



# Sustainable Remediation Program: Tiers, Tools & Tests

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# Presentation Outline



- Sustainable Remediation Program
- Assessment **Tiers**
- Program **Tools**
- Pilot **Tests**
- Questions

# Sustainable Remediation

The use of sustainable practices during the investigation, construction, redevelopment, and monitoring of remediation sites, with the objective of balancing economic viability, conservation of natural resources and biodiversity, and the enhancement of the quality of life in surrounding communities (Sustainable Remediation Forum [SURF], 2013).

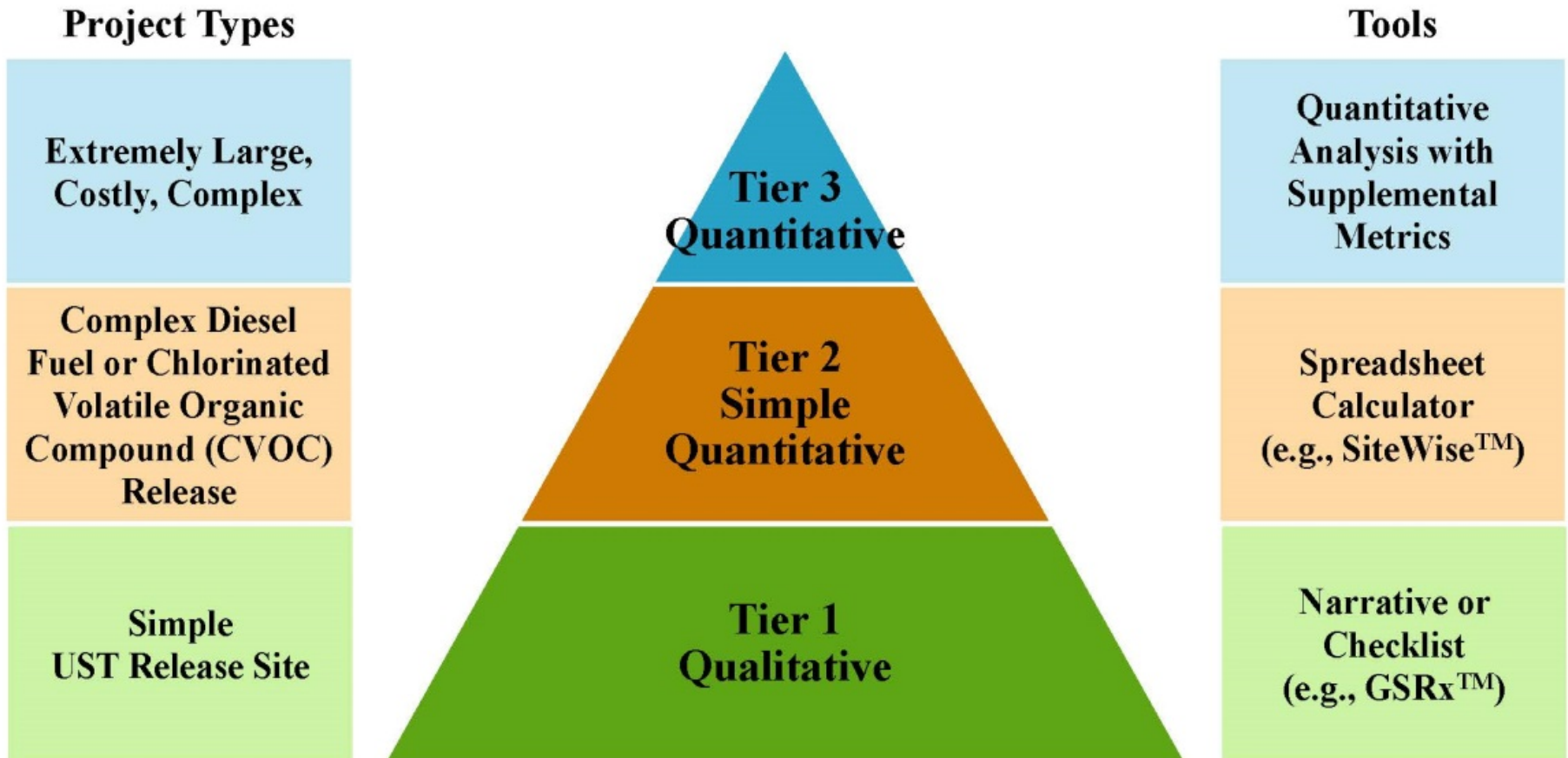


# SR Program Development at NS

- 2014: Draft Guidance Document and Tools
- 2015: Tracking tool, roll up mechanism (in progress), and Pilot Tests
- 2016: Program Rollout
- Objectives of Program:
  - Implement across remediation site portfolio;
  - Use a tiered approach;
  - SR Guidance distributed to NSRC's consultants; use mandatory; and
  - Roll up metrics to support corporate sustainability program.



# Tiered Approach to SR Assessments



# SR Program Tools

Best Management Practices: Site Remediation and Sustainability

**AECOM**

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**Relevant Sustainability Practices Incorporated in this Project**

Management Practices Selected, by EPA Core Element

6 Materials & Waste
 1 Energy
 3 Air
 1 Land & Ecosystems
 1 Water

Core Elements

[Copy Me](#)



SITE INFORMATION	
User Name and Date	Michael Youngblood - 8/14/15
Site Name	Jamestown Yard
