

**Risk Information:** A trend that has been observed in Southeast Kansas in recent years is excessive rain/drought, which tends to come in cycles. The region has been in a drought cycle for the past 2-3 years, while it was experiencing excessive rains prior to 2021. Erratic weather patterns are predicted to impact the productivity of crop production in dryland farming. Significant economic impacts occurred in 2022 due to severe drought and crop yield. On the other hand, seed companies have been improving crop genetics to counteract climate effects. This risk is deemed to be medium.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **36** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

### *3.7.3 Forest/Crop Fire*

**Rationale:** Forest/crop fires, especially when occurring on a large scale, destroy feedstock and create shortages.

Fire-prone conditions are predicted to increase across Canada. This could potentially result in a doubling of the amount of area burned by the end of this century compared with amounts burned in recent decades. Boreal forests, which have been historically greatly influenced by fire, will likely be especially affected by this change.

Other climate change impacts that could add damaged or dead-wood to the forest fuel load (e.g., as a result of insect outbreaks, ice storms, or high winds) may increase the risk of fire activity. New research is aimed at refining these climate change estimates of fire activity and investigating adaptation strategies and options to deal with future fire occurrences. There is growing consensus that as wildfire activity increases, fire agency suppression efforts will be increasingly strained. However, analyses of fire history suggest that the effect of climate variability on precipitation regimes is the primary reason for the decreasing fire activity in the southern BDO Zone of Canada.

**Risk Information:** The primary fire risk for corn stover is at the satellite storage yards where hundreds of bales are stored after the harvest season. Due to the low moisture content of corn stover (15%) and the low ambient temperature after the harvest season, the likelihood of fire as a result of self-heating is low. However, corn stover bales will burn faster at low moisture content. In addition, the biomass projects must meet the fire code required by the authorities, which usually asks for a reasonable space (>100ft) between bale stacks to minimize the spread of fires among stacks.

With proper fire safety measures at the bale storage yards, the impact of fire on the entire bale inventory can be mitigated.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)** | **Score** |
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 24 out of 100. | **24** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100. | **24** |

### *3.7.4 Risk of Infestation*

**Rationale:** Risk of future infestation, including its estimated consequences on feedstock supply, should be calculated into the overall risk profile.

Since forest insect populations are influenced by environmental conditions, future changes in climate can be expected to significantly alter the outbreak dynamics of certain forest insect species. In some cases, larger and more frequent insect outbreaks may occur, but in other cases, recurring outbreaks may be disrupted or diminished. As climate continues to change, we can expect more situations, particularly at the margins of tree ranges, where sub-optimal conditions for tree growth and reduced tree vigor can lead to outbreaks of forest insects.

**Risk Information:** Pests such as corn rootworm (CRW) are an annual problem in fields across the Corn Belt, including the BDO Zone. K-State Research and Extension program at Kansas State University publishes "Corn Insect Pest Management", helping producers manage insect populations with the best available methods proven practical under Kansas conditions. It is revised annually and intended for use during this calendar year.

Another concern raised by some farmers is the possible crop disease movement from custom harvest groups' equipment fleets to crop fields. Farmers expect the custom harvest groups to be mindful of sterilizing their harvesting and collection equipment prior to corn stover harvesting.

Overall, this risk is deemed medium.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)** | **Score** |
| The risk likelihood is deemed high, therefore the RRL is 8 out of 10. | **8** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 32 out of 100. | **32** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)* | **NN** |

| |
|---|
| No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** **Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 32 out of 100. **32** |

### *3.7.5 Risk of Hail*

**Rationale:** Hail has negligible impact on forestry biomass but is one of the principal destroyers of agricultural crops in North America.

There is much uncertainty about the effects of anthropogenic climate change on the frequency and severity of extreme weather events like hailstorms and their subsequent economic losses. Some studies indicate a strong positive relationship between hailstorm activity and hailstorm damage, as predicted by minimum temperatures using simple correlations. This relationship suggests that hailstorm damage may increase in the future if global warming leads to further temperature increases.

**Risk Information** Kansas is one of four states that receive the most hail in the US. Hail can damage a young corn crop, especially when plant roots are not firmly established early in the growing season. In many cases, the hail damage is limited to plant leaves and the crop recovers. Our outreach confirmed that hail is a moderate risk for crop growers in the Supply Zone, as it can cause damage in some years.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)** | **Score** |
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **36** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

### *3.7.6 Risk of Flood*

**Rationale:** Floods can cause catastrophic disruption and delay in feedstock supply. Where there is high risk of flood and thus negative impact to feedstock supply, the BDO Zone rating should account for this risk.

**Risk Information:** Whether a seed or seedling survives flooding is based on the length of time that flooding lasts and the soil temperature. Corn can usually survive up to about four days of outright ponding if temperatures are relatively cool (mid-70s F or cooler) and fewer days if temperatures are warm (mid-70s F or warmer).[35] In the Supply Zone,

[35] Agronomy Department, Purdue University

| |
|---|
| excessive rainfalls happen with moderate frequency and can result in river flooding with a moderate impact on both corn stover logistics (access to roads) and corn stover production and harvesting (access to corn fields and damage to the crop). In our outreach to the local experts, they confirmed that flood is a moderate risk in the Supply Zone. |
| **Raw Risk Likelihood (RRL)** **Score** |
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. **6** |
| **Raw Risk Impact (RRI)** **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. **6** |
| **Gross Risk Indicator (GRI)** **Score** |
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. **36** |
| **Mitigation/Notching** **Notch** |
| *RRL Mitigation (Notch)* **NN** |
| No adjustment. |
| *RRI Mitigation (Notch)* |
| No adjustment. |
| The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. **36** |

### *3.7.7 Risk of Drought*

| |
|---|
| **Rationale:** Droughts can cause significant disruptions to feedstock supplies across entire BDO Zones for extended periods of time, especially in case of agricultural residues and energy crops. |
| **Risk Information:** Among weather-related risk factors, drought is the main concern among farmers, given its continuous frequency in the last three years (2022-2024). Map E-2 shows the intensity of drought in 2024, with severe to exceptional drought happening in the Supply Zone. However, drought mainly affects the availability of grain. The availability of corn stover is only slightly affected by drought. This is because corn stover can be salvaged even if drought affects grain development. |
| **Raw Risk Likelihood (RRL)** **Score** |
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. **6** |
| **Raw Risk Impact (RRI)** **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. **4** |
| **Gross Risk Indicator (GRI)** **Score** |
| The Gross Risk Indicator (RRL X RRI) is 24 out of 100. **24** |
| **Mitigation/Notching** **Notch** |
| *RRL Mitigation (Notch)* **25%** |
| No adjustment. |
| *RRI Mitigation (Notch)* |
| Storing additional stover bales (redundant inventory) and contracting with additional farmers can mitigate the supply shortage due to the drought to some extent. This risk impact is notched down by 25%. |
| The Total Notch (RRL Notch) X (RRI Notch) is 25%. |
| **Loaded RI Score** **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 18 out of 100. **18** |

### *3.7.8 Risk of Hurricanes, Tornadoes, and Strong Winds*

**Rationale:** Hurricanes, tornadoes, and strong winds can destroy timber stands, crops, and feedstock piles. They can also delay forestry and agricultural operations. Hurricanes and tornadoes can indirectly cause temporary shortages of available transportation as available trucking moves to handle higher-value disaster-related contracts. For example, Katrina cleanup limited availability of live-bottom trailers in the North and South-East of the US for several months as truckers shifted operations to handle more lucrative government contracts.

