MANAGING EXTREMES

Willis Re

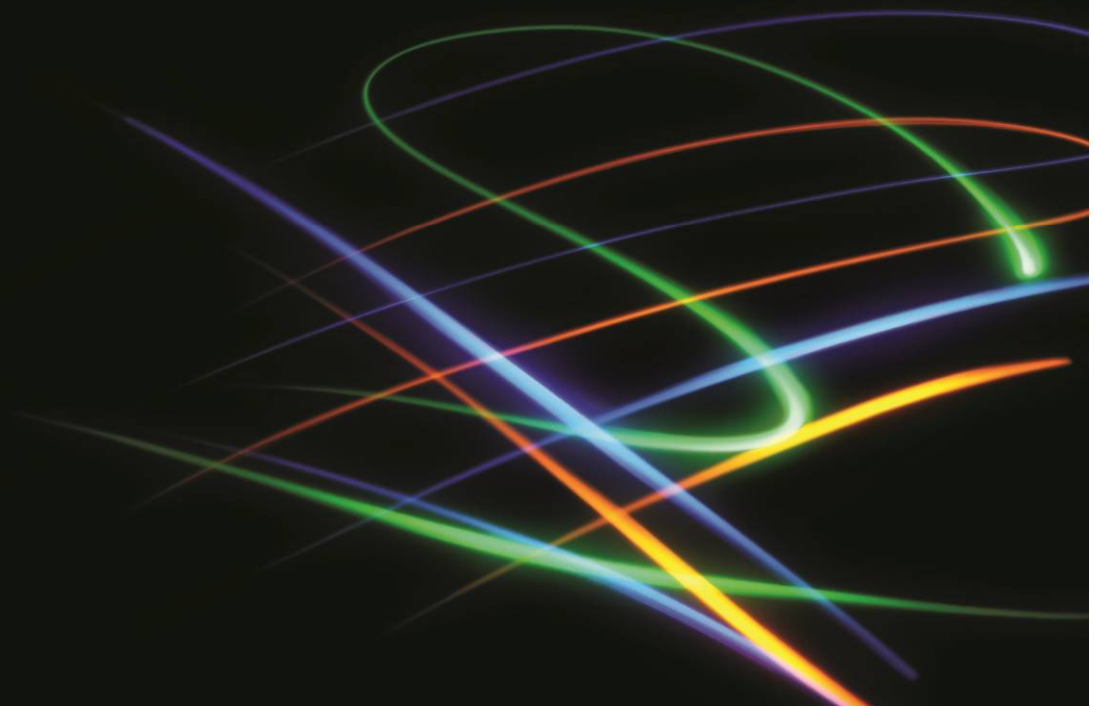
CARGO PORT ACCUMULATION

CAS CARe Seminar on Reinsurance

June 2013

WHAT IS MARINE CARGO INSURANCE?

Willis Re MANAGING EXTREMES



Cargo insurance basics

- One of the oldest forms of insurance
- Coverage
  - Generally purchased by the **shipper** (seller / exporter)
  - Attaches upon releasing goods to a cargo **carrier**
  - Covers goods until they reach the **receiver** (buyer / importer)
- Does not have to involve water to be “marine”
- Cat exposed
- Typical non-cat perils: Fire, theft, water damage, mishandling

Transit & warehouse coverage

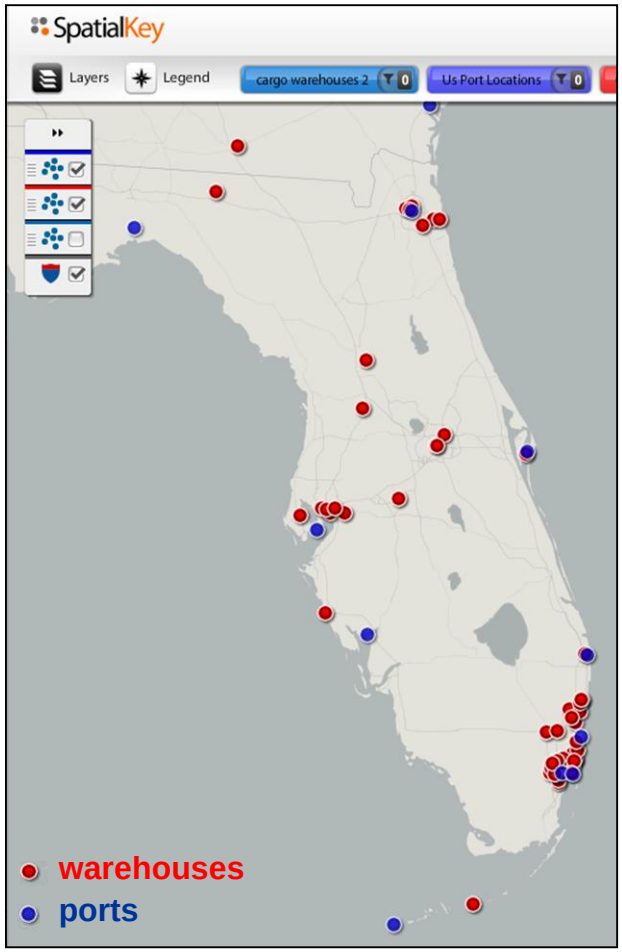
- Transit
  - Covers goods until they reach receiver or an insured warehouse
- Warehouse
  - Covers cargo while held at specified warehouse locations
  - Separate limit specified for each warehouse
- A typical large insured will have **one** transit limit and **multiple** different warehouse limits
- Smaller insureds may only have a transit policy