Remedial Alternative Name	RO5 - In Situ Solidification
Alternative File Name	Remedial Option 5
Choose electricity profile	NY

Component	Component Alias
Component 1	Mobilization and Demobilization
Component 2	Excavation
Component 3	In Situ Solidification
Component 4	Operation and Maintenance

Do you want to reload a previously saved remedial alternative in the SiteWise i...

Yes

Reset all input values on all worksheets to default

[Reset All Values on All Sheets](#)

-- Status --

Done Loading!

Version 3.1

**SiteWise**

SiteWise™ Tool for Green and Sustainable Remediation has been developed jointly by United States (US) Navy, United States Army Corps of Engineers (USACE), and Battelle. This tool is made available on an as-is basis without guarantee or warranty of any kind, express or implied. The US Navy, USACE, Battelle, the authors, and the reviewers accept no liability resulting from the use of this tool or its documentation; nor does the above warrant or otherwise represent in any way the accuracy, adequacy, efficacy, or applicability of the contents hereof. Implementation of SiteWise™ tool and interpretation or use of the results provided by the tool are the sole responsibility of the user. The tool is provided free of charge for everyone to use, but is not supported in any way by the US Navy, USACE, or Battelle.

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# Tier 1: BMP Screening Using GSRx™

- 133 BMPs Identified
- More information for each BMP available
- BMPs categorized by EPA Core Elements:
  - Air
  - Energy
  - Waste & Materials
  - Water
  - Land & Ecosystems

