ESTERHAZY, SK

Biofuel Development Opportunity Zone

RATING GRADE: 'A'

Date of Issue: June 25, 2024

A
High Quality

Rating Parameters:

Category	Rated Quantity	Delivered Price	BDO Zone Size
Flax Straw	**31,700 bdt/yr**	**$64-$76/bdt**	**150-km drive distance from Esterhazy, SK**

BDO ZONE ASSETS

- Producers' strong interest to participate and supply a flax straw project.
- No flax straw competition in the BDO Zone.
- Existing harvesting, collection, and transportation equipment can support rated quantity without scale-up.
- Positively rated infrastructure asset profile highlighted by public safety, healthcare, and land ownership.

BDO ZONE LIABILITIES

- 60% of the available flax straw located more than 100 km outside of Esterhazy, resulting in sensitivity to the fuel cost for transportation.
- Year-to-year variability of flax production can pose medium-high risk to supply security.
- Occurrence of floods and drought can significantly affect flax straw production and logistics.
- Presence of world's largest potash operation in Esterhazy places upward pressure on local wages and reduces amount of skilled and semi-skilled labour available.

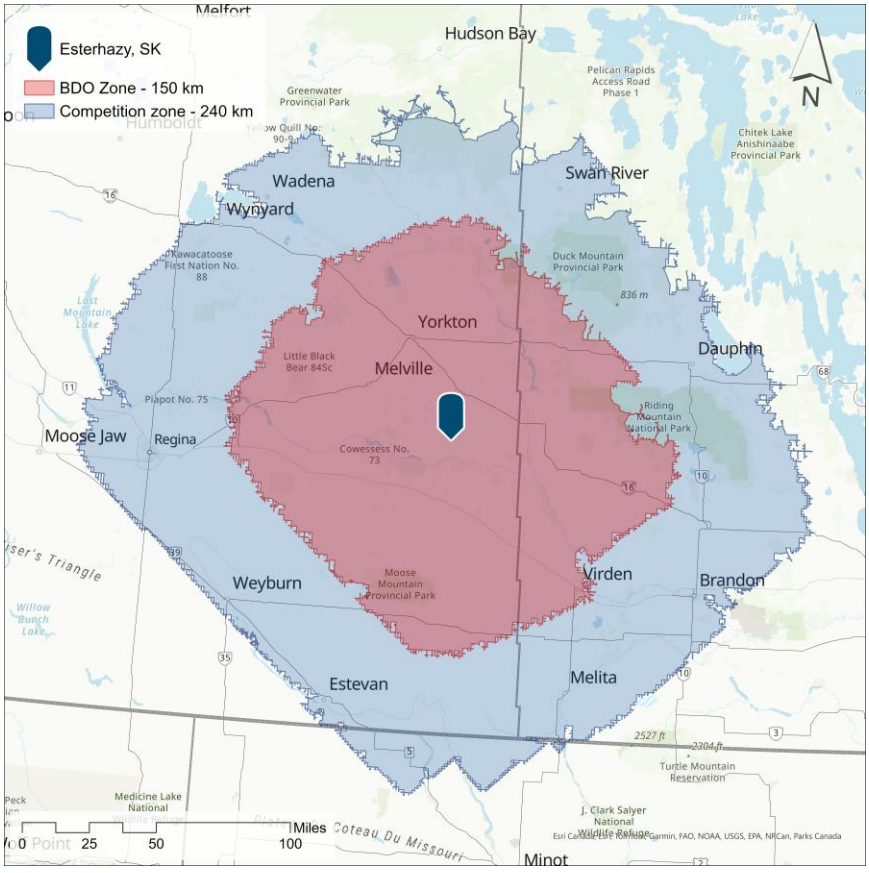
RATING GRADE

The Esterhazy, SK, Biofuel Development Opportunity Zone, is rated 'A', or 'low' 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).

'A' ratings denote high prospective viability of Feedstock Supply and Infrastructure and low expectations of default risk in the Zone. The capacity to support new biobased plant operations is considered strong. This capacity may, nevertheless, be more vulnerable to adverse weather conditions, relatively long straw bale transportation, and competition from other industries for affordable and skillful labour.

ESTERHAZY, SASKATCHEWAN BDO ZONE



BD OZ THE BIOFUEL DEVELOPMENT OPPORTUNITY ZONE INITIATIVE

ANALYST NOTES

In this risk rating assessment, we determined the availability and pricing of flax straw as a feedstock for future biomass projects for the Esterhazy BDO Zone, defined by a 150-km drive distance from the Town of Esterhazy, SK. The estimated rated quantity for future biomass projects is the low-risk quantity after considering current 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.

The average yearly production of flax straw in the BDO Zone was calculated based on the historical production of flaxseed in the BDO Zone over the period of 2013-2022. Subsequently, adjustments were made to account for factors such as harvest equipment efficiency, producer participation rate, and redundancy considerations. We ultimately concluded that a new project in Esterhazy could have access to 31,700 bdt/yr of flax straw at a low risk and a delivered price range of $64-$76 per bdt or $32-$38 per bale.

In addition to the rated quantity and pricing, the Esterhazy BDO Zone's suitability to accommodate future biomass projects was assessed against 10 supplier risks, 10 competition risks, 46 supply chain risks, 2 feedstock scale-up risks, and 20 infrastructure risks. We identified 8 high-risk and 23 medium-risk indicators mainly related to weather conditions and supply chain, particularly risks affecting flax yield and production and harvest equipment efficiency. The other risk indicators (57) are low/very low risks that can be considered BDO Zone assets. Most low-risk indicators are associated with stable farming practices, a lack of competition in the BDO Zone, and an established infrastructure. A summary of main assets (very low/low risks) and liability (medium/high risks) are discussed in the following sections.

BDO ZONE ASSETS

Farmers in the BDO Zone have been growing flax since the turn of the 19th century and have a long, multi-generational history of flax production. Based on outreach conducted, there is a strong desire for growers to participate in a flax straw project as they currently view dealing with the flax straw as problematic. Furthermore, we feel that a stable market for flax straw within the BDO Zone will have a positive influence on the amount of flax planted acres and, consequently, the supply of flax straw. Growers' reluctance to include flax in their crop rotation has, in part, been due to the management of flax straw. Offering growers a market for the straw effectively helps remove this barrier.

The predominant practice within the BDO Zone involves bundling and burning flax straw to address its impracticalities for use in agricultural operations. Considering the physical characteristics of flax straw, it is highly improbable that its utilization for crop cover, animal feed, and bedding will witness significant growth in the future.

Large flax straw purchasers and processors have not historically existed in the area. While smaller processors such as Schweitzer-Mauduit Canada Inc. and Ecusta Fibres Ltd. have existed in the past, none of them are currently in business.

Given the relatively small rated quantity of flax straw (31,700 bdt/yr), sufficient harvesting, baling, and transportation equipment are available within the BDO Zone. Furthermore, risks related to scale-up are significantly reduced.

BDO ZONE LIABILITIES

In the BDO Zone, approximately 40% (23,000 bdt/yr) of flax straw production is accessible within 100 km of Esterhazy at an average transportation cost of $36.00 per bdt. This transportation cost accounts for 47-56% of the total delivered price of flax straw. As most flax straw lies beyond the 100 km threshold, the supply chain faces increased susceptibility to risks such as fuel cost. Significant cost reductions could be achieved by sourcing most flax straw within 100 km if enough quantity is available in a year.

Flax straw availability can be adversely affected by weather events like drought and prolonged rainfall during harvest year-to-year. This can lead to reduced production due to wet conditions hampering combine navigation. Excessive rainfall can shorten the harvesting window and decrease growers' motivation to prioritize flax straw harvesting. Dry weather will impact the crop and straw

yield. Recurrent droughts have caused shortened harvesting periods and negatively affected crop yields. Planning for onsite inventory capacity can help alleviate risks associated with fluctuations in flax straw availability.

The BDO Zone has been susceptible to flooding, causing cropland loss and affecting crop yields, road infrastructure, and soil quality, particularly before 2017. Climate change is expected to worsen these risks, potentially intensifying flooding and erosion. A regional flood recovery centre has been established in Esterhazy to address this risk, but the risk remains high to moderate. Flax straw inventory must be built up at storage yards where the flood risk is low to mitigate the risks associated with flooding and droughts. Understanding the historical and potential future impacts of flooding and drought can help prepare and implement strategies to ensure a more stable flax straw supply in the BDO Zone.

In Esterhazy, the low unemployment rate of 3.1%, 48% lower than the national rate, reflects strong competition for skilled and semi-skilled positions, mainly from Mosaic's potash mining operations (the largest in the world). These mines offer above-average pay and benefits, drawing a significant portion of the local workforce and driving up local wages. The average hourly wage in Esterhazy reached $26.32 as of March 2024 despite Saskatchewan's minimum wage of $14.00 per hour.

INFRASTRUCTURE PROFILE

Esterhazy, Saskatchewan, stands out for its thriving industrial and agricultural community and readily available primary utilities, making it particularly advantageous for new bio-based projects, especially in industrial zones. Despite relatively low housing costs, there may be regional accessibility limitations. The local labour market is highly competitive, particularly around Mosaic's potash mines, resulting in higher average wage rates compared to other regions in the province. This competitiveness can pose challenges in securing employment but also positively impacts the economic vitality of the area.

The community has a well-developed healthcare infrastructure and a low crime rate, enhancing its attractiveness for potential industrial investments. Critical thoroughfares support efficient logistics for transporting products and services, benefiting businesses in the expanding bio-economy industry. Esterhazy's robust infrastructure and favourable business environment indicate strong potential for continued growth and development.

SCORING & RATING METHODOLOGY

In assessing the biomass supply chain risk for the Biofuel Development Opportunity (BDO) Zone, 88 Risk Indicators from the Canadian 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.

Feedstock quantities are expressed in bone dry tonnes per year (bdt/yr), while feedstock costs are expressed in Canadian dollars (CAD). Maximum transport distance is based on a 150-km driving distance from the centre point (Esterhazy, SK).

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 Esterhazy, SK, is ***19.61 out of 100, resulting in an 'A' designation.***

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

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SECTION A: RISK INDICATOR SUMMARY

