



**NORTHSTAR**  
CLEAN TECHNOLOGIES



**EMPOWER**  
Environmental Solutions

# Waste Management Association BC

February 2023



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## OUR MISSION

# Make a Difference.

As an emerging innovator in sustainable processing,

Northstar's mission is to be the leader in the recovery and reprocessing of asphalt shingles in North America,

extracting the recovered components from asphalt shingles that would otherwise be sent to landfill.

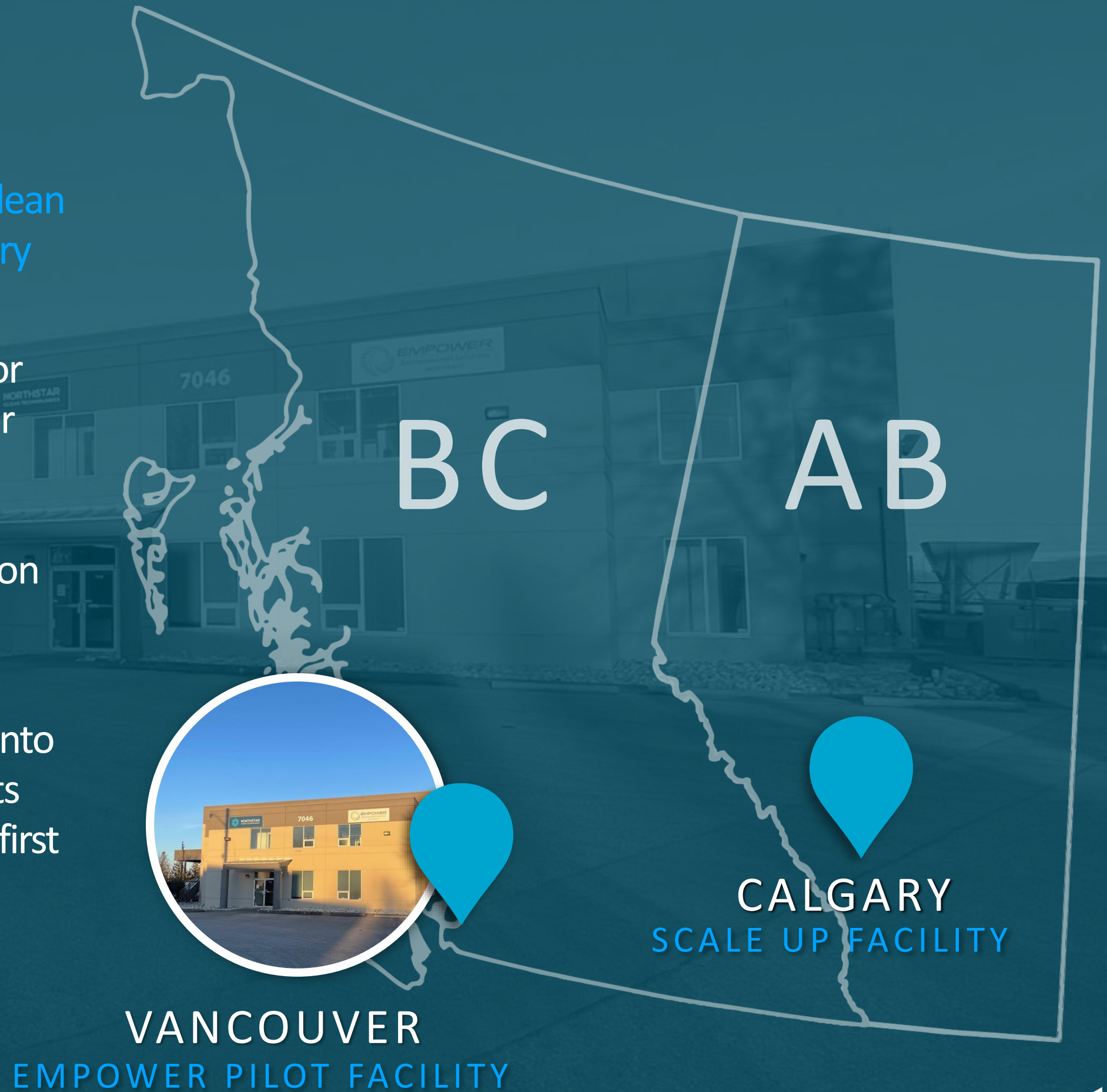


## ABOUT US

Northstar Clean Technologies Inc. is a Canadian-based clean technology company focused on the sustainable recovery and reprocessing of asphalt shingles.

