Green Remediation in the States

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ILLINOIS EPA
FEBRUARY 4, 2009

ASTSWMO

- Association of State and Territorial Solid Waste Management Officials

  Mission: To enhance and promote effective state and territorial waste management programs, and affect national waste management policies.

- Sustainability Sub-Committee est. July 2007
- Greener Cleanups Task Force (GCTF) est. Oct 2007
- Other task forces under the Sustainability Sub-Committee:
  - Green Chemistry
  - Product Stewardship
  - Greening State Government

GCTF Member States and Mission

- Illinois (chair)
- California
- Colorado
- Delaware
- Georgia
- Massachusetts
- Missouri
- New York
- Oklahoma
- Oregon

Mission

Facilitate cleanup decisions that increase the net environmental benefits of remediation, and in doing so, contribute to site sustainability.

GCTF is a cross-program task force representing CERCLA, RCRA, Tanks, Brownfields and Federal Facilities.

GCTF Goals

- Identify best practices and incentives for greener cleanups;
- Support State programs in their efforts to integrate these approaches into State remedy selection processes;
- Strengthen partnerships between the States and U.S. EPA to improve greener cleanup capacities; and
- Operate as a technical resource for other ASTSWMO task forces and sub-committees.

GCTF Strategy Papers

- Implementing Greener Cleanups in the States
- Creating Incentives
- Identifying Barriers to Greener Cleanups
- Incorporating Greener Cleanups into Contract Language
- Incorporating Greener Cleanups into Post Remedy and CERCLA 5-Year Reviews
- Incorporating Greener Cleanups into Supplemental Environmental Projects (SEPs)
- Incorporating Greener Cleanups into Environmental Management Systems (EMS)

State Policy Drivers

- State priorities on sustainability and renewable energy
- State technical capacity and acceptance of innovative technologies
- Regulatory pressures, such as clean air requirements, landfill bans, or energy use restrictions
- Innovative site owners and responsible parties
- State acceptance of risk-based cleanups and institutional controls
- The regional economy, such as fuel costs and pricing for salvaged metals and materials.

GCTF Survey

- Developed to aid in preparing the strategy papers on incentives and barriers
- To be completed online by ASTSWMO members
- Fewer than 10 questions
- Results will be presented at the ASTSWMO mid-year meeting in Columbus, OH in April 2009

Outreach to the States

- Webpage of greener cleanups resources http://www.astswmo.org/resources_sustainability_greenercleanups.html
- Green remediation speakers and panel sessions at ASTSWMO meetings and other venues, such as U.S. EPA conferences
- Collaboration with other ASTSWMO task forces as well as outside parties interested in advancing green remediation practices for State programs

Greener Cleanups in Illinois

- The Matrix
- 5 Guiding Principles
- Strategy Mind Map for all sites
- Decision Tree and Mind Map for LUST sites
- Illinois EPA RCRA Pilot Study with USEPA Region 9

