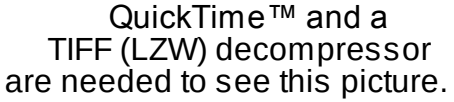


A forum to guide and host an ongoing dialogue between key stakeholders on the appropriate application of wind power technologies in metropolitan Chicago.

A multi-disciplinary conversation can pinpoint where individual or institutional activists can ‘fill the gap’ between multiple stakeholders to address the existing impediments and potential opportunities regarding the introduction and expansion of a broad range of wind powered applications.

Wind Power and the Built Environment

Abdoulaye Diao – (ChemE)

April Chen – (Arch)

Janusz Pula – (EE)

Joon Park – (ME)

Matthew Stewart – (IntArch)

Noel Wessely – (MatSc)

Steve Henry – (Arch)

Thinh Nguyen – (Arch)

Wind rEvolution

Bret Schneider (BFA)

Charles McGhee Hassrick (MFA)

Dong Hwan Kim (ME)

Heidi Moran (BFA)

Lisa Smith - (DesObj)

Segun David (EE)

Soo Ha (ME)

Supreedee Rittironk (Arch)

Wind Power and Open Spaces

Brendan Hudson (BFA)

Cara Ellis (Arch)

Jae Min Lee (Art and Tech)

Michael Kruss (Arch)

Rob Fleming (BFA)

Tor Kyaagba (EE)

Brendan Hudson (Bachelor Arts)

Cara Ellis (Master Architecture)

Jae-Min Lee (Masters Art & Technology)

Michael Krauss (Bachelor Architecture)

Robert Fleming (Bachelors Mechanical Engineering)

Tor Kyaagba (Bachelors Electrical Engineering).

URBAN WIND POWER

Northerly Island Wind and Water Project

- Urban-scale installation
- Demonstrate the benefits of wind power
- Simultaneously improve the urban ecosystem and near-shore aquatic environment
- Inspiration from the directives of the Chicago Lakefront Ordinance

Chicago Lakefront Ordinance

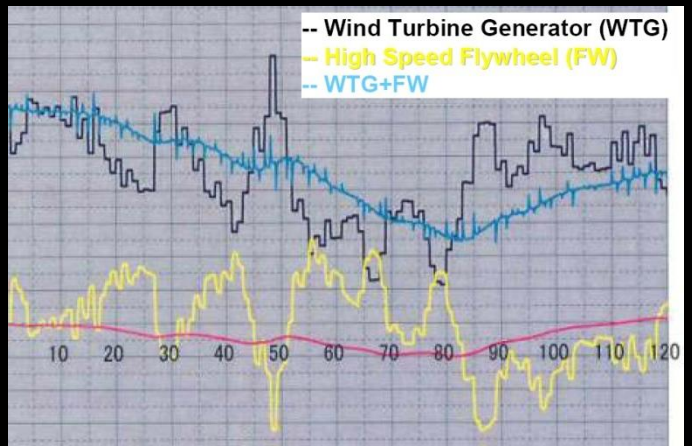
- Continue to improve the water quality and ecological balance of Lake Michigan.
- Protect and develop natural lakeshore park and water area for wildlife habitation.
- Design all lake edge and lake construction to prevent detrimental shoreline erosion.
- Ensure a harmonious relationship between the lakeshore parks and the community edge, but in no instance will further private development be permitted east of Lake Shore Drive.
- Improve access to the lakeshore parks and reduce through vehicular traffic on secondary park roads.
- Ensure that all port, water supply, and public facilities are designed to enhance lakefront character.

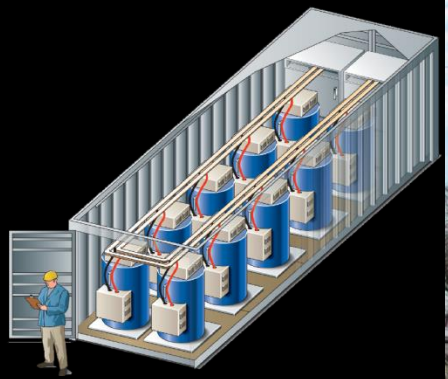
Northerly Island

Pumping Station
Eco Machine
Retention Pond
Return Water
Wetland
Charter II
Wind Turbines
Green Roof Garage
Water Fall

Wind Turbine and Energy Production

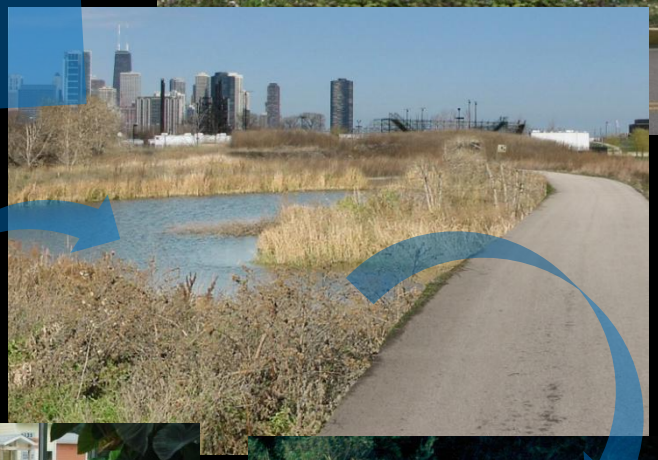
- Hybrid drag and lift turbines work in lower wind speed and have no detrimental effect to birds or other wildlife.
- Can be installed on existing lamp post and on specially designed wind towers which is based on the concept of a sailing mast..
- Flywheels store excess energy and stabilize output, thus guarantying uninterrupted power without grid backup.





Ecosystem and near-shore aquatic environment

- Water is pumped from the south of the marina to either a water fall for oxygenation , wetland pond or to support a biological waste water treatment (Eco-Machine)
- The water fall flows into the northern part of the marina.
- The treated water from the Eco-machine is mixed with marina water in the pond and flows thru a wetland into the lake.



Northerly Island

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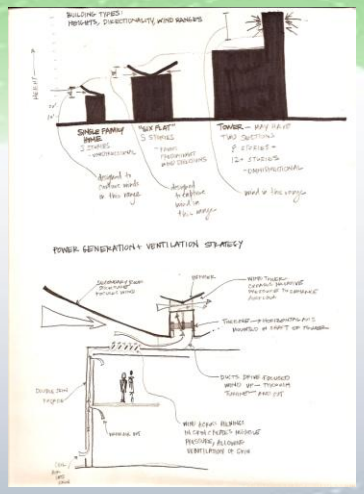


Wind Power and the Built Environment

April Chen	Architecture, SAIC
Abdoulaye Diao	Chemical Engineering, IIT
Steve Henry	Architecture, IIT
Thinh Nguyen	Architecture, IIT
Joon park	Mechanical Engineering, IIT
Janusz Pula	Electrical Engineering, IIT
Matthew Stewart	Interior Architecture, SAIC
Noel Wessely	Materials Science, IIT

Special Thanks:

Professor Hassan Nagib	Aeronautics, IIT
Paul Rozier	Aeronautics, IIT
Bruno Monnier	Aeronautics, IIT

The Art of Wind
IPRO 314 Group 3

Wind Power and the Built Environment
Integrating wind power into architecture

Areas of Investigation

- *Urban planning level:* What strategies can be applied to the design of the city to allow for maximum harvest of wind energy?

- *At the level of individual buildings:* What types of turbines are most appropriate to application to individual buildings and how can they be applied? How can architecture enhance their ability to generate power?

