BDO Zone Rating: **'AA'**

Bioeconomy Development Opportunity Zone Risk Rating

'AA'

The Renfrew County, ON, Bioeconomy Development Opportunity Zone is rated 'AA'. Abundance of available pulpwood and sawmill chip feedstocks, coupled with recent significant decreases in demand for these resources, create a favourable supply situation.

Rating Parameters:

Category	Rated Quantity	Delivered Price	BDO Zone Size
Sawmill Chip	85,000 gmt/yr	$65-$75/gmt	130-km drive distance
Pulpwood	400,000 gmt/yr	$50-$60/gmt	from Pembroke, ON

BDO Zone Assets

- **At least 480,000 gmt/yr of pulpwood is estimated to be potentially accessible in the BDO Zone, of which 400,000 gmt/yr is available at low risk.**
- **In addition to the annual availability, there is a glut of pulpwood currently available for harvesting, resulting from closures of pulp mills over the past two decades**
- **Distance advantage over most competitors for sawmill chips.**
- **Sustainably managed and certified forests.**

BDO Zone Liabilities

- **Contracting logging capacity due to higher operational costs and aging workforce.**
- **Potential risks related to procuring pulpwood from private forests.**
- **Suppliers subject to the same external risk exposure.**

BDO Zone Risk Rating

The Renfrew County, ON, Bioeconomy Development Opportunity Zone is rated 'AA,' or 'low' risk.

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

Renfrew County, ON, BDO Zone



Scoring & Rating Methodology

In assessing the biomass supply chain risk for the Bioeconomy Development Opportunity (BDO) Zone, 72 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 green metric tons per year (gmt/yr). While feedstock costs are expressed in Canadian (CAD) dollars. Maximum transport distance is based on a 130-km driving distance from the centre point (Pembroke, ON).

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).

Next, 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.

Then, the **Gross Risk Indicator (GRI)** score is calculated as the product of the RRL and the RRI

scores. For example, if the 'Competitor Price and Price Sensitivity' is scored at a RRL of 2 and a RRI of 9, then the GRI for this risk indicator is $2 \times 9 = 18$.

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

Finally, the **Loaded RI** score for each Risk Indicator is calculated as the product of the Total Notch and the GRI score, which is the final score for that indicator.

Loaded RI scores of 20 or less are deemed *very low risk*; scores between 21 and 40 are deemed *low risk*; scores between 41 and 60 are deemed *medium risk*; scores between 61 and 80 are deemed *high risk*; and scores of 81 and greater are deemed *very high risk*.

The total risk rating for the BDO Zone is the average of all Loaded RI scores. The BDO Zone score for Renfrew County is ***14.84 out of 100, resulting in an 'AA' designation***.

All scoring and rationale for each Risk Indicator are provided in Appendix B.

Analyst Notes

Based on our analysis, the Renfrew County BDO Zone offers an abundant supply of low-grade roundwood, commonly known as pulpwood, which holds immense potential for new projects. Our estimates indicate an availability of at least 483,000 green metric tons per year (gmt/yr) of pulpwood within the BDO Zone. Among this supply, we believe that approximately 400,000 gmt/yr can be sourced at a low risk, presenting a highly favourable feedstock opportunity. In addition to this annual estimate, there is a glut of pulpwood available in the short-term, resulting from decreased demand over the past two decades.

In addition to the significant pulpwood availability, the BDO Zone is home to 10 sawmills, collectively generating over 440,000 gmt/yr of wood chips. We estimate that at least 85,000 gmt/yr could be accessed by a new project located in Pembroke, at an average price of $65-$75/gmt delivered.

It is important to note that this analysis excludes three other by-product streams produced by the sawmills; namely bark, sawdust, and shavings. These by-products have already secured multiple well-paying markets, and in the case of bark, a large consumer of bark is expected to start operations in a two-to-three-year timeframe. For these reasons, the risk profile of bark, sawdust, and shavings is deemed high, and therefore these feedstock types are not considered in this rating.

Additionally, we have excluded logging residue from our assessment. Logging residue exhibits a lower quality compared to pulpwood and carries a significantly higher cost. Moreover, acquiring logging residue entails a higher risk due to the lack of established supply chains for its collection and processing. Given the abundance of pulpwood and its advantageous risk profile, we find no justification in assessing logging residue for the BDO Zone.

BDO Zone Assets

The Renfrew County BDO Zone boasts an abundance of pulpwood, partly attributed to the closure of significant pulpwood consumers over the past two decades. Notably, a pulp mill in Portage-du-Fort ceased operations in 2008, consuming an estimated 600,000 gmt/yr of pulpwood. Similarly, in 2019, a pulp mill in Thurso also shuttered its operations. These closures have left a void in the market, with no replacements for the lost demand. Consequently, pulpwood often traverses long distances, up to 500 km, to reach current markets.

Pembroke enjoys favourable proximity to major woody biomass suppliers in the region. Notably, large sawmills cluster around Pembroke. The Roseburg Forest Products MDF plant is a large consumer of wood chips and is located right in Pembroke; however, the other consumers are located at considerable distances from the sawmills. This makes Pembroke an attractive location, especially in the light of increasing transport costs.

From a sustainability perspective, a large portion of the BDO Zone comprises public forests that

undergo rigorous certification and adhere to ecological guidelines. Privately owned forests are required to protect endangered species and their habitat, under the Endangered Species Act (2007).

BDO Zone Liabilities

Sawmills, the primary suppliers of bark and wood chips, are subject to external risk factors, including economic fluctuations affecting the housing market. Despite these challenges, sawmills within the BDO Zone have demonstrated resilience historically, as there have been no known sawmill closures following the 2008 financial crisis.

The declining availability of labour for feedstock production presents a significant challenge within the BDO Zone. An aging workforce and the lack of replacements, particularly in logging companies (which are often small, family-owned businesses), further exacerbate the issue. Escalating costs of insurance, capital, and equipment add to the complexities of sustaining logging operations.

For new bio-projects seeking to augment the existing market demand for roundwood, the contracting logging workforce poses considerable risk. To address this concern, a potential mitigation strategy lies in vertical integration. By internally hiring logging crews and procuring equipment, a bio-project assumes operational risks while reducing the dependence on outsourced harvesting from a contracting workforce. Several sawmills in Ontario and Quebec are currently exploring such strategies.

A large portion of the forests in the BDO Zone are privately owned. While these private forests have traditionally been managed for timber production, the landowner profile is evolving, with many now managing forests for recreational purposes. Additionally, the lack of a transparent timber marketing board serving landowners creates risks associated with procuring pulpwood from private forests.

The Species at Risk Act (SARA), a provincial regulation aimed at protecting species, can significantly impact timber harvesters, leading to increased costs and potential liabilities. Although its objective is species preservation, SARA's mechanisms can prove detrimental to the forest industry, generating risks for biomass consumers.

Infrastructure Profile

The BDO Zone infrastructure risk is deemed 13.6 out of 100, which is considered good.

Pembroke has a population of approximately 14,000. It is situated on the Trans-Canada Highway 17 and Highway 41. The nearest marine port is the Port of Johnstown, located 211 km from Pembroke. The Port of Montreal, the second-largest container port in Canada, is 345 km away.

There are two industrial parks with sites available for development: TransCan Corporate Park and McCool Business Park. Both are owned by the Corporation of the City of Pembroke and are connected to natural gas supplied by Enbridge, as well as electrical supply by Hydro One and Ottawa River Power Corp.

Social infrastructure, including educational institutions and community services, provides a supportive environment for workforce development and community engagement.

Renfrew County has a total labour force of 49,115. The minimum wage in Ontario is CAD $15.50 per hour. The average hourly wage for all occupations in Renfrew County is $20, with a median income of $42,000 per year. Pembroke's average household income is $69,000 annually. The average value of a housing unit in Renfrew County is $447,444.

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Figure 1: Risk Indicators (Sorted by Risk Level)

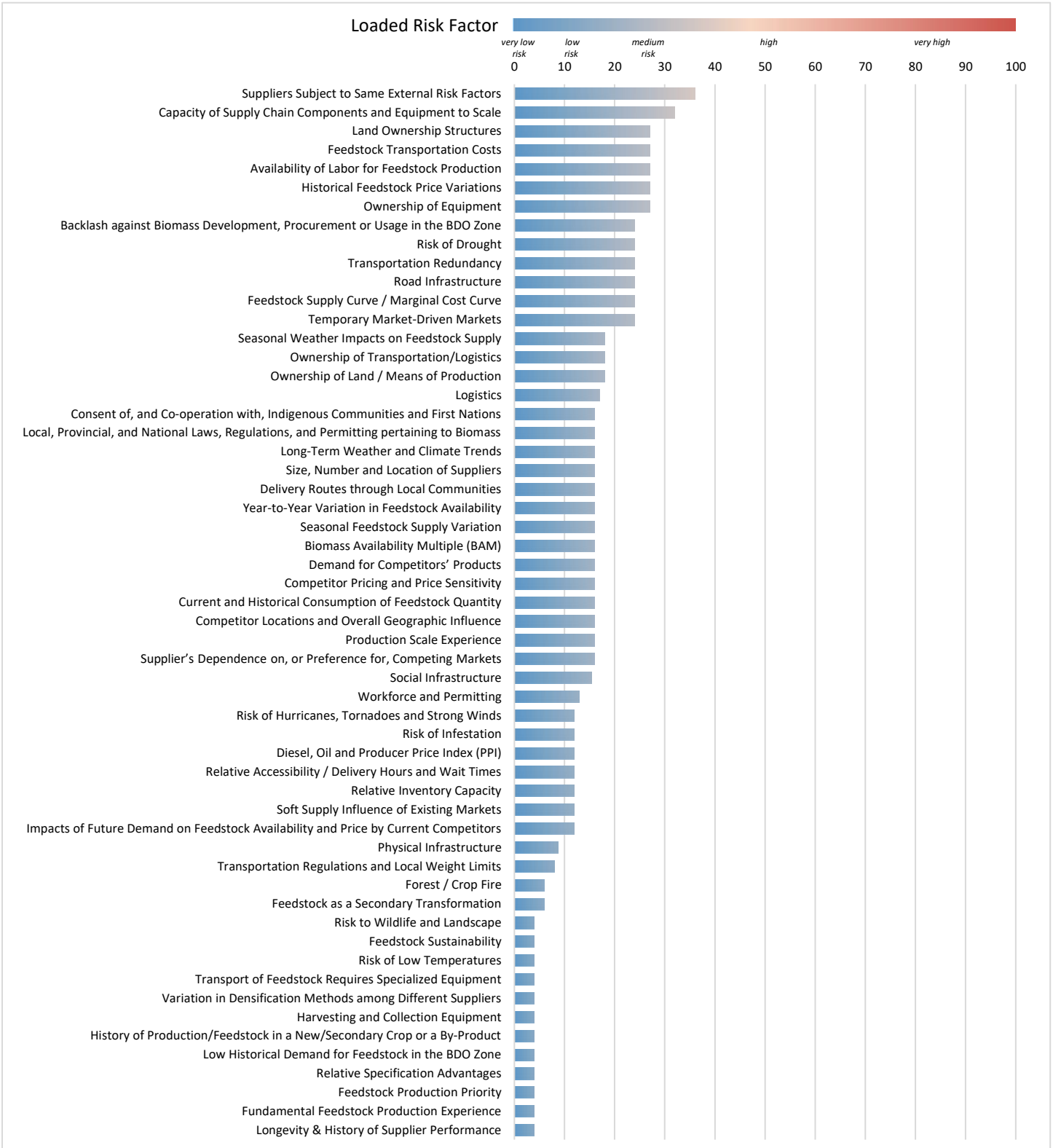


Table 1: Risk Indicators and Associated Scores

	Feedstock Supply Chain Risk Indicators	Raw Risk Likelihood	Raw Risk Impact	Gross Risk Indicator	Mitigation /Notching	Loaded RI Score
	Category 1.0: Supplier Risk					
1.1.1	Longevity & History of Supplier Performance	2	2	4	NN	4
1.2.1	Supplier's Dependence on, or Preference for, Competing Markets	4	8	32	50%	16
1.3.1	Ownership of Land / Means of Production	4	6	24	25%	18
1.3.2	Ownership of Equipment	6	6	36	25%	27
1.3.3	Ownership of Transportation/Logistics	6	6	36	50%	18
1.3.4	Feedstock as a Secondary Transformation	4	2	8	25%	6
1.4.1	Fundamental Feedstock Production Experience	2	2	4	NN	4
1.4.2	Production Scale Experience	4	4	16	NN	16
1.5.1	Supplier's Equipment Efficiency	NR	NR	NR	NR	NR
1.6.1	Feedstock Production Priority	2	2	4	NN	4
	Category 2.0: Competitor Risk					
2.1.1	Competitor Locations and Overall Geographic Influence	4	8	32	50%	16
2.1.2	Current and Historical Consumption of Feedstock Quantity	2	8	16	NN	16
2.1.3	Competitor Pricing and Price Sensitivity	4	8	32	50%	16
2.1.4	Impacts of Future Demand on Feedstock Availability and Price by Current Competitors	2	6	12	NN	12
2.1.5	Soft Supply Influence of Existing Markets	4	6	24	50%	12
2.1.6	Temporary Market-Driven Markets	4	6	24	NN	24
2.2.1	Relative Inventory Capacity	6	4	24	50%	12
2.2.2	Relative Accessibility / Delivery Hours and Wait Times	6	4	24	50%	12
2.2.3	Relative Specification Advantages	2	2	4	NN	4
2.2.4	Demand for Competitors' Products	2	8	16	NN	16
	Category 3.0: Supply Chain Risk					
3.1.1	Biomass Availability Multiple (BAM)	2	8	16	NN	16
3.1.2	Feedstock Supply Curve / Marginal Cost Curve	8	6	48	50%	24
3.1.3	Seasonal Feedstock Supply Variation	4	8	32	50%	16
3.1.4	Year-to-Year Variation in Feedstock Availability	4	8	32	50%	16
3.2.1	Historical Feedstock Price Variations	6	6	36	25%	27
3.2.2	Low Historical Demand for Feedstock in the BDO Zone	2	2	4	NN	4
3.2.3	History of Production/Feedstock in a New/Secondary Crop or a By-Product	2	2	4	NN	4
3.3.1	Diesel, Oil and Producer Price Index (PPI)	8	2	16	25%	12
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	NR	NR	NR	NR	NR
3.4.1	Harvest and Collection Practices and Schedules	NR	NR	NR	NR	NR
3.4.2	Harvesting and Collection Equipment	2	2	4	NN	4
3.4.3	Variation in Densification Methods among Different Suppliers	2	2	4	NN	4
3.4.4	Availability of Labor for Feedstock Production	6	6	36	25%	27
3.5.1	Feedstock Transportation Costs	6	6	36	25%	27
3.5.2	Diesel Cost Impacts	NR	NR	NR	NR	NR
3.5.3	Transport of Feedstock Requires Specialized Equipment	2	2	4	NN	4
3.5.4	Delivery Routes through Local Communities	2	8	16	NN	16
3.5.5	Transportation Regulations and Local Weight Limits	4	2	8	NN	8
3.5.6	Road Infrastructure	4	6	24	NN	24
3.5.7	Transportation Redundancy	6	8	48	50%	24
3.6.1	Size, Number and Location of Suppliers	4	8	32	50%	16
3.6.2	Suppliers Subject to Same External Risk Factors	6	8	48	25%	36
3.6.3	Land Ownership Structures	6	6	36	25%	27
3.7.1	Seasonal Weather Impacts on Feedstock Supply	4	6	24	25%	18
3.7.2	Long-Term Weather and Climate Trends	4	8	32	50%	16
3.7.3	Forest / Crop Fire	6	2	12	50%	6
3.7.4	Risk of Infestation	6	2	12	NN	12
3.7.5	Risk of Hail	NR	NR	NR	NR	NR
3.7.6	Risk of Flood	NR	NR	NR	NR	NR
3.7.7	Risk of Drought	6	8	48	50%	24
3.7.8	Risk of Hurricanes, Tornadoes and Strong Winds	4	6	24	50%	12
3.7.9	Risk of Low Temperatures	2	2	4	NN	4
3.8.1	Government Subsidies for Feedstock Production or Utilization	NR	NR	NR	NR	NR
3.8.2	Local, Provincial, and National Laws, Regulations, and Permitting pertaining to Biomass	8	2	16	NN	16
3.8.3	Backlash against Biomass Development, Procurement or Usage in the BDO Zone	6	8	48	50%	24
3.8.4	Consent of, and Co-operation with, Indigenous Communities and First Nations	2	8	16	NN	16

3.8.5	Food Security Concerns	NR	NR	NR	NR	NR
3.9.1	Feedstock Sustainability	2	2	4	NN	4
3.9.2	Risk to Soil Quality	NR	NR	NR	NR	NR
3.9.3	Risk to Surface and Groundwater	NR	NR	NR	NR	NR
3.9.4	Water Use	NR	NR	NR	NR	NR
3.9.5	Pesticide Risk to Human and Ecosystem Health	NR	NR	NR	NR	NR
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					
4.1.1	Feedstock Quality at Production Scale	NR	NR	NR	NR	NR
4.1.2	Capacity of Supply Chain Components and Equipment to Scale	8	8	64	50%	32
	Category 5.0: Infrastructure					
5.1	Physical Infrastructure	2.8	3.0	9.6	5%	8.8
5.2	Logistics	3.5	4.5	17.0	-	17.0
5.3	Social Infrastructure	3.7	3.7	15.4	-	15.4
5.4	Workforce and Permitting	3.5	3.5	13.0	-	13.0
					Average	**14.84**



Renfrew County, ON, BDO Zone Independent Review Committee (IRC)

David Wybou – County of Renfrew
Melissa Marquardt – County of Renfrew
Lacey Rose – County of Renfrew
Dean Felhaber – Ben Hokum & Son Limited
Ted Murray – Murray Bros. Lumber Company Ltd.
Matthew Mertins – Roseburg Forest Products
Dean Johnson – DF Johnson & Associates
Leo Hall – Opeongo Forestry Service
Malcolm Cockwell – Haliburton Forest & Wildlife Reserve
Grant Gulick – Gulick Forest Products Ltd.
Nick Gooderham – Ottawa Valley Forest Inc.
Megan Hundt – Killaloe Wood Products Ltd.

