



# **Can Cement Plants Help to Make Metro Vancouver Green?**

**Environmental Managers Association of B.C.**

**BCIT Vancouver Campus**

**April 16<sup>th</sup>, 2015**

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## Disclaimer

- Analysis undertaken without external support from any clients.
- Builds on a lifetime of experience working in solid waste.
- Reflects on information kindly shared by many in industry.
- Our analysis is big picture ballpark, and may not be exact, just our best effort within time available.

**“Your generation has screwed up the planet and it will be up to us to fix it!”**







**Logan Lake, 2010**

**Winter, 2014**



# Agenda

1. Methane and GWP
2. Metro Vancouver Diversion Goals
3. The Cement Kiln Story
4. Producing PEF
5. Benefits of Diverting C&D waste to cement plants
6. What about costs?
7. Conclusions

## Our Common Objectives

- Reduce GHG Emissions
- Conserve Resources
- Minimize Costs to Society
- Competing Pressures for Funding
  - Improved transportation
  - Housing for homeless
  - Waste Water Treatment Upgrades
  - Seismic Upgrades to Schools



# Vancouver C&D Active Face (Western 40 Ha)



## Processed Engineered Fuel

- Two cement plants operate in Metro Vancouver:
  - Lafarge Canada in Richmond
  - Lehigh in Delta
- Lafarge produces 1.1 million tonnes cement
- Lehigh produces 1.0 million tonnes cement
- Lafarge can use 40,000 tonnes PEF in front end and 120,000 tonnes PEF at back end
- Lehigh can use 150,000 tonnes PEF
- Total PEF capacity is 310,000 tonnes/year
- Achieving capacity will require modest capital investments at both plants



# Lafarge Cement Plant



# Lafarge Rotary Kiln



**\$10 million upgrade required to increase capacity from 30k to 160k tonnes/yr**

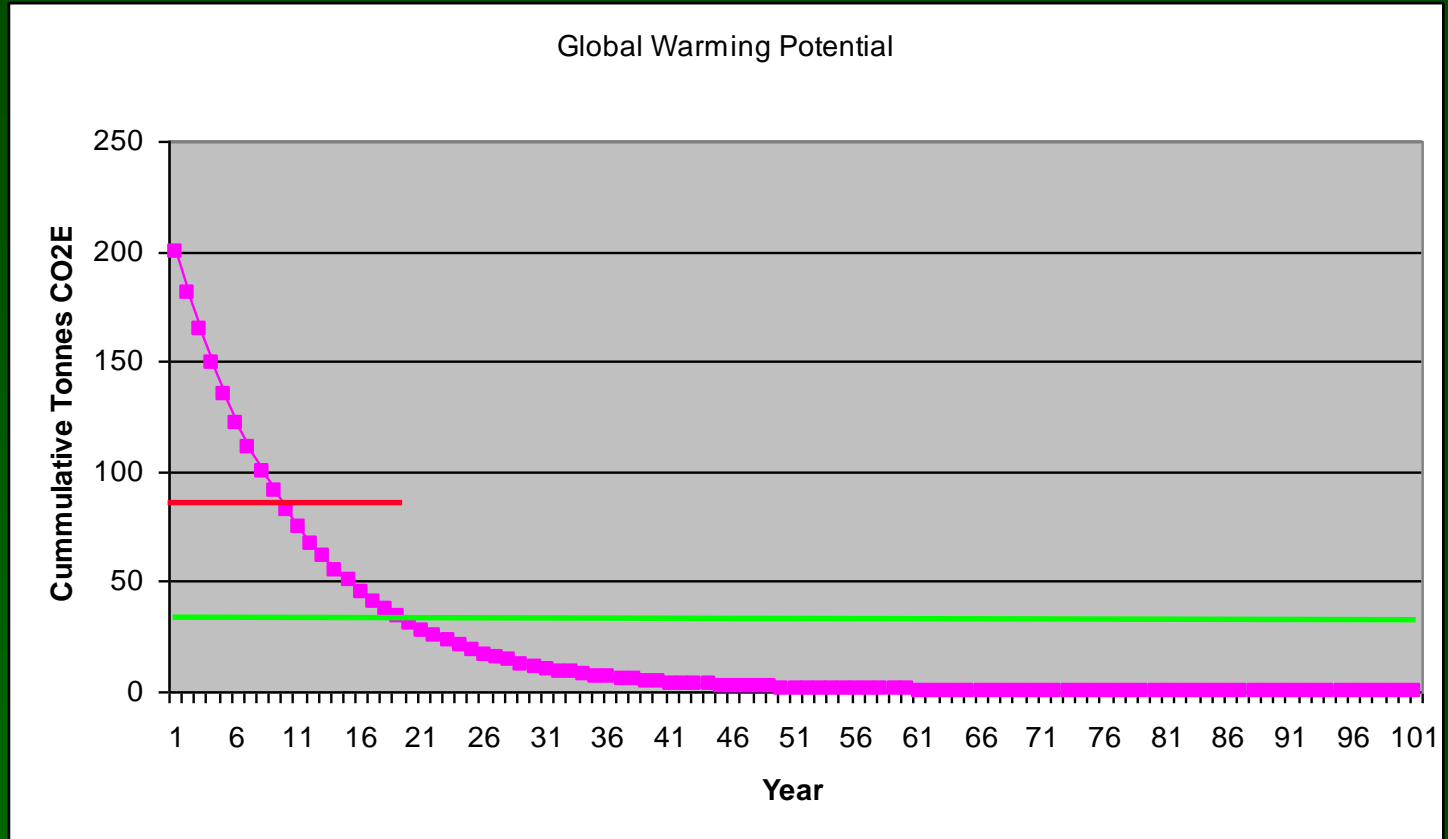
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# Wood chip and plastic PEF