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

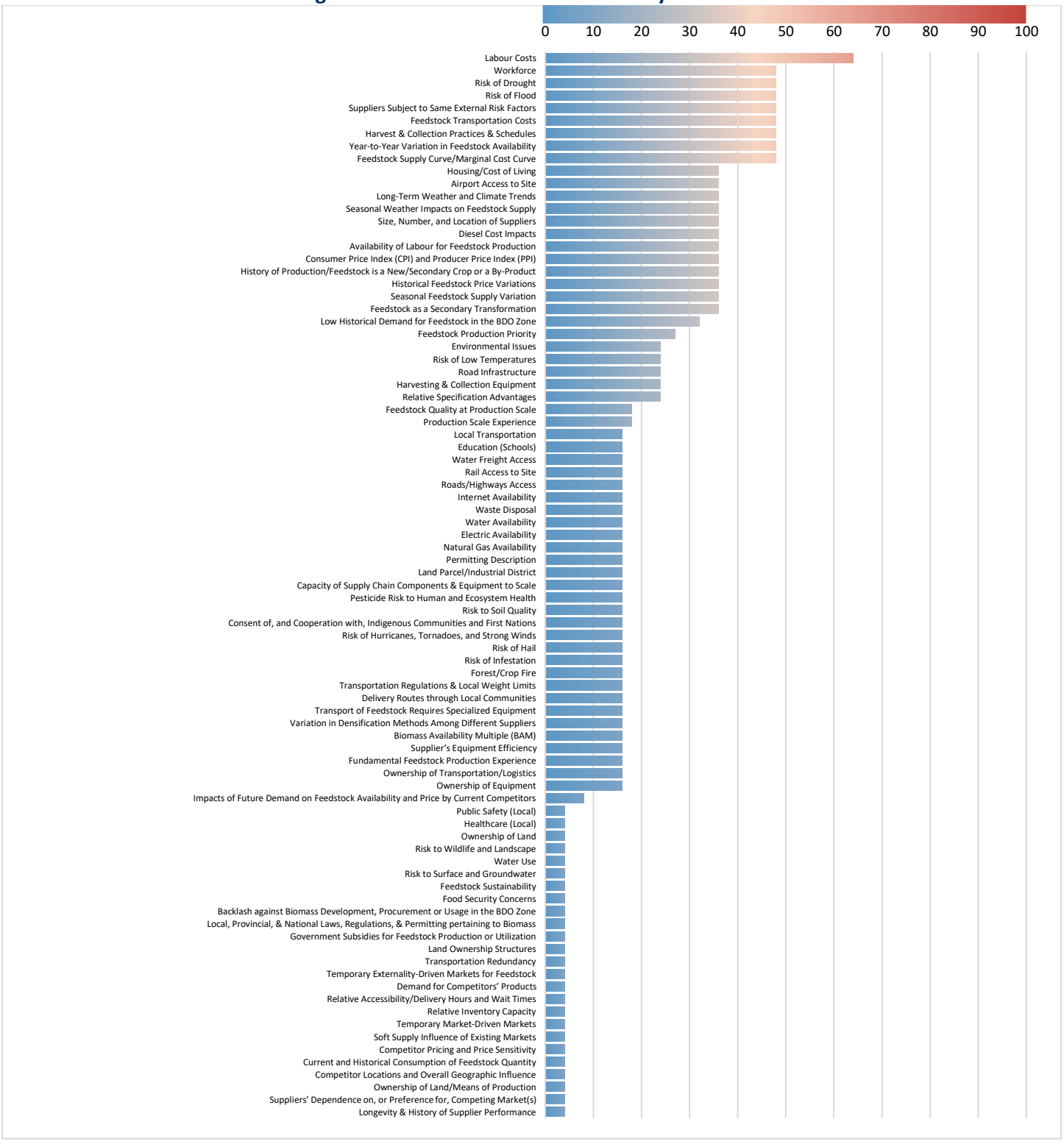


Table A-1. Risk Indicators and Associated Scores

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)	2	2	4	NN	4
1.3 Risk Factor: Supplier Control Over Production and Transportation					
1.3.1 Ownership of Land/Means of Production	2	2	4	NN	4
1.3.2 Ownership of Equipment	4	4	16	NN	16
1.3.3 Ownership of Transportation/Logistics	4	4	16	NN	16
1.3.4 Feedstock as a Secondary Transformation	6	6	36	NN	36
1.4 Risk Factor: Supplier Experience					
1.4.1 Fundamental Feedstock Production Experience	4	4	16	NN	16
1.4.2 Production Scale Experience	6	6	36	50%	18
1.5 Risk Factor: Supplier Harvesting/Collection/Processing Capacity					
1.5.1 Supplier's Equipment Efficiency	4	4	16	NN	16
1.6 Risk Factor: Supplier Motivation					
1.6.1 Feedstock Production Priority	6	6	36	25%	27
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	2	2	4	NN	4
2.1.2 Current and Historical Consumption of Feedstock Quantity	2	2	4	NN	4
2.1.3 Competitor Pricing and Price Sensitivity	2	2	4	NN	4
2.1.4 Impacts of Future Demand on Feedstock Availability and Price by Current Competitors	2	4	8	NN	8
2.1.5 Soft Supply Influence of Existing Markets	2	2	4	NN	4
2.1.6 Temporary Market-Driven Markets	2	2	4	NN	4
2.2 Risk Factor: Specific Competitors' Competitive Advantage					
2.2.1 Relative Inventory Capacity	2	2	4	NN	4
2.2.2 Relative Accessibility/Delivery Hours and Wait Times	2	2	4	NN	4
2.2.3 Relative Specification Advantages	4	6	24	NN	24
2.2.4 Demand for Competitors' Products	2	2	4	NN	4
Category 3.0: Supply Chain Risk					
3.1 Risk Factor: Feedstock Availability					
3.1.1 Biomass Availability Multiple (BAM)	4	4	16	NN	16
3.1.2 Feedstock Supply Curve/Marginal Cost Curve	6	8	48	NN	48
3.1.3 Seasonal Feedstock Supply Variation	6	6	36	NN	36
3.1.4 Year-to-Year Variation in Feedstock Availability	8	8	64	25%	48
3.2 Risk Factor: Historical Issues					
3.2.1 Historical Feedstock Price Variations	6	6	36	NN	36
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	6	36	NN	36
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	2	2	4	NN	4
3.4 Risk Factor: Risks Related to Feedstock Production, Harvest, and Collection					
3.4.1 Harvest & Collection Practices & Schedules	6	8	48	25%	48
3.4.2 Harvesting & Collection Equipment	6	4	24	NN	24
3.4.3 Variation in Densification Methods Among Different Suppliers	4	4	16	NN	16
3.4.4 Availability of Labor for Feedstock Production	6	6	36	NN	36
3.5 Risk Factor: Transportation					
3.5.1 Feedstock Transportation Costs	6	8	48	NN	48
3.5.2 Diesel Cost Impacts	6	6	36	NN	36
3.5.3 Transport of Feedstock Requires Specialized Equipment	4	4	16	NN	16
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	6	24	NN	24
3.5.7 Transportation Redundancy	2	2	4	NN	4
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	8	6	48	NN	48
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	6	36	NN	36
3.7.2 Long-Term Weather and Climate Trends	6	6	36	NN	36
3.7.3 Forest/Crop Fire	4	4	16	NN	16
3.7.4 Risk of Infestation	4	4	16	NN	16
3.7.5 Risk of Hail	4	4	16	NN	16
3.7.6 Risk of Flood	8	6	48	NN	48
3.7.7 Risk of Drought	8	6	48	NN	48
3.7.8 Risk of Hurricanes, Tornadoes, and Strong Winds	4	4	16	NN	16
3.7.9 Risk of Low Temperatures	4	6	24	NN	24
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	2	2	4	NN	4
3.8.3 Backlash against Biomass Development, Procurement or Usage in the BDO Zone	2	2	4	NN	4
3.8.4 Consent of, and Cooperation with, Indigenous Communities and First Nations	4	4	16	NN	16
3.8.5 Food Security Concerns	2	2	4	NN	4
3.9 Risk Factor: Sustainability and Environmental Concern					
3.9.1 Feedstock Sustainability	2	2	4	NN	4
3.9.2 Risk to Soil Quality	4	4	16	NN	16
3.9.3 Risk to Surface and Groundwater	2	2	4	NN	4
3.9.4 Water Use	2	2	4	NN	4
3.9.5 Pesticide Risk to Human and Ecosystem Health	4	4	16	NN	16
3.9.6 Risk to Wildlife and Landscape	2	2	4	NN	4
3.9.7 Biomass Classified as Genetically Modified Organism (GMO)	NR	NR	NR	NR	NR
Category 4.0: Feedstock Scale-up Risk					
4.1 Risk Factor: Feedstock Scale-Up					
4.1.1 Feedstock Quality at Production Scale	6	6	36	50%	18
4.1.2 Capacity of Supply Chain Components & Equipment to Scale	4	4	16	NN	16
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	2	2	4	NN	4
5.1.3 Permitting Description	4	4	16	NN	16
5.1.4 Environmental Issues	4	6	24	NN	24
5.2 Risk Factor: Utilities					
5.2.1 Natural Gas Availability	4	4	16	NN	16
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	4	4	16	NN	16
5.3.3 Airport Access to Site	6	6	36	NN	36
5.3.4 Water Freight Access	4	4	16	NN	16
5.4 Risk Factor: Social Infrastructure					
5.4.1 Healthcare (Local)	2	2	4	NN	4
5.4.2 Education (Schools)	4	4	16	NN	16
5.4.3 Local Transportation	4	4	16	NN	16
5.4.4 Public Safety (Local)	2	2	4	NN	4
5.4.5 Housing/Cost of Living	6	6	36	NN	36
5.5 Risk Factor: Labour					
5.5.1 Workforce	6	8	48	NN	48
5.5.2 Labour Costs	8	8	64	NN	64
				Average	**19.61**

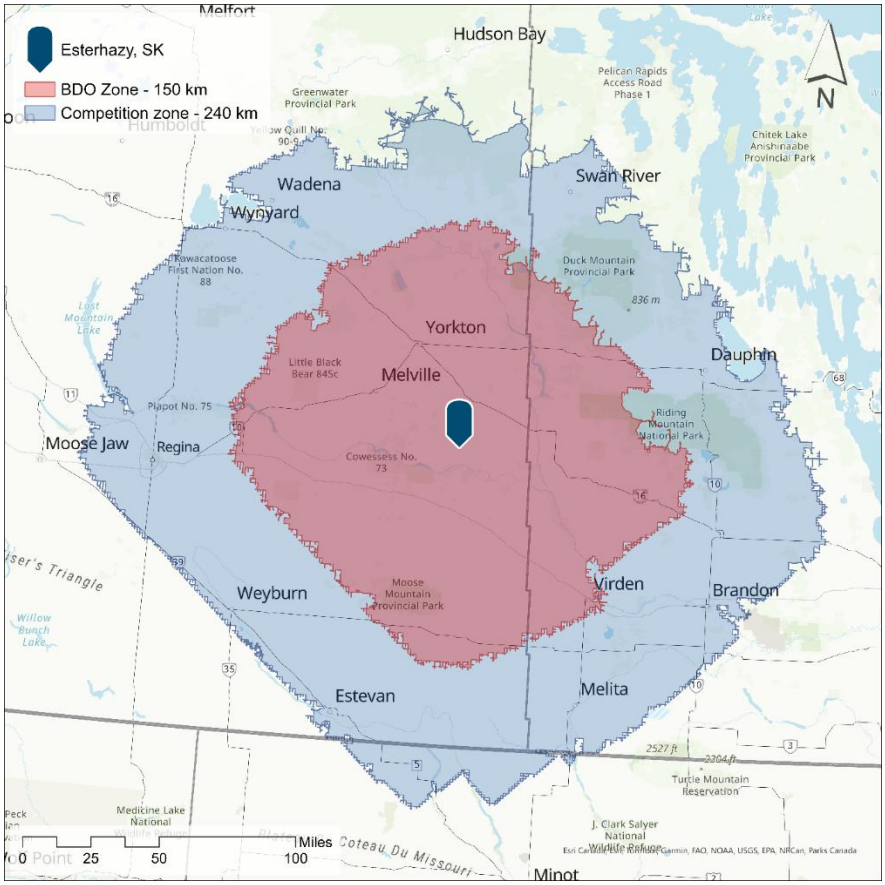
SECTION B: BIOMASS AVAILABILITY AND PRICING

OVERVIEW

This risk rating assessment uses a thorough methodology to estimate the rated quantity and pricing of flax straw within the Esterhazy, Saskatchewan region, as the BDO Zone. The estimated rated quantity is the low-risk quantity after considering current competition, sustainability, supply chain constraints (e.g., farmer participation rate, operational 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.

Our approach begins with estimating the potential quantity of flax straw within the BDO Supply Zone (Map B-1), defined by a 150-km drive distance from the Town of Esterhazy. This estimation is refined by considering the expected demand within the Competition Zone, extending to a 240-km drive distance from Esterhazy. A larger Competition Zone compared to the BDO Zone area is considered to evaluate the potential impact of the existing end users of flax straw outside the BDO Zone on the supply of flax straw inside the BDO Zone. Deductions are applied for sustainable retention, harvesting efficiency, and producer participation rates, ensuring a conservative and low-risk estimate of flax straw availability. Our assessment, incorporating the Biomass Availability Multiple (BAM), considers the redundancy in the flax straw availability to account for uncertainties the future supply and demand dynamics and our data collection and modeling errors in the Esterhazy region.

Map B-1. Map of BDO Zone and Competition Zone with Esterhazy as the centre point



The BAM factor plays a crucial role in our assessment, as it allows us to provide a more realistic understanding of the quantity of flax straw available for new projects in Esterhazy. By factoring in the BAM, we can present a clearer picture of the actual procurement potential, enabling the project developers to make informed decisions. In addition to the BAM, our pricing analysis involves extensive outreach and market analysis within the BDO Zone. This meticulous process establishes a price range associated with the rated quantity of flax straw. This price range reflects the anticipated cost that new bio-projects would likely need to pay to secure the desired quantity of flax straw. By integrating the factors mentioned above and applying a conservative approach, we are confident in our ability to provide a comprehensive understanding of the risks and opportunities associated with flax straw availability and pricing. Our approach enables informed decision-making and empowers project developers to develop effective risk management strategies for new ventures in the Esterhazy region.

EVALUATED FEEDSTOCKS

The evaluated feedstock in this risk rating assessment is flax straw, the by-product of flaxseed production in the BDO Zone, as a feedstock for bioenergy, biofuels and other bio-based products.

SUPPLY ANALYSIS

Saskatchewan dominates Canada's flaxseed production, contributing approximately 85% of the country's output.[1] One in four farms in the province cultivates flax, representing 70% of the country's flax farming.[2] Flax is typically grown using a no-till approach, covering roughly 600,000 hectares yearly as part of crop rotation systems.[3] Saskatchewan's flax farms produce approximately 500,000 tonnes annually, with an average yield of 1.2 tonnes per hectare (19 bushels per acre).[4] This substantial production of flaxseed occurs within a semi-arid continental climate characterized by warm summers and cold winters, with an average of nearly 211 days per year experiencing freezing temperatures.[5]

The Esterhazy BDO Supply Zone is located in the southeastern part of the Province of Saskatchewan, Canada. Esterhazy is the BDO Zone's centre point, located approximately 83 kilometres southeast of Yorkton and 212 km drive distance east of Regina. The BDO Zone has a total area of close to 1.5 million acres (about 600,000 hectares) distributed across five crop districts,[6] four watersheds,[7] and 66 rural municipalities, which include small and rural farming communities. The principal crops produced in the BDO Zone are canola and wheat, with a smaller amount of lentils, oats, barley, and peas cultivated.[8] Flax cultivation in the BDO Zone is relatively limited, accounting for just 4% of the total seeded acres and approximately 2% of the overall crop production.[9] However, within the broader context of Saskatchewan's agricultural sector, the BDO Zone contributes notably to flax cultivation. The Zone's flax production represents 10% of Saskatchewan's overall flax output.[10] This data suggests a moderate level of involvement in flax farming within the BDO Zone relative to the province as a whole.

Flax is commonly integrated into rotations with wheat, canola, and barley, providing farmers with flexibility in their crop planning strategies. It also fits well into farmers' rotations for breaking disease and insect cycles.[11] Agronomic practices are tailored to flax's self-pollinating nature and distinct life cycle, including specific seeding depths and row spacing. Harvesting

[1] https://www.saskflax.com/quadrant/media/Pdfs/Feed/Flax-Feed-Industry-Guide-Final.pdf
[2] Ibid.
[3] https://dashboard.saskatchewan.ca/business-economy/business-industry-trade/crop-production#by-seeded-area-tab
[4] https://exploresaskag.ca/present/field-crops/flax/
[5] https://web.archive.org/web/20090327121655/http://www.on.ec.gc.ca/weather/winners/saskatchewan-e.html
[6] Crop Districts include 1A, 1B, 2B, 5A, and 5B.
[7] Intersecting water sheds include: Upper Souris River, Lower Souris River, Qu'Appelle River, and Assiniboine water shed
[8] https://aitc.sk.ca/Portals/0/INNO/resources/ClassResources/Lesson%202%20-%20Agriculture%20in%20Saskatchewan.pdf
[9] https://pubsaskdev.blob.core.windows.net/pubsask-prod/106829/106829-2017_crop_production_.pdf
[10] Using data based on latest census division production report available)
[11] https://www.saskflax.com/quadrant/media/Pdfs/Feed/Flax-Feed-Industry-Guide-Final.pdf

techniques such as straight combining and swathing aim to maximize seed quality while minimizing damage. Cultivating flax under no-till practice helps enhance soil health and moisture retention and reduce erosion risks.

Flax straw is a byproduct of flax production that has traditionally been discarded by bunching and burning. Flax tends to be less agronomically competitive than other crops, such as canola, making it more of a specialty crop for farmers who often view dealing with the straw as problematic. As no other flax straw markets currently exist, most of it is burned. The prevailing practice within the BDO Zone involves the bundling and burning of flax straw to mitigate its impracticalities in agricultural operations. Several challenges are associated with integrating flax straw into the ground for cover within the BDO Zone and prairies. Primarily, the physical properties of flax straw present obstacles to efficient incorporation. Flax straw's tough, oily nature, coupled with its high linen fibre content, renders it resistant to decomposition, thus impeding its effectiveness as a suitable cover material. Moreover, the coarse and fibrous texture of flax straw makes it ill-suited for cattle feed, as it lacks nutritional value and fails to provide desirable bedding due to its limited absorbent capacity. Furthermore, when applied as bedding, flax straw tends to become slippery and form a matted surface, exacerbating hygiene concerns.[12] As a result, flax straw is a serious residue management issue for flax growers. This is one reason for its relatively low planted areas compared to other oilseed crops, such as canola, despite it being a profitable cash crop.

[12] https://harvest.usask.ca/server/api/core/bitstreams/164eff4d-6c7a-40ae-b126-1d4b6fbe978c/content

Figure B-1. Bundling and burning of flax straw[13]



Given the challenges inherent with flax straw as described above, the utilization of flax straw as a feedstock for biofuel production within the BDO Zone carries notable opportunities due to the lack of current uses for flax straw. Flax growers within the BDO Zone would likely welcome this undertaking. Furthermore, it can potentially encourage farmers growing flax to expand their flax production and incentivize others to begin rotating flax into their existing operations.

[13] https://www.feedipedia.org/node/132 (Credits: David Hill)

Map B-2 shows the spatial distribution of soil types within the Esterhazy BDO Zone. The soil composition, primarily dark grey/grey soil zone, supports flax growth and facilitates diverse agricultural activities. Flax fits into a rotation well in the dark grey/grey soil zones, where moisture is less yield-limiting than in the brown and dark brown soil zones.[14]

Map B-2. Map of soil types in the Esterhazy BDO Zone

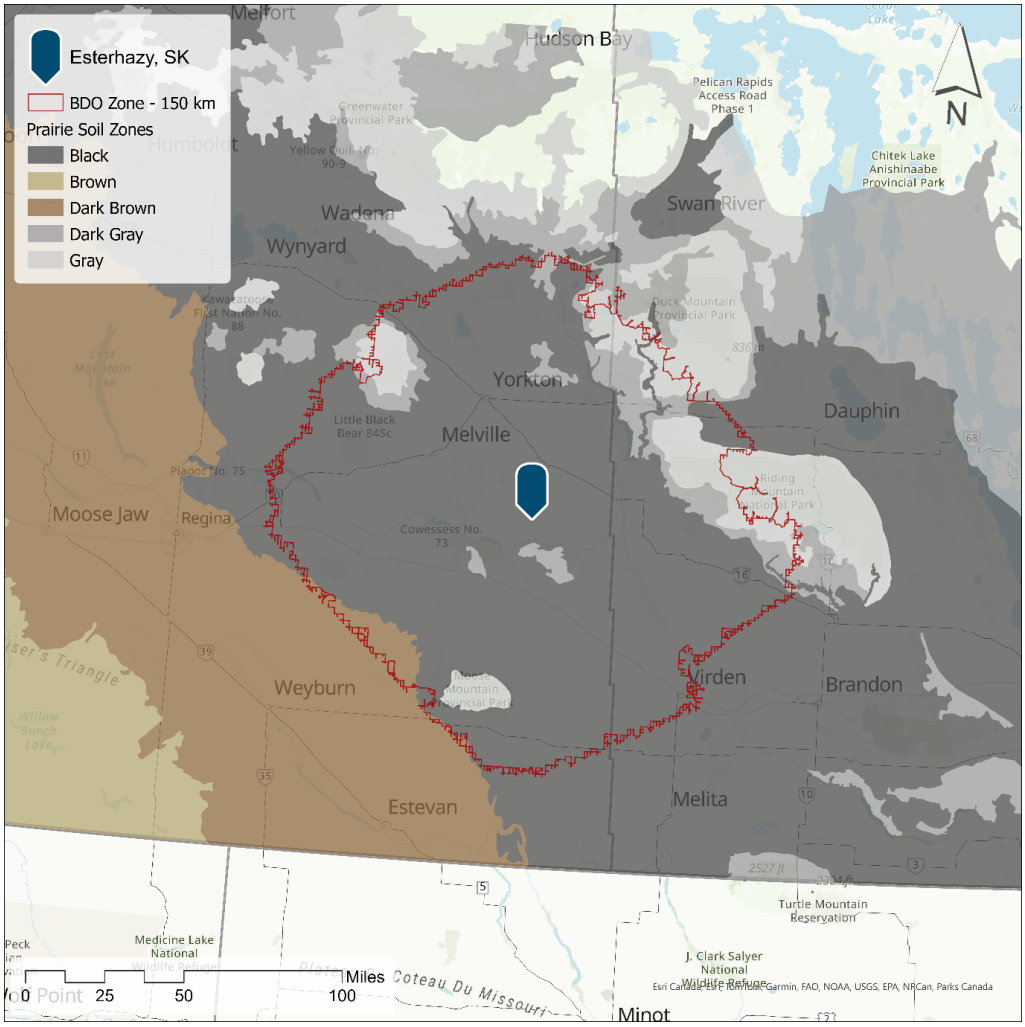
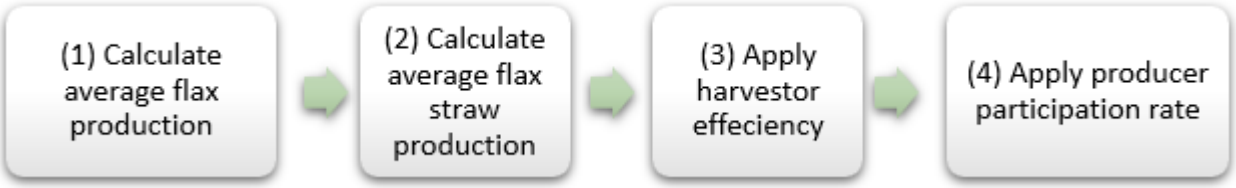


Figure B-2 presents the four-step methodology employed to assess flax straw production in the Esterhazy BDO Zone. It is crucial to note that flax straw lacks nutritional value for use as cattle feed and decomposes slowly, making it suboptimal as cover. Furthermore, processing flax straw is difficult due to the residual fibre left in the field, which causes issues with the planting machines. Farmers can utilize large rotary combines to cut the straw into smaller pieces, so leaving flax straw in the field is less problematic; however, the high capital costs involved for such machines are a challenge for farmers. As a result, as discussed before, flax straw is left in the field, bunched, and subsequently burned. Consequently, our estimation methodology does not account for the sustainable removal of flax straw or its utilization as cattle feed.

