

# Sustainable Winter Management (SWiM)<sup>TM</sup>



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# Problem

Freshwater throughout North America is becoming increasingly contaminated with chlorides as a result of salt (NaCl) applications for managing snow and ice conditions.

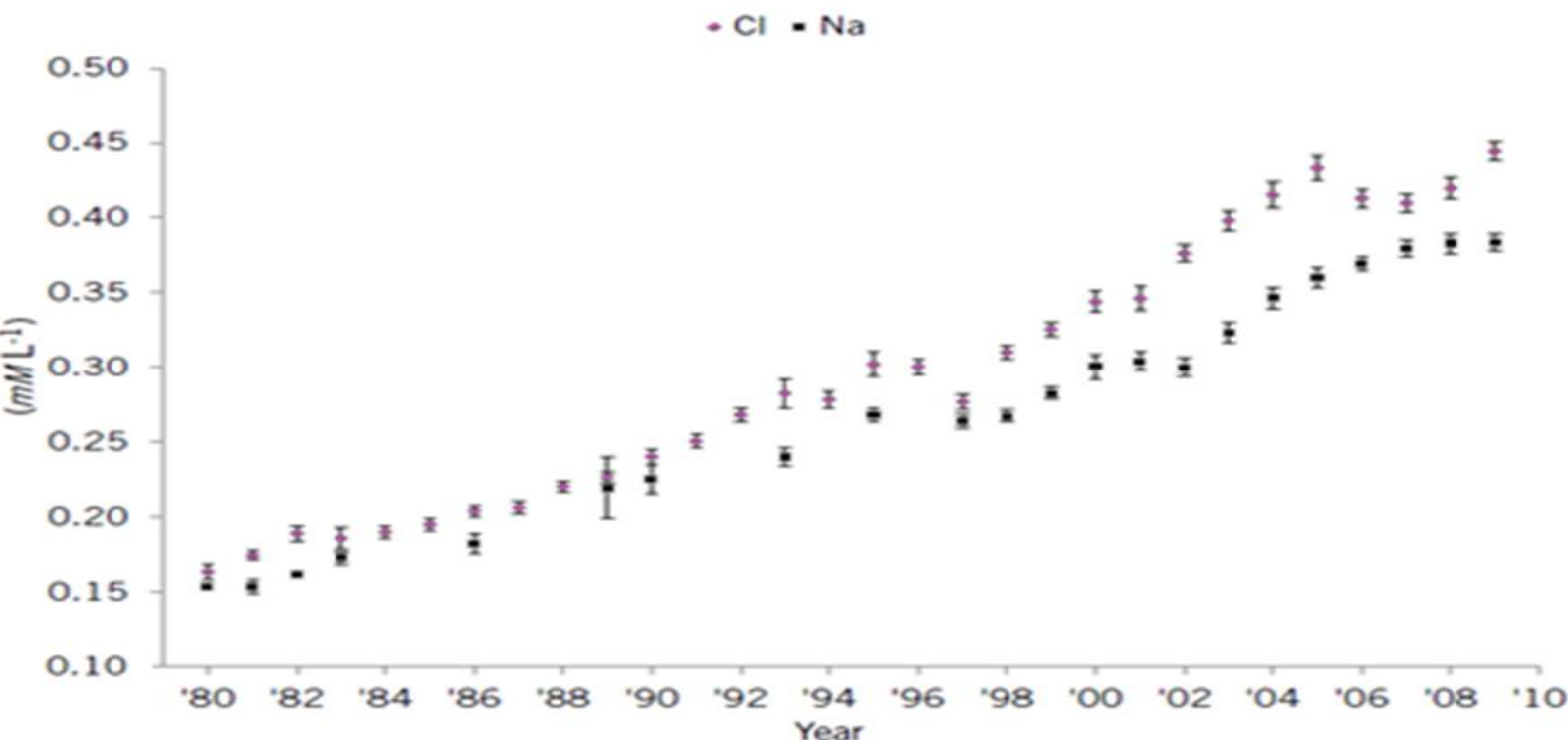
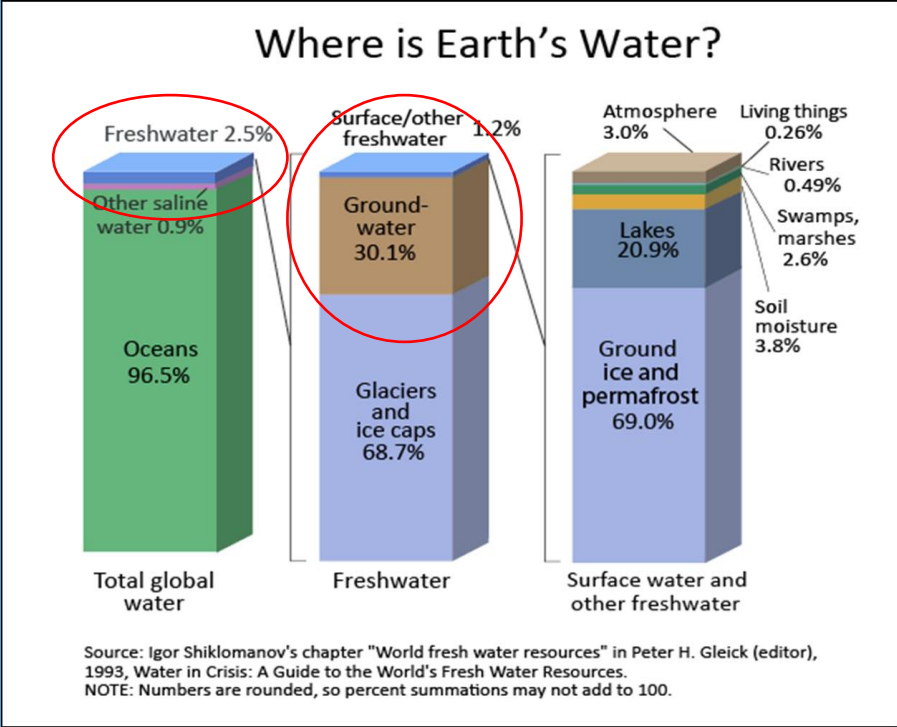


Figure 1. Mean annual sodium and chloride concentrations (millimoles per liter) measured in Lake George, New York, from 1980-2009 (Boylan, et al., 2014).



~ 1  
teaspoon  
pollutes 5  
gallons of  
Water





# So what?...

Independent studies conducted in New Hampshire, Minnesota, Ontario and other Great Lakes Regions indicate a majority of non point source runoff of chlorides from de-icing salts originate from private parking lots and roadways – NOT highways.