Goals

- Choose an appropriate site that displays qualities unique to Chicago, has a relationship with long-term investors and has potential wind activity
- Gather macro wind data from surrounding locations and analyze this data to approximate the prevailing micro wind conditions of the specific site
- Evaluate the energy need of the site and appropriate turbines
- Propose several design hypotheses at the scale of the site and individual buildings and test these designs with wind tunnel testing

Site & Program

- Mixed Income Residential Development: Lake Park Crescent
- Program developed based on CHA plans and phase 1 development numbers:
  - 10 “Eight Flats”
  - 12 Row Homes
  - 24 City Homes
  - 2 17-Story Towers

Developer plans for Phase 1 development

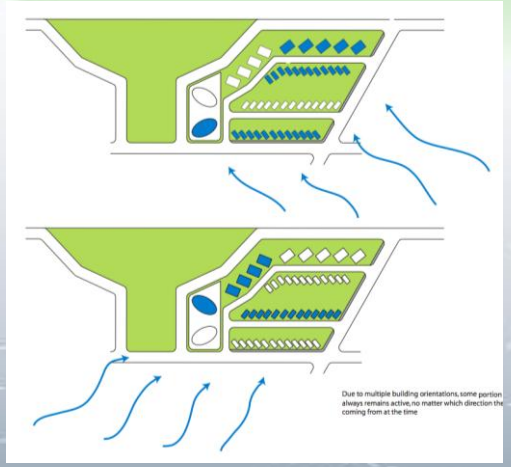
Design Proposals

Tower

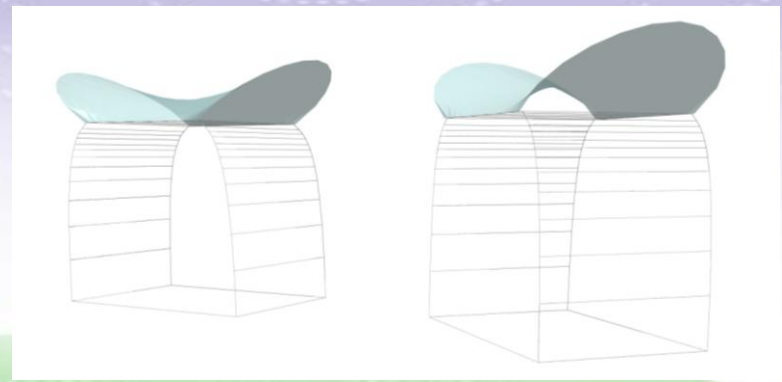
17-story residential tower, 70 units each

Explores placement of vertical axis turbines along recesses in floor plates

Site



Terraced with building oriented to take advantage of multiple wind directions



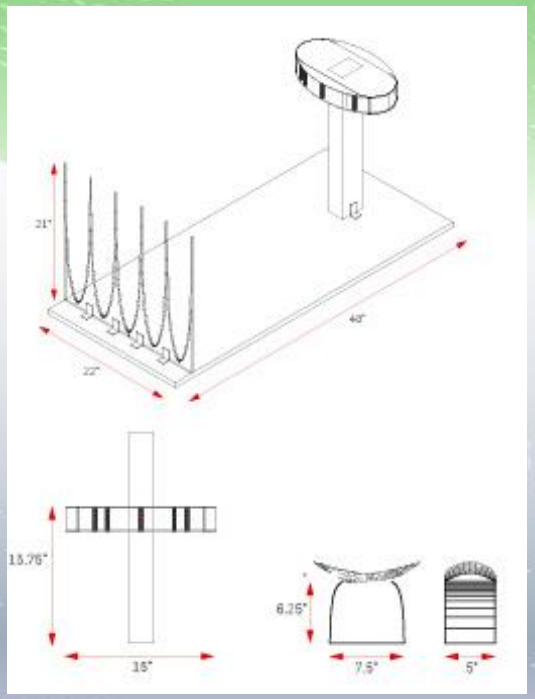
Eight Flat

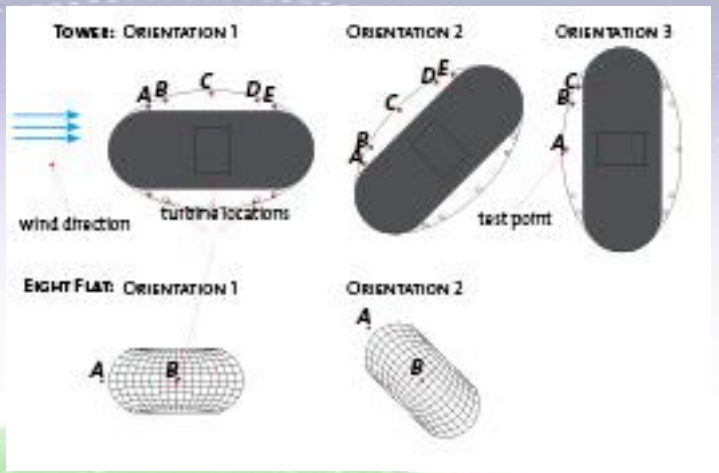
Four story residential building, eight units

Utilizing Funnel Shape to Increase velocity into four horizontal-axis turbines

Wind Tunnel Testing

- Models designed for wind tunnel tests
- Testing at two velocities, various orientations
- Two concepts:
  - Funnel
  - Effectiveness of turbine array



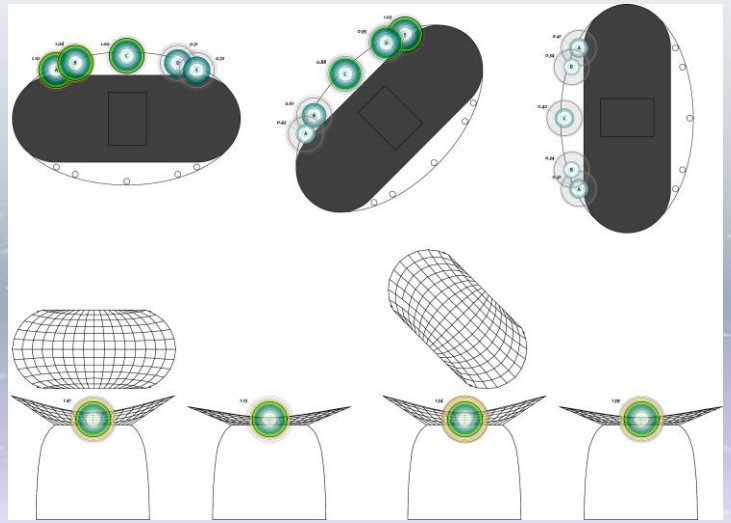


Conclusion

- Building forms can indeed increase the velocity of the wind and thereby improve the effectiveness of turbines integrated into the architecture. The wind tunnel tests confirmed that the roof funnel forms were able to increase the velocity of the wind by a factor greater than 1.5. And the testing of the tower model illustrated just how much or little a building mass can negatively impact the effectiveness of wind turbines.

- We were able to take conceptual ideas and refine them using qualitative analysis through discussion and research, then test those designs in a controlled environment in order to calculate quantitative results.

