HANA Business Case to Attract Investment in the Hemp Fibre Value Chain in Northern Alberta – Phase II

Prepared For

Hemp Alberta Northern Advantage (HANA)

Prepared By

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Mr. Catellier

RE: FINAL REPORT - HANA BUSINESS PLAN

We are pleased to provide you the Final Report for the HANA Hemp processing facility business plan. We appreciate the opportunity to have worked on this project and look forward to following the potential development of hemp processing in Northern Alberta.

As part of our analysis we have conducted extensive sensitivity and scenario analysis on the key cost and revenue drivers by geographic location for three facility sizes. While there is obviously subjectivity involved in some of the assumptions, we have been careful to qualify the impacts of these and suggest risk mitigation options.

Thank you for the opportunity to work with you on this project. Please do not hesitate to contact me directly with any questions and/or areas of clarification.

Yours truly,
SERECON INC.

Enclosure

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1.1 Executive Summary

The purpose of this document is to assess the opportunity, and the marketing, operating and financial plans for the establishment of a 4 MT/hr, an 8 MT/hr and a 10 MT/hr hemp decortication plant on different site locations across northern Alberta. Each site location has contributing factors that give it advantages in key areas associated with building a hemp decortication plant. Some locations have more farmland in the surrounding region, others have advantages in access to a workforce, while others have lower municipal tax rates or industrial land values.

In our assessment, the key critical cost assumptions that differentiate the regions are tax rates, distance from export destination, distance to bring in hemp straw and industrial land values. This document will help the reader make an informed decision regarding various trade-offs related to investment in a decortication plant in northern Alberta.

One of the key assumptions that went into the economic model, and that was used to draw conclusions for this document, is that the market for hemp fibre continues to grow. While continued growth is a reasonable assumption, the extent of that growth has critical implications on the viability of the largest of the hemp decortication plants. Given the growing interest in hemp and the regulatory shift taking place in the United States, we have made the assumption that a 10 MT/hr plant will be able to sell all the fibre, hurd and dust it produces.

Our analysis shows that the 10 MT/hr plant, located in one of the more favorable site locations, has the potential to completely payback $12.7 million in invested capital (50% of the required capital expenditure) in four years of operation. The cash flow generated by the end of year 4 is roughly $22 million (for our example location), with a capitalization rate of 33%. The cash flow and capitalization rate both increase or decrease for every dollar per metric ton change in the price of hemp fibre. While the plant continues to accumulate cash flow if hemp fibre prices drop considerably, the payback period is pushed further out.

With the above conditions in mind, we recommended the following strategy for establishing a hemp decortication plant in northern Alberta:

- Build a 10 MT/hr hemp decortication plant to benefit from economies of scale and be able to take advantage of growing global demand for hemp products. Some companies will choose to grow into a large-scale plant, i.e. start with a scalable 4 MT/hr plant and grow larger as the customer base grows.

- Consider building in regions with either lower municipal tax rates or that are offering tax-free status in the first three years. Securing a three-year tax-free operating window shortens the payback period and increases the capitalization rate.

- Build the hemp decortication plant in a location that has abundant agricultural land in the surrounding region. If more hemp decortication

plants are built in western Canada, there will be increased competition for supply, and it will be important to be in a region with large productive potential.

- Access to rail is a bonus but not necessary unless the decortication plant is located a considerable distance from markets (e.g. Peace River region shipping to Edmonton). If a plant is built in the northernmost site locations, then access to rail is a must.

The economic model shows that a 10 MT/hr decortication plant is resilient to price fluctuations in the cost of hemp straw and the price of hemp fibre on the world market. However, the conclusions drawn for this document are based on the assumptions outlined throughout.

The approach taken for this assessment recognizes that while there is risk involved if the price of inputs (hemp straw) climbs, or oversupply of hemp fibre causes prices to drop, the potential gains from getting in ahead of the expected growth in the global hemp demand are large. Besides the various reasons outlined in the Marketing Analysis and Marketing Segments sections of this document that lead us to believe there is going to be growth in global demand for hemp fibre, the regulatory shift taking place in the United States and the increasing global demand for sustainably produced products are stand-out contributing factors. Finally, given the apparent support at the national and provincial levels for crop diversification in the prairies, this would appear to be an opportune time to invest in hemp processing in Alberta.

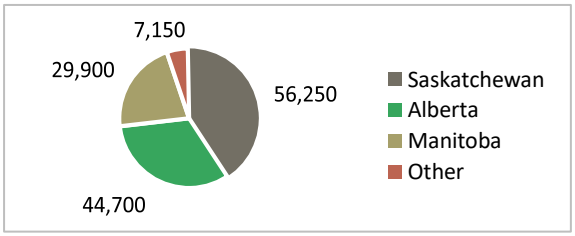
2.0 Industry Analysis - Supply

2.1 Canada

Hemp cultivation was re-introduced in Canada in 1998. Over the past 20 years producers have gradually been building up sources of certified seed and processors have developed numerous hemp products. However, with the introduction of Canada's Cannabis Act (2018), growers can process the hemp flowers, leaves, and branches in addition to just the seed. While seed has long been incorporated into a wide range of food products in Canada, the introduction of the new regulation is expected to further increase interest in growing hemp.

According to Health Canada, in 2017 Canada planted a total of 138,000 acres of industrial hemp (Figure 1). While hemp acres have fluctuated up and down over the past 10 years, it is likely that with the regulatory shift in the United States and the growing interest in hemp processing in Canada, producers are capable of increasing acreage in the coming years.

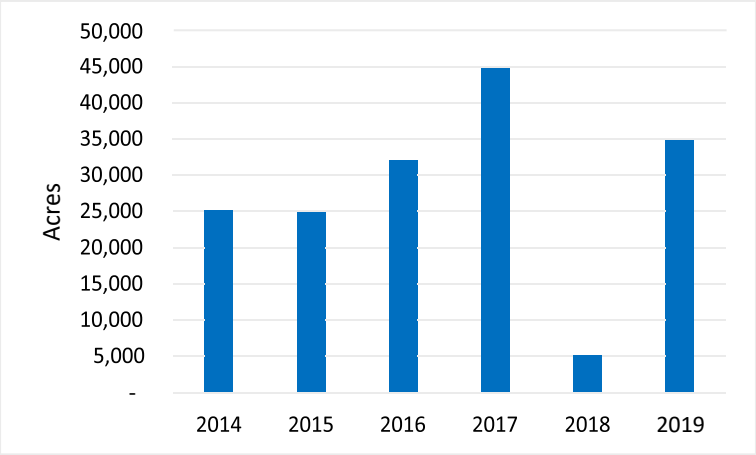
Figure 1: Canadian Acres Plant to Hemp (2017)



Source: Health Canada

Alberta accounts for roughly a third of Canada's total hemp production, which is heavily concentrated in the Prairie Provinces (Figure 2). Alberta also holds the highest number of licenses for cultivating industrial hemp of all provinces in Canada. Farmers in northern Alberta have been experimenting with hemp cultivation for years. Research suggests they have the knowledge and agronomic techniques to successfully grow a 3.5 MT/acre crop (and growing), and they are ready for further investment in processing in the region to signal that it is time to increase area seeded.

Figure 2: Area Seeded to Hemp in Alberta

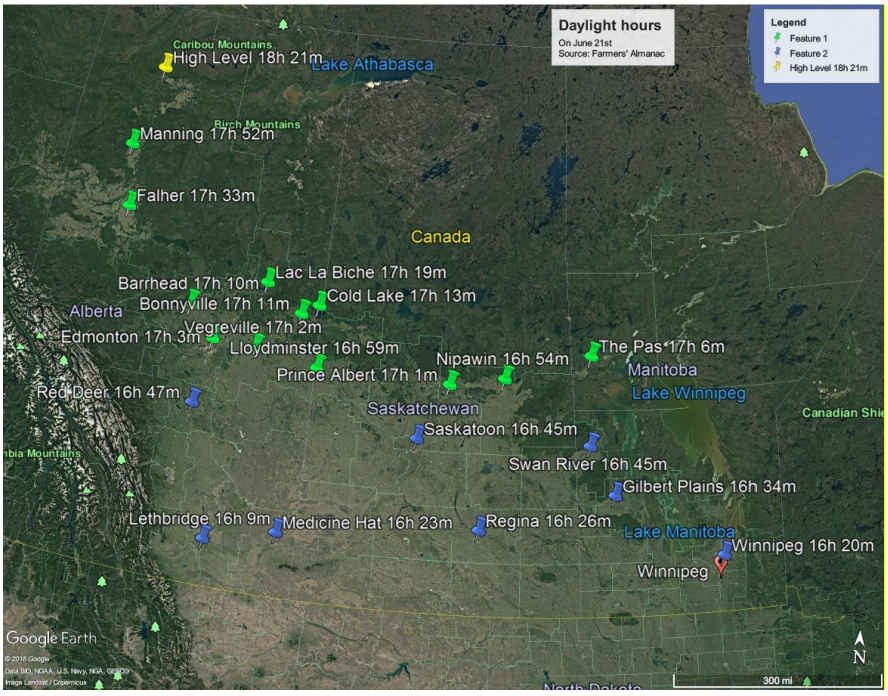


Source: Statistics Canada and Government of Alberta

The drop in 2018 was directly related to overproduction in 2017. A key market for Canadian hemp had been South Korea, which reduced its purchases from Canada in 2017 because their consumption of hemp products declined, and they started importing from China at lower prices. However, hemp acres rebounded again in 2019. Fluctuations like this are not unusual in a new market scenario where supply chains are not fully developed. It does point to the importance of building relationships with producers in the region where a plant is to be built.

Northern Alberta is home to North America's largest Research and Development Decorticator facility (Innotech Alberta Vegreville Site). The longer hours of sunshine (Figure 3) and cooler nights allow hemp to see a 30% increase in fibre and a higher concentration of omegas. The long dews advance retting allowing for optimum fibre quality.

