AAPA Harbors, Navigation and Environmental Seminar

Bayport Sustainable Development: Planning, Design, and Operational Practice

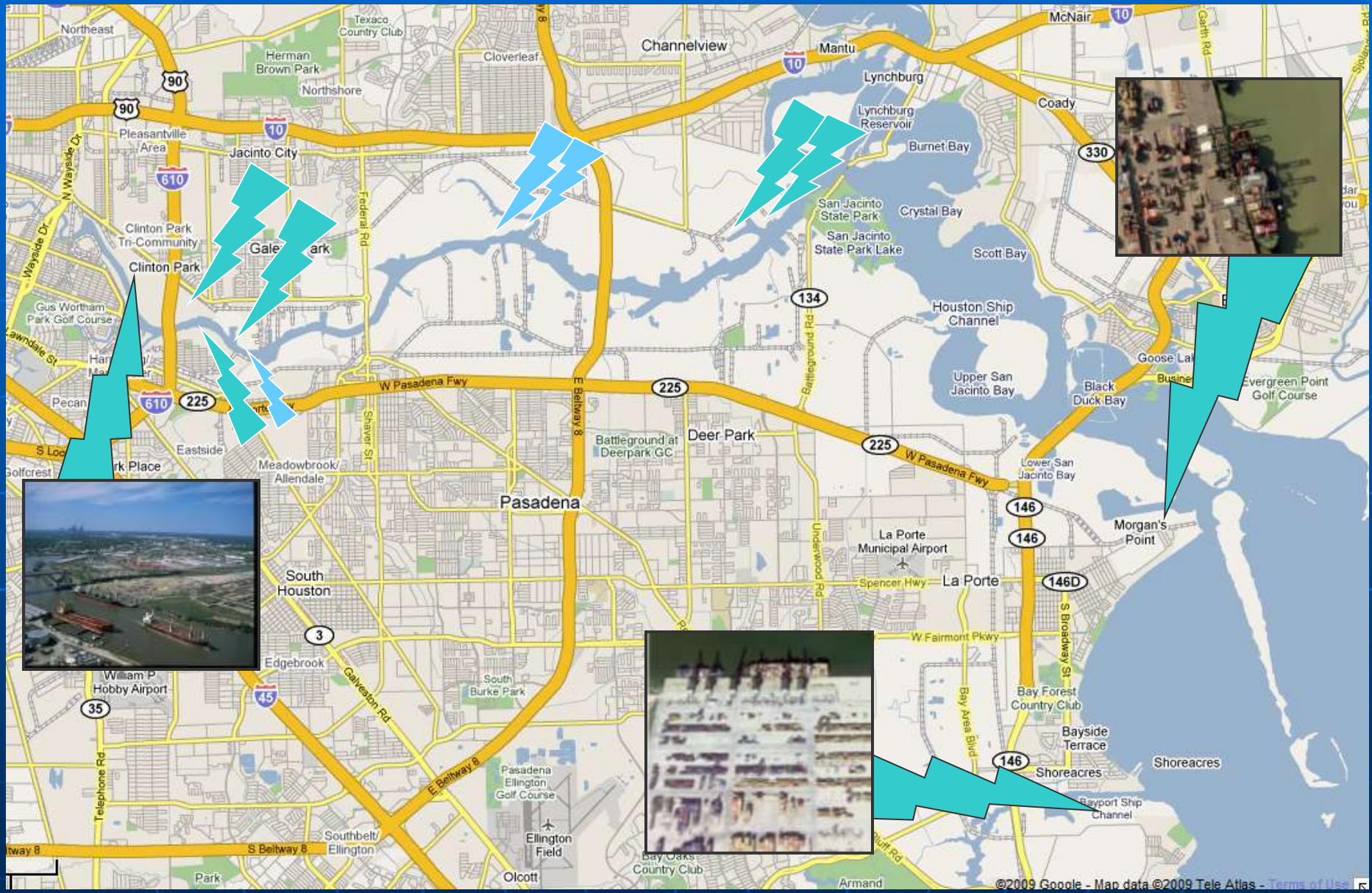
Bayport

- Created to be a standout in the industry
- Exemplifies the environmental commitment of PHA—the standard for the rest of our facilities

