NATURAL LAND MANAGEMENT:

FRAMEWORK FOR INCORPORATING NATURAL CAPITAL INTO CORPORATE LAND MANAGEMENT

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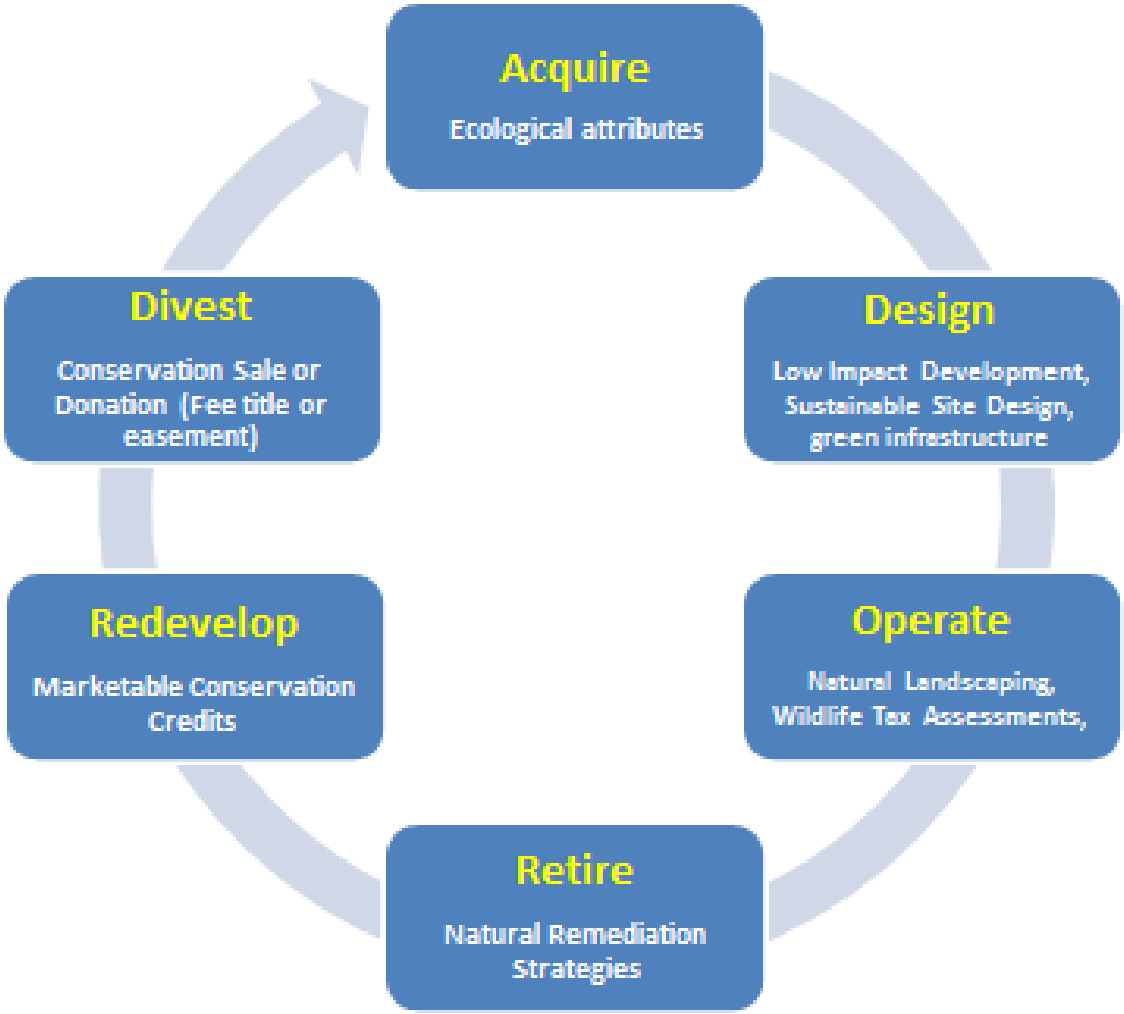
PRESENTATION OVERVIEW

OBJECTIVE - To provide an overview of the NLM assessment framework with case studies ; discuss key challenges