Although scientists are uncertain whether climate change will lead to an increase in the number of hurricanes, warmer ocean temperatures and higher sea levels are expected to intensify their impacts.

Recent analyses conclude that the strongest hurricanes occurring in some BDO Zones, including the North Atlantic, have increased in intensity over the past two to three decades.

**Risk Information:** The most significant issue that results from the storm is root lodging, which occurs when high winds force the corn roots to lose hold and the plant tips over at the soil line without breaking. Although Kansas is part of the US tornado alley, through outreach, we found that it is not a high risk to corn production in the Supply Zone due to its low impact on the crop.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 24 out of 100. | **24** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100. | **24** |

### *3.7.9 Risk of Low Temperatures*

**Rationale:** Low temperatures can cause crop failure, leading to shortages of biomass. Additionally, low temperatures can have adverse impacts on the operations of feedstock processing equipment in Northern BDO Zones.

**Risk Information:** The optimal planting date for corn in the Supply Zone is March-April when soil temperature at a 2-inch depth reaches 55 degrees Fahrenheit.[36,37] The risk of frost (<32 degrees Fahrenheit) can be mitigated by late planting, but it can compromise the corn yield. Crop growers usually consult with local agronomists and crop insurance companies to find the optimal planting dates to minimize the risk of frost and low yield.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |

[36] K-State Research and Extension- Crop planting Dates and Frost Risk in Central and Eastern Kansas
[37] K-State Research and Extension- Kansas Corn Management 2020

| | |
|---|---|
| The risk impact is deemed high, therefore the RRI is 8 out of 10. | **8** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 32 out of 100. | **Score**<br>**32** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 32 out of 100. | **Score**<br>**32** |

## *3.8 Risk Factor: Political and Social*

### *3.8.1 Government Subsidies for Feedstock Production or Utilization*

**Rationale:** Feedstock that is directly subsidized through government programs can pose greater long-term risk than feedstock that is not. Subsidies may be subject to amendment or repeal, sometimes with minimal notice.

*NOTE: This risk indicator refers to direct feedstock subsidies only; it does not apply to government subsidies that pertain indirectly to the Issuer's operations, such as Loan Guarantees, or to the markets for products produced by the Issuer*.

**Risk Information:** There are no government subsidies for the production and use of corn stover in the BDO Zone.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed very low, therefore the RRL is 2 out of 10. | **Score**<br>**2** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed very low, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100. | **Score**<br>**4** |

### *3.8.2 Local, Provincial, & National Laws, Regulations, & Permitting Pertaining to Biomass*

**Rationale:** Feedstock whose production is directly dependent on local, provincial, or national laws or government regulations can pose greater long-term risk than feedstock that is not, since laws and regulations may be subject to amendment or repeal.

If biomass utilization requires specific permits (e.g., percentage removal of forest residues or corn stover, allowable cut limits, air emission, storage permits, rights-of-way, overweight permits for trucks, cross-border permitting for shipment

| |
|---|
| of biomass, chain of custody, or certification of sustainability), the likelihood of obtaining such permits and/or complying with permitting requirements should be examined. |
| **Risk Information:** There are no specific permits, laws, and regulations for the utilization of corn stover for biomass projects. |
| **Raw Risk Likelihood (RRL)** — **Score** |
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. — **4** |
| **Raw Risk Impact (RRI)** — **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. — **4** |
| **Gross Risk Indicator (GRI)** — **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. — **16** |
| **Mitigation/Notching** — **Notch** |
| *RRL Mitigation (Notch)* — **NN** |
| No adjustment. |
| *RRI Mitigation (Notch)* |
| No adjustment. |
| The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** — **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. — **16** |

### *3.8.3 Backlash Against Biomass Development, Procurement, or Usage in the Region*

| |
|---|
| **Rationale:** Public backlash against biomass development in the Issuer BDO Zone can directly impact Issuer's ability to procure, transport, trans-load, store, or utilize feedstock by affecting local policies, regulations, and Issuer's ability to obtain necessary permitting. |
| **Risk Information:** There is no history of backlash against biomass project development in the BDO Zone. In fact, our outreach to local farmers, agronomists, and other local experts in the BDO Zone confirmed that the farm community will support any agriculture-related projects in the region. The only concern raised is the long-term removal of corn stover and its impact on the soil quality. We addressed this concern in our rated quantity by considering 60% of produced corn stover left behind in the field. However, long-term removal of corn stover on an annual basis could raise concern and backlash from the scientific communities and agronomists, given the low corn yield in the region. |
| **Raw Risk Likelihood (RRL)** — **Score** |
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. — **6** |
| **Raw Risk Impact (RRI)** — **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. — **6** |
| **Gross Risk Indicator (GRI)** — **Score** |
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. — **36** |
| **Mitigation/Notching** — **Notch** |
| *RRL Mitigation (Notch)* — **NN** |
| No adjustment. |
| *RRI Mitigation (Notch)* |
| No adjustment. |
| The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** — **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. — **36** |

### *3.8.4 Consent of, and Cooperation with, Indigenous Communities and First Nations*

**Rationale:** Where new project development on or near Indigenous or First Nation land, or where near Indigenous or First Nations exert influence over feedstock producing areas, consent of, and cooperation with, Indigenous communities and First Nations decreases Issuer risk.

**Risk Information:** Most tribal lands are located in the Northeast of Oklahoma. Their total croplands compared to the total croplands in the Supply Zone are very small (<2%). This is a very low risk for any future biomass project.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed very low, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed very low, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100. | **4** |

### *3.8.5 Food Security Concerns*

**Rationale:** Despite the fact that any significant correlation between food prices and biofuel production is unclear, claims that biofuel production has driven up food prices, taken food from communities, or had a negative impact on land use can fuel public backlash. For example, the removal of biomass may raise public concerns relating to food security if Issuer feedstock requires the use of land that would otherwise be used for growing food.

**Risk Information:** Corn stover is a by-product of corn production, and its use does not compete with the food market. Using corn stover for biofuel production instead of corn can help alleviate the food vs. fuel debate.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed very low, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed very low, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100. | **4** |

### *3.9 Risk Factor: Sustainability and Environmental Concern*

#### *3.9.1 Feedstock Sustainability*

**Rationale:** Public concerns about the sustainability of feedstock production can jeopardize biomass feedstock operations. Sustainability certification schemes should be utilized where applicable to ensure that feedstock comes from sustainable sources.

Canada leads all countries with 166 million hectares of certified forests, a figure that is nearly four times more than second-place United States at 47 million hectares.

**Risk Information:** As explained in Section B, we assumed 60% of corn stover is left behind in the field to maintain soil nutrient and organic matters and to mitigate soil erosion.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)** | **Score** |
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

#### *3.9.2 Risk to Soil Quality*

**Rationale:** Soil sustainability can be defined as the management of soil in a way that does not exert any negative or irreparable effects either on the soil itself or any other systems. There is a diversity of approaches to soil sustainability in jurisdictional guidelines for forest biomass harvesting and production. For different feedstock types, there are also different thresholds at which feedstock removal causes significant negative consequences on the soil.

Poor soil quality that negatively impacts the long-term sustainability of the feedstock can entail long-term feedstock risk. Sub-optimal soil management can leave exposed soil post residue-harvest, which can lead to soil wash-off and soil carbon loss from precipitation and wind. Over-harvesting of biomass also depletes the carbon stock in the soil and creates a negative feedback loop that can degrade the soil and its nutrients.

