Integration of Green Technologies into an Existing Terminal

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What is a Green Technology?

noun
noun: **green technology**; plural noun: **green technologies**; noun: **green tech**

technology whose use is intended to mitigate or reverse the effects of human activity on the environment.
"the use of green technology and renewable energy is an integral part of the government's agenda"

Environmental technology (*envirotech*), green technology (*greentech*) or clean technology (*cleantech*) is the application of one or more of environmental science, green chemistry, environmental monitoring and electronic devices to monitor, model and conserve the natural environment and resources, and to curb the negative impacts of human involvement. The term is also used to describe sustainable energy generation technologies such as photovoltaics, wind turbines, bioreactors, etc. Sustainable development is the core of *environmental technologies*. The term *environmental technologies* is also used to describe a class of electronic devices that can promote sustainable management of resources.

All that leads to Sustainable Development

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Green Technologies in Ports Review - 1

	Sustainability objectives	Green Technologies
Air	✓Minimize emissions and GHG ✓Use cleanest energy source ✓Optimize distribution networks	✓Container terminal equipment electrification ✓Cold ironing ✓Marine Highways
Traffic	✓Provide efficient gate operation ✓Grow and optimize intermodal / rail ✓Use faster travel modes	✓Gate OCR, Pedestals, RPMs, Cameras, Weigh-in-Motion Scales, Appointment System ✓Wide span RMGs and automation ✓Hyperloop
Livability	✓Buffer developments ✓Address recreational needs ✓Minimize light & noise	✓Planting trees and vegetation ✓Public open space planning & design ✓LED and Smart lighting

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Green Technologies in Ports Review - 2

	Sustainability objectives	Green Technologies
Water	✓Reduce dredging needs ✓Protect marine habitats ✓Reduce water use ✓Minimize landfill needs	✓Optimize vessel navigation ✓Storm water management ✓Water audits & leak detection ✓Efficient terminal planning and design
Energy	✓Minimize energy use ✓Minimize GHG emissions	✓Energy audits & demand management ✓Solar & wind energy ✓Equipment Electrification & Automation
Material	✓Reuse materials ✓Reduce material CO2 emissions	✓Reuse dredge disposal/demolition and recycled materials ✓Use lower concrete strength, fly ash

Green Technologies in Ports Review - 3

	Sustainability objectives	Green Technologies
Embrace IT	✓24/7 visibility of assets ✓Reduce peaks ✓Reduce dwell times ✓Reduce congestion and on-terminal queues ✓Reduce costs	✓DGPS ✓RFID & AIS tags ✓OCR ✓Pre-data filing ✓Big Data and TOS ✓Internet of Things

Americas Catching Up with Unmanned Container Equipment

Norfolk	APMT (VIG)
Newark	Global
Long Beach	LBCT
Los Angeles	TraPac
Vancouver	Deltaport
Lazaro	
Cardenas	APMT
Tuxpan	SSA - TPT
Manzanillo	SSA
Norfolk	NIT
Houston	Bayport

Rotterdam	ECT
Rotterdam	Euromax
Rotterdam	APMT MVII
Rotterdam	DPW RWG
Hamburg	CTA
Hamburg	CTB
Ludwigshafen	BASF plant
Antwerp	DPW
Barcelona	HPH - BEST
Algicieras	TTI
UK	DPW London
Liverpool	Peel T2
Portugal	PSA Sines
Dublin	DFT
Jebel Ali	T3
Jebel Ali	T4
Abu Dhabi	Khalifa
Doha	Hamad T2?

Nagoya	Tobishima
Yokyo	Oi Pier
Hong Kong	CT9
Hong Kong	HIT CT456
Thailand	HPH
Qingdao	QQCT
Xiamen	XOCT
Singapore	TUAS
Kaoshiung	Evergreen
Pusan	Newport DPW
Pusan	Hanjin Newport
Pusan	BNCT
Brisbane	Patrick
Sydney	Patrick
Melborne	ICTSI - VICT
Brisbane	DPW
Shanghai	Yangshan Ph4
Central Java	TPKS

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Green Technologies Penetrate Faster with Higher Volumes