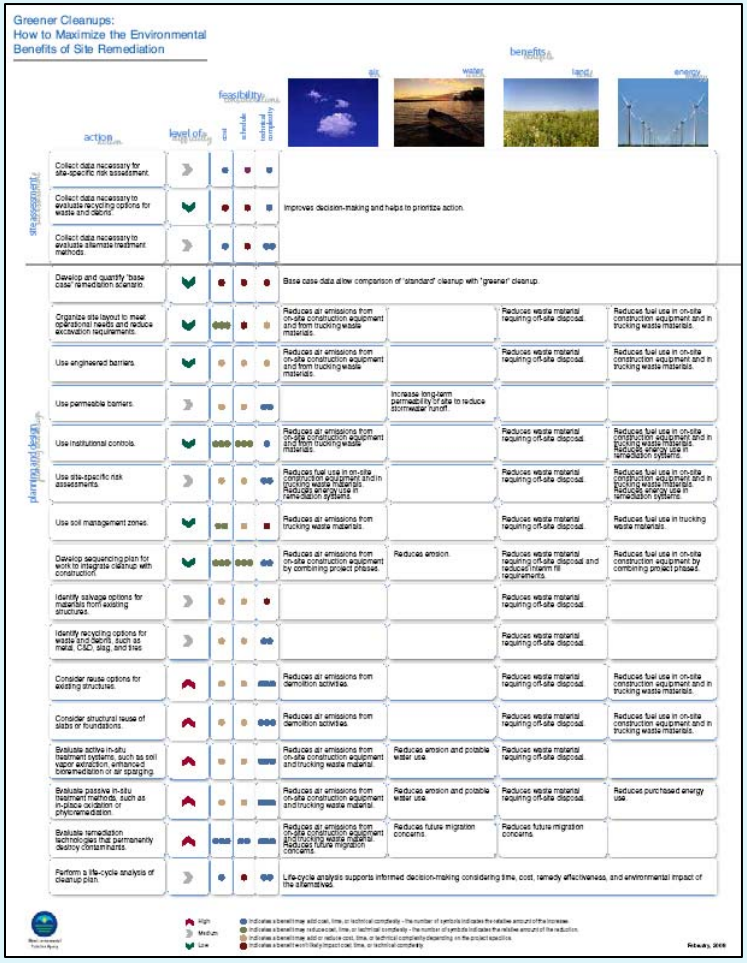
The Illinois Matrix

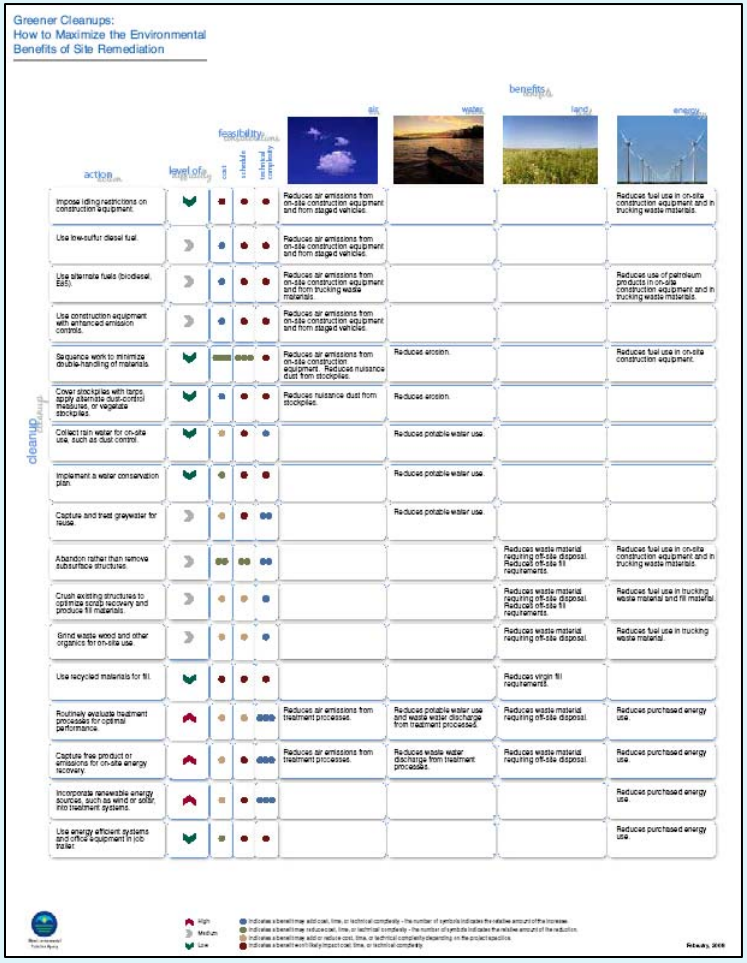
- Created to guide site owners and consultants in choosing sustainable practices that can be applied to site assessment, planning and design, and cleanup.
- Illinois EPA evaluated certain cleanups from LUST, SRP, CERCLA and RCRA programs using questionnaires, field visits and consultations with green remediation practitioners.

The Illinois Matrix

- The matrix lists individual actions, followed by a qualitative ranking of their level of difficulty and feasibility.
- The benefits of each action to air, water, land and energy are also identified.
- 36 actions total
  - Site assessment 3
  - Planning and design 16
  - Cleanup 17

The Matrix


Greener Cleanups:
How to Maximize the Environmental
Benefits of Site Remediation
benefits
air
water
land
energy
feasibility
action
level of effort
cost
schedule
technical complexity
site assessment
design, construction, and planning
Collect data necessary for site-specific risk assessment.
Collect data necessary to evaluate recycling options for waste and debris.
Collect data necessary to evaluate alternate treatment methods.
Improves decision-making and helps to prioritize action.
Develop and quantify "base case" remediation scenario.
Base case data allow comparison of "standard" cleanup with "greener" cleanup.
Organize site layout to meet operational needs and reduce excavation requirements.
Reduces air emissions from on-site construction equipment and from trucking waste materials.
Reduces waste material requiring off-site disposal.
Reduces fuel use in on-site construction equipment and in trucking waste materials.
Use engineered barriers.
Reduces air emissions from on-site construction equipment and from trucking waste materials.
Reduces waste material requiring off-site disposal.
Reduces fuel use in on-site construction equipment and in trucking waste materials.
Use permeable barriers.
Increase long-term permeability of site to reduce stormwater runoff.
Use institutional controls.
Reduces air emissions from on-site construction equipment and from trucking waste materials.
Reduces waste material requiring off-site disposal.
Reduces fuel use in on-site construction equipment and in trucking waste materials. Reduces energy use in remediation systems.
Use site-specific risk assessments.
Reduces fuel use in on-site construction equipment and in trucking waste materials. Reduces energy use in remediation systems.
Use soil management zones.
Reduces air emissions from trucking waste materials.
Reduces waste material requiring off-site disposal.
Reduces fuel use in trucking waste materials.
Develop sequencing plan for work to integrate cleanup with construction.
Reduces air emissions from on-site construction equipment by combining project phases.
Reduces erosion.
Reduces waste material requiring off-site disposal and reduced interim fill requirements.
Reduces fuel use in on-site construction equipment by combining project phases.
Identify salvage options for materials from existing structures.
Reduces waste material requiring off-site disposal.
Identify recycling options for waste and landfill, such as metal, C&D, slag, and tires
Reduces waste material requiring off-site disposal.
Consider reuse options for existing structures.
Reduces air emissions from demolition activities.
Reduces waste material requiring off-site disposal.
Reduces fuel use in on-site construction equipment and in trucking waste materials.
Consider structural reuse of slabs or foundations.
Reduces air emissions from demolition activities.
Reduces waste material requiring off-site disposal.
Reduces fuel use in on-site construction equipment and in trucking waste materials.
Evaluate active in-situ treatment systems, such as soil vapor extraction, enhanced bioremediation or air sparging.
Reduces air emissions from on-site construction equipment and trucking waste material.
Reduces erosion and potable water use.
Reduces waste material requiring off-site disposal.
Evaluate passive in-situ treatment methods, such as in-place oxidation or phytoremediation.
Reduces air emissions from on-site construction equipment and trucking waste material.
Reduces erosion and potable water use.
Reduces waste material requiring off-site disposal.
Reduces purchased energy use.
Evaluate remediation technologies that permanently destroy contaminants.
Reduces air emissions from on-site construction equipment and trucking waste material. Reduces future migration concerns.
Reduces future migration concerns.
Reduces future migration concerns.
Perform a life-cycle analysis of cleanup plan.
Life-cycle analysis supports informed decision-making considering time, cost, remedy effectiveness, and environmental impact of the alternatives.
High
Medium
Low
Indicates a benefit may add cost, time, or technical complexity - the number of symbols indicates the relative amount of the increase.
Indicates a benefit may reduce cost, time, or technical complexity - the number of symbols indicates the relative amount of the reduction.
Indicates a benefit may add or reduce cost, time, or technical complexity depending on the project specifics.
Indicates a benefit will likely impact cost, time, or technical complexity.
Rev. 0 - February, 2008