## TROUBLE IN NEW HAMPSHIRE

A 2008 study on chloride contamination along the I-93 corridor helped lead to the creation of New Hampshire's Green SnowPro certification.

Total imports:  
4,814 tons/yr

Imports divided  
by drainage area:  
473 tons/sq mile

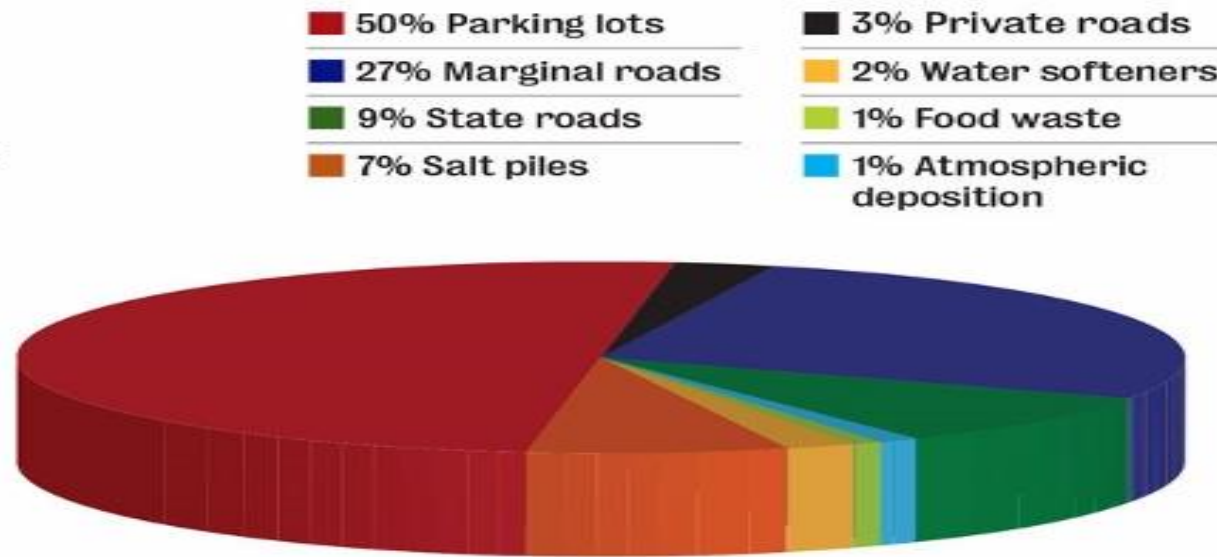


Figure 2. Chloride loads measured in Policy - Porcupine New Hampshire watershed region (Burak, et al., 2008).

SOURCE: BURACK ET AL. 2008

# Primary Question

**How can a highly fragmented industry reduce the rate and frequency of salt it applies?**

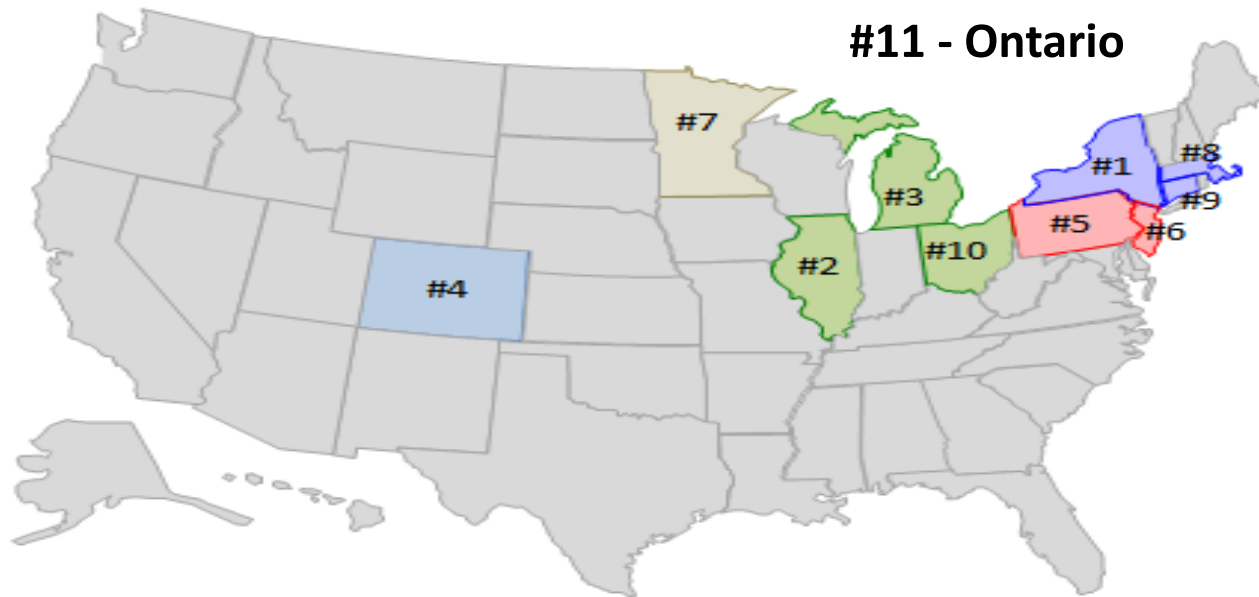


Figure 3. Top 10 commercial winter management service markets (IBIS, 2014).

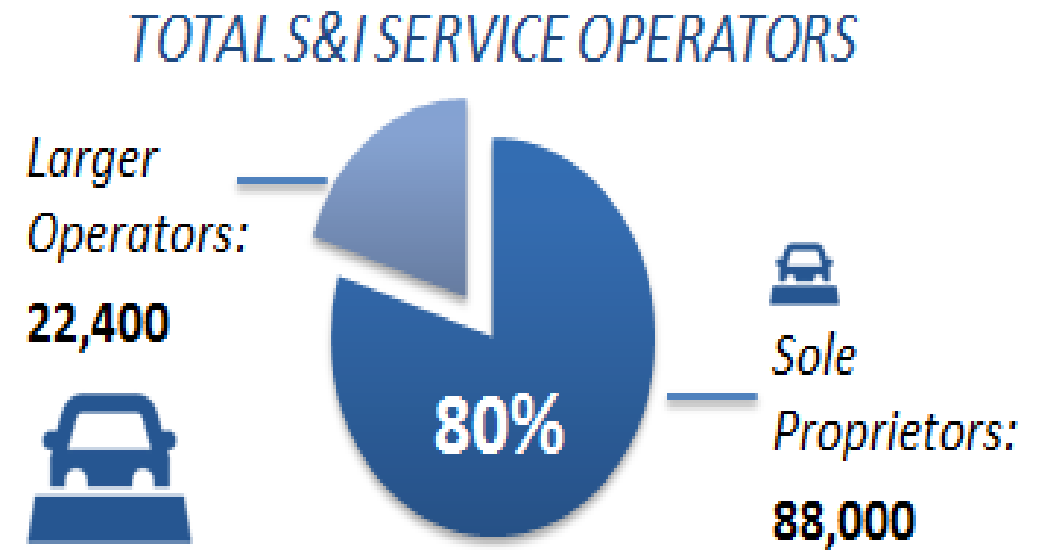


Figure 4. The number of commercial Winter Management Operators confirmed in a 2016 Snow & Ice Management Association industry research study. Wolf, 2016).