Common data issues

- Data is usually sub-standard
- Transit and Warehouse limits are blanket limits
  - Actual cargo exposure at any given time is usually less than the policy limit specified
- Be careful as to how you interpret summarized policy limit data
  - Is it the largest limit for each policy?
  - Average limit?
  - How are transit vs warehouse coverages represented?
- Low to medium severity first loss scales for non-cat exposure rating

Warehouse cat exposure

- Modeled peril
- Warehouse locations and limits are typically provided via an EDM
- An assumption must be made about estimated TIV relative to warehouse limit
  - Typically 50-70%
- Warehouses are often clustered around seaports and airports
  - Significant exposure to hurricanes and earthquakes



Vessel accumulation

- A single container vessel can carry over 10,000 TEUs of containerized cargo
  - Vessel capacity is growing, which produces more concentration risk
- Insurer cannot limit number of insured shipments onboard a single vessel
  - Limits are set per insured
  - No way to monitor actual accumulations
- Unmodeled risk – Not driven by modeled cat perils

Port accumulation

- Typically an unmodeled peril
- Port accumulation is the main transit cat exposure
  - Not captured in EDM
- Accumulated values can be very significant
  - Cargo can remain in port for days
- Exposure is highly uncertain
- Damageability is tough to predict

- Exposed to hurricanes, earthquakes, tsunamis, hail, terrorism

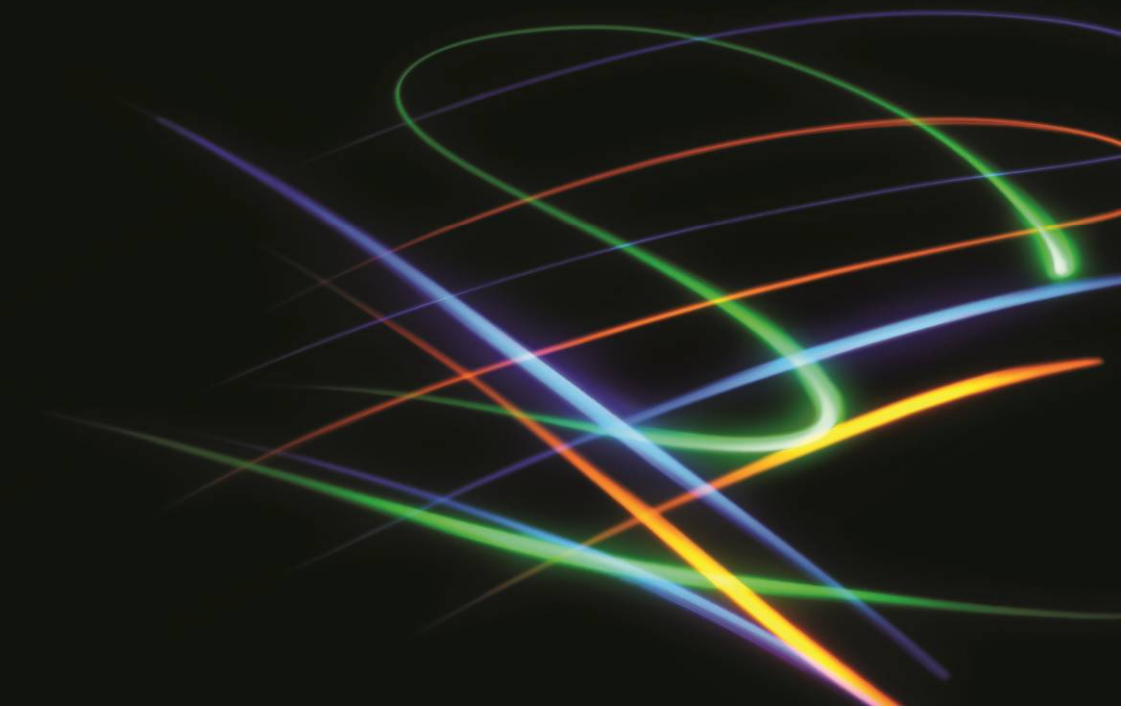
Challenges with port accumulation modeling