APPENDIX A: BIOMASS AVAILABILITY AND PRICING

Here, we establish the parameters for the BDO Zone, which includes the available feedstock quantity and pricing for a potential new bio-project. The feedstock quantity is evaluated based on the Biomass Availability Multiple (BAM), which takes into account the redundancy required for a low-risk supply chain. The pricing reflects the anticipated price for a new bio-project, assuming additional demand equal to the rated feedstock quantity. It is important to note that the pricing does not necessarily reflect the current market price, but rather the expected price available for a new bio-project. However, there is typically a small difference between the current market pricing for feedstock and the anticipated pricing

FOREST RESIDUE

We have assessed the utilization of forest residue within the BDO Zone. Presently, the incorporation of forest residue is not a viable option due to its prohibitively high costs associated with collection and processing. According to local experts, past trials have revealed that forest residue costs are double that of pulpwood.

Considering the BDO Zone's ample availability of pulpwood and the considerable expense linked to forest residue, along with the inherent risks involved in establishing a forest residue supply chain, we have made the decision to exclude forest residue from factoring into the BDO Zone rating.

SAWMILL RESIDUALS

There are 10 sawmills located within the BDO Zone, as indicated in Table C-1 and Map C-3 of Appendix C. Our estimates reveal that these sawmills collectively generate an estimated 740,478 gmt/yr (green metric tons per year) of sawmill residuals. This comprises 443,791 gmt/yr of wood chips, 121,483 gmt/yr of sawdust, 71,333 gmt/yr of shavings, and 103,871 gmt/yr of bark.

It is important to note that most of these residuals currently have existing markets. However, we are particularly interested in assessing the portion of these residuals that could realistically be made available to a potential bio-project in the Pembroke area. To arrive at this evaluation, we have considered several crucial variables:

- Transportation costs have experienced a significant increase, rising from an average of $5.50/mile in 2022 to $7.20/mile in 2023. This escalation underscores the growing importance of proximity between suppliers and buyers.
- The largest consumer of wood chips and sawdust generated in the region is Pembroke MDF. In 2022, the Roseburg Forest Products MDF plant in Pembroke consumed 256,000 gmt of wood chips and 108,000 gmt of sawdust. The second most important consumer of wood chips and sawdust is Ensyn in Renfrew, ON. Other large markets for wood chips are located relatively far and consume residuals generated within the BDO Zone in times of surplus.
- Currently there is a glut of bark in the market resulting from lower demand from Pembroke MDF. However, Pembroke MDF indicated that it plans to install a large bark boiler, eventually consuming substantial quantities of bark.
- Significant competition exists for shavings, mainly from the animal bedding market.
- Recently, a pulp mill in Thurso, QC, has ceased operations. This mill was a significant purchaser of residuals generated in the BDO Zone.

Based on the insights garnered from the market feedback, our assessment indicates that there is substantial demand for sawdust and shavings from high-value markets. As a result, the risk profile of these two feedstock streams is relatively high. Consequently, in our evaluation, we are only considering bark and wood chips as viable feedstock streams:

- *Bark:* The sawmills located within the BDO Zone generate an estimated 103,871 gmt/yr of bark. While there is currently a surplus of bark in the market, Roseburg Forest Products in Pembroke indicated that, in 2026, it is planning to install a large boiler consuming 125,000 gmt/yr of bark. Therefore, if Roseburg moves forward with the plan, which we believe is likely, as Roseburg was previously the largest consumer of bark and understands the economics of a bark boiler, then there will be no surplus of bark in the market. Therefore, bark is not assessed as part of this BDO Zone.
- *Wood Chips:* Within the BDO Zone, an estimated 443,791 gmt/yr of wood chips are generated by sawmills.
    - Although all wood chips currently generated within the BDO Zone have markets (refer to Map C-4, Appendix C), they tend to gravitate towards closer markets. This is due to the high transportation cost compared to the final cost of delivered wood chips. If a new bio-project were to be located in Pembroke, it would 'short-haul' most of the existing markets, thus becoming a more competitive market for sawmills.
    - However, it is important to consider that to mitigate the risk, individual sawmills would not want to commit all of their residuals to one buyer. As a result, sawmills will likely continue to supply a portion of their wood chips to current buyers, even if those buyers are located at larger distances.
    - To calculate the quantity of wood chips potentially available to a new bio-project in Pembroke, we make the following assumptions:
        - The Roseburg Forest Products MDF plant in Pembroke will continue to consume 256,000 gmt/yr of wood chips[1].
        - Sawmills located in the BDO Zone will continue supplying other markets at a rate of 30% of their remaining production volume. This rate is considered conservative, as most sawmills will likely redirect the majority of their remaining wood chips to Pembroke due to the significantly shorter haul distance.
        - Therefore, the calculation is as follows: 70% * (443,791 gmt/yr - 256,000 gmt/yr) = 131,454 gmt/yr.
        - To account for uncertainty in analysis, we assume a redundancy factor (Biomass Availability Multiple) of 1.5x. In other words, to mitigate against potential errors in our calculations and assumptions, we rate this BDO Zone at 50% lower than what we think is potentially available to a new bio-project. Therefore, the quantity of wood chips potentially available to a new bio-project at a 1.5x BAM level is: 131,454 gmt/yr / 1.5 = 87,636 gmt/yr. We round off this estimate to 85,000 gmt/yr.
        - Based on direct feedback from sawmill operators as well as local experts, the expected delivered average price of woodchips, given the additional demand of 85,000 gmt/yr in Pembroke, is $65 - $75/gmt.

Therefore, this BDO Zone is rated for 85,000 gmt/yr of Sawmill Chip at $65 - $75/gmt delivered.

PULPWOOD

The Renfrew County BDO Zone consists of three separate forest management jurisdictions: 1) Public forests in Ontario administered by the Ontario Ministry of Natural Resources and Forestry; 2) Public forests in Quebec administered by the Quebec Ministry of Natural Resources; 3) Private forests. To assess potential pulpwood availability, we look at each of these categories separately.

Quebec

- Over 99% of the Quebec portion of the Renfrew County BDO Zone is located within the Outaouais region. The BDO Zone is comprised of 138,439 hectares (ha) of public forest and 256,288 ha of private forest.

[1] Data provided by Roseburg Forest Products representative.

- In relation to public forests, there are several management units that partially overlap with the BDO Zone. These include: i) 071-51 with a 7% overlap; ii) 071-52 with a 21% overlap; iii) 072-51 with a 3% overlap; iv) 073-51 with a 14% overlap; v) 073-52 with a 14% overlap; and vi) 074-51 with a 41% overlap.
- To estimate the quantity of pulpwood potentially available from each management unit, we multiply the overlap factor by the total pulpwood availability of the management unit. The total pulpwood availability was provided by the Quebec Ministry of Natural Resources. The estimated pulpwood availability from public forests in the Quebec portion of the BDO Zone is 13,919 gmt/yr, of which 10,393 gmt/yr are hardwoods, 2,786 gmt/yr are softwoods, and 740 gmt/yr are poplars.
- Regarding pulpwood potentially available from private forests in the Quebec portion of the BDO Zone, our estimates are based on a 2021 report prepared by WSP for the Quebec Ministry of Natural Resources (WSP Ref: 201-03354-002, Table 14). According to this report, there is a potential availability of 150,924 gmt/yr of pulpwood from private forests in the Outaouais region. Given that 33.7% of private forests in the Outaouais region are also located in the Renfrew County BDO Zone, we estimate that the potential availability of pulpwood from private forests within a 130-km drive of Pembroke is 50,887 gmt/yr. This includes 13,829 gmt/yr of hardwoods, 5,178 gmt/yr of softwoods, and 6,437 gmt/yr of poplars.
- In conclusion, we estimate that a total of **64,806 gmt/yr** of pulpwood is potentially available from the Quebec portion of the Renfrew County BDO Zone.

Ontario

- Forests located in Ontario are categorized into public forests, also referred to as Forest Management Units (FMUs) and private forests. The BDO Zone is comprised of four FMUs: Ottawa Valley Forest (93% overlap with the BDO Zone), Algonquin Park Forest (29% overlap), Mazinaw-Lanark Forest (19% overlap), and Bancroft-Minden Forest (13% overlap). Pulpwood availability was acquired from each FMU's Forest Management Plan, and in particular, Table FMP-14, which indicates planned harvesting quantities.
- The availability estimates were then adjusted based on the percent overlap with the BDO Zone. The following is a breakdown of pulpwood availability by FMU[2] [3] (details provided in Table C-2, Appendix C):
    - Ottawa Valley Forest: estimated availability of 99,048 m3/yr
    - Algonquin Park Forest: estimated availability of 104,693 m3/yr
    - Mazinaw-Lanark Forest: estimated availability of 11,426 m3/yr
    - Bancroft-Minden Forest: estimated availability of 9,599 m3/yr
- For simplicity of calculation, we assume that one cubic meter is equal to one green metric ton of pulpwood. Therefore, in total, there is **224,765 gmt/yr** of pulpwood available in the BDO Zone from public lands in Ontario.
- To estimate pulpwood availability from private forest lands, we assumed that pulpwood ratio in private forests is equal to that in public forests. For example, the ratio of pulpwood to other timber in the public lands of the Ottawa Valley Forest is 0.59 m3/ha/yr; we apply the same ratio to private forests within the Ottawa Valley Forest. All calculations are listed in Table C-3 in Appendix C. Based on these assumptions, the following volumes of pulpwood are available from private lands in Ontario:
    - Ontario Valley Forest: estimated availability of 136,262 m3/yr
    - Algonquin Park Forest: none (all lands are public)
    - Mazinaw-Lanark Forest: estimated availability of 34,756 m3/yr
    - Bancroft-Minden Forest: estimated availability of 22,459 m3/y4

[2] Note that the original values are provided in cubic meters. For the purposes of this report, we assume that one cubic meter of roundwood is equal to one metric ton.

[3] Tables FMP-14 identify utilized and unutilized biomass. For the purposes of this report, we consider only unutilized quantities. It should be noted, however, that recent closure of the pulp mill in Espanola is likely to result in a portion of the 'utilized' biomass become available.

- For simplicity of calculation, we assume that one cubic meter is equal to one green metric ton of pulpwood. Therefore, in total, there is **193,477 gmt/yr** of pulpwood available in the BDO Zone from private lands in Ontario.
- Therefore, we estimate that **within the BDO Zone there is 483,048 gmt/yr of Pulpwood** potentially available (Table C-4, Appendix C).
- To account for estimation errors and unforeseen risks related to access to pulpwood, we apply a Biomass Availability Multiple (BAM) of 1.2x. We are confident with a low BAM, as our estimates are based either on government provided data or on conservative estimates. Furthermore, our estimates do not take into account the fact that currently there is a glut of pulpwood in the forest due to low demand, driven by closures of pulp mills. Finally, we think that our estimate is indeed conservative, as historically pulp mills used to consume roughly twice as much pulpwood as the estimated 483,048 gmt/yr.
- Considering the BAM of 1.2x, we believe there is at least 402,540 gmt/yr of Pulpwood potential available at low risk (Table C-4, Appendix C). We round this estimate to 400,000 gmt/yr, for which this BDO Zone is rated.

Pricing

- Based on direct feedback from the local market and sawmilling industry, the expected delivered price of pulpwood is $50 - $60/gmt.

Therefore, this BDO Zone is rated for 525,000 gmt/yr of pulpwood at $50 - $60/gmt delivered.

APPENDIX B: 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: The forest industry in the BDO Zone boasts a rich and longstanding history. The average age of the sawmills situated within the BDO Zone is 82 years, with the oldest sawmill having been operational since 1847. This extended period of operation reflects the industry's resilience and enduring presence in the region.

Renfrew County, known for its robust sawmilling industry, has exhibited stability during recent economic downturns. Notably, large sawmills in the County have retained continual production amid these recessions, further attesting to the sector's strength and continuity. Although smaller sawmills closed, the larger sawmills remained in operation.

Given the close correlation between the longevity of the logging industry and that of the sawmilling industry, we can confidently draw similar conclusions about the number of years these businesses have been in operation.

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 × 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 × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 4 out of 100.	**Score** **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 to supply to specific competitors for 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 a competitor resulting in supply disruptions for the Issuer.

Risk Information:

Chip: We have identified 10 consumers of sawmill chip within a 260-km drive of Pembroke. The most significant consumer is the Roseburg Forest Products MDF plant in Pembroke, intaking 256,000 gmt/yr of wood chips. Due to the MDF plant's impact on the market, our analysis assumes that the quantity consumed by the MDF plant will not be

available to a new buyer, and therefore we discount it from the rated quantity. Other markets for sawmill chips, as shown on Map C-4 in Appendix C, are located relatively far from most sawmills. Feedback from some of these sawmills indicates that there are no dependencies on current consumers, and that decisions with respect to the choice of the market for sawmill residuals are mainly made based on pricing and transportation distance.

Pulpwood: The region boasts an abundance of pulpwood, and it plays a crucial role in providing access to larger-diameter timber for sawmills. As a result, any new consumer of pulpwood would be warmly welcomed in the region.

Impact. Potential influence of competitors on suppliers can have significant impacts to a new project.

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 *high*, therefore the RRI is 8 out of 10.	**Score** **8**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 32 out of 100.	**Score** **32**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* By focusing feedstock procurement on pulpwood, a new bio-project would significantly mitigate against this RI. The Total Notch (RRL Notch × RRI Notch) is 50%.	**Notch** **50%**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 16 out of 100.	**Score** **16**

1.3 Risk Factor: Supplier Control Over Production and Transportation

1.3.1 Ownership of Land/Means of Production

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

Risk Information:

Chip: When considering the means of production for sawmills, the associated risk is deemed to be low. This is primarily because sawmills have ownership over both their production facilities and the land on which they operate. This level of ownership provides a sense of stability and control, reducing potential risks related to production.