Greener Cleanups:
How to Maximize the Environmental
Benefits of Site Remediation
benefits
air
water
land
energy
feasibility
action
level of effort
cost
schedule
technical complexity
cleanup
Impose idling restrictions on construction equipment.
Reduces air emissions from on-site construction equipment and from staged vehicles.
Reduces fuel use in on-site construction equipment and in trucking waste materials.
Use low-sulfur diesel fuel.
Reduces air emissions from on-site construction equipment and from staged vehicles.
Use alternate fuels (biodiesel, E85).
Reduces air emissions from on-site construction equipment and from trucking waste materials.
Reduces use of petroleum products in on-site construction equipment and in trucking waste materials.
Use construction equipment with enhanced emission controls.
Reduces air emissions from on-site construction equipment and from staged vehicles.
Sequence work to minimize double-handling of materials.
Reduces air emissions from on-site construction equipment. Reduces nuisance dust from stockpiles.
Reduces erosion.
Reduces fuel use in on-site construction equipment.
Cover stockpiles with tarps, apply alternate dust-control measures, or vegetate stockpiles.
Reduces nuisance dust from stockpiles.
Reduces erosion.
Collect rain water for on-site use, such as dust control.
Reduces potable water use.
Implement a water conservation plan.
Reduces potable water use.
Capture and treat greywater for reuse.
Reduces potable water use.
Abandon rather than remove subsurface structures.
Reduces waste material requiring off-site disposal. Reduced off-site fill requirements.
Reduces fuel use in on-site construction equipment and in trucking waste materials.
Crush existing structures to optimize scrap recovery and produce fill materials.
Reduces waste material requiring off-site disposal. Reduced off-site fill requirements.
Reduces fuel use in trucking waste material and fill material.
Grind waste wood and other organics for on-site use.
Reduces waste material requiring off-site disposal.
Reduces fuel use in trucking waste materials.
Use recycled materials for fill.
Reduces virgin fill requirements.
Routinely evaluate treatment processes for optimal performance.
Reduces air emissions from treatment processes.
Reduces potable water use and waste water discharge from treatment processes.
Reduces waste material requiring off-site disposal.
Reduces purchased energy use.
Capture free product or emissions for on-site energy recovery.
Reduces air emissions from treatment processes.
Reduces waste water discharge from treatment processes.
Reduces waste material requiring off-site disposal.
Reduces purchased energy use.
Incorporate renewable energy sources, such as wind or solar, into treatment systems.
Reduces purchased energy use.
Use energy efficient systems and office equipment in job trailer.
Reduces purchased energy use.
High
Medium
Low
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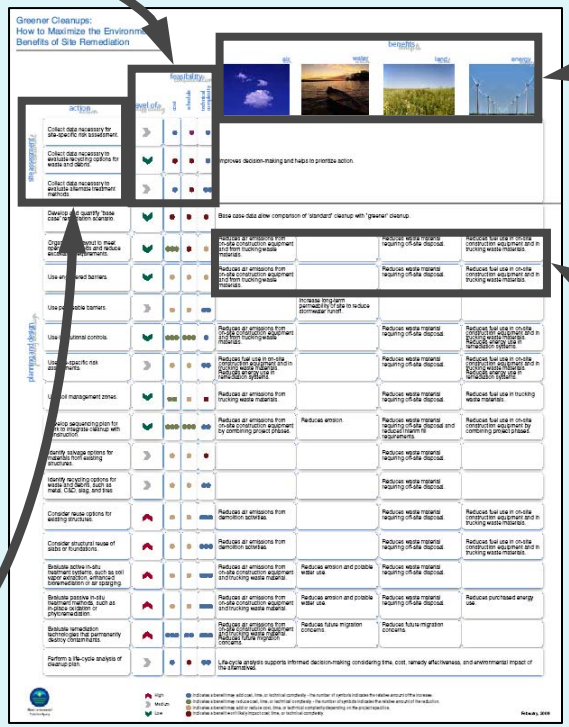


The Matrix

Reduces air emissions from on-site construction equipment and from trucking waste materials.		Reduces waste material requiring off-site disposal.	Reduces fuel use in on-site construction equipment and in trucking waste materials.
Reduces air emissions from on-site construction equipment and from trucking waste materials.		Reduces waste material requiring off-site disposal.	Reduces fuel use in on-site construction equipment and in trucking waste materials.

5 Guiding Principles in Illinois

1. Ensure every cleanup protects human health and the environment.

2. Integrate site reuse plans into the cleanup strategy.
   a. Sequence work to improve efficiency.
   b. Make use of engineered barriers and institutional controls that are compatible with future site development.

