Optimization of Existing Sites

Sustainable Remediation

NEWMOA Workshop December 4 & 5, 2013



Optimization of Existing Sites

- Bill Weber, PE
  Principal Engineer
  william.weber@amec.com

- Hank Andolsek
  Senior Hydrogeologist
  hank.andolsek@amec.com

2

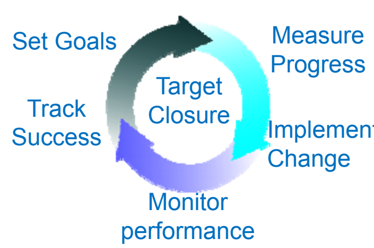
Optimization of Existing Sites

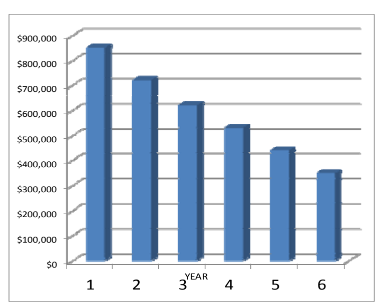
- Remedial System Optimization (RSO) Process
- Importance of Site Conceptual Model
- OM&M Portfolios Best Practices

3

RSO Process

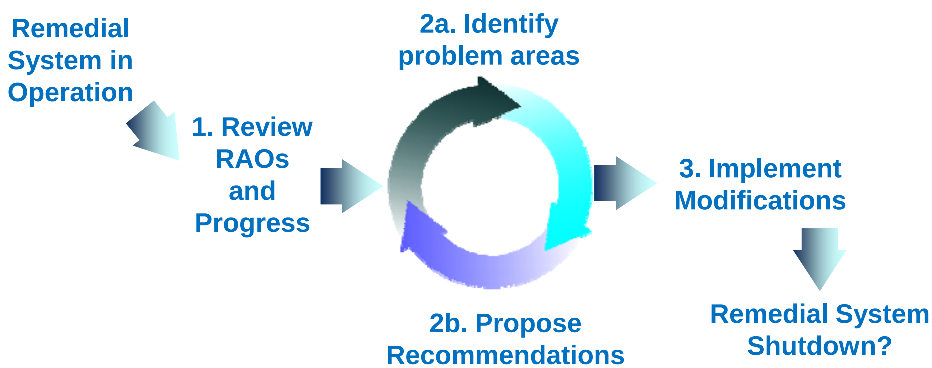
- Optimize operation throughout life cycle of facility
- Reduction in water and vapor treated
- Reduction in waste generated
- Reduction in operating labor
- Reduction in utilities and resulting GHG
- Reduction in Expenses





4

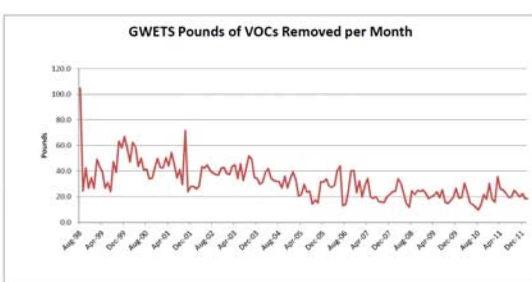
RSO Process

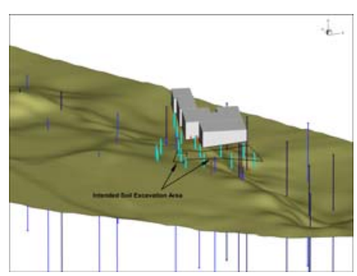


- Step 1 – Review Performance
- Step 2 – Identify Opportunities for Improvement
- Step 3 – Implement Modifications

Step 1 – Review Performance

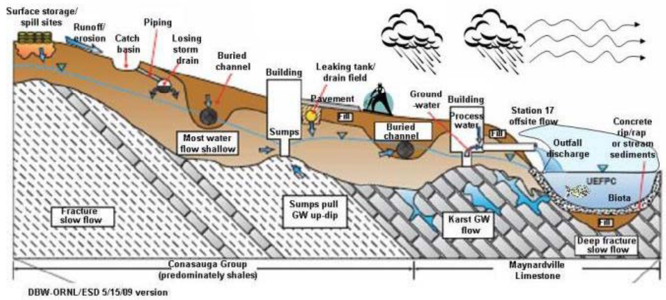
- Does performance match expectations?
- Will RAO be achieved in expected time frame?
- Are costs in line with budget and financial reserves?
- Do assumptions need to be revisited?