Pulpwood: The risks connected to the ownership of land concerning the pulpwood supply are assessed as moderate. We consider estimates on pulpwood availability from public lands to be conservative, as they are provided by the provincial governments.

On the other hand, the other 50% of the forest is privately owned. These private woodlots are generally managed for recreational purposes, rather than timber production. There is an ongoing trend of transitioning from woodlots managed for timber to what are commonly referred to as 'hobby' woodlots, as landowners no longer rely on the forest for their livelihoods. Additionally, there is a lack of expertise in woodlot management, resulting in a lower likelihood of economically viable pulpwood from these private woodlots.

However, although there is a great deal of uncertainty associated with pulpwood available from private lands, we account for that uncertainty through discounting the quantity of pulpwood evaluated in this rating.

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 *medium*, therefore the RRI is 6 out of 10.	**Score** **6**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 24 out of 100.	**Score** **24**
Mitigation/Notching *RRL Mitigation (Notch)* The BDO Zone and its surrounding areas boast a plentiful supply of pulpwood. In the event that obtaining pulpwood from private forests presents challenges, a project can still access pulpwood from Algonquin Park Forest, albeit with a marginal difference in transport costs. While not explicitly assessed here, and therefore not accounted for in the quantity estimates, anecdotal information indicates the presence of substantial quantities of low-grade timber in the Algonquin Park region. Also, expanding the supply basin on the Quebec side would likely significantly increase pulpwood availability. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is 25%.	**Notch** **25%**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 18 out of 100.	**Score** **18**

1.3.2 Ownership of Equipment

Rationale: In most cases, suppliers which own or lease equipment for harvest, collection and processing feedstock are lower risk than those who 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 harvest times that are convenient 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 stover, the use of a third-party company with standard equipment specializing in harvesting, collection and transportation may decrease quality variations (e.g., ash content) of the final feedstock.

Risk Information: The production of sawmill residuals and pulpwood necessitates logging equipment, as both of these feedstock streams are derived from timber harvesting operations. Sawmill residuals, being a byproduct of lumber production, rely on access to appropriate timber harvesting equipment. Similarly, pulpwood is harvested concurrently during these timber harvesting operations.

Within the BDO Zone, the logging industry is primarily composed of small, family-owned companies. However, the sector faces various challenges, such as an aging workforce, higher insurance costs, and increased capital and equipment expenses. These factors have led many loggers to make the decision of closing down their businesses. As a result, some sawmills opt to invest in establishing their own logging crews and acquiring logging equipment to secure a stable supply of timber.

However, it is important to note that the extent to which sawmills currently own logging equipment remains relatively limited. Despite the move towards internalizing logging operations, the majority of sawmills still rely on external logging contractors to fulfill their timber harvesting needs.

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 × RRI) is 36 out of 100.	**Score** **36**
Mitigation/Notching *RRL Mitigation (Notch)* A new bio-project can hire its own crews and purchase logging equipment to support sawmills in harvesting operations, and therefore mitigate the risk of lack of equipment ownership and risks related to the contracting logging sector. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is 25%.	**Notch** **25%**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 27 out of 100.	**Score** **27**

1.3.3 Ownership of Transportation/Logistics

Rationale: In most cases, suppliers that own or lease transportation equipment necessary to transport biomass from forest or field are lower risk than those who do not. However, in some circumstances, reliance on third parties to transport biomass is common practice and does not contribute to risk.

Risk Information:

Chip: The transportation of sawmill residuals is typically facilitated through the use of walking-floor trailers or open top vans. Notably, sawmills usually possess an adequate fleet of trucks and trailers, enabling them to transport their entire sawmill residual output. As a result, the risk associated with bark and chip transportation equipment is considered low.

Pulpwood: The transportation of pulpwood involves the utilization of log trailers, typically owned by logging companies. At present, the market possesses a sufficient number of log trailers to cater to the transportation needs of existing sawmills and pulp mills. Our estimates indicate that an additional demand of 350,000 gmt/yr of pulpwood would necessitate approximately 17 logging trucks.[4] While a considerable portion of this demand can be met using existing infrastructure, some of it would require new log truck purchases.

The challenges confronting the logging sector, such as an aging workforce and increased costs, contribute to the moderate risk related to pulpwood transportation equipment. Although the existing infrastructure can accommodate a portion of the increased demand, there remains a need for additional log truck purchases to fulfill the entirety of the new demand for pulpwood transportation

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 × RRI) is 36 out of 100.	**Score** **36**

[4] Assumptions: 30 gmt per payload; average 2 trips per truck per day; 350 operational days per year: 350,000 / (30*350*2) = 17

Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* A new bio-project can purchase its own log trucks to effectively mitigate potential log truck shortages in the market. The Total Notch (RRL Notch × RRI Notch) is 50%.	**50%**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 18 out of 100.	**18**

1.3.4 Feedstock as a Secondary Transformation

Rationale: A secondary transformation dependent upon the production of primary products, e.g., forest residues, corn stover, bark, or sawmill chips (unless from a dedicated chip mill) are all secondary transformations of a primary product.

Risks are higher if feedstock is a secondary transformation of a primary, more valuable product. It may not be economical for suppliers to produce biomass on its own, in the absence of markets for the primary product. 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 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 production of the primary crop requires resources to be taken away from the production of secondary crop (e.g., in case of shorter harvesting windows due to weather), the secondary feedstock supply will suffer. In times of stretched resources, suppliers may also perceive harvesting and collection of the feedstock as a nuisance, potentially decreasing production levels.

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

Risk Information:

Chip production, being secondary transformations, are by-products of lumber production. As a result, the output of chips is closely tied to the lumber market's dynamics and the sustained operations of sawmills.

However, historical data demonstrates the resilience of sawmills within the BDO Zone to the fluctuations in the lumber market. The demand for lumber is strongly influenced by housing starts in both Canada and the United States. Following the 2008 financial crisis, which led to a significant contraction in housing starts and subsequent declines in lumber prices, all sawmills in the BDO Zone managed to remain operational. This resilience suggests that these sawmills have employed effective strategies, such as product and market diversification or above-average efficiency, to navigate through fluctuating lumber markets successfully.

This conclusion is further substantiated by feedback received from local experts, who indicate that lumber markets are typically not the constraining factor for local lumber output. Instead, the primary challenges lie in accessing logging infrastructure and securing economically viable timber sources.

As a result, while lumber markets remain an important consideration when evaluating chip production as secondary transformation, we assess the risk as moderate. The demonstrated resilience of sawmills to market fluctuations

contributes to a more balanced outlook, although vigilance and adaptability are still necessary to address potential market shifts.

Regarding pulpwood, risks related to feedstock as a secondary transformation are not relevant due to its primary nature in the forest industry's supply chain.

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 *very low*, therefore the RRI is 2 out of 10.	**Score** **2**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 8 out of 100.	**Score** **8**
Mitigation/Notching *RRL Mitigation (Notch)* In case of chip shortages, a new bio-project can substitute these feedstocks with pulpwood, as there is an abundance of pulpwood. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is 25%.	**Notch** **25%**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 6 out of 100.	**Score** **6**

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 sawmilling and logging sectors have had a long presence in the region. We do not expect any risks related to fundamental feedstock production experience.

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 × 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 × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 4 out of 100.	**Score** **4**

1.4.2 Production Scale Experience

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

Risk Information:

Chip: there is no risk associated with scale-up experience, as chips are by-products of lumber production.

Pulpwood: with multiple sawmills and pulp mills operating in the region, loggers have a great deal of experience harvesting pulpwood. There is low risk associated with pulpwood production scale experience (note that the risks associated with logging capacity scale up are addressed in other parts of this rating).

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

1.5 Risk Factor: Supplier Harvesting/Collection/Processing Capacity

1.5.1 Supplier's Equipment Efficiency

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

Risk Information: This RI is not relevant to woody biomass supply chains.

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

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, or when it is a by-product or a residual from a more valuable primary product, then suppliers may not put in sufficient effort for consistent production. Risk of breach increases when production and/or delivery of feedstock compromises a supplier's ability to make a primary product.

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

Risk Information:

Chip: The generation of sawmill residuals, which arise as a secondary outcome of lumber production, is not the primary focus for sawmills. Nonetheless, sawmills demonstrate a degree of consistency in residual production due to the necessity of maintaining lumber production levels to sustain their operations. Furthermore, sawmills exhibit an interest in supplying pulp mills and other residual markets with these by-products, as they rely on these markets to absorb the surplus residuals during heightened production periods. Anecdotal evidence indicates that at least one sawmill in the area processes pulpwood into chips to ensure sufficient deliveries to pulp mills. Given these factors, we assign a low-risk rating to the issue pertaining to the priority of sawmill residual production.

Pulpwood: Within the forest industry, the production of pulpwood takes precedence, as it is often a crucial prerequisite for the simultaneous harvesting of sawtimber.

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 × 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 × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 4 out of 100.	**Score** **4**

CATEGORY 2.0: COMPETITOR RISK

2.1 Risk Factor: Influence on Feedstock Supply of Existing Markets

2.1.1 Competitor 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 the geographical influence a competitor may have on new plants within a BDO Zone, including competitive advantages such as short hauling.

Risk Information:
Chip: The main competitor for chip is the Roseburg Forest Products MDF plant in Pembroke, consuming 256,000 gmt/yr. Other significant, although more distant competitors, include: Resolute Forest Products in Gatineau, QC, White Birch Paper in Gatineau, QC, Louisiana-Pacific in Bois-Franc, QC, Lauzon Recycled Wood Energy in Papineauville, QC, Rayonier in Temiskaming, QC, Norampac in Trenton, ON, and Curran Renewable Energy in Massena, NY. Considering that we discounted the quantity of chip consumed by Roseburg, due to the relatively significant distances of these competitors from Pembroke, we deem the risk posed by the geographic influence of competitors on wood chip supply to be of moderate significance.

Pulpwood: Despite the utilization of pulpwood by some of the same competitors, our availability estimates have already factored in the current pulpwood consumption levels. Moreover, all pulp mills are located at considerable distances from Pembroke.

Impact. Competitors' geographic location can have a very significant influence on feedstock availability.

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 *high*, therefore the RRI is 8 out of 10.	**Score** **8**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 32 out of 100.	**Score** **32**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* Risks related to competitors' geographic influence on wood chip supply can be effectively mitigated by substituting wood chips with pulpwood. The Total Notch (RRL Notch × RRI Notch) is 50%.	**Notch** **50%**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 16 out of 100.	**Score** **16**

2.1.2 Current and Historical Consumption of Feedstock Quantity

Rationale: Clear understanding of feedstock consumption by key competitors for each rated type of feedstock 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 to the impact of external events (e.g., weather events, structural economic changes, seasonality, or policy change).

Risk Information:
Chip: The movement of chips generated by sawmills in the BDO Zone covers considerable distances, reaching up to almost 500 km from Pembroke. Over time, local demand for wood chips has experienced a substantial downturn, marked by the closure of the Portage-du-Port plant (which consumed approximately 200,000 gmt/yr of sawmill chip) in 2008 and the closure of the Thurso pulp mill facility (with consumption estimated at 250,000 gmt/yr) in 2019. Although the Quebec government's efforts to revive the Thurso plant may potentially restore demand in the future, historical trends indicate a significant decline in wood chips consumed within the BDO Zone, necessitating the transportation of

the product over longer distances. As a result, the risks related to the current and historical fluctuations in the usage of sawmill chips are considered low.

Pulpwood: The closures of the two pulp mills, as discussed earlier, have had an impact on the demand for pulpwood. The substantial surplus of pulpwood in the BDO Zone indicates that the remaining competitors for pulpwood pose minimal risk to the local pulpwood supply.

It is important to note that historical pricing data for Ontario is not available, rendering it impossible to ascertain the extent to which pulp mill closures influenced prices. Nonetheless, anecdotal input from local experts suggests that, as anticipated, prices experienced a significant decline following the closures.

Uncertainty. The lack of historical pricing data creates uncertainty in the analysis.

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 *high*, therefore the RRI is 8 out of 10.	**8**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

2.1.3 Competitor Pricing and Price Sensitivity

Rationale: Understanding how much competitors pay (or receive) for different feedstock types is an essential step to determining competitiveness of Issuer and to accurate assessment of the delivered cost range in the BDO Zone rating.

Current and historical prices paid/received by competitors provide insight into their procurement behaviours and exert pressure on suppliers in the BDO Zone. Such as ability/willingness to pay premiums for feedstock during times of feedstock shortage or reduce prices (or cut off deliveries) during gluts. Competitors that have an ability to offer higher prices for feedstock during feedstock shortages can pose significant risk to 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: Historical data on woody biomass pricing in the BDO Zone is unavailable, and the sensitivity of pricing information has deterred competitors and sawmills from sharing current pricing data. Instead, sawmills have provided expected pricing, considering the possibility of increased demand.

Chip: Sawmill chips produced in the BDO Zone can move large distances, which can mean that 1) diminished local demand may compel sawmills to reduce chip prices to explore distant markets, and 2) buyers might exhibit a significant tolerance for chip price hikes. The latter scenario poses a risk concerning the potential for sawmill chip price increases,

driven by competitors' price tolerance. However, the fact that chips are capable of covering large distances also serves to mitigate the significance of this risk indicator.

Pulpwood: Given the abundance of pulpwood in the BDO Zone, as well as in Ontario and Quebec in general, the sensitivity of competitors to pulpwood pricing is not a concern from a risk perspective.

Uncertainty. Due to the lack of historical pricing data our conclusions are based on deduction, introducing uncertainty into the analysis.

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 *high*, therefore the RRI is 8 out of 10.	**Score** **8**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 32 out of 100.	**Score** **32**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* Competitor pricing and price sensitivity risk pertains mainly to sawmill chip. Assuming feedstock flexibility, the ample supply of pulpwood allows for chip removal from the feedstock mix, effectively mitigating this risk indicator (note that risks related to the lack of historical data remain). The Total Notch (RRL Notch × RRI Notch) is 50%.	**Notch** **50%**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 16 out of 100.	**Score** **16**

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 can lead to higher prices, feedstock disruptions, shortages or supplier breach 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 production of renewable chemicals, for example), high interest in a supply basin 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: We found no evidence that current competitors plan to expand their operations. Operational expansion plans often remain unreported. In case we are incorrect with our assessment we ranked impact as medium.

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 *medium*, therefore the RRI is 6 out of 10.	**Score** **6**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 12 out of 100.	**Score** **12**

Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 12 out of 100.	**12**

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 feedstock, especially during times of shortage. This control can derive from qualitative or "soft" factors such as long previous relationships between local suppliers and existing markets for feedstock.

Risk Information: The risk associated with the soft supply influence of existing markets holds significance concerning the supply of sawmill chips. Sawmills maintain longstanding relationships with operational consumers and have a vested interest in fostering the continuous success of these facilities.

Nevertheless, while the risk of soft supply influence of existing markets is a valid consideration, we consider it to be negligible in relation to pulpwood, as pulpwood is abundantly available in 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 *medium*, therefore the RRI is 6 out of 10.	**6**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 24 out of 100.	**24**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* Risks related to soft supply influence on existing markets on wood chip supply can be effectively mitigated by substituting wood chips with pulpwood. The Total Notch (RRL Notch × RRI Notch) is 50%.	**50%**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 12 out of 100.	**12**

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.[5]
Risk Information: Certain temporary (seasonal) markets for bark and pulpwood include landscaping and firewood, respectively. While these markets can exert a notable influence, we have already factored in the demand they generate.
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 × 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 × RRI Notch) is NN (No Notch).
Loaded RI Score — **Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 24 out of 100. — **24**

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 competitively 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 Issuers plant (with lesser inventory capacity) may be forced to put suppliers on quota. Larger inventory capacity on the part of competing markets thereby creates supplier loyalty and can make it more difficult for new projects to secure supply without paying a significant premium.
Risk Information: While data regarding the inventory capacities of competitors was not accessible, it is reasonable to assume that these mills, being sizable operations, likely possess substantial inventory capacities. However, it is important to acknowledge that the relatively considerable distance of these pulp mills from Pembroke constrains the extent of competitors' influence on the BDO Zone, even if their feedstock inventory capacities are indeed substantial.
Impact. Most large competitors are located relatively far from Pembroke, which limits the impact their inventory capacities pose to the supply chain.
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 × RRI) is 24 out of 100. — **24**

[5] Bergtold, 2018.