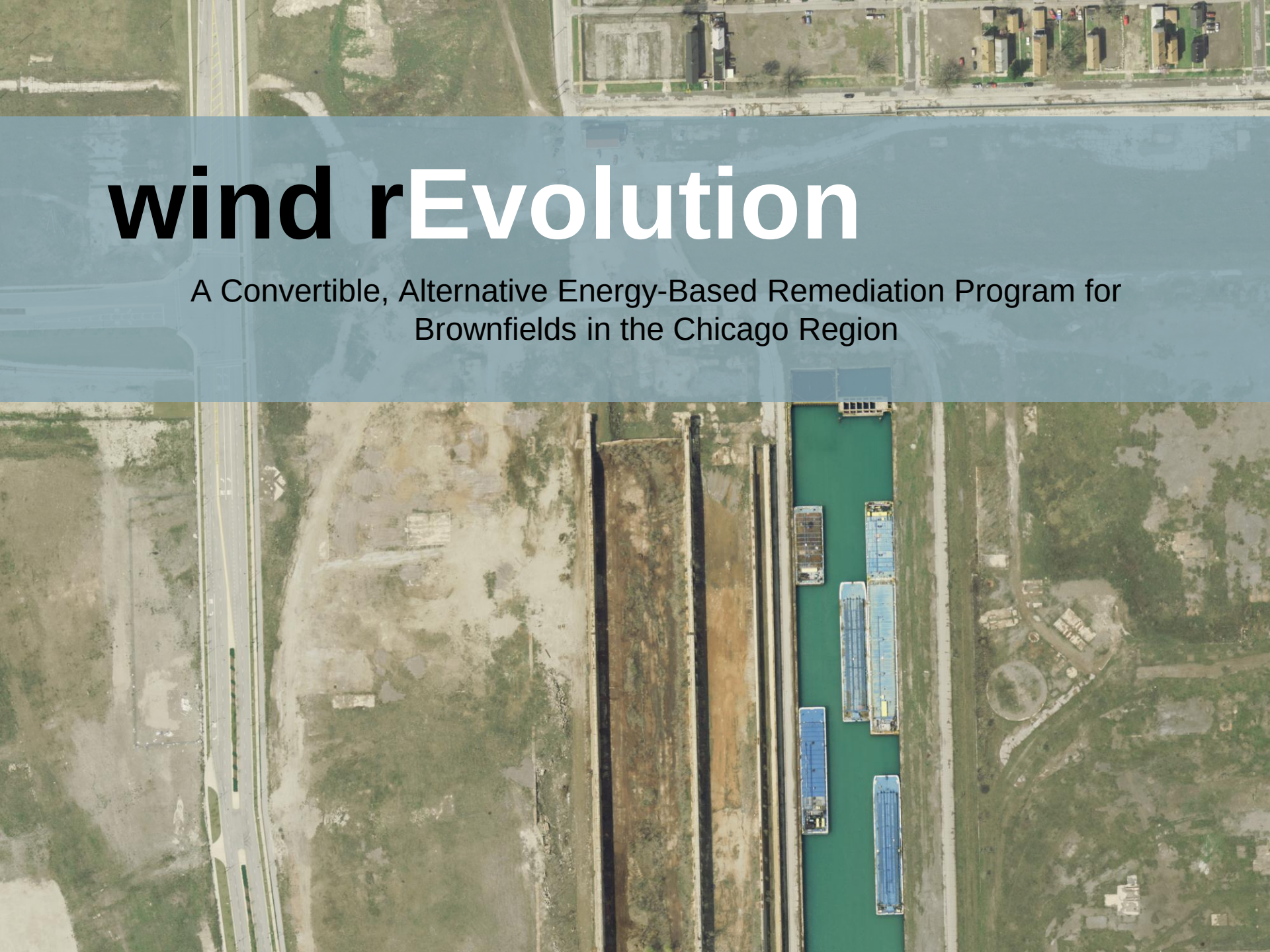
- Future classes will have the opportunity to build upon this to consider in greater depth the intricate relationship between efficiency of design through additional testing and expressive design through greater analysis of the the social and political aspects of this site.