**Risk Information:** As mentioned in the previous risk indicator, we considered 60% of produced corn stover is left behind in the field to maintain soil nutrients and organic matter and to mitigate soil erosion. However, the long-term impact of corn stover removal in the Supply Zone needs to be thoroughly investigated.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)** | **Score** |
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |

| | |
|---|---|
| The Gross Risk Indicator (RRL X RRI) is 24 out of 100. | **24** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100. | **Score**<br>**24** |

### *3.9.3 Risk to Surface and Groundwater*

**Rationale:** Excessive nutrient runoff from biomass feedstock production can accumulate in surface waters and result in algal blooms and hypoxia, which can lead to habitat loss for aquatic species higher up the food chain and alter aquatic ecosystem food webs. Damage to aquatic ecosystems can cause social and regulatory backlash. Water intake issues can also increase risk.

**Risk Information:** There is no risk of nutrient runoff associated with the production and removal of corn stover from corn fields.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *3.9.4 Water Use*

**Rationale:** Biomass feedstock operations can have significant impacts on the hydrological flux (infiltration, groundwater recharge, interception, and transpiration) of ecosystems. This can lead to water shortages, lower yields, and backlash from regulatory bodies if management plans are not properly instituted.

**Risk Information:** Large volumes of water are used in the production of corn grain. However, corn stover is a by-product of grain production, and no additional water is used in the production of corn stover.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed very low, therefore the RRL is 2 out of 10. | **Score**<br>**2** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed very low, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)** | **Score** |

| | |
|---|---|
| The Gross Risk Indicator (RRL X RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100. | **Score**<br>**4** |

### *3.9.5 Pesticide Risk to Human and Ecosystem Health*

**Rationale:** Application of pesticides (i.e., herbicides, fungicides, and insecticides) on agricultural and forest landscapes can result in adverse health effects for humans and ecosystems. If pesticide application is required in feedstock production, the impact must be considered in the BDO Zone rating.

**Risk Information:** No pesticides are used for the production of corn stover.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed very low, therefore the RRL is 2 out of 10. | **Score**<br>**2** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed very low, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100. | **Score**<br>**4** |

### *3.9.6 Risk to Wildlife and Landscape*

**Rationale:** Biomass production and supply chain operations with negative impacts on wildlife and landscape are at a greater long-term risk of encountering project setbacks and disruptions.

**Risk Information:** Removal of a portion of produced corn stover does not impact the wildlife and landscape.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed not relevant, therefore the RRL is not rated (NR). | **Score**<br>**NR** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed not relevant, therefore the RRI is not rated (NR). | **Score**<br>**NR** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is not rated. | **Score**<br>**NR** |
| **Mitigation/Notching**<br>The Total Notch (RRL Notch) X (RRI Notch) is NR (Not Rated). | **Notch**<br>**NR** |
| **Loaded RI Score** | **Score** |

| | |
|---|---|
| The Loaded RI Score ((1-Total Notch) X GRI Score) is not rated. | **NR** |

#### *3.9.7 Biomass Classified as Genetically Modified Organism (GMO)*

**Rationale:** There are various risks associated with GMOs, such as migration or dispersion across the landscape, which can generate community backlash and create supply chain risk. GMOs can also be heavily regulated. If planning to grow or procure GMO feedstocks, especially purpose-grown energy crops, it is important to understand the risks.

**Risk Information:** This risk is irrelevant to corn stover.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)** | **Score** |
| The risk likelihood is deemed not relevant, therefore the RRL is not rated (NR). | **NR** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed not relevant, therefore the RRI is not rated (NR). | **NR** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is not rated. | **NR** |
| **Mitigation/Notching** | **Notch** |
| The Total Notch (RRL Notch) X (RRI Notch) is NR (Not Rated). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is not rated. | **NR** |

## CATEGORY 4.0: FEEDSTOCK SCALE-UP RISK

### *4.1 Risk Factor: Feedstock Scale-Up*

#### *4.1.1 Feedstock Quality at Production Scale*

**Rationale:** The physical and chemical properties of feedstock used in lab, pilot and field testing can fail to be representative of feedstock generated by large-scale operations.

It is important to conduct tests on feedstock representative of that which will be produced by large-scale operations. Failure to adequately test the full range of parameter values can result in severe problems during scale-up.

**Risk Information:** The primary quality parameters of concern for biomass projects are moisture content and ash content. The moisture content of corn stover at the harvest time is relatively low (15%) due to the dry weather conditions at the harvest time. However, ash content is expected to vary from field to field. The introduction of soil contamination during the baling operation is the main concern as it can substantially increase ash content and damage the processing equipment at the biomass facility.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)** | **Score** |
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed very high, therefore the RRI is 10 out of 10. | **10** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 60 out of 100. | **60** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment. | **50%** |
| *RRI Mitigation (Notch)*<br>Soil contamination introduction in corn stover bales can be mitigated by developing best harvest practices protocol for baling, bale collection, and storage operations in collaboration with local farmers and custom | |

| |
|---|
| harvest groups, for example, setting a minimum baler pickup height. This has been done by the industry in other regions. Thus, the risk impact is notched down 50%.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is 50%. |
| **Loaded RI Score** **Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 30 out of 100. **30** |

### *4.1.2 Capacity of Supply Chain Components & Equipment to Scale*

**Rationale:** Scale-up risk increases if supply chain components, or underlying feedstock infrastructure necessary for these components, cannot scale to handle Issuer feedstock requirements and throughput capacity. Capacity to scale should be demonstrated.

**Risk Information:** Due to the limited historical market for corn stover, the current supply chain capacity is likely not sufficient to handle the rated quantity in the short term. However, some crop growers have experience with harvesting and collection of hay and corn stover. We expect the future biomass project would be able to scale up the existing corn stover supply chain after 3-5 years of the project commissioning, especially that the rated quantity is not as large as the annual demand of previous corn stover projects in the Midwest that needed 300,000-350,000 bdt/yr (>3 times more than the rated quantity).

| |
|---|
| **Raw Risk Likelihood (RRL)** **Score**<br>The risk likelihood is deemed high, therefore the RRL is 8 out of 10. **8** |
| **Raw Risk Impact (RRI)** **Score**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. **4** |
| **Gross Risk Indicator (GRI)** **Score**<br>The Gross Risk Indicator (RRL X RRI) is 32 out of 100. **32** |
| **Mitigation/Notching** **Notch**<br>*RRL Mitigation (Notch)* **NN**<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** **Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 32 out of 100. **32** |

## CATEGORY 5.0: INFRASTRUCTURE RISKS

### *5.1 Risk Factor: Physical Infrastructure*

### *5.1.1 Land Parcel/Industrial District*

**Risk Information**: The Great Plains Industrial Park (GPIP) spans 6,800 acres, is located just 5 miles from Parsons, and is designed to attract new industries. Its zoning for commercial and industrial operations, including provisions for a nuclear power facility, positions it as an optimal site for businesses in emerging and environmentally friendly sectors. The park's infrastructure, coupled with its favorable zoning and local support, creates a conducive ecosystem for new industries. See Sections C and E of this report for additional site information.

| |
|---|
| **Raw Risk Likelihood (RRL)** **Score**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. **4** |
| **Raw Risk Impact (RRI)** **Score**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. **4** |

| Gross Risk Indicator (GRI) | Score |
|---|---|
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | 16 |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>**RRI Mitigation (Notch)**<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | 16 |