Construction\_Practices

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Number	Practice	Check	NA
? 1	Consider in-situ waste characterization to reduce on-site stockpiling of waste	<input checked="" type="checkbox"/>	<input type="checkbox"/>
? 2	In cases where stockpiling of waste is unavoidable, consider segregating waste from different locations at the site to minimize contamination of potentially non-impacted	<input type="checkbox"/>	<input type="checkbox"/>
? 3	Consider solid waste volume reductions when determining acceptable water content limits for off-site disposal	<input checked="" type="checkbox"/>	<input type="checkbox"/>
? 4	Limit noise impacts to off-site receptors	<input type="checkbox"/>	<input type="checkbox"/>
? 5	Limit artificial light impacts to off-site receptors	<input type="checkbox"/>	<input type="checkbox"/>
? 6	Sequence work and traffic patterns to minimize local traffic congestion	<input type="checkbox"/>	<input type="checkbox"/>
? 7	Consider the use of engines that have been retro-fitted to accommodate diesel emission controls (e.g., low-maintenance multistage filters)	<input type="checkbox"/>	<input type="checkbox"/>
? 8	Consider the use of electric, hybrid, or hydrogen fuel cell vehicles	<input type="checkbox"/>	<input type="checkbox"/>
? 9	Implement an idle reduction plan for vehicles and machinery	<input type="checkbox"/>	<input type="checkbox"/>
? 10	Establish efficient traffic patterns to minimize soil disturbance and noise on-site.	<input type="checkbox"/>	<input type="checkbox"/>
? 11	Select Equipment suitably sized to perform the work	<input type="checkbox"/>	<input type="checkbox"/>
? 12	Perform routine and on-time maintenance to equipment to improve fuel efficiency (i.e., oil changes)	<input type="checkbox"/>	<input type="checkbox"/>
? 13	Implement a fuel reduction plan	<input type="checkbox"/>	<input type="checkbox"/>
? 14	Limit on-site vehicle speed to ten miles per hour	<input type="checkbox"/>	<input type="checkbox"/>
? 15	Consider the use of clean fuel alternatives such as ultra-low sulfur diesel, biodiesel, etc.	<input type="checkbox"/>	<input type="checkbox"/>
	<b>Secondary</b>		
	<a href="#">More Construction Practices.</a>		
? 17	Implement storm water pollution prevention techniques to prevent sediment travel off-site	<input type="checkbox"/>	<input type="checkbox"/>
? 18	Consider purchasing Renewable Energy Certificates (RECs) to offset energy consumption associated with remedial activities.	<input type="checkbox"/>	<input type="checkbox"/>
? 19	Consider reusing wells throughout the entire remediation process at the site (i.e., investigation, design, construction, and long-term monitoring)	<input type="checkbox"/>	<input type="checkbox"/>
? 20	Conduct a bench-scale test to establish material quantity requirements of different products on-site	<input type="checkbox"/>	<input type="checkbox"/>

HOME Project\_Management End\_Use\_Design Procurement Construction\_Practices Disposal\_Reu

# Tier 1: BMP Screening Using GSRx™

- Supplemental information:
  - Description
  - Comments
  - Examples
  - Useful links
- Detailed table and summary graphic output
- Organized by Project Phase

**BMP: Flexible Equipment** Hide Me

Classification: ( check all that apply)

Economic Environment	Energy	Remedy Selection	Remedial Action	Long-term Mana
<u>Sustainability Leg</u>	<u>EPA Element</u>	<u>Remediation Phase</u>		
<input checked="" type="checkbox"/> Economic	<input type="checkbox"/> Stewardship	<input type="checkbox"/> Investigation		
<input type="checkbox"/> Social	<input checked="" type="checkbox"/> Energy	<input checked="" type="checkbox"/> Remedy Selection and Design		
<input checked="" type="checkbox"/> Environment	<input type="checkbox"/> Air	<input checked="" type="checkbox"/> Remedial Action		