The Art of Wind
IPRO 314 Group 3

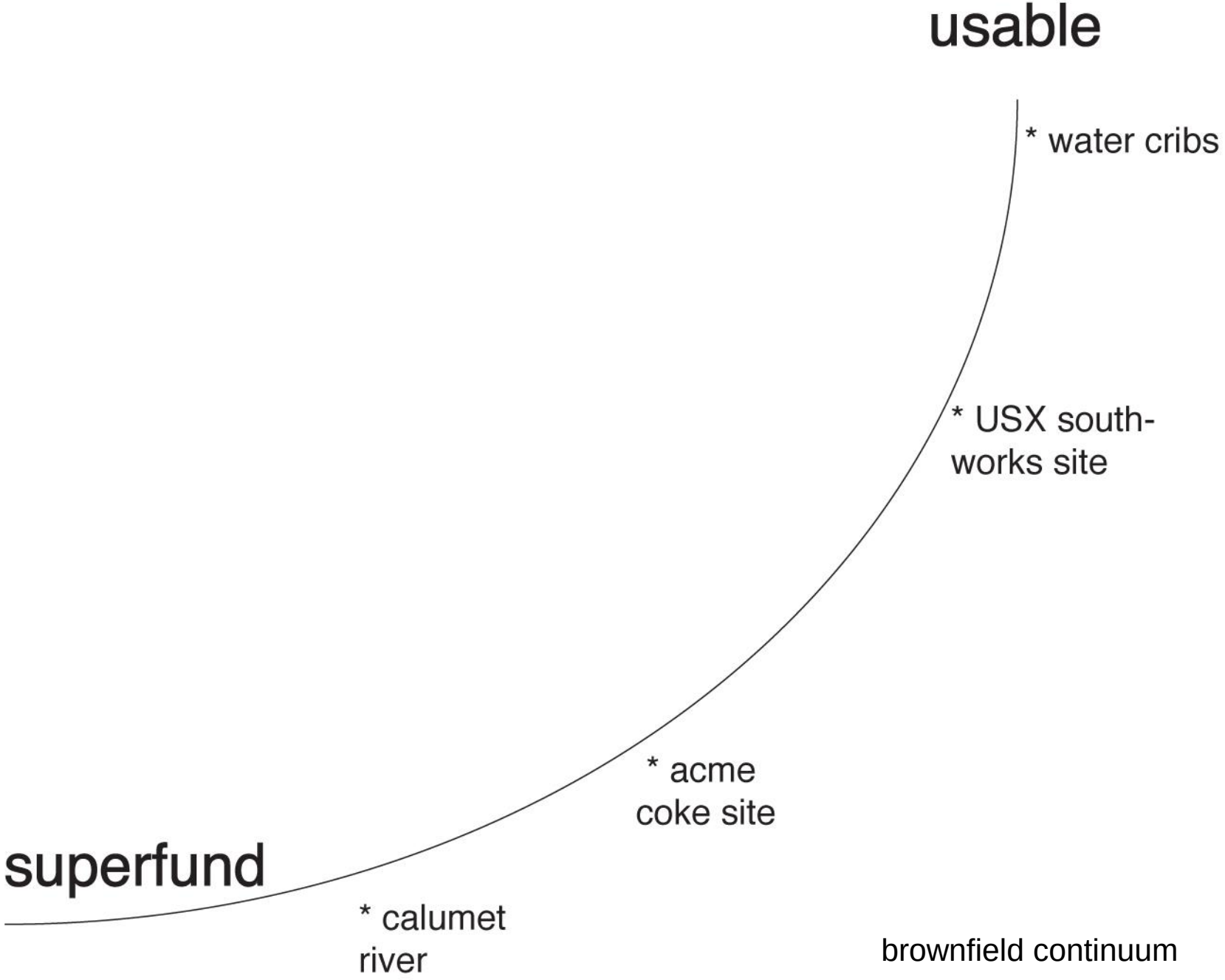
Wind Power and the Built Environment

Integrating wind power into architecture

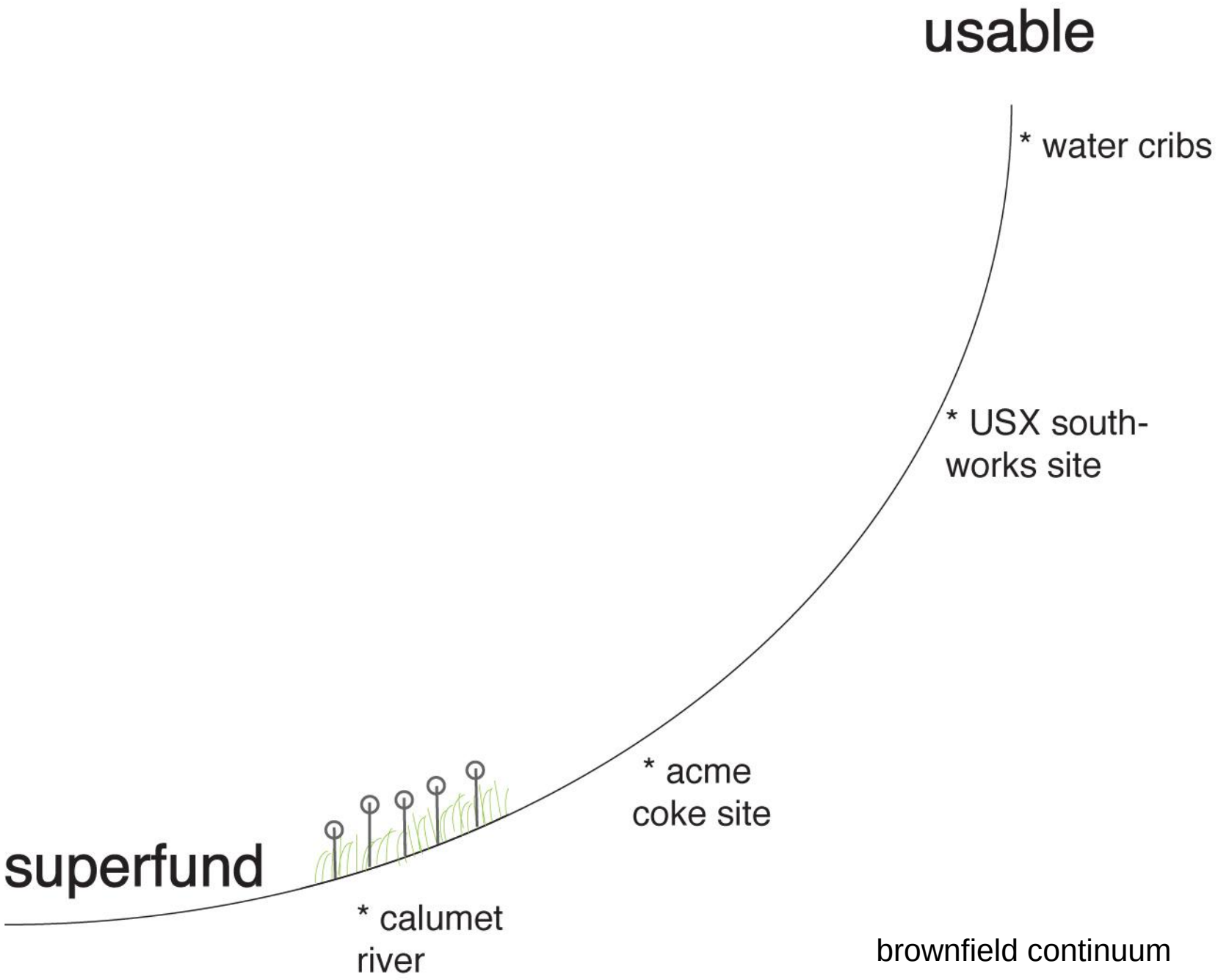


wind rEvolution

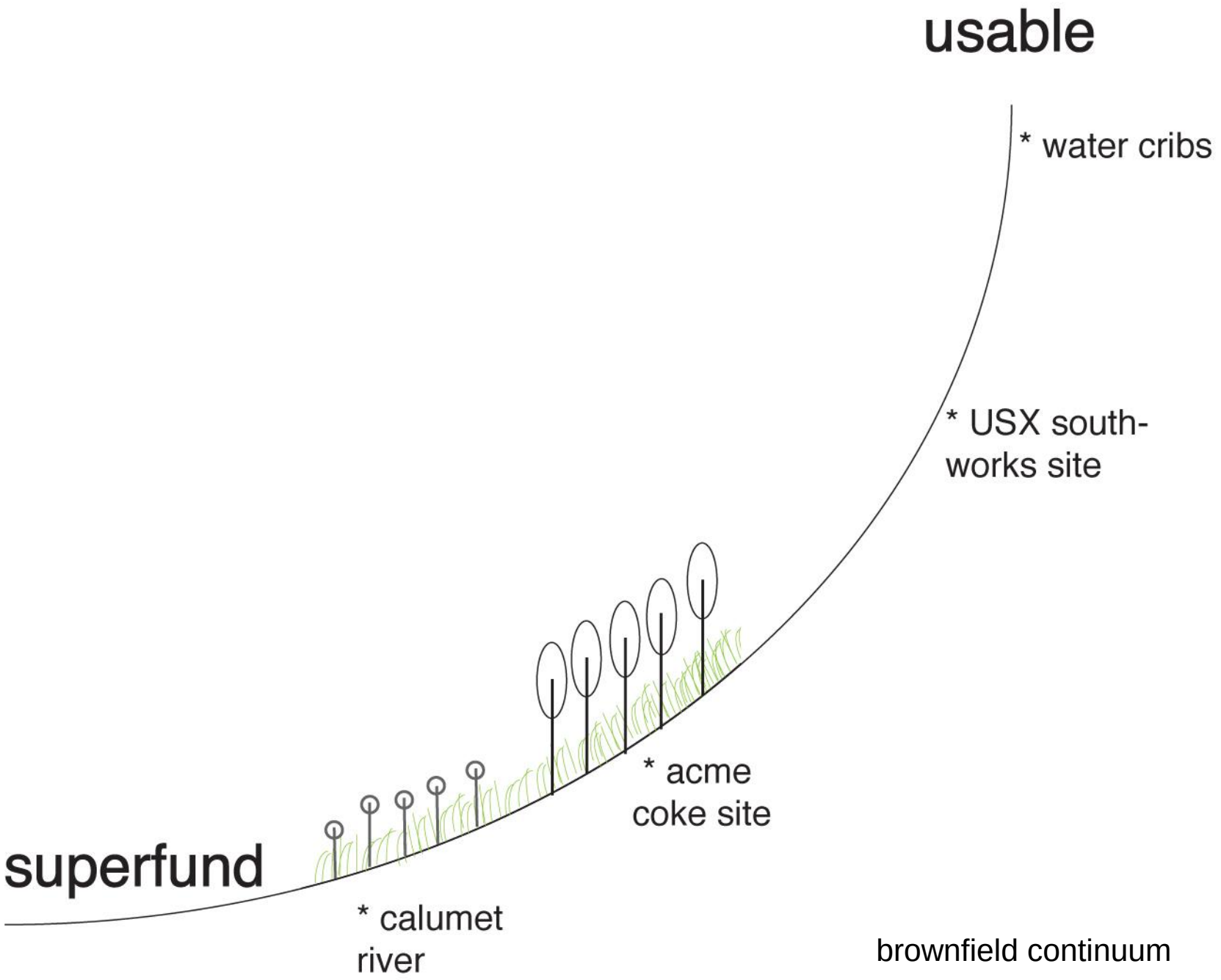
A Convertible, Alternative Energy-Based Remediation Program for Brownfields in the Chicago Region