### *5.1.2 Ownership of Land*

**Risk Information**: The ownership of the land within the Great Plains Industrial Park (GPIP) by the Great Plains Industrial Development Authority (GPIDA) enhances the land acquisition process for new businesses. As the sole owner, GPIDA has the authority to set rates, contract terms, and restrictions for all leased or sold parcels. This centralized control allows for a streamlined and consistent approach to land transactions, reducing potential complications and ensuring that businesses can secure the property they need with greater ease and reliability.

| Raw Risk Likelihood (RRL) | Score |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | 4 |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | 4 |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | 16 |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | 16 |

### *5.1.3 Permitting Description*

**Risk Information:** Permitting is efficiently managed by the City of Parsons and Labette County, providing a predictable process. Rights-of-way and easement management by the Great Plains Industrial Park itself further expedite reviews and any required inspections. The average permitting timeline of just 60 days from application offers a competitive advantage, enabling businesses to commence operations more swiftly than in regions with more complex or extended procedures. This streamlined process is an attractive feature for industries seeking accelerated development timelines.

| Raw Risk Likelihood (RRL) | Score |
|---|---|
| The risk likelihood is deemed very low, therefore the RRL is 2 out of 10. | 2 |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | 2 |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 4 out of 100. | 4 |

| Mitigation/Notching | Notch |
|---|---|
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | NN |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100. | 4 |

### *5.1.4 Environmental Issues*

**Risk Information**: Parsons and the surrounding BDO Zone benefit from a favorable environmental profile and are free from air attainment issues, endangered species concerns, floodplain restrictions, and groundwater limitations. This absence of environmental constraints allows for project development with minimal risk of regulatory delays or added compliance costs for companies seeking efficient project timelines that support a streamlined development process.

| Raw Risk Likelihood (RRL) | Score |
|---|---|
| The risk likelihood is deemed very low, therefore the RRL is 2 out of 10. | 2 |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed very low, therefore the RRI is 2 out of 10. | 2 |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 4 out of 100. | 4 |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | NN |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100. | 4 |

## *5.2 Risk Factor: Utilities*

### *5.2.1 Natural Gas Availability*

**Risk Information**: The lack of natural gas infrastructure at the Great Plains Industrial Park (GPIP) poses a moderate risk for prospective tenants, particularly in projects that require natural gas for essential processes. Currently, businesses must depend on propane, which is likely less efficient and more costly than natural gas.

Kansas Gas Services has pledged to install a 12" pipeline extension from the Southern Star pipeline, contingent on adequate customer demand to support the investment. However, the timing of this development remains uncertain, potentially delaying operations for businesses reliant on natural gas. Although expedited permitting could accelerate pipeline installation, the current absence of natural gas may deter some industries from locating in the GPIP or necessitate interim energy solutions, impacting their operational timelines and capacity plans.

| Raw Risk Likelihood (RRL) | Score |
|---|---|
| The risk likelihood is deemed high, therefore the RRL is 8 out of 10. | 8 |
| **Raw Risk Impact (RRI)** | **Score** |

| | |
|---|---|
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 48 out of 100. | **Score**<br>**48** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 48 out of 100. | **Score**<br>**48** |

### *5.2.2 Electric Availability*

**Risk Information:** The electrical infrastructure serving Parsons and the Great Plains Industrial Park (GPIP) poses a low risk to prospective businesses. Evergy Kansas Central Inc., a well-established utility in the state, provides reliable power to GPIP, with plans to more than triple the area's capacity to 25 MW by 2026. This planned expansion underscores a proactive commitment to supporting future industrial growth. Additionally, Evergy's electric rates in Kansas are nearly 20% below the national average for both residential and industrial customers, offering a significant cost advantage. There will still be substations and distribution lines to be installed, but the combination of dependable service, anticipated capacity growth, and favorable pricing makes electrical infrastructure a low risk to new industries.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *5.2.3 Water Availability*

**Risk Information**: The Great Plains Development Authority's management of water and wastewater services at the industrial park represents a significant advantage for prospective businesses. With water sourced from the Neosho River under long-term rights, the industrial park offers a stable and reliable water supply, free from groundwater dependency. This independence allows the Authority to maintain competitive pricing, reducing costs for companies operating within the park. Additionally, the on-site water purification facility ensures water quality meets industrial standards, enhancing suitability for a broad range of operations. The park's self-sufficiency in water services strengthens its appeal as a cost-effective and dependable location for industrial development.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *5.2.4 Waste Disposal*

**Risk Information**: See 5.2.3 above. The Great Plains Industrial Park's wastewater and sewer services are managed by the Park Authority, with sufficient capacity available to support both current and future industrial tenants through its existing filtration systems. Solid waste disposal is handled at the Labette County landfill, located just two miles west of the GPIP, ensuring convenient and efficient waste management.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *5.2.5 Internet Availability*

**Risk Information**: Telecommunications in the Great Plains/Parsons region, supported by AT&T, offer robust, reliable fiber and wireless networks with high-speed internet access. Competitive pricing for both industrial and residential users enhance the region's attractiveness and presents a low risk for developers and new industries.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. | **Score**<br>**4** |

| **Gross Risk Indicator (GRI)** | **Score** |
|---|---|
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

## *5.3 Risk Factor: Transportation/Logistics*

### *5.3.1 Road/Highway Access*

**Risk Information**: Parsons' strategic location at the intersection of State Highways 59 and 400, just 50 miles from Interstates I-44 and I-49, offers a logistical advantage for industries. This proximity to major transportation routes enables efficient access to commercial centers such as Kansas City, Tulsa, and Little Rock. Parsons' central position allows reduced shipping times and costs.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

### *5.3.2 Rail Access*

**Risk Information:** The Union Pacific Railroad (UPRR) presence within the Industrial Park offers a logistics advantage, as illustrated in Figure E-4. UPRR's infrastructure, which bisects the park and includes multiple spurs and connection lines, enables the transport of various cargo types, including liquid, flatbed, and container cars. This established rail access facilitates connections to national markets and increases the park's value for industrial development.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed very low, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed very low, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 4 out of 100. | **4** |

| Mitigation/Notching | Notch |
|---|---|
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100. | **4** |

### *5.3.3 Airport Access*

**Risk Information**: The proximity of Tri-City Airport and Joplin Regional Airport offers significant aviation support to the Parsons area and the Great Plains Industrial Park (GPIP). Tri-City Airport, located 17 miles from GPIP, features a 5,000-foot runway capable of accommodating medium-sized private jets and provides full ground services. Joplin Regional Airport, 50 miles southeast, offers daily flights to major hubs such as Denver and Chicago via United's SkyWest and is equipped to handle both passenger and freight traffic, with connections to domestic and international markets.

| Raw Risk Likelihood (RRL) | Score |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

### *5.3.4 Water Freight Access*

**Risk Information**: This item is not rated for Parsons, KS.

| Raw Risk Likelihood (RRL) | Score |
|---|---|
| The risk likelihood is deemed not relevant, therefore the RRL is not rated (NR). | **NR** |
| Raw Risk Impact (RRI) | **Score** |
| The risk impact is deemed not relevant, therefore the RRI is not rated (NR). | **NR** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is not rated. | **NR** |
| **Mitigation/Notching** | **Notch** |
| The Total Notch (RRL Notch) X (RRI Notch) is NR (Not Rated). | **NR** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is not rated. | **NR** |