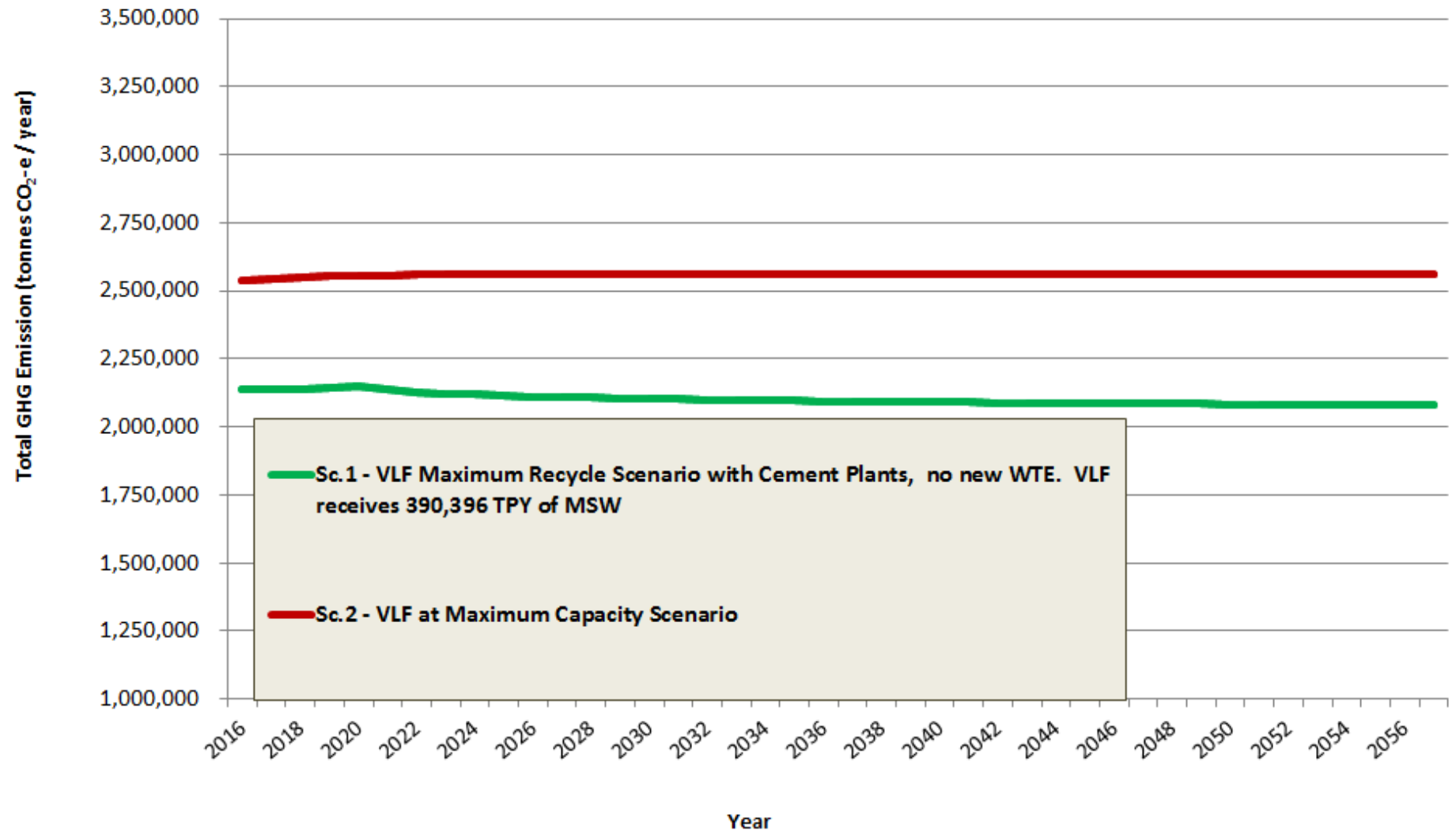
# Global Warming Potential of Methane



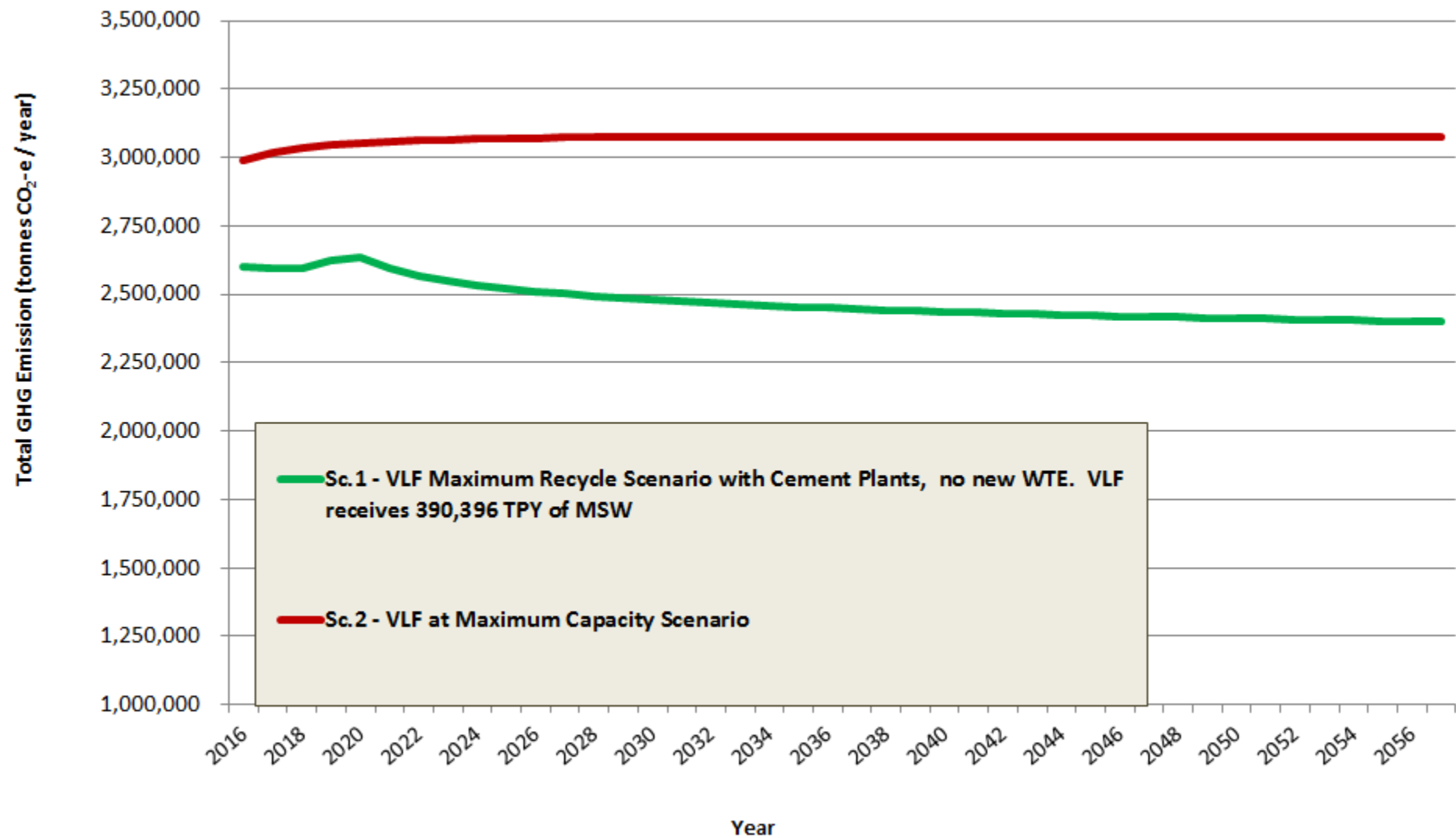
	Protocol	100 Yr GWP	20 Yr GWP	Half Life
•	IPCC 2013	34	86	12.4
•	IPCC 2007	25	72	12
•	IPCC 2001	23	62	12
•	KYOTO	21		



## Total GHG Emissions for Landfill vs. Cement Plant Fuel (at 25 GWP)



## Total GHG Emission in 3 Scenarios (at 86 GWP)





# Metro working toward Zero Waste

- Current diversion rate is 60%
- 2015 Goal is 70% diversion
- 2020 Goal is 80% Diversion

Can goals be realistically achieved? YES  
NOT an aspirational goal!!!!