[14] https://www.saskflax.com/growing/croprotation.php

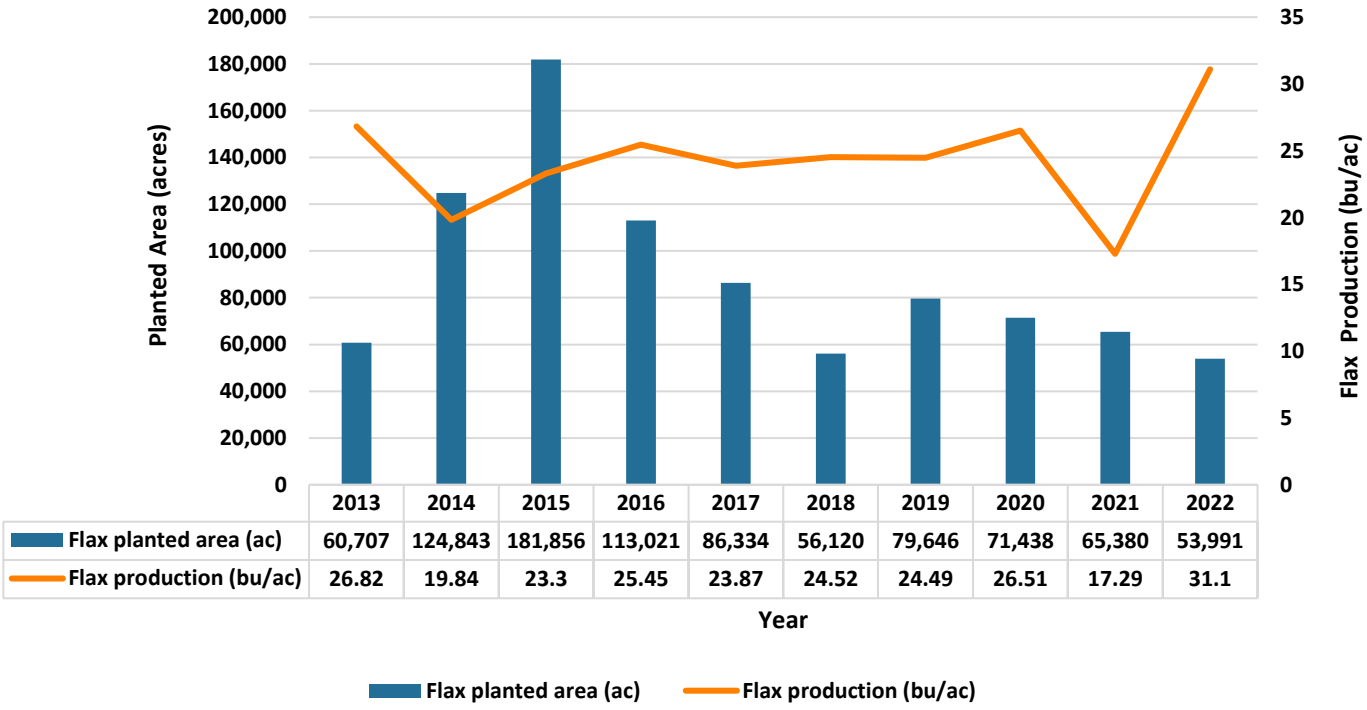
Figure B-2. Flax straw supply estimation methodology



Step 1- *Average Flax Production*

Historical data on flax planted area and yield in the Esterhazy BDO Zone (Figure B-3) were utilized to determine the average planted area and yield. Given the historical planted area and flax yield values, the average annual flax production is estimated to be approximately 55,000 tonnes.[15]

Figure B-3. Historical planted area and flax yield in the Esterhazy BDO Zone, 2013-2022



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Flax planted area (ac)	60,707	124,843	181,856	113,021	86,334	56,120	79,646	71,438	65,380	53,991
Flax production (bu/ac)	26.82	19.84	23.3	25.45	23.87	24.52	24.49	26.51	17.29	31.1

Fluctuations in flax-planted areas are influenced by market prices, weather conditions at the planting and harvesting seasons, and crop rotations. Over time, the planted area for flax within the BDO Zone has steadily decreased, with a notable decline of over 85% from 2015 to 2022. Feedback suggests that this decline is primarily attributed to market cap for flaxseed, competition from other countries, and better pricing and market conditions for other crops like canola, which have outperformed flax from a market development standpoint.

Variable yields and the practice of removing flax straw after harvest have also discouraged growers from cultivating flax. Two significant drops in flax yields occurred in the 2013/2014 and 2020/2021 crop years. In the 2013/2014 crop year,

[15] Figure rounded to nearest 1,000

persistent rainfall during the growing and harvesting seasons led to delays and reduced quality, resulting in lower yields than the previous year. Similarly, in the 2020/2021 crop year, below-average yields were attributed to drought and high temperatures during flowering.[16] Dry soil and cold temperatures posed challenges for weed control and fertilizer applications, further impacting yields. Escalating costs have constrained fall weed control and fertilizer applications, exacerbating the challenges flax growers face.[17] These substantial fluctuations in yield highlight the vulnerability of flax production to weather events, particularly droughts, which can diminish the supply of flax straw. It is noteworthy that such vulnerability is also relevant to other major crops such as canola and wheat and similar drops for these crops have been observed in the 2013/2014 and 2020/2021.

Step 2—The flax straw to grain ratio and flax straw moisture content were applied to estimate the average annual straw production of approximately 58,000 bone-dry tonnes. Due to flax straw's lack of nutritional value, long fibrous nature, and high prussic acid content, its use for animal feed and bedding is limited.[18] As such, reductions for use in cattle feed and bedding were not accounted for in our calculations.

Step 3—Flax straw has slow decomposition and can cause issues with subsequent cultivation operations if left in the field; therefore, it is often burned in the field.[19] As a result, the sustainable straw removal factor is not accounted for when calculating the average annual flax straw availability. However, a harvest efficiency factor of 82% was applied, as in real practice, the entire produced flax straw can not be harvested.

Step 4—A producer participation rate of 80% was justified by the black soil type coverage in the BDO Zone and outreach to local producers and experts. As discussed before, removing flax straw from the field is a complementary activity by farmers as it is currently a burden for them to manage. Therefore, we expect a high farmer participation rate for any project that aims to use flax straw as feedstock. The resulting flax straw availability was estimated to be approximately 38,000 bdt/year.[20] Table B-1 summarizes the final results obtained through the four-step methodology outlined in Figure B-2.

[16] https://www.saskflax.com/quadrant/media/Pdfs/Annual%20Reports/211221%20SaskFlax%20Annual%20Report%20Final.pdf
[17] ibid
[18] https://www.saskatchewan.ca/business/agriculture
[19] https://www.researchgate.net/publication/365007631_
[20] Figure rounded to nearest 1,000

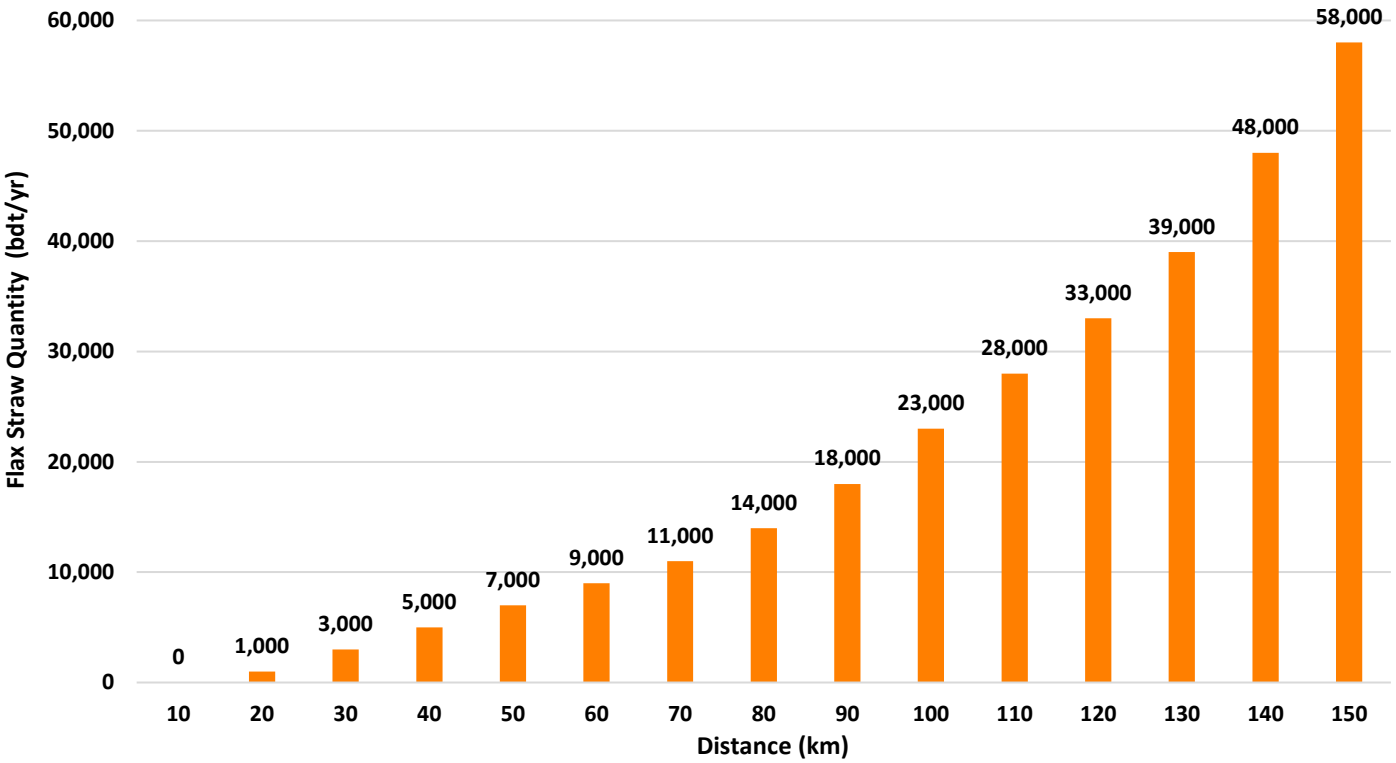
Table B-1. Annual flax straw availability calculation.

Step 1	**Average annual planted area (acres)**[21]	**89,000**
	Average annual flax production (bu/ac)[22,23]	24.26
	Average annual flax production (tonnes/ac)[24]	0.62
	Average annual flax production (tonnes) [25]	**55,000**
Step 2	Flax Straw/Grain Ratio[26]	1.2
	Average flax straw moisture content (wet basis)[27]	13%
	Average annual flax straw production (bdt)[28]	**58,000**
Step 3	Harvester efficiency (%)	82%
	Sustainably removed quantity (bdt)[29]	**48,000**
Step 4	Producer Participation (%)	80%
	Annual flax straw availability (bdt)[30]	**38,000**

A supply curve was developed to represent the total quantity of flax straw available within 10-mile increments from Esterhazy, SK, to gain a clearer insight into the availability of flax straw within a 150-km driving distance (Figure B-4). The graph reveals that roughly 55 percent of the flax straw quantity is within a 150 km driving distance from Esterhazy, SK.

[21] Rounded to nearest 1,000
[22] https://dashboard.saskatchewan.ca/agriculture/rm-yields/rm-yields-data
[23] Data averaged for each year 2014 - 2023 based on crop district identifier (RM)
[24] 1 ha = 2.471 acres; 1 bushel of wheat = 36.744 tonnes.
[25] Rounded to nearest 1,000
[26] www.saskatchewan.ca/business/agriculture-natural-resources-.
[27] https://www.gov.mb.ca/agriculture/farm-management/production-economics/pubs/cop-agrienergy-flax-straw-biomass.pdf
[28] Rounded to nearest 1,000
[29] https://www.researchgate.net/publication/365007631
[30] Rounded to nearest 1,000

Figure B-4. Estimated flax straw quantities by distance from Esterhazy, SK



COMPETITION ANALYSIS

Our literature review and outreach efforts have confirmed that there is no currently established competition for flax straw within the Esterhazy BDO Zone. Recently, a new company based in Regina is pursuing the production of a pellet manufacturing facility in the competition zone and has purchased small quantities of flax straw to validate their technology and market but their timeline for the commercial production of biomass pellets from flax straw is not definite. Thus, it is not considered as an established competitor in this risk rating assessment.

RATED QUANTITIES AND PRICING

Table B-2 illustrates the application of the Biomass Availability Multiple (BAM) to the flax straw estimate derived in Table B-1. The BAM provides a prudent redundancy factor, ensuring investors' confidence in the project-ready estimates' accuracy, credibility, and achievability. A conservative BAM of 1.2 accommodates uncertainties such as data accuracy, readiness for scale-up, historical harvesting practices and volumes, and potential fluctuations in flax straw production and demand. A low BAM factor was selected due to the lack of established competition for flax straw and the historical production of flaxseed in the BDO Zone. As shown in Table B-2, the resulting rated quantity was estimated to be close to 31,700 bdt/year, representing 55% of the total estimated flax straw production in the Esterhazy BDO Zone, indicating a cautious estimate aligned with feedback from local producers. However, this percentage is anticipated to rise by implementing a mutually beneficial project. Outreach efforts suggest that participation rates and delivered quantities will depend largely on pricing, product development, and farmers achieving a reasonable profit margin.

Table B-2. BAM and rated quantity of wheat straw

Annual flax straw availability (bdt)[31]	38,000
BAM	1.2
Rated Quantity (bdt)	31,700
Removal % from total flax straw production	55%

The delivered price range for the rated quantity of flax straw was estimated using the formula presented in Figure B-5.

Figure B-5. Price estimation methodology



In determining the price at the farm gate, the following assumptions/values were utilized:[32]

Table B-3. Farm-gate price ($/bdt) and assumptions for flax straw

Bale average moisture content	13%
Bale average weight	0.5 tonne or 1,100 lbs.
Baling cost ($/bdt)	$16.40
Collection and stack costs ($/bdt)	$4.32
Farm-side storage costs ($/bdt)	$3.44
Producer's markup	15%
Farm-gate price ($/bdt)	$27.78

The above Table calculates the price of flax straw bales at the farm gate (transportation and bale handling are not included). However, the farm-gate price may vary depending on the flax straw supply and demand. Since flax straw does not have an established demand in the BDO Zone, the current prices are spot prices, vary widely, and can get up to $60/bdt ($30/bale). However, we expect that a future biomass project can secure a lower price than the spot market by establishing long-term relationships with local farmers, particularly since flax straw is a residue management issue for local growers. Based on the data we collected from outreach, the upper range of farm-gate prices can be secured at $40/bdt. Thus, we use a range of $28-40/bdt as the rated pricing at the farm gate.

[31] Rounded to nearest 1,000
[32] https://www.gov.mb.ca/agriculture/farm-management/production-economics/pubs/cop-agrienergy-flax-straw-biomass.pdf Applies to farm gate price assumptions used in table.

The following assumptions/values were used in calculating transportation costs:

Table B-4. Transportation cost assumptions

53 ft. flatbed trailer and 34 bales (0.5 tonne round bale) per load [33] (payload per dry tonne)	14.5
Transportation cost (loaded and empty) ($/hr.):[34]	$150.00
Loading/unloading time (hr.):	1
Average speed (km/hr.):	80

Table B-5 shows the estimated cost of $36/bdt to transport flax straw from an average 100 km driving distance to Esterhazy. See Figure E-1 for transportation costs up to 150 km in 10 km increments driving distance from Esterhazy.