- Exposure
  - No access to timely shipment information
  - How clustered are an insured's shipments?
  - What ports might the cargo travel through?
  - Which of your other insureds might have cargo at that same port at the same time?
  - Seasonality of exposures
  - **Must rely on estimation**
- Damageability
  - Diverse types of cargo
  - How will containerized cargo hold up in an Earthquake?
  - Limited historical events to back test

HOW DO WE MODEL PORT ACCUMULATION?

Willis Re

MANAGING EXTREMES

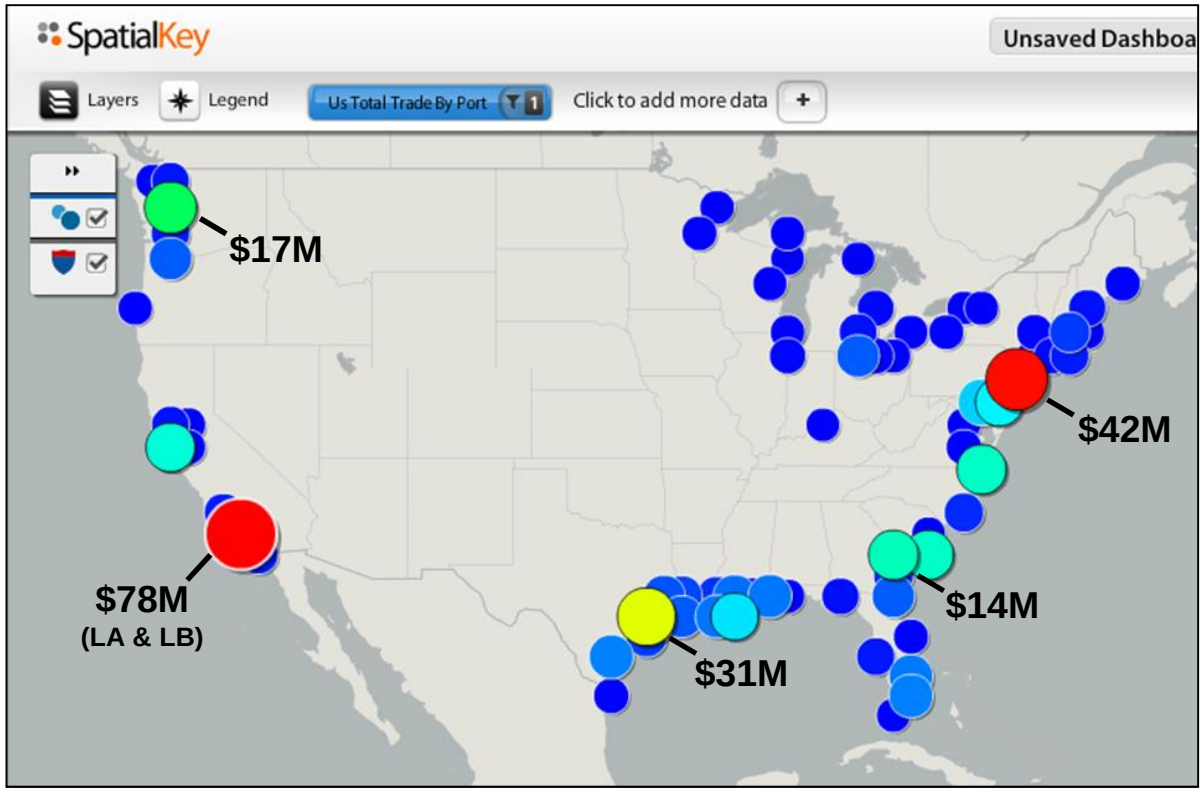


Market share:
A basic top-down approach

General Method	Port of Los Angeles Example
• Start with data on cargo flow by port (publicly available)	• $284B per year
• Calculate average daily flow for each port [A]	• $780M per day
• Make an assumption about average # of days in port for typical cargo [B] (generally 3-5 days)	• 3 days
• A * B = Average industry accumulation	• $2.3B accumulated TIV
• Research insurer's cargo market share [C]	• 2.5%
• A * B * C = Average insurer accumulation	• $58M accumulated TIV