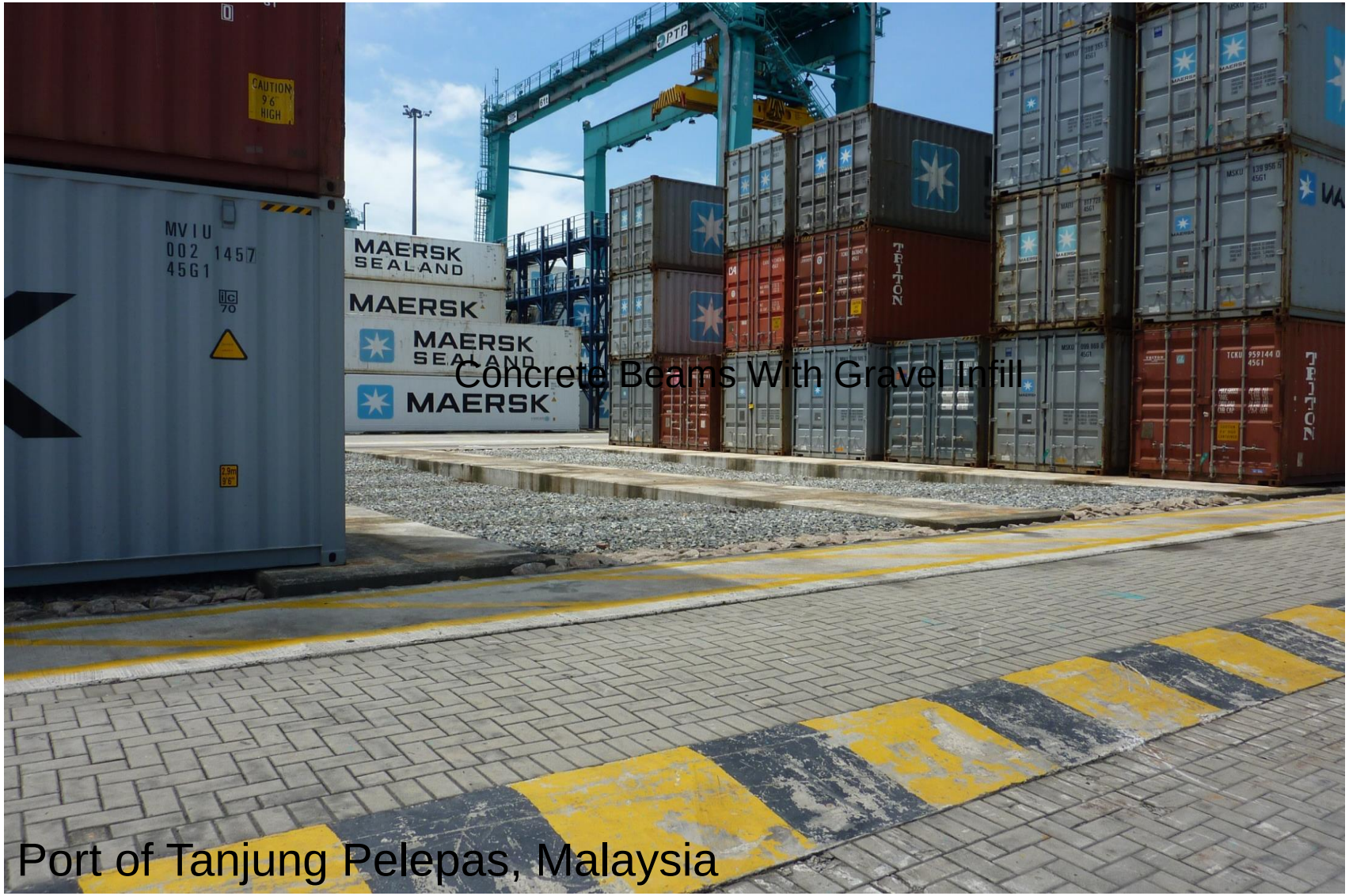
from AAPA website

2016 Rank	Port	Country	2016
1	Los Angeles	United States	8,856,783
2	Long Beach	United States	6,775,170
3	New York/New Jersey	United States	6,251,953
4	Savannah	United States	3,644,521
5	Seattle/Tacoma Alliance	United States	3,615,752
6	Vancouver (BC)	Canada	2,929,585
7	Hampton Roads	United States	2,655,707
8	Manzanillo	Mexico	2,580,660
9	Oakland	United States	2,369,641
10	Houston	United States	2,182,720
11	Charleston	United States	1,996,276
12	Montreal	Canada	1,447,566