PRESENTATION OVERVIEW

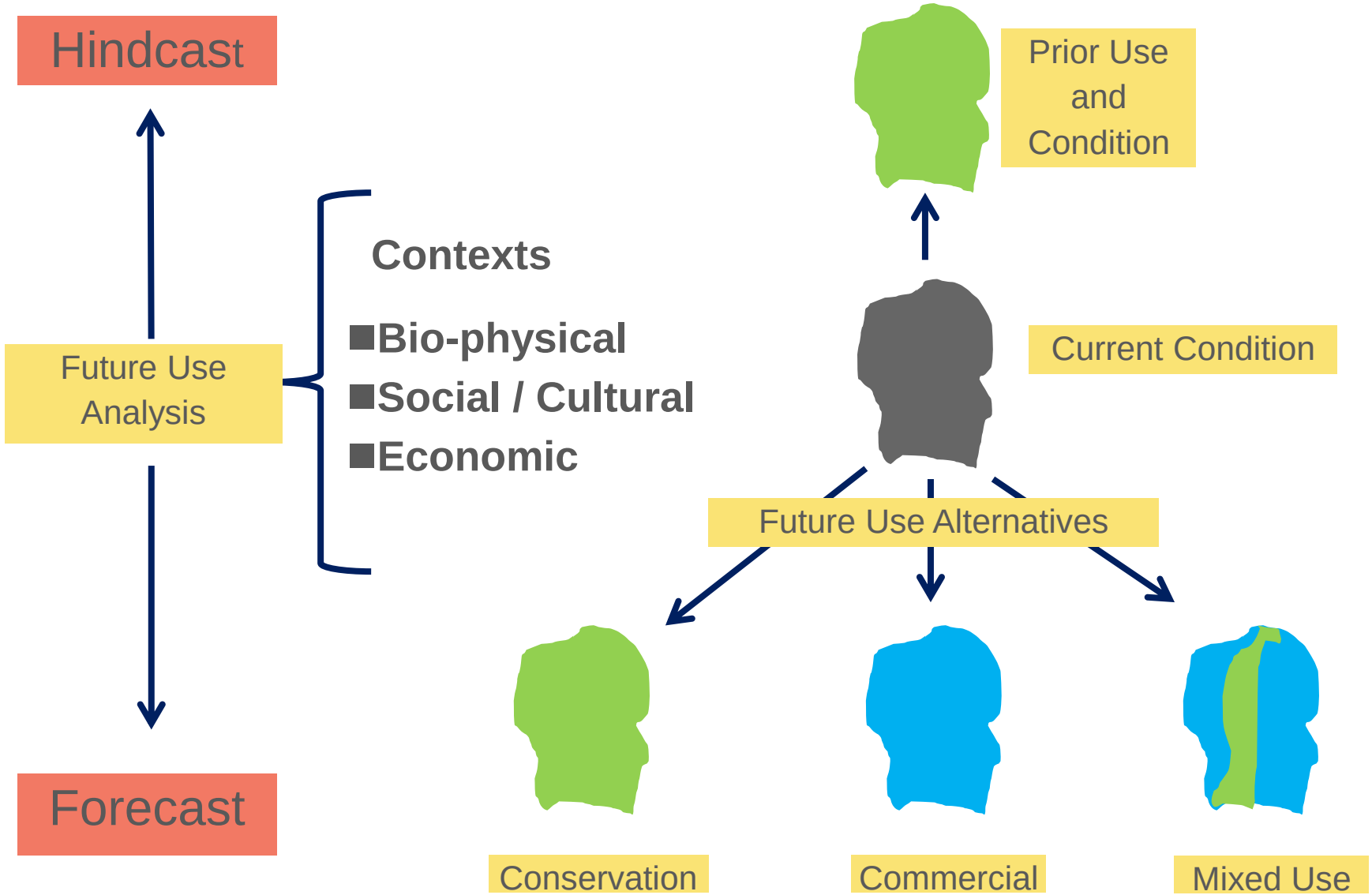
- Property Life Cycle
- NLM Assessment Framework
- Property Evaluation Process
- Case Study 1 - Surplus Property Divestment
- Case Study 2 – Designing New Construction
- Challenges / Opportunities

NATURAL CAPITAL IN PROPERTY LIFE CYCLE



Optimal value achieved through early implementation

NLM ASSESSMENT FRAMEWORK



PROPERTY EVALUATION PROCESS
ITERATIVE APPROACH

Site Selection

- Portfolio screening review – company data
- Site(s) selected

Preliminary Future Use Analysis

- Desk top analysis – site and on-line data
- Future use option identification
- Preliminary market analysis and valuation

Field and Market Assessment

- Characterization of site ecological and hydrological condition
- Refined market analysis
- 3rd party opinion on value

Refined Future Use Analysis and Recommendation

- Select highest value future use(s)
- Plan redevelopment strategy

Case Study 1

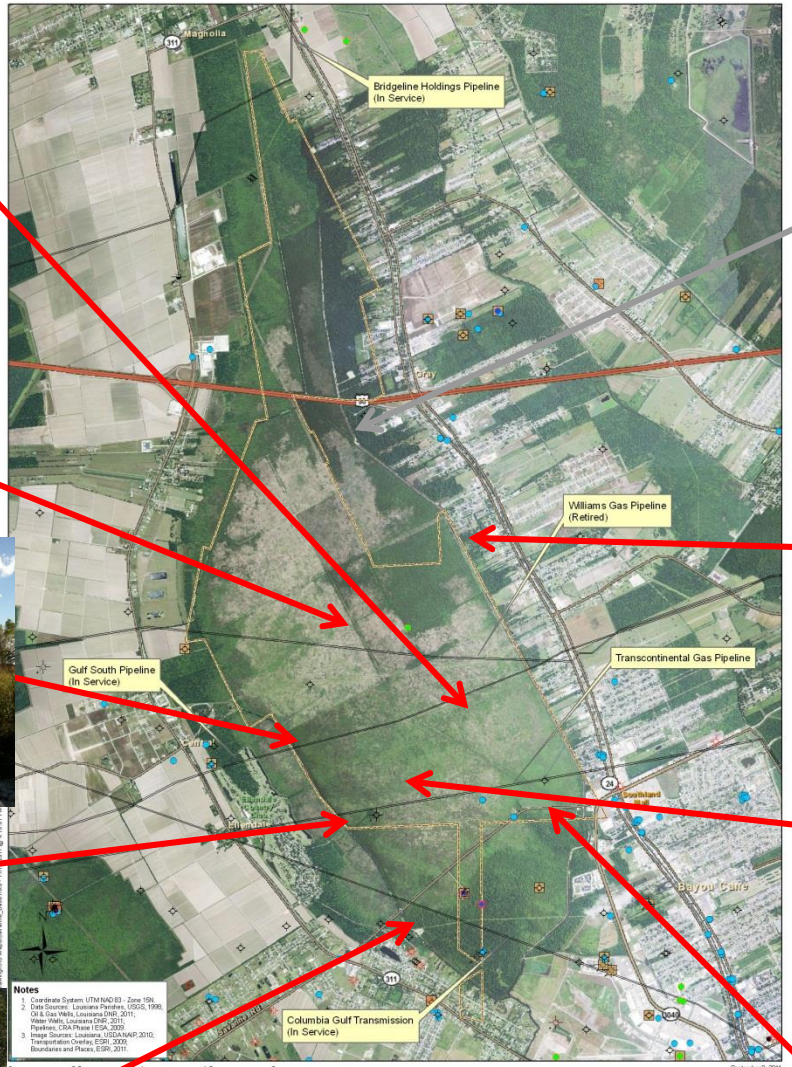
Surplus Property - Divestment Assessment