# Research Methods

## Comparative Analysis of salt application rate guidelines;

- Three sets of N. American guidelines - MN, NH, & SIMA
- Three year salt application study (the “control”) - U. Waterloo
- Sustainable Salt Initiative (SSI) – my sample group

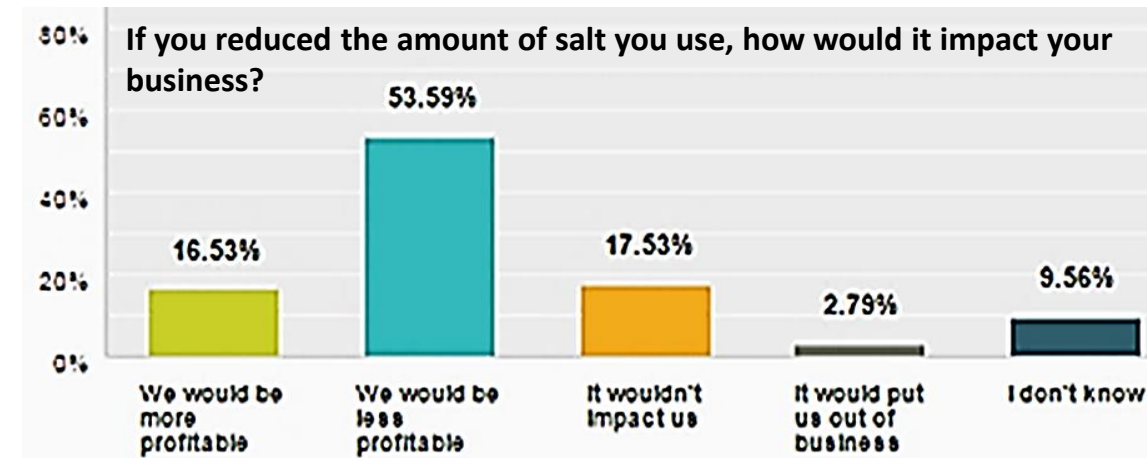


## Sustainability Analysis of the industry related to salt use;

- PESTLE - political, environmental, social, technology, legal, environmental
- Field Observations
- Industry Survey's

## Materiality Analysis of the primary drivers and variables that influence the rate and frequency salt is applied by industry;

- Ranking from PESTLE
- Salt Use Survey
- Prioritized by success for industry and environment