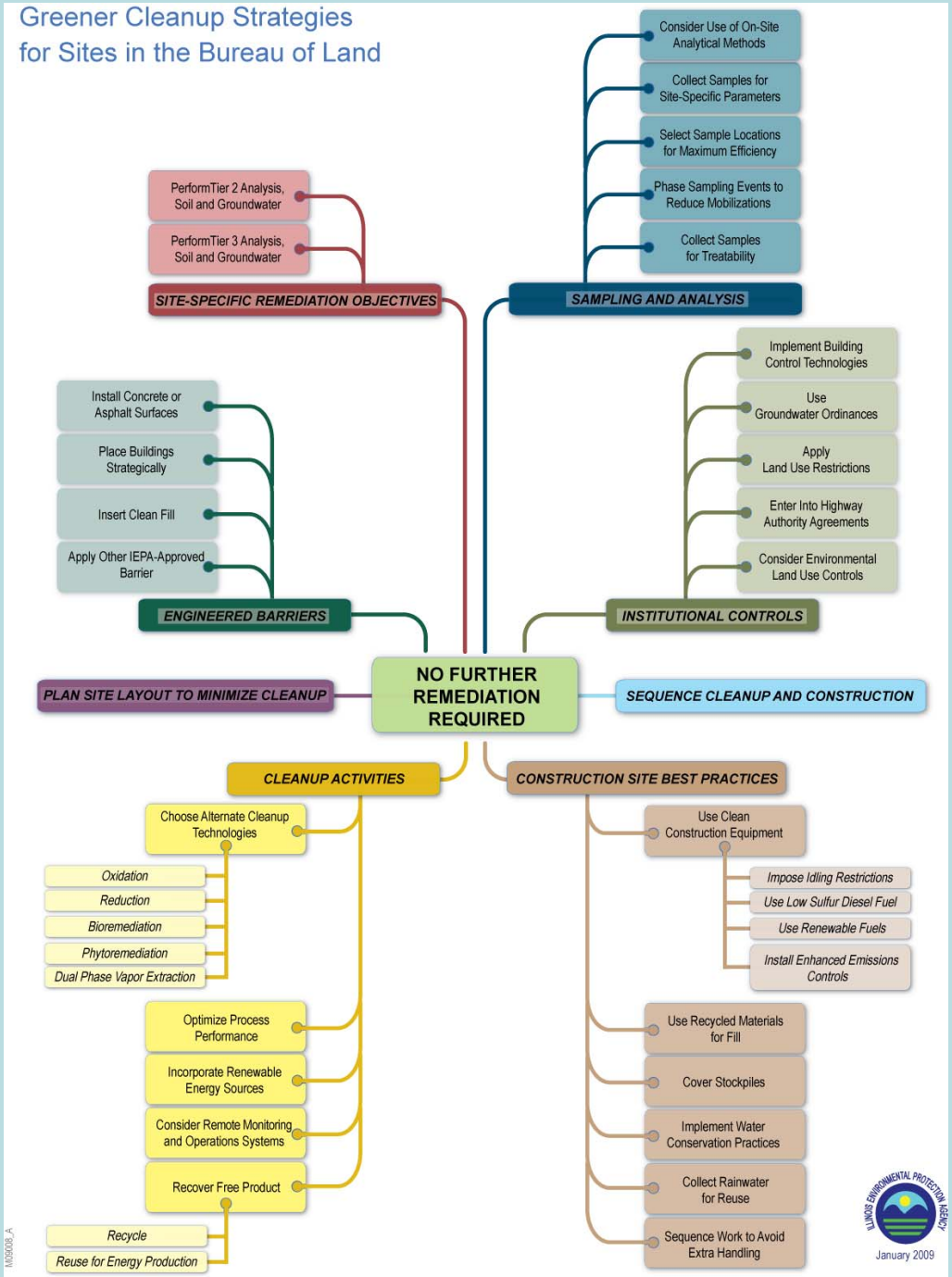
5 Guiding Principles in Illinois

3. Conserve raw materials such as soil and water; salvage building materials and other resources.
   a. Reduce waste disposal.
   b. Reduce the need for new materials, including clean fill and potable water.
   c. Use existing infrastructure.

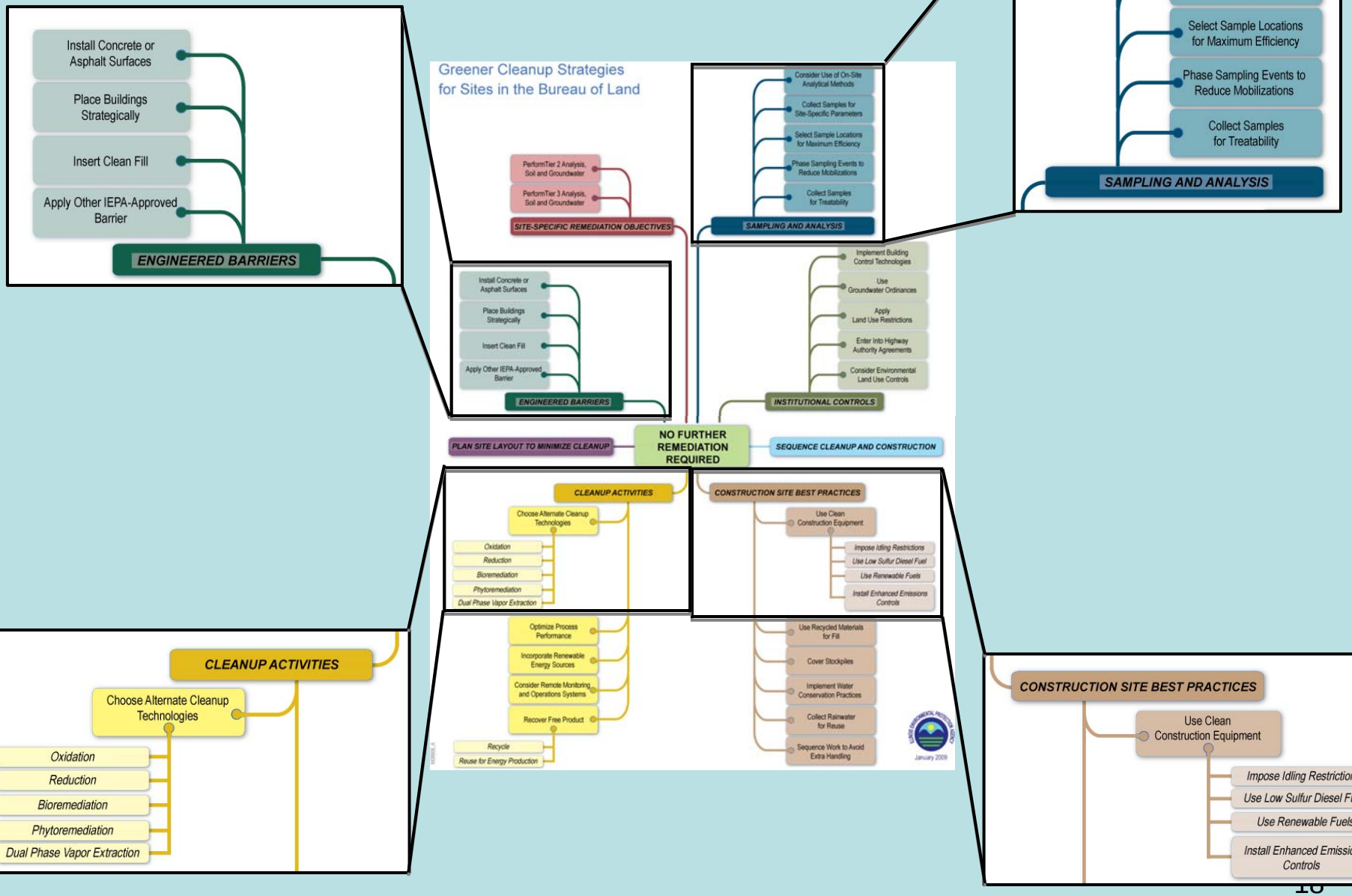
4. Conserve energy.
   a. Reduce energy consumption.
   b. Use renewable energy sources to power cleanup activities where possible.

5 Guiding Principles in Illinois

5. Consider the environmental effects of treatment technologies when choosing a site remedy.
   a. Compare options for contaminant disposition (permanent destruction, pollutant transfer or management in place).
   b. Evaluate resource demands.
   c. Assess long-term stewardship responsibilities.