## Option 1. Partnership with Cement Producers

226,000 Organics diverted to compost

**165,000 C&D Waste Diverted to PEF**

280,000 Burnaby Incinerator

390,398 Residuals to VLF

670,398 Total Residuals (80% diversion)

## Option 2. Using VLF to Full Capacity

285,000 Burnaby Incinerator

0 New WTE

700,000 Residuals to VLF

985,000 Total Residuals(71% diversion)



## Getting to 80% Diversion

	Tonnes	Extra Div.
Total MSW	3,349,000	
Diverted 2013	2,022,000	
Residuals 2013	1,327,000	
Additional Organics	226,000	50%
Additional Fibre	74,500	50%
Plastic Containers	63,000	50%
Building Material	165,000	75%
Non Compostable Organics	125,400	60%
Total New Diversion	653,900	80%

- Come on Lower Mainland, we can do this!!!!

# Where is residual coming from?

Residual Sources	(2013)	(2012)	EBA 2012
Single Family	304,347	345,118	230,174
Residential Drop Off	included	included	133,032
ICI	365,191	404,648	
ICI Out of Region	49,000	35,000	
Multi Family in Region	196,504	198,509	
Multi Family Out of Region	21,000	15,000	
DLC	392,342	358,691	
Total Waste	<b>1,328,384</b>	<b>1,356,966</b>	

**DLC waste is low hanging fruit.  
Next target is ICI (apartments).**

# Where is residual going?

Residual Disposal				
Vancouver Landfill MSW	416,947	tonnes (2013)		
Vancouver Landfill DLC	158,387	tonnes (2013)		
Vancouver Landfill Bottom Ash	21,977	tonnes (2013)		
Vancouver Road Base Materials	104,643	tonnes (2013)		
Vancouver Landfill Total	701,954	tonnes (2013)		
Burnaby Incinerator	285,000	tonnes (2013)		
Cache Creek Landfill	53,080	tonnes (2013)		
Ecowaste - Richmond	233,955	tonnes (estimated)		
Leakage - Waste Export to U.S.	70,000	tonnes (2013 Metro Estimate)		
Total Check Sum:	1,343,989	tonnes (2013)		
	1,328,384	tonnes (2013 actual Metro Vancouver)		

Should start looking at VLF.



## Organics Diversion

- 309,000 tonnes of organics (yard waste and food waste) diverted in 2013
    - Harvest Power 200,000 tonnes
    - Envirosmart 90,000 tonnes
    - VLF 22,000 tonnes (yard and garden)
  - 458,000 tonnes remain in residual stream
  - Need 226,000 tonnes more to hit 80%
    - Surrey AD 115,000 tonnes
    - Envirosmart 20,000 tonnes
    - Lytton 20,000 tonnes
    - Harvest Power 100,000 tonnes
- 255,000 tonnes

# Anaerobic Digesters at Harvest Power





## DLC Processing

- Modern DLC facilities have capacity to recycle about 70 to 90% of typical DLC waste.
  - Wood and plastic for PEF
  - High value PET and HDPE for recycle
  - Brick and concrete for aggregate
  - Ferrous metal for scrap
  - Non ferrous metal
  - Fines to landfill
- 392,342 tonnes of DLC in 2013
- Goal to divert 110,000 tonnes by 2015 and 290,000 tonnes by 2020