What is a CSM?

- It is a tool to be used in the planning, investigation and remedial design process
- It is our “best guess” explanation of what we are observing based on available data
- It is a dynamic model, it should be updated as new data is acquired



7

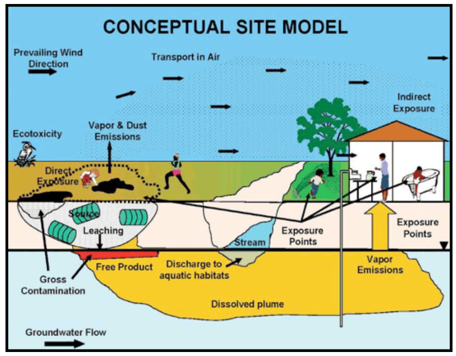
Why is a CSM necessary?

- It helps to focus, justify and modify data gathering activities
- Existing sites, it helps identify potential data gaps
- New sites, it helps identify the data that is needed to evaluate the nature and extent of risk posed by the site
- It represents the current understanding of a site
- It serves as a basis for conducting subsequent field activities (e.g., remedial actions)

8

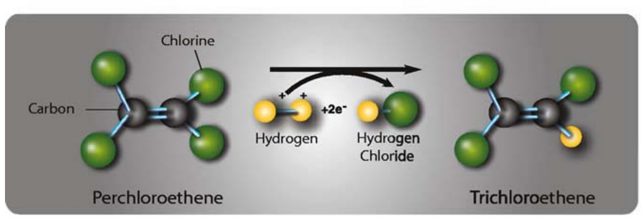
How does a CSM benefit the RSO process?

- Provides holistic understanding of the Site
- Provides technical platform for assessing the RA
- Illuminates realistic expectations



CSM Development

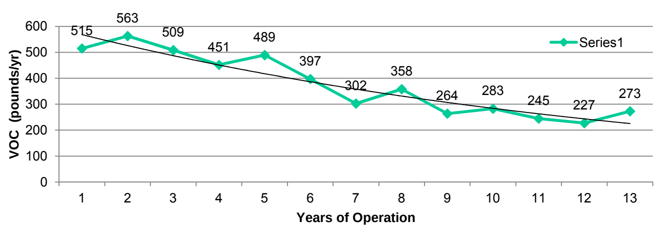
- What do we expect to see based on:
  - COCs
  - Hydrogeology
  - History of Operations



Case Study: American Thermostat Site
South Cairo, New York

- Through the manufacturing of thermostats, PCE was introduced into the environment
- High concentration of PCE (~150 ppm) was detected in nearby residential bedrock well
- RA included soil removal, thermal treatment and installation of a Groundwater Extraction and Treatment System

VOC Mass Removal (lbs/yr)



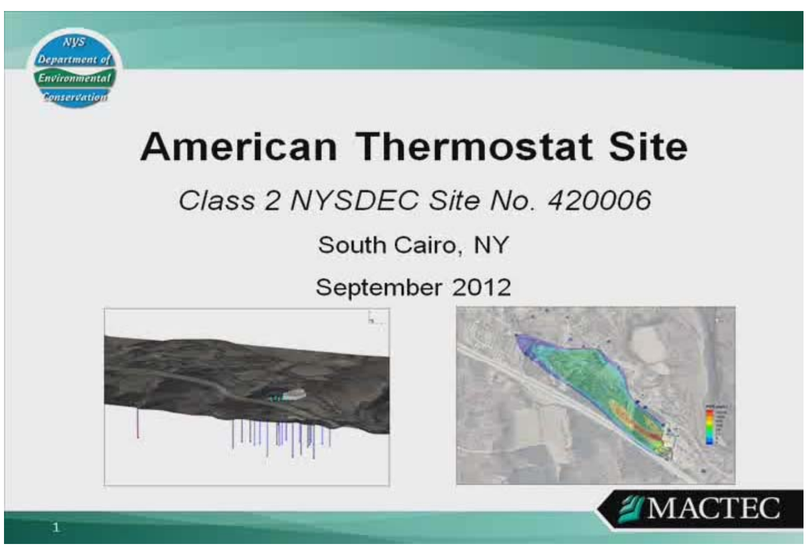
American Thermostat Site: The Obvious Problems