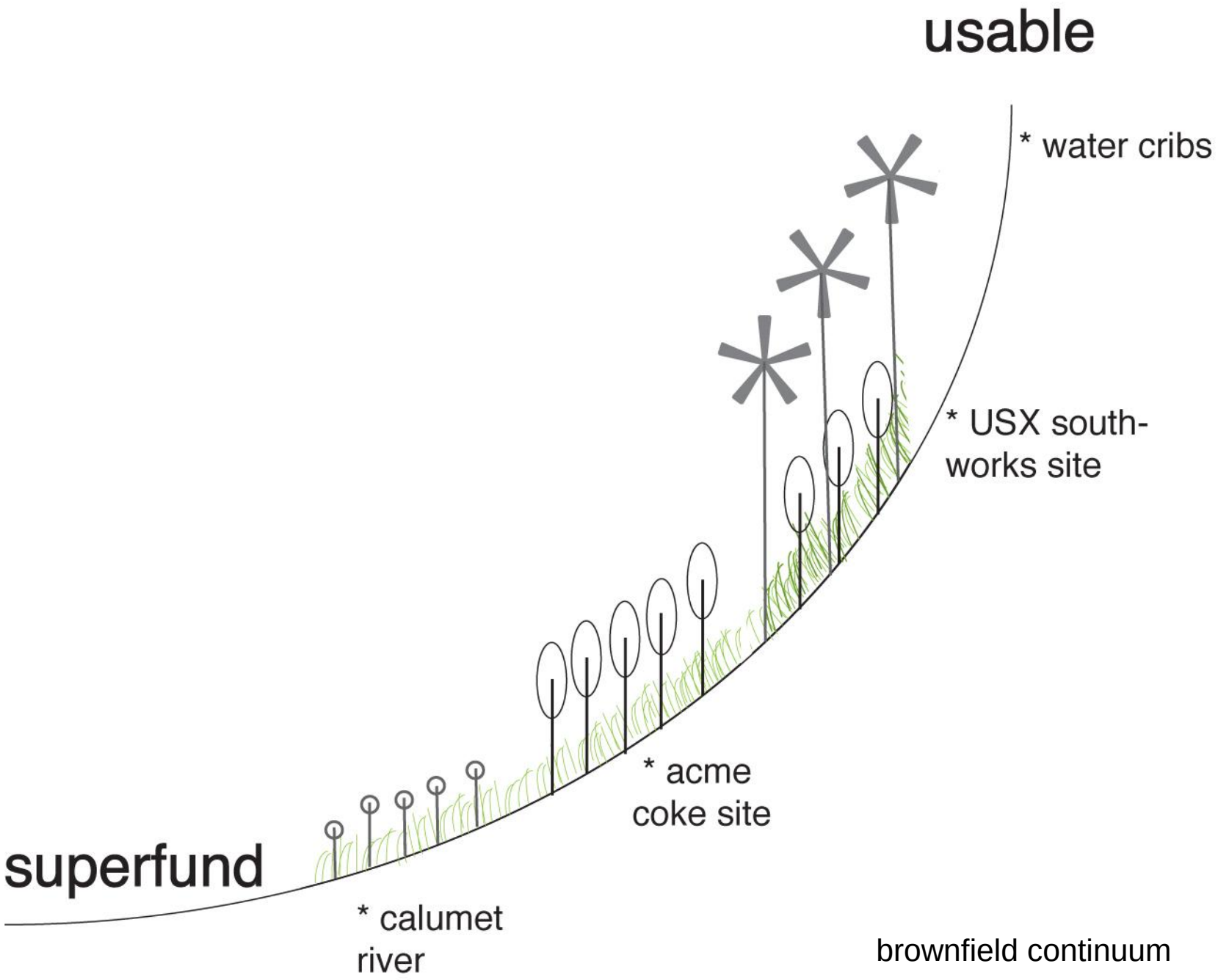
brownfield continuum



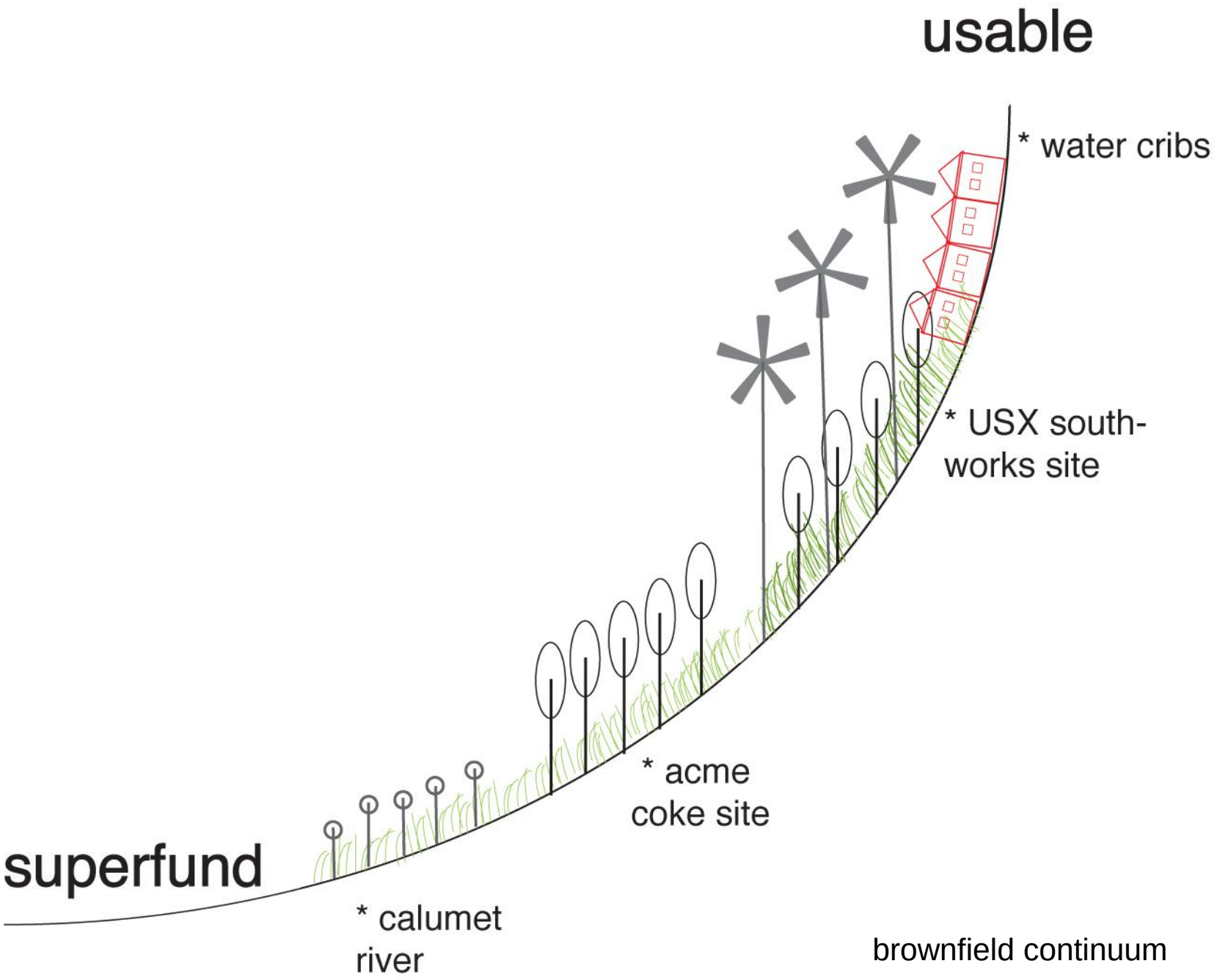
brownfield continuum



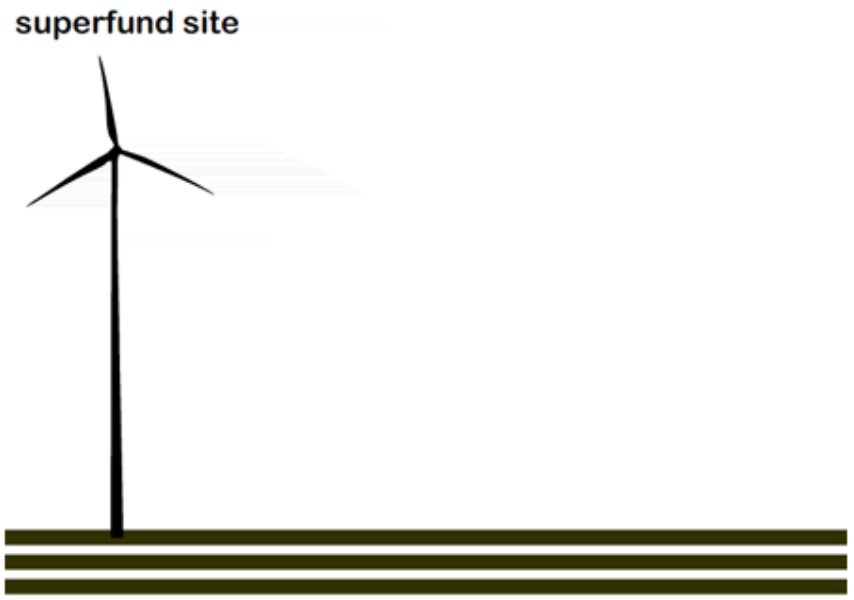