# SUSTAINABLE SALT INITIATIVE (SSI)

SALT APPLICATION STANDARDIZATION FOR THE INDUSTRY BY THE INDUSTRY

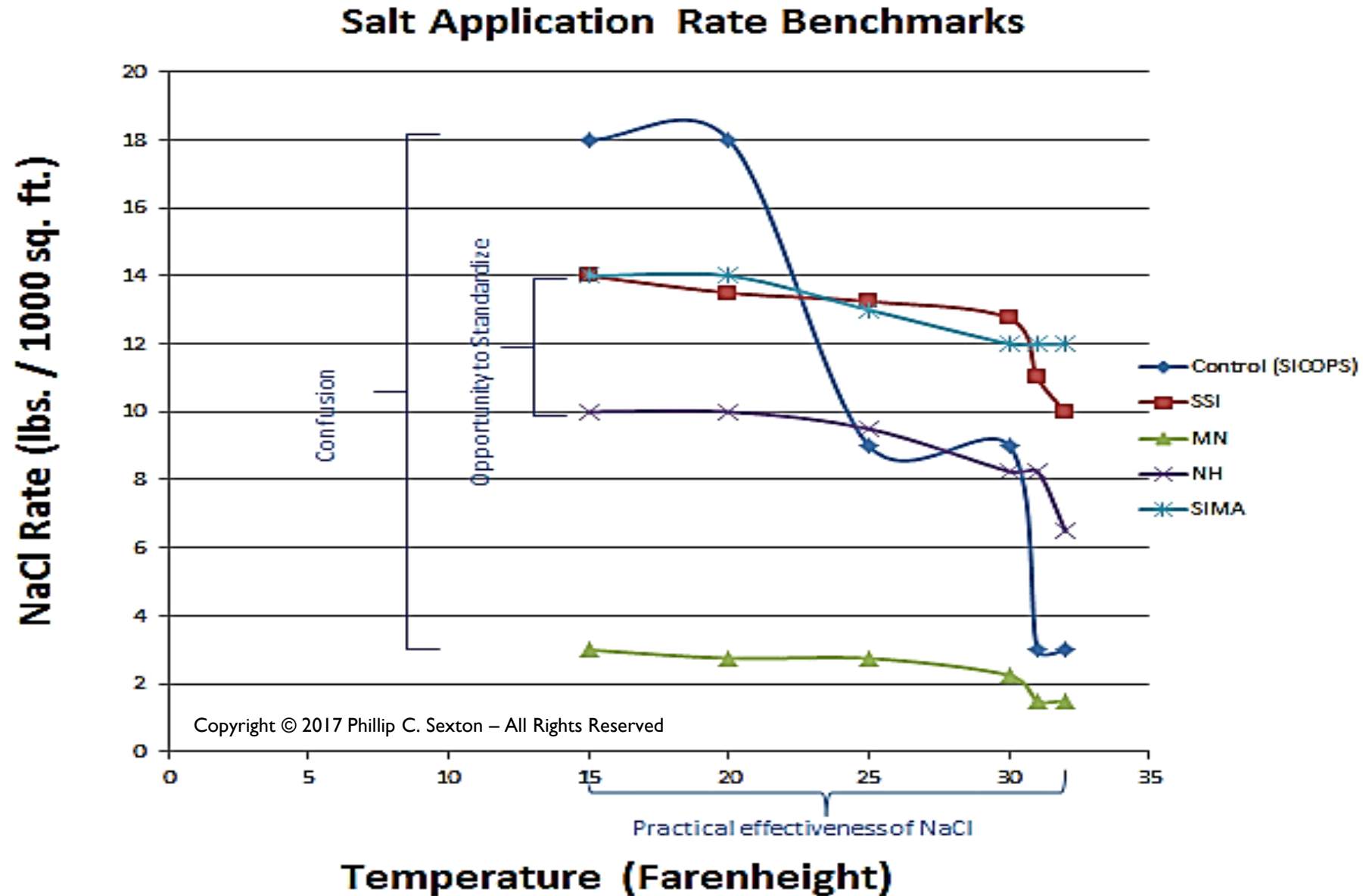


## The Sample Group:

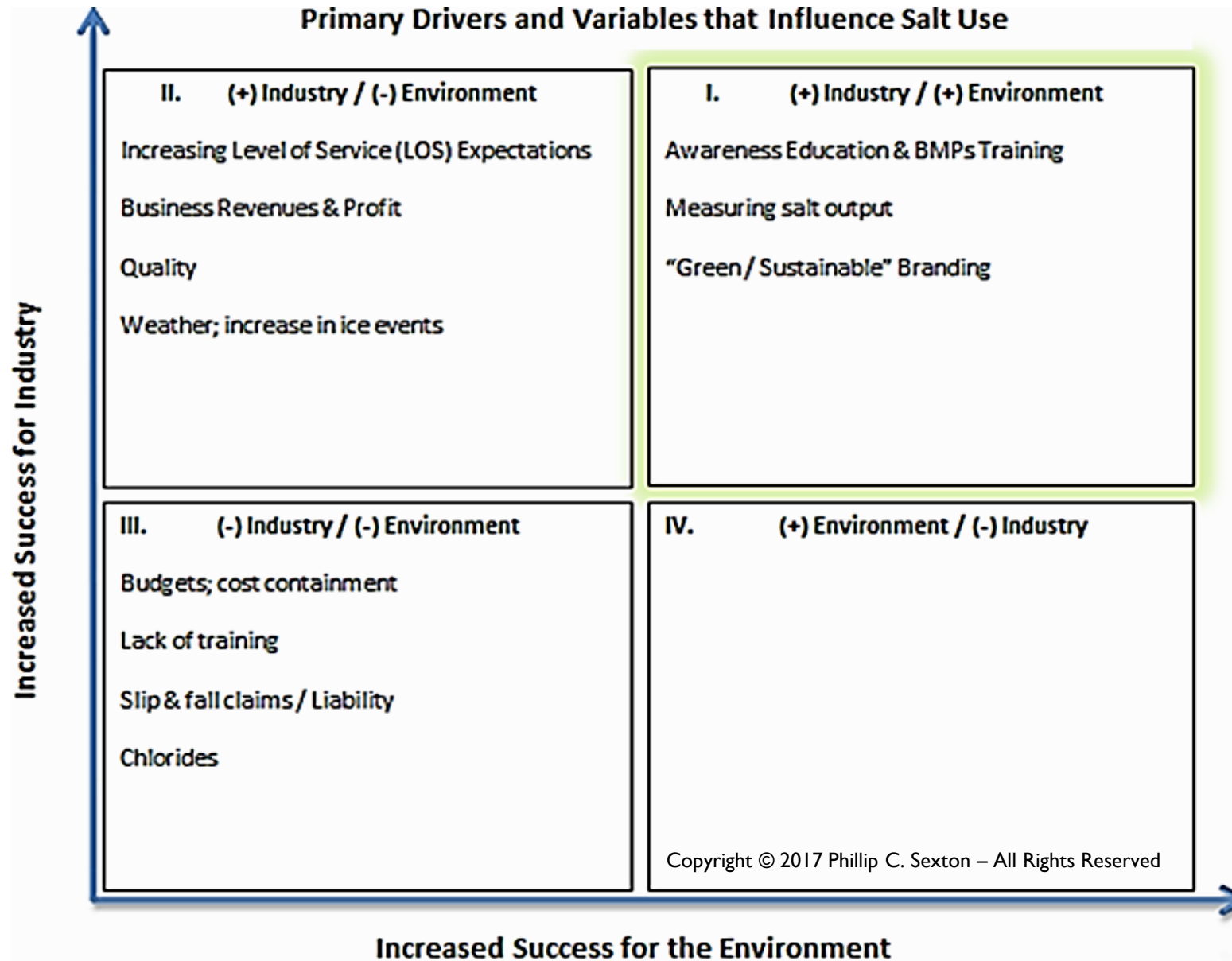
- 2,000 + properties in 2 provinces & 10 states
  - >100,000 + tons of salt measured
  - Over 100,000,000 data points collected
- 
- ✓ Preliminary baseline of salt application rates and frequencies
  - ✓ Identify trends in over application from real world application data
  - ✓ Document methods that reduce salt use
  - ✓ Evolution of a formal process of data analysis and refinement to scale



# Results – Comparative Analysis



# Results – Materiality Analysis





# A New Question

**How can the commercial winter management industry change it's current practices given what we now know from this research?**



Figure 5 . Observation of rock salt over applied in a commercial parking lot.