Market share:
A basic top-down approach

- Method can be repeated for ports across the US and internationally
- An EDM can be produced so cat modeling estimates can be run and correlated with warehouse exposure
- Distribution of exposure will mimic industry exposure



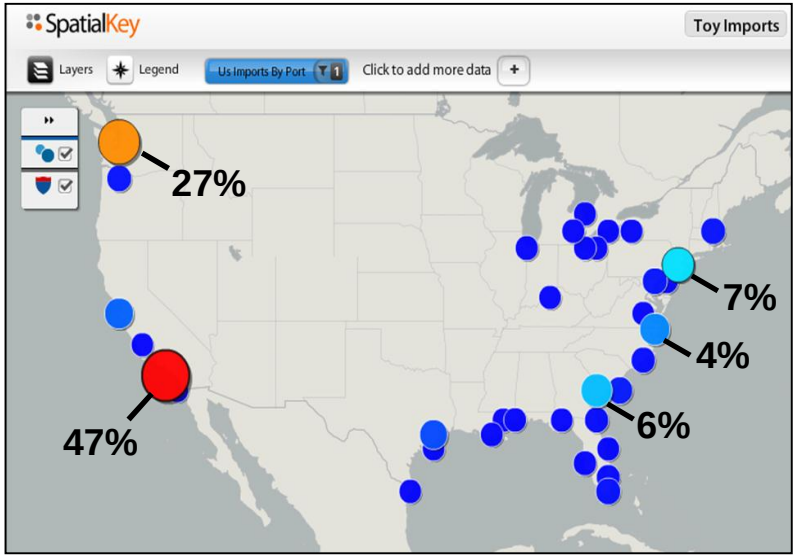
Beyond market share: A more refined model

- Goal: To reflect how an insurer's exposure may differ from the industry average
- Utilize insurer's data to refine model
  - Types of goods shipped by insureds
  - Locations of warehouses
  - Locations of insureds

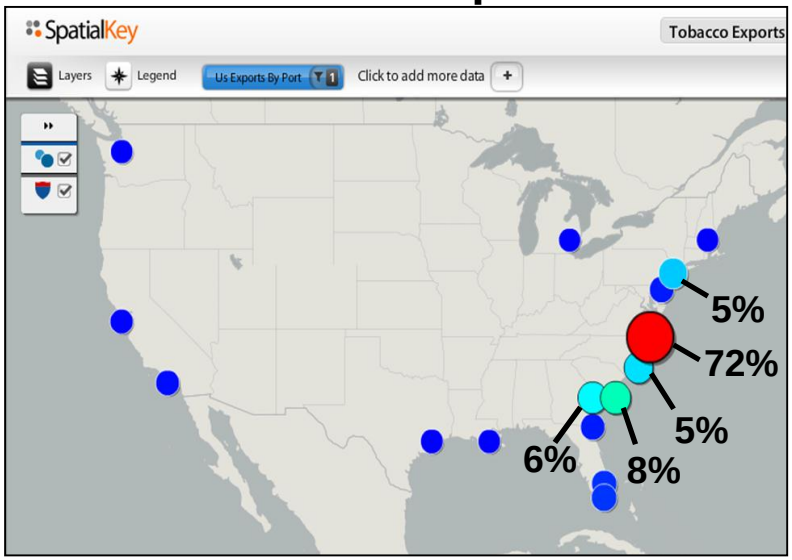
Refinement 1: Commodity flows

- Identify main commodity shipped by each insured
- Map commodities to Harmonized System (HS) taxonomy
- Cargo flows by HS code by port are publically available