LOUISIANA PROPERTY – FOREST - WETLANDS COMPLEX

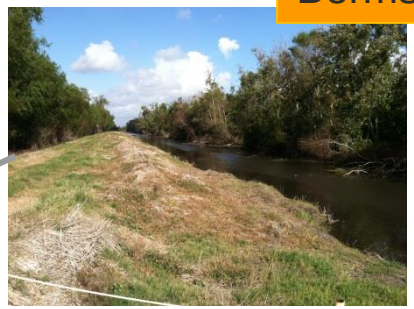
Pipeline ROWs

Flotant Marsh

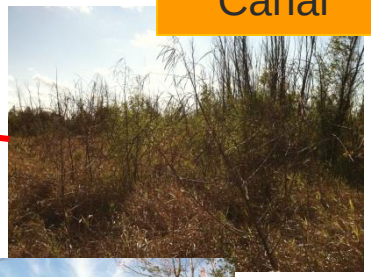
Bayou



Berms



Drainage Canal



PRELIMINARY FUTURE USE OPTIONS ANALYSIS

- Only 10 % of acreage can be commercially developed
- Real estate value ~ $400 ac.
- Property has significant flood control and habitat value
- Site ecology and hydrology degraded by surrounding development
- Wetlands Mitigation credit possible from restoration; Market demand strong
- Credit values $17K – $70K

FIELD STUDIES – REFINE ANALYSIS

- Site-specific data needed for a refined ***Future Use Analysis*** and valuation of options
- Habitat types, condition and spatial extent needed to design and value bank
- USDA soil data confirmed
- Understanding water levels and hydro-periods key to hydrological modification for restoration
- Boundaries confirmed to understand encroachments and adjacent stakeholders