# Philosophy – A new way of doing business



## Principles of Sustainability

### Economics



Sales & Marketing  
Operations  
Finance & Administration

### Social Responsibility



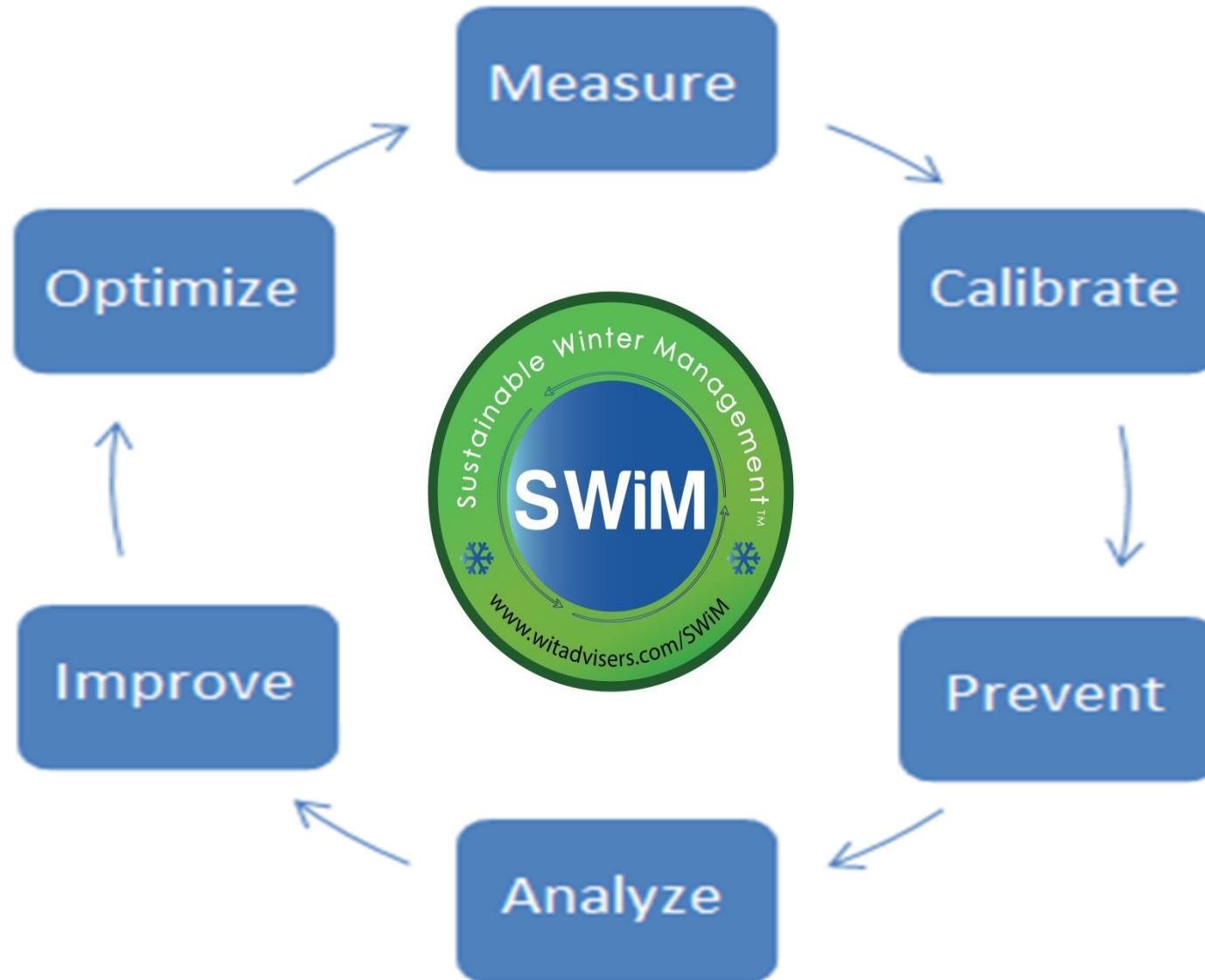
Transparency  
Integrity  
Reputation

### Environment



Water  
Air  
Soil

# Standards of Policy - that enable best practices





# Measure





# Calibrate



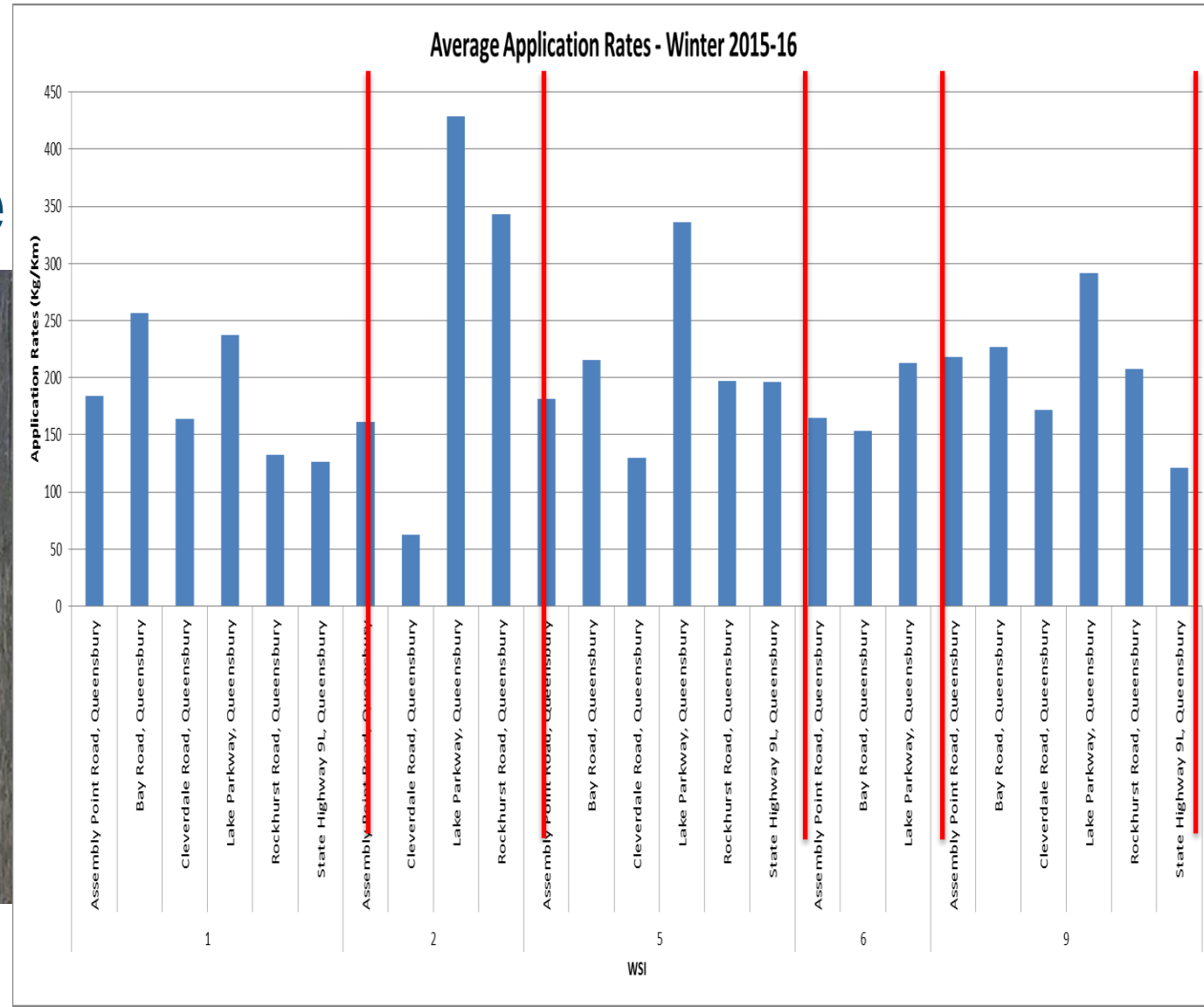
# Prevent

**Anti-Icing:** A strategy of applying salt directly to a paved surface before a snow storm begins and before snow and or ice has bonded to the pavement.