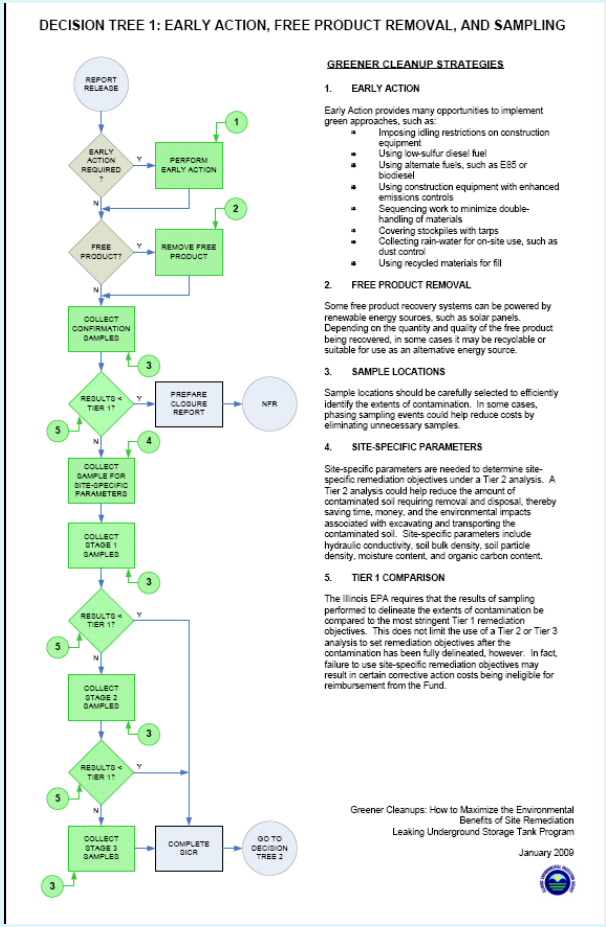
Greener Cleanup Strategies Mind Map

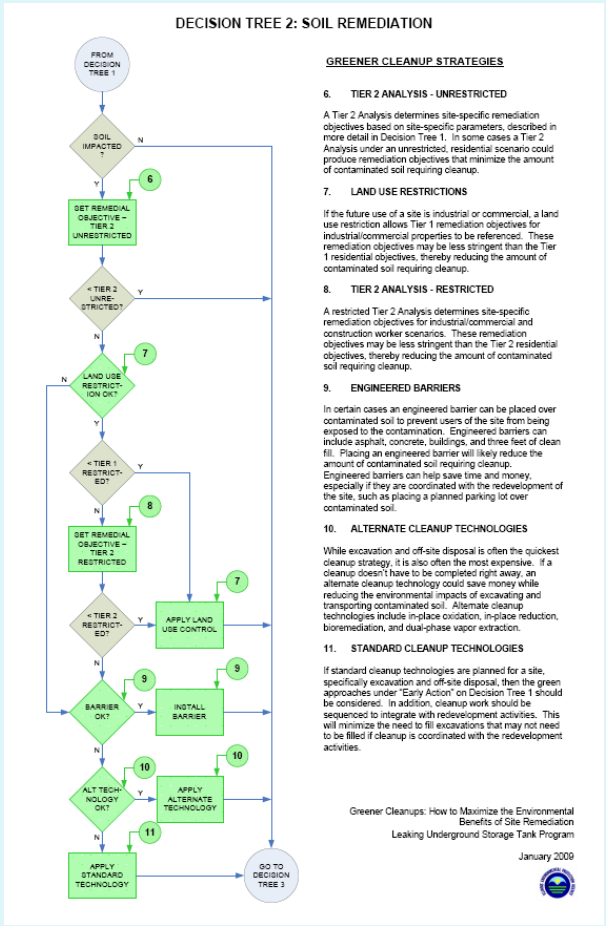

Greener Cleanup Strategies for Sites in the Bureau of Land
Install Concrete or Asphalt Surfaces
Place Buildings Strategically
Insert Clean Fill
Apply Other IEPA-Approved Barrier
ENGINEERED BARRIERS
PerformTier 2 Analysis, Soil and Groundwater
PerformTier 3 Analysis, Soil and Groundwater
SITE-SPECIFIC REMEDIATION OBJECTIVES
Consider Use of On-Site Analytical Methods
Collect Samples for Site-Specific Parameters
Select Sample Locations for Maximum Efficiency
Phase Sampling Events to Reduce Mobilizations
Collect Samples for Treatability
SAMPLING AND ANALYSIS
Implement Building Control Technologies
Use Groundwater Ordinances
Apply Land Use Restrictions
Enter Into Highway Authority Agreements
Consider Environmental Land Use Controls
INSTITUTIONAL CONTROLS
PLAN SITE LAYOUT TO MINIMIZE CLEANUP
NO FURTHER REMEDIATION REQUIRED
SEQUENCE CLEANUP AND CONSTRUCTION
CLEANUP ACTIVITIES
Choose Alternate Cleanup Technologies
Oxidation
Reduction
Bioremediation
Phytoremediation
Dual Phase Vapor Extraction
Optimize Process Performance
Incorporate Renewable Energy Sources
Consider Remote Monitoring and Operations Systems
Recover Free Product
Recycle
Reuse for Energy Production
CONSTRUCTION SITE BEST PRACTICES
Use Clean Construction Equipment
Impose Idling Restrictions
Use Low Sulfur Diesel Fuel
Use Renewable Fuels
Install Enhanced Emissions Controls
Use Recycled Materials for Fill
Cover Stockpiles
Implement Water Conservation Practices
Collect Rainwater for Reuse
Sequence Work to Avoid Extra Handling
January 2009

