Risk Assessment, Management, and Mitigation for Port and Marine Terminals Projects

PRESENTERS:
Kat Janowicz, 3COTECH, Inc.
John Pauling, CARDNO (absent)

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Topics

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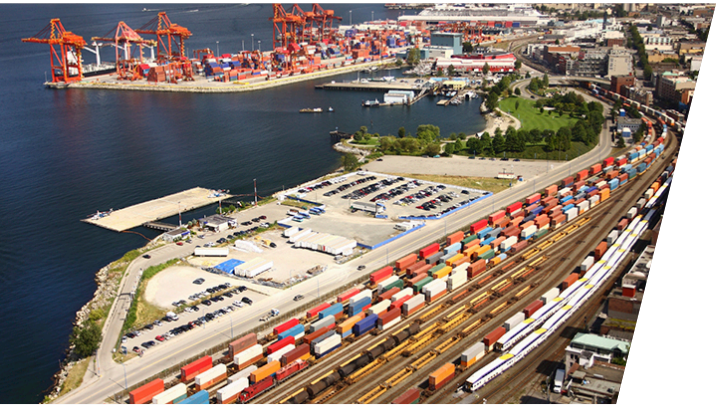
01 Overview of Risk Management and Asset Management Services

01 Risk management can

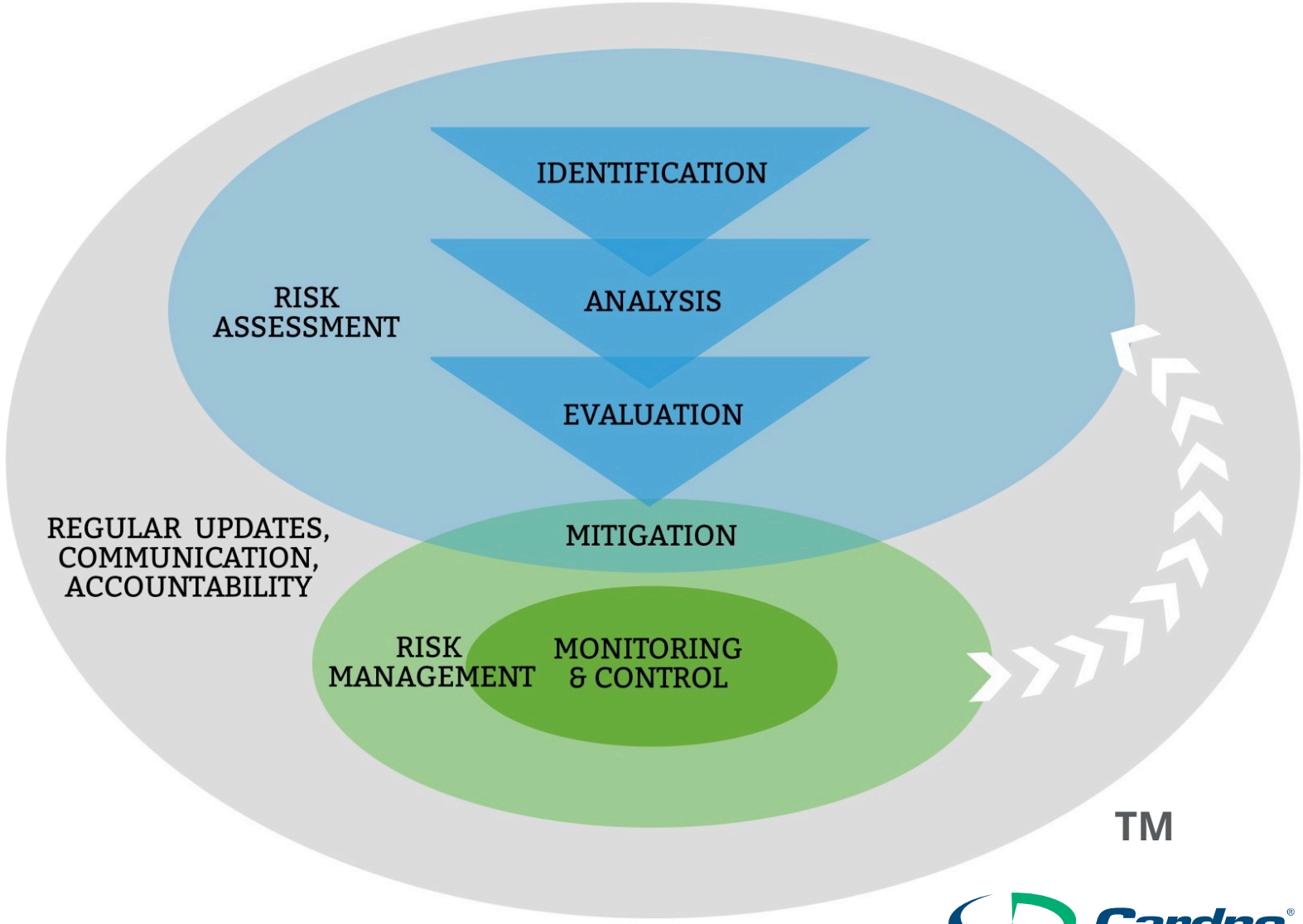
- Resolve challenges
- Reduce risk exposure
- Engage stakeholders
- Save time and money
- Give management a basis for allocating resources