- A **Proactive** approach to winter management
- **Prevents** the bonding of snow and ice between the road surface and the snow/ice layer
- **Optimizes** the melting process

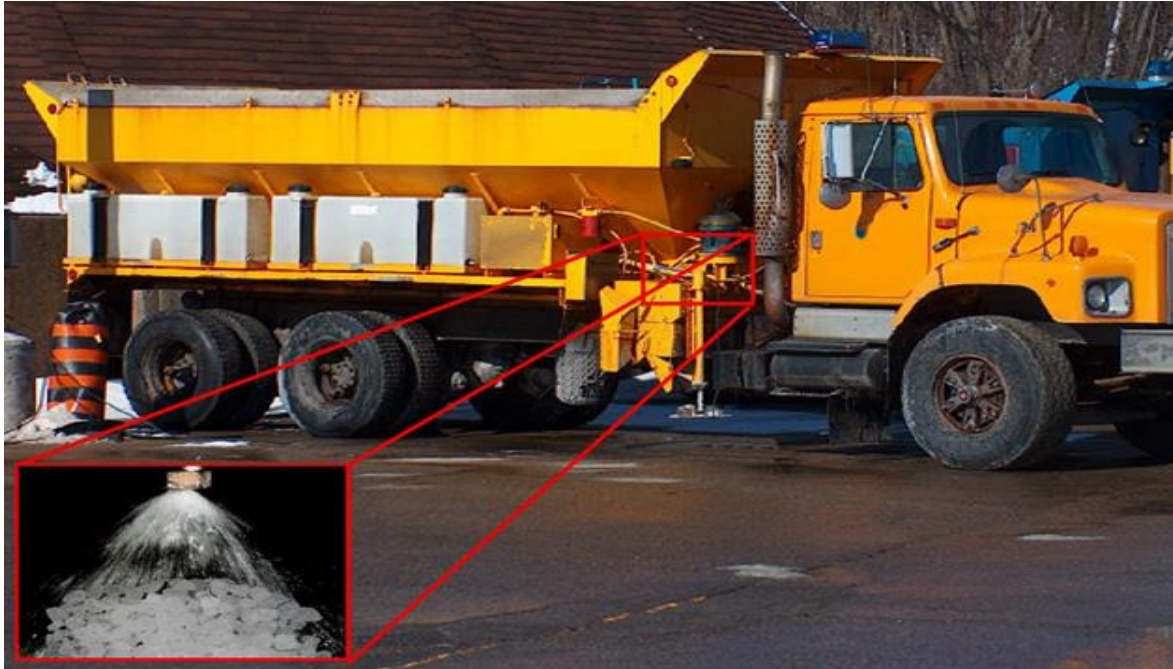
# Analyze & Improve

- Data Analysis
- Verify Level of Service
- Re-calibrate
- **REDUCE**
- Repeat