**Best Management Practices: Site Remediation and Sustainability**

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BMP Short Name: \_\_\_\_\_

Source: \_\_\_\_\_

BMP Full Name: \_\_\_\_\_

**List of Relevant Sustainability Practices Incorporated in This Project**

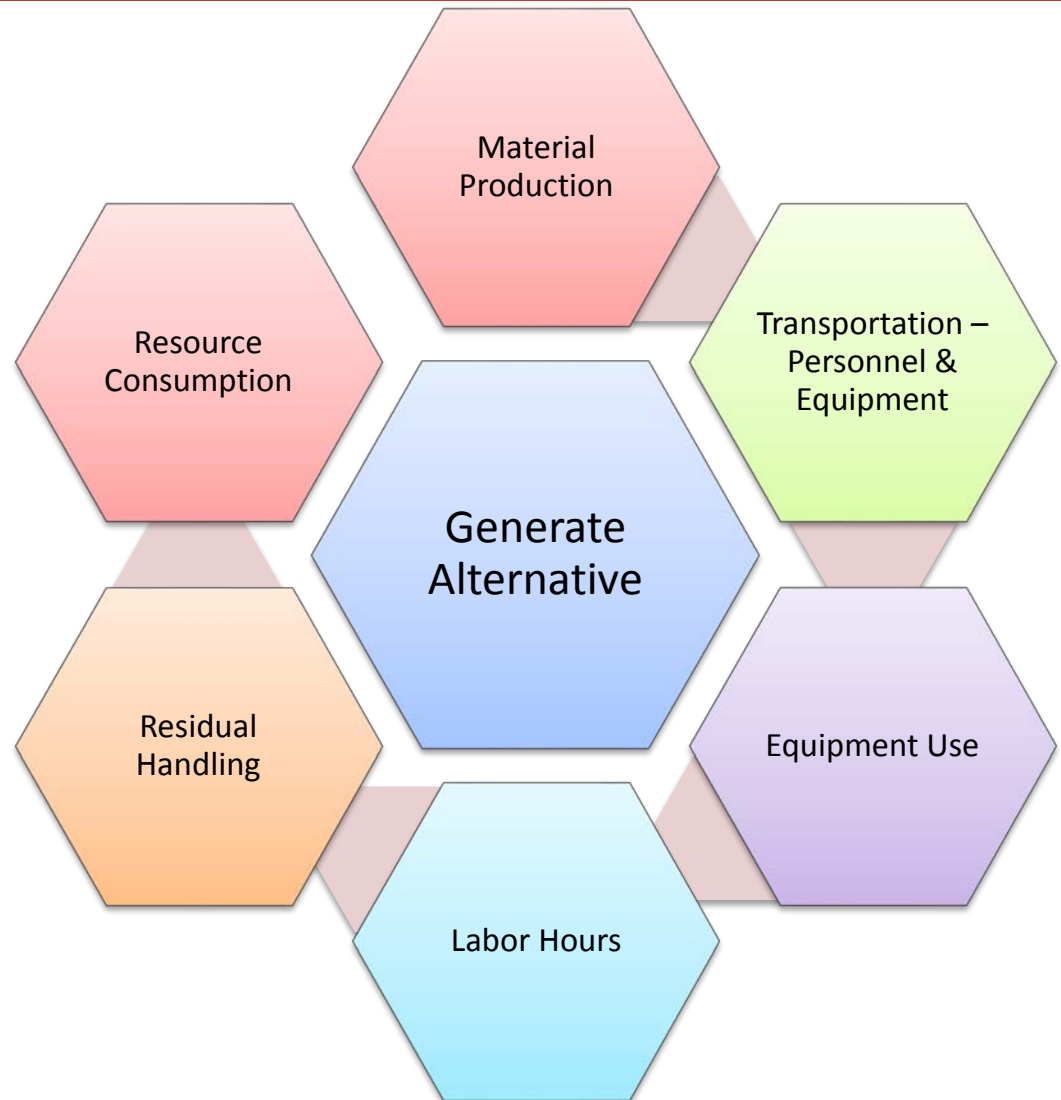
<i>Category and Practice</i>	<i>Project-Specific Details</i>
<b>Project_Management</b> Identify opportunities for resource sharing with other sites within a portfolio Include milestones to complete remedial site optimization process in site schedules	
<b>End_Use_Design</b> Carbon footprint has been evaluated for all major activities associated with the site	
<b>Procurement</b> Consider the use of products with recycled, rapidly renewable, and bio-based materials. Provide materials from local sources (especially backfill material)	
<b>Construction_Practices</b> Consider in-situ waste characterization to reduce on-site stockpiling of waste Consider solid waste volume reductions when determining acceptable water content limits for off-site disposal	
<b>Disposal_Reuse</b> Evaluate onsite disposal and reuse options for waste material. Segregate materials for recycling off-site versus disposal in an off-site landfill	
<b>Community</b> Implement a plan to include external stakeholders in decision-making Consider local sources of field labor	
<b>OnSite_Treatment</b> Consider treatment system use only during off-peak utility periods to reduce energy costs.	
<b>Habitat_Ecosystem</b> Consider the use of on-site habitats to treat collected stormwater	
<b>Sampling_Monitoring</b> Consider the use of direct sensing technologies to obtain geological, geotechnical, and hydrogeological information.	