Less than 5 years ROI on Electric RTGs

Criteria	Cable-Reel	Bus Bar	Overhead
Market adoption	Low	High	Low
Capital Cost	Low	Med	Low – High (Short – Long RTG rows)
Operational flexibility	Med	Med	High
Crane weight	Heavy	Light	Light
Automation Potential	High	Low	High
Limitation	Length of cable-reel restricts long distance travel	Bus-bar system need to be above ground	Maintenance Access
Suitable for	Wharf, CY, Intermodal	Square and rectangular shape CY	Rectangular shape CY with long RTG rows

Use Concrete Beams With Gravel Infill as a Pavement



Port of Tanjung Pelepas, Malaysia

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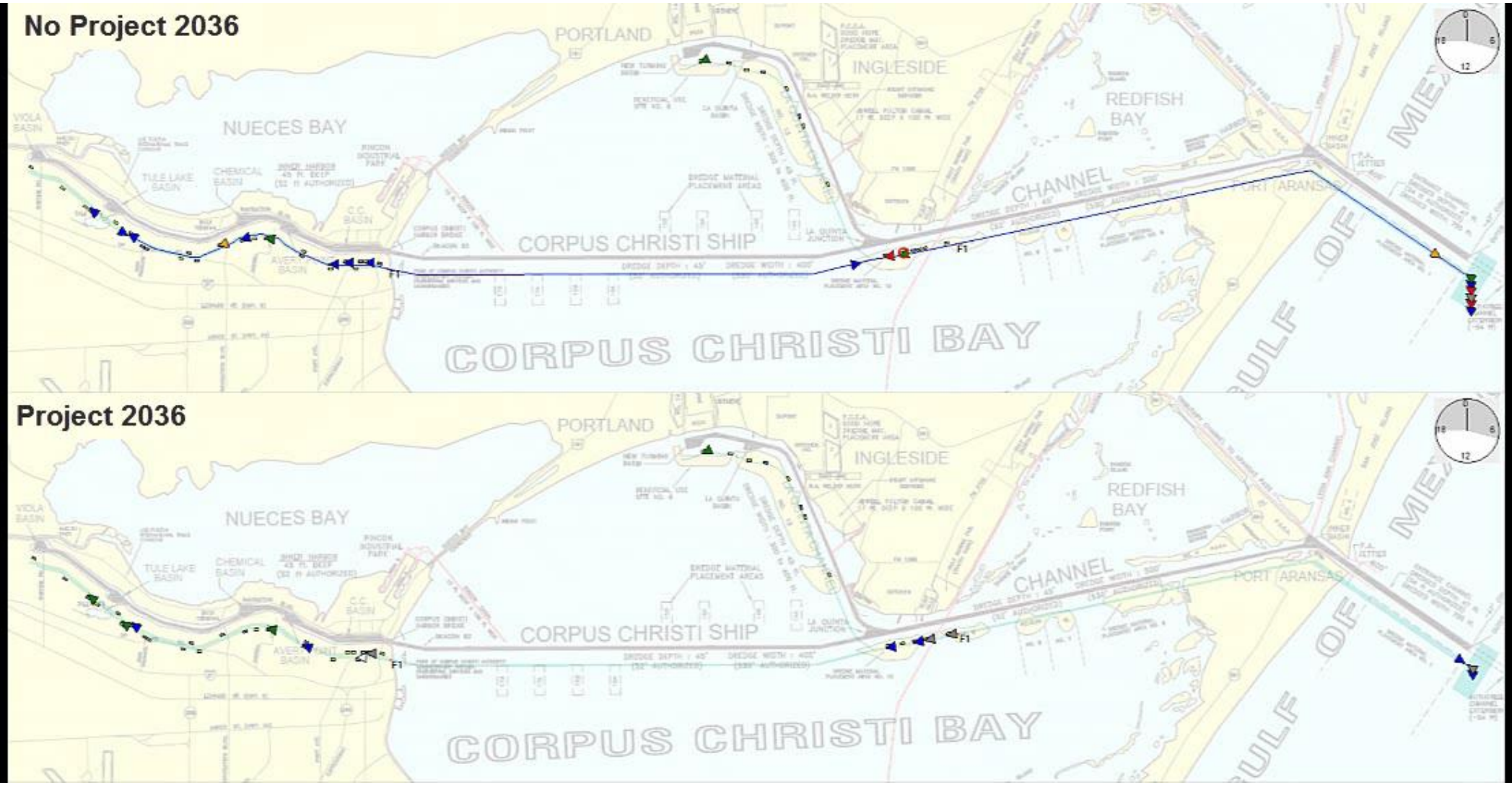
Optimize and Prioritize Dredging Requirements