brownfield continuum



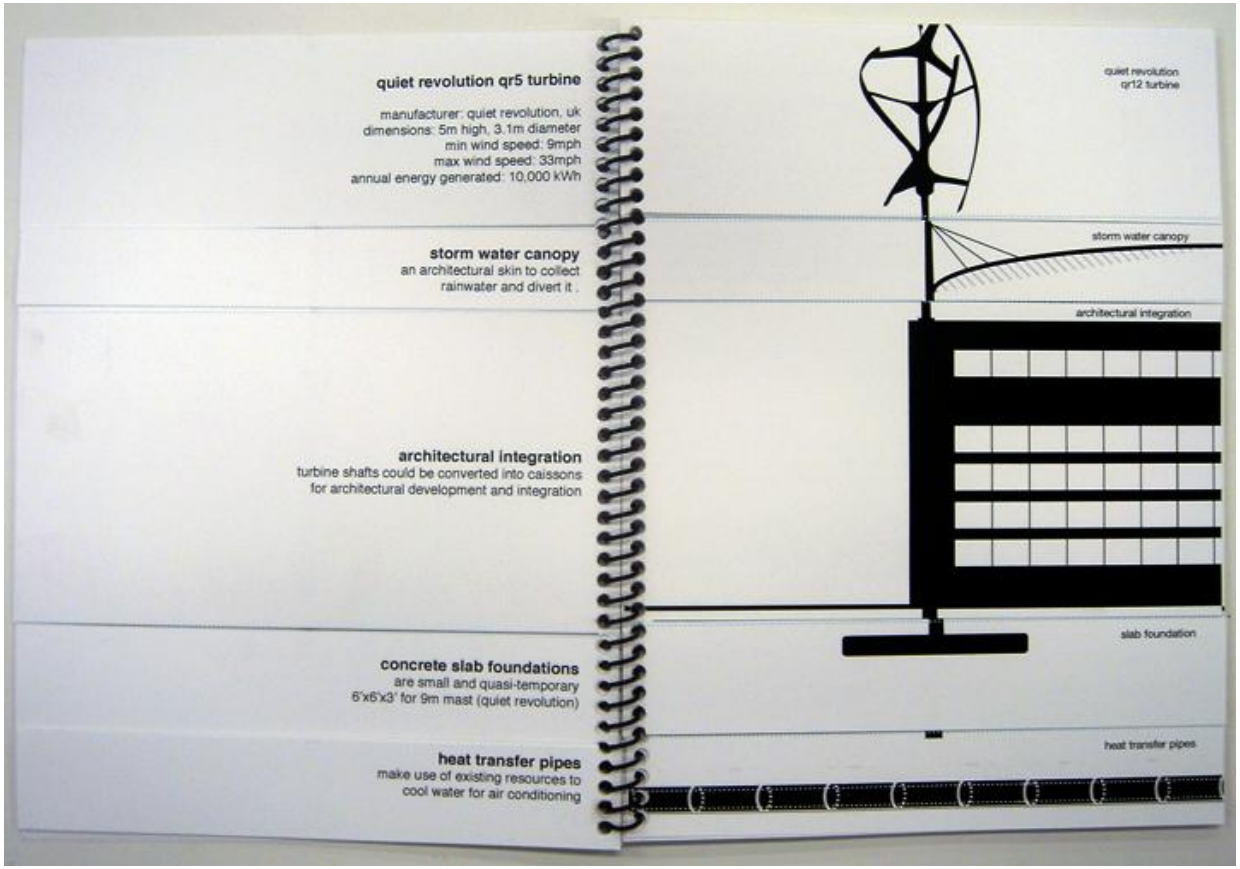
brownfield continuum



brownfield continuum

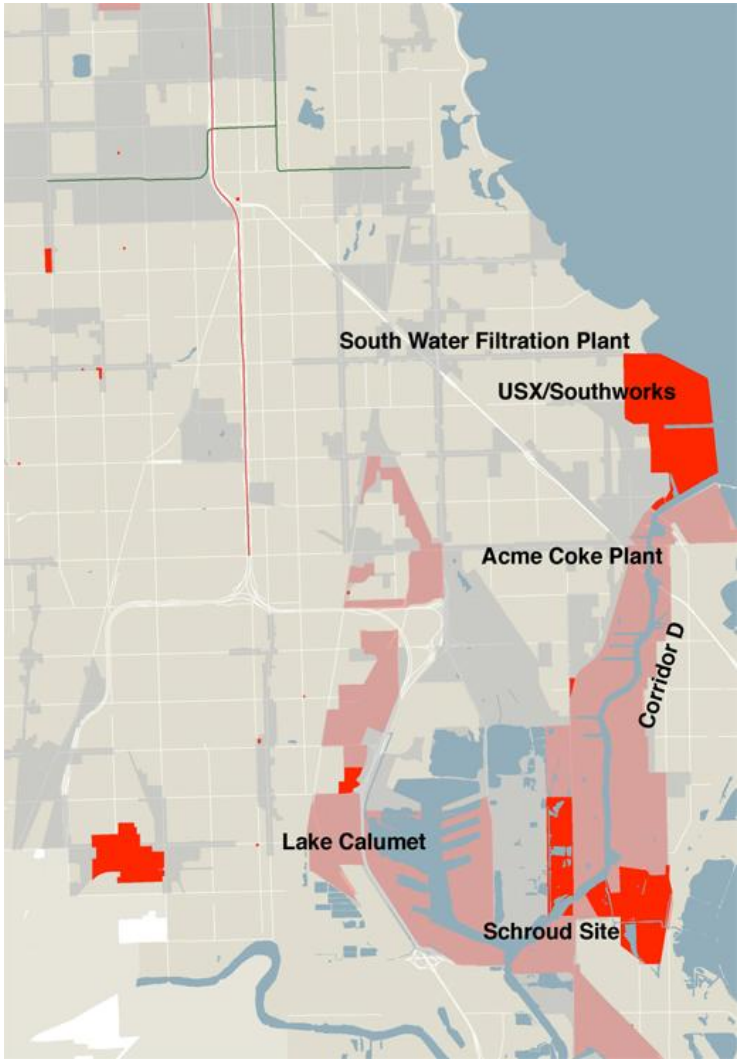


life of a brownfield (animation)

