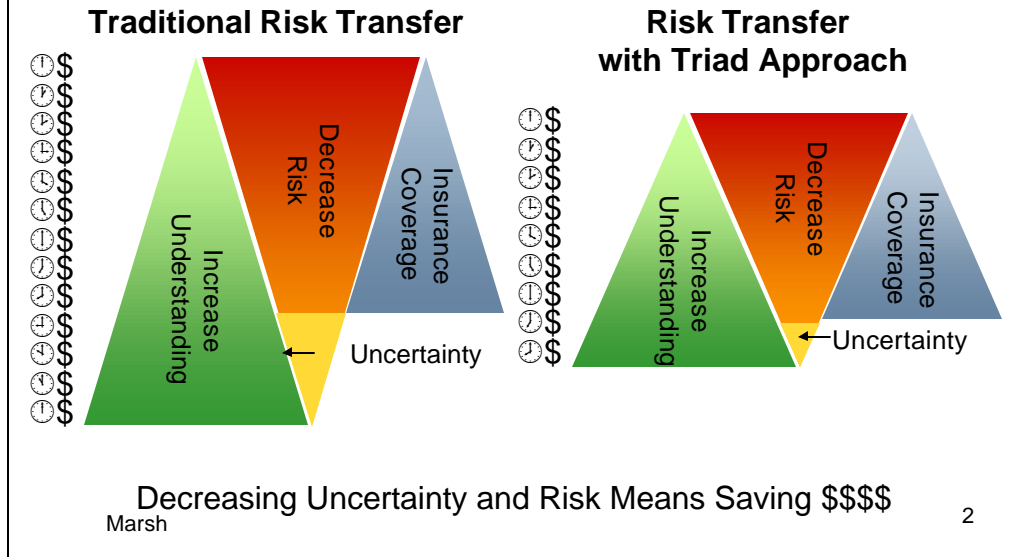# MARSH

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Reducing Uncertainty in Brownfields Transactions
Using a Combination of Triad, Risk Quantification, and Environmental Insurance

Jim Mack, New Jersey Institute of Technology
Bryn Woll, Marsh
Jim Vetter, Marsh

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Why Reduce Uncertainty?
Improved Information Reduces Uncertainty

Traditional Risk Transfer

Increase Understanding

Decrease Risk

Insurance Coverage

← Uncertainty

Risk Transfer with Triad Approach

Increase Understanding

Decrease Risk

Insurance Coverage

← Uncertainty

Decreasing Uncertainty and Risk Means Saving $$$$

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We're going to talk about how to reduce uncertainty in Brownfields transactions. The picture on the left represents the traditional risk transfer approach. At Time Zero you have zero understanding of a site, a large amount of risk associated with that site, and, therefore, no insurance coverage is available. As you continue through time and spend money, you increase your understanding, decrease your risk, and increase the available coverage.

The yellow triangle represents uncertainty about the site. No matter how much you spend in terms of time and money, you can never completely eliminate risk and will have to retain a certain amount. The ultimate goal is to implement activities that will make the picture on the left look like the picture on the right. We are going to introduce one method of reducing the time and money expended to reach the same or smaller levels of the residual uncertainty, or to look more like the figure on the right. We propose to do this using the Triad Approach to site characterisation.

Triad Approach for Brownfields

Field Analytical Methods (FAMs) coupled with **Judgmental Sampling**, or dynamic & infield decision making, allows **Higher Sample Density** & **Increased Sampling Accuracy**, resulting in more precision, which **Reduces Uncertainty**.
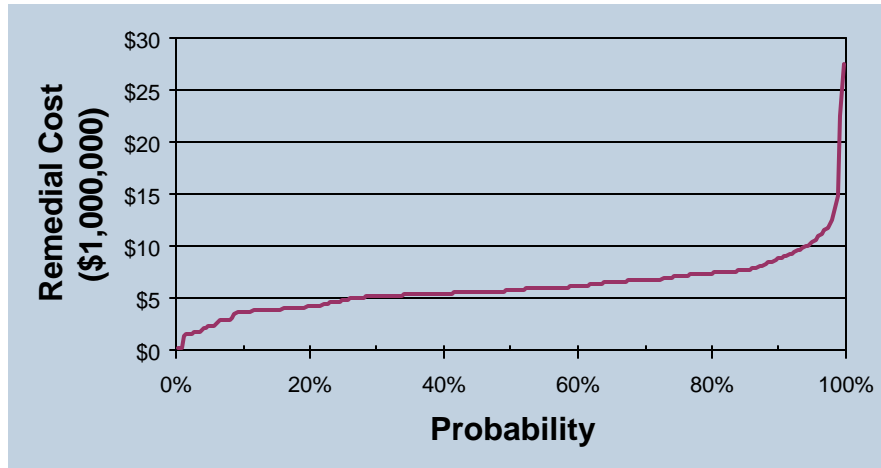
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First, let's define what the Triad Approach is. It's the combination of three elements:

1. Systematic planning to articulate clear project goals.

2. A dynamic work plan that allows for real-time decisions.

3. Field analytical methods that provide real-time data to aid in decision making.

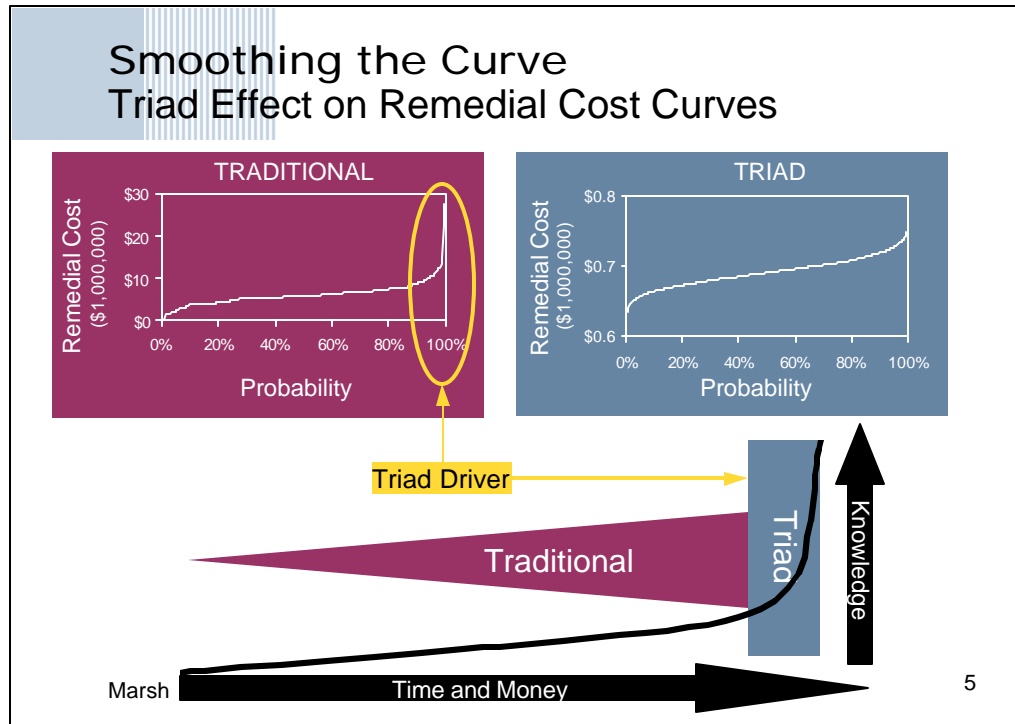These three pieces combine to provide a high quality data set that reduces overall uncertainty.

It is important to reduce uncertainty because uncertainty is expensive. This curve is what we call a Remedial Cost Probability Curve. It shows the probability that the cost to remediate a site will be X dollars or below. For example, this curve says that there is an 80% chance that this site will be remediated for $7.5 MM or less.

Marsh has a process that we call Peer Review[SM] to create this curve. The process compiles the available information and data about a site. An Expert Panel analyses the information using decision tree analysis,and the outcome of the analysis is the Remedial Cost Probability Curve like the one shown on the slide. Peer Review is a great way to digest and present a site for risk transfer purposes.

It is important to understand a little about how to read the Remedial Cost Probability Curve for our discussion today. The shape and the magnitude of this curve is what drives available insurance coverage. A rapid change in slope or steep slope indicates an area of uncertainty. In this example, which is the curve for the case study we'll discuss in a moment, the insurance carriers would probably look to provide coverage above or in the middle of the large spike at the end of the curve. This spike represents about 10% of the total curve and peaks at around $27.5 MM.

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Smoothing the Curve
Triad Effect on Remedial Cost Curves

TRADITIONAL

Remedial Cost ($1,000,000)

$30, $20, $10, $0

Probability: 0%, 20%, 40%, 60%, 80%, 100%

TRIAD

Remedial Cost ($1,000,000)

$0.8, $0.7, $0.6

Probability: 0%, 20%, 40%, 60%, 80%, 100%

Triad Driver

Traditional

Triad

Knowledge

Marsh — Time and Money

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The red curve is the one we were just looking at. It was derived using the traditional phased approach to the site investigation -- spending lots of time and money to obtain enough information to create a feasibility study.