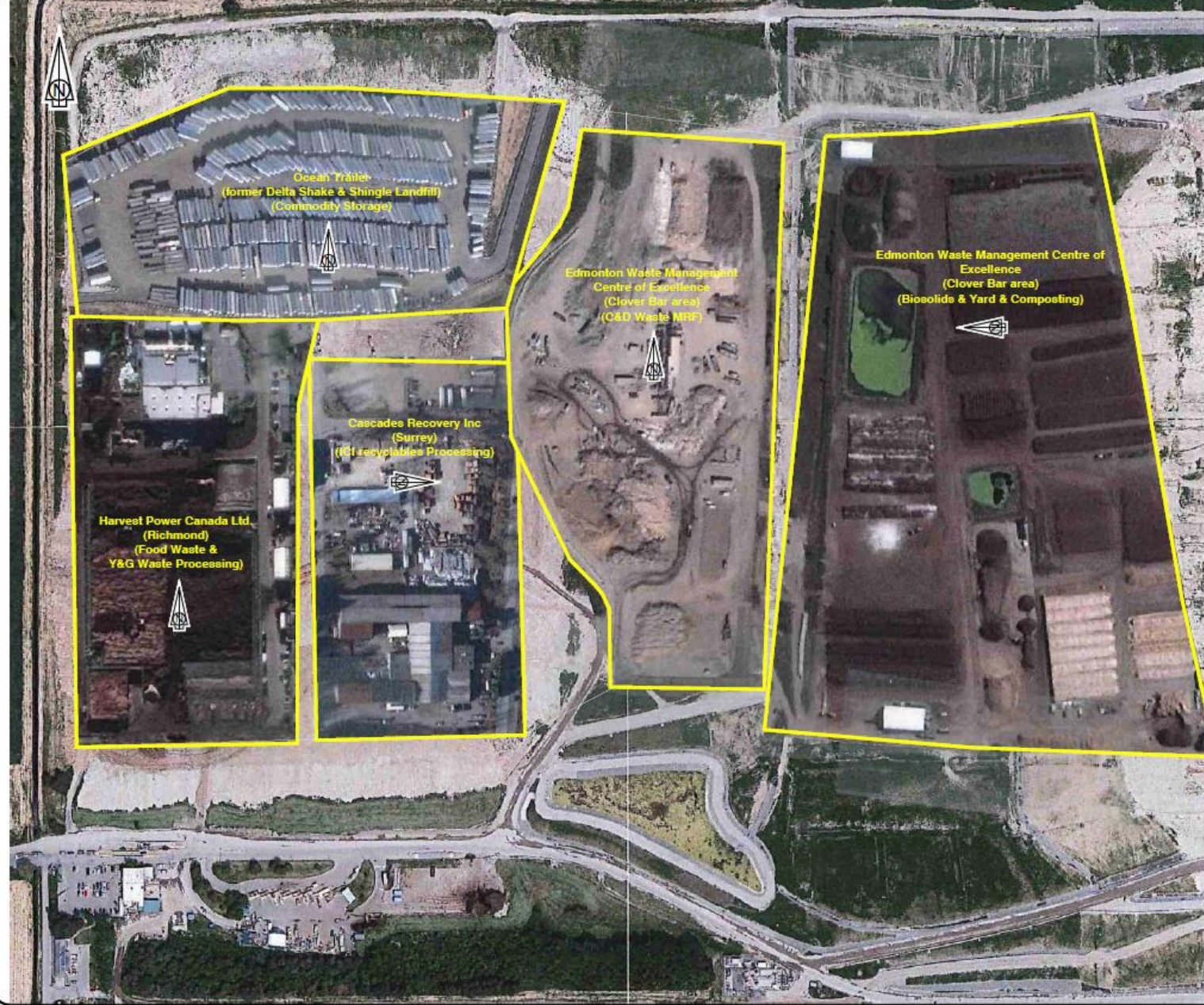
# DLC MRF – Edmonton Waste Management Centre



## High Capacity DLC MRF

- BHS Equipment, a leader in MRF automation provided following summary
  - Plant capacity 75 tonnes/hour
  - Capacity of 150,000 to 200,000 TPY
  - Capital of \$5 to \$6 million U.S. or \$8 million CDN
  - Operating costs of \$50 to \$60/tonne
- GENTE Strategies Inc. Estimate 120,000 TPY
  - \$8 to \$10 million plant, \$6 million building
  - \$15 million capital investment
  - Operating cost \$51.60/tonne
  - \$4.4 million return (high risk without market)





Landfill Services Group  
• Landfill Site  
• Design & Operations Plans  
• Landfill Closure  
• Environmental Monitoring  
#10 - 1225 East 44th Road  
North Vancouver, B.C. V7J 1J3  
Phone: (604) 966-7725  
Fax: (604) 966-7754

LEGEND:

USEABLE AREA:  
Approx. 39 ha = 96 acres

CLIENT:  
SPERLING HANSEN ASSOCIATES

PROJECT:  
METRO VANCOUVER SOLID WASTE  
SYSTEM INITIATIVE

TITLE:  
REGIONAL SOLID WASTE  
MANAGEMENT

SCALE: 1:3000	DATE: 2015/03/23 3/23/2015	PROJECT NO: INH14224
DESIGNED	DRAWING NO:	
DRAWN DR	FIGURE 1	
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HANSEN  
ASSOCIATES