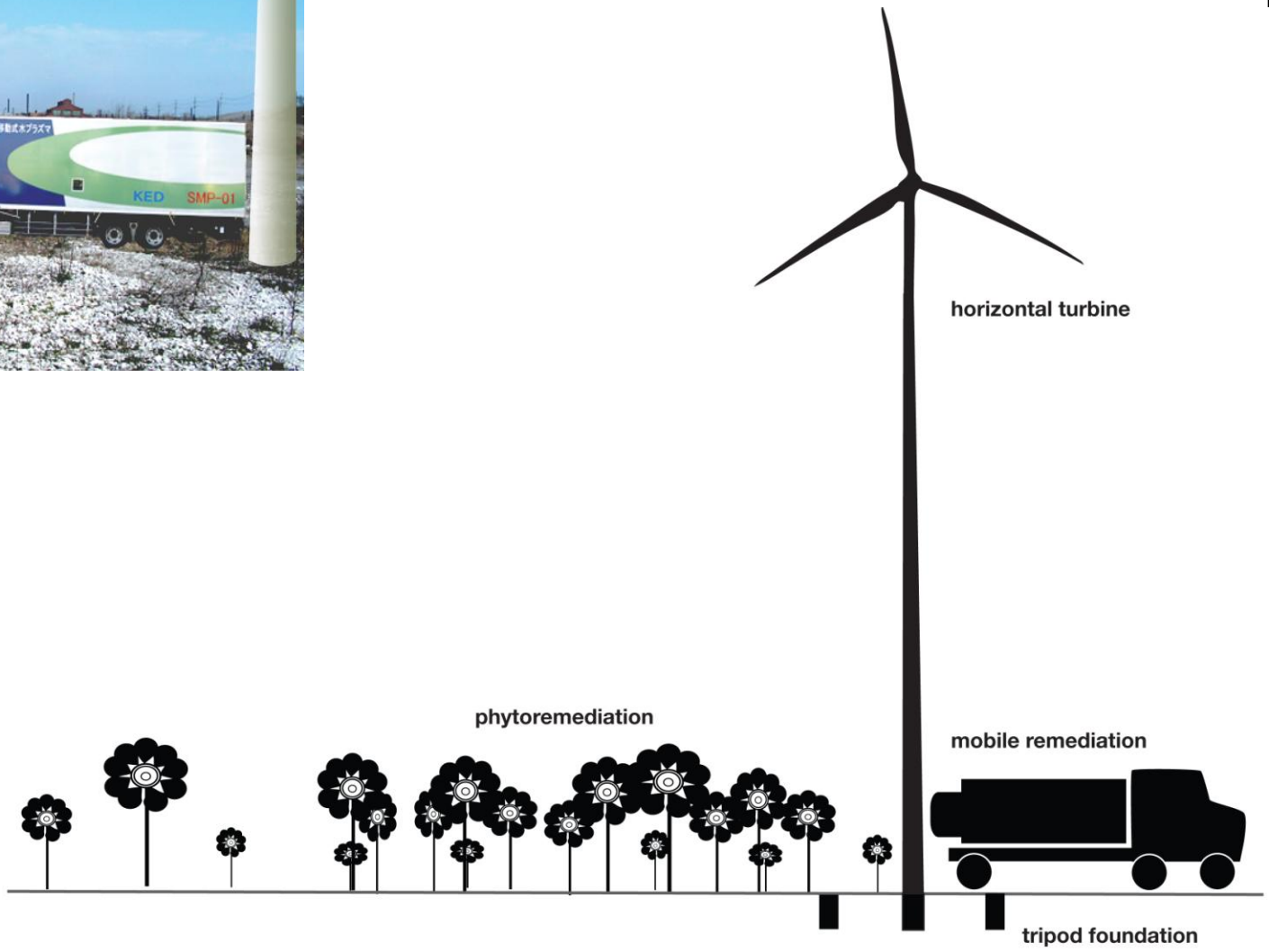

quiet revolution qr5 turbine
manufacturer: quiet revolution, uk
dimensions: 5m high, 3.1m diameter
min wind speed: 9mph
max wind speed: 33mph
annual energy generated: 10,000 kWh
storm water canopy
an architectural skin to collect rainwater and divert it .
architectural integration
turbine shafts could be converted into caissons for architectural development and integration
concrete slab foundations
are small and quasi-temporary
6'x6'x3' for 9m mast (quiet revolution)
heat transfer pipes
make use of existing resources to cool water for air conditioning
quiet revolution qr12 turbine
storm water canopy
architectural integration
slab foundation
heat transfer pipes

flipbook

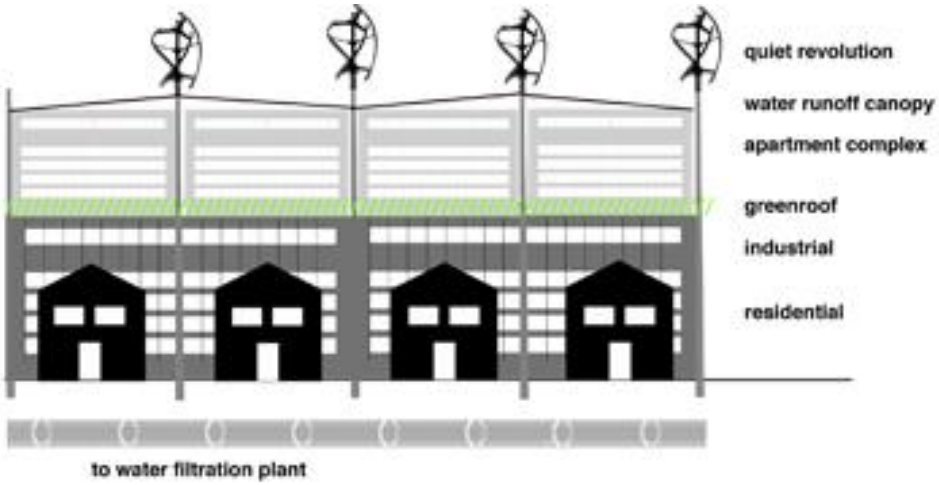
Prototypical Site: Calumet Industrial Corridor