## *5.4 Risk Factor: Social Infrastructure*

### *5.4.1 Healthcare (Local)*

**Risk Information**: Parsons' robust healthcare infrastructure, highlighted by Labette Health and Katy Memorial Hospital with over 130 beds and a full range of medical and surgical specialties, is a key asset for new industries. Labette County Ambulance further supports the region by providing comprehensive emergency medical and transportation services. This established healthcare system reduces risks for citizens.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| Raw Risk Impact (RRI)<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *5.4.2 Education (Schools)*

**Risk Information:** Parsons District Schools offer a strong educational infrastructure, with a full spectrum of options from elementary through higher education. The area includes four elementary schools, a three-year middle school, and a four-year high school, providing a solid foundation for families. Labette Community College offers accredited two-year programs in vocational, science, agriculture, and healthcare fields, while the Kansas State University Southeast Agricultural Research Center contributes to regional research initiatives. Additional institutions such as Franklin University, Kansas City University, and Ozark Christian College expand higher education opportunities.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *5.4.3 Local Transportation*

**Risk Information**: The public bus service in Parsons may present challenges for new industries, particularly those considering the Great Plains Industrial Park (GPIP). Although Parsons Transportation Express (PTE) offers services such as grocery pick-up, courier, taxi, and after-hours rides, these are limited by the need for advance scheduling. Similarly, while Uber and Lyft are available, they require pre-arrangement, lacking the convenience of a regular transit system. For industries looking to attract workers from surrounding areas, the absence of a public transit network could impact workforce availability and reliability.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **36** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

### *5.4.4 Public Safety (Local)*

**Risk Information:** As of 2023, Parsons' violent crime rate is 35.9,[38] well above the national average of 22.7,[39] encompassing serious offenses such as assault, robbery, and homicide. Property crime is also a concern, with a rate of 63.7, nearly double the national average of 35.4. This high incidence of both violent and property crime presents medium risks to personal and community safety despite local law enforcement efforts. These factors contribute to an unfavorable security outlook for the city, elevating risks for both residents and visitors.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **36** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |

[38] Incidents per 1000 residents
[39] https://www.bestplaces.net/crime/city/kansas/parsons

| | |
|---|---|
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

### *5.4.5 Housing/Cost of Living*

**Risk Information:** Parsons has a BestPlaces Cost of Living score of 66.4 (national average is 100),[40] indicating that the overall cost of housing, food, childcare, transportation, healthcare, taxes, and other necessities is 33.6% lower than the U.S. average but 20.1% higher than the Kansas average. The cost of a typical home in Parsons is 80.5%[41] below the national average and 66.0% lower than the average home price in Kansas. Renting a two-bedroom unit costs $700 per month, 51.0% less than the national average and 38.6% below the state average of $970. The availability of both homes and rental units is sufficient to accommodate potential growth in the area.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)** | **Score** |
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

## *5.5 Risk Factor: Labor*

### *5.5.1 Workforce*

**Risk Information**: Kansas' labor market has experienced a strong recovery since 2021, with the unemployment rate falling from 4.2% in 2021 to 2.7% in 2022,[42] signaling significant improvement. However, the projected slight increase in the unemployment rate to 3.1% in the coming years suggests the market is stabilizing at a more sustainable level. In Labette County, the workforce totals 9,500, with over 85% having at least a primary education and 55% holding a secondary (high school or higher) certification,[43] reflecting a reasonably skilled labor pool.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)** | **Score** |
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)* | **NN** |

[40] https://www.bestplaces.net/cost_of_living/city/kansas/parsons
[41] Ibid.
[42] https://www.dol.ks.gov/labor-market-information/overview
[43] Ibid.

| |
|---|
| No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** — **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. — **16** |

### *5.5.2 Labor Costs*

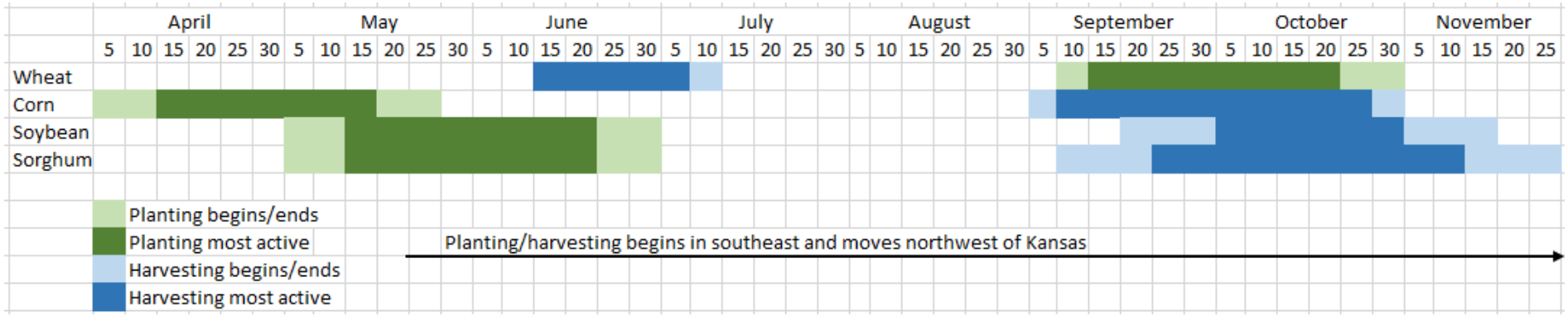
**Risk Information:** Kansas' minimum wage of $7.25 per hour[44] aligns with the federal standard, which has remained unchanged for years. However, the average salary in the Parsons area is significantly higher, at $49,700 annually ($24 per hour),[45] making the region attractive for businesses seeking to recruit employees, particularly in sectors with competitive pay. This disparity between the minimum wage and average earnings offers an advantage to industries looking to attract workers with the potential for above-average compensation.

| |
|---|
| **Raw Risk Likelihood (RRL)** — **Score** |
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. — **4** |
| **Raw Risk Impact (RRI)** — **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. — **4** |
| **Gross Risk Indicator (GRI)** — **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. — **16** |
| **Mitigation/Notching** — **Notch** |
| *RRL Mitigation (Notch)* — **NN**<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** — **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. — **16** |

[44] https://www.dol.gov/agencies/whd/minimum-wage/state
[45] https://www.ziprecruiter.com/Salaries/-in-Parsons,KS#