# SHA Vision for Regional Solid Waste Management Facility at VLF



## Facilities at VLF

- Mayor Lois Jackson promoting “Saving Our Industrial Land Strategy”
- W40 Ha could be converted to very productive industrial land now instead of a park or golf course decades in the future
  - Advanced DLC MRF to produce PEF
  - Organics facility for food waste and y&g waste
  - Organics facility for biosolids processing for biocover/top soil
  - Storage facility
  - Other MSW processing facilities
  - On land Fish Farm

## Creating Sustainable Revenue at VLF

- 4 major facilities, each employing 40 to 50 people.
- 96 acres of productive industrial land with land value of about \$100 million.
- Annual lease revenue of \$6.3 million at \$1.50/ft<sup>2</sup> per year.
- Increased property tax revenue to Delta.
- Ongoing benefit of free MSW disposal for Delta.
- Additional host royalties?



## Cost Comparison

- **Waste Disposal and Cement Kiln Fuel Cost with PEF Diversion Strategy to 2057**
  - \$2.8 Billion
- **Continued landfilling of C&D waste to VLF and continuing to fuel kilns with Coal**
  - \$3.8 Billion
- **System wide cost saving of \$861 million**
- **19.2 million tonnes of GHG reduction to 2057**
- **\$480 million in carbon credits (at \$25/tonne)**

## Lets Get it Done

- I sincerely believe that the waste management strategy presented here is the most sustainable and cost efficient method to move toward Zero Waste and SHA would be honoured to work with any and all interested parties to make this win-win-win vision a reality.



**SPERLING  
HANSEN  
ASSOCIATES**

**Engineering Better  
Solid Waste  
Management Systems  
Today  
for a Cleaner  
Tomorrow.**





Topographic map of the Ashland Landfill showing various phases and areas. The map includes contour lines, a north arrow, and labels for different sections. A table at the bottom summarizes the volume of material in each section.

Section	Volume (m³)
WESTERN 40	655,743
PHASE 3	2,604,189
SURPLUS SOIL MONOFILL	1,958,124
ASH MONOFILL	2,459,868
PHASE 4	3,482,377

**CUT AND FILL FOR WESTERN 40**  
FINAL TO APR 07, 2012 CONTOURS  
SEE FIGURE 12

PHASE	CUT	FILL	NET
PHASE 3	3,095 cu.m	3,606,775 cu.m	3,603,680 cu.m
PHASE 2	975 cu.m	9,167,760 cu.m	9,166,785 cu.m
PHASE 8	3,370 cu.m	4,701,105 cu.m	4,697,735 cu.m
PHASE 7	864 cu.m	3,972,503 cu.m	3,971,639 cu.m
PHASE 6	810 cu.m	4,388,361 cu.m	4,387,551 cu.m
PHASE 5	340 cu.m	1,788,796 cu.m	1,788,456 cu.m
PHASE 4	1,513 cu.m	3,280,275 cu.m	3,278,762 cu.m