Mitigation/Notching	**Notch**
RRL Mitigation (Notch) Wood chips are the only type of feedstock under constraint in the BDO Zone. Fully substituting wood chips with pulpwood should effectively mitigate risks related to competitors' feedstock inventory capacities. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is 50%.	**50%**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 12 out of 100.	**12**

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 efficiently discharge can occur.

Risk Information: Data on delivery hours and wait times for the competitors were unavailable. However, the uncertainty related to the lack of these data is limited by the relatively considerable distance of most of these pulp mills from Pembroke.

Impact. The significant distance of most major competitors from Pembroke restricts the potential influence that feedstock intake flexibilities may exert on the supply chain.

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 × RRI) is 24 out of 100.	**24**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) Wood chips are the only type of feedstock under constraint in the BDO Zone. Fully substituting wood chips with pulpwood should effectively mitigate risks related to competitors' relative accessibility. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is 50%.	**50%**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 12 out of 100.	**12**

2.2.3 Relative Specification Advantages

Rationale: When choosing a market for biomass feedstock, suppliers not only look at price, but also at relative quality requirements or specifications. It is important to understand feedstock quality specifications for competing markets within the BDO Zone in order to accurately quantify the risk that competitors can exert on the Issuer's supply chain.

Risk Information: In this assessment we assume that a new bio-project would be able to intake woody biomass that is available in the market. From this perspective, competitors do not have relative feedstock specification advantages.

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) 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 × 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 × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 4 out of 100.	**Score** **4**

2.2.4 Demand for Competitors' Products

Rationale: Increased demand for 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: Other than the Roseburg Forest Products MDF plant in Pembroke, which has been accounted for in our estimates, the primary competitors for woody biomass produced in the BDO Zone consist of pulp and paper mills. Global projections indicate a forecasted increase in demand for pulp and paper, estimated at 0.72% based on the Compound Annual Growth Rate (CAGR).[6] While it remains uncertain how local producers will respond to this global demand, our assessment indicates that the forecasted CAGR of 0.72% is not sufficiently substantial to warrant expectations of significant expansions by current competitors.

Uncertainty. In the realm of market forecasts, a notable level of uncertainty prevails, encompassing the potential impact of global market dynamics on local supply chains. For instance, a decline in global demand for pulp may lead to the closure of inefficient pulp mills in specific regions, while more efficient pulp mills could witness expansions during subsequent market rebounds.

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 *high*, therefore the RRI is 8 out of 10.	**Score** **8**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**Score** **16**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment.	**Notch** **NN**

[6] Source: https://www.globenewswire.com/en/news-release/2023/05/24/2674939/0/en/Latest-News-Pulp-and-Paper-Market-to-Worth-USD-372-70-Billion-by-2029-Fortune-Business-Insights.html

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

CATEGORY 3.0: SUPPLY CHAIN RISK

3.1 Risk Factor: Feedstock Availability

3.1.1 Biomass Availability Multiple (BAM)

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

Risk Information: BAM calculations are already accounted for in the initial biomass quantity set up in Appendix A.

Chips: To account for uncertainty in analysis we assume a redundancy factor (Biomass Availability Multiple) of 1.5x. In other words, to mitigate against potential errors in our calculations and assumption we rate this BDO Zone at 50% lower than what we think is potentially available to a new bio-project. Therefore, the quantity of wood chips potentially available to a new bio-project at a 1.5x BAM level is: 131,454 gmt/yr / 1.5 = 87,636 gmt/yr; or 85,000 gmt/yr rounded off.

Pulpwood: We are confident with a low BAM of 1.2, as our estimates are based either on government provided data or on conservative estimates. Furthermore, our estimates do not take into account the fact that currently there is a glut of pulpwood in the forest due to low demand, driven by closures of pulp mills. Finally, we think that our estimate is indeed conservative as historically pulp mills used to consume roughly twice as much pulpwood as the estimated 483,048 gmt/yr.

Considering the BAM of 1.2x, we believe there is at least 402,540 gmt/yr of pulpwood potential available at low risk (Table C-4, Appendix C). We round this estimate to 400,000 gmt/yr, for which this BDO Zone is rated.

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 *high*, therefore the RRI is 8 out of 10.	**8**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × 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 × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × 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 core supplier.

Risk Information: The sawmill chip supply curve, depicted in Chart C-1 within Appendix C, reveals a relative scarcity of sawmill residuals generated within a 40 km drive distance of Pembroke. Despite the fact that approximately 50,000 gmt/yr of sawmill chip is generated within 40 km of Pembroke, these chips are likely spoken for by the Roseburg Forest Products MDF plant. The quantity of generated sawmill chip increases significantly at distances over 50 km, with about 223,000 gmt/yr generated within 80 km. The quantity further increases to over 400,000 gmt/yr within 100 km.

As for pulpwood, spatial data with any level of accuracy were not obtainable, leading to the inability to construct a pulpwood supply curve. However, anecdotal information suggests a high density of forests with available pulpwood in Renfrew County, indicating a potentially positive supply curve given the general abundance of pulpwood.

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 × RRI) is 48 out of 100.	**Score** **48**
Mitigation/Notching *RRL Mitigation (Notch)* In this assessment we assume that a new bio-project can economically substitute sawmill chip with pulpwood. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is 50%.	**Notch** **50%**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 24 out of 100.	**Score** **24**

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

[7] Golecha & Gan 2016.

Risk Information:
Chips: Lumber production typically experiences seasonal variations in response to the demand from the construction industry. During the winter months, lumber production tends to slow down compared to the summer months. The extent of this production fluctuation is contingent upon prevailing lumber prices, the individual sawmills' operational efficiencies, and their market access capabilities. The seasonality of sawmill residual supply is further accentuated by the fact that most sawmills, primarily due to space limitations and fire hazards posed by chip piles, do not maintain inventories of the residuals. Instead, they sell these residuals to the market as they are generated.

Pulpwood: The harvesting seasons for pulpwood depend on the specific silvicultural system employed. Within the BDO Zone, more than half of timber is harvested through the partial cutting system, generally occurring between January and March when the ground is frozen. Clear cuts, on the other hand, are carried out during the spring and summer, when there is a higher risk of damaging remaining trees. Additionally, timber harvesting ceases for a period of time during the spring break-up.

In summary, chip production peaks in the spring and summer months, while pulpwood production reaches its highest levels during the winter months.

Impact. Feedstock supply seasonality has a potential to result in temporary feedstock shortages.

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 *high*, therefore the RRI is 8 out of 10.	**Score** **8**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 32 out of 100.	**Score** **32**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* Traditional users of sawmill residuals and pulpwood have successfully addressed the feedstock supply seasonality by maintaining large inventories. The presence of a substantial and well-managed feedstock inventory should effectively alleviate the risk of feedstock shortages resulting from production seasonality. The Total Notch (RRL Notch × RRI Notch) is 50%.	**Notch** **50%**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 16 out of 100.	**Score** **16**

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: In the BDO Zone, the year-to-year fluctuation in feedstock availability is primarily attributed to changing demand for feedstock rather than changing supply. Despite experiencing tumultuous conditions over the past two decades, sawmills in the BDO Zone have demonstrated resilience, remaining operational and sustaining their production lines.

Chip: Owing to several sizable markets, the demand for sawmill chips remains relatively stable. Coupled with consistent chip production, the year-to-year variation in wood chip availability is low. However, it is important to note that there remains a risk of potential sawmill closures.

Pulpwood: The forest contains an abundant supply of pulpwood. Although its actual availability is constrained by logging capacity (addressed in other sections of this report), we do not anticipate significant year-to-year variation in its availability.

Impact. Year-to-year variation in feedstock availability has the potential to result in temporary feedstock shortages.

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 *high*, therefore the RRI is 8 out of 10.	**Score** **8**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 32 out of 100.	**Score** **32**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* Based on historical data, the sole feedstock stream where we identified a potential risk concerning the year-to-year variation in availability is bark. However, this risk can be effectively mitigated through feedstock substitution, which allows for feedstock flexibility. The Total Notch (RRL Notch × RRI Notch) is 50%.	**Notch** **50%**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 16 out of 100.	**Score** **16**

3.2 Risk Factor: Historical Issues

3.2.1 Historical Feedstock Price Variations

Rationale: If volatility is shown in the historical feedstock price, 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 pricing data for wood chips, or pulpwood are not compiled in Ontario. This absence of historical pricing availability and pricing transparency introduces risk. However, it is worth noting that the lack of historical data is of lesser relevance in understanding pulpwood pricing risk, given the significant surplus of pulpwood, leading to price insensitivity.

Impact. Due to the surplus of standing pulpwood, its price is predictable, limiting the impact of the lack of historical data to the risk profile.

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 × RRI) is 36 out of 100.	**Score** **36**

Mitigation/Notching *RRL Mitigation (Notch)* During periods of wood chip price increases, these feedstocks can be effectively substituted with pulpwood, which offers a more predictable pricing trend. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is 25%.	**Notch** **25%**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 27 out of 100.	**Score** **27**

3.2.2 Low Historical Demand for Feedstock in the BDO Zone

Rationale: If Issuer BDO Zone does not have history of developed, large-scale feedstock procurement, suppliers may not have sufficient expertise in feedstock production to ensure reliable supply, especially in 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 of pulpwood and manage log debarking and chipping internally. Rather than requiring inexperienced suppliers to deliver debarked wood chips.

Risk Information: Despite encountering substantial pulp mill closures over the past two decades and experiencing a recent decline in the demand for bark, the demand for woody biomass has demonstrated sufficient resilience.

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 × 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 × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 4 out of 100.	**Score** **4**

3.2.3 History of Production/Feedstock is a New/Secondary Crop or a Byproduct

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: Suppliers have significant experience producing sawmill residuals and pulpwood 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 × 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 × RRI Notch) is NN (No Notch).
Loaded RI Score **Score** The Loaded RI Score ((1-Total Notch) × GRI Score) is 4 out of 100. **4**

3.3 Risk Factor: Non-Weather Based Externalities

3.3.1 Diesel, Oil and Producer Price Index (PPI)

Rationale: Diesel, oil, and PPI can impact feedstock cost of harvest and collection over time. Sensitivities to worst case scenarios should be run.
Risk Information: The impact of diesel prices can exert a considerable influence on transport costs. For instance, in 2021, the transport cost stood at approximately $5.50 per loaded mile, whereas in 2022, it escalated to $7.20 per loaded mile. Given the significant fluctuations in diesel prices, as evident from the period between 2020 and 2022, we assess the risk related to diesel prices as substantial. However, it is noteworthy that since competitors for biomass are located relatively distant from the BDO Zone centre point, higher diesel costs can prove advantageous to a new project. This is due to the fact that the larger the portion of transportation cost in the total feedstock cost, the more critical the proximity to markets becomes. **Impact.** The Impact Level of diesel, oil, and producer price index is assessed as low due to the abundance of pulpwood in the BDO Zone and the tendency of sawmill residuals generated in the area to be transported over relatively large distances.
Raw Risk Likelihood (RRL) **Score** The risk likelihood is deemed *high*, therefore the RRL is 8 out of 10. **8**
Raw Risk Impact (RRI) **Score** The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. **2**
Gross Risk Indicator (GRI) **Score** The Gross Risk Indicator (RRL × RRI) is 16 out of 100. **16**

Mitigation/Notching	**Notch**
RRL Mitigation (Notch) The fluctuating cost of diesel can be effectively mitigated by sourcing feedstock from closer distances. The presence of abundant pulpwood within the BDO Zone indicates that large quantities of pulpwood could be feasibly obtained from relatively close proximity. Consequently, the substitution of sawmill residuals with pulpwood offers a viable strategy to alleviate the impact of fluctuating diesel costs. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is 25%.	**25%**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 12 out of 100.	**12**

3.3.2 Currency Risk

Rationale: Where feedstock is purchased in a currency different than that which a new bio-based plant with 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: The BDO Zone is within Canada, therefore the currency risk is irrelevant to this rating.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *not relevant*, therefore the RRL is not rated.	**NR**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *not relevant*, therefore the RRI is not rated.	**NR**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is not rated.	**NR**
Mitigation/Notching	**Notch**
The Total Notch (RRL Notch × RRI Notch) is not rated.	**NR**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × 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: The BDO Zone is within Canada, therefore the border risk is irrelevant to this rating.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *not relevant*, therefore the RRL is not rated.	**NR**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *not relevant*, therefore the RRI is not rated.	**NR**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is not rated.	**NR**
Mitigation/Notching	**Notch**
Total Notch (RRL Notch × RRI Notch) is not rated.	**NR**

Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is not rated.	**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.[8]

Risk Information: This RI has been already addressed in RI 2.1.6. To prevent double-counting risk, we mark this RI as irrelevant.

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

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.

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 risk such as frost or rain.

Risk Information: This RI is irrelevant to the Renfrew County BDO Zone.

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

[8] Bergtold, 2018.

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. Use of 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: Pulpwood harvesting and collection equipment used in the BDO Zone does not affect the variation in pulpwood quality. (Note that this RI is irrelevant to sawmill residual supply chains.)

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 × 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 × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 4 out of 100.	**Score** **4**

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.[9]

Risk Information: There is no variation in densification methods among feedstocks this BDO Zone is rated for.

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 × RRI) is 4 out of 100.	**Score** **4**

[9] Huhnke, 2018.

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

3.4.4 Availability of Labor for Feedstock Production

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

Risk Information:

Chip: Chips are a by-product of lumber production. Chip quantity estimates in this report assume current and expected production levels, with presently available labour.

Pulpwood: A scarcity of loggers and logging truckers is prevalent within the BDO Zone. The costs associated with running a logging business, encompassing insurance, capital, and equipment costs, have witnessed significant escalation in recent years, while wood prices have experienced a decline since the 2008 financial crisis. As a result, logger margins have dwindled, impeding the entry of new market players. Coupled with an aging logging workforce and a dearth of skilled labour, the risk of logging labour shortage is deemed substantial.

However, feedback from local experts indicates that the logging industry should be able to meet an additional demand of 525,000 gmt/yr. The demand from sawlogs from sawmills is healthy and keeps logging crews employed, so a large portion of the additional demand for pulpwood should be met by these logging crews.

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 × RRI) is 36 out of 100.	**36**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) To counteract logging capacity shortages, certain sawmills have adopted the approach of hiring their own logging crews. A new bio-project can also opt for vertical integration, following a similar approach, as a partial measure to mitigate the risks associated with the availability of labour for feedstock production. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is 25%.	**25%**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 27 out of 100.	**27**

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 average transport distance from suppliers to Issuer is high, the supply chain is subject to greater sensitivities to risks, such as increases in diesel cost, weather impacts, mechanical breakdown, and by 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 of the date of this report, the average transportation cost in the BDO Zone stands at $4.50 per loaded km. Given a supply basin of 130 km with an average transport distance of approximately 80 km, the average transport cost amounts to $360 per load. In specific terms, a typical load of chips comprises about 25 metric tons, while a load of pulpwood holds around 33 metric tons. As a result, the transport cost translates to $14.40 per metric ton for chips, and $10.91 per metric ton for pulpwood.

For wood chips, we estimate the delivered cost to be in the range of $65 to $75 per metric ton, with the transport cost accounting for 19% to 22% of the total cost. As a result, the transport cost is moderately significant to wood chip supply, and any variations in transport cost pose a moderate risk to the supply.

Similarly, for pulpwood, we estimate the delivered cost to be in the range of $50 to $60 per metric ton, with the transport cost representing 18% to 22% of the total cost. As a result, the transport cost is moderately significant to pulpwood supply, and any variations in transport cost pose a moderate risk to the supply chain.

Impact. Impact level is increased due to recent increases in transport costs.