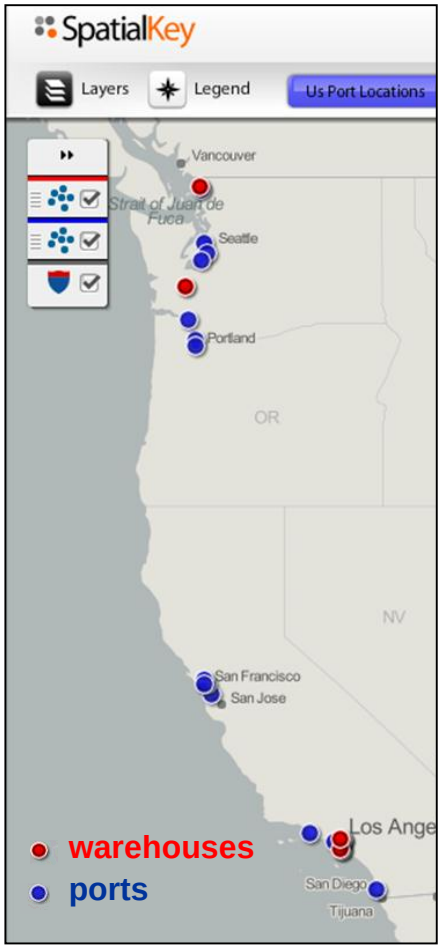
Toy Imports



Tobacco Exports



Refinement 2:
Locations of warehouses



- Look up locations of warehouses for insureds
- Map insureds' exposure to ports in vicinity of warehouses
  - Take into account proximity and size of port
- Can only be used for insureds who purchase warehouse coverage

Refinement 3:
Locations of insureds

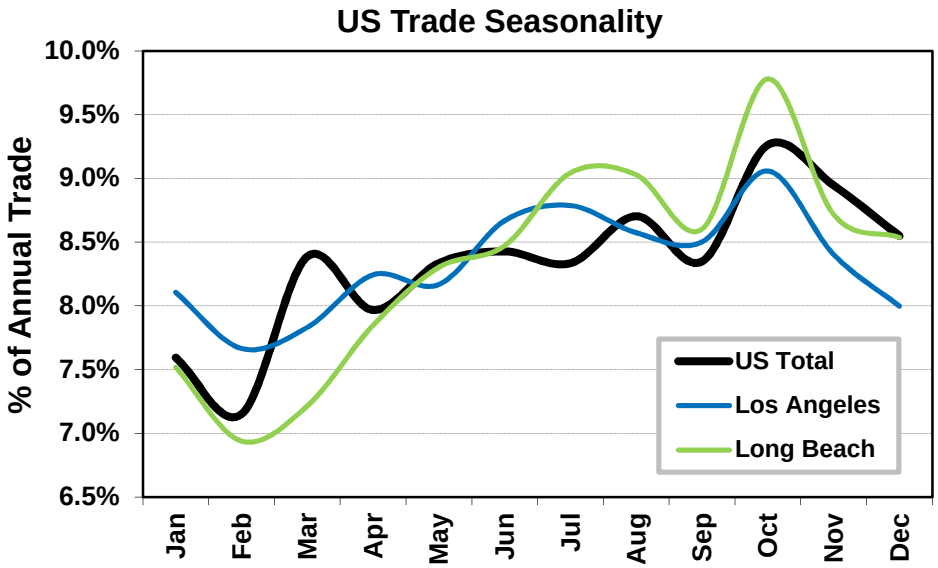
- Location of insured business can also be used to estimate ports utilized
- Only appropriate for smaller insureds
  - More localized operations
- Cargo is likely to travel through nearby ports
- Assign exposure based on port proximity and throughput

Results of refined method

- Recommended methodology
  - Location of insureds (for small risks)
  - Location of warehouses (for risks with warehouse coverage)
  - Commodity flows (for all other)
- Approach tailors estimated exposure to insurer's portfolio
  - Takes into account geographic / commodity specialization
  - We have seen changes up to +/- 50% at major ports using this revised method
  - Can significantly alter PMLs