Ecological Condition

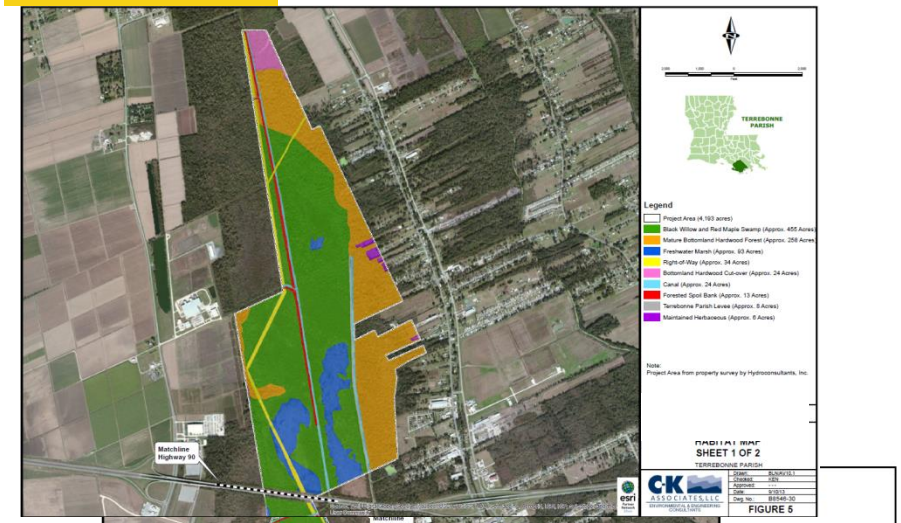
Hydrological Processes

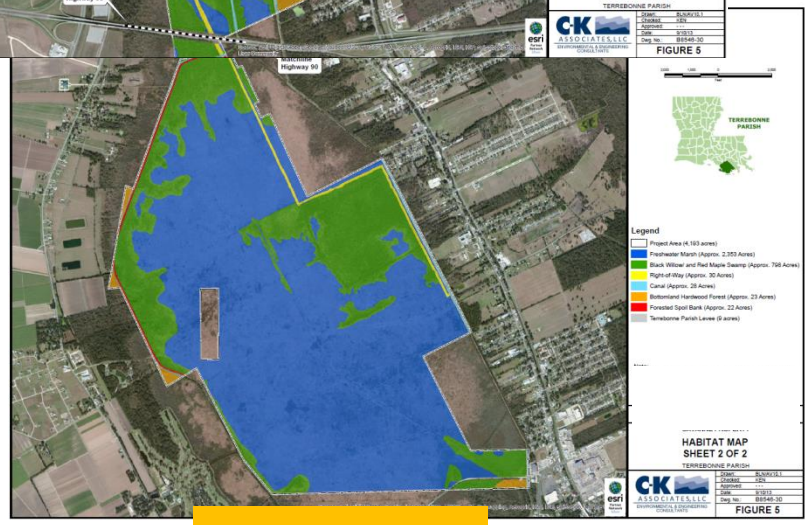
Site Elevation

Property Boundaries

Ecological Survey – Habitat Maps / Findings

North Tract



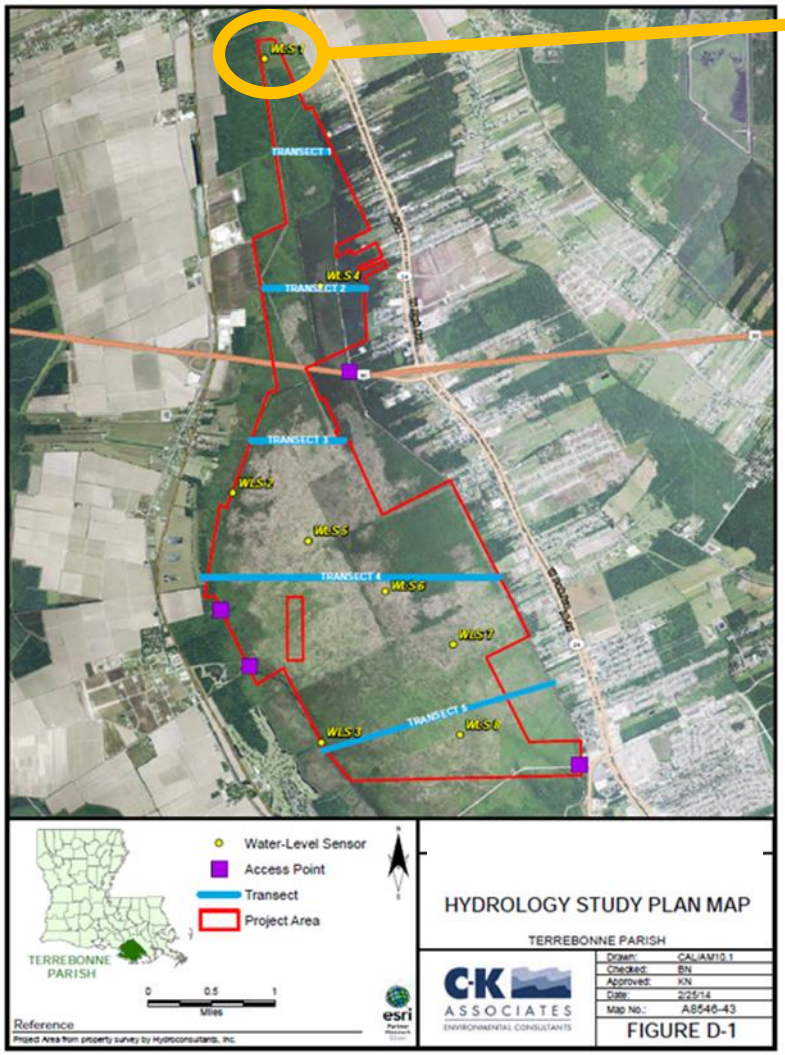


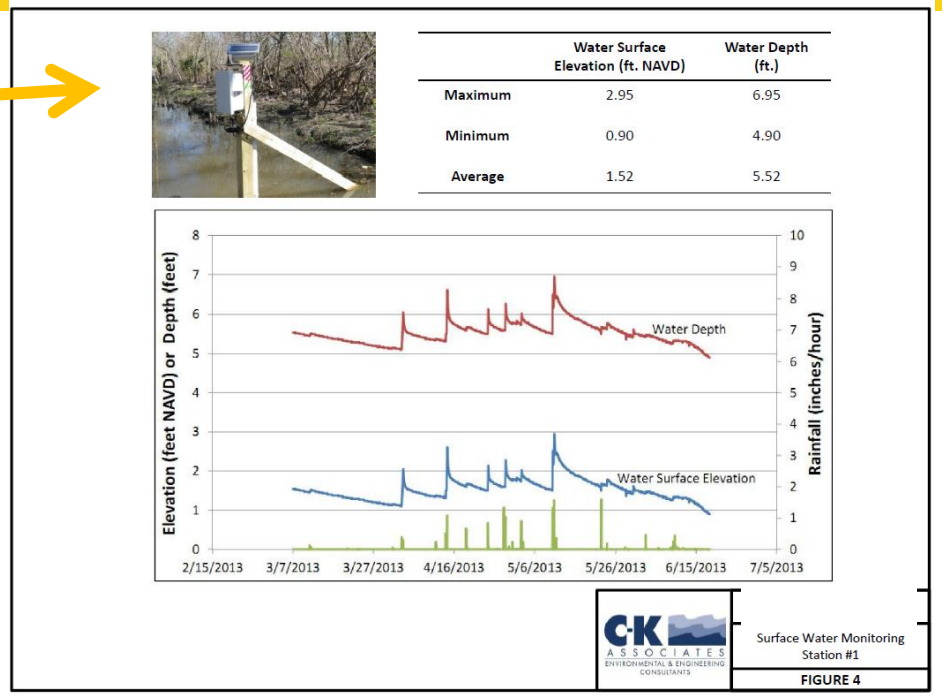
South Tract

Land Cover /Habitat	Acres
Freshwater Marsh	2,446
Black Willow Swamp	1253
Bottomland Forest	281
Right-of-Ways	64
Spoil Banks	35
Disturbed Forest (cutover)	24
Herbaceous zone	6

- Property is primarily a freshwater marsh surrounded by wet forest with various degree of inundation
- 4,139 ac. Most likely jurisdictional wetlands
- Marsh is healthy but hydrologically constrained
- Adjacent land use and water management structures maintained high water .
- High standing water prevents forest maturation and allows invasive and noxious trees to dominate
- Marsh and swamp a target for enhancement by hydrologic modification; Invasive control and revegetation will enhance hardwood forests