Northstar has developed a proprietary design process for taking discarded asphalt shingles, otherwise destined for landfills, and extracting the liquid asphalt for usage in paving, shingle manufacturing and asphalt flat roof systems, and aggregate and fiber for usage in construction products and other industrial applications.

Focused on the circular economy, Northstar plans to reprocess used or defective asphalt shingle waste back into its three primary components for reuse/resale at both its Empower Pilot Facility in Delta, British Columbia and its first commercial scale up facility in Calgary, Alberta.



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# ABOUT US



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## THE PROBLEM

### Limited Processing Solutions for Single-Use Asphalt Shingles

# 84%

OF HOMES IN CANADA &us ROOFED  
WITH ASPHALT SHINGLES ANNUALLY

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**83M single family homes in the USA, 84% of which are roofed with asphalt shingles annually.** The average house in the USA has 2,000 sqft. of roofing (generates 5,000 lbs of asphalt tear-off, where up to 5-10% is reclaimed for asphalt re-paving).

# 14.5M

TONS OF ASPHALT SHINGLES SENT TO  
LANDFILLS IN ANNUALLY

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**Under the US Environmental Protection Agency's 2022 Sustainable Materials Management (SMM) Plan, objective #1 is to decrease disposal rate,** aiming to reduce the amount of materials sent to landfills. 143Mt of construction & demolition (C&D) debris sent to landfills in the USA annually. Product does not biodegrade or decompose.



# OUR BUSINESS MODEL

## Input Revenue

TIPPING FEES



ASPHALT SHINGLES



GRINDING



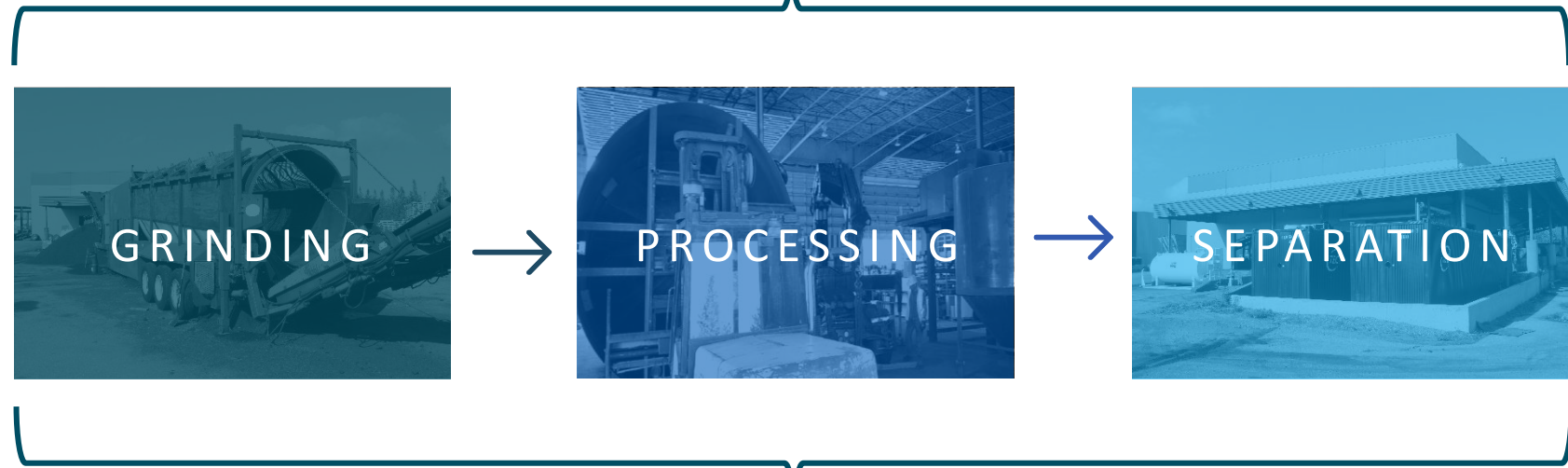
PROCESSING



SEPARATION



Capex & Opex



CARBON CREDITS

## Outputs

LIQUID ASPHALT



ASPHALT SALES

FIBER



FIBER SALES

AGGREGATE



AGGREGATE SALES

## Output Revenue



## LIQUID ASPHALT SPECIFICATION

The Delta Pilot Facility is producing asphalt to design specification



Recycled Liquid Asphalt is separated from shredded roofing shingles diverted from landfills using Northstar's proprietary extraction and separation process.