# Optimize

## Pre-wetting at the Spinner

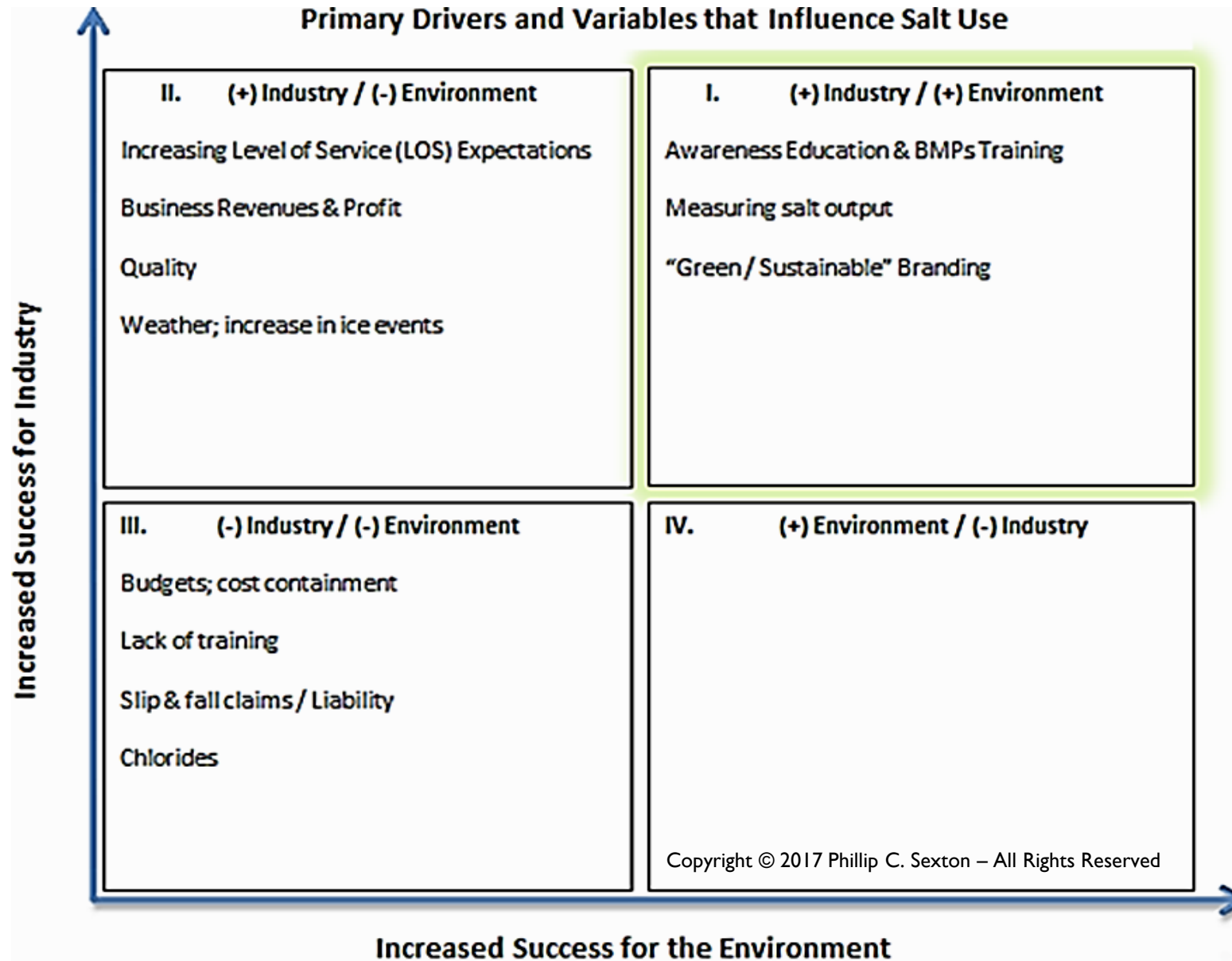


**Use 8-14 gallons/ton of 23.3% salt brine**





# Materiality Analysis





# Level of Service (LOS)

## Reality vs. Expectations



# Level of Service (LOS)

## Expectations vs. Reality

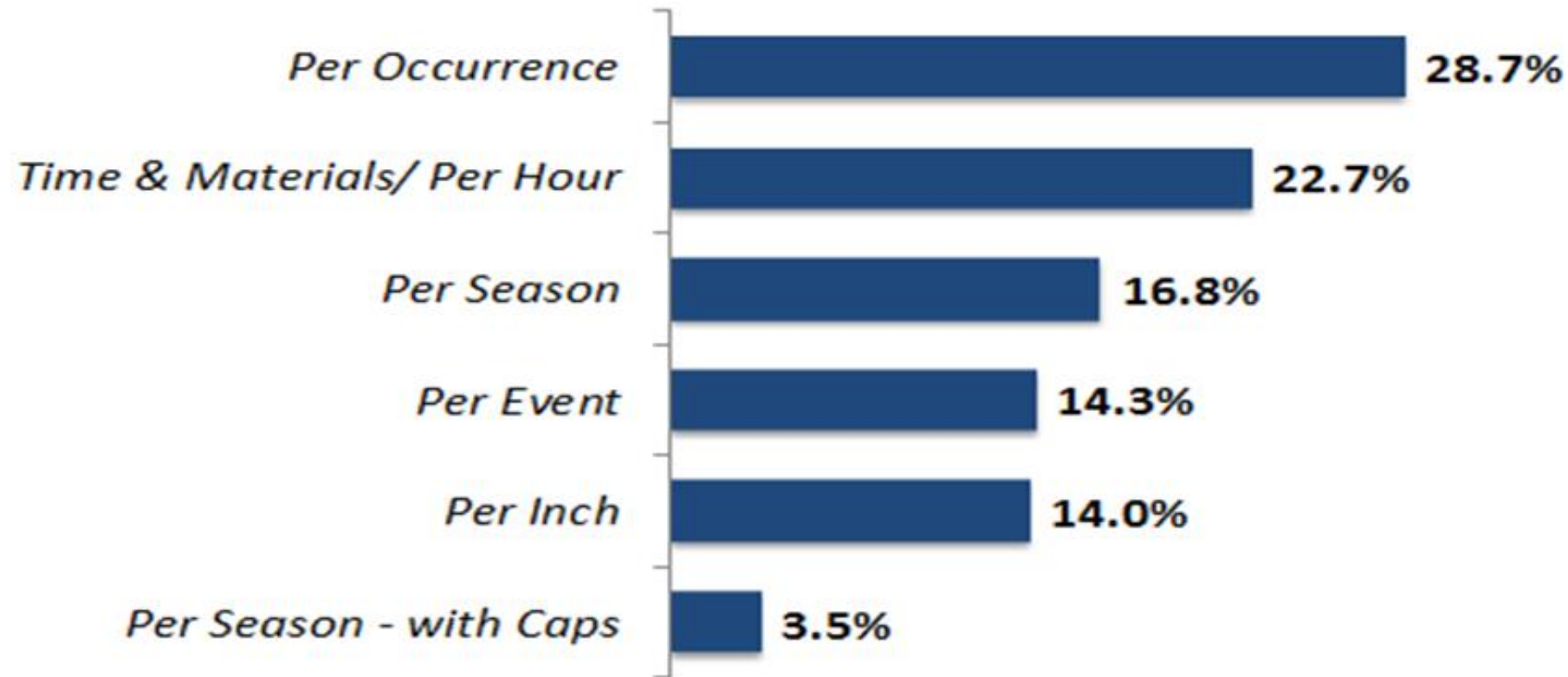


Figure 5 . Observation of rock salt over applied in a commercial parking lot.