Table B-5. Transportation cost using a 53ft flatbed trailer

Average bales per load	34
Average Bale Weight (lb.)	1,100
Average load weight (bdt)	14.8
Average travel speed (km/h)	80
Average load/unload time (hr.)	1
Transportation rate ($/hr.)	$150.00
Transportation cost to 100 km ($/bdt)	$36.00

Table B-6 shows the breakdown of the average price of flax straw delivered to the BDO Zone centre point. As previously discussed, there is no established demand for flax straw in the region; thus, there is no historical pricing data. The pricing calculation in this BDO Zone project considers pricing at the farm gate received from local growers and various other factors and presents a reliable basis for estimating the price range.

Table B-6. Farm gate and average delivered price.

Price Component	$/bdt	$/bale
Baling/Moving/Stacking cost	24-35	12-14.5
Producer markup (15%)	4-5	2-2.5
Price at farm gate[35]	**28-40**	**14-20**
Average transportation cost (100km)	36	18
Delivered price[36]	**64-76**	**32-38**

[33] ibid
[34] https://open.alberta.ca/dataset/690317b0-1d07-4f9e-ae71-6340e1
[35] Rounded to nearest dollar
[36] Based on pricing range received from outreach of $10 and $12 per bale at farm gate

SECTION C: INFRASTRUCTURE



PROPERTY OVERVIEW

Address:	East Avenue and Park Dr
City:	Esterhazy
State:	Saskatchewan
County:	N/A
Acres:	10
Pricing Note:	Open
Topography:	Gently sloping
Zoning:	Industrial-Light, Industrial-Heavy

SITE CONTACTS

Economic Development Contact
Crystal Sabo
Dir, Planning and Economic Development
306-745-5405
ecdev@esterhazysk.ca

ADDITIONAL NON-RATED SITES

Infrastructure Site Contact
Bob Buckingham
BDO Zone Infrastructure
bob@ecostrat.com

PROPERTY PROFILE

The primary 10-acre site is currently undeveloped. It is located ½ km south of the city at the intersection of SK 22 (Park Dr) and East Avenue. It is owned by the City and is available for sale or long-term lease. The gently sloping terrain is conducive to new construction and is easily accessible via a major highway. Most primary utilities are available in the area but not stubbed at the site.

Transportation

Nearest Highway: SK-22 (<1/4 km)
Nearest Interstate: N/A
Nearest Airport: Regina, SK (238 km)
Rail Served: No
Rail Accessible: Regina (2 hours)

Electric Service

Supplier: SaskPower
Ownership: Crown Investments Corp
Phone: 888-757-6937
Website: www.saskpower.com
All Utilities Extend to Site: No
Nearest Substation: ¼ km
Capability: 3-Phase overhead, 24,900 volts is available in the area but not stubbed to the site. 40 MWs of available capacity on existing lines.

Natural Gas

Supplier: SaskEnergy/Trans Gas
Ownership: Crown Investments Corp
Phone: 888-577-6937
Website: www.saskenergy.com
Size of Main: 6" - 12"
Pressure: 50 psi
Capability: Gas is in the vicinity but not to the site.

Water

Supplier: City of Esterhazy
Ownership: Municipal
Phone: 306-745-5403
Website: www.townofesterhazy.ca
Size of Main: 10" – 12"
Peak Capacity: 2,000,000 gals (maximum)
Capability: A new water system will be completed in 2024 for 50-year capacity volumes.

Wastewater

Supplier: City of Esterhazy
Ownership: Municipal
Phone: 306-745-5403
Website: www.townofesterhazy.ca
Size of Main: 8" – 24"
Capability: Included in water system upgrade.

Telecommunications

Supplier: SaskTel
Ownership: Provincial Government
Phone: 800-727-5835
Website: www.sasktel.com
Platforms: Fiber, wireless
Capability: Primary wireless 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: Farmers in the BDO Zone have been growing flax since the early 1900s and have a long multi-generational history of flax production where the flax straw has often been burned as it is currently. According to the 2021 agriculture census, there were close to 3,875 farms within the BDO Zone, with approximately 970 farms, including flax, as part of their rotation.[37,38] Additionally, approximately 19,039 tractors and 3,594 balers were reported in the BDO Zone.[39]

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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 large-scale consumers of flax straw in the region. Flax straw's use in the cattle bedding market is too small to pose a significant risk. In fact, flax straw is a residue management issue for farmers as they cannot leave it in the field and have no preference for markets to sell it.

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**

[37] https://www.saskflax.com/industry/index.php; where 1 in 4 farms include flax in their rotation
[38] https://www.statcan.gc.ca/en/census-agriculture
[39] ibid

Gross Risk Indicator (GRI)	Score
The Gross Risk Indicator (RRL X RRI) is 4 out of 100.	4
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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

1.3 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: Within the BDO Zone, the majority of farmland, or 65% (5,877,000 acres), is owned by the farmers, 28% (2,878,000 acres) is leased from others within the region, 5% (574,000 acres) is leased from the government, and a small portion or 2% (222,000 acres) are crop-shared land. Due to the highly productive agricultural lands, regardless of the ownership, we expect these lands will continue being used for crop production, such as flaxseed.[40]

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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

1.3.2 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 residues such as corn

[40] 2021 Census of Agriculture https://www.statcan.gc.ca/en/census-agriculture

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: According to the 2021 Census of Agriculture, farming equipment owned in the BDO Zone includes close to 19,000 tractors, 9,000 cargo vans, 5,200 combines, 7,100 swathers and mowers, and 3,525 balers.[41] There are also farming equipment dealers within 75 km of Esterhazy: at least six in Yorkville and two in Moosomin.

Based on our outreach, we found that some farmers had their own baling equipment in the region; however, it was being utilized for other crop residues like wheat straw. This is indicative of the fact that there are limited markets for flax straw. However, the above-mentioned baling equipment owned by farmers in the BDO Zone can be utilized for baling flax. In the absence of a project providing harvesting/collection services or an incentive for farmers to purchase suitable equipment, farmers may want to avoid purchasing the baling equipment.

To address this risk, a third-party baling service provider like Pacific Ag could offer a temporary solution until the growers procure their own baling equipment. Promptly addressing this risk necessitates partnering with a third-party baling company, at least initially, until growers make equipment investments. As such, the risk is deemed 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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

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: Within the BDO Zone, there is a highly structured agricultural network comprising producers, custom harvesting, and transportation operations. According to 2021 census data, growers within the BDO Zone owned 15,120 pick-up trucks, 9,000 cargo vans, and 3,700 other farm trucks.[42]

[42] 2021 Census of Agriculture https://www.statcan.gc.ca/en/census-agriculture

The rated quantity of flax straw is relatively small, at 31,700 bdt/yr. Furthermore, outreach suggests that growers should not have any issues using their own equipment or third-party custom transportation providers in the region. As such, the risk is deemed 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**
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**

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: Feedstock, derived from the primary crop of flax seed, remains secondary to flax seed production for producers. Most growers bunch and burn flax straw following harvest due to the lack of markets for this crop residue. A direct correlation exists between flax straw and the primary product, with the flax straw to grain ratio of 1.2 (1.2 lbs. of residue per lb. of flax seed harvested).

Historically, the flax planted area within the BDO Zone has fluctuated in price and rotation. It was once widely grown but declined, with canola profits becoming more attractive for growers. Within the BDO Zone, flax planting has consistently decreased, notably by over 85% from 2015 to 2022. Consequently, as flax production lowers, so does flax straw generation. This decline is mainly due to better pricing and market conditions for crops like canola, surpassing flax in market development. Significant yield drops in 2013/2014 and 2020/2021 resulted from persistent rainfall and drought/high temperatures. Dry soil and cold temperatures also hindered weed control and fertilizer applications, compounding yield challenges. Yield fluctuations due to weather events are expected to continue and, as such, will affect the sustainability of supply.

Expanding the BDO Zone beyond 150 km at higher transportation costs to access more volumes could broadly mitigate flax straw production shortages. Moreover, maintaining long-term storage onsite and undercover could further mitigate flax straw harvest shortfalls. Risk is deemed moderate.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

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: The supply chain has limited experience in flax straw production, primarily bunching and burning flax straw after harvest. While some growers have baled straw from other crops, many have not baled flax straw. That said, growers are familiar with harvesting and collecting crop residues, and we expect low risk associated with supplier flax straw harvesting experience.

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**

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: The supply chain lacks substantial experience in producing and harvesting flax straw at a production scale. Scaling up from current levels to meet the demands of a small-to-medium scale facility utilizing the rated quantities would present moderate challenges. These challenges primarily stem from increased labour, equipment, and transportation efficiency requirements. However, the producers have experience with producing and harvesting other crop residues in the BDO 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) No adjustment. *RRI Mitigation (Notch)* The risk could be partially mitigated by engaging an experienced third-party baling company to handle the harvest and collection of flax straw. 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 18 out of 100.	**18**

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: To utilize the rated quantity of flax straw for a new project in or around Esterhazy, SK, the following equipment would be necessary: approximately 12 balers, 12 bale collectors, 24 tractors, and three trucks with 53-ft flatbed trailers. Given the limited amount of rated flax straw within the BDO Zone, these equipment and labour requirements are achievable with the current regional resources.

However, the prevalence of round balers combined with rotary combines may be less efficient for baling flax straw. Rotary combines often leave flax straw in a condition that complicates round baling. Growers can mitigate this inefficiency by not engaging the chopper on the combine, thereby saving horsepower and reducing fuel costs. Given

the small-scale processing needs for the rated quantity of flax straw in the BDO Zone, investing in more efficient equipment like square balers is unlikely to benefit growers. We do not see the current equipment combination of rotary combines and round balers posing any significant risk.

Outreach efforts have revealed that growers are open to using third-party balers to ensure the efficient collection, baling, and storage of flax straw bales. Due to the manageable scale-up requirements for equipment associated with the relatively small rated quantity of flax straw, the risk level is assessed as 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 *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**16**

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: Flax straw is a by-product of flaxseed production. Outreach confirms that high farmer participation could be expected considering the lack of existing uses for flax straw. As such, we have determined that a grower participation rate of 80% is reasonable. Furthermore, offering a stable regional market for flax straw within the BDO Zone can be expected to have a positive influence on the number of planted acres of flax.

There is a relatively narrow harvesting timeframe, typically spanning 4 to 6 weeks from late August to early October.[43] Consequently, certain suppliers may prioritize grain production, opting to supply flax straw if it does not hinder their grain harvesting efficiency. This consideration underscores the importance of risk mitigation strategies in the supply chain to encourage the participation of flax producers as a flax straw supplier.

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**

[43] According to outreach with two local experts and flax farmers in the Esterhazy, SK region

Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL X RRI) is 36 out of 100.	**Score** **36**
Mitigation/Notching *RRL Mitigation (Notch)* Engaging a qualified third-party baling company to handle the harvest and collection of flax straw can effectively mitigate this risk. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is 25%.	**Notch** **25%**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 27 out of 100.	**Score** **27**

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: No current competitors exist for flax straw within the region. Risk is deemed very low.

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

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: Historically, there have been no major buyers or processors of flax straw in the region. While smaller buyers and processors had existed previously, none are currently operational. Among these smaller processors were Schweitzer-Mauduit Canada Inc. and Ecusta Fibres Ltd., both located in Winkler, Manitoba. Bio-Fibre Industries Ltd., with an ethanol plant in Weyburn, SK, also ceased operations in 2015. Despite a limited number of processors and buyers in the past, the quantities of flax straw purchased were minimal, and none of these companies are currently operational.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

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: Flax straw has no significant competitors within the region and, thus, no established historical price. Because flax straw is usually burned after the harvest season, the future biomass project should be able to secure an affordable price from the local growers. The Raw RI Score indicates a very low level of risk.

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) No adjustment.	**NN**

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 4 out of 100. **4**

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 signalling 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: The predominant practice within the BDO Zone involves bundling and burning flax straw to address its impracticalities in agricultural operations. Considering flax straw's physical characteristics (tough fibre with slow decaying), it is highly improbable that its utilization for crop cover, animal feed, and bedding will witness significant growth in the future.

No foreseeable large-scale competitors are expected to emerge for flax straw within the BDO Zone. Prairie Clean Energy, headquartered in Regina, SK, intends to construct a pellet facility utilizing flax straw as its primary feedstock. However, given the distance from the project's centre point, it is unlikely to impact the BDO Zone.

Some potential applications being explored for flax straw include paper for cigarettes, plastic composite products, insulation, and its use in textiles. However, these applications are still in the nascent stages of development, and we do not attribute significant risk to their potential impact.

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)* **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 8 out of 100. **8**

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: No soft supply influences on existing markets were identified. Any temporary supply shortage would likely not significantly impact future flax straw projects. Flax straw has no large-scale competitors and is widely available throughout Saskatchewan.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

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.[44]

Risk Information: There are no non-traditional or market-driven markets for feedstock. As such, the risk is deemed very low. Burning flax straw after the harvest season is the most common practice in the BDO 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)	**Score**
The Gross Risk Indicator (RRL X RRI) is 4 out of 100.	**4**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)*	**NN**

[44] Bergtold, 2018.

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 4 out of 100. **4**

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: Currently, there are limited markets and competitors in relation to flax straw. Risk is deemed very low.
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)* **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 4 out of 100. **4**

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: There are relatively limited competing uses for flax straw. It is highly unlikely that any competitor, present or future, will have a significant edge when it comes to accessibility, delivery hours, and wait times, as the practice of harvesting, collecting, and storing flax straw bales will remain the same. The level of risk is considered to be very low.
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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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

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, to accurately quantify the risk that competitors can exert on the Issuer's supply chain.

Risk Information: Due to the absence of commercial-scale feedstock demand in the region, competitive pressure cannot be exerted through quality and specifications.

Several factors influence the quality and value of flax straw throughout the supply chain, encompassing harvesting, baling, transportation, and storage. Attributes such as moisture content, bale size, and bulk density are pivotal considerations for new entrants, alongside other factors affecting flax straw value, including the presence of soil or weeds, transportation cost, fibre content, amount of retting, and size of straw pieces. Implementing a quality control program for producers can significantly mitigate the risk of supplying low-quality flax straw bales. Risk is deemed low to moderate.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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 favourable clean fuels policy can cause increased pellet/biofuel production by competing markets. Thereby driving demand for feedstock within a BDO Zone.

Risk Information: No significant competitors exist for flax straw within the region. Risk level is deemed very low.

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

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: BAM serves to provide a prudent redundancy factor, ensuring investors' confidence in the accuracy, credibility, and achievability of the project-ready estimates. A conservative BAM of 1.2 was chosen to accommodate uncertainties such as data accuracy, readiness for scale-up, historical harvesting practices and volumes, and potential fluctuations in flax straw production and demand. A low BAM factor was selected due to the lack of established competition for flax straw, the burning of flax straw by growers, and the historical production of flaxseed in the BDO Zone. The resulting rated quantity of flax straw of 31,700 bdt/yr represents 55% of the total estimated flax straw production in the Esterhazy BDO Zone. This risk indicator is deemed to have low risk.

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

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

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: A supply curve was generated to better understand flax straw availability within 10-mile intervals from Esterhazy, SK (Figure B-4). The supply of flax straw increases proportionally with distance from the centre point. Analysis shows that approximately 39% of total flax straw production and the entire rated quantity lies within a 100-km driving distance from Esterhazy, SK. In order to reduce costs associated with transportation, sourcing feedstock supply from within 100 km will be key. Given the uncertainty that the project will be able to able to source all feedstock requirements from within this area, the risk is deemed moderate 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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

3.1.3 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[45] and can manifest in shortages and higher costs for Issuers.

[45] Golecha & Gan, 2016.

Risk Information: Flax's growth cycle spans 90 to 125 days, typically aligning with planting between May 1 and May 31 and harvesting in autumn.[46] Optimal results are often achieved with early seeding in May, as flax demonstrates resilience to light spring frosts.[47]

The harvesting and baling operations for flax straw last approximately 40 days, from late August to early October. However, prolonged rainy spells pose a notable risk, potentially shortening this window. Consequently, certain suppliers may prioritize grain production, opting to supply flax straw if it does not hinder their grain harvesting efficiency. This consideration underscores the importance of risk mitigation strategies in the supply chain. The risk associated with a short harvest is already accounted for in 1.6.1; therefore, this risk is deemed moderate.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

3.1.4 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: Historical yield data (Figure B-3) indicates notable declines in flax yields during the 2013/2014 and 2020/2021 crop years within the BDO Zone. In 2013/2014, persistent rainfall during the growing and harvesting seasons caused delays and diminished quality, resulting in lower yields compared to the previous year. Similarly, below-average yields in the 2020/2021 crop year were attributed to drought and high temperatures during flowering. Dry soil and cold temperatures presented challenges for weed control and fertilizer applications, exacerbating yield impacts.