Figure 3: Daylight Hours

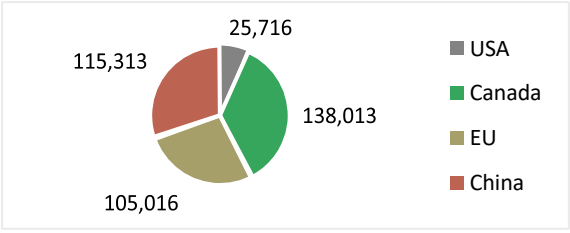


Source: Farmers' Almanac

2.2 International

In 2017, Canada planted 37% of global hemp acres, China planted 30%, the European Union planted 27% and the United States planted 7%. (Figure 4).[1]

Figure 4: 2017 Hemp Acres – Leading Producers



Source: USA – Vote Hemp; Canada – Statistics Canada; EU – European Industrial Hemp Association; China – Heilongjiang Academy of Sciences

Hemp fibre is an expanding industry in China and has become the most popular fibre in the bast textiles market with 70% of total hemp grown used in textile industry. If hemp production continues to expand in China it could lead to more hemp fibre being incorporated in to manufactured goods, which could in turn increase demand for hemp on the global market. China is the global leader in producing industrial products produced with hemp as an additive. While China does not currently import a significant amount of hemp fibre (they supply their processing industry with domestically produced fibre), further interest in these products on the global market

[1] Statistics on global hemp production come from a presentation at the 15th Conference of the European Industrial Hemp Association (EIHA) in Cologne, Germany, in June 2019.

could expand the processing sector in China and require them to begin importing fibre. Canada is ideally located to supply this market.

For the last ten years, progress in the pulp and paper, insulation and bio-composites markets in the EU have seen steady growth. The growth of environmentally conscious consumers has helped to push this trend. France is the leading producer of hemp straw and intermediate processed fibre, with Germany and the Czech Republic leading the way regarding further processing.

While the United States currently trails the other three leading producers, this is expected to change given the latest developments in the 2018 Farm Bill. Since the early 1990's, there has been sustained pressure pushing for commercial hemp cultivation again. In 2014, Congress took the first step by allowing some research institutions and state departments of agriculture to grow hemp under an agricultural pilot program. Finally, in 2018 the latest iteration of the Farm Bill directed the U.S. Department of Agriculture (USDA) to issue regulations and guidance to implement a program for the commercial production of industrial hemp in the United States. For the 2020 planting season, U.S. producers are hoping to have regulation in place for industrial hemp production in the United States. This could greatly increase the market for Canadian industrial hemp and hemp by-products.

2.3 Summary

There are several significant changes in the supply chain that are of critical significance to the potential growth of the industry. Canada has made the regulatory changes to promote hemp production, and the world appears to be eager for hemp fibre, especially with the changes taking place in the United States.

While the momentum is very positive it is important that hemp production must increase in Alberta for a large hemp decortication facility to be viable. On the positive side, there were 34,600 acres of hemp planted in Alberta in 2019 and this is likely just the starting point for the industry. As markets mature this figure is expected to grow significantly. Alberta has the agricultural land and skilled producers capable of diversifying their crop rotations by adding hemp. This momentum will obviously increase as markets grow and supply chains become more mature.

3.0 Market Assessment

3.1 Context

While the extent of the growth of the global hemp industry is dependent on investment in processing capacity and the development of markets, the growth is clearly taking place. This could spell incredible opportunity for Canada's hemp industry, including farmers, processors, food manufacturers and researchers. Currently, Canada is the global leader in hemp production and is looking to further develop domestic manufacturing in the hemp sector in order to capture some of the growing global market.

The various marketing segments potentially open to hemp by-products from a hemp decortication facility in Alberta include industrial applications such as technical fibres for advanced industrial applications, non-wovens, (including growth mats and erosion mats) and natural semi-fabricated product for pressing composite materials, and hemp pellets for the injection molding industry. In addition, hemp products are being used for construction applications such as insulation, plate material for external wall insulation and roof construction, non-woven felt for sound absorption, and hemp blocks.

3.1.1 Canada

In September 2018, the federal government announced investment of $330,550 CAD in the Canadian Hemp Trade Alliance (CHTA) to develop industry-wide grading standards so that Canadian hemp products could be recognized globally for their quality and consistency. In addition, the federal government has pledged investment of $950 million CAD towards transforming sectors of Canada's economy to become global market leaders.

Protein Industries Canada (PIC), the newly created organization in Canada representing producers and processors of plant-based proteins, received $153 million CAD in federal funding to put towards projects to further develop the plant-based industry. As a positive sign that investment dollars are behind the hemp industry in Canada, in June 2019, PIC announced their first project investment of $8 million being allocated to creating new processing techniques for hemp and canola in Alberta. This will certainly increase the level of confidence for the industry as a whole and demonstrate long-term commitment to producers.

With projected growth at the global level of between $10-15 billion USD and considerable investment in Canada towards hemp processing, the foundation is set for hemp in Canada to capitalize on the projected growth in the hemp industry south of the border. Canada and the United States trade roughly $25 billion CAD in agriculture and agri-food products on an annual basis, making it the largest bilateral agri-food trading relationship in world. Therefore, Canada is ideally situated to supply growing demand in the United States. The market for hemp products in the United States alone was already estimated at just under $700 million USD back in 2016, displaying year on year growth of 20% since 2011.[2] Estimates place the market for hemp-based products sales at just over $1.8 billion USD by 2020 in the United States alone. With a head start by having regulation already in place, and the ideal growing

[2]Statistics come from a Congressional Research Service report (CRS REPORT 7-5700 RL32725) published by Renée Johnson in 2018 titles: Hemp as an Agricultural Commodity.

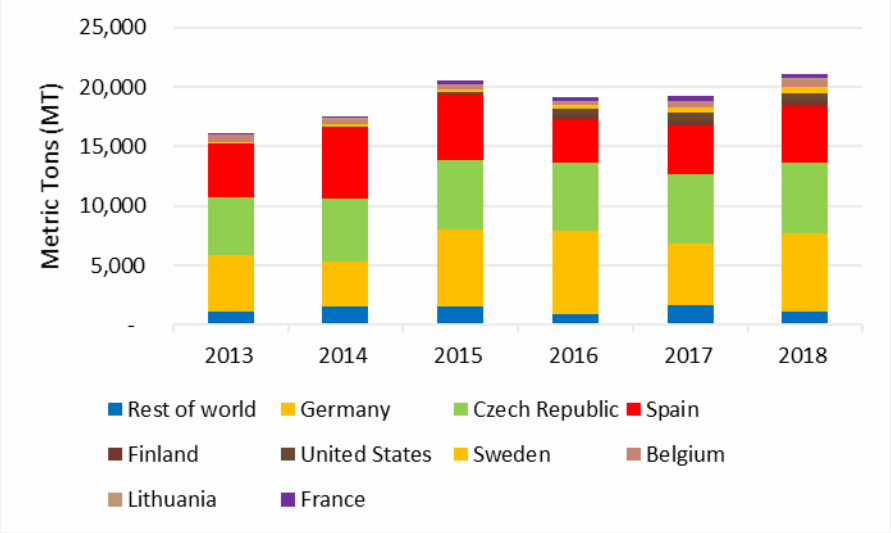
conditions for hemp including long daylight hours in the summer, Canada is ideally located to take advantage of growing U.S. market in the coming years.

3.1.2 Global

To date, most of Canada's hemp related exports have focused on hemp seed. However, with the new regulations in Canada's Cannabis Act this is expected to change. In 2017, Canada exported 10,500 metric tons (MT) of hempseed valued at nearly $50 million USD. Seventy percent of Canada's export volume went to the United States, followed by European Union (EU) member countries and South Korea.

The top markets for hemp fibre globally are Germany, the Czech Republic, Spain and Finland. In 2018, Germany imported 6,563 MT of hemp fibre, much of that coming from France. The Czech Republic and Spain imported 5,901 MT and 4,800 MT in 2018, respectively. The average total market for hemp fibre imports has been roughly 20,000 MT for the previous four years (Figure 5).[3]

Figure 5 : Global Hemp Imports



Source: Global Trade Atlas

Global imports of hemp fibre to date may downplay the potential available market for hemp fibre over the coming years, and in doing so undersell the opportunity for intermediate hemp processing in Alberta. For one, the United States has not yet been accounted for because the USDA is only now in the process of developing regulation for the hemp industry.

Once the United States begins processing hemp it is expected to increase the overall demand for hemp fibre. Secondly, Canada itself (including Alberta) is receiving considerable investment in the hemp processing industry. For instance, two hemp processing industries are looking to build or expand their operations producing non-woven matting and/or hempcrete building blocks, offering potential local demand

[3] The data on hemp fibre is limited given its proprietary nature. For the purpose of "Hemp Imports" we have used HS code 5302: (True hemp (cannabis sativa L.), raw or processed but not spun; tow and waste of true hemp (including yarn waste and garnetted stock).

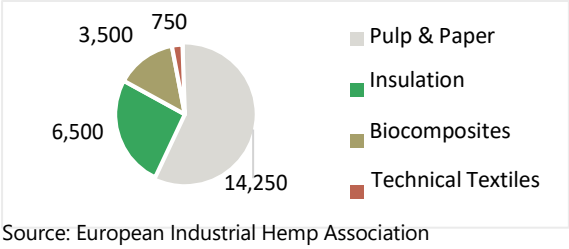
for both fibre and hurd.[4] A hemp processing plant could supply local secondary processing industries.

3.1.3 Processing

The most developed markets for hemp fibre processing are in China and the European Union. China is a large hemp producer (Figure 4), accounting for 30% of global production, yet they have not historically imported very much hemp from abroad. The large processing markets for hemp fibre in the European Union are in the Netherlands, Germany, the Czech Republic and Spain. While China may not offer an immediate export market for Canadian hemp, European trade partners could be potential markets from the start.