- Plume is perpendicular to assumed hydraulic gradient
- Source area was presumably mitigated
- Overburden GW in treated soil area is greater than 10ppm
- GWETS operational since 1998 and influent is still greater than 1ppm

American Thermostat Site: Data Gap Evaluation

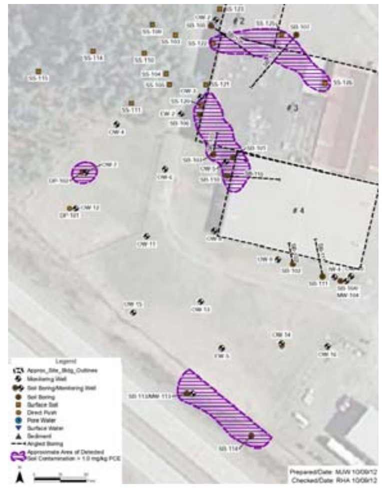
- Vapor Intrusion Investigation
- Shallow Soil Characterization
- Subsurface Soil Characterization
- Monitoring Well Installation
- Borehole Geophysics
- PDB Sampling
- Packer Testing
- Pore-water Sampling
- Surface Water / Sediment Sampling

American Thermostat Site - CSM Animation



American Thermostat Site – CSM Summary

- PCE was discharged to the ground
- Drawn into BRx by pumping residential well
- Combined effect from residential wells drew PCE west
- Matrix diffusion (till & BR) provides on-going source
- GWETS well network maintained NW plume configuration despite NE hydraulic gradient

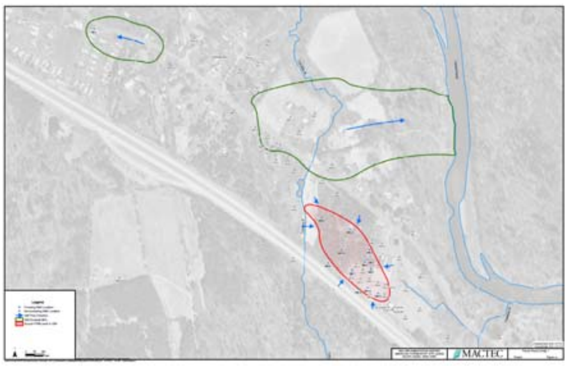


American Thermostat Site – Outcome of CSM

- Provided an explanation for the "obvious problems"
- Reduced number of extraction wells from 23 to 12
- Reduced sampling for long-term monitoring from semiannual to 15 month cycle.

American Thermostat Site – Long-Term Outlook

- Highest concentrations in groundwater will be hydraulically contained on site.
- Remaining portion of plume will dissipate via dilution and discharge to surface water.

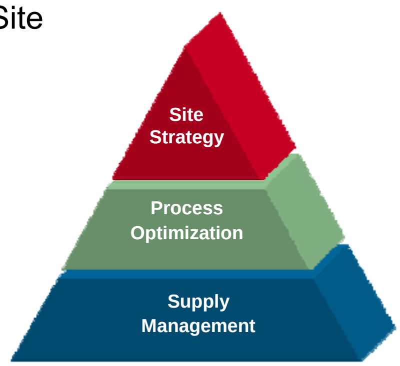


17

Step 2 – Identify Opportunities for Improvement

Three Tiered Approach

- Regulatory – does CSM support Site Strategy?
- Engineering – Can operation be modified to be more efficient?
- Labor – Resources most effective option?