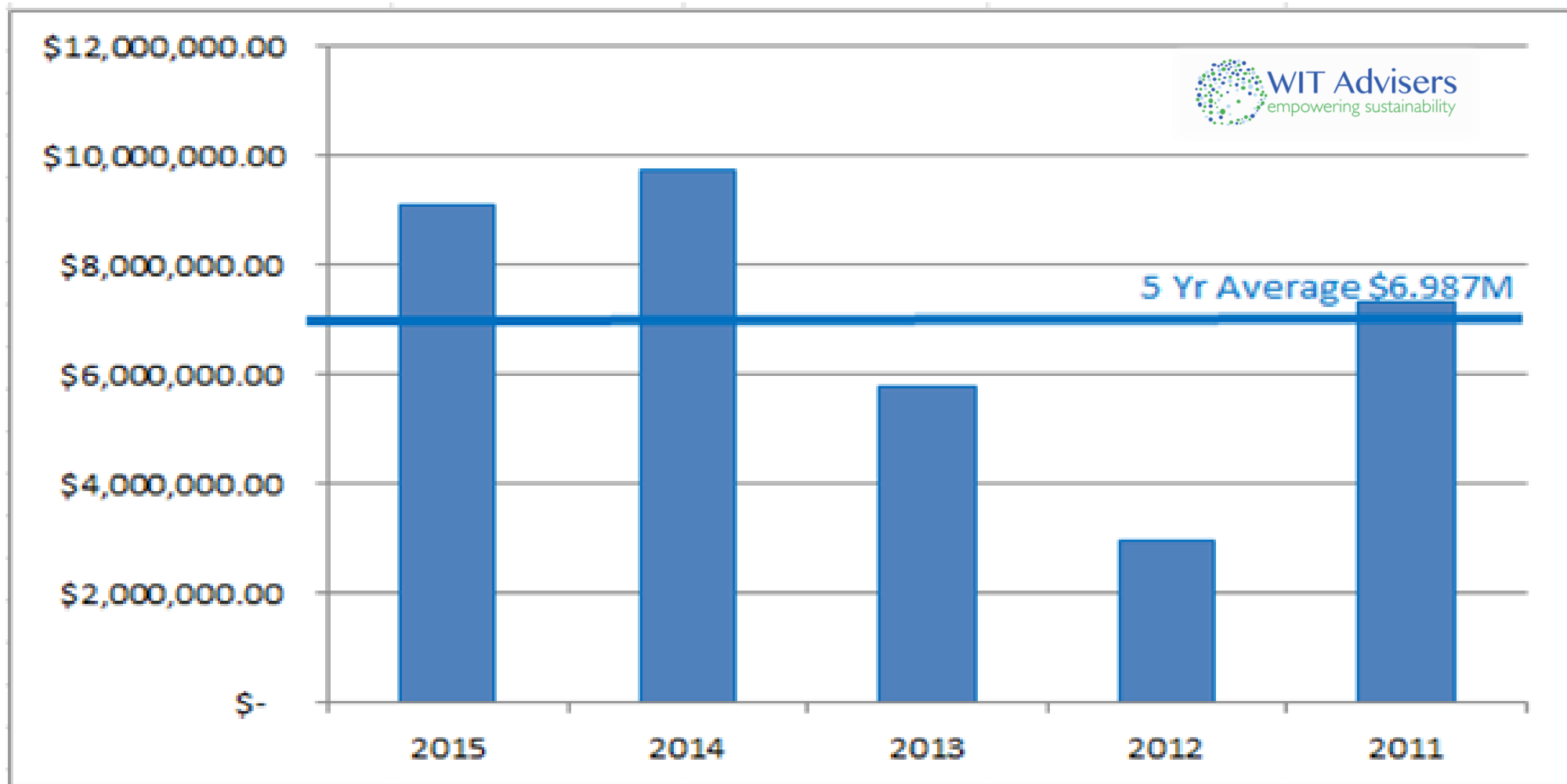
# Economics – the amount of salt

Only one way salt applications are typically sold incentivize for efficiency



# Economics – the amount of weather

## 5 year spend analysis



# Here's a new idea - 'Normalized' Snow

## A seasonal Approach

### Occurrences by Season

	<u>Dustings</u>	<u>0.1-0.9"</u>	<u>1.0-1.9"</u>	<u>2.0-3.9"</u>	<u>4.0-5.9"</u>	<u>6.0"+</u>	<u>Non-Trace</u>	<u>Total Events</u>
2010-11 Season	6	20	4	5	1	2	32	38
2011-12 Season	9	20	10	6	2	3	41	50
2012-13 Season	20	14	14	9	5	4	46	66
2013-14 Season	10	20	15	6	2	4	47	57
2014-15 Season	2	10	4	1	3	2	20	22
5 Year Average	9.4	16.8	9.4	5.4	2.6	3.0	37.2	46.6

### Average Season Event Distribution

	<u>Dustings</u>	<u>0.1-0.9"</u>	<u>1.0-1.9"</u>	<u>2.0-3.9"</u>	<u>4.0-5.9"</u>	<u>6.0"+</u>	<u>Non-Trace</u>	<u>Total Events</u>
Webster Climate Zone	9.0	17.0	9.0	5.0	3.0	3.0	37.0	47.0

### Snowfall % by Quarter

	<u>Q3</u>	<u>Q4</u>	<u>Q1</u>	<u>Q2</u>	<u>Annual</u>
Snowfall	0.0	18.5	56.1	0.6	75.2
% of Season	0.0%	24.6%	74.6%	0.8%	0.8%

### Season % of 5 Year Average

	<u>Snowfall</u>	<u>Events</u>	<u>Trace Events</u>	<u>&gt;0.1" Events</u>	<u>% of 5 Yr. Average</u>
weighting	30%		20%	50%	
2010-11 Season	45.0	38	6	32	73.7%
2011-12 Season	73.4	50	9	41	103.5%
2012-13 Season	111.6	66	20	46	148.8%
2013-14 Season	93.2	57	10	47	121.6%
2014-15 Season	53.2	22	2	20	52.3%
5 Year Average	75.3	47	9	37	100.0%

# 'Normalized' Snow

## Seasonal Spend Analysis for Eastway Store #3

### Budget Analysis & Key Cost Points

The Average season budget analysis provides a range for a seasonal budget, based on the 5 year average snowfall and occurrences. The range is based on a low if 100% Average Season, and a high of the maximum of the past five seasons. Included are key cost points for utilization in comparison of competitive bid information.

#### Seasonal Budget Range

**\$ 99,939.00 to \$ 148,753.00**

#### Seasonal Budget Spread

	<u>October</u>	<u>November</u>	<u>December</u>	<u>January</u>	<u>February</u>	<u>March</u>	<u>April</u>
100% of Normal Season	\$ -	\$ 4,688.00	\$19,908.00	\$23,890.00	\$39,153.00	\$11,414.00	\$ 796.00
148.8% of Normal Season	\$ -	\$ 6,993.00	\$29,632.00	\$35,558.00	\$58,276.00	\$16,989.00	\$ 1,185.00

#### Factors that affect Budget Ranges

- Commodity market pricing (ice-melt products)
- Market rates for labor and equipment
- Overall service levels and expectations, as defined above

#### Key Cost Points

Average time for Full Plowing Occurrence	6.09	Hrs.
Average time for Full Walk Clearing, Public Private	2.83	Hrs.
Average time for Walk Clearing, Private, only	2.31	Hrs.
Full Application of Bulk Salt, Pavement areas	4.34	Tons
Full Application of Ice Melt, Public Private	3.05	50# Bag
Full Application of Ice Melt Private, only	1.60	50# Bag



# Green and Sustainability Branding



SUSTAINABLE  
SALT INITIATIVE



Official Research Partner  
[sima.org/saltmatters](http://sima.org/saltmatters)



SUSTAINABLE  
SALT INITIATIVE

Efficient salt management makes business sense





## **SUSTAINABLE WINTER MANAGEMENT (SWiM)<sup>™</sup> PROGRAM**



**When Winter Hits...  
Keep Your Business Running**

Endorsed by



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# A Program for Properties

## Benefits



**Financial**



**Reputation**



**Environment**

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## PROGRAM INCLUDES:

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Training

Implementation

Management

Certification

Continuous Quality Improvement

Service & Supply Network

Standardization & Automation



**WIT Advisers**  
empowering sustainability

[WITAdvisers.com](http://WITAdvisers.com)

[psexton@witadvisers.com](mailto:psexton@witadvisers.com)