Recent data from the European Industrial Hemp Association shows that 25,000 MT of bast fibre was produced in 2013. The bast fibre was then divided amongst the following industries: the pulp and paper market, insulation, the BioComposites market, and technical textiles. These are current and well-established markets that Canada could potentially access.

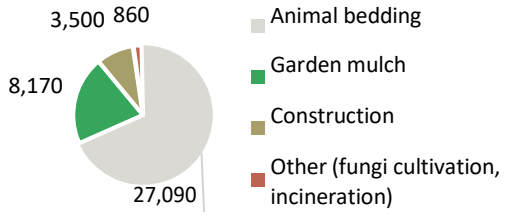
Figure 6: 2013 European Union Hemp Fibre Domestic Disposition (MT)



Source: European Industrial Hemp Association

In the EU, hemp hurd has traditionally been used as animal bedding, garden mulch, and more recently in emerging sectors such as construction and for the cultivation of fungal crops and for generating heat (incineration). Hemp fibre typically generates a much higher rate of return for processors compared with hemp hurd, but this gap could close if more uses are discovered.

Figure 7: 2013 European Union Hemp Hurd Domestic Disposition (MT)



Source: European Industrial Hemp Association

3.2 Marketing Segments

In addition to the geographic distribution of markets, it is also important to consider the specific market categories across geography. This is a of critical importance as the attributes required are likely more related to function than market location.

[4] JustBioFiber and BioComposites Group.

The following outlines the key applications that are currently being considered. Given the significant changes occurring in regulations it is likely that additional markets will also surface. However, the assessment to follow has not considered this directly in the analysis and these opportunities need to be considered in the application of a discount rate.

3.2.1 Industrial Applications

Potential industrial applications for hemp include technical fibres for advanced applications such as interior paneling for the automotive sector. In the coming years there could be increased demand from leading car manufacturers interested in incorporating materials into their production process that contribute to a more sustainable vehicle. As in almost every other industry, the automotive sector is trying to improve their image through marketing sustainability.

In recent years leading auto manufacturers in Europe have attempted to incorporate renewable hemp fibre into interior car paneling. However, the technology was not yet at the point where parts providers could maintain the consistency of quality at the required price demanded by the automotive sector to make it feasible on continuous basis, i.e. those auto companies experimenting with hemp fibre returned to polypropylene based technologies. This is not to say that the auto sector does not offer great potential in the coming years, it is that to date it should not be relied upon to support a hemp decortication plant.

A current market that is consistently incorporating hemp fibres is the pulp and paper industry. For example, one of the leading industrial hemp cooperatives in Europe, La Chanvrière, is made up of 800 producers cultivating 20,000 acres in a 140 km radius around a hemp decortication plant located at Bar-Sur-Aube, France. La Chanvrière primarily supplies hemp fibre for paper production in Europe. In the European Union, nearly 60% of hemp fibre is destined for the paper industry. New research is showing that paper produced from hemp has greater recycling potential than traditional wood-based paper. The other industries supplied by La Chanvrière are mattress production (mattress spring covers), the construction sector (mats) and some automotive.

Hemp fibres are also increasingly being used in non-woven and natural semi-fabricated products for pressing composite materials. These products include erosion mats for retaining purposes in the industrial sector. Additionally, the technical fibres can be combined with bio-based polymer into injection mould pellets, which can then be used in several injection mould processes to make anything from plastic cups to home furniture. The industrial applications for the byproducts from hemp processing (fibre, hurd, and dust) appear to be expanding as more companies find innovative applications

3.2.2 Construction Applications

Hemp by-products are being used to create insulation, plate material for external wall insulation and roof construction, non-woven felt for sound absorption, and lime hemp and hemp blocks.

They are also being incorporated into building blocks (hempcrete), which is a mixture of hemp hurds and lime used as a new material for construction and insulation. This

product is currently being marketed as less brittle than traditional concrete building blocks in addition to having favorable insulating and thermal mass qualities. There is currently a company in Airdrie (JustBioFiber), Alberta, producing hempcrete blocks and looking to expand production.

On a global scale, Germany, Spain and the United Kingdom were the largest importers of bio-fibre based building materials for the construction sector (Table 1). Imports of bio-fibre based building materials by these top importers reached nearly $150 million USD in 2016, signaling a growing interest in hemp-fibre based building materials.

Table 1: Bio-Fibre Based Building Materials Importers (2016)

Country	Imports (US$)
Germany	$19,918,248
Spain	$18,446,647
United Kingdom	$18,239,735
Republic of Korea	$15,446,565
Switzerland	$15,144,403
Denmark	$14,886,703
Australia	$13,059,744
USA	$11,340,010
Russian Federation	$11,183,505
France	$9,412,371

Source: FAO Trade Data

Bio-fibre based building material exports were led by China ($121 million USD), Japan ($30 million) and Germany ($29 million) in 2016. This is a growing market and one that could provide great opportunity for a hemp decortication plant in northern Alberta.

3.2.3 Food Service Sector

Hemp seeds can be consumed or used to produce a variety of food products including hemp milk, hemp oil, hemp cheese substitutes and hemp-based protein powders.

A Manitoba based company has been selling hulled hemp seeds for human consumption for over 15 years. They are well established in the North American market. Farmers in the prairies growing dual-purpose hemp (for seeds and fibre) could easily benefit from selling both the hemp seed and hemp straw. Hemp byproducts are being incorporated into everything from cereals to body lotions and roasted hemp coffee. The possibilities for incorporating hemp into food and lifestyle products appear to be endless at this point although the current demand is relatively small. It is important to recognize that entry into this market has significant regulatory hurdles – getting approval for food products/ingredients is generally relatively complex in most countries.

3.2.4 Livestock and Pet Applications

According to Statistics Canada, global imports of dog and cat food were valued at $12.4 billion USD in 2017. Tapping into the pet food market with new hemp products has significant potential for this industry. Hemp-based therapeutic dog products in the form of a chewable are already being exported by a British Columbia company to

the New Zealand market. In this way, hemp fibre and hurd are already being incorporated directly into pet food itself. Another Manitoba-based company is producing a list of 'pet booster' edible products for cats and dogs and selling them on the domestic market. The segment of the pet food sector that appears to have the most growth potential is CBD-based pet treats. This market is growing rapidly and is expected to do so over the coming years.

In addition to pet food, hemp fibre and hurd are being used for various forms of bedding for cats and other pets like rabbits and guinea pigs. Hemp straw and by-products are also being used as bedding in larger livestock production systems for cattle and other animals. A market with large potential for the hemp hurds is the equestrian market. Another British Columbia based company is currently supplying 15 kg compressed bags of hemp hurds (bedding) to the local equestrian hobby market. This sort of business opportunity could provide a value-added revenue stream for a hemp decortication plant in Alberta.

3.3 Summary

The Canadian government has demonstrated their support for the hemp industry by providing investment towards transforming the sector, which coincides with projections of considerable growth in the global hemp industry over the next decade. This is an important signal to industry, as the current market for hemp fibre, hurd and dust is in the early stages of growth. Global demand for the primary commodity seems to be growing based on changing consumer trends. This is a must to make a decortication plant in Alberta viable.

4.0 Operations

4.1 Overview

This section identifies the various components of the operations having a critical impact on the cost to produce: labour, utilities, capacity, freight, capital use, the impacts of location, overhead, and other operating costs.

Analysis is related to the estimated attainable market as outlined in the previous section as well as linked directly to the financial section to follow. It is also important to recognize that the assumptions made on operations are considered as part of the scenario analysis that has been conducted and that the sensitivity of financial results to these scenarios will be discussed in the following sections.

The regions assessed in the scenario analysis are grouped into their five Regional Economic Development Alliances (REDA's) (Figure 8).

Figure 8: REDA Groups

Northeast Alberta Information HUB Ltd

Peace Region Economic Development Alliance (PREDA)

Growth Alberta Regional Economic Development Initiative (GROWTH Alberta)

Grande Alberta Economic Region (GAER)[5]

Regional Economic Development Initiative (REDI) for Northwest Alberta

Source: Modified version from Government of Alberta

4.2 Operating Costs

The assessment considers operating and capital costs separately so that impacts of scale economies can be assessed. Key cost drivers are identified and qualified, and the ones with the most impact on net profitability have been used to drive sensitivity and scenario analysis. This enables a more robust assessment of the potential returns of a facility.

[5] For our assessment we have also included the region of GAER. While this may no longer be a REDA entity, for the purpose of comparability we have used it in our model as a region.

4.2.1 Cost of Goods Sold

The costliest input for a hemp decortication plant is hemp straw. Therefore, a sufficient and reliable supply is critical for the viability of the plant. In order to be conservative, a yield of 3.6 MT/acre for hemp straw has been used in the benchmark analysis. This is consistent with current estimates in research from the Government of Alberta and the University of Alberta.[6]

Other current research provides data that indicated yields upwards of 6.7 MT/acre for Mackenzie County, but we have chosen to maintain 3.6 MT/acre in our model because it is a more widely accepted yield variable for hemp at this time. Increased yields greatly reduce the required land and distance hemp straw must be hauled to a decortication plant (Table 2). Given the experience with improvements in yield in the canola industry, it is likely that as investment and acreage increases in the hemp sector yield increases will also follow.

Perhaps even more important is the impact that yield increases might have on price. As the cost per unit of production drops, it is very likely that at least some of this will be passed on to buyers via typical supply/demand relationships.

Table 2: Required land relative to hemp straw yield

Size of Plant	Required Straw	Yield	Required land
10 MT/hr	36,500 MT	2.0 MT/acre	18,250 acres
10 MT/hr	36,500 MT	3.6 MT/acre	10,140 acres
10 MT/hr	36,500 MT	6.7 MT/acre	5,450 acres

Note: Required farmland assumes that producers are growing hemp on a four-year rotation with other crops.