01 Types of Risks (uncertainties):



- Technical (Engineering)
- Assets / Procurement
- Commercial / Financial / Contractual
- Security
- Environmental / Community
- Safety & Health

Risk Assessment and Management Process



02 Case Study:

Port of Long Beach

02 Port of Long Beach

Policy Level

Drafting a Risk Assessment Manual for Project Managers

Program Level

Assessing risks and building tools for the $500M Middle Harbor Redevelopment Program Phase 2

Project Level

Providing risk-adjusted budget contingency estimates through a quantitative risk assessment process

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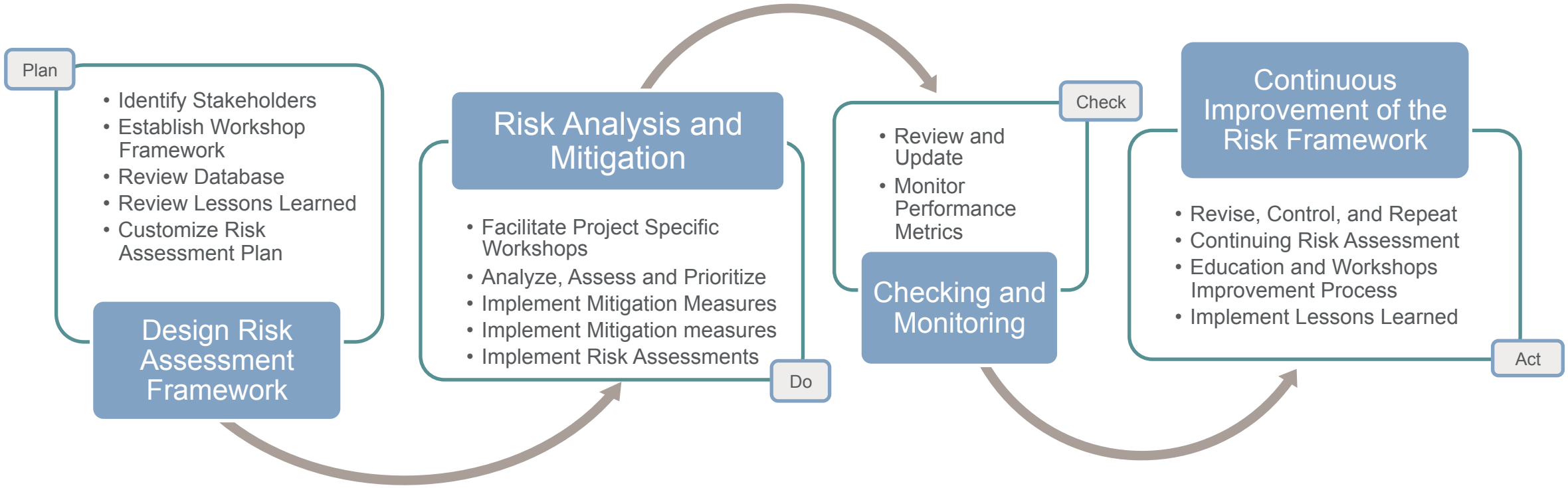
02 Port of Long Beach: Risk Process Overview