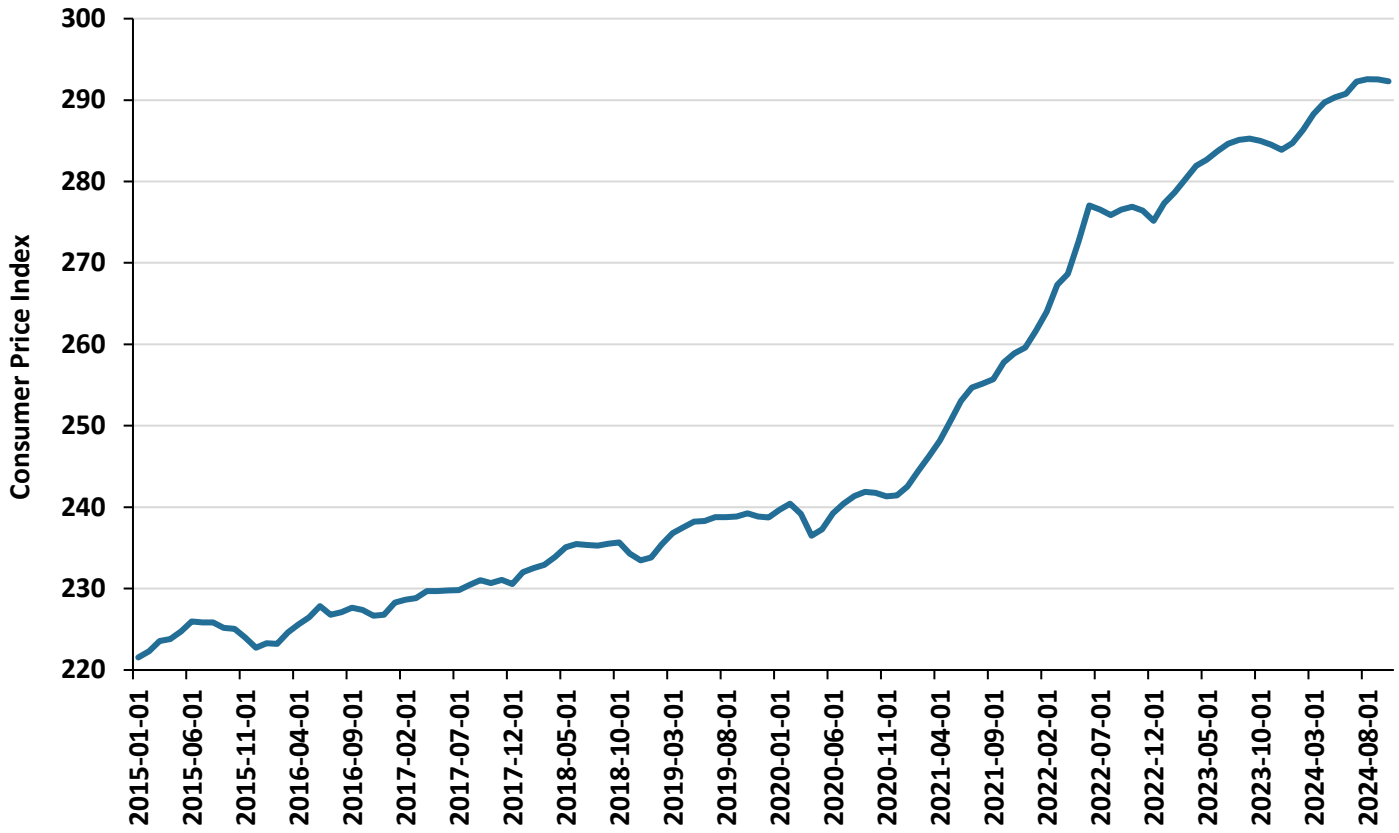
## SECTION E: TABLES AND FIGURES

**Figure E-1. Planting and harvesting schedules of four major crops in Kansas[46]**



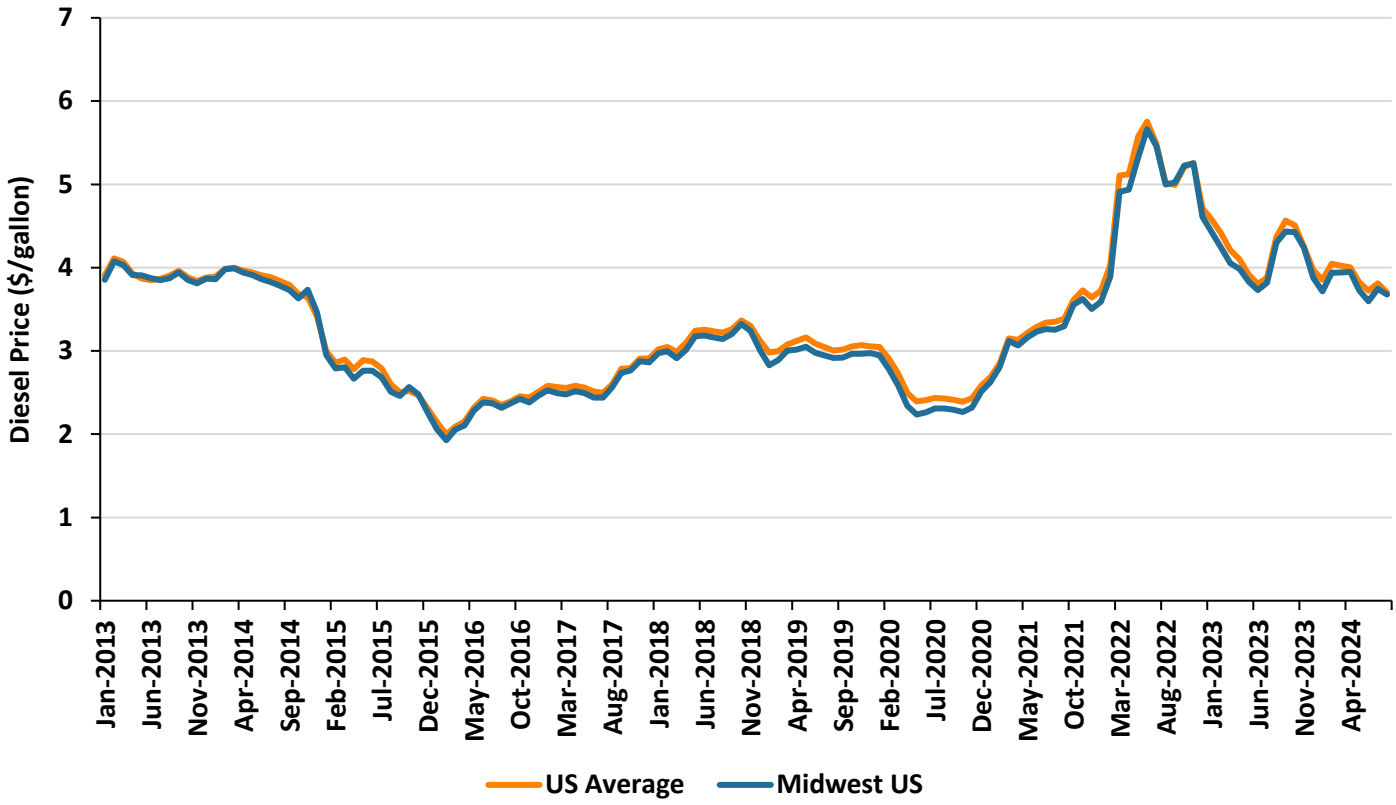

[46] USDA, Field Crops Usual Planting and Harvesting Dates

**Figure E-2. Consumer Price Index- All Items in Midwest, 2015-2024[47]**




[47] US Bureau of Labor Statistics

**Figure E-3. Historical Diesel Price in the US and Midwest US[48]**




[48] US Energy Information Administration: https://www.eia.gov/petroleum/gasdiesel/