Caveats

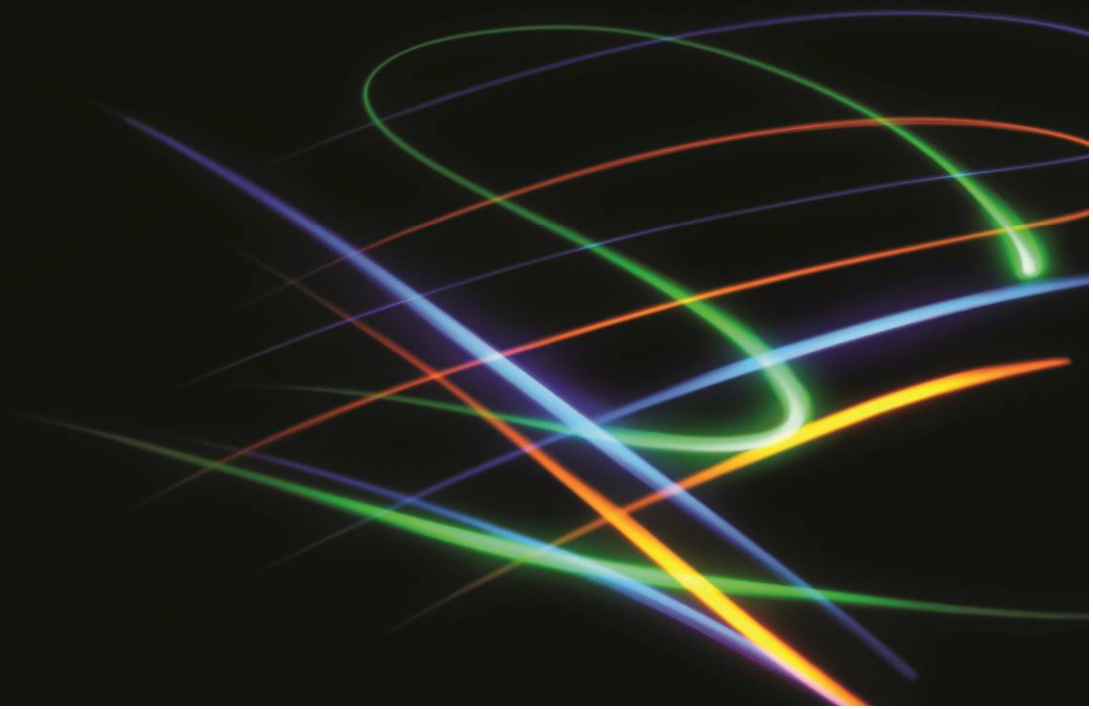
- Exposures are not constant throughout the year
  - Peak in the fall leading up to holiday season
  - Seasonality will vary by port
- PMLs will be understated
  - Exposures are inherently stochastic, shipments are sporadic
  - Significant uncertainty in damageability estimates



WHAT DID WE LEARN FROM SANDY?