First U.S. Container Shipment: Ideal X to Houston

1956: 58 containers from New Jersey to Houston

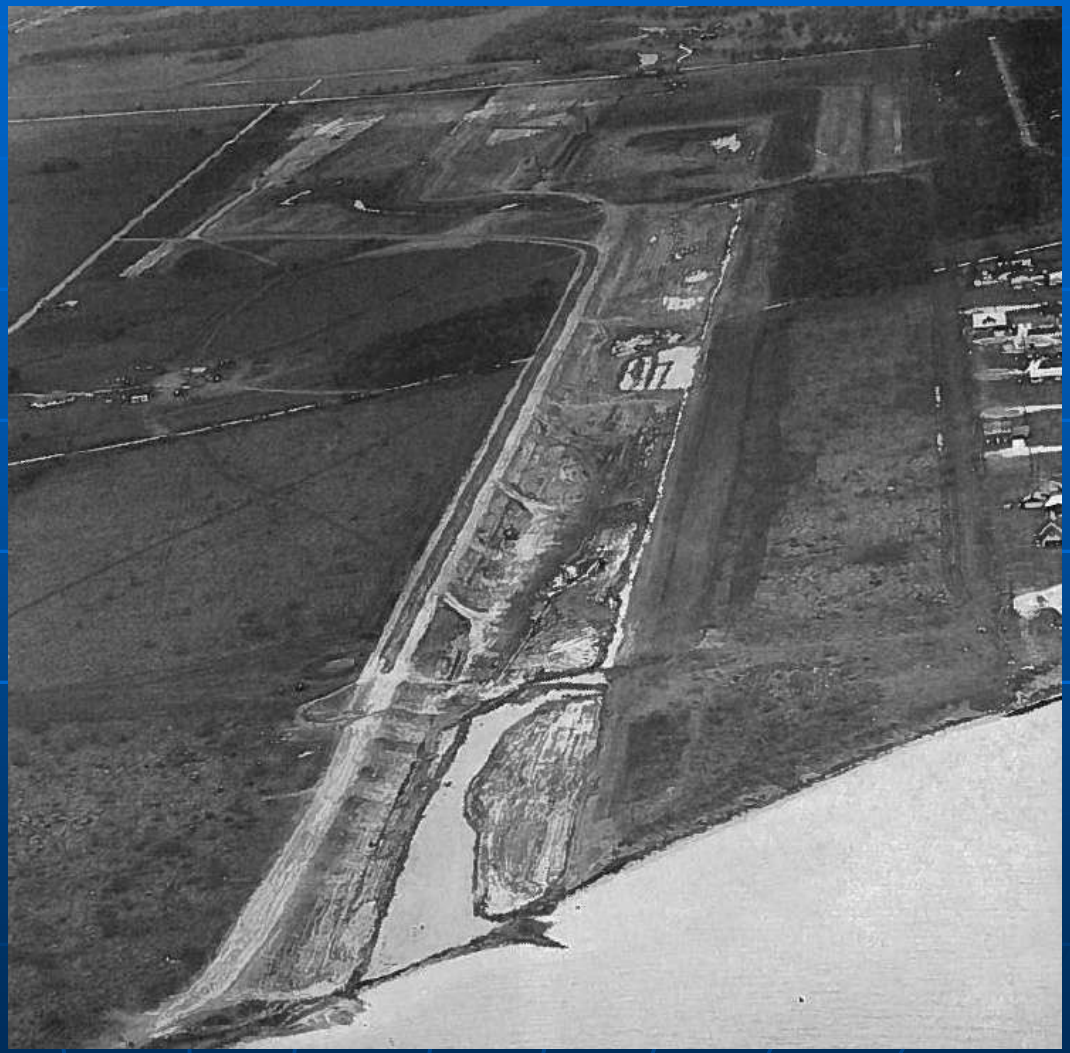
PHA Terminals



Primary terminals along a 32-mile reach of the ship channel

Bayport in the 1960's

- Very lightly developed
- Former W W I airfield and rice fields
- Partnership between PHA and industrial developers