18

Establish a Site Strategy

- Develop Closure Strategy
- Understand Shareholders Agenda
- Review Regulatory Requirements
- Understand Remediation Environmental Footprint

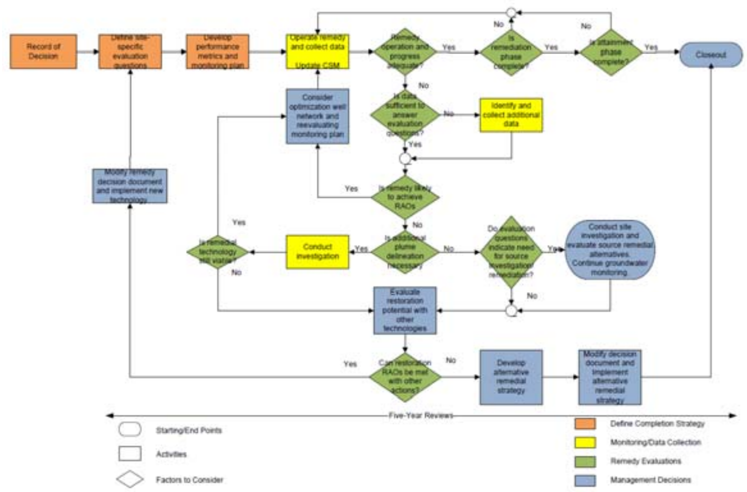
Establish a Site Strategy

- Revisit ROD Language for Opportunities to improve performance.

> “The groundwater treatment will continue until federal and state standards for the organic contaminants have been achieved in the groundwater throughout the contaminated plume area or until a point has been reached at which contaminants concentrations in the groundwater “level off”. At that point, the remedy will be reevaluated for its effectiveness”.

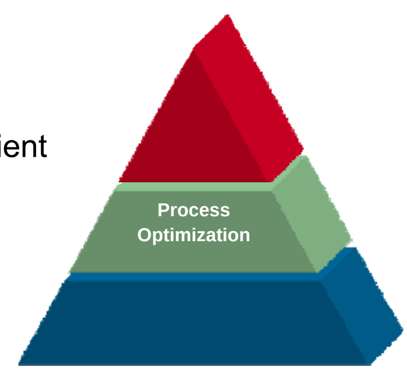
EPA Groundwater Remedy Completion Strategy [Draft]

Figure 2: Groundwater Remedy Completion Strategy Implementation



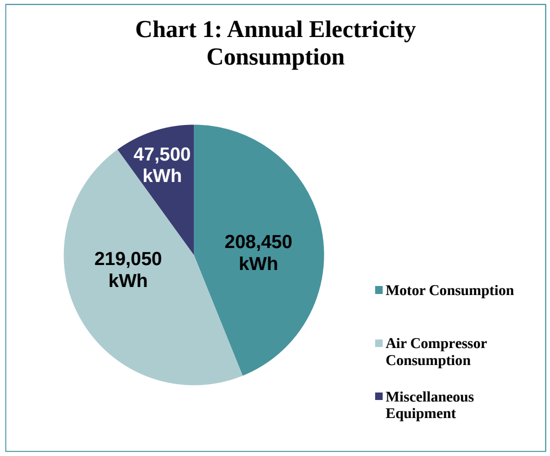
Perform Process Optimization

- Modify Recovery Network
- Eliminate or Replace Treatment Operations
- Make Systems more Energy Efficient



Perform Process Optimization

- Conduct Energy Audit
  - Review Energy Bills
  - Evaluate Incentives
  - Field Inspection
  - Evaluate Renewable Energy Potential
  - Develop Energy Conservation Measures (ECM)