Initial Hydrology Monitoring Results

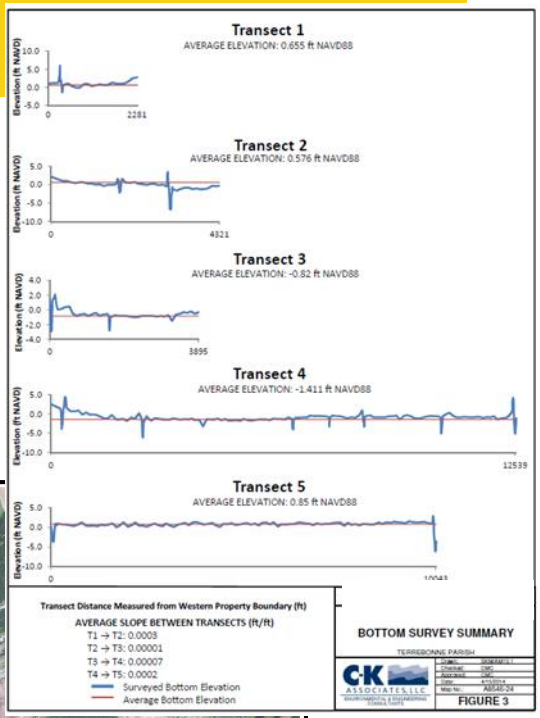


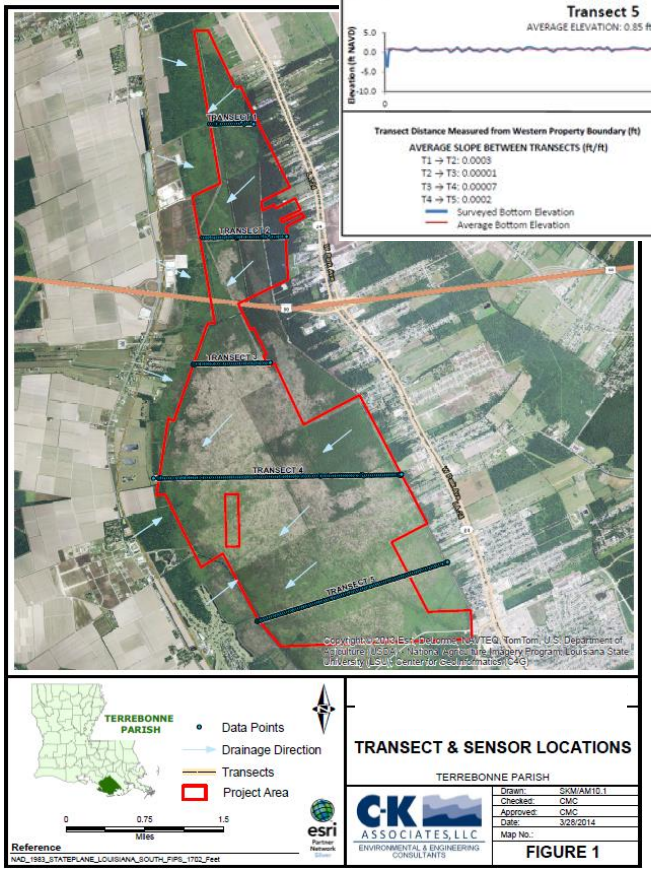


- Monitoring data collected continuously accessed by internet
- Data collection on-going - 3/13 -9/13 shown above demonstrates response of water levels to rainfall (Green)
- Response time and rate can be capture from slope of curve post rainfall event
- Time for levels within site to drop to pre-rainfall levels can be matter of weeks

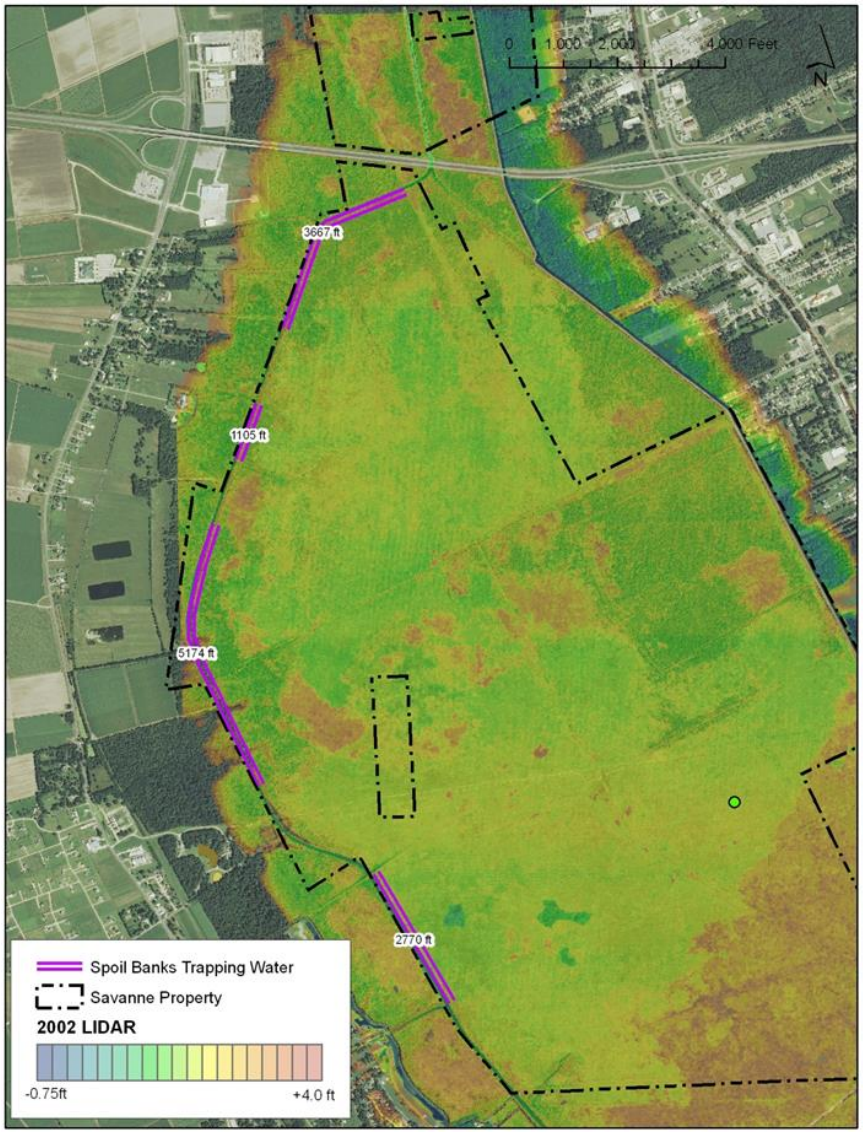
HYDRO-MORPHOLOGY AND FLOW

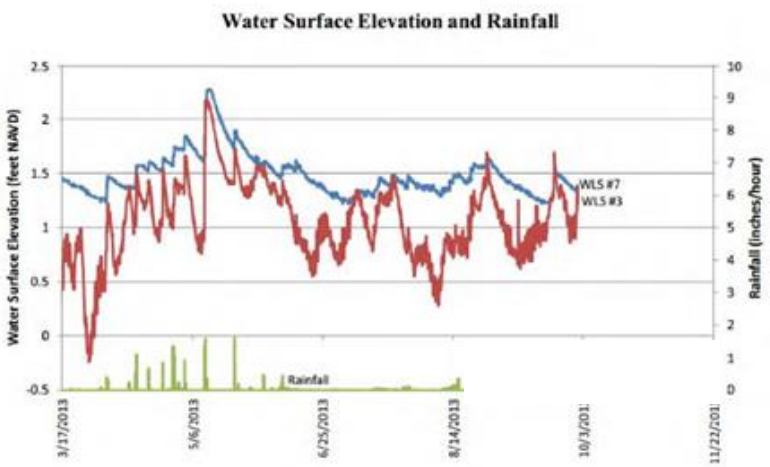
- **Site shaped like a shallow bowl**
  - Water from North tract to South track
  - Water from southern edge of Savanne property runs northward.
- **Property normally drains south west to bayou**
  - if water is high will run over berm on Northwestern edge
- **No current outlet to drainage canal on East; historic connection closed**
- **Water control structures linked to bayou maintain water levels at artificial height**
- **Opening spoil banks adjacent to bayou could improve hydrologic flow and allow ecological improvements**