Over the past twenty years, flax production in Saskatchewan and the BDO Zone has experienced considerable fluctuations driven by market prices and crop rotation practices. Notably, flax production surged in the province in 2005 and again in 2015, reaching approximately 800,000 tonnes per year in both years. However, since 2005, there has been a marked decline in flax cultivation, with production downturns occurring in 13 of the past 20 years.[48] This variation in flax production is directly correlated with the planted area, as farmers have increasingly transitioned to other crops, such as canola. The primary factors driving this shift are the superior pricing and favourable market conditions for canola, which have consistently outperformed flax. This has led growers to favour crops with higher profitability and more robust market development.

[46]https://www.saskflax.com/quadrant/media/Pdfs/Flax%20on%20the%20Farm/180724_July_Flax_on_the_Farm_Final.pdf
[47] https://www.gov.mb.ca/agriculture/crops/seasonal-reports/pubs/growing-flax.pdf
[48] Statistics Canada

As a result of the above-described factors affecting flax straw availability, the risk is deemed 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 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)* **25%** No adjustment. *RRI Mitigation (Notch)* Planning for on-site capacity inventory can partially mitigate the risks associated with year-to-year variation in feedstock. Furthermore, engaging a third-party baling company for harvest and collection tasks can also effectively mitigate this risk associated with reduced incentives for growers to prioritize flax straw harvesting. 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 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: Historical flax straw pricing data is limited, primarily due to the absence of information regarding smaller quantities previously purchased by now-defunct processors in the region, as outlined in section 2.1.2. Schweitzer-Mauduit Canada typically paid $5.00 to $10.00 per tonne for uncontaminated flax straw, with variations depending on the year and the possibility of baling in spring.[49] They also covered expenses for baling, transportation, and storage. Outreach with an industry expert and former purchaser and processor of baled flax straw within the region quoted pricing in the range of $7.00 to $10.00 per bale at the farm gate. Recent spot prices for round-baled flax straw vary widely, ranging from free to $30.00 per bale delivered roadside.[50] These fluctuations stem from the absence of established markets, with local users sourcing straw from the spot market. Establishing robust relationships with growers in the BDO Zone, implementing fixed-price offtake agreements with baseline quality standards established through a quality control program, and effective inventory management are recommended to mitigate price volatility. Price determinants include processor demand and the costs of harvesting, baling, and delivery. Moreover, with minimal competition and alternative markets for flax straw, a new project can maintain pricing control. Consequently, the risk associated with historical price variations is assessed as moderate.

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**

[49] https://www.saskflax.com/quadrant/media/Pdfs/Growing%20Flax/150101_FCOC-growers-guide-v11.pdf
[50] (a) https://www.kijiji.ca/v-livestock/regina/1000-pound-flax-bales/1679452098 (b) https://www.kijiji.ca/v-other-business-industrial/saskatoon/flax-bales-free/1687974198

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

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: Historically, the region has not witnessed any significant buyers or processors of flax straw. While smaller entities engaged in buying and processing flax straw have existed in the past, the quantities of flax straw processed were negligible, and none of these processors are currently operational. Given the limited historical demand for flax straw in the BDO Zone, growers lack experience in flax straw harvesting and logistics. As such, there is a high risk associated with supply reliability.

Raw Risk Likelihood (RRL) The risk likelihood is deemed high, therefore the RRL is 8 out of 10.	**Score** **8**
Raw Risk Impact (RRI) The risk impact is deemed high, therefore the RRI is 8 out of 10.	**Score** **8**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL X RRI) is 64 out of 100.	**Score** **64**
Mitigation/Notching *RRL Mitigation (Notch)* With the established future demand for biomass projects, outsourcing harvest and collection to a third-party baling company could substantially reduce the risks associated with these tasks. As such, this risk is notched by 50%. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is 50%.	**Notch** **50%**
Loaded RI Score	**Score**

The Loaded RI Score ((1-Total Notch) X GRI Score) is 32 out of 100.	**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: Flax cultivation has been a longstanding tradition in the BDO Zone since the early 19th century, with the region having generations of experience in growing flax. However, large-scale production of flax straw has not been prevalent; instead, it is a by-product of flax cultivation. Flax straw availability depends on various factors, including weather conditions and planted acreage, with pricing significantly influencing planting decisions. Dry weather presents challenges to flax straw availability for two primary reasons: reduced flax yields and increased difficulty in baling dry straw, particularly with the prevalent use of rotary combines in the BDO Zone. Feedback from local growers indicates that a new project creating a market for flax straw could stimulate increased acreage devoted to flax cultivation, but still, flax straw probably will not be a main source of income for flax producers, and flaxseeds will remain their main focus of production. Overall, this is a medium risk for future biomass projects.

Raw Risk Likelihood (RRL) The risk likelihood is deemed medium, therefore the RRL is 6 out of 10.	**Score** **6**
Raw Risk Impact (RRI) The risk impact is deemed medium, therefore the RRI is 6 out of 10.	**Score** **6**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL X RRI) is 36 out of 100.	**Score** **36**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100.	**Score** **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: Metrics like the Consumer Price Index (CPI) provide valuable insights into price trends that impact biomass logistics operations and associated costs, encompassing factors such as fuel, labour, equipment parts, and administrative expenses. Figure E-3 illustrates the fluctuations in the CPI over the past ten years in Saskatchewan, highlighting a consistent rise in inflation from 2014 through 2024 and a sharp 9% increase between 2022 and 2024. However, it is crucial to exercise caution when interpreting such trends, as they may not accurately reflect the nuances

and complexities inherent in agricultural residue logistics management and cost considerations. A comprehensive analysis, accounting for industry-specific factors and regional dynamics, is essential to make informed decisions and mitigate potential risks.

Diesel fuel is a major component of biomass harvesting and delivery. Comparing diesel prices (Figure E-4) to the trend in CPI between 2020 and 2023 (Figure E-3) reveals that fuel prices strongly respond to general economic trends. The price of delivered flax straw also tracks the CPI. Such variations in CPI and diesel prices can have a moderate impact on the price of delivered feedstock. The risk is rated as moderate.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

3.3.2 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: Not relevant.

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: Not relevant.	
Raw Risk Likelihood (RRL) The risk likelihood is deemed not relevant, therefore the RRL is not rated (NR).	**Score** **NR**
Raw Risk Impact (RRI) The risk impact is deemed not relevant, therefore the RRI is not rated (NR).	**Score** **NR**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL X RRI) is not rated.	**Score** **NR**
Mitigation/Notching The Total Notch (RRL Notch) X (RRI Notch) is NR (Not Rated).	**Notch** **NR**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is not rated.	**Score** **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.[51]

Risk Information: The analysis did not uncover any unconventional or externally influenced markets for flax straw. Risk is deemed low.	
Raw Risk Likelihood (RRL) The risk likelihood is deemed very low, therefore the RRL is 2 out of 10.	**Score** **2**
Raw Risk Impact (RRI) The risk impact is deemed very low, therefore the RRI is 2 out of 10.	**Score** **2**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL X RRI) is 4 out of 100.	**Score** **4**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100.	**Score** **4**

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.

[51] 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.

For forestry biomass, unsightly clear-cuts and slash piles (even on plantation forests and especially when located near communities) can provoke unwanted public backlash even when suitable and sustainable replanting regimes are followed.

Risk Information: The harvesting of flax straw, lasting approximately 40 days from late August to early October, is followed by the prompt baling and transport of round bales. Based on conversations with local growers, they had stated a strong preference for the timely removal and baling of flax straw so as to cause any delays with a subsequent seeding period. During the harvesting period, adverse weather events like drought and prolonged rainfall can slow production by hindering combine navigation in wet conditions or making straw baling more difficult in dry weather, particularly with rotary combines. Additionally, heavy showers, hail, and strong winds can damage crops, leading to lower quantities of flax straw.

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 *RRL Mitigation (Notch)* *RRI Mitigation (Notch)* Utilization of a qualified third-party baling service could help partially mitigate the impact from a shorter harvesting period by drawing on their experience and ability to efficiently complete collection and bailing. The Total Notch (RRL Notch) X (RRI Notch) is 25%.	**Notch** **25%**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 48 out of 100.	**48**

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: For harvesting and collection equipment, the combine type has a significant impact. Within the BDO Zone, the most common type of combine is the rotary combine which is a more recent design compared to the traditional combine. When compared to traditional combines, rotary combines have a more simplistic design including fewer moving parts, resulting in lower maintenance and breakdowns. Consequently, rotary combines boast higher capacity, superior grain separation, and a smaller footprint. Traditional combines, however, generate longer flax straw lengths, enabling more efficient gathering for balers, whereas rotary combines cut straw into shorter lengths, making it more difficult to bale. This issue can be addressed by growers turning off the chopper on the rotary combine.

Given the small-scale requirements for the rated quantity of flax straw and the capital investment required to acquire a traditional combine to achieve the efficiencies described above for flax straw processing, growers would likely not acquire the traditional combine while compromising the advantages the rotary combine has for other grown crops.

In the BDO Zone, there is a prevalence of round balers and rotary combines. That said, we do not attribute significant risk as growers do not have to engage the chopper on the rotary combine. Furthermore, the small-scale requirements for the rated quantity of flax straw do not justify the need for growers to invest in new, more efficient harvesting equipment. Based on our analysis, it has been determined that growers are open to the idea of utilizing 3rd party balers to enhance the collection, baling, and storage of flax straw bales. Implementing this measure would assist in reducing the risk. As such, the risk is deemed to be moderate.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is 25%.	**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 fibre 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.[52]

Risk Information: In the BDO Zone, round bales are predominant and are usually stored outdoors, stacked and optionally covered with a tarp to minimize losses. Conversely, according to feedback from growers, square bales are less common, mainly due to their high capital cost. Given the small size of the rated quantity, we expect round bales will be the most common feedstock form available in the BDO Zone. As such, this risk is scored 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**

[52] Huhnke, 2018.

Mitigation/Notching	Notch
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

3.4.4 Availability of Labour for Feedstock Production

Rationale: Skilled labour shortages can be difficult to remedy in the short term. The availability of suitable labour in an area can impact the ability to procure sufficient feedstock quantities on required schedules. Labour 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 labour force.

Risk Information: Following discussions with local growers and industry experts, it has been determined that acquiring the necessary labour and custom transportation for the anticipated quantity of flax straw is feasible. The flax straw harvesting, spanning approximately 40 days from late August to early October, necessitates timely baling and transport of round bales. Labour demands primarily revolve around flax straw baling, collection, and transportation during the harvest period. Given the nascent nature of the flax straw market, training initiatives are anticipated to be essential to address supply chain challenges.

The presence of one of the world's largest potash mining operations in Esterhazy, owned by Mosaic, significantly influences labour availability in the region. Mosaic's operations employ nearly 1,200 individuals and exert pressure on regional labour markets and wages.

Discussions with local experts revealed that in the past there had been more skilled operators such as experienced balers in the region, however, there has been migration of this skilled labour to higher paying jobs in the oil industry. Training skilled balers has traditionally been done on the job rather than through vocational school or certification programs. According to outreach, the presence of 3rd party bailing services is more common in Manitoba.

Based on the analysis of labour availability, we have determined that the risk associated with Mosaic's mining operation is moderate. This conclusion takes into account the relatively small amount of flax straw involved and the labour demands it entails. Furthermore, interactions with local growers and market experts provide reassurance regarding the probability of fulfilling labour requirements within the region. One possible approach to mitigate risks is to consider outsourcing the harvest, collection, and hauling activities to qualified third-party companies. This can help to minimize the potential risks involved. Based on the available information, it appears that third-party harvesting services are more prevalent in Manitoba. As a result, there should be a number of viable options for these services from third-party companies located in Manitoba. Risk is deemed moderate.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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 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: As illustrated in Table B-6, transportation cost constitutes between 47% to 56% of the overall cost or $36.00 per bdt of delivered flax straw, based on an average drive distance of 100 km. Approximately 40% (23,000 bdt/yr) of total flax straw production is accessible within this 100 km drive distance. Conversely, at an average drive distance of 120 km, 57% (33,000 bdt/yr) of flax straw production becomes available, albeit with transportation costs representing 60% to 64% of the total delivered cost or $41.00 per bdt. Given that the majority of flax straw lies beyond the 100 km threshold, the supply chain becomes more susceptible to various risks, including fuel costs, truck maintenance, and weather conditions over longer distances. Significant cost reductions can be achieved if the project can secure most of the flax straw volume within 100 km of the project centre point. Risk is deemed moderate 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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

3.5.2 Diesel Cost Impacts

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

Risk Information: The diesel price has gone up nearly two-fold since the low prices in mid-2020. However, it has been less volatile since early 2023 (See Figure E-4). The potential for a fuel surcharge on top of the current rate of approximately $150.00/hr in the BDO Zone can add significantly to the cost of transportation. This would typically be applied when the cost of fuel hits a certain threshold and ultimately can lead to a significant increase in the delivered price of flax straw.

The federal carbon tax has also increased the cost of diesel by $0.21 per litre in Saskatchewan as of April 2024. Agricultural producers, however, are privy to an exemption that includes diesel used for eligible farming activities such as using a tractor or combine but are not exempt from diesel used for transportation of production to shipping facilities. The risk is deemed moderate.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

3.5.3 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: Flax straw bales are transported using flatbed trucks which are available in the BDO Zone and not considered specialized equipment.

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) No adjustment. *RRI Mitigation (Notch)*	**NN**

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**

3.5.4 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: To ensure the delivery of the rated annual quantity of flax straw to the Esterhazy project site, an estimated 3 truck journeys per day will be necessary.[53] The industrial site's location, situated 2 km southeast of Esterhazy, minimizes the impact of heightened truck activity on local residents. Feedback from local growers, who are also Esterhazy residents, suggests that any potential discontent among the public would be negligible. While public consultation will be necessary prior to project implementation, the anticipated minor uptick in daily traffic is not expected to pose a significant obstacle. Consequently, the associated risk is evaluated as 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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

3.5.5 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: Truck weight classifications in the BDO Zone are determined by factors like highway classification, maximum registered gross vehicle weight, tire size, and axle spacing. The weight classification map in Figure E-5 outlines the various weight classes on provincial highways, including primary, 63,500 kg, 9-month primary, and secondary weight designations, along with bridge restrictions and other details relevant to the BDO Zone.

Road restrictions aim to protect road surfaces during transportation, with commercial truck limits enforced year-round, though exceptions are made for weather conditions. Various truck configurations exist, with maximum loaded vehicle

[53] Assuming truck payload of 15 bdt, 38,000 bdt of biomass per year, 3 trips per day, and total transported biomass per year per truck of 13,500 bdt

weights contingent upon several factors, including highway classification and tire size. The nearest government weight scale is located 3 miles south of Yorkton.

Outreach indicated that the road quality in the Esterhazy region falls behind that of the southern portion of the province in terms of road quality. However, the local road network has ample roads in all directions that allow for primary weights or are limited to weight restrictions for three months of the year. Furthermore, the relatively low truck traffic expected for the rated quantity of flax straw minimizes the risk of exposure related to road restrictions and conditions. Consequently, the risk level is deemed 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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

3.5.6 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: As highlighted in section 3.5.5, despite an extensive road network within the BDO Zone, outreach efforts have revealed suboptimal road conditions compared to the southeastern region of the province. This disparity primarily concerns wear and tear levels and the proportion of paved roads. During the spring thaw, the local road network experiences common issues such as potholes, surface breaks, and cracks, mirroring challenges across much of the province.

Two major provincial highways stand out near Esterhazy, both exempt from seasonal weight limit restrictions. Highway 16, situated north of Esterhazy, traverses the province eastward and westward. Conversely, to the south, Highway 1 forms part of the Trans-Canada Highway, serving as a pivotal commercial route spanning Alberta to Manitoba. Considering these factors, the assessed risk level falls within the low-to-medium range.

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)	**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 24 out of 100.	**24**

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: Considering the modest transportation needs associated with the rated quantity of flax straw, involving only three trucks and small to medium-scale transportation equipment such as pickup trucks and trailers, we anticipate ample redundancy within the BDO Zone. Engagements with local growers and industry experts corroborate the existence of redundancy in sustaining the rated supply of flax straw. As such, the risk is deemed very low.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

3.6 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 predetermined number or optimal ratio of suppliers, although having too many or too few can pose higher risks.

