Turning Brown into Green:
Responding to Soil Contamination and Community Recreation Needs in the Redevelopment of Brownfields for Open Space

Brown2Green Masters’ Project Team
Introductions

- Project Team
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- Client: Southwest Detroit Environmental Vision
Presentation Outline

- Introduction to Brownfields and Redevelopment for Open Space
- Research Questions
- Project Overview
- The Project Components
  - Contaminant Identification
  - Remediation Techniques
  - The Community
  - Using the “Toolbox”
  - Conclusion
Introduction to Brownfields

- “abandoned, idled or under-used industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination” (U.S. EPA 2001)

- Redeveloped for many uses

- Potential benefits to open space redevelopment
Challenges
- Highly degraded site conditions
- Lack of clean up standards for future use

Opportunities
- Incorporating community feedback
- Using remediation technologies creatively
- Integrating remediation technologies into end use design
Research Question #1

What are the design implications of some appropriate remediation techniques for contaminants commonly found on brownfield sites, namely heavy metals, PCBs, PAHs, and VOCs?
How can community recreational needs be integrated with the aesthetic implications of remediation techniques to develop a site layout for a recreational open space at a brownfield site?
Project Overview

- Contaminant Identification
  - Remediation Technique
- Aesthetic Considerations
- Community Participation
  - Recreational Needs
- Synthesis
- Design Implications
Part I: Contaminant Identification

- Contaminant Identification
  - Remediation Technique
- Community Participation
  - Recreational Needs
- Aesthetic Considerations
- Synthesis
- Design Implications
What follows:

- Overview of Demonstration Site: *Revere Copper and Brass*
- Definition of soil contaminants present
- Overview of soil remediation technologies investigated
- Discussion of aesthetic implications of remediation technologies
Demonstration Site: Context
Revere Copper & Brass Site
Role of Revere

- Revere Copper and Brass served as a demonstration site

- Representative of “sites like this”
  - Adjacent to residential areas
  - Low-level heavy metal contamination across the site
  - Higher-level contamination existing in smaller areas
  - Soil pollution as a result of:
    - Manufacturing / Smelter activities
    - Underground Storage Tanks
Soil Contamination

- Soil contaminants common to “sites like this”
  - Polycyclic Aromatic Hydrocarbons (PAHs)
  - Polychlorinated Biphenyls (PCBs)
  - Volatile Organic Compounds (VOCs)
  - Heavy Metals

- Some soil contaminants present at Revere
  - PAHs - Benzo(a)pyrene
  - PCBs - various
  - VOCs - only trace amounts at Revere
  - Metals - Arsenic, Chromium, Copper, Lead
Soil Contamination at Revere

Source: Snell Environmental Group’s Phase I and Phase II Remedial Investigation Reports
Soil Remediation Techniques

Remediation Techniques Researched:

- Stabilization - Chemical and Solid
- Surface Control Caps (Capping)
- Excavation
- Phytoextraction
- Bioremediation
Soil Remediation - Stabilization

- Contaminants Treated: **Metals & PCBs**

- Methods:
  - **Solid Stabilization** physically immobilizes contaminant
  - Lime, Cement, Organic Polymers & Silicates
  - **Chemical Stabilization** converts contaminant into an immobile form.
  - Uses soil amendments, phytostabilization, or bioremediation
Contaminants Treated: Metals & PCBs

Methods:
- **Capping** prevents water infiltration
- **Vegetation** controls erosion and takes up water through evapotranspiration
Soil Remediation - Extraction

- Contaminants Treated: All Types
- Methods:
  - **Excavation** involves removal of the soil from the site
  - **Phytoextraction** uses plants to pull contaminants out of the soil so they can be harvested and disposed of
Soil Remediation - Degradation

- Contaminants Treated: PAHs, PCBs, VOCs
- Methods:
  - **Bioremediation** uses microorganisms to ingest and degrade contaminants into non-toxic by-products of water and carbon dioxide.
Aesthetic Implications

- What are the aesthetic implications of each remediation technique?

- What are their effects on:
  - Surface Treatment
  - Vegetation
  - Surface Plane
  - Treatment Area
  - Design Potential
Aesthetic Implications - Example

Example: Capping

- **Surface Treatment:**
  - Hardscape (asphalt, cobbles, brick) or softscape (vegetation)
  - Vegetation preferred since it can evapotranspirate water

- **Vegetation:**
  - Limited to shallow-rooting varieties in order to protect the cap from root intrusion

- **Surface Plane:**
  - Compacted clay cap must be below frost line (42-48” in Michigan), so area will most likely be raised at least 4 feet
  - Must be graded to drain well

- **Treatment Area:**
  - No set minimum treatment area
Aesthetic Implications - Example

Design Potential:

- What design opportunities exist when using capping to treat an area?