# VLF Progressive Closure Plan

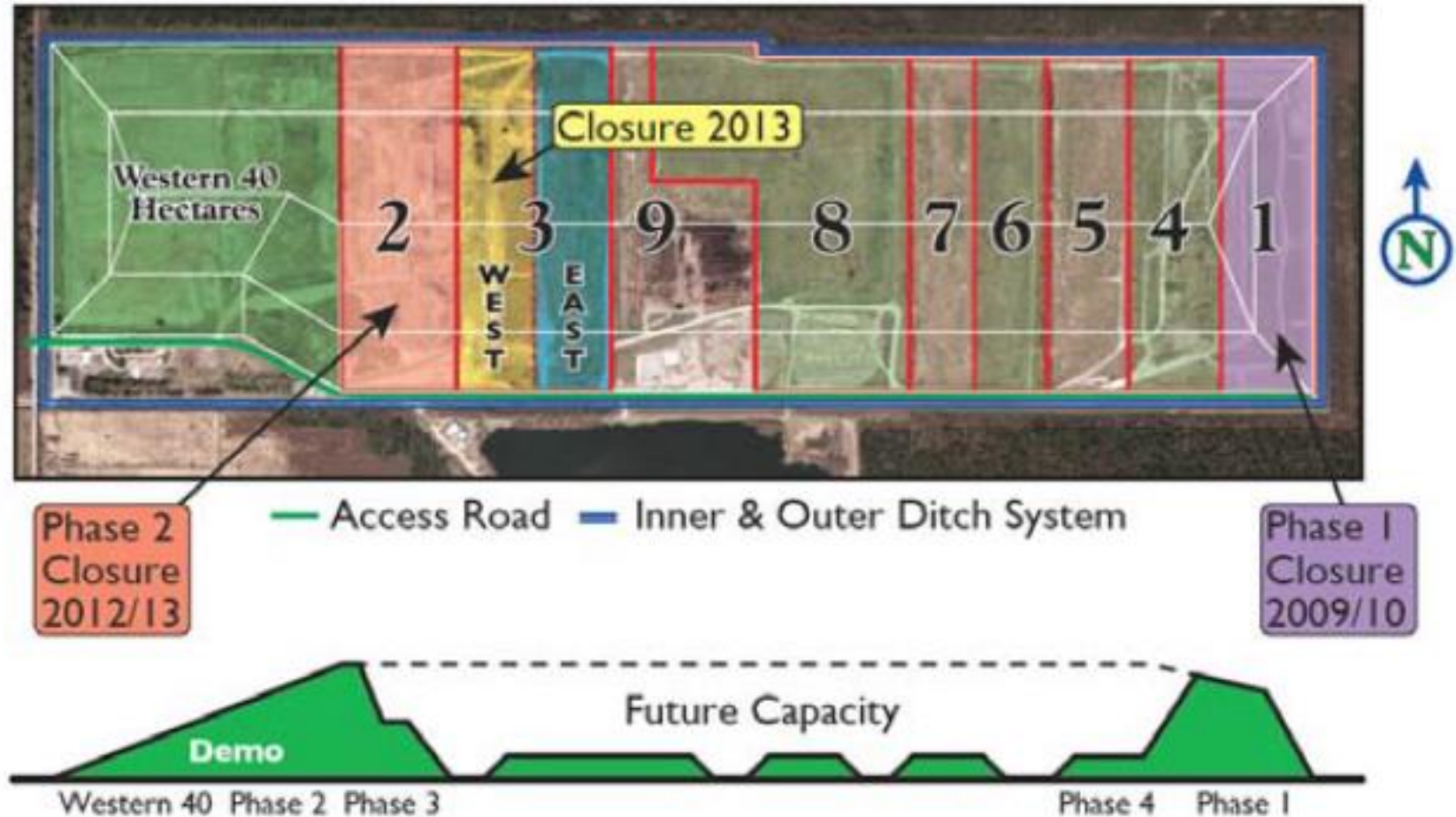


Figure 2: 2012 Vancouver Landfill Fill Plan



# Roadmap to Achieving 70% Diversion in 2015

	2015 Recycled	2015 Residuals	2015 Div. Rate	Additional Diversion	
Household Hygiene	-	47,000	0%	-	
Fines	-	11,000	0%	-	
Building Material	110,000	110,000	50%	110,000	50% building material
Non Compostable Organics	-	209,000	0%	-	
Concrete	485,000	-	100%	-	
Wood	435,000	-	100%	-	
Yard Waste and Food Scraps	458,160	302,840	60%	149,160	30% food scraps
Metal	75,000	37,000	67%	-	
Gypsum	82,000	-	100%	-	
Plastic Containers	63,170	99,830	39%	49,170	33% plastic containers
Paper Fibre	245,000	126,000	66%	-	
Asphalt	160,000	-	100%	-	
E-Waste	14,000	11,000	56%	-	
Batteries	11,000	-	100%	-	
Glass	60,000	18,000	77%	-	
Household Hazardous Waste	30,000	9,000	77%	-	
Tires	12,000	-	100%	-	
Soil, other bulk	90,000	38,000	70%	-	
	2,330,330	1,018,670		308,330	
	70%	30%	70%	9%	

- Divert 50% of remaining building material
- Divert 30% of remaining food scraps and Y&G waste
- Divert 33% of remaining plastic containers