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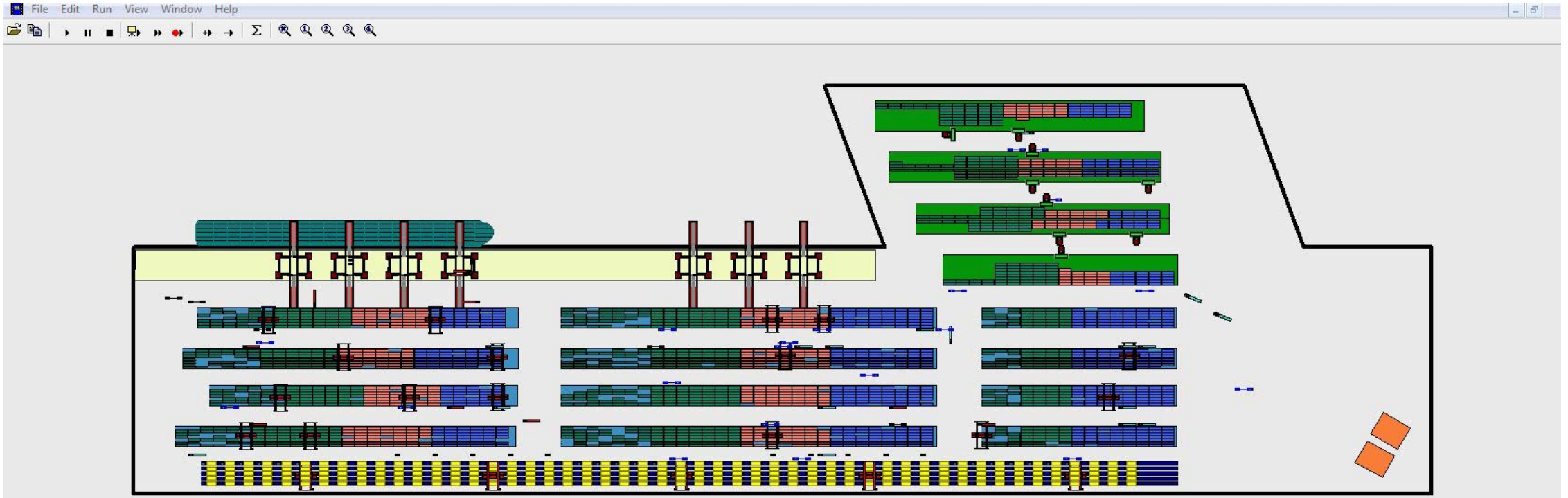
Increase Density and Terminal Velocity