**Figure E-4. Great Plains Industrial Park – Parsons, KS**

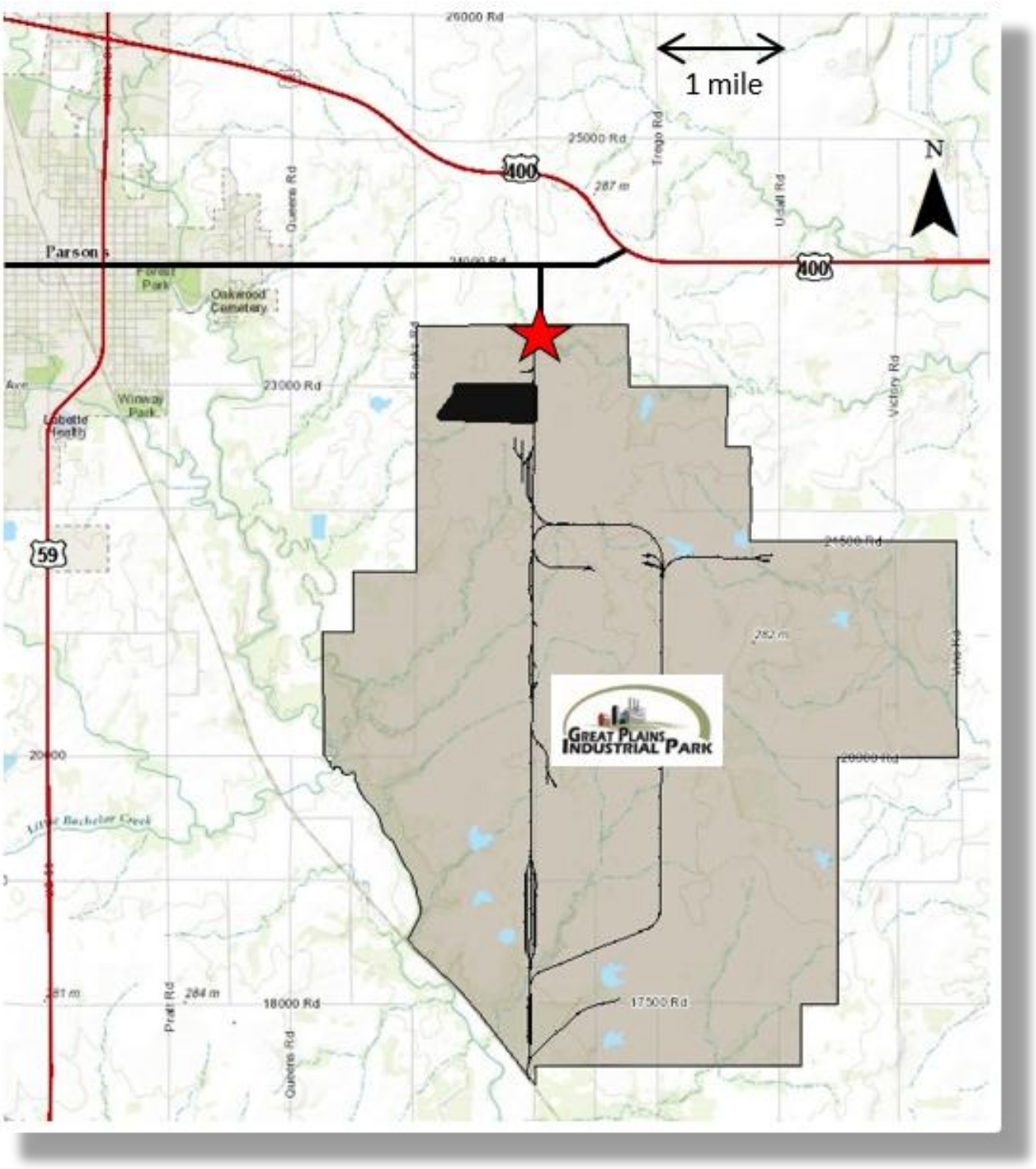
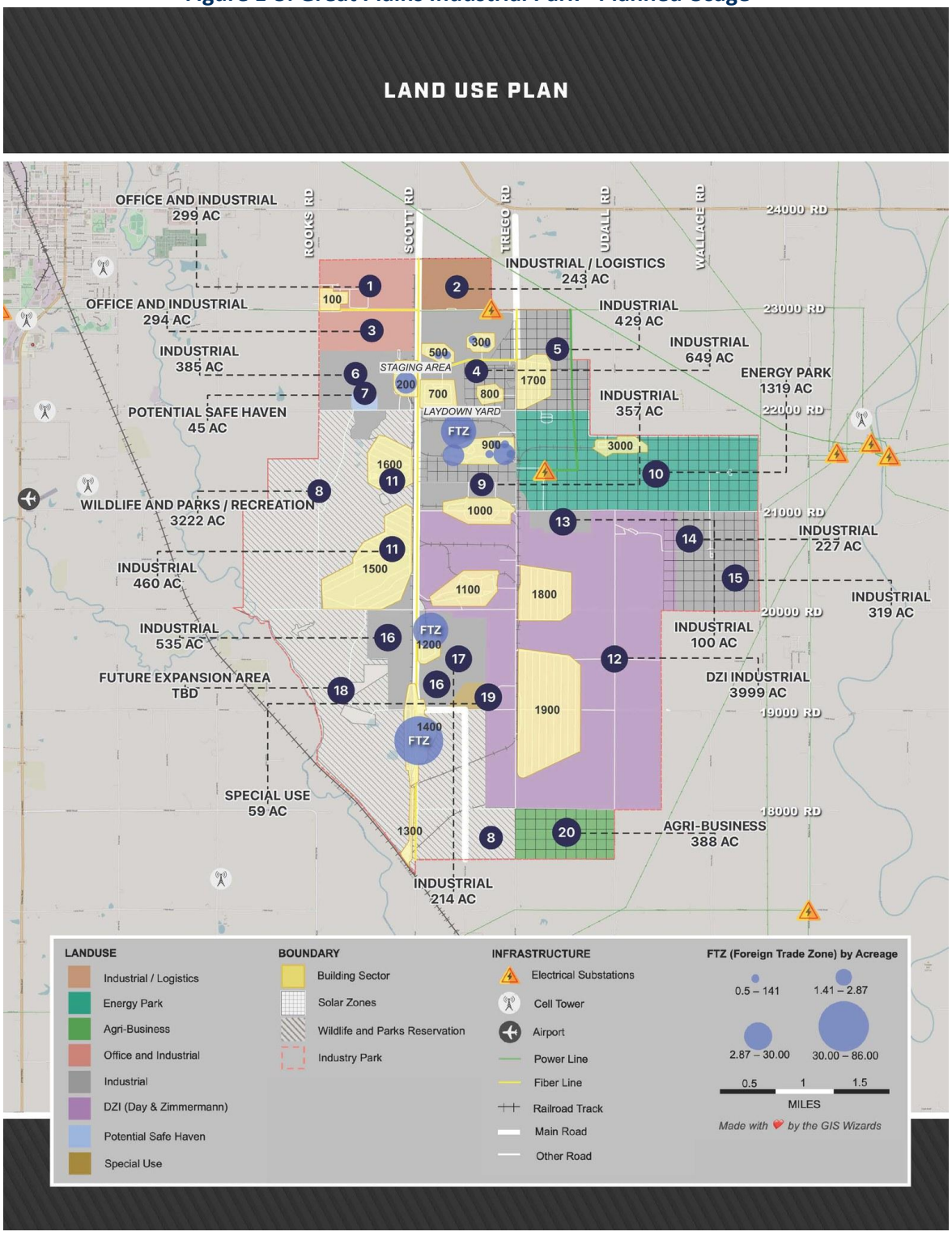