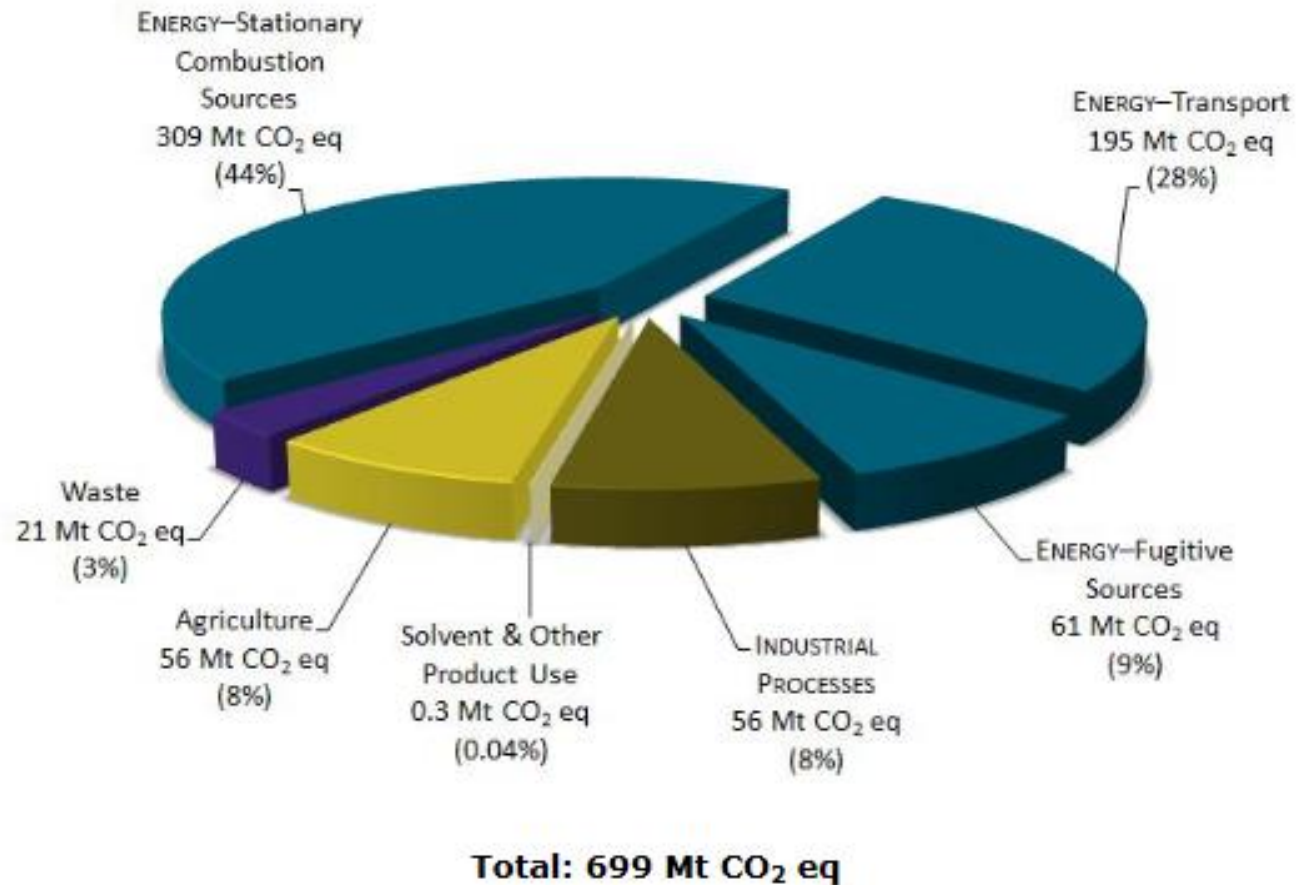
# Roadmap to Achieving 80% Diversion by 2020

	2020 Recycled	2020 Residuals	2015 Div. Rate	Additional Diversion	2020 Strategy
Household Hygiene	0	47,000	0%	-	
Fines	0	11000	0%	-	
Building Material	165,000	55,000	75%	165,000	75% building material
Non Compostable Organics	125,400	83,600	60%	125,400	60% non compostable organics
Concrete	485,000	-	100%	-	
Wood	435,000	-	100%	-	
Yard Waste and Food Scraps	535,000	226,000	70%	226,000	50% food scraps
Metal	75,000	37,000	67%	-	
Gypsum	82,000	-	100%	-	
Plastic Containers	88,500	74,500	54%	74,500	50% plastic containers
Paper Fibre	308,000	63,000	83%	63,000	50% fibre
Asphalt	160,000	-	100%	-	
E-Waste	14,000	11,000	56%	-	
Batteries	11,000	-	100%	-	
Glass	60,000	18,000	77%	-	
Household Hazardous Waste	30,000	9,000	77%	-	
Tires	12,000	-	100%	-	
Soil, other bulk	90,000	38,000	70%	-	
	2,675,900	673,100		653,900	
	80%	20%	80%		

# Waste Sector represents 3% of GHG emissions

## Yes, but at 100 yr. GWP. At 20 yr its 9.5%

**Figure S-1: Canada's Emissions Breakdown by IPCC Sector (2012)**





# Harvest Power Organics Facility in Richmond





## Classic Recycling

- Residential recycling programs are mature
- MMBC program shifting costs from municipalities to consumers
- 461,000 tonnes of PPP, glass, WEE, scrap, tires, batteries and HHW recycled by Green by Nature and Urban Impact
- About 350,000 tonnes remain in waste stream. 74,500 Tonnes of plastic and 63,000 tonnes of fibre still to be pulled out (50% of remaining residuals)
- Focus needs to be on ICI sector
- MRF's becoming more efficient, continuous improvements being realized