Bayport—June 2004

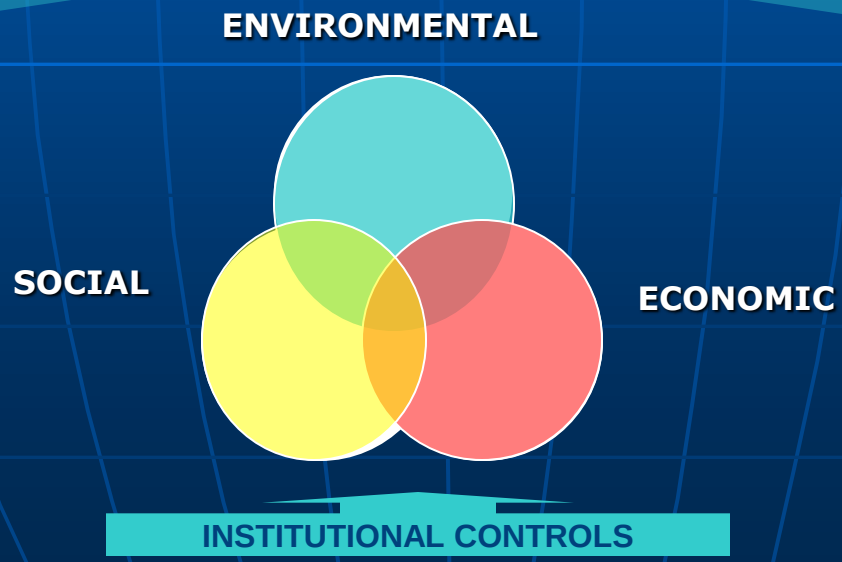
- Over 80 plants in the Bayport Industrial District
- 6,600 vessel transits of the Bayport channel annually

Bayport Terminal

Development Pressures

- Permits
- Homeowner opposition
- Alternative sites
- Funding
- Regional growth
- Jobs
- Lawsuits

- ISO 14001 Initiative
- Costs
- Best practices
- PHA commitments
- Continuous improvement



The Route to Sustainable Development

- In 1998, Bayport planning didn't start with "sustainability" in mind
- Planning was molded by environmental and social considerations
  - Many planning commitments were codified by permits, requiring special features and construction practices
- "Green" development was an early focus
- Design flowed from planning commitments
  - Design details used best practices
  - Sustainable design philosophy extended goals and further improved the product

Bayport Sustainable Development

Focus areas:

- Site factors
- Minimizing social impacts
- Storm water practices
- Emissions and air quality
- Energy efficiency
- Quality and durability of infrastructure
- Low-impact materials, reuse and recycling
- Other social and economic features

Full cycle considerations: planning, design, construction, and operations

Site Planning

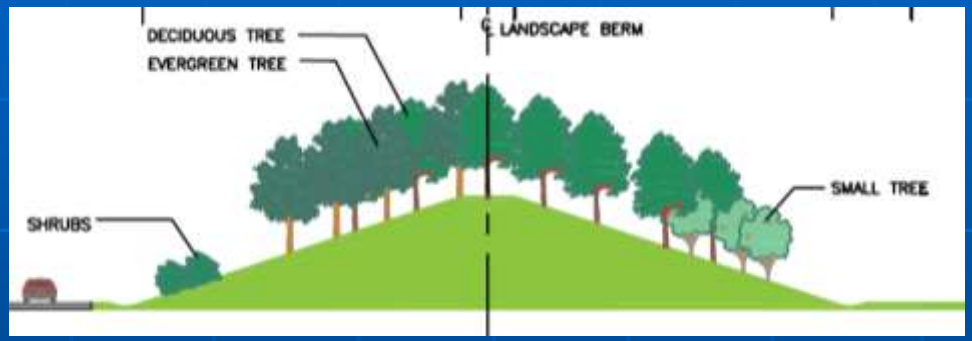
- Size considerations-right sizing
  - Consolidation of container storage on the terminal—no sprawl
  - Preferable to minimal site, with only core business
- Transportation-help separate truck from POV traffic
- Relocation of access roads to service communities
- Insulate the terminal from the public-sight and sound
- Minimize impact to municipal services
- Best practices-stormwater management
- During design, relocated the pre-check gate

Site Design Features

- 19.7 acres of jurisdictional wetlands replaced at 3.4 to 1, plus 900 acres of wetlands and coastal prairie placed in conservation easements
- Minimized heat sink—cool roofs, Portland cement concrete

Site Design Features

- Sight and sound berms- over 16,000 lf
- Native plants
- Isolates terminal, roads, and rail



- Landscape screening on north shore

Social Features-Improve support or Minimize Impact to the Community

- High voltage substation, independent of community service
- Independent sewer system, connected to industrial treatment
- On-site police, fire, emergency response services

Social Measures-Noise Mitigation

- Use of electric dredge, built for a Bayport project
- Use of broadband backup alarms to eliminate “nuisance” beeping alarms
- Commitment to construct wharf with drilled shafts, not driven piles
- Noise limits during construction—75dbA during the day, 55 dbA at night
- Special exhaust mufflers on yard cranes

Social Impacts-
Water and wastewater

- Eliminated consideration of well supply, because of association with localized subsidence;
- Built a 1,000,000 gallon elevated storage tank, connected it to municipal water line, to improve pressure to the community—then conveyed it to the city
- Constructed separate waste water utilities, tied to industrial treatment facility