Farmers that are storing hemp straw on site rather than the hemp decortication facility storing it at their location are incurring an opportunity cost. In inventory management theory, the general "rule of thumb" for inventory carrying cost is 18-25% of the inventory value on hand.[7,8] Research out of Kansas State University suggests that the annual cost to farmers per MT of hay stored on site is 14% of the value of inventory. This cost needs to be accounted for in the model, especially considering we are modelling a relatively small lot size for the hemp decortication facility, i.e. limited storage on site. We include the assumption that farmers are compensated to store hemp straw on farm rather than sell it to another prospective buyer. In our model we assume the hemp decortication facility and farmers in the surrounding region form a contract so that the facility has a secure supply of hemp straw throughout the year.

[6] Alberta Agriculture and Forestry put the yields at between 2.4 and 4.8 MT/acre for the province of Alberta, with an average of 3.6 MT/acre. Recent industrial hemp experiments conducted by Dr. Miles Dyck and Dick Puurveen in 2017 (University of Alberta) in the Brazeau County region show similar average results. Some other recent work conducted by the Mackenzie Applied Research Association (MARA) in 2017 at their Fort Vermillion research facility shows average yields at 6.7 MT/acre for this region, compared with their findings of 4.8 MT/acre for Southern Alberta. They attribute the higher yields to the northern location and longer days. However, other more current information (2019) from an industrial hemp workshop, presented by Dr. Jan J. Slaski puts average yields at 2 MT/acre for Southern Alberta. Therefore, we have chosen to stick with a value of 3.6 MT/acre for our model given that it comes from a provincial level source and is a more widely accepted yield rate at this time.

7 Richardson (1995) suggests that the total inventory costs can be estimated at between 25%-55% on an annual basis (Richardson, H. (1995). Transportation & Distribution; December 1995, Vol. 36 Issue 12, p94).

8 The authors Stock and Douglas (1987) are often referenced as using 25% as the general rule of thumb for inventory carrying costs (Strategic Logistics Management, 2nd edition, 1987, James R. Stock and Douglas M. Lambert, Irwin, Homewood, Illinois).

As a rough estimation, we add 14% to the cost of hemp straw to account for inventory carrying cost to farmers. Therefore, the price of hemp straw is $100/MT[9] plus an addition $14 for inventory carrying cost. Straw prices for the hemp decortication facility are $114/MT.

4.2.2 Labour

With the contraction of the oil and gas sector in Northern Alberta many skilled workers have been left searching for new opportunities. This provides a significant advantage as the oil and gas sectors have invested in training employees, especially in the northern half of the province, and this could provide a unique opportunity to tap into that skilled workforce. The share of the workforce with a diploma, certificate or degree as highest level of education is over 90 percent (2017), suggesting that access to highly skilled labour will not be an issue.

Labour costs for a 10 MT/hr hemp decortication plant account for 5 percent of net expenses on an annual basis by year 5. Due to economies of scale, labour's share of net expenses reduces as the size of the facility increases, i.e. hemp straw, interest, property tax and depreciation all grow relative in share of total expenses relative to labour requirements as the plant increases in MT/hr capacity.

For the assessment, our models of the three facility sizes requires between 10 and 16 employees. Specifications for labour requirements were developed through consultation with leading hemp decortication equipment manufacturers (Table 3).

Table 3: Labour Requirements

Plant Size	Managers	Supervisors	Production	Technicians	Administrative
4 MT/hr	1	2	4	2	1
8 MT/hr	1	2	8	2	1
10 MT/hr	1	2	10	2	1

The chosen labour schedule for the decortication plant is the same regardless of the plant size. It will operate five days per week with two 7.5-hour shifts per day (i.e. the plant operates 15-hours per day). The total hours worked by the production staff in a year is 1,825, which means that in the year the decortication machines will run 3,650 hours. We have modelled just under 49 weeks on the job for decortication line workers to account for vacations, sick leave and other time away from work. This is industry standard.

In a 10 MT/hr plant as an example, there will always be one supervisor and eight production staff on site operating the decortication equipment as well as one technician troubleshooting repair issues. At the same time, a manager and an administrative employee will work a 7.5-hour shift during 'regular' business hours. The manager will supervise the ongoing business-related aspects of the decortication facility as well as being on call to handle any issues beyond the scope of the shift supervisors. The administrative employee will be on site to handle the regular administrative aspects of running a facility of this nature.

[9] Our hemp straw price estimate (without the addition of inventory carrying costs) comes from our conversations Chris Dzisiak (Parkland Industrial Hemp), Stephen Christensen (Canadian Greenfield Technologies Corp) and Dan Madlung (BioComposites Group). These sources all suggested a price of $100/MT is reasonable.

In general, the locations immediately surrounding Edmonton have the advantage regarding population – and thus a reliable source of workers. The locations of Vegreville, Lac Ste. Anne County, Lamont County, Minburn County, Bruderheim, and Barrhead County all have populations within 100 km exceeding 1 million because of their proximity to Edmonton. After these locations, most of the locations with greater than 40,000 population are in Alberta HUB (between Edmonton and the Saskatchewan border). Towns such as Vermillion and Elk Point boast populations of roughly 60,000, when counting the surrounding region. However, all the site locations in the study have population sizes adequate for putting in place a hemp decortication facility. What some regions may lack in population they make up in hemp production potential (i.e. acreage of land in crop), which is a much larger factor when it comes to sourcing and transporting hemp straw.

Table 4 provides a list of the various site proposal locations as well as their populations within a 100 km radius. This information comes from a previous transportation study conducted as a part of the HANA assessment.

Table 4: Population within 100 km

Site locations	Population (2018)	Population (2018) within 100km
Barrhead County	6,288	>1,000,000
Big Lakes County	5,772	103,352
Bonnyville MD	6,082	59,865
Bruderheim	1,330	>1,000,000
Cold Lake Indian Reserve	15,205	43,065
Drayton Valley	7,500	123,720
Elk Point	1,474	56,003
Falher	994	21,592
High Level	3,297	20,260
Lac La Biche County	8,452	151,571
Lac Ste. Anne County	10,953	>1,000,000
Lamont County	3,909	>1,000,000
Minburn County	3,244	216,103
Northern Lights County	10,785	55,930
Smoky Lake County	4,503	>1,000,000
Smoky River MD	2,072	71,235
St. Paul County	6,105	134,231
Thorhild County	3,239	>1,000,000
Town of Two Hills	1,377	55,142
Two Hills County	3,187	55,142
Vegreville	5,873	157,843
Vermillion River Country	8,485	59,157
Vermillion	4,154	59,157
Woodlands County	4,786	>149,180

Source: Government of Alberta[10]

[10] Population data (2018) comes from the Government of Alberta (link). To gather the population data within the surrounding 100 km area, each region was selected and then the option "By Municipality" was selected and the "Distance From" was set to 50 km away. The example of the population data for Vermillion can be seen here. The column on the right shows the potential labour force that would be able to commute from within 50 km, or a total of 100 km in diameter.

4.2.3 Utilities

Alberta has roughly a $0.02/kWh electricity price advantage for large industrial consumers when compared with Saskatchewan, the other leading province for registered acreage of industrial hemp. As Canada's leading producer of natural gas, favorable rates can also be expected for heating industrial buildings. Access to telephone infrastructure is also widespread, however, high speed internet connectivity varies by site location. Many of the county site proposal locations are in the process of 'bringing in' high speed internet from the local town, but this needs to be assessed on a case-by-case bases. However, satellite high speed internet is becoming more accessible province-wide through organizations - Xplornet as an example.

A hemp decortication facility will require a 575 volt (60 Hz) 3-phase power supply. Electrical costs incorporated into the model have been held constant for all 24 locations at $0.10/kWh. The Alberta Utilities Commission[11] provides the most up-to-date rate options, showing that residential regulated rates vary between $0.68/kWh ($0.8294/kWh actual) to $0.68/kWh ($0.9424/kWh actual). While industrial rates will vary from residential rates, this information is proprietary and not made available by energy providers. Natural Resources Canada (NRC) provides an overview of industrial electricity prices across Canada ($0.078/kWh in Edmonton for industrial), however, they do not include line fees and other charges in this price. Therefore, we have used $0.10/kWh in the model because it provides a realistic indication of the actual electricity costs in the REDA regions (when additional fees are included).

A hemp decortication facility will consume roughly 190 kW/hr (140 kW/hr without factoring in compressed air) per MT/hr of output (Table 5). At an electrical rate of $0.10/kWh, a 10 MT/hr plant would cost roughly $730,000 a year to operate. Reducing the cost of electricity to $0.07/kWh reduces the cost of electricity on the same sized plant to $485,000. Increasing the price of electricity to $0.15/kWh, to account for higher prices resulting from carbon mitigation policy as an example, would increase the cost of operating a 10 MT/hr plant to $1,000,000. Negotiating favorable electrical rates with regional provider is, therefore, important to keeping down the cost of operating a decortication facility.

Table 5: Electricity Requirements by Plant Size

Machine Size	Electricity Consumption
4 MT/hr	760 kW/hr
8 MT/hr	1520 kW/hr
10 MT/hr	1900 kW/hr

Source: Industry consultations

4.2.4 Freight

Transportation costs have been factored into the model depending on the scenario, but in general they break down into three categories:

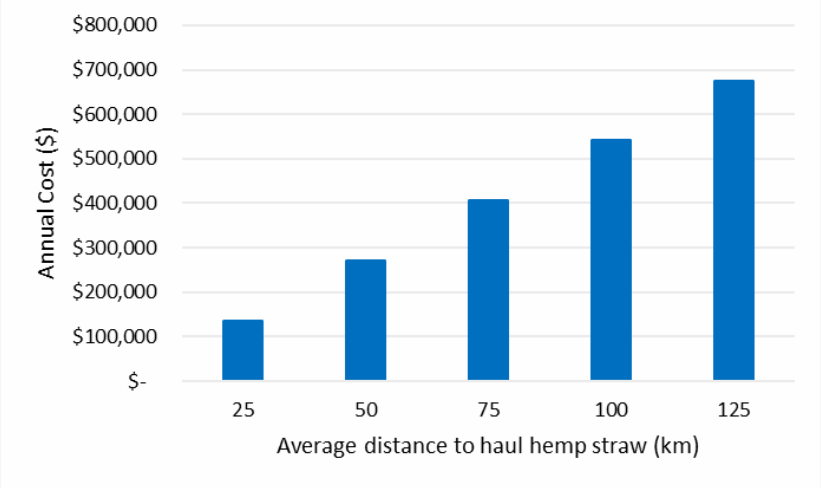
- Transport to the site for processing (from the farm)
- Transport to Drayton Valley (fibre)
- Transport to Edmonton (fibre, hurd and dust)

[11] http://www.auc.ab.ca/Pages/current-rates-electric.aspx

All sourcing of hemp straw and transportation into the site location have been modelled using tractor semi-trailers (truck)[12], whereas shipping processed fibre, hurd and dust to Edmonton and Drayton Valley have been modelled with both: (1) truck, and (2) truck and rail.