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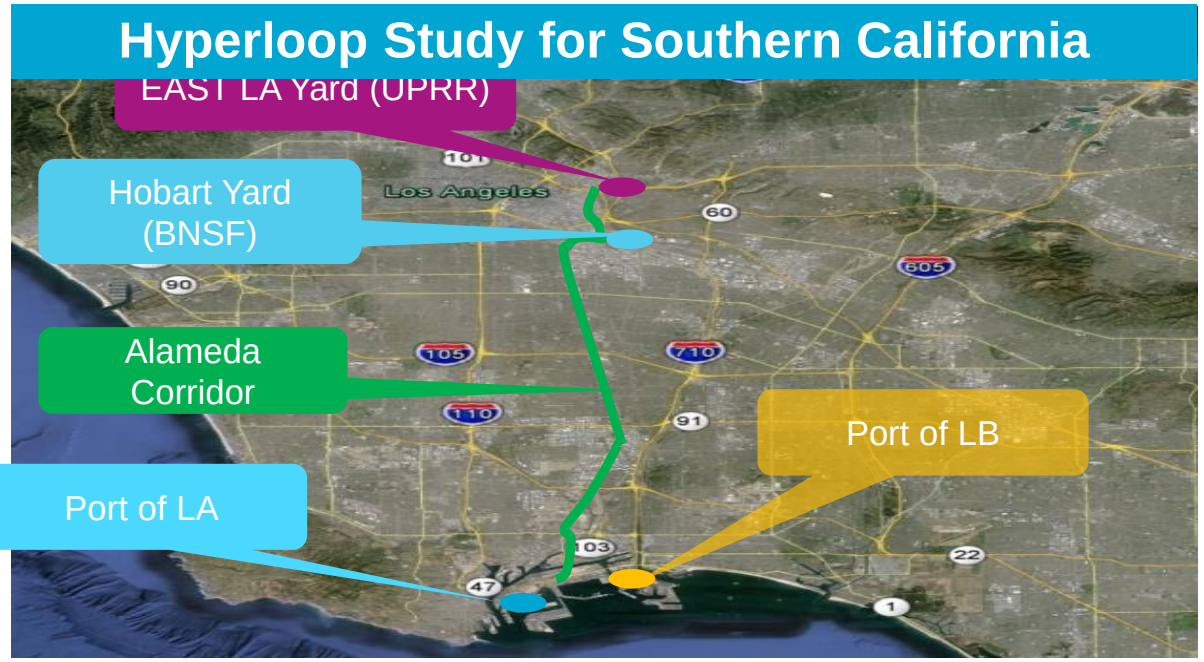
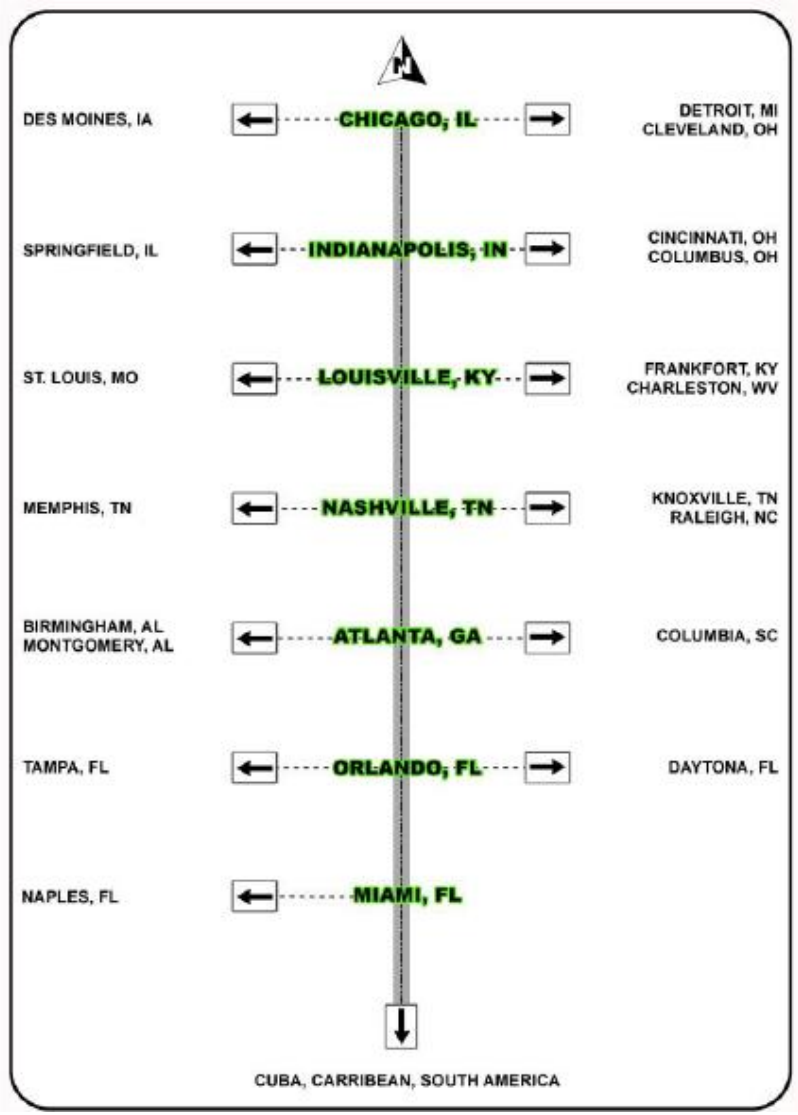
Hyperloop Connectivity – Multiple Corridors





- Applying AECOM simulation model to test and optimize Hyperloop concept
- Opportunities for freight and passenger

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Process for Integrating Green Technologies