Additional Social Features

- No visible glare from site illumination
  - Fixture cutoff
  - Non-reflective poles
- No fugitive construction dust

Stormwater Quality

- “First flush” –capture of first one inch or rainfall for entire terminal
- 28 acres of ponds
- EPA: valve outfall to enable containment from first flush pond

Stormwater Quality Design features

- Leaking container station (isolated drainage)
- Closure gates in trench drains
- On-site hazmat response
- High impact area
- Oil water separators
- Automated samplers

Stormwater-Watershed Planning and Commitments

- Design to mimic existing drainage flow-volume and rate
- Wetland creation within retention ponds

Emissions

- 25 ton rolling 12-month limit on construction emissions for Nox
  - Use of an emissions calculator for planning and management
- Consolidated gate-eliminates over one million truck miles annually
- Infrastructure to support future “cold ironing”

Emissions Reduction-Construction

- On-site batch plants-eliminating over 200,000 truck miles to date
- Mechanical dredging, where necessary
- Electric hydraulic dredge use (powered through Bayport substation)
- Contractors repower equipment with cleaner engines, use catalytic converters, fuel additives, limit idling, use electric carts
- Barged aggregate deliveries

Air Quality-Operations

- Operational commitments:
  - Tier III engines on equipment
  - Earlier use of ultra-low sulfur diesel than required
  - All new vehicle fleet at Bayport—including stevedore operations
  - Fuel-reducing diesel engine technology on yard cranes

Energy Efficiency

- New 138 kV substation and transmission lines
  - Efficiency
  - Separation from community

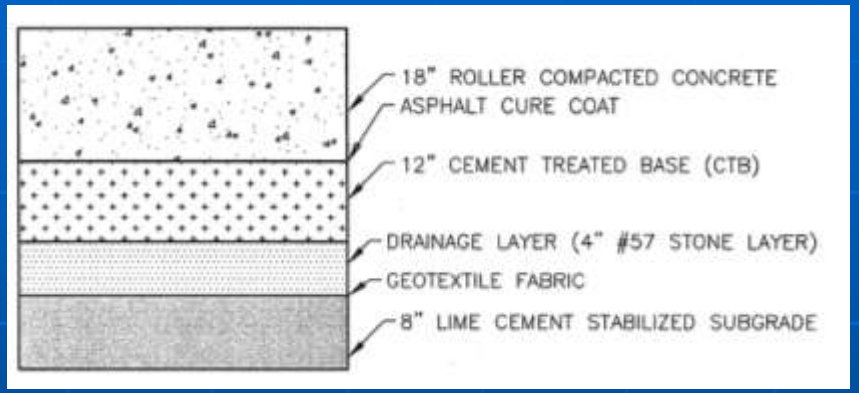
- Regenerative power from crane operations used within the system-

Use of Recycled Materials

- Dredge fill-5 million CY to be dredged and used as fill to elevate the site
- Recycled concrete-over 200,000 tons to date
  - Crushed concrete base course for pavement
  - Outfall and shoreline revetment material reclaimed from demolition of relocated county road

Quality and Durability
Design impact measures

- Modified pavement design—30-year life vs. original 20-year thickness, for a 2% additional cost



- Fly ash use in soil modification

- Wharf designs use high strength steel to reduce steel quantity and improve constructability

Low-Impact Materials-Design

- Standard pavement was redesigned to eliminate rebar from the latest 95 acres of container yard (approximately 12 million pounds)
  - Closest source was 200 miles away)
- Concrete mix design revised to include fly ash as 25% cement replacement
- Steel sheet pile walls were substituted for heavy riprap (available source in Illinois)

ROLLER COMPACTED CONCRETE

Sustainable Buildings

- Administration/ gate building will be LEED certified
- All buildings will incorporate LEED features

Sustainable Buildings

- Next two stevedore support buildings (5,500 sf each) will use containers as the structural system
- Containers will be used, configured locally

Sustainable Buildings-Cruise Terminal

- Designed to LEED standards
- Incorporates translucent walls to reduce electrical load

Sustainable Design Practice

- Policy for PHA facilities
  - Consideration of sustainable products and practices for all terminal projects
  - During development of every project, coordination among PM, Environment, Operations, and Maintenance staff for sustainable development and complementary improvements
  - LEED standards for all major building projects
  - Requirements and metrics part of the EMS
  - Sustainable development outreach to tenants and Port of Houston partners and businesses
- PHA finds environmental, social, and economic principles to be truly complementary

The Port Delivers the Goods….

From a more sustainable Bayport