As with capacity considerations when building a decortication plant, one must not only consider whether the farmland in the region is capable of supplying the quantity of hemp straw necessary to keep a plant running (arable land) at full capacity, but also how far the straw will need to be hauled. If either competition for scarce hemp straw increases, or farmers shift to other crops in the region, transportation costs to bring in straw could impact the viability of the facility. For an 10 MT/hr plant sourcing hemp straw from within a 50 km radius would cost the facility $270,000 in transportation costs annually (Figure 9). Increasing the required transport distance to 125 km increases the transportation costs to $675,000 for the same sized facility.

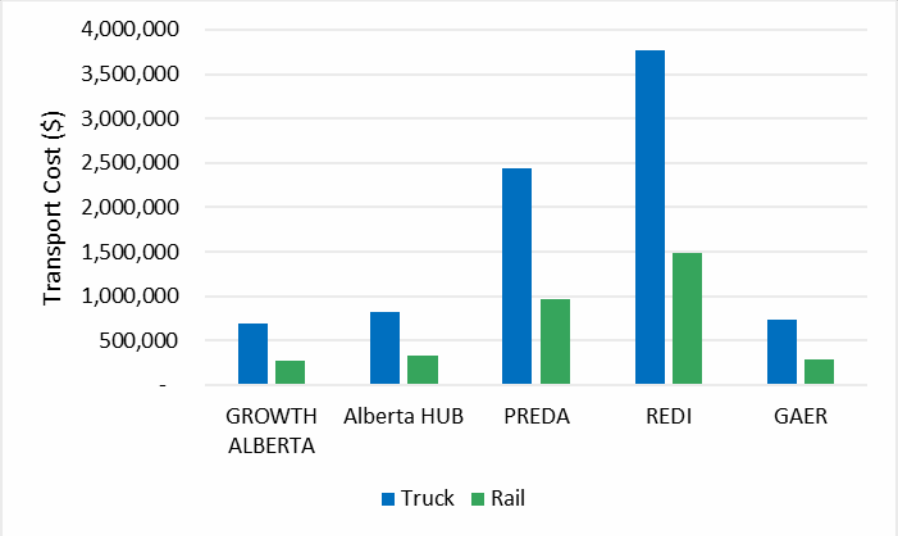
Figure 9: Cost to Haul Straw to a 10 MT/hr Plant



Taking the average distance of the site locations in each region provides the following visual of the difference in transport costs to move fibre, hurd and dust to Edmonton via truck and rail transport for 10 MT/hr plant (Figure 10). As can be expected, the two northern most regions of the province are at a disadvantage relative to the regions closer to Edmonton, particularly when it comes to transport via truck. However, if access to rail can be secured regions such as Falher become just as competitive as some regions closer to Edmonton given their productive acreage advantage and low tax rates.

Figure 10: Transport Costs by Location to Edmonton

[12] In reality the decortication plant will pay a Free On Board (FOB) price for hemp straw delivered at site, but for the sake of comparing site locations it makes more sense to set the price of straw ($114/MT) in the model and have the different locations pay the transport cost to bring it from the surrounding regions to their processing site.



4.2.5 Overhead & Other Operating Costs

Overhead costs refer to the ongoing expense of operating the decortication facility. Unlike other operating expenses such as raw material and labor, overheads are not linked with any cost unit.

As this is an intermediate processing facility and not one producing finished goods, the marketing budget has been kept on the conservative side at $10,000 per year. Accounting and bookkeeping services have been budgeted at $500 per month or $6,000 per year. The meals and entertainment budgeted in the model are $2500. The meetings, convention and travel budget for this facility is $3000. The annual office, computer, and telephone budget for the facility is $3000. For some years (e.g. initial setup) the budget will likely be higher, but for subsequent years it will likely be lower, so an annual budget of $3000 should cover office, computer and telephone costs.

Property tax for this model is calculated by multiplying a mill rate by the assessed industrial property value (land, buildings, and equipment). The mill rate is the amount of tax payable per dollar of the assessed value of a property. When tax data was available in the individual site proposals it was incorporated into the model. The remainder of the tax information was collected from the Government of Alberta (Table 6). The site locations with the most favorable tax rates are Woodlands County, Cold Lake First Nations, Vermillion, and Vermillion River County.

Table 6: Municipal Non-Residential Mill Rates and Total Tax Burden

	Mill Rate	Education	Other	Total
GROWTH ALBERTA				
Barrhead County	17.30%	3.6900%	0.1913%	21.1813%
Lac Ste. Anne County	22.63%	3.3060%	0.2910%	26.2280%
Woodlands County	10.37%	4.1551%	0.2239%	14.7514%
Northeast Alberta Information HUB Ltd (Alberta HUB)				
Bruderheim	18.64%	3.6325%	0.4985%	22.7681%
Cold Lake First Nations	12.32%	3.7879%	0.1679%	16.2750%
Vegreville	20.57%	3.5004%	0.1401%	24.2105%
Vermillion River Country	13.86%	0.0000%	0.0000%	13.8640%
Vermillion	11.04%	3.8952%	0.0786%	15.0088%

Lamont County	19.56%	3.5587%	0.6531%	23.7704%
Minburn County	22.00%	3.5004%	0.1401%	25.6431%
St. Paul County	18.86%	3.9426%	0.2610%	23.0610%
Thorhild County	22.72%	3.5406%	0.6027%	26.8619%
Elk Point	15.92%	3.8320%	3.1830%	22.9330%
Bonnyville MD	15.03%	4.8197%	0.0839%	19.9377%
Lac La Biche County	18.40%	3.6737%	0.2753%	22.3478%
Smoky Lake County	20.28%	4.0900%	1.2356%	25.6056%
Town of Two Hills	22.98%	3.3450%	0.5640%	26.8900%
Two Hills County	21.87%	4.0811%	0.6663%	26.6183%
Peace Region Economic Development Alliance (PREDA)				
Northern Lights County	14.04%	4.5775%	0.0341%	18.6551%
Falher	15.68%	3.9500%	0.1510%	19.7782%
Smoky River MD	20.04%	3.5600%	0.1712%	23.7704%
Big Lakes County	14.53%	3.7950%	0.1495%	18.4786%
Regional Economic Development Initiative (REDI) for Northwest Alberta				
High Level	14.93%	3.6400%	0.1960%	18.7607%
Grande Alberta Economic Region (GAER)				
Drayton Valley	14.44%	4.0831%	0.2543%	18.7800%

Source: Site proposals and Government of Alberta

Property taxes are a significant fixed cost to consider when setting up a hemp decortication facility. For our assessment, we averaged the combined non-residential tax rate, education tax and all other additional tax burden for the respective municipality, county or town (e.g. senior taxes) into one rate and then averaged that rate for the entire region, i.e. each of the REDA groups has an average tax burden for that region. However, for the financial projections in the following section we altered the model to include the specific information for each region.

The average tax burden ranges from 18.79 percent to 24.17 percent across all regions. Taking the example of GROWTH Alberta, the tax burden ranges from 14.75 percent to 26.23 percent, meaning that there is considerable disparity within the average of 20.71 percent. Adjusting the average tax rate for GROWTH Alberta from 20.71 percent down to 14.75 percent (the lowest tax burden for that region) drops property tax's share of overall net expenses significantly.

4.3 Capital Costs

There are significant capital costs associated with all three facility size categories. This is a critical consideration as these costs are essentially sunk once assigned and virtually impossible to recover. As a result, a significant amount of due diligence was conducted on this cost category the relevant cost drivers.

4.3.1 Capacity Considerations

A hemp decortication plant requires considerable feedstock (i.e. hemp straw) from the surrounding region. This means that productive acreage within a 150 km radius is important for reducing transportation costs to source hemp straw. Under the assumption that hemp is going to be grown on a four-year rotation, ideally, the chosen site location for the hemp decortication facility would have four times the acreage in the surrounding region than is required to supply the facility. The values displayed in Table 7 are modelled at a hemp straw yield rate of 3.6 MT/acre.

Table 7: Capacity Input Requirements

Plant Size	MT/hemp required	Acres of hemp	Acres of farmland

4 MT/hr	14,600	4,050 acres	16,220 acres
8 MT/hr	29,200	8,190 acres	32,780 acres
10 MT/hr	36,500	10,140 acres	40,555 acres

While the REDA site locations have varying levels of productive acreage northern Alberta does appear to be ideally suited to hemp production based on available potential supply of suitable land.

Stem elongation of the hemp plant occurs before flowering, meaning that northern latitudes such as the regions in this assessment, have an advantage in hemp production. With upwards of 17 hours of daylight during the growing season, hemp plants in Alberta can grow up to 15-20cm per day and reach up to 4m in height, which makes it one of the fastest growing regions in North America.

The REDA site locations with the most production acres are Barrhead County, Lac Ste. Anne County, Woodlands County, Bruderheim, Falher, Smoky River, Vegreville, Minburn County and Vermillion. These regions boast over 600,000 productive acres within the surrounding region. Only three of the site locations have fewer acres than are required to put in place the largest decortication facility in this assessment, which demonstrates the productive capacity of northern Alberta.