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 × RRI) is 36 out of 100.	**Score** **36**
Mitigation/Notching *RRL Mitigation (Notch)* To control for transport cost, a new bio-project can focus its procurement efforts on widely abundant pulpwood. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is 25%.	**Notch** **25%**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 27 out of 100.	**Score** **27**

3.5.2 Diesel Cost Impacts

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

Risk Information: Risks related to this RI have been already addressed in RI 3.3.1 above. To prevent risk double-counting, this RI is deemed irrelevant.

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

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 in required transportation equipment, equipment owners have increased leverage over transportation prices and supply chain resiliency can be lower.

Risk Information:

Chip: Sawmill residuals are typically transported either in open-top vans or walking floor trailers. Of the two options, walking floor trailers are more costly, granting facilities with truck tippers and the capability to accommodate open-top vans a competitive edge. In this rating, we presume that a new bio-project would be of sufficient scale to incorporate truck tippers, thus leading to a low risk related to specialized equipment for transporting sawmill residuals.

Pulpwood: Pulpwood is typically transported using traditional log trucks and, as such, does not necessitate specialized transport equipment.

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 × 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 × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 4 out of 100.	**Score** **4**

3.5.4 Delivery Routes through Local Communities

Rationale: Transportation of biomass can become a nuisance to local communities, especially if a large number of trucks pass through residential and school areas. Local communities often have power to force regulations regarding truck transport, impeding the ability BDO Zone suppliers to transport feedstock.

Risk Information: Pembroke is situated in a rural region with a substantial history in the forestry sector. Given this context, we anticipate that the risk associated with delivery routes through local communities is low.

Impact. The impact of community backlash arising from increased traffic can be significant. As this analysis is at an early stage, there remains a degree of uncertainty regarding potential transport routes.

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 *high*, therefore the RRI is 8 out of 10.	**8**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × 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 × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × 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: Road weight limits in Ontario are governed by the Highway Traffic Act, which allows for load weight limit increases for raw forest products (pulpwood) during the winter months when forest roads freeze. Conversely, during spring thaws, weight limits may be further reduced, with some municipalities implementing reduced road weight limits between early March to late May.[10]

Trucking regulations, particularly those related to electronic tracking systems, pose challenges for truckers and are generally unpopular among the aging trucker workforce, which comprises the majority of the trucker workforce in the region. This issue becomes relevant as the supply chain is currently facing shortages in logging truckers. However, other regulations do not appear to hinder the supply of woody biomass. Large consumers of biomass have successfully procured feedstock for decades, underscoring that any risks related to transportation regulations and local weight limits are considered low.

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

[10] Source: https://511on.ca/list/seasonalloads; https://ontruck.org/ontario-reduced-load-spring-thaw-restrictions/

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 × RRI) is 8 out of 100.	**8**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 8 out of 100.	**8**

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:

Chip: Road infrastructure does not represent a risk factor for sawmill residual supply.

Pulpwood: The availability of logging roads is crucial for loggers to efficiently harvest pulpwood. However, it is worth noting that logging roads are already constructed for sawtimber harvesting, and pulpwood harvesting takes place concurrently. As a result, while access to logging roads remains essential, we do not foresee significant risks related to logging road infrastructure.

Uncertainty. There is a degree of uncertainty in our assessment of logging road availability, as the sources used are anecdotal.

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 × RRI) is 24 out of 100.	**24**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × 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:

Chip: The transportation of sawmill residuals typically involves the utilization of walking-floor trailers or open-top vans. Sawmills generally maintain a sufficient fleet of trucks and trailers, enabling them to transport their entire sawmill residual output. While we lack specific data on the exact number of trucks and trailers available in the region, we anticipate that the equipment quantity is adequately tailored to meet local supply chain requirements, with minimal redundancy.

Pulpwood: Pulpwood transportation involves the use of log trailers, often owned by logging companies. Presently, the market possesses an ample number of log trailers to cater to the transportation needs of existing sawmills and pulp mills. Our estimations suggest that an additional demand of 350,000 gmt/yr of pulpwood would necessitate approximately 17 logging trucks. While a significant portion of this demand can be met using existing infrastructure, some may require the acquisition of new log trucks. Similar to sawmill residuals, though precise data on the exact number of trucks and trailers available in the region is unavailable, we expect that the equipment quantity is adequately aligned with local supply chain demands, with minimal redundancy.

In summary, a new bio-project would generate a significant increase in demand for woody biomass, for which there may be an insufficient number of transportation equipment available. However, in the short-term, any shortages of transport equipment in the supply chain could be mitigated by importing equipment from adjacent regions. In the long-term, the supply chain should adapt to accommodate the heightened demand.

Impact. Potential shortages in transportation can exert a significant impact on the supply chain. Moreover, there exists a degree of uncertainty concerning the actual number of trucks and trailers available for feedstock delivery.

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 *high*, therefore the RRI is 8 out of 10.	**Score** **8**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 48 out of 100.	**Score** **48**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* The bio-project can effectively mitigate against the risk of insufficient equipment redundancy through vertical integration, i.e., purchasing and operating its own fleet of trucks and trailers. The Total Notch (RRL Notch × RRI Notch) is 50%.	**Notch** **50%**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 24 out of 100.	**Score** **24**

3.6 Risk Factor: Supply Chain Resiliency

3.6.1 Size, Number and Location of Suppliers

Rationale: In general, a supply portfolio involving multiple suppliers of various sizes (and from multiple BDO Zones) is important for ensuring steady and uninterrupted feedstock supply with minimal price fluctuations. If a small number of

large suppliers provides a high proportion of total feedstock, a disruption or supplier breach will have greater impact on the supply chain. In such cases the risk of disruption is lower, but the impact of those disruptions is higher. Conversely, many small suppliers are less likely to have the capacity to withstand internal disruptions and thus may be more likely to breach. Here, risk of disruption is higher, but their likely impact is lower. The number of suppliers as well as the ratio of small to large suppliers should be optimized.

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

Risk Information:
Chip: Within the BDO Zone, we have identified 10 sawmills, and their locations and relative sizes are illustrated in Table C-1 and Map C-3 in Appendix C. Among them, five sawmills are categorized as large, generating over 40,000 gmt/yr of chips; four sawmills are considered medium, producing between 20,000 and 40,000 gmt/yr of chips; and one sawmill generates around 3,000 gmt/yr of chips. This mix of large and medium potential suppliers is regarded as favourable for a new bio-project.

Distance-wise, large sawmills are distributed evenly across the BDO Zone, with four large sawmills within 50 km of Pembroke. The largest sawmill, generating over 130,000 gmt/yr of chip, is located 107 km from Pembroke.

Impact. The impact of the size, number, and location of suppliers is considered significant in any woody biomass supply chain.

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 *high*, therefore the RRI is 8 out of 10.	**Score** **8**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 32 out of 100.	**Score** **32**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* The risk pertains mainly to wood chip supply. Assuming feedstock flexibility, wood chips can be substituted with pulpwood, effectively mitigating the risk. The Total Notch (RRL Notch × RRI Notch) is 50%.	**Notch** **50%**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 16 out of 100.	**Score** **16**

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: Suppliers operating within the Renfrew County BDO Zone are exposed to various common external risks that can significantly impact their operations. The performance of the forest products industry is closely tied to the overall state of the economy, with its fortunes fluctuating in response to economic conditions. Solid wood products,

such as softwood lumber, are particularly sensitive to economic conditions as they serve as crucial raw materials for new construction, with their demand closely linked to the housing market.

Logging activities within the Zone are also subject to macroeconomic factors, most notably the housing market. Downturns in the market can pose a threat to the viability of sawmills, subsequently impacting the harvest of sawtimber and pulpwood.

Additionally, increased prices of natural gas can introduce risks to the industry. In response, facilities may choose to burn their own residuals, particularly bark, for energy generation purposes. This can result in these materials being less available and more expensive for potential bio-based projects. Therefore, it is crucial for new operators in the Renfrew County BDO Zone to be aware of these external risks and incorporate them into their business plans to effectively navigate and mitigate potential challenges.

Nonetheless, the risk is mitigated by the relatively large number of sawmills 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 *high*, therefore the RRI is 8 out of 10.	**8**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 48 out of 100.	**48**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* The abundance of pulpwood in the region allows for feedstock substitution, partially mitigating against the risk of suppliers being subjected to the same external risks. The Total Notch (RRL Notch × RRI Notch) is 25%.	**Notch** **25%**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 36 out of 100.	**36**

3.6.3 Land Ownership Structures

Rationale: The ownership (or control) of the land base on which feedstock is produced can have significant impact on 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 are 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: In Ontario, the risk associated with pulpwood supply is notably higher when forests are privately owned, as forest landowners have varying forest management objectives. The profile of a forest owner in Southern Ontario is undergoing changes, with many individuals purchasing forests for leisure purposes, often without optimizing timber production. Furthermore, woodlot ownership is scattered, with no single marketing body, making it challenging for buyers to procure pulpwood.

Conversely, pulpwood available from public lands overseen by the OMNRF (Ontario Ministry of Natural Resources and Forestry) can be considered more secure, although this should be assessed on a case-by-case basis. Nonetheless, the

risk that wood supply will decrease in the long-term is present. Some of the reasons include natural disturbance, species at risk, and inclusion of protected areas.

Impact. The fact that a large portion of forestland in the BDO Zone is privately owned, and the increasing trend of private woodlot ownership leaning towards recreational forests rather than timber management, can have a somewhat significant impact on the supply chain.

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 × RRI) is 36 out of 100.	**36**
Mitigation/Notching *RRL Mitigation (Notch)* Sawmills located in the BDO Zone conduct frequent timber harvesting on private lands. A new bio-project can cooperate with these sawmills to coordinate harvesting and access pulpwood from private lands at lower risk. Such strategy would partially mitigate risks related to private land ownership. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is 25%.	**Notch** **25%**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 27 out of 100.	**27**

3.7 Risk Factor: Climate and Natural Risks

3.7.1 Seasonal Weather Impacts on Feedstock Supply

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

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

Risk Information: Spring thaw is an annual weather occurrence that exerts an impact on the production of woody biomass in the region. During this period, the ground becomes too wet for logging operations to be carried out effectively. Typically, logging operations cease for a duration of 2 to 4 weeks during spring thaw, and recent years have shown slightly extended thaw periods.[11] It is important to note that from the perspective of this rating, spring thaw may impact pulpwood availability, but it may not necessarily affect sawmill residual availability. Sawmills often build up timber inventory to sustain operations throughout the thaw.

In the BDO Zone, there has been an increase in the frequency of wind storms over the past few years. These wind storms can result in tree blow downs, making pulpwood harvesting more challenging and, consequently, more expensive.

[11] Source: local expert, could not be confirmed by quantitative data.

However, it is worth considering that large swaths of blown-down trees can also be seen as a short-term opportunity for a bio-project. Blown-down trees are seldom of high enough quality to be used as sawtimber but can instead be utilized as pulpwood, presenting a potential feedstock source for the project. Nonetheless, larger disturbances result in lower wood supply in the medium-to-long term.

Impact. Occasionally, seasonal weather events, especially wind storms, can have significant impacts on standing trees.

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 × RRI) is 24 out of 100.	**24**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* All large facilities in the region employ substantial feedstock inventories as a means to buffer against seasonal feedstock supply interruptions caused by weather conditions. Given that weather interruptions in the BDO Zone are generally of short duration, the presence of a large inventory is expected to effectively mitigate any risks related to seasonal weather impacts on feedstock supply. The Total Notch (RRL Notch × RRI Notch) is 25%.	**25%**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 18 out of 100.	**18**

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: The BDO Zone has been witnessing visible signs of a warming climate. Some of the effects observed include an extended spring break-up season, during which logging operations are typically impeded. Additionally, there have been instances of tree insect and disease outbreaks, such as beech bark disease. However, it is worth noting that, to date, these diseases and insects have not significantly affected commercial tree species. Moreover, the region is also expected to experience more frequent droughts that can lead to tree mortality. The increased frequency of wind storms is also attributed to the changing climate.

Despite these climate-related challenges, the impact on feedstock supply is somewhat limited. Most disturbances caused by climate change are likely to occur over time, allowing the supply chain to adapt accordingly. Furthermore, the abundance of pulpwood in the region provides a buffering effect against the impacts of climate change on feedstock supply.

Impact. The long-term impacts of climate change on local forests can be hard to predict.

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 *high*, therefore the RRI is 8 out of 10.	**8**

Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 32 out of 100.	**32**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* A large feedstock inventory can mitigate against risks related to impacts due to climate change. The Total Notch (RRL Notch × RRI Notch) is 50%.	**50%**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

3.7.3 Forest/Crop Fire

Rationale: Forest/crop fires, especially when occurring at 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 at investigating adaptation strategies and options to deal with future fire occurrence. There is growing consensus that as wildfire activity increases, fire agency suppression efforts will be increasingly strained. However, analyses of fire history suggest that it is the effect of climate variability on precipitation regimes that is the primary reason for the decreasing fire activity in the southern BDO Zone of Canada.

Risk Information: Historically, the BDO Zone has not encountered significant forest wildfires (please note that the large fires in the 2023 season occurred north of the BDO Zone and in Quebec). While forest fires do pose a risk in the BDO Zone, this risk is somewhat mitigated by the fact that the forests in the region are mixed, reducing their susceptibility to insect outbreaks. Such outbreaks can lead to tree mortality, rendering the forests more vulnerable to forest fires.

Nevertheless, the expected increase in heat waves due to climate change implies that forest fires remain a potential risk to the woody biomass supply chain.

It is essential to acknowledge that heightened forest fire risk can also trigger societal awareness of increased forest fuel loads. Consequently, this awareness may foster an environment that promotes biomass harvesting as a measure to mitigate fire hazards.

Impact. The geographic extent of most forest fires is generally limited. Specifically, within the settled area of the BDO Zone, it is anticipated that any forest fires would be swiftly extinguished to prioritize community safety, thereby restricting the fires' impact on fibre supply. Moreover, the heightened risk of forest fires can raise public awareness regarding the accumulation of forest fuels, potentially fostering an environment that encourages biomass harvesting as a proactive measure.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10.	**6**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *very low*, therefore the RRI is 2 out of 10.	**2**

Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 12 out of 100.	**12**
Mitigation/Notching *RRL Mitigation (Notch)* Due to the fact that forest fires are relatively short-lived, a large feedstock inventory can mitigate against risks related to their impacts. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is 50%.	**Notch** **50%**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 6 out of 100.	**6**

3.7.4 Risk of Infestation

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

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

Risk Information: According to insights from local experts, potential insect outbreaks are considered the most probable disturbance to occur in the BDO Zone forests. While the risk is partially mitigated by the fact that the forests are of mixed composition, meaning an insect outbreak would only have a partial impact on the landscape, it is essential to acknowledge that the risk remains tangible.

Impact. Insect outbreaks happen over time, allowing for biomass supply chains to adjust.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10.	**6**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *very low*, therefore the RRI is 2 out of 10.	**2**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 12 out of 100.	**12**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 12 out of 100.	**12**

3.7.5 Risk of Hail

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

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

Risk Information: Risk of hail is irrelevant to woody biomass supply chains.

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

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: Risk of flood is irrelevant to woody biomass supply chains.

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

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 fibre for an Issuer.

Risk Information: Anticipated more frequent heat waves resulting from climate change contribute to the continued significance of droughts as a risk to the supply chain. While forecasting the exact risk of drought over an extended period is challenging, there is an expectation of increased occurrence of drought periods within the next two decades.

Impact. Drought can create dangerous conditions for loggers to operate in. Extended drought periods can therefore have a significant impact on woody biomass supply chains.

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 × RRI) is 48 out of 100.	**48**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* Due to the fact that droughts are relatively short-lived, a large feedstock inventory can mitigate against risks related their impacts. The Total Notch (RRL Notch × RRI Notch) is 50%.	**50%**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 24 out of 100.	**24**

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: In recent years, the BDO Zone has observed an elevated occurrence of wind storms, including tornadoes, leading to tree blow downs that can complicate and raise the cost of timber harvesting. However, amidst this challenge, there arises an opportunity for a bio-project, as the large swaths of blown-down trees are typically of lower quality and not suitable for sawtimber use, presenting the chance to utilize them exclusively as pulpwood feedstock.