Description: \_\_\_\_\_  
 Comment: \_\_\_\_\_  
 Useful Links or Resources: \_\_\_\_\_  
 Compelling Example: \_\_\_\_\_



# Tier 2: SiteWise™

- Series of Excel workbooks to calculate the environmental footprint of remediation in terms of sustainability metrics
- Freeware originally developed by Battelle and further developed with Navy and USACE



# Evaluating Alternatives in SiteWise™

## Metrics:

### Energy Consumption

Expressed as British Thermal Units (BTUs)

### Greenhouse Gases Emitted

Metric tons CO<sub>2</sub>e

Includes CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O

### Criteria Air Pollutants Emitted

NO<sub>x</sub>, SO<sub>x</sub>, PM in metric tons

### Water Consumption

Expressed as gallons

### Worker Safety

Accidental injury and death and lost hours

### Resource Consumption

Landfill space, top soil

### Cost of Footprint Reduction

Wind, solar, microturbines

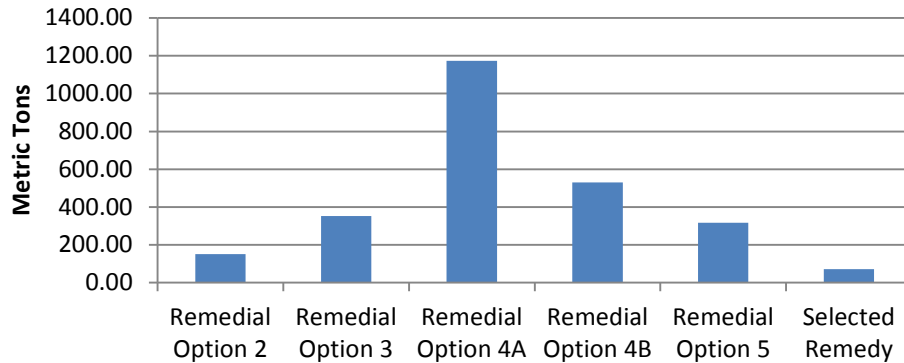
Remedial Alternatives	GHG Emissions	Total energy Used	Water Consumption	Electricity Usage	Onsite NO <sub>x</sub> Emissions	Onsite SO <sub>x</sub> Emissions	Onsite PM <sub>10</sub> Emissions
	metric ton	MMBTU	gallons	MWH	metric ton	metric ton	metric ton
Remedial Option 2	150.94	1.41E+04	7.79E+04	1.53E+02	1.17E-01	1.23E-02	1.05E-02
Remedial Option 3	351.85	5.14E+04	9.99E+04	1.96E+02	3.70E-01	2.82E-02	2.94E-02
Remedial Option 4A	1172.88	2.51E+04	1.65E+01	3.23E-02	2.84E-01	5.93E-02	2.09E-02
Remedial Option 4B	530.24	1.45E+04	1.65E+01	3.23E-02	2.84E-01	5.93E-02	2.09E-02
Remedial Option 5	317.14	1.09E+04	0.00E+00	0.00E+00	2.22E-01	3.60E-02	1.68E-02
Selected Remedy	71.89	4.92E+03	0.00E+00	0.00E+00	3.33E-02	3.64E-03	2.92E-03

## Relative Impact

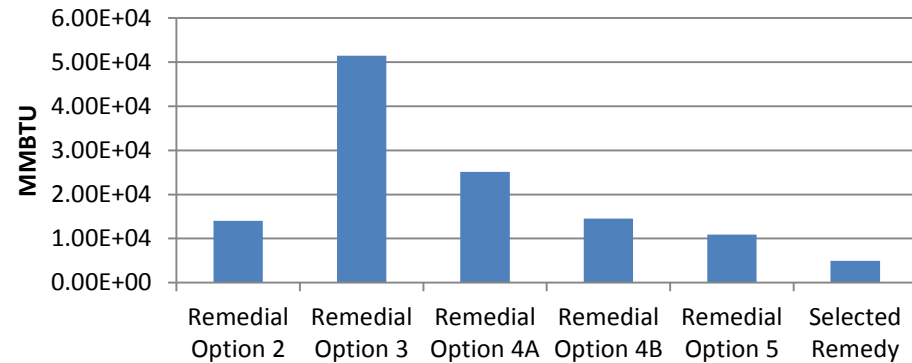
Remedial Alternatives	GHG Emissions	Energy Usage	Water Usage	Electricity Usage	Onsite NO <sub>x</sub> Emissions	Onsite SO <sub>x</sub> Emissions	Onsite PM <sub>10</sub> Emissions
Remedial Option 2	Low	Low	High	High	Medium	Low	Medium
Remedial Option 3	Low	High	High	High	High	Medium	High
Remedial Option 4A	High	Medium	Low	Low	High	High	High
Remedial Option 4B	Medium	Low	Low	Low	High	High	High
Remedial Option 5	Low	Low	Low	Low	Medium	Medium	Medium
Selected Remedy	Low	Low	Low	Low	Low	Low	Low