Risk Information: Based on the 2021 agriculture census data, the BDO Zone encompasses nearly 3,875 farms, approximately 970 of which integrate flax into their crop rotation.[54,55] Moreover, growers within this region possess an average total farmland of around 2,327 acres. The extensive history of flax cultivation among farmers in the BDO Zone, combined with the relatively modest rated quantity of flax straw, is anticipated to mitigate overall suppliers' risks, but future biomass projects need to encourage most of the flax producers to supply their straw to meet the rated quantity. Consequently, the assessed risk level is categorized as moderate.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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 number of planted acres of flax and the resulting flax straw production are closely tied to flax prices. A notable decrease in flax prices would likely prompt a reduction in planted acres and, consequently, flax straw output. Growers would be motivated to transition to more lucrative crops such as canola. Between 2015 and 2002 in the BDO Zone, flax planted area decreased by 70% from 181,856 planted acres to 53,991 planted acres.

Concerning a grower's choice of what crops to plant, canola competes with flax. Although the prices for flax have competed well, canola yields have moved from < 20 bushels per acre to the more recent 40 bushels per acre, whereas flax yields have lagged in the very low-to-middle 20-bushel range.[56] As such, flax competes with canola, and growers' choice to grow more canola directly affects the flax planted acres, which in turn affects flax straw output.

Flax growers are also exposed to weather impacts, such as continuous rain during the growing season, which can shorten the harvest period, and drought, which can affect crop yields. Weather can also significantly impact plant height, the severity of insects and diseases, the date of maturity, and the quantity and quality of flax harvest. Early seeding can help mitigate the risk of damage caused by early fall frosts.

[54] https://www.saskflax.com/industry/index.php; where 1 in 4 farms include flax in their rotation
[55] https://www.statcan.gc.ca/en/census-agriculture
[56] https://www.grainews.ca/daily/canola-cash-market-stronger-but-lagging-2/

One mitigation measure to cope with flax production volatility is to hold flax straw inventory at satellite bale storage yards, which can also help reduce risks associated with weather impacts.
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)* **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 48 out of 100. **48**

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 fibre (i.e., the cost that one pays to a landowner for the right to cut and purchase their wood fibre), 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: Within the BDO Zone, the majority of farmland, accounting for 65% or 5,877,000 acres, is owned by the farmers. A significant portion, 28% or 2,878,000 acres, is leased from other regional landowners. Additionally, 5% or 574,000 acres are leased from the government, while a small fraction of 2% or 222,000 acres are crop-shared lands. Whether leasing or owning the farmland, growers would retain control over pricing decisions of flax straw sold. The risk associated with land ownership is deemed very low.
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)* **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 4 out of 100. **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 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: Growing season weather has a great effect on all crops – it significantly impacts plant height, the severity of insects and diseases, date of maturity, and the quantity and quality of flax harvest. Weather impacts on flax straw are evident in historical crop yield within the BDO Zone. Two notable declines in flax yields were observed during the 2013/2014 and 2020/2021 crop years due to continuous rainfall during growing and harvesting periods, drought conditions, and cold weather exacerbating yield limitations. These seasonal weather impacts can shorten the harvesting period and adversely affect crop yield, highlighting the significance of these weather-related events.

Early seeding can help mitigate the risk of damage caused by early fall frosts. Furthermore, holding flax straw inventory at satellite bale storage yards can also help reduce risks associated with seasonal weather impact. As such, the risk is deemed moderate.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

3.7.2 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: Several global climate models and greenhouse gas emission scenarios that predict long-term weather and climate trends in Saskatchewan all show that future yearly temperatures and rainfall will rise. This makes it hard to predict when to plant flax and how much will be produced.[57] The risk is deemed moderate.

[57] https://www.parc.ca/saskadapt/sk-climate/sk-climate-future.html

Raw Risk Likelihood (RRL) The risk likelihood is deemed medium, therefore the RRL is 6 out of 10.	**Score** **6**
Raw Risk Impact (RRI) The risk impact is deemed medium, therefore the RRI is 6 out of 10.	**Score** **6**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL X RRI) is 36 out of 100.	**Score** **36**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100.	**Score** **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 risk of fire is heightened by the prevailing dry conditions experienced throughout the growing season. Growers are advised to prepare fire mitigation resources proactively. Past incidents within the general region have demonstrated instances where flax bales ignited due to arson or other causes. Notably, extinguishing flax fires can be challenging due to the elevated heating value associated with flax oil. Insights from local experts suggest that to minimize the risk of fire outbreak, outdoor stored bales are typically arranged with stacked bales 200 feet apart and every third row spaced 500 feet apart. This configuration is repeated to enhance fire mitigation measures. Risk is deemed low.

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

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**

3.7.4 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 climate changes 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 vigour can lead to outbreaks of forest insects.

Risk Information: Flax is seen as beneficial for including in growers' rotation as a means of breaking disease and insect cycles. With respect to growing flax, no major infestations have been identified as occurring within the BDO Zone that have caused damage beyond an economic threshold to cause a real concern for growers. To keep damage low, growers should examine fields regularly and apply controls when insect populations warrant these measures. Risk is deemed 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** 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**

3.7.5 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 if global warming leads to further temperature increases.

Risk Information: The Flax plants are very tolerant to hail, as compared with other crops. When flax plants are damaged by hail, they often produce lateral branches. The risk of significant crop damage from hail is limited. As such, the risk is deemed low.	
Raw Risk Likelihood (RRL) The risk likelihood is deemed low, therefore the RRL is 4 out of 10.	**Score** **4**
Raw Risk Impact (RRI) The risk impact is deemed low, therefore the RRI is 4 out of 10.	**Score** **4**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL X RRI) is 16 out of 100.	**Score** **16**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**Score** **16**

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: Flooding incidents are relatively common in Esterhazy, typically driven by antecedent conditions, winter precipitation, and spring runoff rains. In 2014, heavy rainfall during spring runoff led to significant flooding, prompting Esterhazy to be classified as a high-risk community for flooding. Subsequently, in 2021, two of Mosaic's mines were compelled to halt operations due to flooding. Figure E-6 illustrates a flood map for Esterhazy, SK, depicting areas at risk of flooding above sea level rise, primarily concentrated east of Esterhazy and along the local watercourse to the northwest. Historically, substantial cropland has been lost to flooding prior to 2017, although efforts have been made by farmers to reclaim these lands. The adverse effects of flooding extend to crop yield, road infrastructure, and soil quality. Climate change further exacerbates the risk, potentially intensifying flooding and erosion along water bodies. Given the overlap between the BDO Zone and the high-risk flood zone, the associated risk is classified as high. Understanding and mitigating the potential impact of flooding is essential for effective project planning and implementation within the area. To address this risk, a regional flood recovery centre has been established in Esterhazy, offering resources and support to affected parties. Consequently, the risk associated with flooding is assessed as high-to-moderate.	
Raw Risk Likelihood (RRL) The risk likelihood is deemed high, therefore the RRL is 8 out of 10.	**Score** **8**
Raw Risk Impact (RRI) The risk impact is deemed medium, therefore the RRI is 6 out of 10.	**Score** **6**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL X RRI) is 48 out of 100.	**Score** **48**

Mitigation/Notching	Notch
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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

3.7.7 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. Parts of Western Canada are experiencing more frequent and severe droughts, and scientists expect drought to affect new areas across Canada going forward.

Tree species are adapted to specific moisture conditions. Having less water available through drought has a range of negative impacts on the health of forest ecosystems. Direct impacts include reduced growth, increased tree mortality, and failure to regenerate. Indirect impacts include reduced ability to defend against insects and disease and increased fire risk. These impacts can affect the availability of wood fiber for an Issuer.

Risk Information: Droughts have been a recurring phenomenon in the BDO Zone, resulting in shortened harvesting periods and adverse impacts on crop yield. Figure B-3 illustrates two significant declines in flax yields attributed to drought during the 2013/2014 and 2020/2021 crop years. In both instances, continuous rainfall during growing and harvesting seasons, coupled with drought conditions and cold weather, exacerbated yield limitations.

Establishing and maintaining flax straw inventory at satellite bale storage yards can mitigate risks associated with reduced crop yield due to drought. Considering these factors, the assessed risk level is categorized as moderate to 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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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

3.7.8 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: Extreme wind events present minimal risk to flax straw availability within the Esterhazy BDO Zone. The windier period spans approximately 8.5 months, from September 16 to May 30, with average wind speeds exceeding 17.2 kilometres per hour. March emerges as the windiest month, characterized by an average hourly wind speed of 19.1 kilometres per hour.[58] Consequently, the assessed risk level is classified as 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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

3.7.9 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: In the BDO Zone, an average of nearly 211 days per year experiences freezing temperatures. The coldest months, from December to February, witness the lowest average monthly temperatures, with January recording the lowest at -19°C. Flax is typically planted in early to mid-May and harvested in late August to mid-September. No crop failures or shortages have been reported in the BDO Zone because of low temperatures.

Frost poses a risk to producers in the BDO Zone, typically manifesting around the last week of August, potentially impacting the harvesting period of flax straw. Variables such as temperature, humidity, exposure time, and rate of temperature decline can significantly influence the extent of frost damage on crops. Nonetheless, flax exhibits tolerance to frost, and early seeding can help mitigate the effects of spring frost.

[58] https://weatherspark.com/y/4400/Average-Weather-in-Esterhazy-Saskatchewan-Canada-Year-Round

Abrupt cold spells can disrupt flax straw transportation, necessitating adjustments to transportation routes and snow clearance efforts around stored bales to facilitate pickup at storage locations. Consequently, the assessed risk level is elevated to low medium to account for abrupt temperature changes.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

3.8 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: No federal, provincial, or municipal subsidies were reported or identified for the direct production and utilization of flax straw. As such, risk is deemed to be very low.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

3.8.2 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: The supply of flax straw remains unaffected by government laws, regulations, or permits, and no forthcoming changes in these aspects are anticipated concerning flax straw. Consequently, risk is deemed very low.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

3.8.3 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: No public backlash is expected for projects using flax straw as feedstock; therefore, risk is deemed very low.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment.	**NN**

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 4 out of 100.	**4**

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: No Indigenous communities have been identified as being affected by flax straw production and outreach with local experts confirms that consultation with First Nations communities is not required within the BDO Zone. As a result, the risk is deemed 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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

3.8.5 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: Since flax straw is a by-product of flax production, there is no competition between renewable fuels and food. Additionally, flax straw is not a suitable animal feed alternative. As a result, the risk is deemed very low.

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) No adjustment. *RRI Mitigation (Notch)*	**NN**

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 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: Flax straw decomposes at a slow rate, rendering it unsuitable as cover material. Moreover, processing flax straw presents challenges due to the residual fibre left in the field, leading to issues with planting machines. While large rotary combines can mitigate some of these challenges by cutting the straw into smaller pieces, the high capital costs associated with such equipment pose a significant hurdle for farmers. Consequently, flax straw is often bunched together and then burned. As such, we deem the risk related to feedstock sustainability as very low.

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)* **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 4 out of 100. **4**

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: Flax is seeded shallow, and there is typically a carryover of nutrients and moisture below 70 cm of soil for the next crop where the flax crop is grown.[59] Because of the flax straw qualities described earlier in 3.9.1, growing flax often leaves minimal residue compared to other crops, which may increase the risk of soil loss from wind and water erosion. This can be mitigated by ensuring that a cereal crop is in rotation following flax to have a good amount of crop residues. Risk is deemed low.	
Raw Risk Likelihood (RRL) The risk likelihood is deemed low, therefore the RRL is 4 out of 10.	**Score** **4**
Raw Risk Impact (RRI) The risk impact is deemed low, therefore the RRI is 4 out of 10.	**Score** **4**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL X RRI) is 16 out of 100.	**Score** **16**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**Score** **16**

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: In our findings, there were no known issues or reported incidents within the BDO Zone related to growing flax straw and risk to surface or groundwater. Risk is deemed very low.	
Raw Risk Likelihood (RRL) The risk likelihood is deemed very low, therefore the RRL is 2 out of 10.	**Score** **2**
Raw Risk Impact (RRI) The risk impact is deemed very low, therefore the RRI is 2 out of 10.	**Score** **2**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL X RRI) is 4 out of 100.	**Score** **4**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100.	**Score** **4**

[59] https://www.mackenzieresearch.ca/wp-content/uploads/2021/02/Factsheet-Growing-Flax-Feb-2021.pdf

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: Flax straw use has no impact on surface and groundwater resources.

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 16 out of 100.	**4**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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.	**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: Health Canada's Pest Management Regulatory Agency (PMRA) oversees pesticide regulation in Canada, determining which pesticides can be sold and their conditions of use. Currently, the PMRA has registered three herbicide groups (1, 4, and 6) for in-crop use on flax to prevent weeds.[60] The application of broadleaf herbicides on flax is limited to the early bud stage, and only one application per season is permitted for MCPA and quizalofop-containing products.

The use of unregistered pest control products or applications outside recommended intervals can lead to trade issues concerning maximum residue limits.[61] However, the PMRA's primary goal is to mitigate risks to human health and the environment from pesticide use, supported by careful monitoring and guidance on pesticide application. Considering these factors, the risk associated with pesticide regulation is assessed as 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**

[60] https://www.oag-bvg.gc.ca/internet/english/parl_cesd_201601_01_e_41015.html
[61]https://www.saskflax.com/quadrant/media/Pdfs/Flax%20on%20the%20Farm/2022/May%20Flax%20on%20the%20Farm.pdf

Mitigation/Notching	Notch
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

3.9.6 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: No known issues associated with growing and the production of flaw straw to wildlife and the landscape were identified during outreach. The risk is deemed very low.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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

3.9.7 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 is not applicable to flax straw.

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**

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 large-scale operations will produce. Failure to adequately test the full range of parameter values can result in severe problems during scale-up.

Risk Information: To ensure a consistent level of flax straw quality, a new project can implement quality control measures and policies for feedstock. Several factors can influence flax straw quality, from harvesting to transportation and storage throughout the supply chain. Attributes such as moisture content, bale size, and bulk density are key considerations alongside other factors affecting flax straw value, including weeds, soil or rocks, plastics, metal contamination, fibre content, amount of retting, and size of straw pieces.

Raw Risk Likelihood (RRL) The risk likelihood is deemed medium, therefore the RRL is 6 out of 10.	**Score** **6**
Raw Risk Impact (RRI) The risk impact is deemed medium, therefore the RRI is 6 out of 10.	**Score** **6**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL X RRI) is 36 out of 100.	**Score** **36**
Mitigation/Notching *RRL Mitigation (Notch)* By implementing a quality control program for flax straw and given the small size of the rated quantity, the risk of supplying low-quality flax straw bales can be significantly mitigated. Consequently, the likelihood is notched 50%. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	**Notch** **50%**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 18 out of 100.	**Score** **18**

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: To utilize the rated quantity of flax straw for a new project in or around Esterhazy, SK, the following equipment would be necessary: approximately 12 balers, 12 bale collectors, 24 tractors, and three trucks with 53-ft flatbed trailers. Given the limited amount of rated flax straw within the BDO Zone, these equipment and labour requirements are achievable with the current regional resources.

However, the prevalence of round balers combined with rotary combines may be less efficient for baling flax straw. Rotary combines often leave flax straw in a condition that complicates round baling. Growers can mitigate this

inefficiency by not engaging the chopper on the combine, saving horsepower and reducing fuel costs. Given the small-scale processing needs for the rated quantity of flax straw in the BDO Zone, investing in more efficient equipment like square balers is unlikely to benefit growers. Considering the limited scale of flax straw processing needed for the amount of flax straw in the BDO Zone, we do not perceive any significant risk associated with using this equipment combination. Based on our outreach efforts, it has been determined that growers are open to utilizing third-party balers to collect, bale, and store flax straw bales efficiently. Given the manageable equipment and the scale-up requirements for the relatively small amount of flax straw, a low-risk level has been assigned.

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

CATEGORY 5.0: INFRASTRUCTURE RISKS

5.1 Risk Factor: Physical Infrastructure

5.1.1 Land Parcel/Industrial District

Risk Information: The parcel submitted is a 10-acre greenfield site approximately 2 km SE of Esterhazy (Figure E-7). It is situated in a commercial/industrial area with access to power and septic. Natural gas and potable water are available in the area and would require some connection costs. There is easy access to SK 22, a major highway less than 1 km to the north. The area is currently zoned for light/medium industrial operations and is in an air attainment area (no major permitting needed).