HYDROLOGIC MODIFICATION – KEY TO MITIGATION BANK

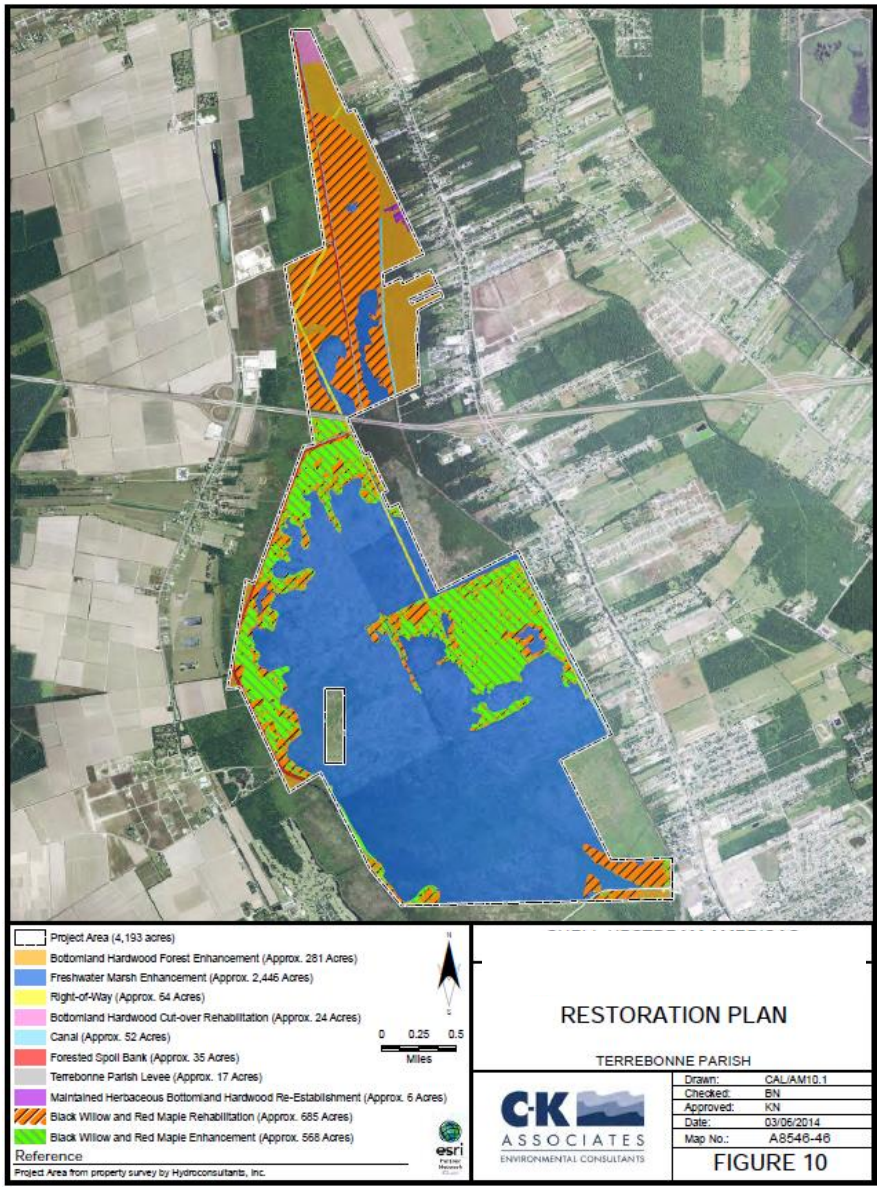




- Spoil banks prevent water on site (Blue Line) from dropping when Bayou (Red Line) drops
- High standing water leads to open water in marsh and degraded forested swamps
- Breaching spoil banks will create more natural oscillation of water level on property
- Lower water levels in forested swamps allows natural maturation and replanting
- Stormwater detention will be increased

PHASED BANK DEVELOPMENT – MARSH, SWAMP AND FOREST

- Bank will be executed in **3 Phases**
- **Phase 1 (Marsh and Hardwoods)**
  - Improve hydrology for freshwater marsh by opening spoil banks with Ouiski Bayou
  - Rehabilitate bottomland hardwood forests by removing invasive species and planting native hardwood trees
- **Phase 2 (Swamp North of 90)**
  - Forested swamp will be enhanced by invasive removal
  - Acres with shallow water cover will be converted to Cypress Tupelo swamp
- **Phase 3 (Swamp South of 90)**
  - As technically feasible apply phase 2 design south of Route 90



WETLAND MITIGATION BANKING CASES

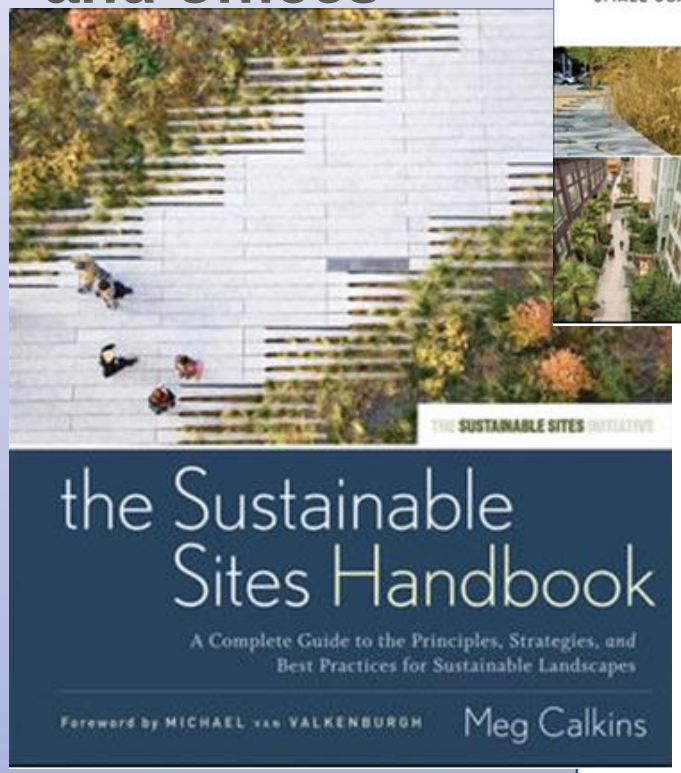
Development Case Return	Total Credits	Lower Total Value ($M)	Upper Total Value ($M)	Lower NPV ($M)	Upper NPV ($M)
Low	622	$11.3M	$16.5M	$5.9M	$9.5M
Medium	779	$18.0M	$32.3M	$5.9M	$10.9M
High	1444	$25.0M	$42.0M	$6.2M	$11.3M