23

Renewable Energy for Long Term Operations

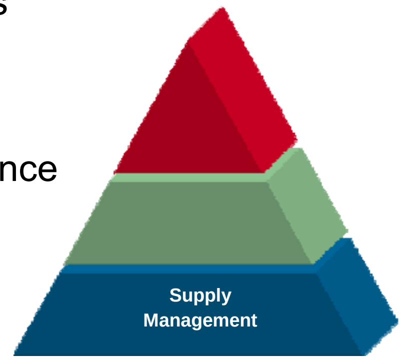
Scituate Municipal Landfill

- 3 MW
- 13,000 Solar PV modules
- 29 Acres

24

Supply Management

- Labor – Resources most effective option?
  - Aggregate Site Operations
  - Automate Operations with Remote Monitoring
  - Incentive Based Performance



Step 3 – Implement Modifications

- Track Performance Post Modifications

FOR SALE!!

OM&M Best Practices

- Revisit Site Conceptual Model often
- Develop closure strategy
- Measure and track metrics
- Understand the limitations of groundwater extraction systems

OM&M Best Practices

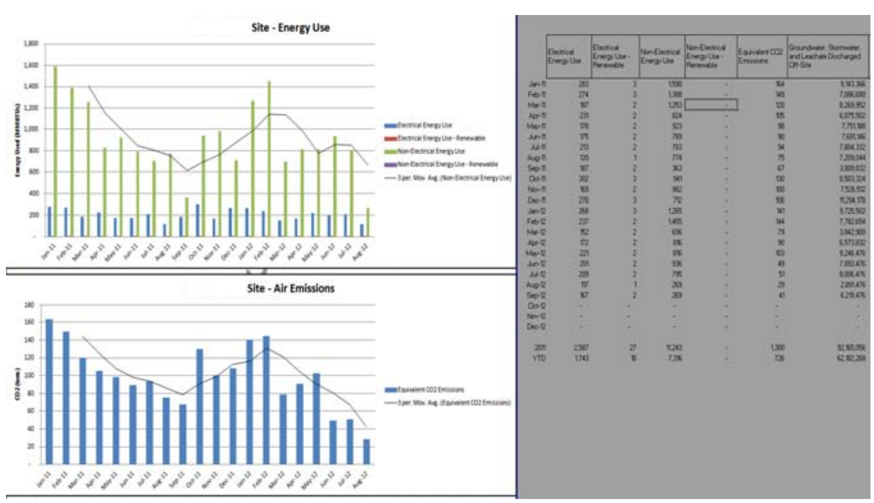
- Define Metrics to Track

Core Element	Metric		Unit of Measure
Materials & Waste	M&W-1	Refined materials used on-site	Tons
	M&W-2	% of refined materials from recycled or waste material	%
	M&W-3	Unrefined materials used on-site	Tons
	M&W-4	% of unrefined materials from recycled or waste material	%
	M&W-5	On-site hazardous waste disposed of off-site	Tons
	M&W-6	On-site non-hazardous waste disposed of off-site	Tons
	M&W-7	% of total potential waste recycled or reused	%
Water		On-site public water use (by source)	MG
	W-1	- Groundwater (specify aquifer, use, and fate)	MG
	W-2	- Groundwater (specify aquifer, use, and fate)	MG
	W-3	- Groundwater (specify aquifer, use, and fate)	MG
	W-4	- Surface water (specify source, use and fate)	MG
	W-5	- Surface water (specify source, use and fate)	MG
	W-6	- Reclaimed water (specify source, use, and fate)	MG
	W-7	- Stormwater (specify source, use, and fate)	MG
	W-8	- Other water (specify source, use, and fate)	MG
	W-9	- Other water (specify source, use, and fate)	MG
Energy	E-1	Total energy used	MMBtu
	E-2	Total energy voluntarily derived from renewable resources	
	E-2A	- Biodiesel use and onsite generation or use	MMBtu
	E-2B	- Voluntary purchase of renewable electricity	MWh
	E-2C	- Voluntary purchase of RECs	MWh
Air	A-1	On-site NOx, SOx, and PM emissions	Pounds
	A-2	On-site HAP emissions	Pounds
	A-3	Total NOx, SOx, and PM emissions	Pounds
	A-4	Total HAP emissions	Pounds
	A-5	Total greenhouse gas emissions	Tons CO2e
Land & Ecosystems		Qualitative Description	