Impact. Occasionally, seasonal weather events, especially wind storms, can have significant impacts on standing trees.

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 × RRI) is 24 out of 100.	**24**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* Weather interruptions in the BDO Zone are relatively short, a large inventory should effectively mitigate any risks related to seasonal weather impacts on feedstock supply. The Total Notch (RRL Notch × RRI Notch) is 50%.	**Notch** **50%**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 12 out of 100.	**12**

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: While temperatures in the BDO Zone can indeed reach low levels, anecdotal data indicates that they have not been sufficiently extreme to impede forest operations for extended durations. As a result, we do not anticipate significant risks to the supply chains stemming from low temperatures.

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

3.8 Risk Factor: Political and Social

3.8.1 Government Subsidies for Feedstock Production or Utilization

Rationale: Feedstock that is directly subsidized though 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 subsides only; it does not apply to government subsidies that pertain indirectly to the operations of the Issuer such as Loan Guarantees or to the markets for products produced by the Issuer.

Risk Information: No government subsidies for feedstock production were identified. This risk indicator is irrelevant to the BDO Zone.

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

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 utilization of biomass requires specific permits (i.e., 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) then likelihood of obtaining such permits and/or complying with permitting requirements should be examined.

Risk Information: The Species at Risk Act (SARA) presents a notable challenge to the forestry sector, particularly in the BDO Zone. The legislation includes protections for various species, including turtles that are prevalent in the region. As a result, logging operations are subject to timing restrictions to safeguard these species, limiting logging activities to only six months of the year in some areas. This poses significant difficulties for loggers, as they must cover equipment costs each month. SARA's impact extends to approximately 30% of productive land in Renfrew County.

Impact. In our estimate of available pulpwood, we have already accounted for potential impacts to the supply chain due to SARA.

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 *very low*, therefore the RRI is 2 out of 10.	**Score** **2**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × 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 × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 16 out of 100.	**Score** **16**

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

Rationale: Public backlash against biomass development in the Issuer BDO Zone can directly impact Issuer's ability to procure, transport, trans-load, store, or utilize feedstock by affecting local policies, regulations, and Issuer's ability to obtain necessary permitting.

Risk Information: In Ontario, there is a negative sentiment associated with using pulpwood for energy production, especially when clear-cutting entire stands of forests dominated by pulpwood may compromise ecological value. Community members emphasize the importance of preserving ecological integrity and maintaining a balance between economic activities and environmental considerations.

Additionally, a growing conservation and recreational movement among private landowners is influencing forestry practices. Private landowners, who own around 50% of the forestland in Renfrew County, are increasingly cautious and discerning about engaging in certain forestry operations. They are mindful of forests' role in combating climate change and may have reservations about practices that appear counterproductive to conservation efforts.

In light of these considerations, new operators should adopt sustainable forestry practices and emphasize the positive environmental impact of their projects. By aligning with local values and demonstrating responsible forest management, operators can address concerns and navigate potential challenges related to pulpwood utilization. Building a reputation as environmentally responsible and community-conscious partners will be essential to fostering greater acceptance and cooperation within the Renfrew County BDO Zone.

Impact. Local opposition can be detrimental to new projects and stifle their development.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10.	**6**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *high*, therefore the RRI is 8 out of 10.	**8**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 48 out of 100.	**48**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) The proponent can mitigate the risk related to potential backlash against feedstock use by an educational campaign focusing on economic development, job security, as well as sustainability of operations and the "waste-to-product" concept. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is 50%.	**50%**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 24 out of 100.	**24**

3.8.4 Consent of, and Co-operation 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 co-operation with, Indigenous communities and First Nations decreases Issuer risk.

Risk Information: The Algonquin Land Claim remains an ongoing matter, and while the exact timeline for resolution is uncertain, it is anticipated that the claim will be concluded within the next few years. Approximately 7% of Renfrew County is included in this land claim (Map C-5, Appendix C).

Impact. Any bio-project developing in the BDO Zone should consult with the Algonquin First Nations. A lack of consent from the First Nations would have a significant negative impact to a project.

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 *high*, therefore the RRI is 8 out of 10.	**Score** **8**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × 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 × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 16 out of 100.	**Score** **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, 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: Risks related to food security concerns are irrelevant to woody biomass supply chains.

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

3.9 Risk Factor: Sustainability and Environmental Concern

3.9.1 Feedstock Sustainability

Rationale: Public concerns about 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: All Crown lands within the Renfrew County BDO Zone are subjected to rigorous certification processes, ensuring adherence to sustainable forest management practices. These certifications, provided by either the Forest Stewardship Council (FSC) or the Sustainable Forestry Initiative (SFI), serve as a guarantee that forest operations conducted within these areas meet the highest standards for sustainable harvesting. The certification criteria encompass a comprehensive range of factors, including sustainable harvest practices, watercourse protection, soil conservation, and more. In addition to the Crown lands, many private forests in the BDO Zone are also certified by the Forest Stewardship Council (FSC), further reflecting the commitment to sustainable forestry practices.

A market for biomass material would allow for more undersized and unmerchantable material to be harvested from already allocated areas, improving forest health and conditions for forest regeneration.

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 × 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 × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 4 out of 100.	**4**

3.9.2 Risk to Soil Quality

Rationale: Soil sustainability can be defined as 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 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 which can degrade the soil and its nutrients.

Risk Information: This risk indicator is irrelevant to woody biomass supply chains.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *not relevant*, therefore the RRL is not rated.	**NR**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *not relevant*, therefore the RRI is not rated.	**NR**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is not rated.	**NR**

Mitigation/Notching The Total Notch (RRL Notch × RRI Notch) is not rated.	**Notch** **NR**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is not rated.	**Score** **NR**

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: This risk indicator is irrelevant to woody biomass supply chains.

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

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: This risk indicator is irrelevant to woody biomass supply chains.

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

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: This risk indicator is irrelevant to woody biomass supply chains.

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

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: Public forests within the BDO Zone are overseen and regulated by the OMNRF and are subjected to stringent guidelines regarding wildlife and landscape conservation, including forest certification systems, like FSC. Private forests, which comprise approximately 50% of the forests in Renfrew County, are less likely to be managed according to these guidelines. However, all forests in Ontario are subject to the Species at Risk Act (SARA), and Endangered Species Act (2007) which require the protection of species at risk and their habitat.

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 × 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 × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 4 out of 100.	**Score** **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 risk indicator is irrelevant to woody biomass supply chains.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *not relevant*, therefore the RRL is not rated.	**Score** **NR**
Raw Risk Impact (RRI) The risk impact is deemed *not relevant*, therefore the RRI is not rated.	**Score** **NR**

Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is not rated.	**Score** **NR**
Mitigation/Notching The Total Notch (RRL Notch × RRI Notch) is not rated.	**Notch** **NR**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is not rated.	**Score** **NR**

Category 4.0 Feedstock Scale-Up Risk

4.1 Risk Factor: Feedstock Scale-Up

4.1.1 Feedstock Quality at Production Scale

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

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

Risk Information: This risk indicator is irrelevant to woody biomass supply chains.

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

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: The scale-up of the supply chain primarily focuses on pulpwood, as chip supply chain is already well-established in the region. However, there are notable risks associated with pulpwood supply chain scale-up that warrant consideration:

i) The logging workforce in the BDO Zone is facing an aging demographic, and younger generations display limited interest in pursuing careers within the forest industry. Given that many logging businesses are small and family-owned, the lack of workforce replacement poses a significant challenge to sustain and expand operations.

ii) The cost of operating a logging business has seen substantial increases, marked by higher insurance rates, elevated capital costs, and escalated equipment expenses. These mounting financial burdens impact the feasibility of expanding pulpwood supply chain components.

iii) The log truck industry is also grappling with workforce challenges, as retiring log truck drivers often encounter a lack of incoming replacements to sustain the workforce. Notably, our assessment indicates that an additional 17 log trucks are required to accommodate the delivery of the 350,000 gmt/yr of pulpwood within the BDO Zone's capacity.

As a result, the risks related to the capacity of pulpwood supply chain components and equipment to successfully scale are deemed significant. The shortage of skilled labour and financial constraints may impede the smooth expansion of the pulpwood supply chain. Addressing these challenges and implementing effective strategies to attract and retain a skilled workforce and secure adequate financing will be crucial in overcoming these potential limitations.

The potential inability of the supply chain to scale to meet additional biomass demand can result in extended feedstock shortages.

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 × RRI) is 64 out of 100.	**64**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) A new-bio project can vertically integrate by hiring its own logging crews and purchasing logging and trucking equipment to mitigate the risk of the supply chain components and equipment to scale. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is 50%.	**50%**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 32 out of 100.	**32**

CATEGORY 5.0: INFRASTRUCTURE RISKS

5.1 Risk Factor: Physical Infrastructure

5.1.1 Land Parcel

Risk Information: Pembroke, with a population of roughly 14,000, is the centre point for supply and supply chain analysis. It provides access to major routes, notably Trans-Canada Highway 17 and Highway 41, and offers promising industrial facilities and ample sites for development. The TransCan Corporate Park and the McCool Business Park have been chosen at this time as the industrial sites with the most promise for bio-based project development for purposes of infrastructure scoring. Note that there are other sites that could be considered and developers are encouraged to speak with local economic development staff. Both the TransCan Corporate Park and the McCool Business Park are within Pembroke city limits, and offer competitive land pricing at $12,000/acre.

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 × 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 × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 4 out of 100.	**4**

5.1.2 City Ownership

Risk Information: Both industrial sites (TransCan Corporate Park and McCool Business Park) in the City of Pembroke are owned by the Corporation of the City of Pembroke.	
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 × 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 × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 4 out of 100.	**4**

5.1.3 Industrial Land Use Zone

Risk Information: Land use/zoning is in place for general industrial development in the City of Pembroke. The TransCan Corporate Park is zoned as an Economic Enterprise Zone (M2), while the McCool Business Park is designated as a General Industrial Zone M1 (light-industrial zoned area), with the ability to attain permitting of M2 (heavy-industrial zoned 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 × 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 × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

5.1.4 Natural Gas Line

Risk Information: Natural gas in the County of Renfrew and the surrounding Pembroke region is mainly supplied by Enbridge. Natural gas connections are already linked for both sites (TransCan and McCool), with Enbridge supporting 281 bcf of natural gas storage capacity within the region west of Ottawa. Medium-large sized commercial operations in Pembroke can anticipate fixed rates between 29.6¢ to 30.3¢ p/m³.

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 × 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 × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 4 out of 100.	**4**

5.1.5 Electrical

Risk Information: The County of Renfrew has electrical supply overseen by Hydro One, Ottawa River Power Corp., and Renfrew Power Generation. These entities ensure both residential and commercial consumers in the region receive consistent access to power. Recent indications for commercial supply in Pembroke have a price ranging between 10.50¢-11.29¢ p/KWH, with connectivity already provided to commercial customers at TransCan and McCool.

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 × 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 × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 4 out of 100.	**4**

5.1.6 Fresh Water Supply

Risk Information: All major towns in the County of Renfrew have access to city water. Pembroke has two major zones of public water supply; Zone II covers both industrial sites in Pembroke, extending into the Township of Laurentian Valley. The aquifer housing the wells in this zone is highly vulnerable to contamination lacking requisite hydrogeologic barriers.

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 × RRI) is 16 out of 100.	**16**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* Risk is deemed low, requiring some minor investments to be made to the Zone II hydrogeologic barriers within the greater Pembroke region. As this will be completed in the next 5 years the risk is still deemed as manageable. The Total Notch (RRL Notch × RRI Notch) is 50%.	**50%**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 8 out of 100.	**8**

5.1.7 Sewage Disposal Trunk Line

Risk Information: The city of Pembroke has access to city sewage; however, these services do not extend beyond the town limits of Pembroke (18 km SW of Pembroke). All industrial operations in Pembroke that produce contaminants beyond acceptable levels must pretreat their waste prior to disposal. The Ottawa Valley Waste Removal Center offers tipping fees for $250/MT for this particular waste.

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

5.1.8 Drainage and Stormwater Management

Risk Information: Pembroke has an effective drainage and stormwater management system, encompassing both engineered infrastructure and natural methods to manage stormwater runoff. The TransCan Corporate Park and the McCool Business Park have access to this storm drainage system, as well as adjacent ditches. The City of Pembroke has taken adequate precautions to mitigate potential flooding, particularly during heavy rainfall in the surrounding area.

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 × 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 × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 4 out of 100.	**4**

5.1.9 Available ICT (Information & Communication Technology) Services

Risk Information: Pembroke's industrial areas, specifically the TransCan Corporate Park and the McCool Business Park, are equipped with tailored connectivity solutions, including customizable fibre optic and cable internet services. Standard phone and DSL services are provided by Bell, while fibre optic access spans the Hwy 417/17 corridor through Bell, Cogeco, and NRTC Communications. Alternative connectivity options exist via private line-of-sight solutions and satellite providers like Xplorenet and Starlink. Cell coverage is generally strong, but some rural pockets in Renfrew County exhibit inconsistent service.

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 × 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 × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 4 out of 100.	**4**

5.1.10 Infrastructure – Landfill/Alternative Markets for Waste Disposal

Risk Information: In the nearby vicinity of Pembroke, there are designated solid waste disposal facilities. The Ottawa Valley Waste Removal Center (located 20 km from Pembroke) is the closest landfill and has tipping fees of $100/tonne for standard bagged/sorted garbage/building materials and $250/MT fee for unsorted construction materials. We consider these tipping fees relatively high. Currently the landfill does not present any capacity issues, and is deemed open to prospective new commercial entities for disposal services. It is the responsibility of commercial entities operating in the TransCan Corporate Park and McCool Business Park to manage and transport their solid waste to the specified facilities.

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

5.2 Risk Factor: Logistics

5.2.1 Road and Highway Access and Intersection

Risk Information: The TransCan Corporate Park and the McCool Business Parks benefit from a strategic location within the Ottawa Valley. The Hwy 17/417 offers direct routes to Ottawa, Cornwall, Montreal, Kingston, and Toronto. Highways 60, 62, and 41 offer accessibility to regions like Huntsville, Barrie, Peterborough, Belleville, and more. From these industrial parks in Pembroke, the distances to major centres are as follows: Ottawa is 146 km away, Montreal is 355 km, and Toronto is roughly at 387 km.

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) 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 × 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 × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 4 out of 100.	**Score** **4**

5.2.2 Ocean/River Access

Risk Information: The Port of Johnstown is 211 km from Pembroke, and is one of Eastern Ontario's premier ports that provides inland deep marine dockage for shipping and receiving dry bulk cargo such as grain, aggregates, road salt, slag etc. The Port of Montreal is 345 km from Pembroke, and is the second-largest container port in Canada. It has direct access to the Atlantic Ocean via the St. Lawrence River.

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 *medium*, therefore the RRI is 6 out of 10.	**Score** **6**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 24 out of 100.	**Score** **24**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 24 out of 100.	**Score** **24**

5.2.3 Railway Service

Risk Information: There is a 40 km spur line that connects the Beachburg Sub to Ottawa, and further to the east through the Ottawa Rail terminal, and to the US with the CN Rail. This is roughly 135 km from the TransCan Corporate Park and McCool Business Park. Currently, Nylene (Manufacturer of Nylon Resin) is using the rail to import raw materials from Virginia, US. However, the company feels that the rail is underutilised and can accommodate more traffic, and is inviting other industries to share the tracks maintained by them.

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 *medium*, therefore the RRI is 6 out of 10.	**Score** **6**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 24 out of 100.	**Score** **24**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 24 out of 100.	**Score** **24**

5.2.4 Accessibility to Airport

Risk Information: The Pembroke Airport is a regional airport located in the city of Pembroke, in Renfrew County. The airport primarily serves general aviation, with no scheduled commercial airline services. However, it plays a vital role in supporting local businesses and aviation-related services, including aircraft maintenance, fuelling, and rental. The Ottawa/Macdonald-Cartier International Airport, a major international gateway, is located in Ottawa and is about an hour's drive from Pembroke. Other significant airports in proximity to Pembroke include: Mirabel International Airport, Montreal, approximately 250 km away; Pierre Elliot Trudeau Airport, Montreal, roughly 340 km away; Toronto Pearson International Airport, about 400 km away; and Billy Bishop Toronto City Airport, approximately 390 km away.