This sustainably sourced asphalt uses include circular re-use in new roofing shingle manufacturing, and as a component in hot-mix asphalt manufacturing.

# 9.7 dmm

PENETRATION

# 109.7°C

SOFTENING POINT

# 239°C

FLASH POINT

Test	Standard	Units	Ave Value	Std Dev
Pen @ 25C 100g	ASTM D5	dmm	9.7	0.6
Softening Point	ASTM D36	C°	109.7	0.6
Flash Point	ASTM D92	C°	239	nm



# ASPHALT SPECIFICATION COMPARISON

The Northstar specification demonstrates our asphalt has a wide range of applications

# 110°C

SOFTENING POINT

# 10 dmm

PENETRATION

# 239°C

FLASH POINT

	Standard	Northstar	Shingle Asphalt	Roofing Type III	Roofing Type IV	Road 80-100
Softening Point (C°)	ASTM D5	110	88 - 113	85 - 96	99 - 107	N/A
Penetration (dmm) @ 25 C° & 100g	ASTM D36	10	15	15 - 35	12 - 25	80 - 100
Flash Point (C°)	ASTM D92	239	N/A	260	260	230





# AGGREGATE SPECIFICATION

The Delta Pilot Facility aggregate has a wide range of applications



Recycled 2.5mm Aggregate is separated from shredded roofing shingles diverted from landfills using Northstar's proprietary extraction and separation process.

This sustainably sourced aggregate contains no added process chemicals, and it's uses include circular re-use in new roofing shingle manufacturing, and as a component in hot-mix asphalt manufacturing.