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 *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	**Notch** **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 site described above is currently publicly owned by the City of Esterhazy. Their participation in this BDOZ rating indicates their willingness to promote the area to developers and encourage new industries to pursue this or any surrounding parcels for lease or purchase. This represents a pro-business attitude and is an asset to any new developer.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

5.1.3 Permitting Description

Risk Information: The County issues an average of 22 building permits per year, each requiring a 3–4-month approval process. The city is very pro-business and encourages new industries to locate there, so this is perceived as low risk.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

5.1.4 Environmental Issues

Risk Information: The town of Esterhazy is committed to mitigating environmental risks through strict policies in development and permitting, particularly in sensitive areas prone to groundwater and erosion impacts. Major

developments with pollution risks must be located outside these sensitive areas. Buffer strips near watercourses and wetlands must be maintained to control erosion and floods. Agricultural practices should follow the best management guidelines for manure and chemical applications to protect water sources. The town consults the Saskatchewan Watershed Authority for flood advice, and floodplain developments must be reviewed before approval. Developers may be required to submit certified environmental, geotechnical, and hydrological reports to assess development hazards. A preliminary analysis by a professional engineer or environmental scientist may also be necessary to identify potential hazards in the proposed development area.

The environmental effect of a new flax straw facility will ultimately depend on several factors, including the processing and/or conversion technology utilized and the scale of operations. Since the project in question deals with relatively small quantities of flax and the conversion technology is yet to be known, the risk is deemed low to moderate.

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

5.2 Risk Factor: Utilities

5.2.1 Natural Gas Availability

Risk Information: SaskEnergy/TransGas provides natural gas service with high-pressure and elevated-pressure pipelines in the area. This is a deregulated gas market area. Regular service is 4,000 GJ per day, with over 10,000 GJ per day available for high users. The cost of natural gas is $3.30/GJ (variable). This is competitive with the rest of the province and western Canada. The risk is deemed low as natural gas would be easily available to new bio-industries.

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 *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment.	**Notch** **NN**

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**

5.2.2 Electric Availability

Risk Information: SaskPower is the provider to most residential and industrial sites with distribution systems and higher voltage lines of 25KV/69KV (three phase). Recent grid notes show 40MWs of available capacity in the area. Cost of service is ¢11.987 for the first 16,750 kWh and ¢7.674/kWh for the balance. These rates reflect an average for the province. Risk is deemed low as electric power is at a reasonable price to new industries.

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**

5.2.3 Water Availability

Risk Information: Esterhazy is completing construction of its new water system (began in 2022) that will be capable of handling the water need for a population of 8,000 for the next 50 years. This type of infrastructure development is attractive to new employees as it shows the growth potential for the area. This is a low-risk item.

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**

5.2.4 Waste Disposal

Risk Information: The Town of Esterhazy Landfill Site is located east on Hwy. #80. The area has a very strong recycling program for residential and commercial customers. The landfill accepts batteries, used motor oil, and other semi-hazardous items. The rates for residents and local businesses are generally under $100.00 per full truckload. This represents a low-risk issue for new industries.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

5.2.5 Internet Availability

Risk Information: There are at least six providers of internet services in the Esterhazy area. Their services include wireless and high-speed hardwire connections for industrial customers. The number of available sources makes the pricing competitive. This is a low-risk item for new businesses coming into 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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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 Risk Factor: Transportation/Logistics

5.3.1 Road/Highway Access

Risk Information: Primary Road access into and out of Esterhazy is highway SK-22 to the east and west and SK 80 to the north. Both are provincial highways that are maintained and cleared year-round. Smaller roads in the area are accessible

even in winter. The provincial weight limits on these primary roads are 9,100 kg per axle, whereas secondary and municipal roads are 8,200 kg per axle. The weight limits on primary, secondary, and municipal roads are sufficient to allow semi-trucks to move freely for the transportation of feedstock in all areas, with the exception of residential areas. This is a low-risk item for new industries to be concerned with.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

5.3.2 Rail Access

Risk Information: There is access to rail 10 minutes north of Esterhazy via a private rail spur leased by a local flax seed processor that connects to the CN line. Based on outreach with the owner of the rail spur, rail access can potentially be made available to a new bio-based project through this rail spur. Aside from this rail spur, the closest CN or CP connection is in Regina, a 2-hour drive to the west. There are rail lines supporting the Mosaic mine site 10 minutes east of the city, but use by any non-mine customers may not be available. Risk is deemed 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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

5.3.3 Airport Access

Risk Information: Regina International Airport is 238 km to the west of Esterhazy and provides full commercial passenger and air freight service to most major cities in the US and Canada. Brandon Municipal Airport is 219 km to the

east in Winnipeg and has very limited passenger service to Calgary, AB. The Esterhazy airport has a 3000' asphalt runway and can handle small private aircraft but no business jets. The distance to the nearest commercial airport is a medium risk for new companies when considering employee travel and freight needs.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

5.3.4 Water Freight Access

Risk Information: The site has no water freight access. The risk rating is low or no effect; having water freight access is an asset to new development but not a negative if it is unavailable.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

5.4 Risk Factor: Social Infrastructure

5.4.1 Healthcare (Local)

Risk Information: All public health care facilities in Esterhazy are amalgamated under the Sunrise Health District, including a 21-bed hospital, a public health office, mental health services, a home care program, physiotherapy, and a care home.

- St. Anthony's Hospital - St. Anthony's Hospital is located at 216 Ancona Street

- Esterhazy's Centennial Special Care Home - Esterhazy's Centennial Special Care Home is also located on the south end of town, at 300 James Street.
- Esterhazy District Medical Clinic - Esterhazy District Medical Clinic is in the Mosaic District Medical Building, located at 300 Gonczy Avenue, corner of Schafer Street and Gonczy Avenue.
- Esterhazy Dental Clinic, 603 Veterans Avenue
- Esterhazy Optometry Clinic, 519 Main Street

This amount and variety of healthcare coverage in the area is attractive to new developers and potential new employees to the area. This is an asset to any 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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

5.4.2 Education (Schools)

Risk Information: Esterhazy schools consist of P.J. Gillen School for kindergarten through grade 5 and Esterhazy High School offering grades 6-12. Both P.J. Gillen and the High School are fully equipped with libraries, computer labs, and gymnasiums. The Esterhazy High School has a complete industrial arts lab, band room, and home economics lab. Parkland College offers academic, vocational and evening curriculums to the region.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

5.4.3 Local Transportation

Risk Information: The only local transportation in Esterhazy is by taxi or private car. Bus service to Regina is available after a 45-minute taxi ride south to Whitewood. The estimated cost of travelling from Esterhazy to Regina is $120.00-$180.00. The lack of local transportation is a medium risk when developers consider their employees getting to work. However, Esterhazy is a small community, and many areas are within walking or biking distance. This reverts to a minimal risk.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

5.4.4 Public Safety (Local)

Risk Information: Esterhazy is graded with an A- by having a total crime rate of 38% less than the national average. That creates a very livable environment to attract workers. Local law enforcement is provided by the RCMP. There are local fire stations and ambulance (EMS) services. This represents a very low-risk item.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

5.4.5 Housing/Cost of Living

Risk Information: The overall cost of living in the Esterhazy area is 15% lower than the national average. Housing costs, in most areas, are over 60% lower than the average cost nationally. This is very attractive to new residents. However, as with many smaller communities in the province, the availability of housing to either buy or rent can be somewhat limited. This might require workers to locate further from their employment centre in search of housing. This potential shortage is mitigated by the low costs but still presents a medium risk for new industries to consider.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

5.5 Risk Factor: Labour

5.5.1 Workforce

Risk Information: The unemployment rate in Esterhazy is 3.1%, which is 48% lower than the national rate. There is strong competition for skilled and semi-skilled jobs from the three local potash mines. Their pay scales are some of the highest in the province, and they offer reasonable benefits to workers. The labour force participation rate is 64% (the percentage of people in the labour force as a percentage of the civilian noninstitutional population) compared to 60% for the province. This suggests the availability of labour in the area may be very limited as unemployment is very low and a high percentage of those who want to work are working. This is a medium to high-risk item for new industries seeking employees.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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**

5.5.2 Labour Costs

Risk Information: The minimum wage in Saskatchewan is $14.00 per hour. However, as of March 2024, the average hourly wage in Esterhazy is $26.32, or $54,752 per year. Workers in road construction, healthcare, education, and retail management make $18.50-$28.00/hour. These wage rates show a higher-than-average level of income in the local workforce. This, combined with a low unemployment rate and the presence of higher-paying mining jobs, increases the risk for new industries to secure workers without paying a premium for labour.

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) No adjustment. *RRI Mitigation (Notch)* No adjustment. 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 64 out of 100.	**64**

SECTION E: TABLES AND FIGURES

Figure E-1. Flax straw cost by distance from Esterhazy, SK

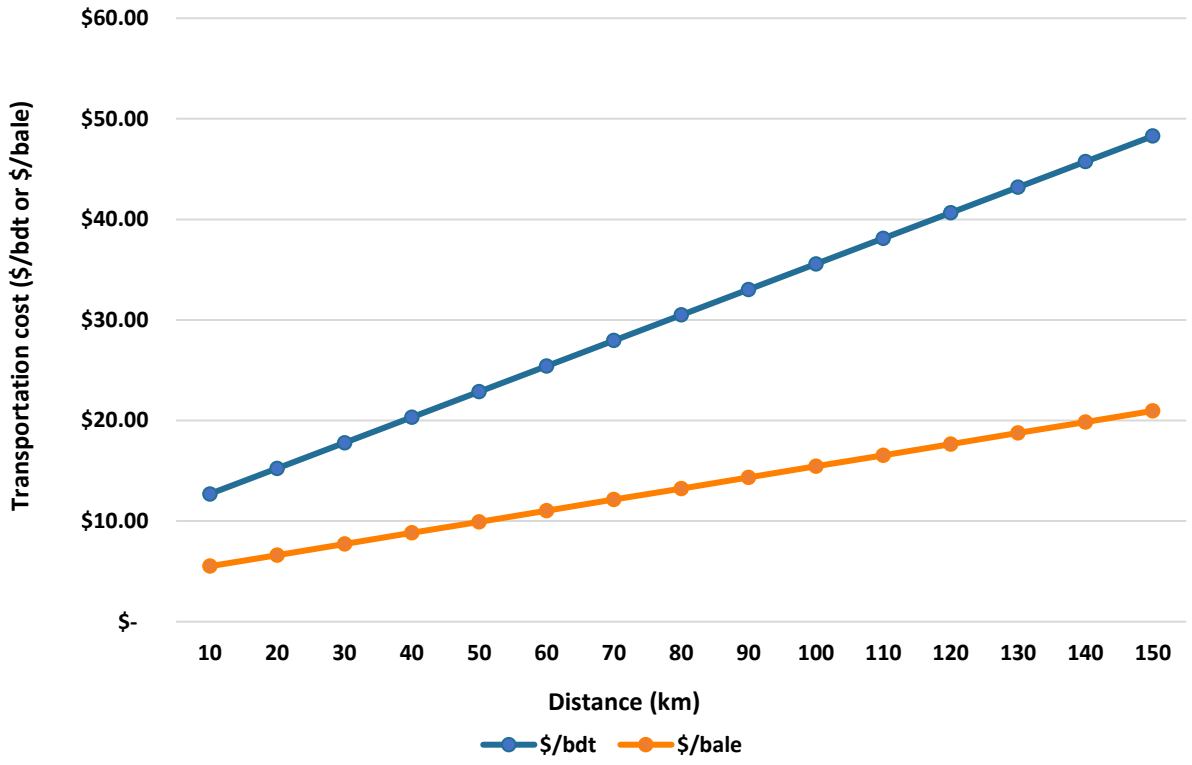
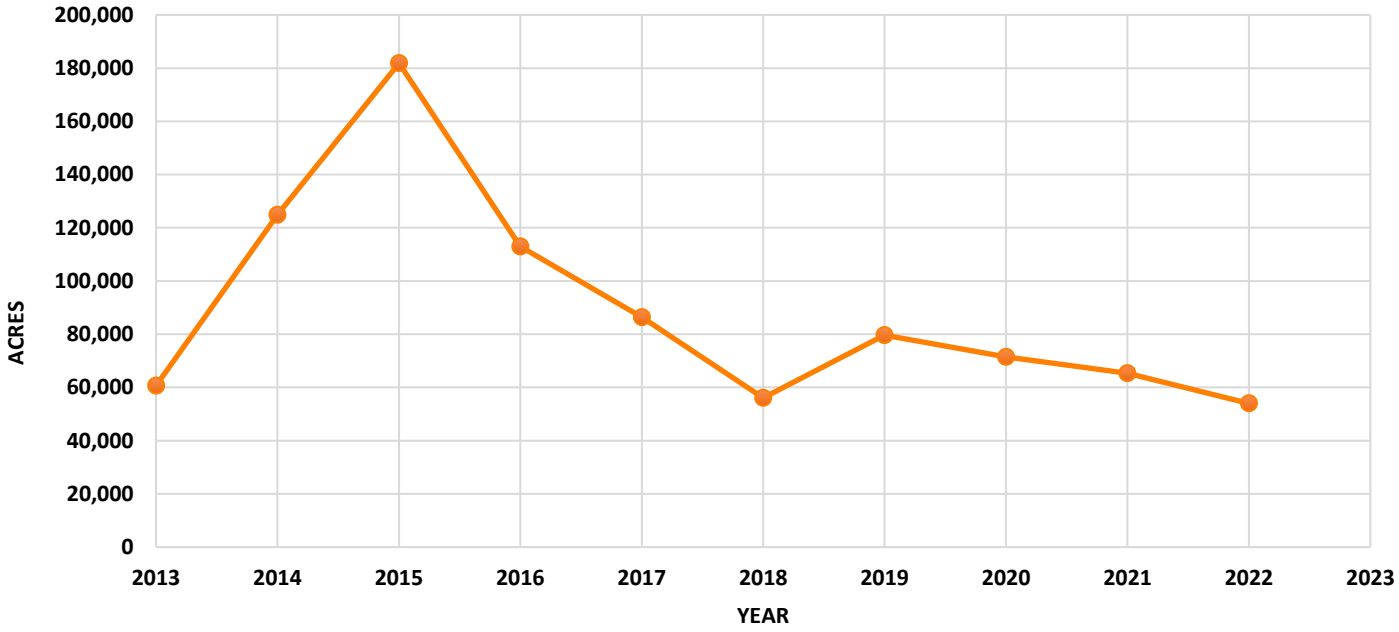


Figure E-2. Flax-planted area within BDO Zone by year



- Flax planted area had nearly doubled year over year between 2013 to 2015 peaking at 181,856 planted acres in 2015.
- Since 2015, flax planted area has continually declined where in 2022 the planted area was close to 54,000 acres a 70% decrease from 2015.
- The decline in flax planted area is attributed to growers switching to canola.