However, it is important to keep in mind that our model does not account for competition for hemp straw or fluctuating prices going forward. For example, if demand for hemp straw exceeds supply and prices increase it will affect the revenue generation of the plant. In the model the price of hemp straw has been set at $114/MT, however if through competition it were to grow to $120/MT it would reduce cash flow and increase the payback period.

To house all the decortication machinery as well provide room for the other necessary equipment (air compressor system) and space to maneuver forklifts and other industrial equipment, the facility needs to be approximately 4,300 square feet for every 1 MT/hr capacity of decortication equipment. In addition, the site location requires storage capacity to house all the processed fibre, hurd and dust. For this purpose we have factored an addition 1,075 square feet for every MT/hr capacity of decortication equipment to allow for storage capacity (Table 8). [13]

Table 8: Building Requirements by Machine Size

Machine Size	Decortication Building	Storage Capacity	Total
4 MT/hr	17,200 ft^2	4,300 ft^2	21,500 ft^2
8 MT/hr	34,400 ft^2	8,600 ft^2	43,000 ft^2
10 MT/hr	43,000 ft^2	10,750 ft^2	53,750 ft^2

Source: Industry consultations

4.3.2 Building Costs

Land costs are incorporated into the model separately using information provided in the site proposals in addition to primary research. The average land cost estimates are provided in the following section titled *Land and Land Preparation*.

[13] The land and building requirement estimates are based off an MNP LLP study titled *Clean Energy Technology Centre*

The startup costs for the building and equipment have been grouped together into one overall cost (Table 9). Steel building construction costs are estimated at $40/ft^2. We have added an additional 15% contingency to the overall cost of the steel building, decortication equipment and industrial land to account for unexpected costs.[14]

Table 9: Building and Equipment Costs

Machine Size	Total
4 MT/hr	$7,430,850
8 MT/hr	$ 14,861,700
10 MT/hr	$ 18,577,125

Source: Consultation with industry experts and calculated using straight line costing formula based on 4MT/hr in Tabel 10.

The breakdown for equipment costs can be separated into various subcomponents that include all of the associated costs with bringing a decortication facility up and running (Table 10). The following table displays the cost breakdown for a 4 MT/hr facility.

Table 10: Breakdown of Install Cost: 4 MT/hr Decortication Plant

Description	**$ CAD**
Feeding and decortication	$1,821,330
Cleaning and refining	$1,362,690
Technical fibre baling	$257,250
Core cleaning	$588,000
Filtration (+ transport of dust to once central point)	$543,900
Electrical system	$1,134,840
Short fibre baling	$105,840
Budget for decortication equipment:	$5,813,850
Estimation of cost of ductwork	$294,000
Estimation of cost for cables and cable trays	$294,000
Estimation of cost for transportation to Alberta (from Belgium)	$404,250
Estimation of cost for supervising the installation	$382,200
Estimation of cost for starting up, testing, training & commissioning	$242,550
Budget for additional equipment:	$1,617,000
Total:	**$7,430,850**

Source: Estimates based on Cretes Manufacturing quote. Estimates were provided in Euros and converted to Canadian dollars using a conversion rate of 1.47 for this work.

In addition, there are assumed to be some capital expenditures required for the administration of the business (Table 11). These are initial capital expenditures, but they all require a budget for upkeep following the first year.

Hemp Cluster Feasibility Study published in October 2018. Their estimates are based on interviews with Byron James and Dan Madlung; HempTrain equipment dimensions, Powerzone equipment dimensions. We cross checked these estimates with a recent quote from Crete's (Creative Technical Solutions) dated 15/8/2019 from Stefaan Declerck.

[14] We have selected 15% based on a study Canada's Chief Review Services. The review found that contingency on large projects typically ranged from 10-15%, with some as high as 20%.

Table 11: List of Other Equipment Purchases

Furniture (desks and chairs)	$15,000
Computers	$10,000
Telephones	$2,000

4.3.3 Land and Land Preparation

Consultation with industry representatives suggest that facilities of the sizes modelled require between 5 to 13 acres. More specifically, for the model we have estimated that a 4 MT/hr requires approximately 5 acres, an 8 MT/hr requires 10 acres, and a 10 MT/hr requires 13 acres.[15]

A piece of flat land with good ground-bearing capacity would be ideal because the outdoor space would be used for parking trucks and storing hemp fibre. The assumption has been made that less land is required because the majority of the straw will be kept on-farm. Straw is delivered as needed, as is the case for other leading operations such as La Chanvrière Cooperative in France. If the facility adopts a model that requires more on-site storage capacity (less frequent straw delivery), the required land will increase from what we have proposed in our model.

Site preparation includes site clearing and grading (if necessary), excavation and trenching for the building's concrete pad, water mains, sanitary sewer systems, storm sewer and retention systems, underground (if necessary) electrical and telecommunication systems, road and access parking, and pathways and sidewalks. All the site preparation costs have been factored into the initial capital expenditure and outlined in the Financial Assessment section of this document.

Land prices vary by REDA site location, as well as various other factors including whether the plot of land has: frontage on a main road, municipal water services, rail access, and various other considerations. Therefore, specific site locations will need to be priced on a case-by-case basis. However, for the purpose of our assessment we were able to estimate industrial land values based on the regional averages (Table 12).

Table 12: Industrial Land Prices[16]

Regions	Price per acre
GROWTH ALBERTA	$ 75,000
Alberta HUB	$ 75,000
PREDA	$ 85,000
REDI	$ 90,000
GAER	$ 95,000

Source: Based on site proposals and consultations. Price per acre is subject to fluctuations due to other variables and potential incentives. Please consult with land vendor prior to assumption.

[15] The land requirement estimates have been altered (reduced) from earlier iterations of the economic model based on more recent consultation with industry. Review of other economic studies and consultation with industry suggest that less land is required for a facility because the straw will be stored mostly on farm, rather than at the site location. As a result of this adjustment to the model, we have also increased the price of hemp straw to account for farmers having to store the straw.

[16] Investors should contact site locations directly for updated industrial land value prices. The prices provided in the table above are averages across the region.

4.3.4 Summary

Estimated capital expenditure requirements for a 4 MT/hr, 8 MT/hr and 10 MT/hr hemp decortication facility are approximately $10 to $25 million dollars (CAD) including the land, site preparation, building and equipment (piping, electrical, compressed air, decortication machines, etc.).[17]

A salvage value of 25 percent of the original value of the capital expenditure is assumed and applied at the end of the 20-year useful life of the facility. This is applied in every financial scenario modelled.

[17] Total capital expenditure costs have been adjusted from earlier iterations based on more recent quotes from equipment suppliers. Earlier cost estimates were based on a more complex facility design.

5.1 Financial Assessment

5.1 Overview

In this section we will present an overview of the financials for operating a hemp decortication facility in Alberta. We have listed and provided context on each of the key assumptions made and provided sensitivity analysis on the impacts of each one.

Each of the critical assumptions made in the marketing and operating sections are assessed as part of the analysis. Different scenarios are used to ensure that the model and results are robust. Any critical success factors are discussed in detail in terms of how they might impact financial feasibility.

The costs associated with setting up of the hemp decortication plant would include purchasing the land, building a steel structure between 21,500 ft^2 and 53,750 ft^2, purchasing and installing decortication machinery with an output between 4 MT/hr and 10 MT/hr, and all the other associated costs.

At this point the startup value is simply an estimate and would need to be re-priced based on detailed equipment quotes, and detailed engineering plans for the building. This detailed pricing can be completed once the business plan and rough plant layout have been decided upon.

5.2 Assumptions

5.2.1 Variable & Fixed Costs

The following tables outline the main cost elements associated with plant operations. These are further broken into fixed and variable costs. It is important to note that this information is reflective of what a reasonable person would be expected to pay for the specific cost element.

Table 13: Fixed Costs

Salaries	
Manager	$105,000
Supervisors	$82,500
Production Staff	$50,000
Technician/Millwright	$82,500
Administration	$48,000
EI/CPP/Benefits	15%

Insurance	$90,000/year
Professional fees (accounting and legal)	$25,000/year
Fixed Utilities	$2,500/year
Finance and banking charges	$1,500/year
Long term loan interest rate	4%
Phone, fax, internet, web page	$6,000/year
Web page (design and maintenance)	
Year 1	$20,000
Ongoing	$5,000/year
Marketing	$50,000/year
Meals and Travel	$50,000/year

Hemp License	$1000/year
Recruiting (Advertising for other staff)	
Year 1	$10,000
Ongoing	$2,000/year
Software purchases	
Year 1	$3,000
Ongoing	$1,000/year
Photocopier Lease	$4,800/year
Office Supplies	$2,750/year
Vehicle lease	$8,500/year
Fuel and oil	$10,000/year

Table 14: Variable Operating Costs

Labour – Hemp Decortication Plant				
		4 MT/hr	8 MT/hr	10 MT/hr
Hemp Decortication Line	$15	2 people/hour	4 people/hr	5 people/hr
Supervisor	$25	1 person/hour	1 person/hr	1 person/hr
Hours per shift		7.5	7.5	7.5

Table 15: Variable Costs

	Price	4 MT/hr	8 MT/hr	10 MT/hr
Hemp Straw	$114/MT	14,600 MT/yr	29,200 MT/yr	36,500 MT/yr
Trucking	$4/km			
Rail	$0.84/km			
Electricity[18]	$0.10/kWh	760 kW per hr	1,520 kW per hr	1,900 kW per hr

5.2.2 Plant Productivity by Size Category

Plant size has an important impact on financial feasibility. The following tables clearly illustrate the production differences by plant size. In Year 1 the decortication plant does not produce any output, but in the following years it increases in efficiency until it maxes out at 95% from Year 5 onwards. Table 16 shows the output of fibre, hurd and dust for a 4 MT/hr, an 8 MT/hr and a 10 MT/hr from Year 2 to Year 5.