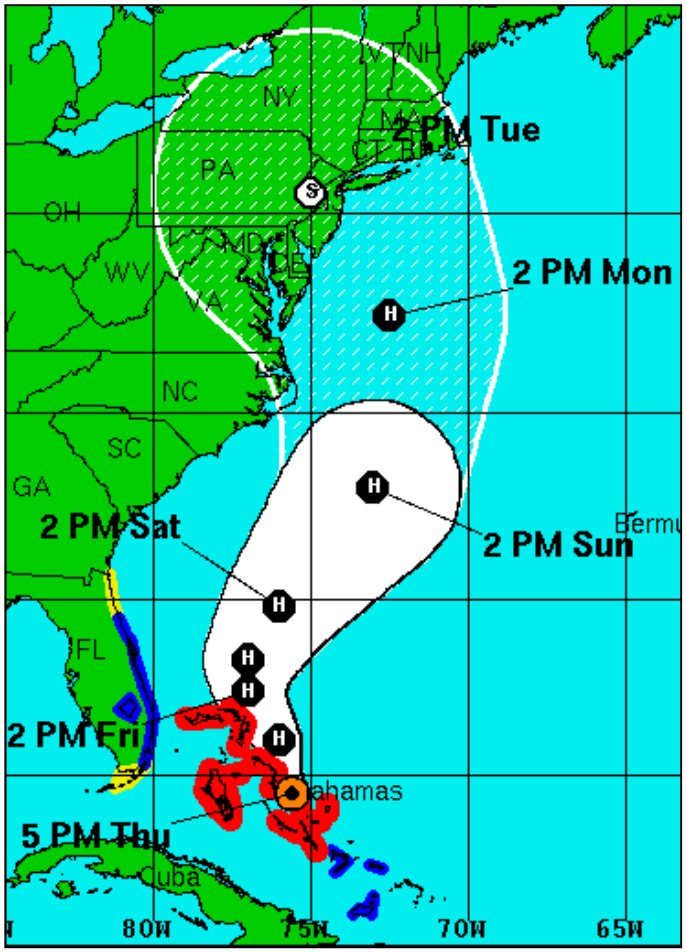
Willis Re MANAGING EXTREMES

Port of Newark Retrospective



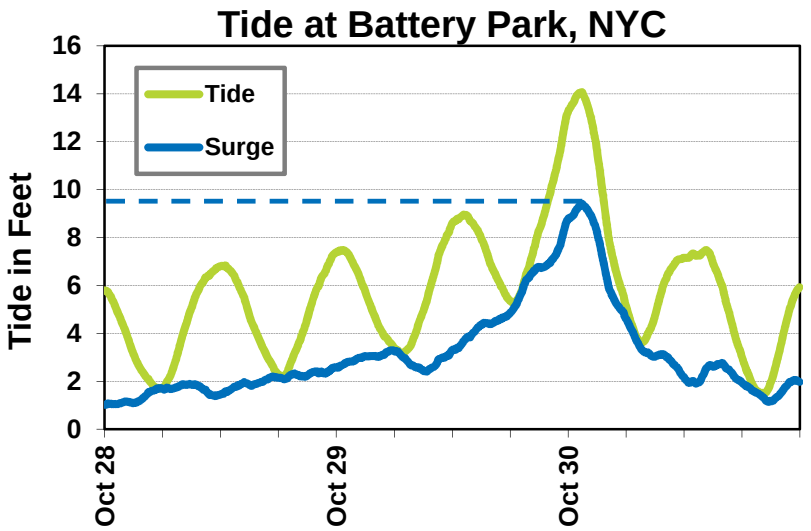
Superstorm Sandy

- $2.5B - $3B of insured ocean marine losses (IUMI)
- Impressively accurate forecast
  - NJ landfall predicted 4 days in advance
- Theory: Port will be relatively empty before a hurricane
- Reality: Terminal operators continued to receive shipments up until Coast Guard closed the port