# Evaluating Alternatives in SiteWise™

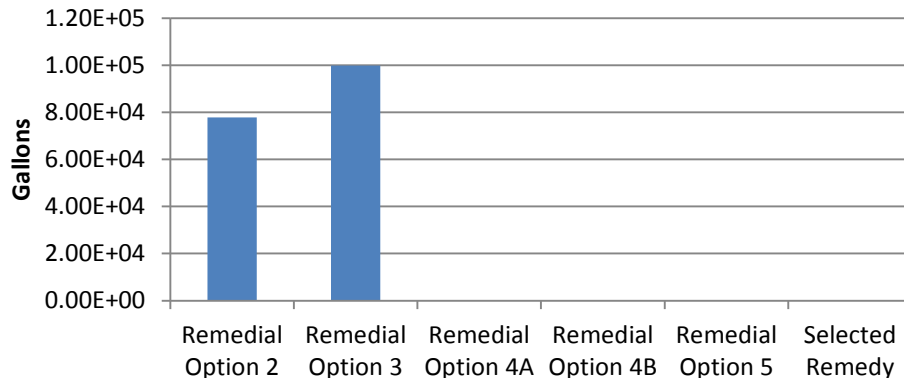
## GHG Emissions



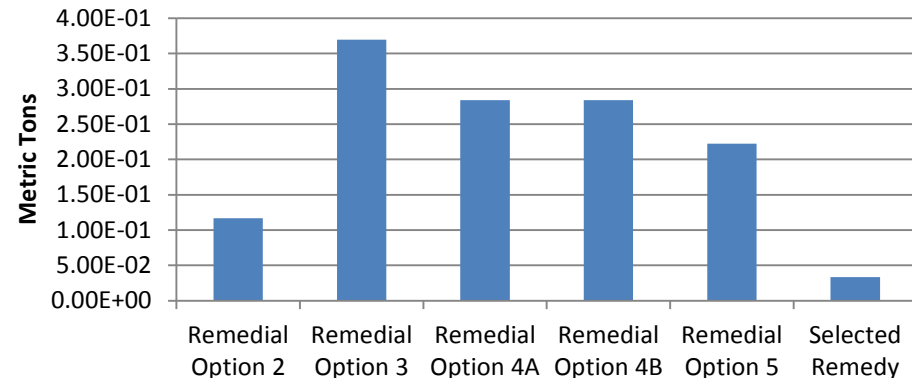
## Total Energy Used



## Water Impacts

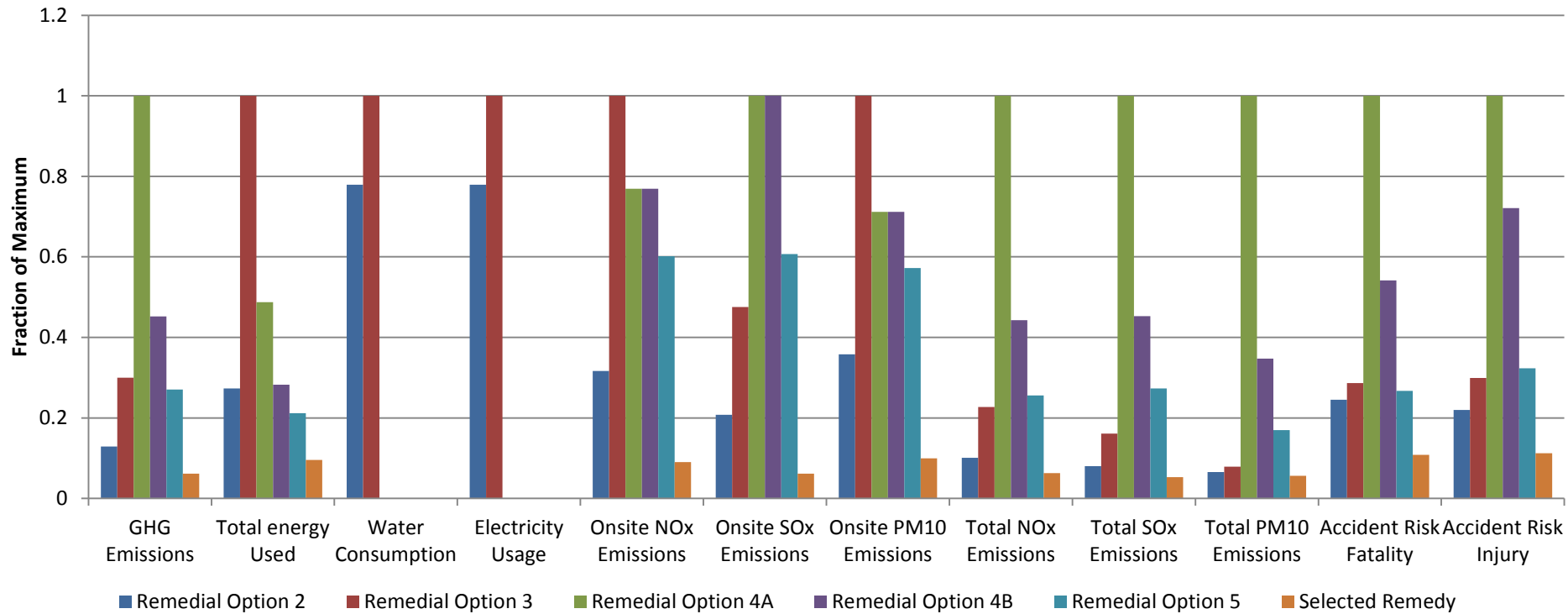


## Onsite NO<sub>x</sub> Emissions



# Evaluating Alternatives in SiteWise™

## Normalized Impacts



# Pilot Tests

- Desktop Evaluation
  - Landfill
  - Former Diesel Repair Shop
  - Former Lumber Yard
- Provided PMs with:
  - Training Webinar
  - Draft Guidance Document
  - GSRx™ and SiteWise™ Tools
  - Metrics Evaluation Form
- Scope
  - Tier 2 Assessment
  - SiteWise™ evaluation
  - BMP selection using GSRx™

- Deliverable
  - SR Assessment Memo
  - Completed MEF
  - SiteWise™ Workbooks
  - Feedback on SR Program materials and process



# Metrics Tracking and Reporting

- Report metrics from SiteWise™ for selected or completed alternative
- Data will be compiled for all NS sites
- Year-end reports of sustainability metrics
- Track performance year-to-year


Go to: [Site Information](#) [Phase Estimates](#) [Edit Log](#)

**NS NORFOLK SOUTHERN** Sustainable Remediation Program : the remediation of

---

Remediation Phase and Strategy

Phase	Corrective Action
Phase Start Date	5/1/2016
Strategy Description	The selected remedy involves a small excavation (approx. 950 yd³) to remove shallow LNAPL.
Strategy Status	Planned

Click to  Pull metrics data from a SiteWise Summary File

Note:

- \* Open workbook named Summary.xls
- \* If asked about links, update them only if you have all the SiteWise files in the same folder