Table 16: Fibre, Hurd and Dust Production by Plant Size and Efficiency

4 MT/hr				
Output	**Year 2**	**Year 3**	**Year 4**	**Year 5**
	77%	**84%**	**91%**	**95%**
fibre	2,811	3,066	3,322	3,468
hurd	6,183	6,745	7,307	7,629
dust	2,248	2,453	2,657	2,774
8 MT/hr				
fibre	5,621	6,132	6,643	6,935
hurd	12,366	13,490	14,615	15,257
dust	4,497	4,906	5,314	5,548
10 MT/hr				
fibre	7,026	7,665	8,304	8,669
hurd	15,458	16,863	18,268	19,071

[18] The Alberta Utilities Commission (AUC) provides details on regulated rate options by retailer. However, pricing is dependent on the exact land location, expected draw, and requirements for upgrading lines and transformers. The additional inclusion of line charges is also an undefined variable in the regulated prices provided by AUC. Therefore, in the model we have used $0.10 kWh as the price in all regions.

dust	5,621	6,132	6,643	6,935

5.2.3 Price Benchmarks

For our model we have used a value of $1,300/MT for hemp fibre (Table 17). The price of hemp fibre has been determined through consultation with industry.[19] The other two by-products being modelled for this business plan are hemp hurd and hemp dust, which are priced at roughly $300/MT and $150/MT, respectively.

The following table outlines the benchmark prices, which are then adjusted as part of the sensitivity analysis.

Table 17: Pricing Schedule

Commodity	Price
Fibre	$1,300/MT
Hurd	$300/MT
Dust	$150/MT

5.3 Critical Cost Assumptions Impacting Model

While all assumptions are critical to the evaluation of the model, there is more weight given to variables that have the most significant impact on the profitability of the business. The critical assumptions are described below.

For the following critical cost assumptions, we have controlled by maintaining a 10 MT/hr hemp decortication plant, located in Barrhead, shipping fibre, hurd and dust to Edmonton by truck.

- Hemp straw costs on a 10 MT/hr hemp decortication plant are $4.2 million per year, modelled using a price of $114/MT. Cash flow in the model is affected when the price per ton of straw goes up, or if the distance required to haul fibre to markets increases.
- The cost of property tax for a $25.4 million 10 MT/hr hemp decortication plant are $570,000 per year (Barrhead), 14% of operating costs. Reducing the tax burden increases the capitalization rate of the plant.
- Interest on commercial loans, modelled at conventional 5-year mortgage rates to cover 50% of initial capital investment ($12.7 million) are roughly $600,000 per year, or 15% of operating costs.
- The difference in price per MT to transport fibre, hurd and dust to Edmonton via rail compared with truck is less than half per MT. This becomes more important the further one gets from Edmonton, especially for the site locations in the Peace River or even beyond.
- At a $0.10/kWh electrical rate the annual cost on a 10 MT/hr plant is close to $700,000. If policy changes in Alberta, such as taxes on electricity

[19] Consultation with representatives from BioComposites group provided price estimates for hemp fibre in Europe and various locations in Western Canada.

produced with fossil fuels (Carbon Taxes), significantly increase the cost of electricity it may alter the viability of a plant. Increasing the price of electricity to $0.15/kWh increases the annual cost to the plant to $1,000,000. In this way, reducing the price to $0.60/kWh reduces the annual cost to $420,000.

5.4 Breakeven Analysis

A breakeven analysis has been completed for the following four generalized locations[20]:

- Northeast Alberta Information HUB Ltd (Alberta HUB)
- Growth Alberta Regional Economic Development Initiative (GROWTH AB)
- Grande Alberta Economic Region (GAER)
- Peace Region Economic Development Alliance (PREDA)

For the breakeven analysis, the locations were modelled with a 10 MT/hr decortication plant transporting fibre, hurd and dust to Edmonton by truck. The assumption was also made that the plants receive 50% invested capital. The inputs for each location are given below.

5.4.1 Alberta HUB

Total Tax Rate: 24% (Mill Rate=19.6% + Education tax + Other)
Transportation Distance to Edmonton: 162
Industrial Land Cost per Acre: $145,000
Average Distance to Source Raw Material: 75 km

- Under the base scenario the repayment period is four years and the capitalization rate is 32.4%.
- If the price of hemp straw were to increase to $150/MT, the repayment on investment remains in Year 4 but the capitalization rate would drop to 29.7%.
- If fibre prices drop from $1,300/MT to $800/MT, the repayment on investment is pushed to Year 5 and the capitalization rate drops to 21.6% (all else equal).

5.4.2 GROWTH Alberta

Total Tax Rate: 21% (Mill Rate=16.8% + Education tax + Other)
Transportation Distance to Edmonton: 110 km
Industrial Land Cost per Acre: $75,000
Average Distance to Source Raw Material: 75 km

- Under the base scenario the repayment period is three years and the capitalization rate is 33.5%.
- If the price of hemp straw were to increase to $150/MT, the repayment on investment is pushed out to Year 4 and the capitalization rate drops to 30.8%.
- If fibre prices drop from $1,300/MT to $800/MT, the repayment on investment is pushed to Year 5 and the capitalization rate drops to 22.8% (all else equal).

5.4.3 GAER

Total Tax Rate: 19% (Mill Rate=14.44% + Education tax + Other)
Transportation Distance to Edmonton: 145 km (no rail access)

[20] Those seeking the mill rates, transportation distances and industrial land prices for specific regions should contact the municipal or town authorities directly. The above rates are averages across the regions.

Industrial Land Cost per Acre: $175,000
Average Distance to Source Raw Material: 75 km

- Under the base scenario the repayment period is four years and the capitalization rate is 32.6%.
- If the price of hemp straw were to increase to $150/MT, the repayment on investment remains in Year 4 but the capitalization rate drops to 30%.
- If fibre prices drop from $1,100/MT to $800/MT, the repayment on investment is pushed to Year 5 and the capitalization rate drops to 22% (all else equal).

5.4.4 PREDA

Total Tax Rate: 20% (Mill Rate=16.07% + Education tax + Other)
Transportation Distance to Edmonton: 478 km (rail access)
Industrial Land Cost per Acre: $105,000
Average Distance to Source Raw Material: 50 km

- Under the base scenario the repayment period is four years and the capitalization rate is 29.8%.
- If the price of hemp straw were to increase to $150/MT, the repayment on investment would remain at Year 4 but the capitalization rate would drop to 26.7%.
- If fibre prices drop from $1,100/MT to $800/MT, the repayment on investment pushes out to Year 6 and the capitalization rate drops to 17.6% (all else equal).

5.4.5 Summary

The critical conclusion from the breakeven analysis is that the impact of the cost of transportation, the price of hemp straw and the price received for hemp fibre are all crucial for decortication plant. When shipping fibre, hurd and dust to Edmonton, the closer locations have an advantage in lower transportation costs.

However, when switching to rail transportation, the northern regions may actually come out ahead – this impact may be further affected by higher yields and thus potentially lower pricing. It is important to note that to this point in time the other two regions have displayed more resilience to fluctuating hemp straw prices and lower prices of hemp fibre on the world market. It would be critical to understand if this would continue given the major change in the marketplace that is likely to occur.

5.5 Financial Projections

A complete financial assessment was completed for a single location in order to test the sensitivity of the key cost elements. All costs were held constant other than those specifically identified in the various options.

Barrhead was selected as the sample location. Four different financial projections (Projection 1, 2, 3 and 4) were built to demonstrate relative earning potential of a 10 MT/hr decortication plant shipping fibre, hurd and dust to Edmonton:

Projection 1: shows the financial projection resulting from the commercial loan to private equity ratio being 50/50.

Projection 2: shows how the financial projections change when the commercial loan to private equity ratio changes to 30/70.

Projection 3: shows how the projections change given a 50/50 capital split when the price offered for hemp fibre increases to $1,500/MT, all else equal.

Projection 4: shows how the projections change given a 50/50 capital split when the price offered for hemp fibre drops to $800/MT, all else equal.

Projection 1	1	2	3	4	5
Starting Cash		-$ 2,653,205	$ 4,196,999	$ 12,185,853	$ 21,347,300
Gross Sales	$ -	$ 14,833,819	$ 16,425,083	$ 18,060,748	$ 19,137,446
Cost of Goods Sold	$ -	$ 3,252,030	$ 3,600,884	$ 3,959,472	$ 4,195,517
Gross Income	$ -	$ 11,581,789	$ 12,824,200	$ 14,101,276	$ 14,941,929
Operating Costs	$ 1,644,936	$ 3,813,039	$ 3,916,798	$ 4,021,283	$ 4,092,429
EBITDA	-$ 1,644,936	$ 7,768,751	$ 8,907,402	$ 10,079,993	$ 10,849,500
Bank Loan Pmt	-$ 918,547	-$ 918,547	-$ 918,547	-$ 918,547	-$ 918,547
Annual Cash Flow	-$ 2,563,483	$ 6,850,204	$ 7,988,855	$ 9,161,446	$ 9,930,953
LOC	-$ 89,722	$ -	$ -	$ -	$ -
Accumulated Discretionary Cash Flow	**-$ 2,653,205**	**$ 4,196,999**	**$ 12,185,853**	**$ 21,347,300**	**$ 31,278,252**
Capitalization Rate				32.7%	
Invested Capital:	$ 12,702,972				

Projection 2	1	2	3	4	5
Starting Cash		-$ 1,999,983	$ 5,475,971	$ 14,084,914	$ 23,860,493
Gross Sales	$ -	$ 14,833,819	$ 16,425,083	$ 18,060,748	$ 19,137,446
Cost of Goods Sold	$ -	$ 3,252,030	$ 3,600,884	$ 3,959,472	$ 4,195,517
Gross Income	$ -	$ 11,581,789	$ 12,824,200	$ 14,101,276	$ 14,941,929
Operating Costs	$ 1,381,223	$ 3,554,707	$ 3,664,128	$ 3,774,569	$ 3,851,980
EBITDA	-$ 1,381,223	$ 8,027,082	$ 9,160,071	$ 10,326,707	$ 11,089,949
Bank Loan Pmt	-$ 551,128	-$ 551,128	-$ 551,128	-$ 551,128	-$ 551,128
Annual Cash Flow	-$ 1,932,351	$ 7,475,954	$ 8,608,943	$ 9,775,579	$ 10,538,821
LOC	-$ 67,632	$ -	$ -	$ -	$ -
Accumulated Discretionary Cash Flow	**-$ 1,999,983**	**$ 5,475,971**	**$ 14,084,914**	**$ 23,860,493**	**$ 34,399,315**
Capitalization Rate				29.6%	
Invested Capital:	$ 17,784,161				