**Figure E-5. Great Plains Industrial Park - Planned Usage[49]**

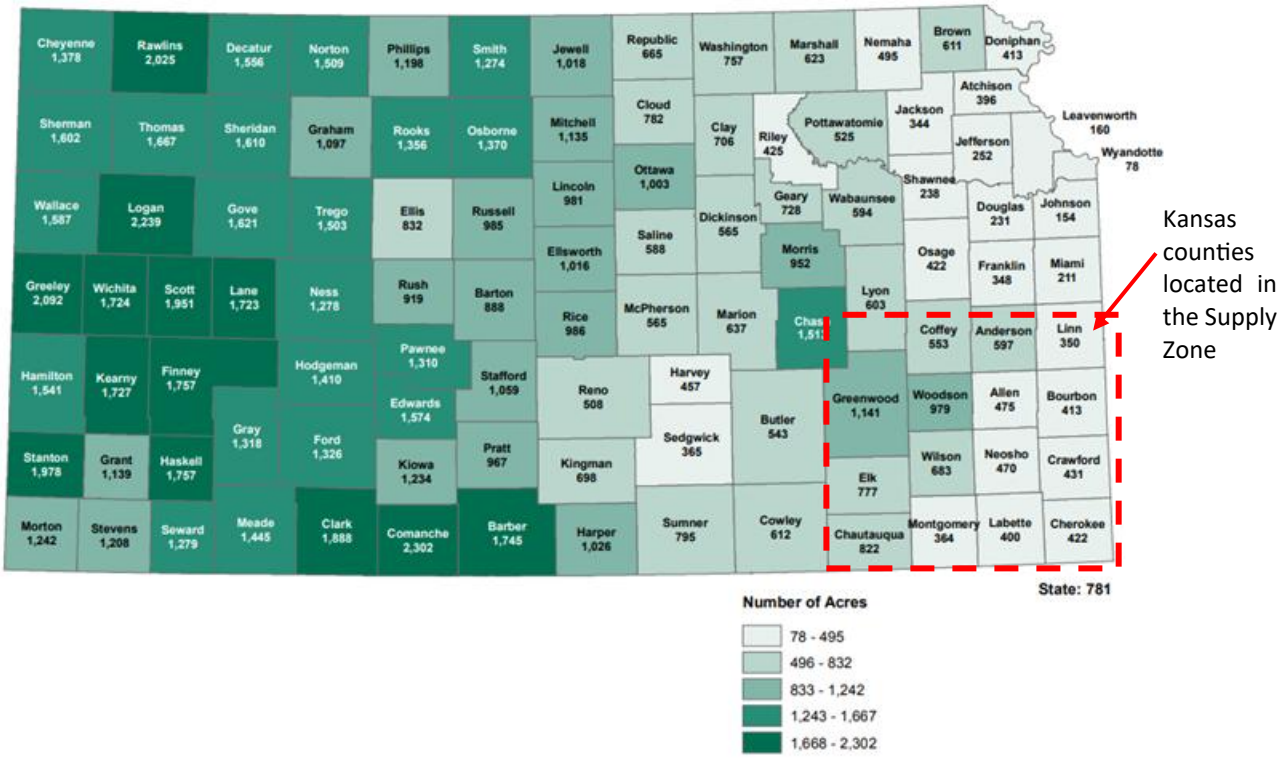



[49] Great Plains Industrial Park

**Figure E-6. Great Plains Industrial Park – Current Landscape**



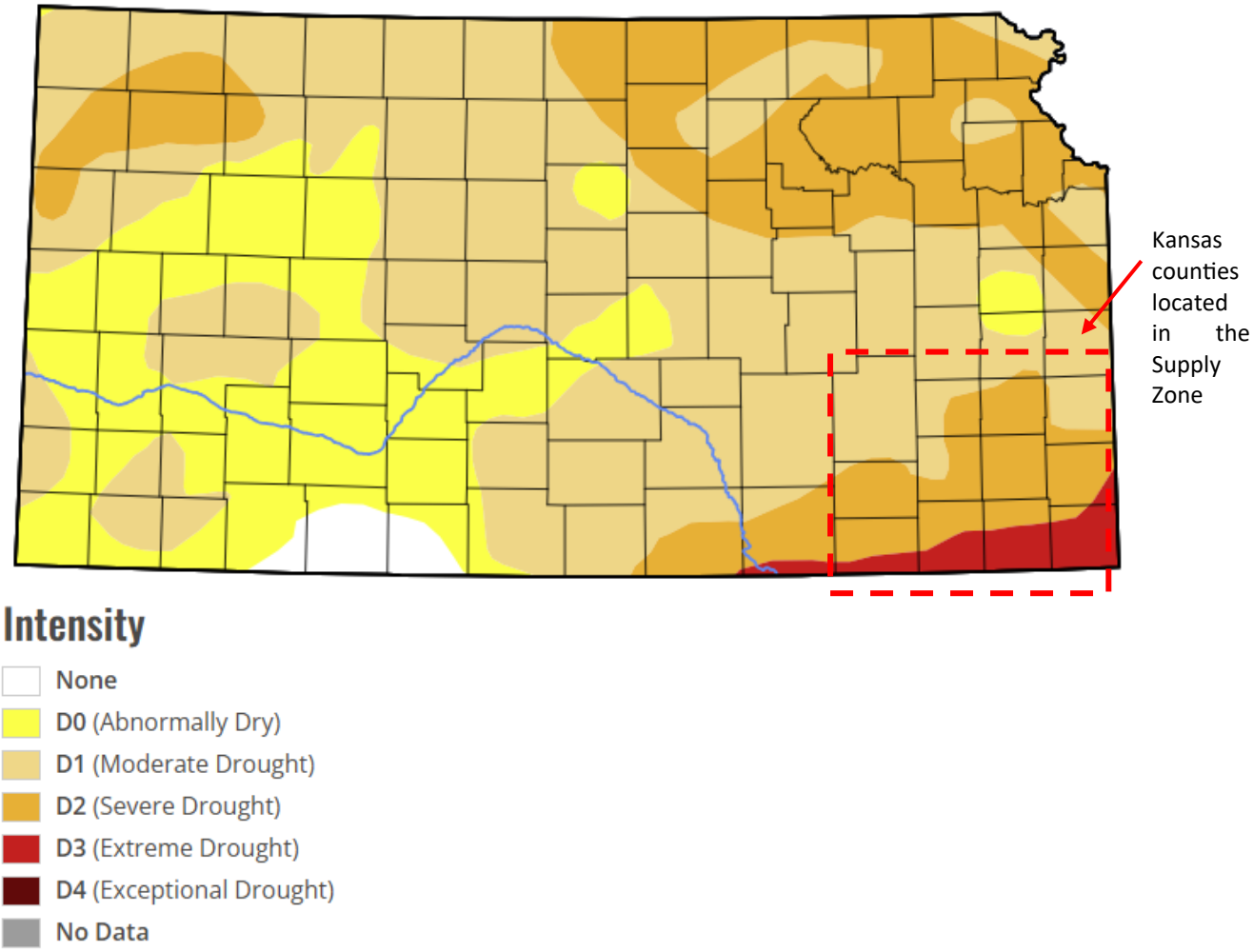
**Map E-1. Average size of farm in Kansas, by county, 2017[50]**




Kansas counties located in the Supply Zone

[50] Institute for Policy & Social Research, The University of Kansas. Data from US Department of Agriculture, 2017 Census of Agriculture.

**Map E-2. US Drought Monitor- Kansas, 2024[51]**




[51] U.S. Drought Monitor, 2024

## SECTION F: LEGAL DISCLAIMER

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