The yellow circles an area of uncertainty that will limit the insurance coverage and other risk transfer options. The curve indicates that additional analysis of this area will be beneficial to the client. We have termed the circled spike as the "Triad Driver" because the Triad Approach was used to further refine the site information.

Triad Approach provided a large amount of quality data in a short amount of time to create a curve that is smooth (or shows no rapid slope changes) and much smaller in magnitude. The blue curve shows the results of the Peer Review process after the Triad data was incorporated into the decision tree analysis. The two curves show how increased knowledge reduces uncertainty. We'll look at the case study that these two curves describe to see how decreased uncertainty can lead to improved insurance coverage and risk transfer options.

Case Study

Albert Steel Drum Site
Newark, New Jersey

Albert Steel Drum Site
Case Study

Industrial Clean Property Valued at $4.5 - $5 Million

- 13 Acres in Newark, New Jersey

- 25 Year History of Investigation
  - Initial Analysis Produced Large Uncertainty

- Triad Approach Used to Define "Hot-Spots"
  - Triad Analysis Significantly Reduced Uncertainty
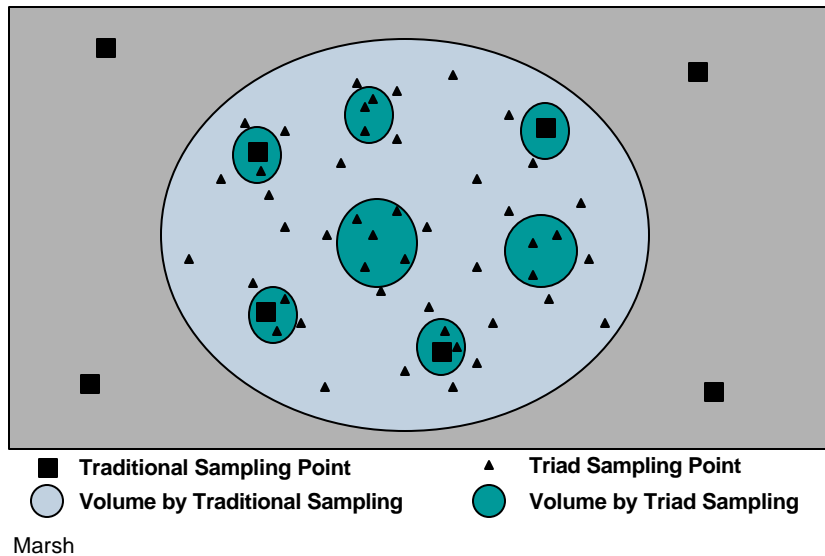
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The Albert Steel Drum site is a 13-acre property in Newark, NJ. It is valued at $4.5 - $5 MM once it is industrial clean.

It has undergone 25 years of investigation that produced a Feasibility Study. The F.S. offered a number of remedial options for an uncertain amount and quality of contaminated soil and groundwater. In other words, the F.S. presented a large amount of uncertainty.

In the past year, the Triad Approach was employed at the site. Now the remedial estimates are much more certain because of accurate estimates of soil volumes and an approved remedial action.

Albert Steel Drum Site
Contamination Schematic

Traditional Sampling Point   Triad Sampling Point
Volume by Traditional Sampling   Volume by Triad Sampling
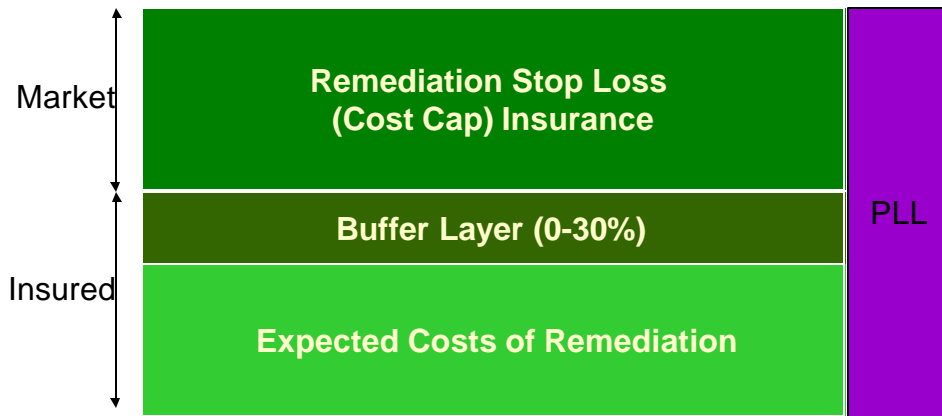
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This is a schematic of the site. The large grey box represents the entire site. The black squares represent the samples collected using traditional sampling methods in the 25 years of investigation. The grey circle represents the estimated volume of contaminated soil based on the 25 years of investigation.