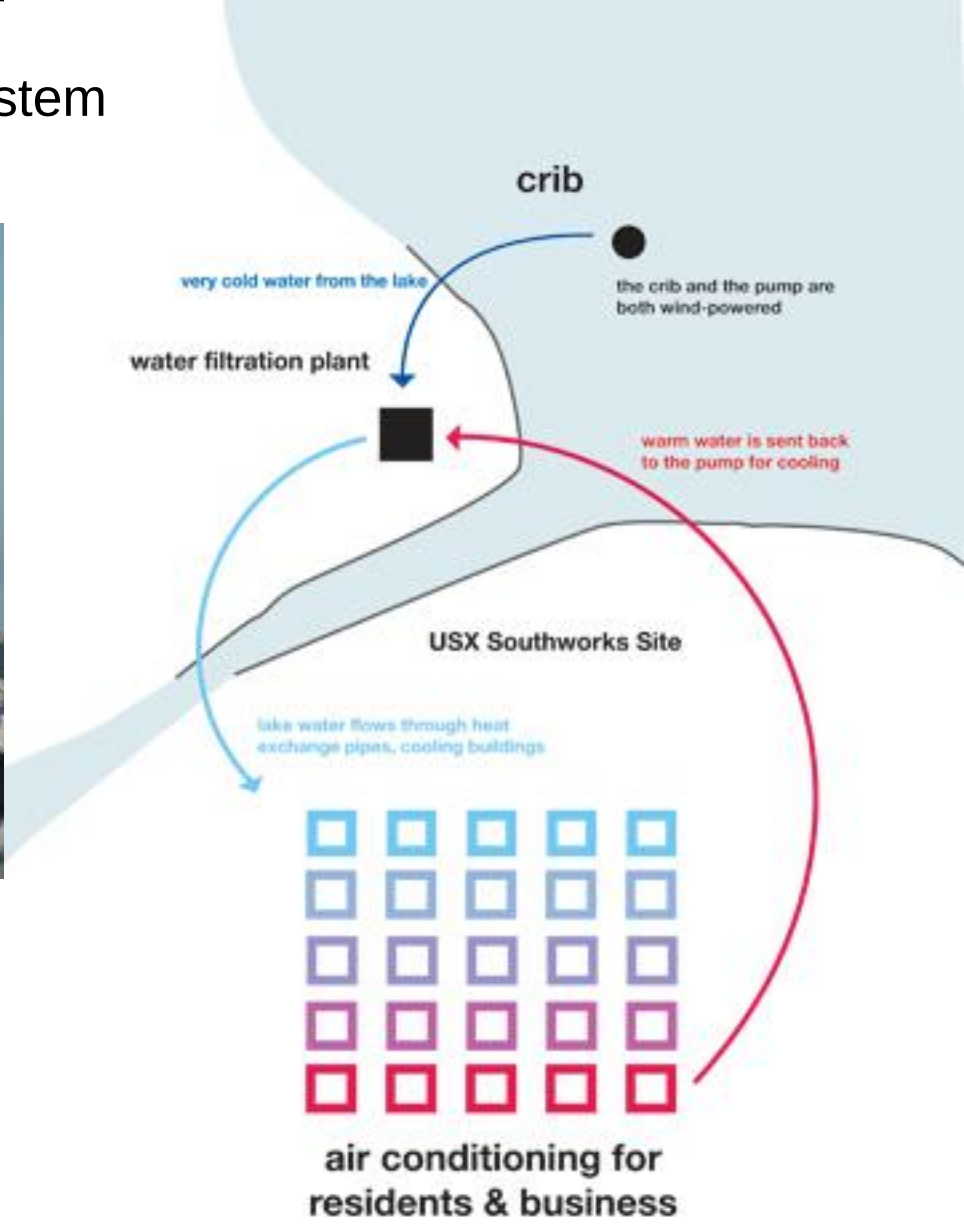
Brownfield Mobile Remediation Units (passive and active)



USX/Southworks Wind and Plasma Energy System

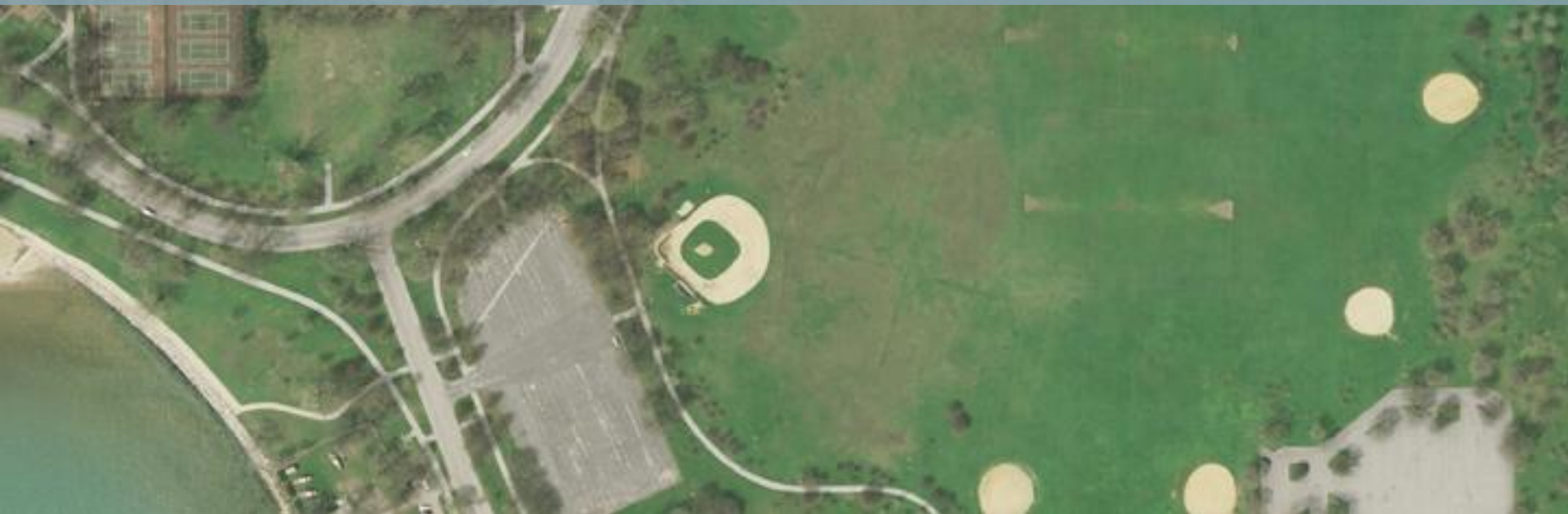


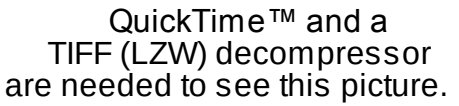
Wind Driven Lake-Source Cooling System



Art of Wind Power, Team Three

Olusegun David, Electrical Engineer, *electrical systems and site research*
DongHwan Kim, Mechanical Engineer, *turbine systems and wind data*
Sooyoung Ha, Mechanical Engineer, *foundation systems and wind data*
Charles McGhee-Hassrick, MFA, Designed Objects, *concept development and design*
Heidi Moran, BFA, Sculpture, *remediation and site research, concept development*
Bret Schneider, BFA, Sculpture, *concept development, graphics and animation*
Lisa Smith, Mdes, Designed Objects, *project manager, concept development, book production*
Supreedee Rittironk, PhD, Architecture , *architectural design and site planning*





There are numerous opportunities in Chicago and and the surrounding region for the application of wind powered technologies that can provide us with clean energy, enhance our environment and transform our neighborhoods. We hope we have inspired you to think about this powerful and abundant resource and look forward to your questions.

This morning's presentation has only scratched the surface of a semester's worth of research. We invite you to please visit our tables for an in-depth explanation of each of these unique projects and to learn more about how Chicago can benefit from the adoption of wind powered technologies.