6.63%

MOISTURE %

0.0%

VOC %

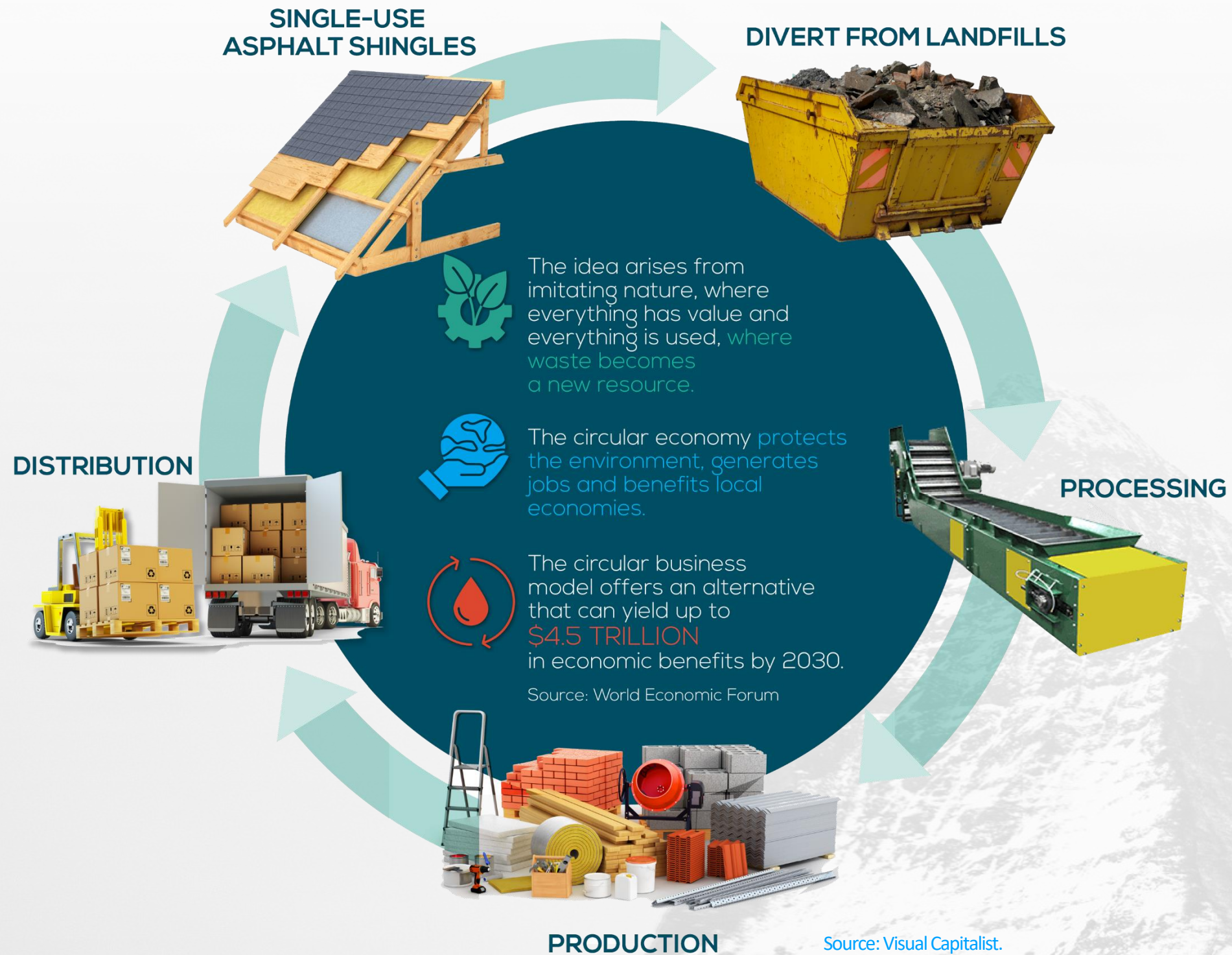
0.50%

ASPHALT %

Sieve Size	Passing Mean	Std Dev
5.000 mm	100%	0.0%
2.500 mm	96.9%	1.8%
1.250 mm	55.1%	4.5%
0.630 mm	12.9%	1.1%
0.315 mm	3.0%	0.2%
0.160 mm	0.9%	0.2%
0.080 mm	1.1%	0.2%



# FOCUS OF OUR BUSINESS: THE CIRCULAR ECONOMY



1. Avoid disposal of asphalt shingles by diverting waste from landfill
2. Avoid environmental impacts from new extraction of virgin materials (bitumen and aggregate)
3. Recover liquid asphalt, aggregate and fiber to serve as inputs into other processes and production



# CALGARY SCALE UP FACILITY LIFE-CYCLE ASSESSMENT (LCA)

## 60.3%

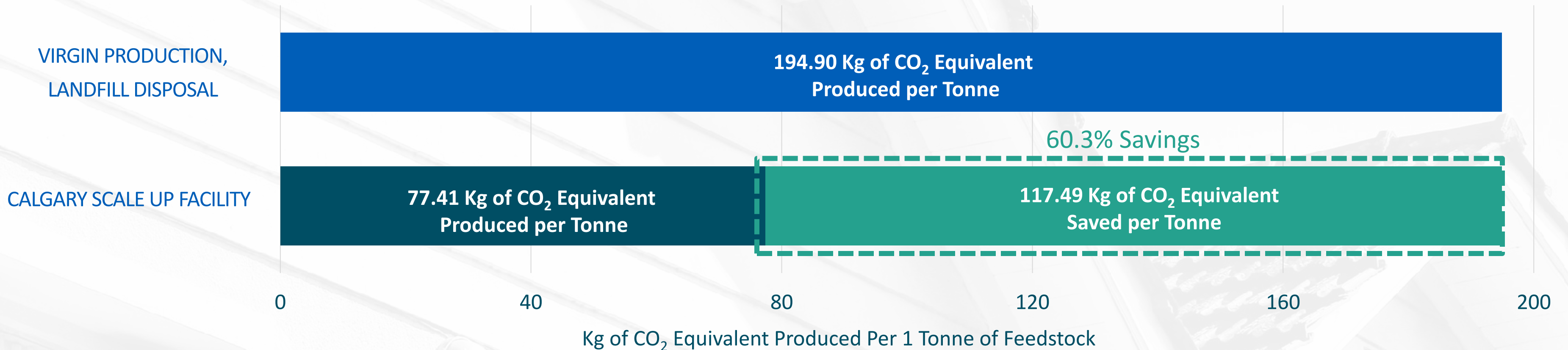
CO<sub>2</sub>e EMISSION SAVINGS  
FROM CALGARY FACILITY <sup>(1)</sup>