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

5.3 Risk Factor: Social Infrastructure

5.3.1 Healthcare Facilities

Risk Information: The Renfrew Victoria Hospital, which is 57 km from Pembroke, provides a wide range of services including emergency care, diagnostic imaging, surgery, and rehabilitation. The Pembroke Regional Hospital, has approximately 900 staff members, offers services in emergency and intensive care, medical/surgical care, acute mental health, orthopaedics, and obstetrics. Other hospitals/clinics near Pembroke are - Arnprior Regional Health (84 km), Deep

River & District Hospital (53 km), and St. Francis Memorial Hospital (81 km). According to the Canadian Community Health Survey research (CCHS), the Renfrew County area when compared with the broader Ontario healthcare system was viewed as a low/neutral risk of material deprivation of basic healthcare necessities.

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

5.3.2 Educational Facilities

Risk Information: There are a good number of schools and higher educational institutes in the Renfrew County area, with remote campuses in Pembroke. Elementary and secondary school education is provided by four school boards, of which two are in Renfrew County. The Renfrew County District School Board comprises twenty-four elementary schools, seven secondary schools, and four alternative schools. The Renfrew County Catholic District School Board provides twenty elementary schools, two secondary schools, and two alternative schools. Two Ottawa based school boards - Conseil Des Écoles Publiques de l'Est de l'Ontario / Eastern Ontario French-Language Public School, and Conseil des écoles Catholiques du Centre-Est / Eastern Ontario French-Language Catholic School offer elementary and secondary education in French. Pembroke has some options for post-secondary education nearby including Algonquin College's Pembroke campus with the addition of the Renfrew campus many locals have the option to complete higher education without the need to relocate. The University of Ottawa also offers courses at Algonquin College in Pembroke. Two major Canadian universities, Carleton University, and the University of Ottawa, are within 145 km from Pembroke.

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 × 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 × RRI Notch) is NN (No Notch).	**Notch** **NN**

Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 4 out of 100.	**4**

5.3.3 Transportation Facilities

Risk Information: Pembroke is in the early stages of establishing a new public transit system, with the proposed system expected to include electric buses in response to growing demand for public transport for commuters.

Labour commuter data for Pembroke reveals that 78% of the employed labour force uses private cars, trucks, or vans for their commute, with 55% having a commuting duration of less than 15 minutes, indicating relatively short travel distances for work. Public transit is currently not a commuting option, underscoring the need for the proposed transit system.

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 × 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 × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 36 out of 100.	**36**

5.3.4 Recreational Facilities

Risk Information: Pembroke has extensive recreational amenities. The city boasts 200 acres of parkland and a 1.5 km waterfront walkway that showcases the scenic beauty of the region. There are six ball diamonds, five regulation soccer fields, and nine mini-pitch soccer fields. Additionally, there are 58 serviced camping spots, and the Pembroke Marina houses 100 boat slips. Riverside Park is another highlight, offering a diverse range of recreational spaces. Broadening the view to the wider Renfrew County, there are ample recreational options - ranging from parks, swimming facilities, playgrounds, tennis courts, and golf courses to hiking trails, skating rinks, skiing, snowshoeing, and snowmobiling. A particularly notable addition is the expansion of the Ma-Te-Way Activity Centre, a 76,500 ft² facility adjoining the existing arena in Ma-te-Way Park.

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 × 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 × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 4 out of 100.	**4**

5.3.5 Cultural Facilities

Risk Information: Pembroke, has multiple cultural amenities that reflect a diverse heritage and dynamic arts community. The city is home to several art galleries that showcase both local and regional artists. Other facilities include the Pembroke Heritage Murals and the Upper Ottawa Valley Heritage Centre. Additionally, Pembroke is known for its lively festivals, including the annual Canada Day celebrations and the Pembroke Old Time Fiddling and Step Dancing Championships, drawing visitors and performers 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 × 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 × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

5.3.6 Public Safety

Risk Information: The total crimes in Renfrew County are 3,842 for every 100k people in the region. The crime rate of Renfrew County is 9% lower than the national average, and is safer than 60% of the cities in Canada. Year over year, the crime in the region has decreased by 18%. In Pembroke, the crime rate (violent and non-violent) is low (5.9%) with a 25% decrease in reported incidents/crimes within city limits, contributing to the overall safety of the region. The Pembroke Fire Department offers emergency management services and actively seeks and trains volunteer firefighters to ensure the community's safety.

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

5.3.7 Housing

Risk Information: There is a variety of housing available within Renfrew County and Pembroke in particular. Within Renfrew County the average value of a housing unit is $447,444. According to Statistics Canada 2021, there are 51,134 housing units in total, where 33,640 of them are occupied by owners, and 11,260 are occupied by renters; and a significant number of units rented are between $ 1700 to $ 2500. Pembroke has similar values for housing prices, however with slightly more affordable renting options available with an average monthly rent at $1,100 monthly. There are roughly 7,000 privately owned dwellings within Pembroke, with 2,700 rented.

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

5.4 Risk Factor: Workforce and Permitting

5.4.1 Labor Availability

Risk Information: There is a good labour market for new industrial development. According to Statistics Canada 2021, Renfrew County has a total labour force of 49,115; an employment rate of 56.8%; unemployment rate of 7.2% and participation rate of 61.2%. The major industries in the region are - Public administration (8190 people); Healthcare (6840 people); Construction (4800 people); Professional services (3835 people); and Manufacturing (3035 people). Pembroke comparatively has an average labour size of just over 6,000 people, with an unemployment rate of 4.5%. The median age in the region is 45; 81.6% of the residents have a high school diploma; and 50.5% of them have a diploma/degree. The local workforce is accustomed to commuting for work, with daily commutes averaging 20-45

minutes to their respective location(s) of employment, with potential facilities drawing from Petawawa, Chalk River, Renfrew, and other municipalities in the area.	
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 × 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 × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 16 out of 100.	**Score** **16**

5.4.2 Labor Cost

Risk Information: The minimum wage rate in Ontario is $15.50 per hour for most workers. While further county comparisons for minimum hourly wages are inconclusive, Ontario holds the fourth highest minimum wage in Canada and Quebec (directly across the river from Pembroke) maintains a minimum payable wage of $14.60 per hour. According to Statistics Canada 2020, the average hourly wage for all occupations in Renfrew County is $20 per hour, with a median income of $42,000 per year. Pembroke has an average household income of $69,000 per year.	
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 × 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 × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 16 out of 100.	**Score** **16**

5.4.3 Training Programs/Community College

Risk Information: Algonquin College in Pembroke Campus is recognized for technical courses in natural resource management and other programs training industrial skills.	

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 × 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 × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 4 out of 100.	**Score** **4**

5.4.4 Permit Process

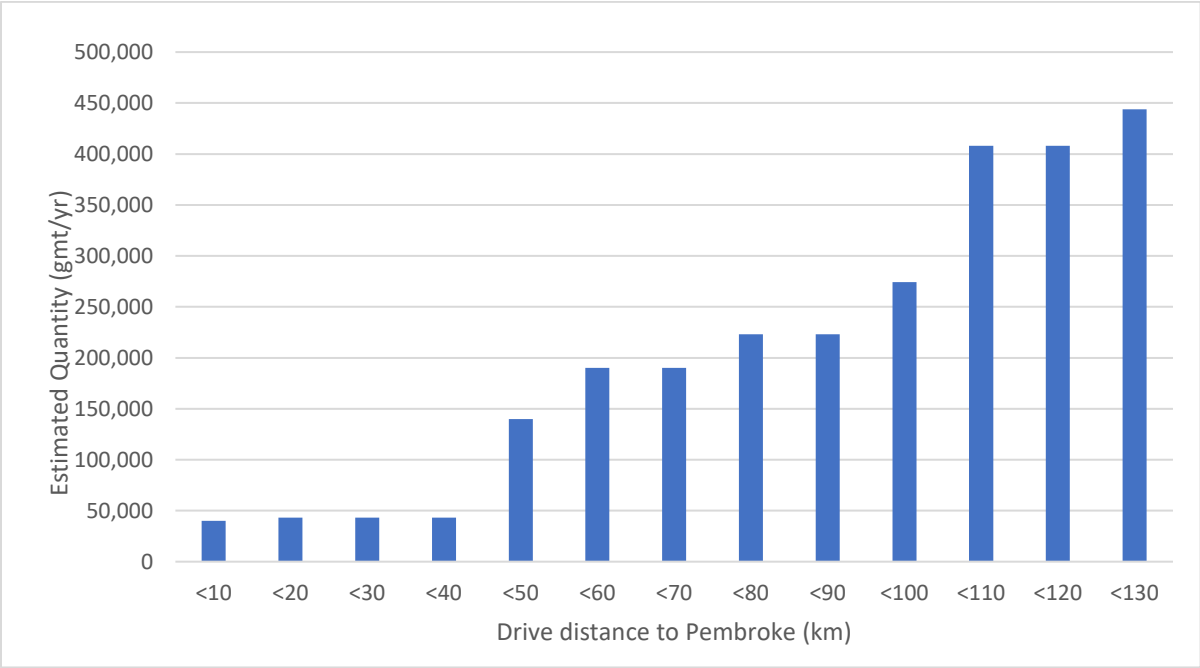
Risk Information: Permitting process is described on the Pembroke Municipal Website. The City of Pembroke has a well-established economic development department and supports timely processing for all projects spanning from light industrial to heavy industrial development. The permitting process ranges between 2 to 6 months.

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

APPENDIX C: TABLES AND FIGURES

CHARTS

Chart C-1. Sawmill chip generation curve



TABLES

Table C-1. Sawmill chip generation estimates by sawmill and distance

Sawmill*	Drive Distance to Pembroke (km)	Feedstock Species Group	Estimated Sawmill Chip Generation (gmt/yr)
Sawmill 1	10	Softwood / hardwood	40,132
Sawmill 2	15	Softwood	3,075
Sawmill 3	43	Softwood	46,801
Sawmill 4	47	Softwood	50,000
Sawmill 5	55	Softwood / hardwood	50,000
Sawmill 6	77	Softwood	33,036
Sawmill 7	92	Softwood / hardwood	26,755
Sawmill 8	92	Softwood / hardwood	24,428
Sawmill 9	107	Softwood / hardwood	133,774
Sawmill 10	129	Softwood	35,789
TOTAL			**443,791**

*Note that we keep sawmill names confidential due to privacy concerns.

Table C-2. Unutilized Merchantable Pulpwood and Undersize and Defect Wood in the Ontario Part of the BDO Zone

FMU	Overlap with BDO Zone	Merchantable Pulp in FMU (m3/yr) from FMP-14 (unutilized)	% assumed available	Merchantable Pulp in FMU (m3/yr) from FMP-14 (utilized)	% assumed available	Merchantable Pulp in BDO Zone (m3/yr)	Undersize & Defect in FMU from FMP-14 (utilized and unitized) (m3/yr)	Undersize & Defect in BDO Zone (m3/yr)	Total in FMU (m3/yr)	Total Estimated pulpwood/ undersized/ defect volume in BDO Zone (m3/yr)
OVF	0.93	42,408	1.0	55,573	0.73	77,168	23,527	21,880	121,507	99,048
APF	0.29	109,426	1.0	178,400	0.6	62,775	144,544	41,918	432,371	104,693
MLF	0.19	31,951	1.0	48,400	0.4	9,749	8,824	1,677	89,175	11,426
BMF	0.13	24,416	1.0	68,610	0.4	6,742	21,979	2,857	115,004	9,599
Total										**224,765**

Table C-3. Pulpwood (Undersize and Defect) Availability from Private Forest Lands in the Ontario Part of the BDO Zone

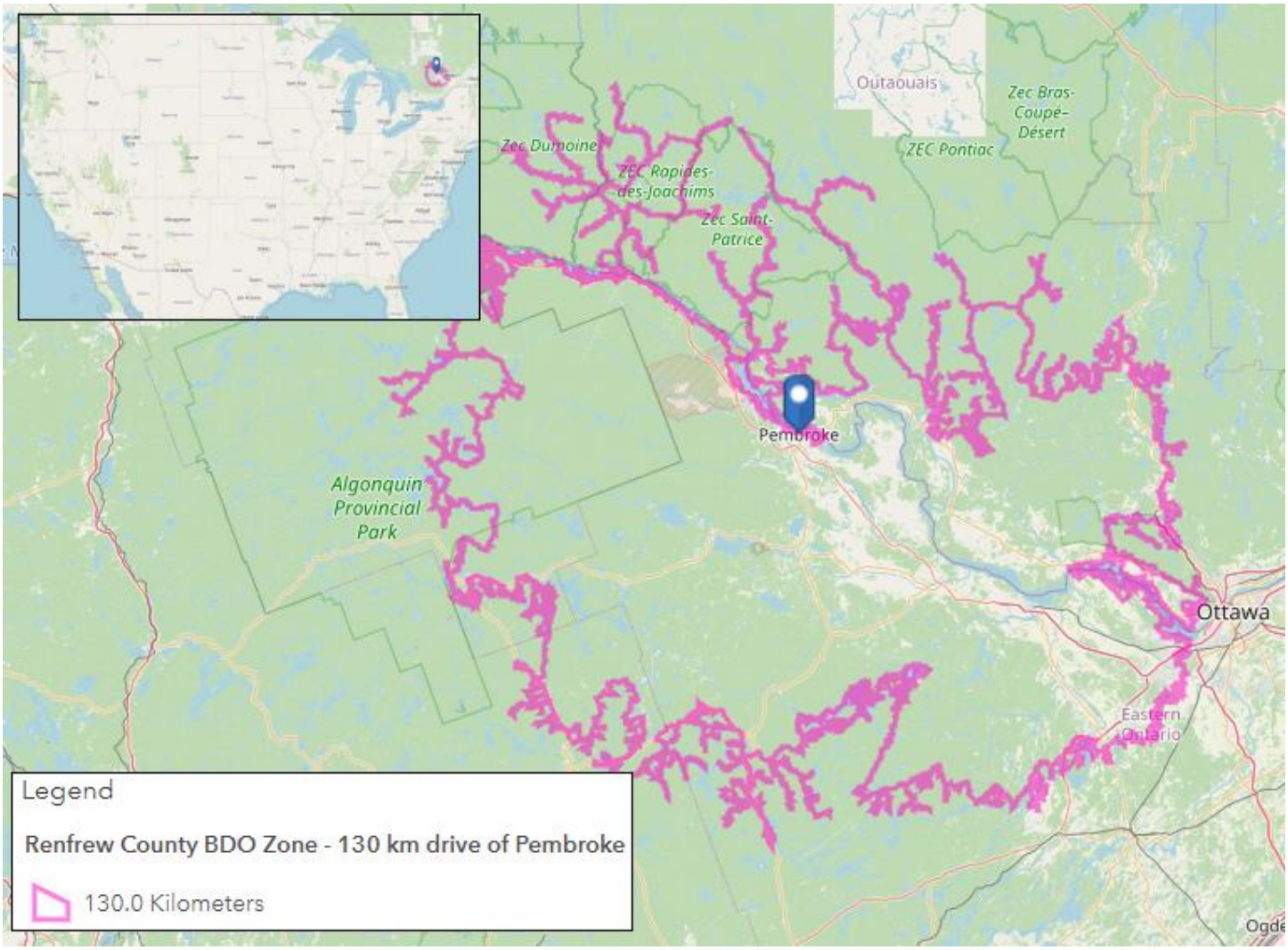
FMU	Overlap with BDO Zone	Productive Forest Area (ha)	Private Forest Area in the BDO Zone (ha)*	Ratio assumed from Crown land (m3/ha/yr)	Estimated volume in BDO Zone (m3/yr)
OVF	0.93	250,452	232,920	0.59	136,262
APF	0.29	n/a			
MLF	0.19	379,064	72,022	0.48	34,756
BMF	0.13	394,000	51,220	0.44	22,459
Total					193,477