Change in elevation can be an efficient way to install “stadium seating” for a stage or provide a bleacher section for an adjacent play field.

Changes in elevation offers an opportunity for slides, sledding, or spontaneous play.
Aesthetic Implications - Example

Berms increase the soil depth to provide opportunities to use more deeply-rooted plant material.

Change in elevation can serve to efficiently separate conflicting uses.
Community Participation & Recreational Needs

What follows:

- Environmental Justice Issues
- Recreation in SW Detroit
- Community Profile
- Community Participation
  - Methods
  - Results
Environmental Justice Issues

- “Typical” Brownfield Communities
  - low income
  - minority
  - abandoned industrial sites
  - degraded neighborhoods
  - desire for improvement

- Access to Environmental Benefits
  - Differences by race/ethnicity and class

- Meaningful Involvement
  - Difficulties for participation
    - language
    - timing
    - access/power differentials
  - Allowing community input to inform design process
Recreation in SW Detroit

- Very little access to open space
  - Area parks
    - poor condition
    - unsafe
  - Connections to the river from residential areas very limited
  - “The only other green space is the cemetery” - SDEV’s Alison Benjamin
Community Profile

- Large Population of People of Color
  - 51.8% Non-White
  - 58.6% Hispanic
  - 12.2% African American

- Low Income population
  - Avg. Household Income Range of $18,529 - $32,292 across seven Census Tracts

- Non-English speaking population
  - 50.7% speaking language other than English at home

Source: Brown2Green Analysis of SF3, 2000 U.S. Census
Collection of Community Input

- Focus Groups & Written Surveys
- Two different areas of Southwest Detroit
  - Harms Elementary School Parent’s Community Group
  - Delray Community Center
- Topics Explored
  - Residents’ recreational needs
  - Recreational & aesthetic preferences
  - How residents want to participate
Study Area vs. Sample

Other sample characteristics
- Majority female sample (85%)
- Large families with multiple children
Results

Program Development from Community Input

- Amenities with a 30% or higher response rate
  - Trails
  - Basketball courts
  - Children’s Play Equipment
  - Place to Hear Music
  - Soccer Fields
  - Plaza/Pavilion
  - Bird/wildlife watching area
  - Picnic area
  - Volleyball Court
  - Tennis Courts
Part IV: Using the Toolbox

Contaminant Identification → Remediation Technique → Aesthetic Considerations → Synthesis → Design Implications

Community Participation → Recreational Needs
What follows:

- Developing a conceptual park design
  - goal is to place program elements over soil contamination
- Use the toolbox to suggest how soil remediation and program element might be integrated
Site Program to Conceptual Design

- Site Program
- Conceptual Design
- Ecology
- Community Preferences
- Community Needs
- Remediation Techniques
- Soil Contamination
- Aesthetics

Diagram showing the interrelation of these elements.
Site Inventory and Analysis
Conceptual Design

Park Program Elements
As identified by the community

- Plaza/Pavilion
- Place to Hear Music
- Bird/wildlife watching area
- Picnic area
- Children’s Play Equipment
- Basketball courts
- Soccer Fields
- Volleyball Court
- Tennis Courts
- Trails
Area 1: Entry Plaza

Solid Stabilization: Plaza

Bioremediation: Plaza
Area 2: Northeast Buffer

Chemical Stabilization: Changes in Vegetation
Area 3: Active Play Area

- **Capping:** Unique topography
- **Capping:** Berms
- **Capping:** Recreation
Area 4: River Promenade

Capping: Retaining Walls
Area 5: Informal picnic

- Capping: Berms
- Separation of uses
Area 6: Southeast Buffer

Bioremediation:

Planting Materials

Phytoextraction:

Grid Planting

Planting Materials
Conclusion

- Potential for **creativity** in the use of soil remediation techniques
  - Consider the future use when selecting remediation techniques
  - Consider aesthetic implications of techniques
  - Seek to incorporate these into the design

- **Meaningful public participation** is crucial in the redevelopment process
  - Allow residents to shape the future of their communities
  - Leads to more successful projects
Thank you!

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