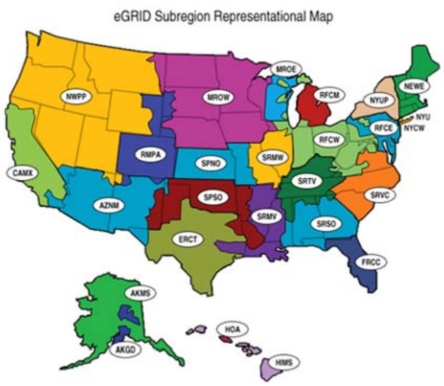
Sustainability Tool – OM&M Dashboard

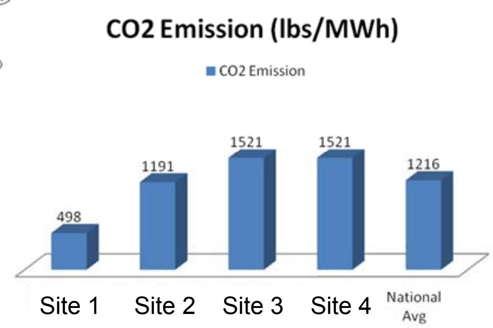
Site/Group	Electrical Energy Use (MMBTU)	Electrical Energy Use - Renewable (% of total use)	Non-Electrical Energy Use	Non-Electrical Energy Use - Renewable (% of total use)	Equivalent CO2 Emissions (tons)	Groundwater, Stormwater, and Leachate Discharged Off-Site (gal)	Public Water Consumption (gal)	Hazardous Waste Disposed Off-Site (tons)	Non-Hazardous Waste Disposed Off-Site (tons)	Average Ranking	Ranking of Average Rank
Site A	15		7		15	13	11	11	11	12	16
Site B	10		5		11	7	11	6	7	8	9
Site C	7		3		7	1	3	11	2	5	3
Site D	11		7		10	12	11	4	11	9	11
Site E	1		7		2	5	7	11	4	5	4
Site F	3		1		1	18	1	5	9	5	5
Site G	14		7		14	14	10	8	10	11	13
Site H	5		2		4	4	2	1	1	3	1
Site J	2		7		3	2	9	2	6	4	2
Site K	6		4		5	6	4	9	5	6	6
Site L	8		6		8	8	11	3	8	7	8
Site M	12		7		12	17	5	11	3	10	12
Site N	4		7		6	3	8	11	11	7	7
Site P	9		7		9	9	11	7	11	9	10
Site Q	17		7		17	10	6	10	11	11	15
Site R	13		7		13	11	11	11	11	11	13
Site S	17		7		17	16	11	11	11	13	18
Site T	16		7		16	15	11	11	11	12	17

OM&M Best Practices



Environmental Footprint





Sustainability Tool – Review BMPs

O & M
Best Management Practices (BMPs)
Test Project Name
123 Test Project Street Test City, NJ 12345

More Info	Best Management Practices	Can BMP be implemented?	Comments	Remarks
	Have the conceptual site model (CSM) and monitoring data been reviewed to confirm CSM accuracy and the appropriateness of remedial actions to address site risks?			
	Has remedial system evaluation/remedial system optimization (RSE/RSO) program been implemented?			
	Does long-term monitoring plan include criteria for transitioning from active/resource-intensive remediation to more passive approaches such as enhanced remediation and monitored natural attenuation?			
	Does long-term monitoring plan include criteria for reducing frequency of sampling, number of target analytes, and number of sample locations?			
	Does long-term monitoring plan include an "exit strategy" for determining when remediation is complete?			
	Is continued treatment operation still needed?			
	Are more cost-effective treatment alternatives available to meet treatment requirements?			
	Is dedicated sampling equipment used to minimize collection time and IDW?			
	Are passive sampling approaches used where feasible?			

Optimizing Existing Systems

- Discussion
- Further Questions