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02 Port of Long Beach: Program Level

Middle Harbor Terminal Redevelopment Program

- Review the aggregate risk outcome variability for a contingency budget and schedule estimate
- Determine action items in the form of risk treatments
- Develop tools than could be used to monitor risks and treatments for individual projects under the program

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02 Port of Long Beach: Project Level

- Preliminary Planning and Meetings with PM & Staff
- Risk workshop with Stakeholders to Identify Risks
- Analysis and Evaluation of Identified Risks
- Development of Risk Register
- Monte Carlo Simulation
- Reporting and Accountability
- Ongoing Monitoring and Treatment

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02 Likelihood & Consequence Scale

Likelihood				
E	**D**	**C**	**B**	**A**
Rare	**Unlikely**	**Moderate**	**Likely**	**Almost Certain**
Highly unlikely to occur on this project	Given current practices and procedures, this incident is unlikely to occur on this project	Incident has occurred on a similar project	Incident is likely to occur on this project	Incident is very likely to occur on this project, possibly several times
OR				
5% chance of occurring	20% chance of occurring	50% chance of occurring	80% chance of occurring	95% chance of occurring

	Consequence				
	1 - Insignificant	**2 - Minor**	**3 - Moderate**	**4 - Major**	**5 - Catastrophic**
Safety and Health	First Aid Case	Minor Injury, Medical Treatment Case with/or Restricted Work Case	Serious injury or Lost Work Case	Major or Multiple Injuries permanent injury or disability	Single or Multiple Fatalities
Environment	No impact on baseline environment. Localized to point source. No recovery required	Localized within site boundaries. Recovery measurable within 1 month of impact	Moderate harm with possible wider effect. Recovery in 1 year	Significant harm with local effect. Recovery longer than 1 year.	Significant harm with widespread effect. Recovery longer than 1 year. Limited prospect of full recovery
Financial	< $50k	$50k - $200k	$200k - $1m	$1m - $5m	> $5m
Schedule	< 3 days	3 days - 1 month	1 - 3 months	3 - 6 months	> 6 months
Reputation	Localized temporary impact	Localized, short term impact	Localized, long term impact but manageable	Localized, long term impact with unmanageable outcomes	Long term regional impact
Business Impact	Impact can be absorbed through normal activity	An adverse event which can be absorbed with some management effort	A serious event which requires additional management effort	A critical event which requires extraordinary management effort	Disaster with potential to lead to collapse of the project

02 Port of Long Beach: Project Level Risk Register Input

Number	Rank	Initiator	Risk Description	Risk Consequence (including schedule/cost impacts)	Category	Phase	Existing Controls	Risk Severity Before Treatment				
									Consequence		Likelihood	Risk Level Before Treatment
2	3	AB	Known and unknown pile obstructions resulting in pile damage	$1M / 1 month	Piling	Construction	Strict contractor's prequalification process; additional piling in material requisition as contingency	4	Major	B	Likely	***Extreme***

Information shown here does not reflect actual project risk data

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02 Port of Long Beach: Project Level Risk Register Input (cont.)