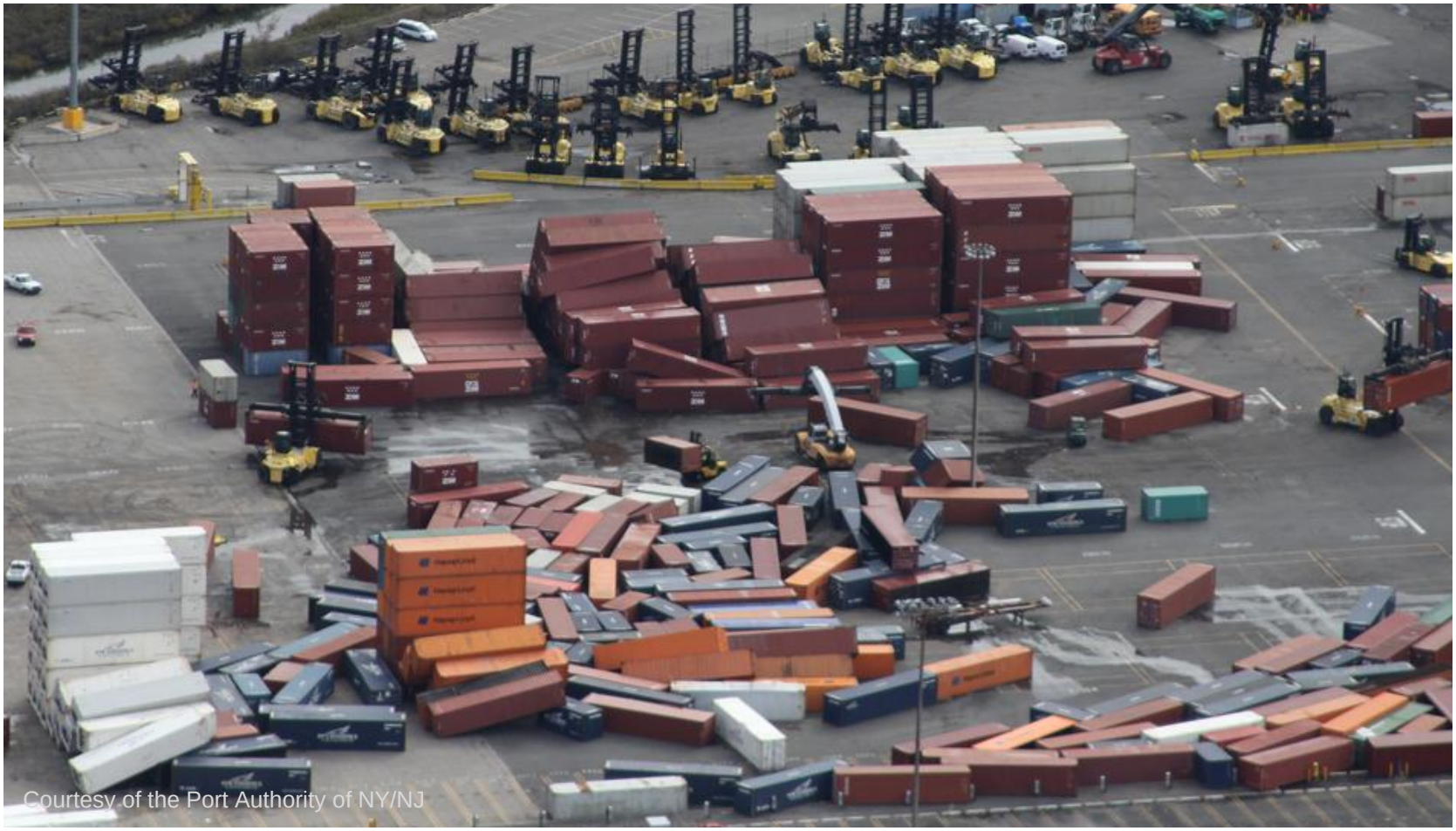


Sandy winds vs surge

- Relatively benign winds - borderline cat 1
- Storm surge was massive - more typical of a cat 3 storm
  - Compounded with landfall at high tide
- Old definitions from NHC (surge guidance retired in 2010)
  - Cat 1: 4-5 foot surge
  - Cat 3: 9-12 foot surge
- Port of Newark had prepared for a wind event
  - Unstacked all loaded containers ahead of landfall



Containerized cargo damage



Auto losses

Infrastructure damage

$16M beer & liquor loss

Legal disclaimer

- This analysis has been prepared by Willis Limited and/or Willis Re Inc ("Willis Re") on condition that it shall be treated as strictly confidential and shall not be communicated in whole, in part, or in summary to any third party without written consent from Willis Re.
- Willis Re has relied upon data from public and/or other sources when preparing this analysis. No attempt has been made to verify independently the accuracy of this data. Willis Re does not represent or otherwise guarantee the accuracy or completeness of such data nor assume responsibility for the result of any error or omission in the data or other materials gathered from any source in the preparation of this analysis. Willis Re, its parent companies, sister companies, subsidiaries and affiliates (hereinafter "Willis") shall have no liability in connection with any results, including, without limitation, those arising from based upon or in connection with errors, omissions, inaccuracies, or inadequacies associated with the data or arising from, based upon or in connection with any methodologies used or applied by Willis Re in producing this analysis or any results contained herein. Willis expressly disclaims any and all liability arising from, based upon or in connection with this analysis. Willis assumes no duty in contract, tort or otherwise to any party arising from, based upon or in connection with this analysis, and no party should expect Willis to owe it any such duty.
- There are many uncertainties inherent in this analysis including, but not limited to, issues such as limitations in the available data, reliance on client data and outside data sources, the underlying volatility of loss and other random processes, uncertainties that characterize the application of professional judgment in estimates and assumptions, etc. Ultimate losses, liabilities and claims depend upon future contingent events, including but not limited to unanticipated changes in inflation, laws, and regulations. As a result of these uncertainties, the actual outcomes could vary significantly from Willis Re's estimates in either direction. Willis makes no representation about and does not guarantee the outcome, results, success, or profitability of any insurance or reinsurance program or venture, whether or not the analyses or conclusions contained herein apply to such program or venture.
- Willis does not recommend making decisions based solely on the information contained in this analysis. Rather, this analysis should be viewed as a supplement to other information, including specific business practice, claims experience, and financial situation. Independent professional advisors should be consulted with respect to the issues and conclusions presented herein and their possible application. Willis makes no representation or warranty as to the accuracy or completeness of this document and its contents.
- This analysis is not intended to be a complete actuarial communication, and as such is not intended to be relied upon. A complete communication can be provided upon request. Willis Re actuaries are available to answer questions about this analysis.
- Willis does not provide legal, accounting, or tax advice. This analysis does not constitute, is not intended to provide, and should not be construed as such advice. Qualified advisers should be consulted in these areas.
- Willis makes no representation, does not guarantee and assumes no liability for the accuracy or completeness of, or any results obtained by application of, this analysis and conclusions provided herein.
- Where data is supplied by way of CD or other electronic format, Willis accepts no liability for any loss or damage caused to the Recipient directly or indirectly through use of any such CD or other electronic format, even where caused by negligence. Without limitation, Willis shall not be liable for: loss or corruption of data, damage to any computer or communications system, indirect or consequential losses. The Recipient should take proper precautions to prevent loss or damage – including the use of a virus checker.
- This limitation of liability does not apply to losses or damage caused by death, personal injury, dishonesty or any other liability which cannot be excluded by law.
- Acceptance of this document shall be deemed agreement to the above.