Table C-4. Pulpwood (Undersize and Defect) Potential Availability in the BDO Zone

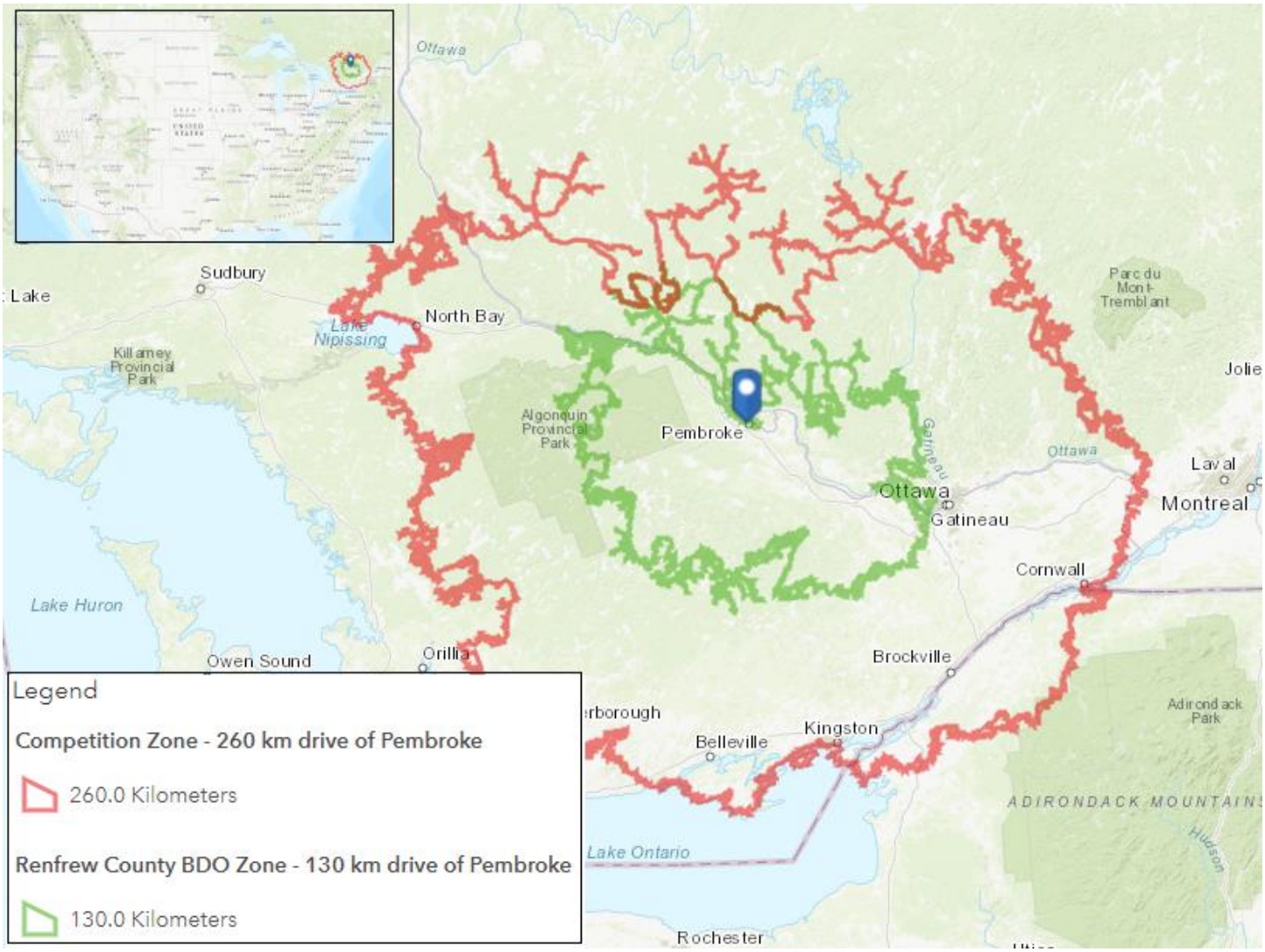
Province and Ownership	Potential Pulpwood Availability (gmt/yr)	Potential Pulpwood Availability at BAM = 1.2x (gmt/yr)
Quebec Public	13,919	11,599
Quebec Private	50,887	42,406
Ontario Public	224,765	187,304
Ontario Private	193,477	161,231
Total	**483,048**	**402,540**

Maps

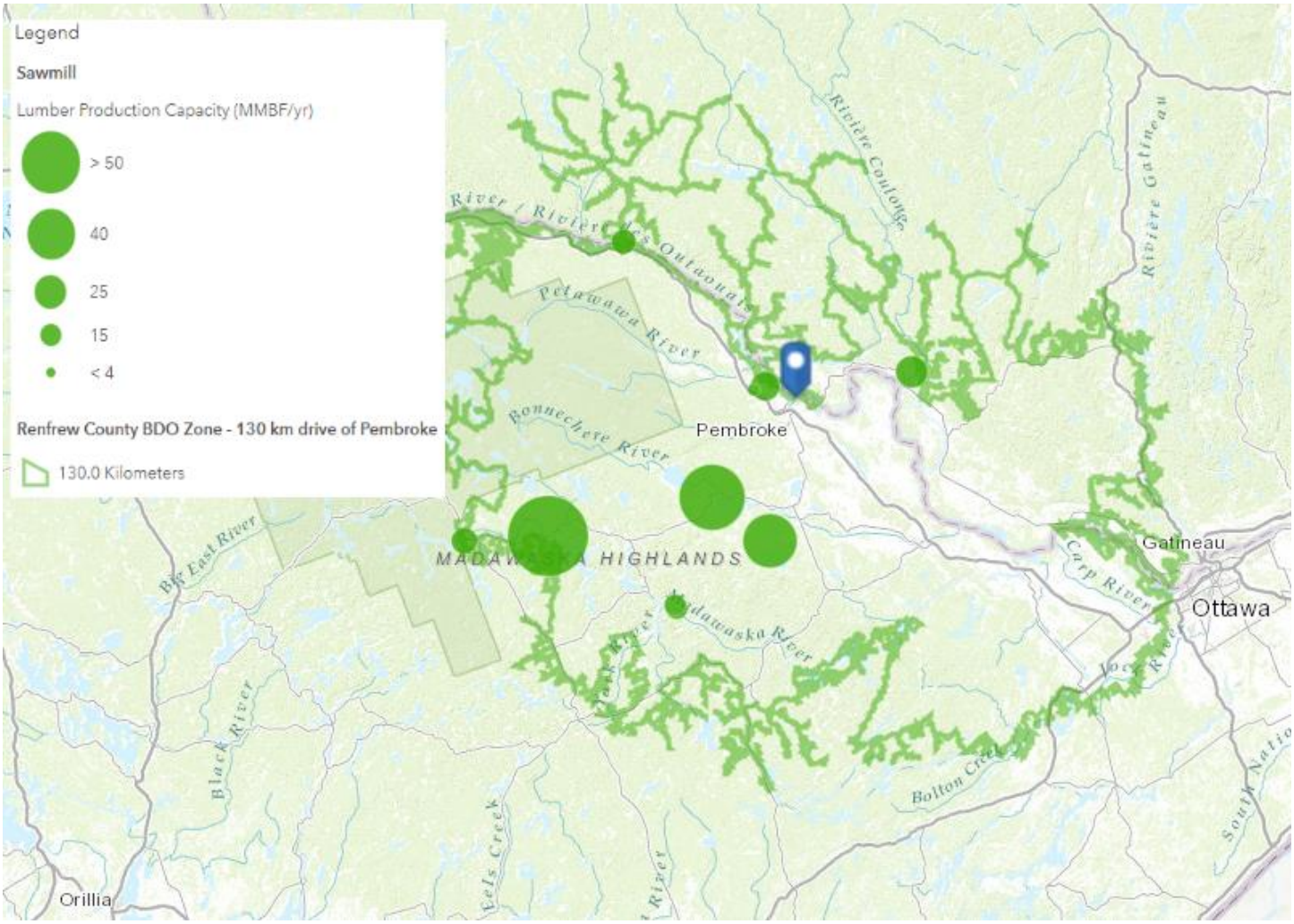
Map C-1. Renfrew County BDO Zone defined by a 130-km drive distance of Pembroke, ON



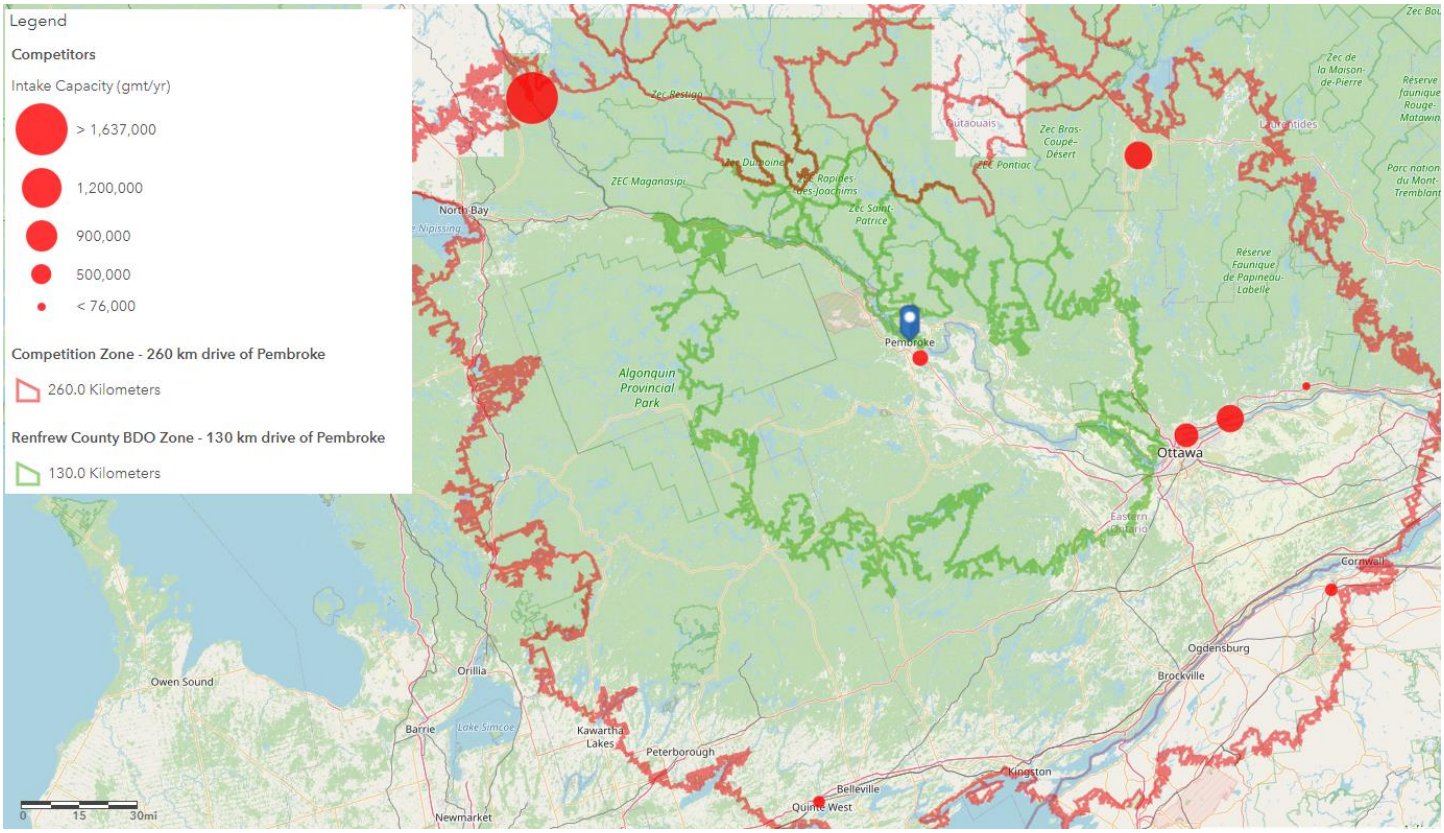
Map C-2. Renfrew BDO Zone and the Competition Zone



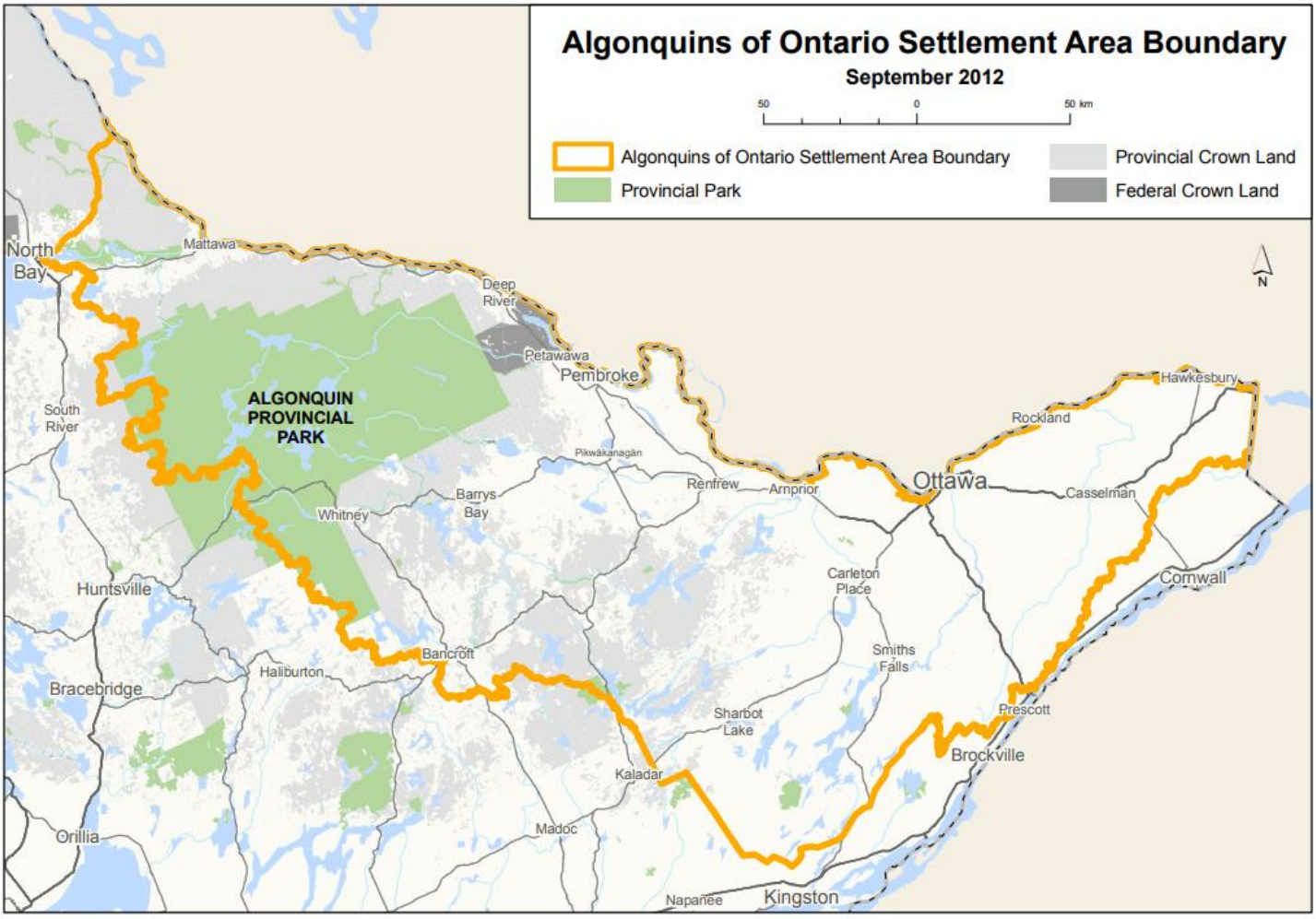
Map C-3. Sawmills within the Renfrew County BDO Zone



Map C-4. Competitors within 260-km drive of Pembroke, ON



Map C-5. Algonquins of Ontario Settlement Area Boundary



APPENDIX D: LEGAL DISCLAIMER

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