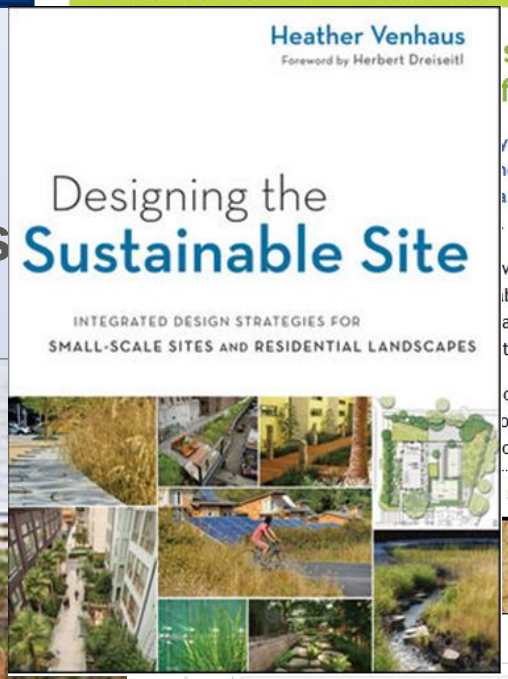
- **Conservative assumptions used for range of mitigation banking cases**
  - No growth in credit values; prices rose > 500 % in last 15 years
  - Market demand 50 credits per year; Dampens NPV for later sales
  - Only first 2 phases included in NPV calculations
- **Conservatively used medium banking case for future use options comparisons**
  - Highest probability for regulatory approval

Designing Operations
for
Sustainable Performance

Sustainable Site Initiative

Becoming a standard of practice for new construction of homes and offices





All sites - both urban and rural - have the potential to heal humanity's environmental offenses and improve our quality of life. Each decision is an opportunity to reduce consumption, eliminate waste, nurture healthy ecosystems and connect people with nature. Building a sustainable future for the burgeoning population is not out of reach, but achieving it will require rethinking the way we build and maintain the environment that surrounds us.

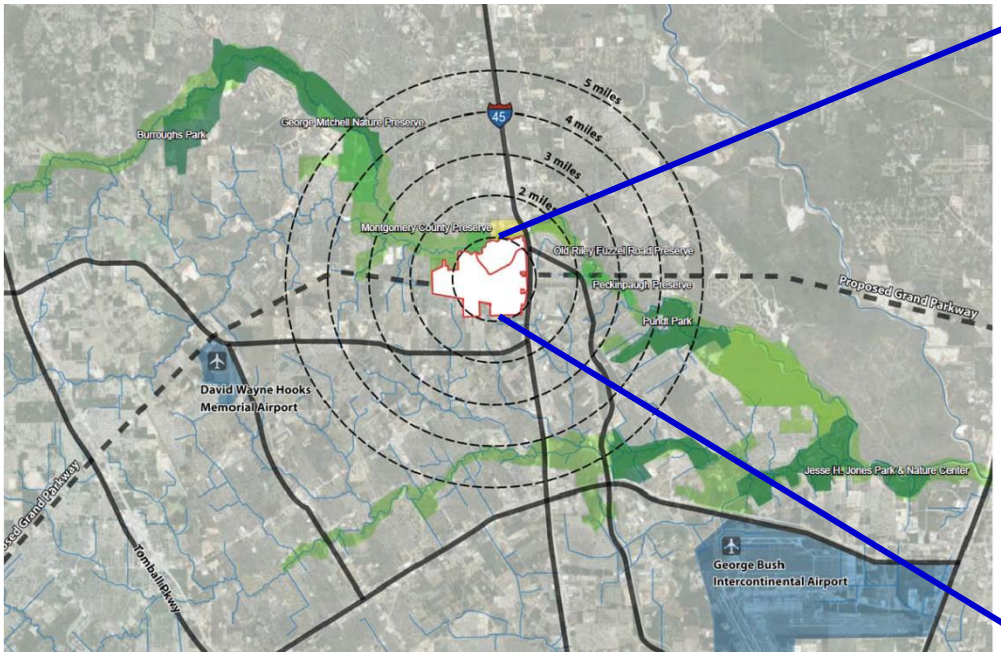
approach

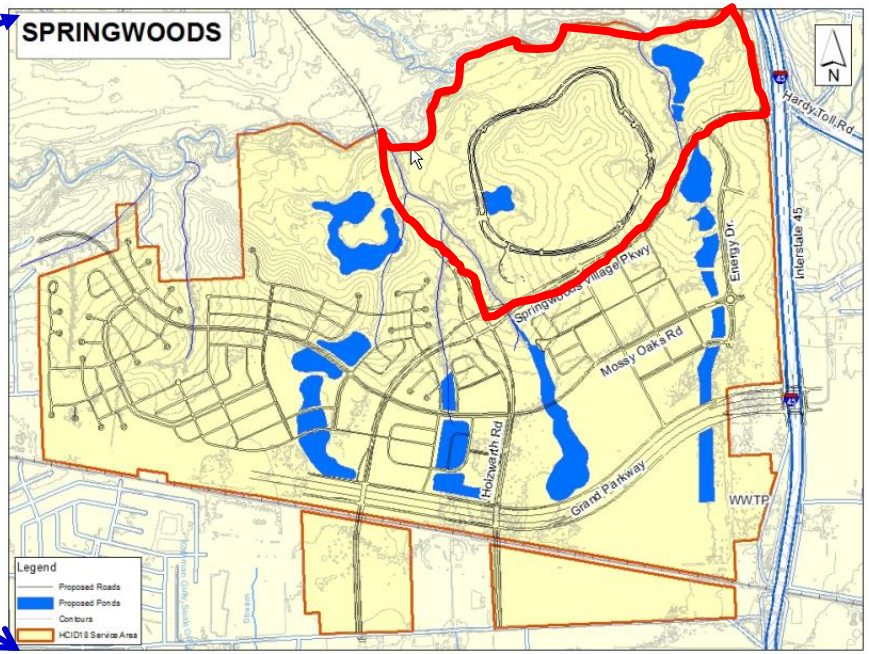
Regenerative Environmental Design employs a creative and analytical approach - founded in both art and science - to connect natural and built systems in mutually beneficial ways. RED works closely with project teams to find sustainable design solutions that improve site performance and save time and money over the life of the project.