In the past year, the triangles, which are the Triad sampling locations, were collected. The blue circles represent the volume of contaminated soil based on the Triad results.

It is clear that the Triad Approach greatly reduced the volume of soil to be remediated by more precisely delineating the contamination and more accurately identifying the contaminants. Again, to relate this back to the Remedial Cost Probability Curves we looked at before, the red curve with the spike at the end represents the grey circle, or the site situation after the 25 years of traditional site investigation. The smooth, blue curve represents the green circles, or the site situation after the Triad data was collected.

Insurance Programs
Integrated Program Structure

Market

Insured

Remediation Stop Loss (Cost Cap) Insurance

Buffer Layer (0-30%)

Expected Costs of Remediation

PLL

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Jim Vetter of Marsh desk quoted insurance premiums and terms of coverage based on the two Remedial Cost Probability Curves. Before we look at the the desk quotes, I would like to make sure everyone understands how the insurance works.

The green section shows how a Cost Cap or Remediation Stop Loss policy works. These policies protect the insured, in this case the site owner, from major cost overruns on remediating known contamination on a site. The policy is written around a defined scope of work. The site owner retains responsibility for paying the expected cost of remediation as well as a buffer layer of between 10% and 30% of the expected remediation costs. The insurance will cover cost overruns above the expected costs of remediation and the buffer layer.

The purple bar on the right represents the Pollution Legal Liability coverage. This coverage sits beside a Cost Cap policy to protect the insured against liability issues and unknown contamination conditions. The terms of the a PLL policy are sensitive to site use history, environmental management, surrounding land use, among other things.

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Albert Steel Drum Site
The Numbers

	Incremental Investigation Cost	Remedial Expense	Remediation Stop Loss (Cost Cap) in millions		
			Premium	Attach Pt. & Limit	Term (Years)
Traditional Sampling	$400,000	$14.35 MM (98% Certainty)	$1.58 - $1.89	$15.79	10
Triad Sampling	$30,000	$0.76 MM (95% Certainty)	$0.08 - $0.10	$0.84	10
Delta	$370,000	$13.59 MM	$1.5 – $1.79	$14.95	0
Pollution Legal Liability Coverage	$0.24 MM Premium $0.10 MM Deductible		$15 MM Limit 10 Year Term		

NOTE: Triad investigation costs would have been more substantial without the traditional investigation. However, if the entire investigation process had been a Triad process, total investigation costs may have been less than $430,000.

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Let's take a look at the desk quotes for the insurance products so you can get a sense of the magnitude of the savings won by employing Triad.

The three columns on the right show the terms for the Cost Cap coverage. The grey row on the bottom shows the terms for the Pollution Legal Liability coverage. The Incremental Investigation Cost shows the costs for the investigation work that was completed during the 25 years of traditional sampling (1st row) and the last year using the Triad Approach (2nd row). The Remedial Expense is taken from the Remedial Cost Probability Curves we saw earlier at the cumulative probability noted below each dollar value.

The row labelled "Delta" highlights the difference in the Cost Cap terms based on the two different sampling approaches. Because of the reduced uncertainty, the Cost Cap insurance coverage went from the site owner retaining $15.8 mm to the site owner retaining $.84 mm of the liability. (Remember, this retained liability is the expected cost of remediation and a 10% buffer.) The limits of cover are 1 times the attachment point. The premium went from above $1.5 MM to less than $100,000.

Remember the site we are discussing is valued at $4.5 - $5 MM. So, by employing the Triad Approach, the uncertainty associated with the site was substantially reduced, insurance coverage became reasonable, and the redevelopment of the property became potentially profitable.

Contact Information

Brownfields 2002 Conference
Authors of *Reducing Uncertainty in Brownfields Transactions*

Contact Information

Jim Mack
New Jersey Institute of
  Technology
138 Warren Street
Newark, NJ 07102
Phone: 973.596.5857
mack@adm.njit.edu

Bryn Woll
Marsh
44 Whippany Road
PO Box 1966
Morristown, NJ 07962
Phone: 973.401.5275
bryn.woll@marsh.com

Jim Vetter
Marsh
Two Logan Square
Philadelphia, PA 19103
Phone: 215.246.1046
james.vetter@marsh.com

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