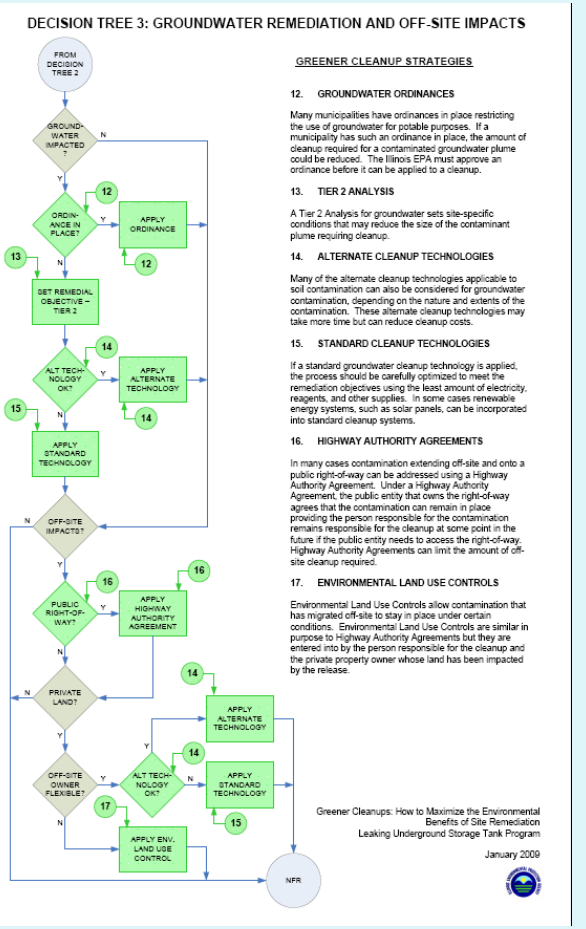
Greener Cleanups at Tank Sites

- Why focus on the LUST program?
  - Similarity between sites – a single green remediation model can be applied many times over
  - Large volume of sites – more than 8,000 open incidents
  - UST Fund reimbursement of assessment and cleanup costs – opportunity to incentivize greener cleanup choices
- Tools under development
  - A decision tree that shows when green practices can be incorporated during an ordinary LUST cleanup
  - A mindmap that shows a one-page holistic view of greener cleanups

LUST Decision Trees for Greener Cleanups



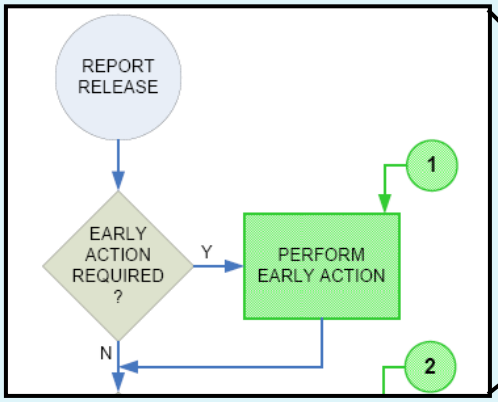


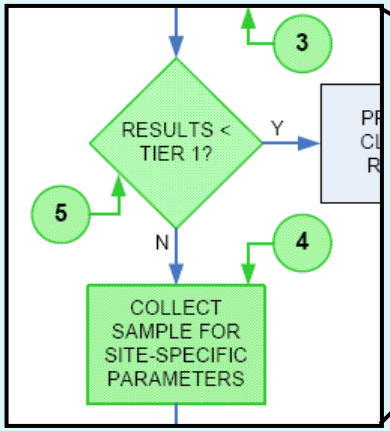


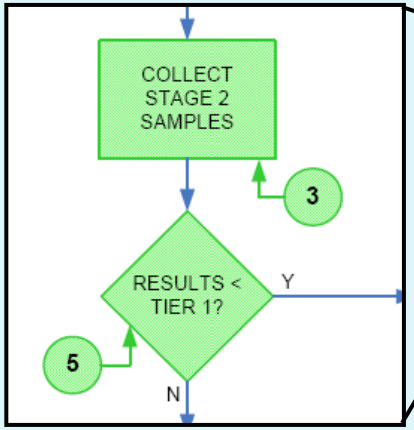
EARLY ACTION, FREE PRODUCT REMOVAL, AND SAMPLING

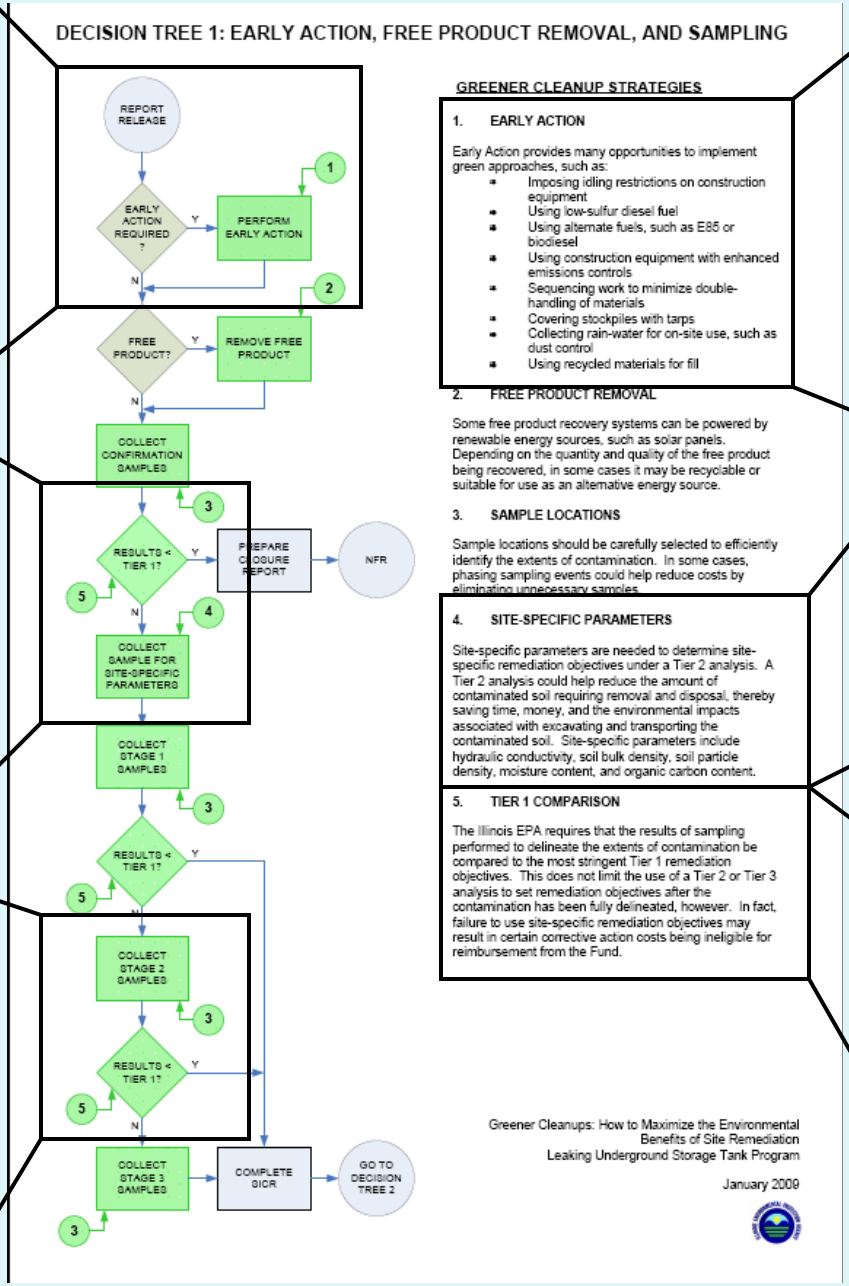
SOIL REMEDIATION

GROUNDWATER REMEDIATION AND OFF-SITE IMPACTS









1. EARLY ACTION

Early Action provides many opportunities to implement green approaches, such as:

- Imposing idling restrictions on construction equipment
- Using low-sulfur diesel fuel
- Using alternate fuels, such as E85 or biodiesel
- Using construction equipment with enhanced emissions controls
- Sequencing work to minimize double-handling of materials
- Covering stockpiles with tarps
- Collecting rain-water for on-site use, such as dust control
- Using recycled materials for fill

4. SITE-SPECIFIC PARAMETERS

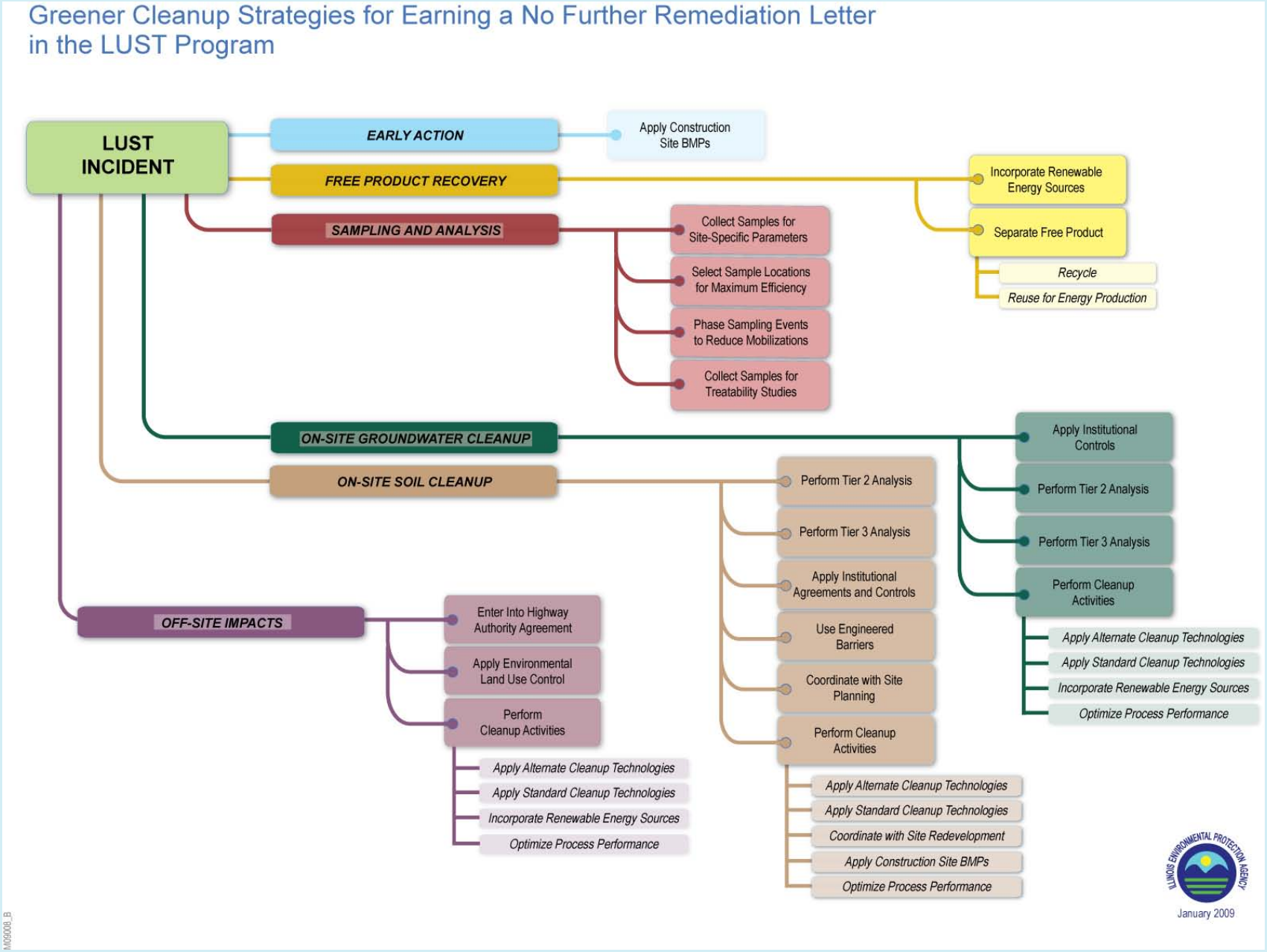
Site-specific parameters are needed to determine site-specific remediation objectives under a Tier 2 analysis. A Tier 2 analysis could help reduce the amount of contaminated soil requiring removal and disposal, thereby saving time, money, and the environmental impacts associated with excavating and transporting the contaminated soil. Site-specific parameters include hydraulic conductivity, soil bulk density, soil particle density, moisture content, and organic carbon content.