Risk Treatment Plan	Ability to Influence	Action Plan Type	Risk Consequence After Treatment (including schedule / cost impacts)	Risk Severity After Treatment					Responsible Person & Organization	Due Date
					Consequence		Likelihood	Risk Level After Treatment		
Spec requirement	Moderate	Reduce consequence and likelihood	$500K / 14 days	3	Moderate	C	Moderate	*High*	PS	1/1/2015

Information shown here does not reflect actual project risk data

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02 Port of Long Beach: Project Level Risk Register Output

Risk Map Before Treatment

Likelihood			Consequence: Insignificant 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
	A Almost Certain	95%		12	3		
	B Likely	80%			6	1	
	C Moderate	50%	25 26		7 8 9 10 11	2	
	D Unlikely	20%		20 21 22	13 14 15 16 17		
	E Rare	5%	27	23 24		4 5	

Risk Map After Treatment

Likelihood			Consequence: Insignificant 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
	A Almost Certain	95%		3			
	B Likely	80%		12			
	C Moderate	50%	25	6 10 11	2		
	D Unlikely	20%	26	7 15 18 21 22	8 9 13 14 16		
	E Rare	5%	27	20 23 24		1 4 5	

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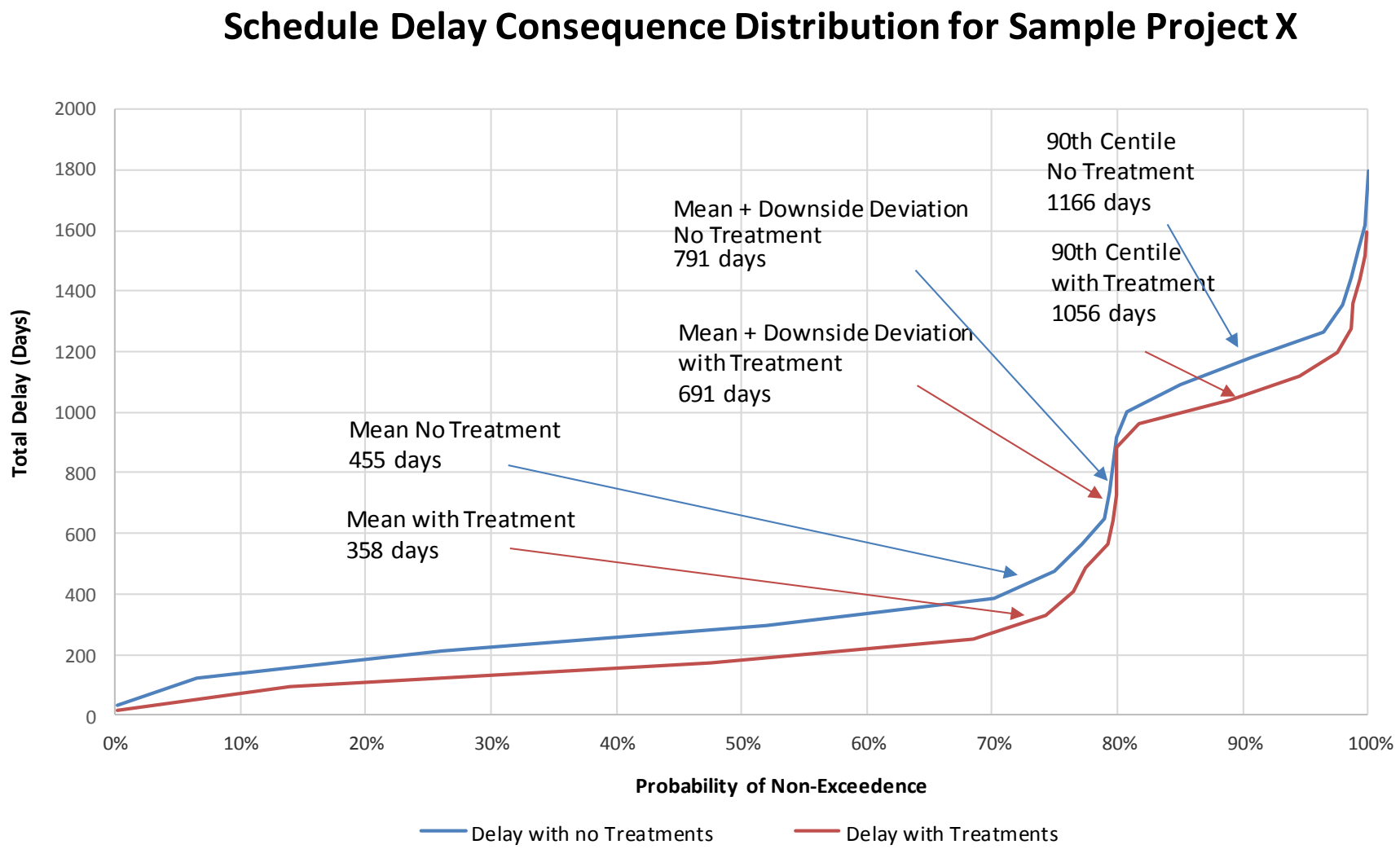
02 Port of Long Beach: Project Level Monte Carlo Analysis