Projection 3	1	2	3	4	5
Starting Cash		-$ 2,653,205	$ 5,623,327	$ 15,191,517	$ 26,089,574
Gross Sales	$ -	$ 16,260,148	$ 18,004,418	$ 19,797,358	$ 20,977,585
Cost of Goods Sold	$ -	$ 3,252,030	$ 3,600,884	$ 3,959,472	$ 4,195,517
Gross Income	$ -	$ 13,008,118	$ 14,403,535	$ 15,837,886	$ 16,782,068
Operating Costs	$ 1,644,936	$ 3,813,039	$ 3,916,798	$ 4,021,283	$ 4,092,429
EBITDA	-$ 1,644,936	$ 9,195,080	$ 10,486,737	$ 11,816,603	$ 12,689,639
Bank Loan Pmt	-$ 918,547	-$ 918,547	-$ 918,547	-$ 918,547	-$ 918,547
Annual Cash Flow	-$ 2,563,483	$ 8,276,533	$ 9,568,190	$ 10,898,057	$ 11,771,092
LOC	-$ 89,722	$ -	$ -	$ -	$ -
Accumulated Discretionary Cash Flow	**-$ 2,653,205**	**$ 5,623,327**	**$ 15,191,517**	**$ 26,089,574**	**$ 37,860,665**

Capitalization Rate	36.5%
Invested Capital:	$ 12,702,972

Projection 4	1	2	3	4	5
Starting Cash		-$ 2,653,205	$ 631,177	$ 4,671,694	$ 9,491,615
Gross Sales	$ -	$ 11,267,997	$ 12,476,746	$ 13,719,222	$ 14,537,099
Cost of Goods Sold	$ -	$ 3,252,030	$ 3,600,884	$ 3,959,472	$ 4,195,517
Gross Income	$ -	$ 8,015,968	$ 8,875,862	$ 9,759,750	$ 10,341,581
Operating Costs	$ 1,644,936	$ 3,813,039	$ 3,916,798	$ 4,021,283	$ 4,092,429
EBITDA	-$ 1,644,936	$ 4,202,929	$ 4,959,064	$ 5,738,467	$ 6,249,152
Bank Loan Pmt	-$ 918,547	-$ 918,547	-$ 918,547	-$ 918,547	-$ 918,547
Annual Cash Flow	-$ 2,563,483	$ 3,284,382	$ 4,040,517	$ 4,819,920	$ 5,330,605
LOC	-$ 89,722	$ -	$ -	$ -	$ -
Accumulated Discretionary Cash Flow	**-$ 2,653,205**	**$ 631,177**	**$ 4,671,694**	**$ 9,491,615**	**$ 14,822,220**
Capitalization Rate					21.7%
Invested Capital:	$ 12,702,972				

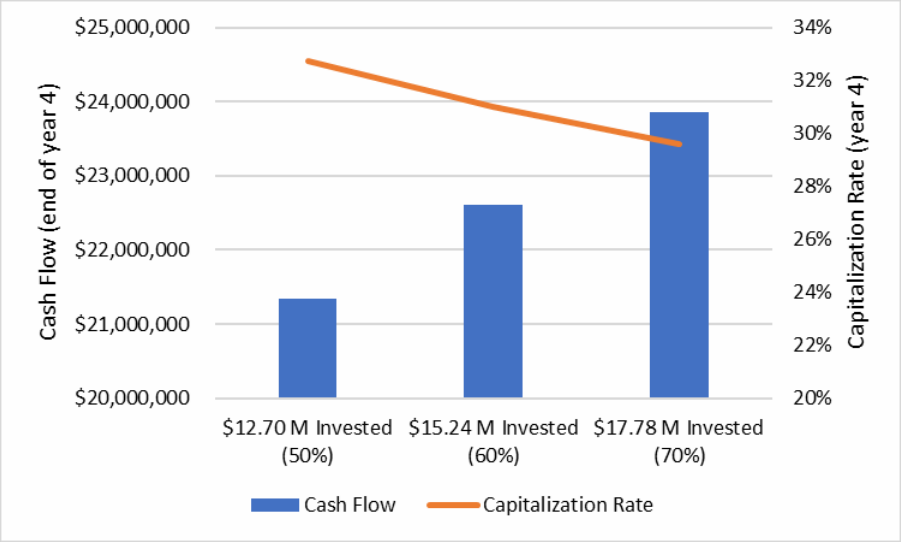
5.6 Summary of Results

The following summarizes the findings from the financial analysis for the four projections described above.

- A 10 MT/hr hemp decortication plant, shipping fibre, hurd and dust to Edmonton via truck generates a capitalization rate of 32.7% with payback on invested capital ($12.7 million) by Year 4. The accumulated discretionary cash flow at the end of year 4 equals $21.3 million.

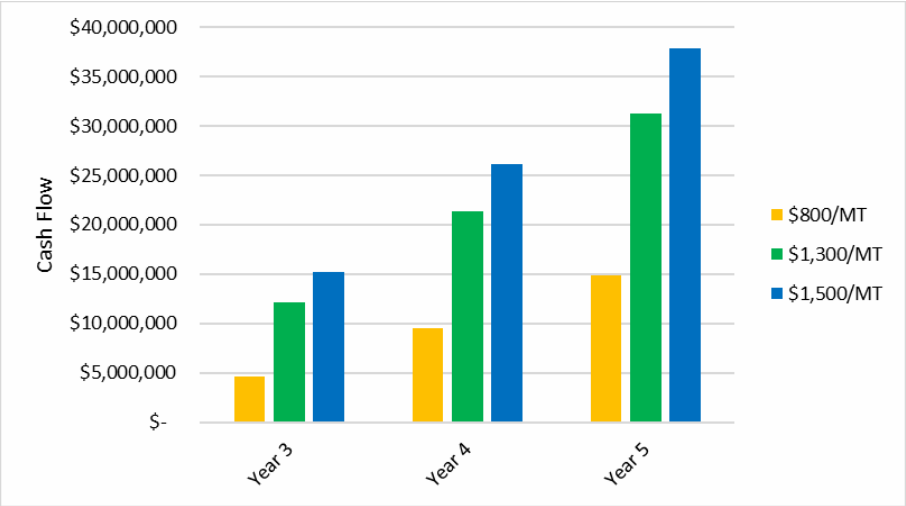
- Increasing the invested capital to 70% ($17.8 million) of total capital requirement ($25.4 million) increases the accumulated discretionary cash flow to $23.9 million by year 4 but decreases the capitalization rate to 29.6% (see Figure 11).

Figure 11: Cash Flow in Year 4 Relative to Initial Investment



- Two projections were used to demonstrate the effect of the price of hemp fibre. The first illustrates what happens when the price of fibre increases to $1,500/MT and the second shows what occurs when it drops to $800/MT. For a 10 MT/hr plant with 50% invested capital ($12.7 million), the capitalization rate increases to 36.5% and comes forward to year 3 when fibre increase in value and it drops to 21.7% and pushes out to year 5 when fibre decreases in value (Figure 12).

Figure 12: Cash Flow Relative to Hemp Fibre Prices



- The economic model shows that building a 10 MT/hr hemp decortication plant generates a healthy return on investment under that assumptions that hemp straw prices remain low and hemp fibre prices remain high.

The choice of Barrhead for the benchmark analysis in no way suggests that this location is the most favorable choice to locate a decortication plant. The model requires that a given location be used in order to generate the results for comparison purposes. What it does illustrate is the relative importance of cost of goods sold and market pricing.

6.0 Conclusions

The basic findings of this feasibility study are that under the market conditions identified, 10 MT/hr hemp decortication plant offers the largest benefits for investors regarding an earlier payback period and the largest accumulated cash flow. A 10 MT/hr plant, located in a favorable region, returns an investors capital in three years with a capitalization rate of roughly 20-35% depending on the price of hemp fibre on the world market.

Regarding where to place the decortication plant, the various site locations need to be assessed on an individual bases to determine their transportation cost advantages, municipal tax rates benefits, and the productivity of their surrounding farmland. However, increasing the distance to haul hemp fibre pushes the payback period later and reduces the cash flow of the operation. Similar results are found with higher municipal tax rates and having to draw from a larger area to source hemp straw (i.e. fewer productive acres in the surrounding region). Therefore, these factors need to be considered when choosing a site location.

While producers in Alberta have recently seeded enough hemp to supply a 10 MT/hr decortication plant, there is by no means a large surplus at this time. As a result, following any initial investment and breaking ground for a decortication plant will need to be followed by outreach to establish growing contracts with farmers in the surrounding region in order to secure hemp straw. With yield improvements in the coming years the required acreage to supply a large decortication plant will decrease but securing supply in the beginning is crucial for the viability of this facility.

In the first years of operation the critical costs for the decortication plant are interest payments on commercial loans, municipal taxes and the cost of goods sold. The price of hemp straw incorporated into this analysis is $114/MT, which allows for accumulation of discretionary cash and various capitalization rates according to the level of invested capital and the price received for hemp fibre.

All of the regions taken into consideration for this assessment have the necessary qualifications to host a hemp decortication facility. However, some regions boast advantages in areas that are critical to keeping down costs. The regions of GROWTH Alberta and Alberta HUB are particularly well suited to hemp processing given their proximity to both Edmonton and the Saskatchewan border, in addition to their relatively large workforces compared with some other regions. In addition, some locations within these two regions have advantages with lower municipal tax rates and access to rail infrastructure, both of which are key to keeping down costs.