services

professional experience

Campus Design – Integrated with Natural Systems



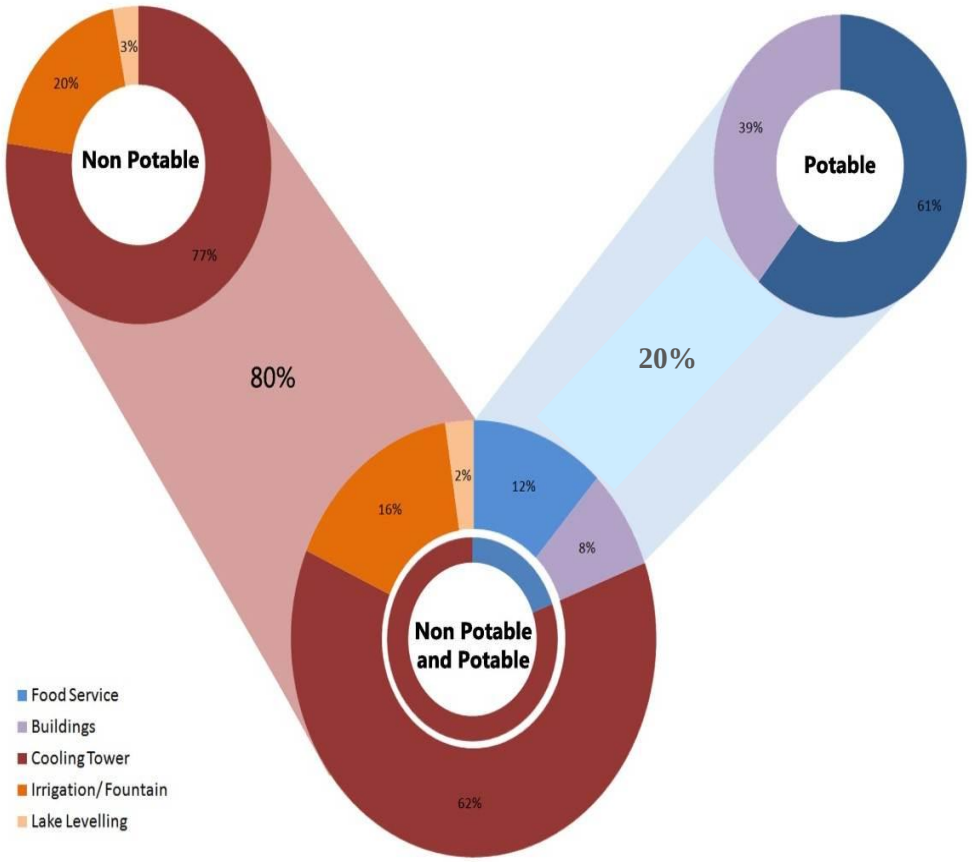


- New corporate campus property connected to natural water systems and evolving “creek” greenway; connected to new sustainable community
- Property past uses working oil field (13 well); Timber and hunting leases
- Historic ecology transition from Big Piney forests to east and Post Oak savanna to west
- Design Integrates NLM , *U.S. GBC LEEDs* and *Sustainable Sites Initiative*

Low Impact Landscape Design

- **Limited campus footprint ; Habitat diversity greatly improved**
  - > 50% existing vegetation left in place
  - 77% vegetated - 2% lakes
  - 21% buildings / impervious surface
- **Manage storm runoff with natural infrastructure that will enhance water quality and increase diversity of habitats**
  - Rain gardens
  - Vegetated swales
  - Meadows
- **Landscape designed to use less water and sustain in drought**
  - Smart Irrigation Systems
  - Drought tolerance / native species
- **Aggressive rainwater harvesting, and wastewater recycling supply operations**

Designed for Water Conservation



- **Aggressive rainwater harvesting, and wastewater recycling supply operations**
- **Lakes serve as habitat as well as non-potable storage**
- **Overall water use of 40 GDP significantly less than National and Houston averages**
  - **65% less** than national average
  - **37% less** than local company offices
- **80% of campus water demand replaced with non-potable**
  - 8 GDP Potable / 32 GDP Non potable
- **Overall potable water use of 8 GDP significantly less than National and Houston averages**
  - **93 % less** than national average
  - **88 % less** than local company offices

KEY CHALLENGES

- Internal acceptance – “not core business”
- Availability of right economic data for the decision
  - Projects investments need comparison of actual cost – return data
- Acceptance of Green infrastructure as equivalent to Grey by regulators
- Acceptance of natural capital and ecosystem service values as real property (e.g. IRS appraisals)
- Highest financial return may not be highest value to company and community
- Process takes longer than you might expect.

Questions / Discussion

Photos this slide: Cliff Meinhardt

CONTACT INFORMATION

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Know Your Site

- Regional Specific Environmental Condition
  - Climate
  - Ecology / Biodiversity
  - Watershed / Hydrogeology
  - Land Use
- Ecological Uniqueness
- Natural Value / Ecosystem Services
- Importance of place - What matters to the community?
- Opportunity to add natural value through design

Know Your Project

- **Purpose in the community**
- **Tie to community / regional goals**
  - Water conservation
  - Migratory birds
- **Scale of project to site**
- **Environmental Footprint**
- **Role of landscape in project purpose**
  - Outdoor meeting space
  - Employee recreation and education
- **Can natural systems service your design?**
  - Rainwater capture