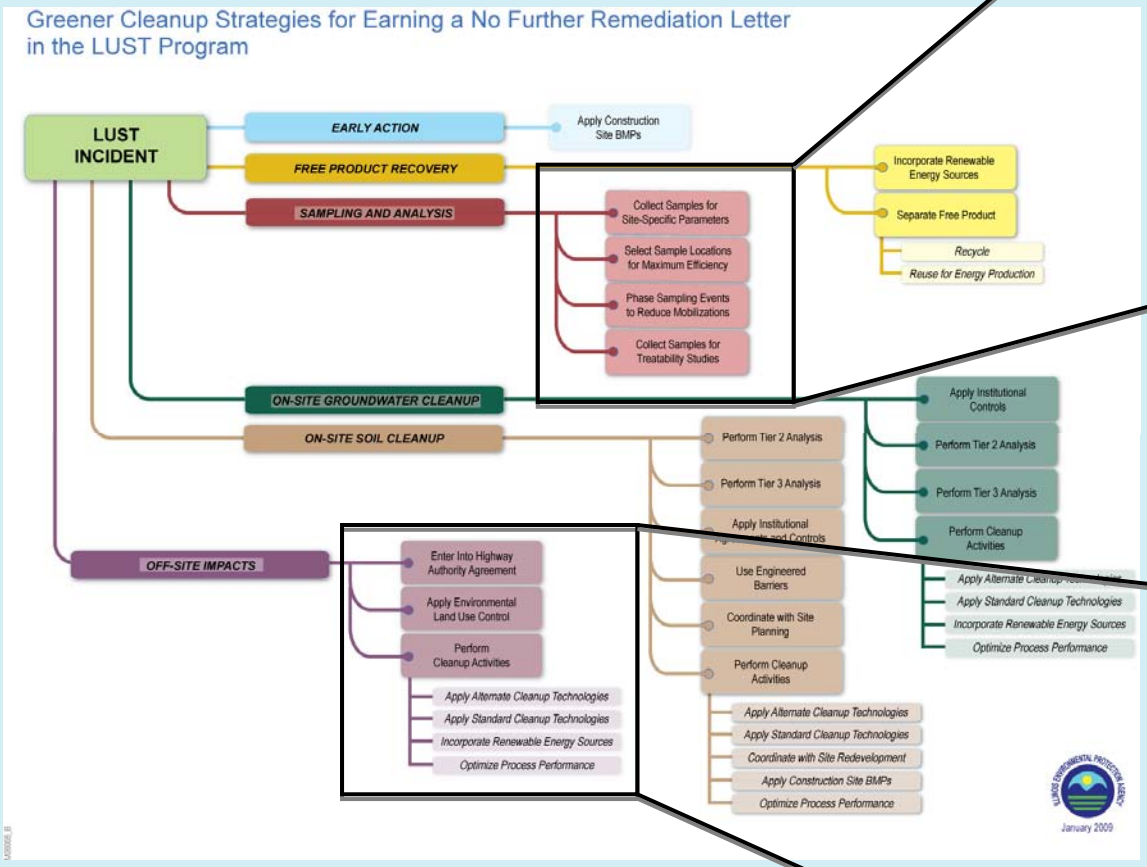
5. TIER 1 COMPARISON

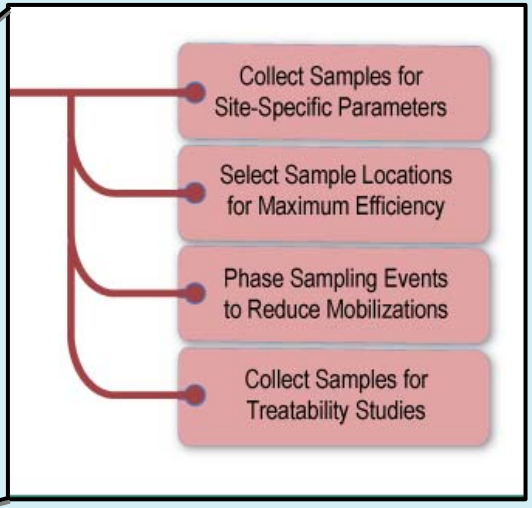
The Illinois EPA requires that the results of sampling performed to delineate the extents of contamination be compared to the most stringent Tier 1 remediation objectives. This does not limit the use of a Tier 2 or Tier 3 analysis to set remediation objectives after the contamination has been fully delineated, however. In fact, failure to use site-specific remediation objectives may result in certain corrective action costs being ineligible for reimbursement from the Fund.

DECISION TREE 1: EARLY ACTION, FREE PRODUCT REMOVAL, AND SAMPLING

Greener Cleanup Strategies for Tanks Mind Map




Greener Cleanup Strategies for Earning a No Further Remediation Letter in the LUST Program
LUST INCIDENT
EARLY ACTION
Apply Construction Site BMPs
FREE PRODUCT RECOVERY
SAMPLING AND ANALYSIS
Collect Samples for Site-Specific Parameters
Select Sample Locations for Maximum Efficiency
Phase Sampling Events to Reduce Mobilizations
Collect Samples for Treatability Studies
Incorporate Renewable Energy Sources
Separate Free Product
Recycle
Reuse for Energy Production
ON-SITE GROUNDWATER CLEANUP
Apply Institutional Controls
Perform Tier 2 Analysis
Perform Tier 3 Analysis
Perform Cleanup Activities
ON-SITE SOIL CLEANUP
Perform Tier 2 Analysis
Perform Tier 3 Analysis
Apply Institutional
Use Engineered Barriers
Coordinate with Site Planning
Perform Cleanup Activities
Apply Alternate Cleanup Technologies
Apply Standard Cleanup Technologies
Coordinate with Site Redevelopment
Apply Construction Site BMPs
Optimize Process Performance
OFF-SITE IMPACTS
Enter Into Highway Authority Agreement
Apply Environmental Land Use Control
Perform Cleanup Activities
Apply Alternate Cleanup Technologies
Apply Standard Cleanup Technologies
Incorporate Renewable Energy Sources
Optimize Process Performance
January 2009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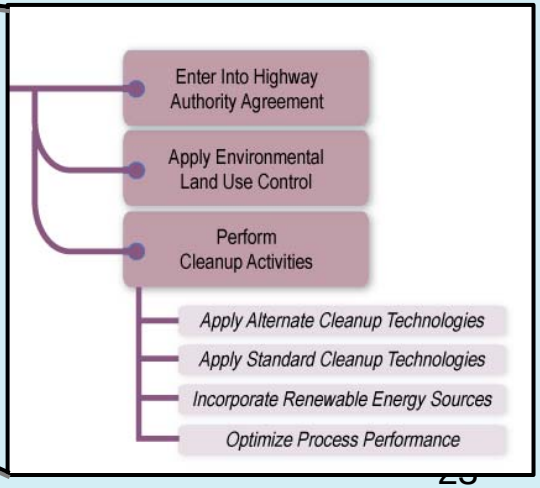
Enter Into Highway Authority Agreement
Apply Environmental Land Use Control
Perform Cleanup Activities
Apply Alternate Cleanup Technologies
Apply Standard Cleanup Technologies
Incorporate Renewable Energy Sources
Optimize Process Performance

RCRA Green Remediation Pilot Study

- Conducted by EPA Region 9's RCRA Corrective Action Office
- EPA Region 5 and Illinois invited to participate
- Purpose is to quantify the environmental effects of cleanups and develop a methodology for conducting green remediation analyses
- Illinois site will be the BP Riverfront Facility in Wood River, IL used to manage refinery wastes
- BP's proposed a phytoremediation system to provide both final cover and a leachate management program

For More Information

http://www.epa.state.il.us/land/greener-cleanups

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