Figure E-3. Consumer Price Index – Saskatchewan (2014-2024).[62]

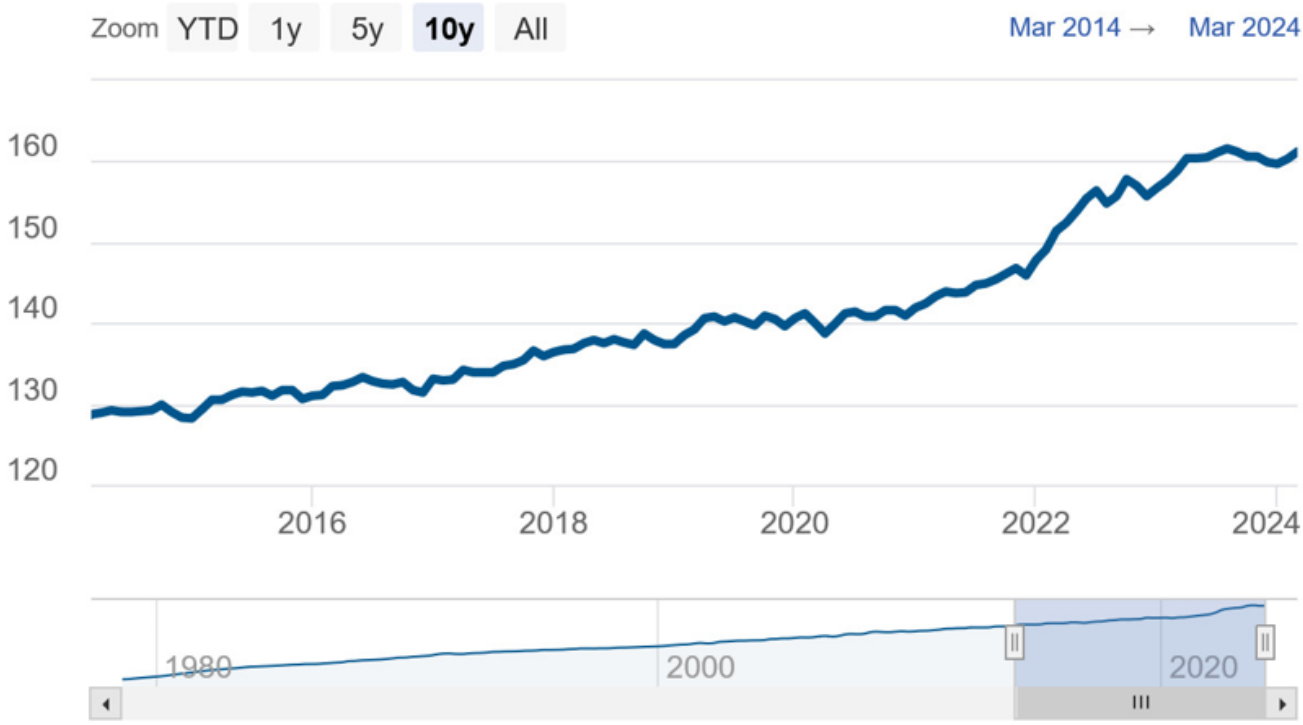
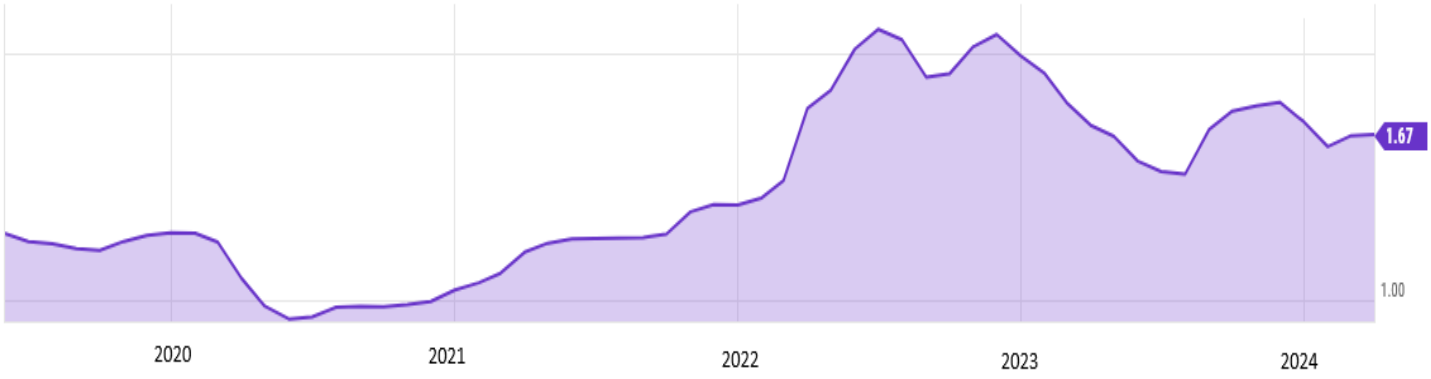


Figure E-4. 5 yr Retail Price Diesel Saskatoon, SK[63]

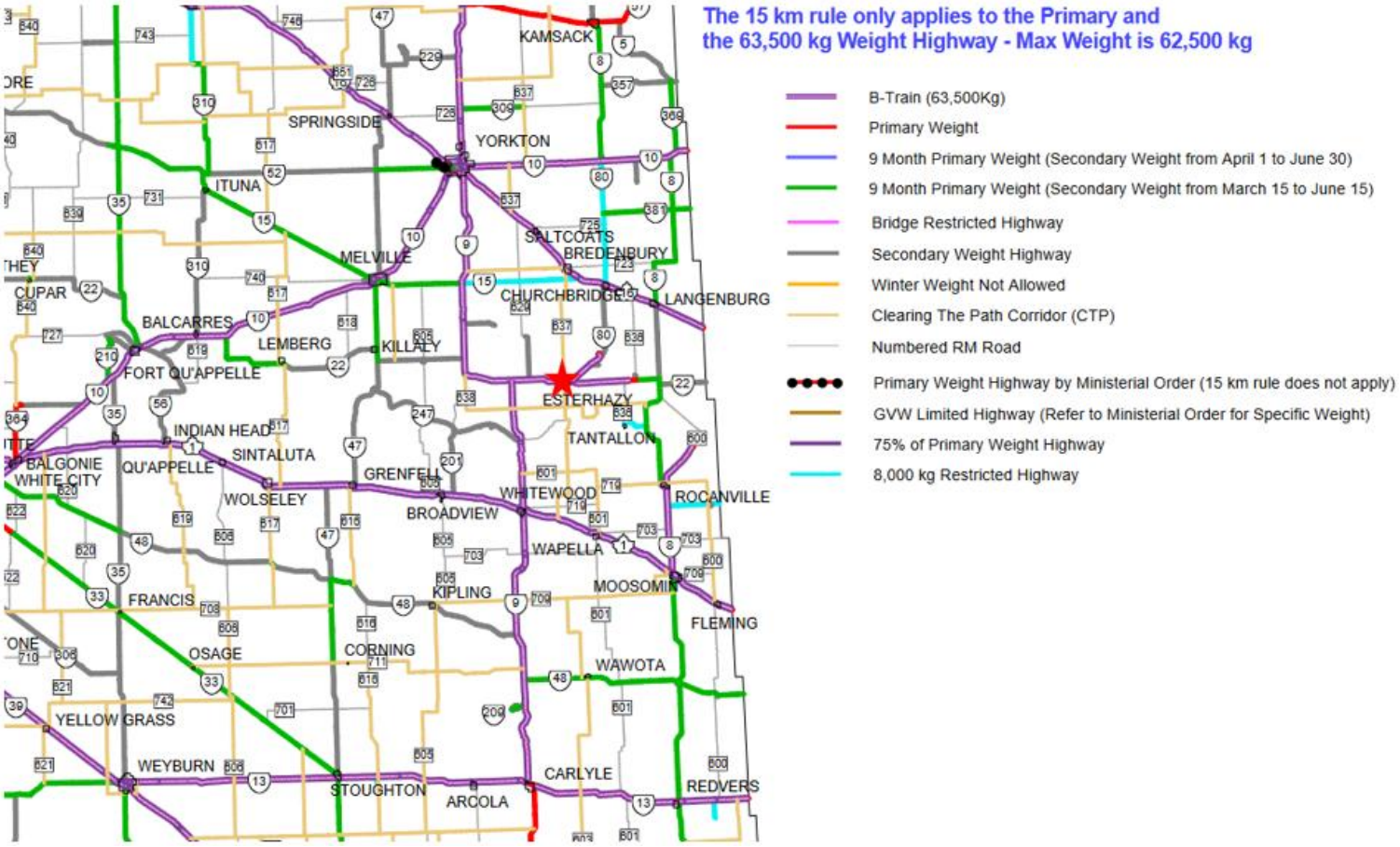


[62] https://dashboard.saskatchewan.ca/business-economy/key-economic-indicators/consumer-price-index#saskatchewan-tab
[63] https://natural-resources.canada.ca/our-natural-resources/domestic-and-international-markets/transportation-fuel-prices/diesel-prices/4797

Table E-1. Ag Machinery Calculation

Ag Machinery Calculation		
Dry tonnes / Acre - Yield	0.62	Each crew: 2 balers, 2 bale collector, 4 tractors
Acres / Baler	3,500	Each baler harvest about 3500 acres per year
Tractors / 2 Baler	4	2 tractors for 2 balers, and 2 tractors for two wagons to collect bales
Bale collector / 2 Balers	2	
Annual Biomass Demand (Dry tonnes)	31,700	
Acres of Land harvested	45,300	
Balers Required	12	
Tractors Required	24	
Wagons / Collectors Required	12	
Truck Payload (bdt)	15	
Truck Cycle time (hr per trip)	3	2 hr travel time and 1 hour load and unload
Working hours	10	
Number of trips per day	3	
working days per year	300	
Number of trips per year	900	
Total transported biomass per year per truck	13,500	
Trucks #	3	

Figure E-5. Road weights and restrictions in the BDO Zone[64]



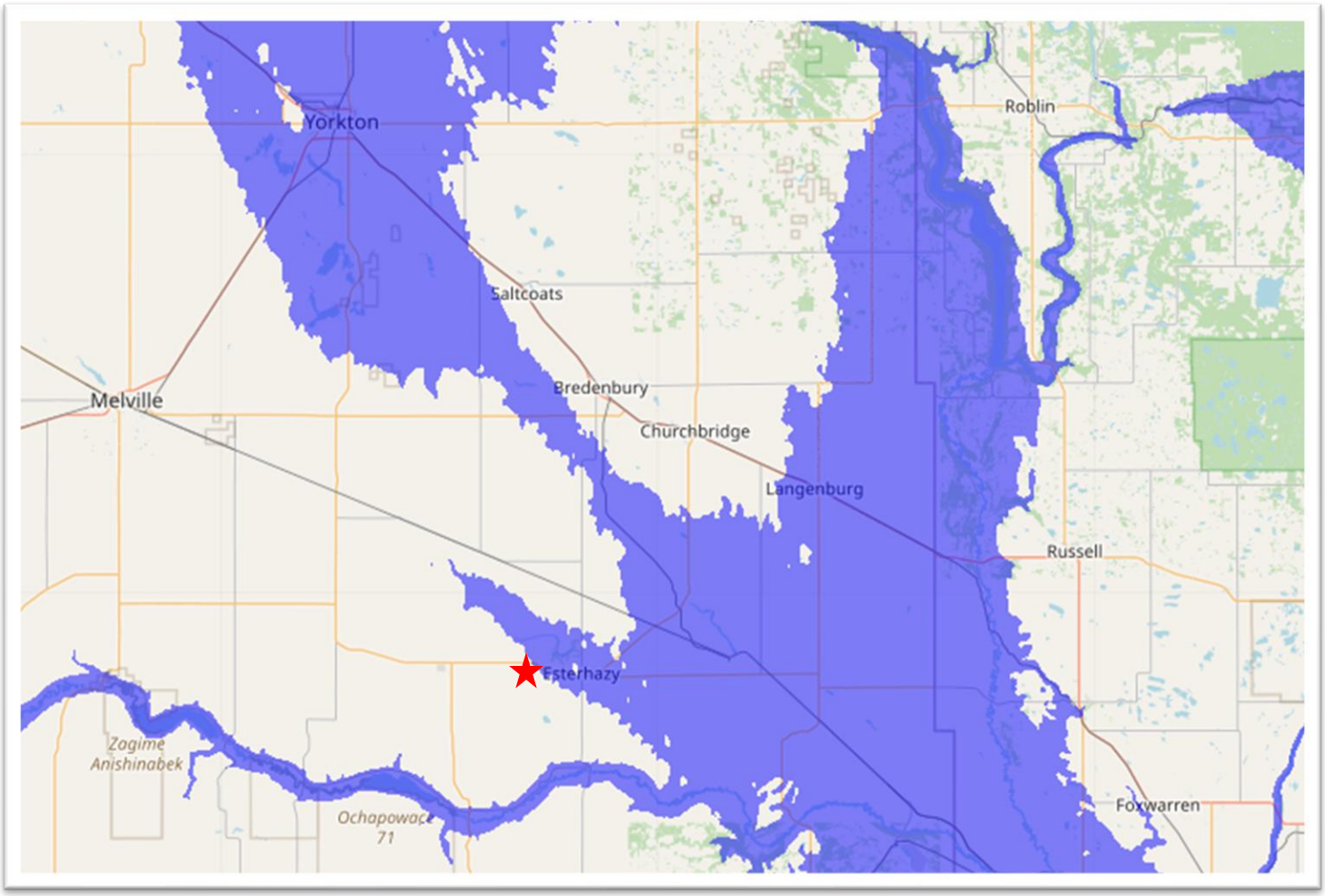
The four classes of highways that surround Esterhazy and displayed in the above Map Bre described below:

- Strong presence of roads allowing for B-Train configurations and weights up to 63,500 kg surrounding Esterhazy region in all directions.
- Highways where winter weight allowances are not allowed whereas winter weights allow additional weight and typically run from November 16 through March 14.
- Secondary weight highways that are limited to 41 500 kg regardless of truck configuration and unless otherwise noted.
- Highways where there is a 9-month primary weight (63,500 kg) allowance and secondary weight in effect from March 15 to June 15. This type of highway is east of Esterhazy and runs north and south.

[64] https://pubsaskdev.blob.core.windows.net/pubsask-prod/142494/WeightClassMap_CTP_63500.pdf

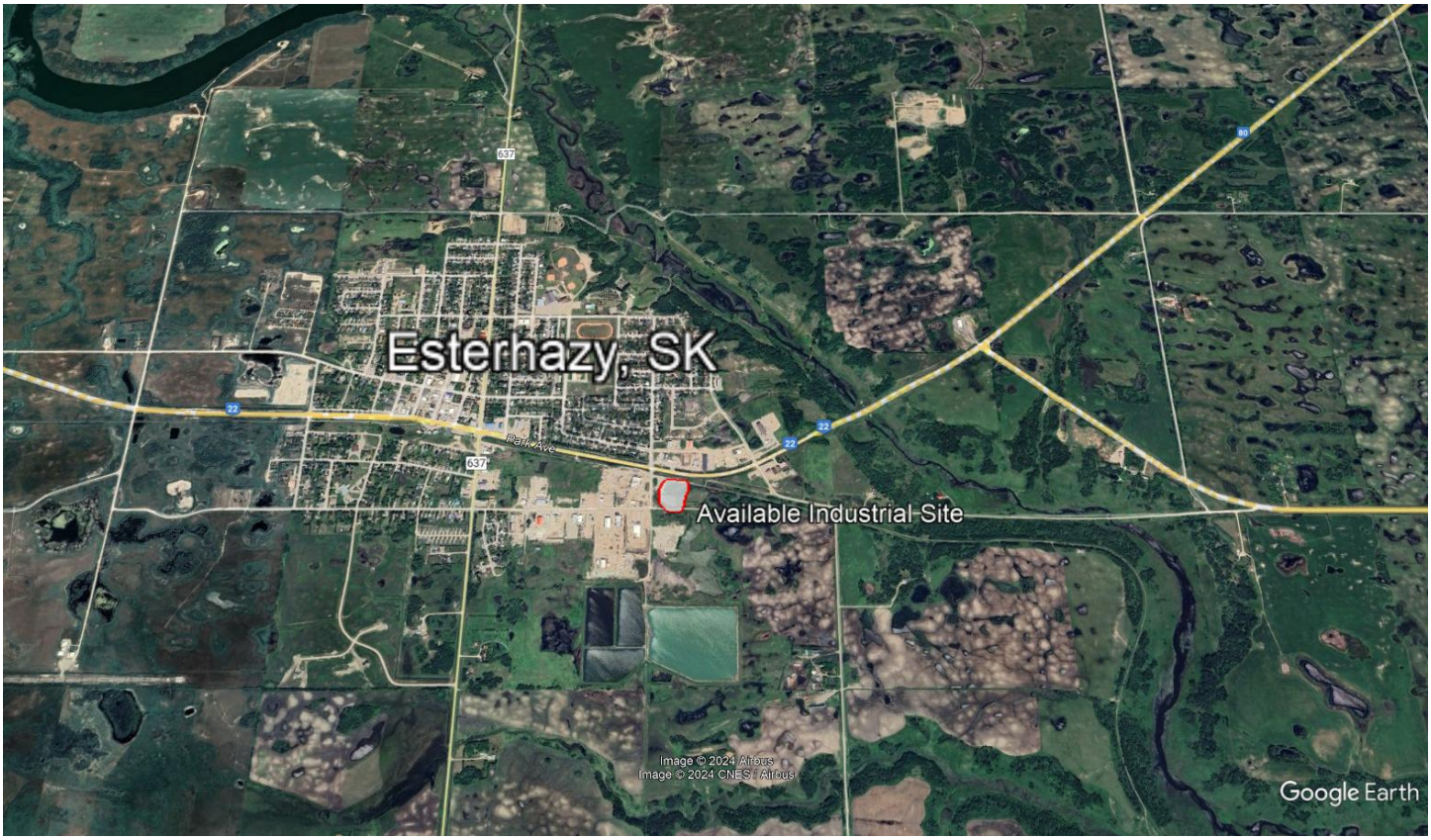
The below map depicts areas at risk of flooding above sea level rise, primarily concentrated east of Esterhazy and along the local watercourse to the northwest.

Figure E-6. Esterhazy region flood elevation above sea level rise map[65]



[65] https://www.floodmap.net/?gi=5949563

Figure E-7. Industrial site location



- 10-acre greenfield site approximately 2 km SE of Esterhazy
- Situated in a commercial/industrial area with access to power and septic
- Natural gas and potable water are available in the area and would require some connection costs
- Easy access to SK 22, a major highway less than 1 km to the north
- Zoned for light /medium industrial operations and is in an air attainment area (no major permitting needed)

SECTION F: LEGAL DISCLAIMER

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