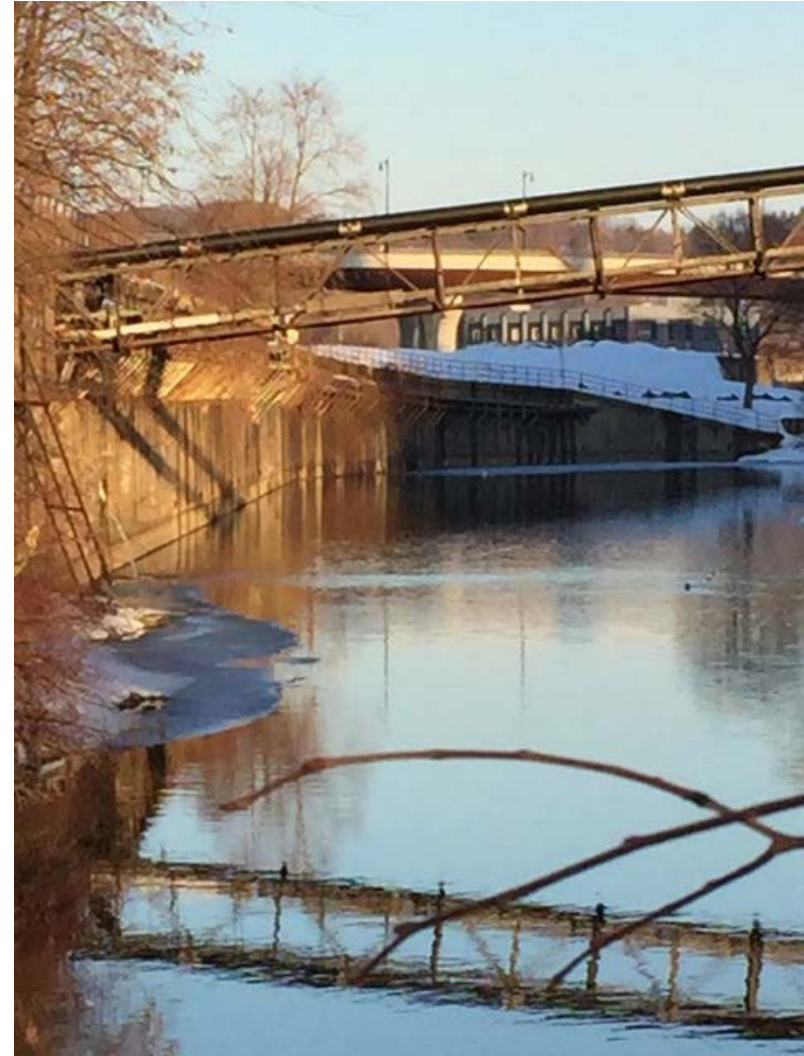
is a safe choice

Metrics from SiteWise calculated for this strategy

GHG Emissions	71.8928	Metric tons
Total Energy Used	4918.8815	MMBtus
Water Consumption	0.0000	Gallons
Electricity Usage	0.0000	MWh
Onsite NO <sub>x</sub> Emissions	0.0333	Metric ton
Onsite SO <sub>x</sub> Emissions	0.0036	Metric ton
Onsite PM10 Emissions	0.0029	Metric ton
Total NO <sub>x</sub> Emissions	0.2532	Metric ton
Total SO <sub>x</sub> Emissions	0.1899	Metric ton
Total PM10 Emissions	0.3093	Metric ton
Accident Risk Fatality	0.0002	
Accident Risk Injury	0.0234	
Non-hazardous Waste Landfill Space	0.0000	Tons
Hazardous Waste Landfill Space	0.0000	Tons
Topsoil Consumption	0.0000	Cubic Yards
Costing	0.0000	\$ US
Lost Hours- Injury	0.0045	Hours
Percent Electricity from Renewable Sources	0.0000	%
Total Cost with Footprint Reduction	\$ -	\$ US
Other		

# Pilot Test Outcomes & Next Steps

- Identified areas of clarification
  - Guidance and SOPs
  - Selection of BMPs
  - Application of sustainability metrics to remedy selection
- Potential for qualitative remedial alternative evaluation tool in Tier 1 assessments
- Training sessions for staff on program and tools (2016)
- Testing and maintenance of metrics database (2016)



# Thank You!

- Questions

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