## 117.49 kg

PER TONNE OF NET  
ESTIMATED CO<sub>2</sub>e EMISSION  
SAVINGS

## 3.5-4.7M kg

ANNUAL NET ESTIMATED  
CO<sub>2</sub>e EMISSION SAVINGS <sup>(2)</sup>



Source: Burgess Environmental Ltd. Independent Life-Cycle Assessment (LCA) for Calgary Scale Up Facility (May 2022). Based on Global Reporting Initiative (GRI) Standards. Available for download at [here](#).

(1) Compared to virgin production and landfill disposal of asphalt shingles.

(2) Dependent on steady state production volume.



## THE ZERO WASTE TREND: REDUCING LANDFILL USE



### “Advancing Towards Zero Waste Declaration”

75+

GLOBAL CITIES  
COMMITTED

50%+

REDUCTION OF MUNICIPAL SOLID  
WASTE BY 2030

800M

PEOPLE REPRESENTED

27%

OF THE WORLD'S ECONOMY FROM  
75+ CITIES

75+ pioneering cities (incl. New York, London, San Francisco, Los Angeles, Dubai, Tokyo, Sydney, Delhi, Mumbai, Beijing, Moscow, Mexico City, Sao Paulo, Toronto, Montreal & Vancouver) have committed to significantly cut waste generated, moving towards zero waste by pledging to the following by 2030 (vs. 2015):

- 1) Cut the amount of waste generated by each citizen 15%
- 2) Reduce waste sent to landfills and incineration by 50%
- 3) Increase the diversion rate to 70%



# NORTHSTAR EXPANSION PLAN- PHASE 1

CANADA

VANCOUVER  
(PILOT FACILITY)

CALGARY  
(APPROVED)

PACIFIC NORTHWEST  
(PLANNED)

TORONTO  
(PLANNED)

USA



- EMPOWER PILOT FACILITY**
- ✓ Fully Constructed
  - ✓ Initiated steady state production
  - ✓ Targeting 50-75tpd
  - ✓ 20,000 sqft. facility
  - ✓ Located 10 min drive from landfill
  - ✓ 60% CO<sub>2</sub>e Savings



- CALGARY SCALE UP FACILITY**
- ✓ Detailed design in 1Q 2023
  - ✓ Targeting 150-200tpd
  - ✓ Site selected

Facility	Date
Calgary	End 2023
Toronto	End 2024
Vancouver / PNW	End 2024



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## FOCUS OF OUR BUSINESS: ROLLING OUT OUR CIRCULAR ECONOMY SOLUTION

### Phase 1 Plan - Next Steps

- Customer contracts
- Finalize funding
- Debottleneck Delta Pilot Plant to 60tpd
- Construct Calgary facility for 150tpd - ramping up to full production in 4Q 2023
- Follow on with Toronto and Pacific NorthWest location in 2024
- Work with industry, partners and government to determine carbon protocol

### Phase 2 Plan

#### Northstar Assets

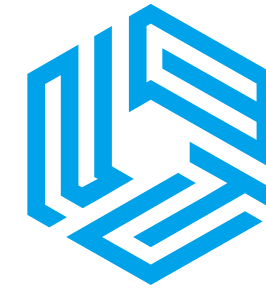
- Plan for 10 Northstar plants – Canada and US markets
- Locations under discussion
- Site selection for first five sites in 2023, depending on customer engagement
- Expected deployment of 4 facilities per year – commencing 2024
- BBA engineering will continue to provide process improvement with each facility.

#### Licensed Assets

- Investigating parallel licensing model to accelerate deployment and therefore provide incremental shingle diversion solution across a wider geography



## CONTACT US



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CLEAN TECHNOLOGIES

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