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02 Findings from the Port of Long Beach

- Garbage in, garbage out (GIGO)
- Environmental compliance risks
- Monte Carlo analysis as a basis for adjusted contingency
- Early risk assessment
- Regular risk updates and tracking
- Stakeholder engagement at the right time
- Risk assessment & management process is not static

03 Potential Application of Risk Management for Ports and Marine Terminals

03 Potential Applications Areas for Ports/Terminals

- Asset Management: maintenance versus replacement
- Market analysis and highest/best use of properties
- Non-technical risks associated with stakeholder involvement in executing major projects
- Assessing risks associated with different contracting mechanisms used for procurement
- Evaluating new technologies or plans

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04 About Cardno and 3COTECH

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Cardno Shaping the Future

04 Cardno - A History of Excellence

- Founded in 1945
- A strong reputation throughout our domestic and international operations
- *Engineering News Records* Top Firms Lists
  - #23 Top 500 Design Firms
  - #14 Top 20 Industrial Process/Petroleum Firms
  - #28 Top 200 Environmental Firms
- Environmental Business Journal Award
  - Business Achievement Award for revenue growth, acquisitions, innovative project designs, technology applications, new practice areas, social contributions and industry leadership in 2014

70 YEARS of shaping the future
1945-2015

ENR #23
2015 TOP 500
DESIGN FIRMS

ENGINEERING NEWS RECORD
#14
2015 TOP 20
INDUSTRIAL PROCESS/
PETROLEUM FIRMS

ENGINEERING NEWS RECORD
2014 TOP 200
ENVIRONMENTAL FIRMS
28

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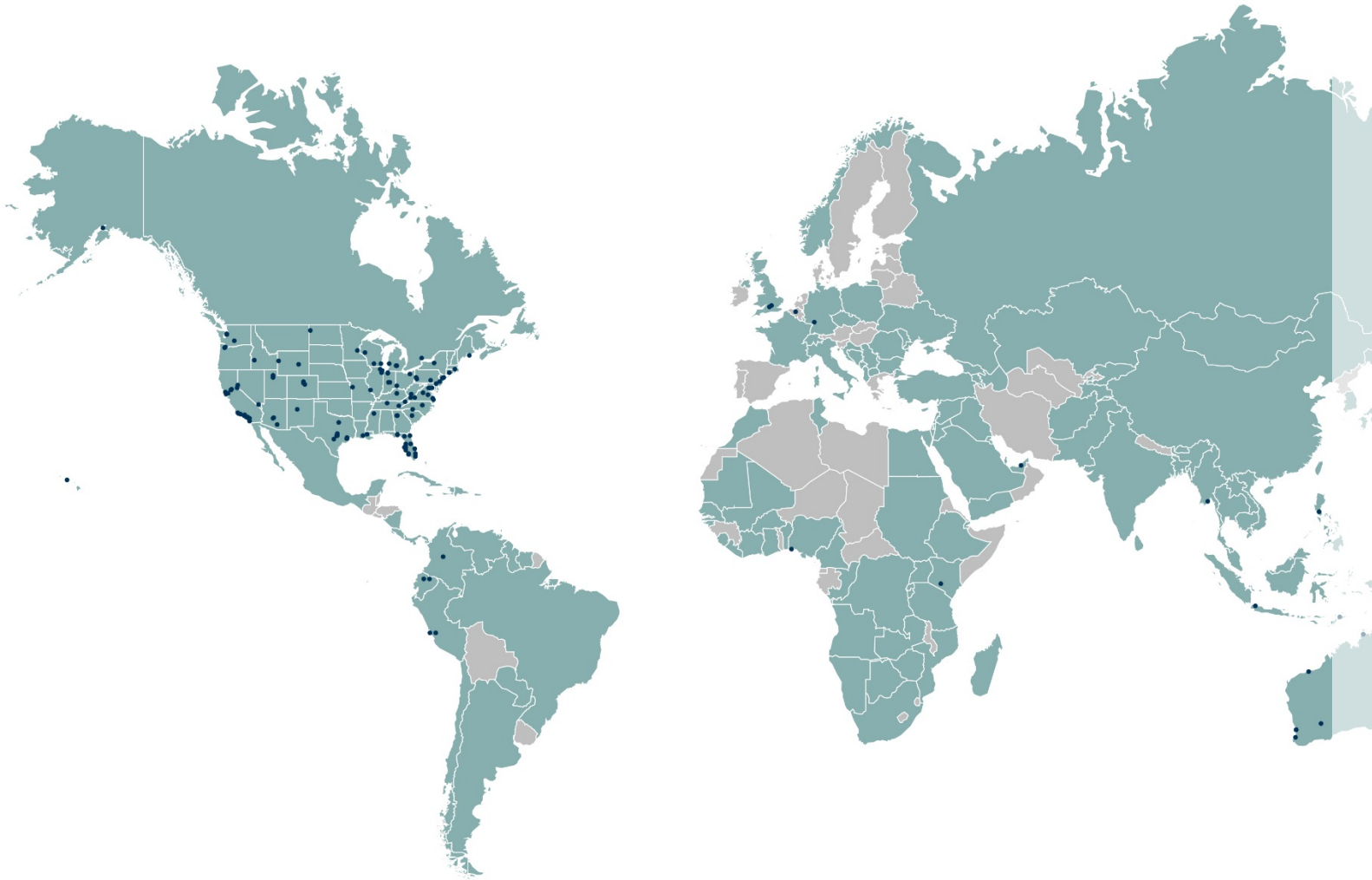
04 Local Expertise, Around the World



GLOBAL	AMERICAS
PEOPLE	PEOPLE
6500+	3500+
OFFICES	OFFICES
200+	150+

GLOBAL PROJECT PRESENCE

Countries Cardno has delivered projects in **100+**

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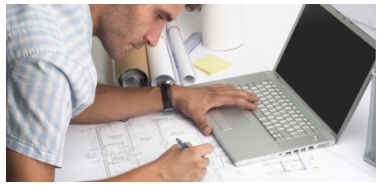
04 The Cardno Advantage - Multidisciplinary expertise, hands-on experience

Integrated Services...

Planning



Engineering

Environmental

Construction Services

across All Market Sectors

Ports & Harbors

Transportation

Buildings & Land

Government

Emerging Markets

Industrial & Water

Mining & Energy

Oil & Gas

Power Generation

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Thank you

Kat Janowicz

kat@3cotech.com

+1 714 478 4434

John Pauling

john.pauling@cardno-gs.com

+1 856 217 7238

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