Region 2 Clean and Green Policy

Overview and Update

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The Policy

- The policy was signed March 17, 2009 by the Director of the Emergency and Remedial Response Division (Superfund)
- Stated Purpose:

  To enhance the environmental benefits of federal cleanup programs by promoting technologies and practices that are sustainable.

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The Policy (cont.)

- As a start, the policy requires the use of four approaches at all sites unless a site-specific evaluation demonstrates impracticability or favors an alternative green approach
- Applies to all superfund sites in the region, including EPA lead, PRP lead, and federal facilities, as well as RCRA corrective action and brownfields cleanups
- Additional approaches will be added to the list of required practices over time

Immediate Goals of Policy

- Obtain 100% of Electricity from Renewable Sources
- Use of Clean Diesel Fuel, Practices, and Technologies
- Use of "Green" Concrete
  - Concrete made with coal combustion products replacing a portion of the Portland cement
- Capture of Methane at Landfills

Implementation

- A Green Remediation workgroup was formed within the region
- The workgroup was divided into 5 subgroups: technical, policy, outreach/training, metrics, and contracting
- Workgroup comprised of individuals from almost every division to allow for cross-divisional knowledge exchange

Technical and Outreach/Training

- Holding a series of training sessions for each of the four approaches
- Preparing technical primers for use of site managers
- Held Clean Diesel training on April 23rd, 2009 and Renewable Energy training on November 10th; prepared technical primers for each of these.

Policy and Legal

- We are requiring incorporation of GR language into all new RODs and PRP Orders/Agreements
  - 7 RODs and 7 Enforcement Agreements have included GR language so far this year
- We are requesting that PRPs already working under an existing order comply with the policy

Contracts

- Language has been added to all of our new RACs contracts and IAs
- Existing contracts will be updated with GR language when they need to be updated
- We have successfully been working with the USACE and our contractors to implement and track the success of the policy
- We are working to incorporate language into our contracts for other programs

Metrics

- We have tentatively identified metrics for each of the initial required practices
- We have received funding to work with a contractor to track metrics
- Contractors are keeping track of their progress as an additional line item in their standard monthly progress reports.
  - We're working on developing a consistent format

Example of Progress

- Many sites in the region have implemented aspects of the policy; we are still developing a standard way to record progress
- In the interim, we have completed a draft analysis of the carbon-emission reductions that can be achieved by switching to the use of renewable energy

Example (cont.)

- We have compiled data on the kWh used per month at 12 USACE-managed sites in NY and NJ
- 6 of these sites have switched to purchasing 100% renewable energy for use at their site
  - one more is switching this month, and one site has switched to using 5% renewable energy
  - Some sites have been unable to switch due to a lack of viable options; others are still exploring their options. More sites are implementing the policy every day.

Analysis of Benefits of Switching to Renewable Energy at 6 out of 12 Sites

	Annual Estimate of Total kWh Used		Annual Estimate of Cost	
Renewable	285,600	$	47,820.00	
Non-Renewable	1,338,000	$	235,968.00	

Cost Summary			**Carbon Summary**	
Total Annual Cost of Energy at 12 Evaluated Sites	$	283,788.00	Total Metric Tons of Carbon Emitted IF all Non-Renewable Energy is Used at the 12 Evaluated Sites	997
Actual annual Cost Increase of Switching to Renewable Energy (average cost increase of $0.04 / kWh)	$	11,424.00	Total Metric Tons of Carbon No Longer Being Emitted because of Switch to use of Renewable Energy	167
Percent Cost Increase due to Use of Renewable Energy at 6 of 12 Evaluated Sites		**4%**	**Percent Reduction in Carbon Emitted due to Use of Renewable Energy at 6 of 12 Evaluated Sites**	**17%**

*Metric tons of carbon emitted were calculated using the website: http://www.epa.gov/cleanenergy/energy-and-you/how-clean.html. Inputs needed are zip-code of site and monthly average kWh used.

For further information...

- You can find the Clean and Green Policy at:

  http://www.epa.gov/region02/superfund/green_remediation/policy.htmlClean and Green Policy

- Questions?

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Evaluating Green Strategies: Case Study at the Fort Devens Superfund Site - Pump & Treat System at the Shepley's Hill Landfill

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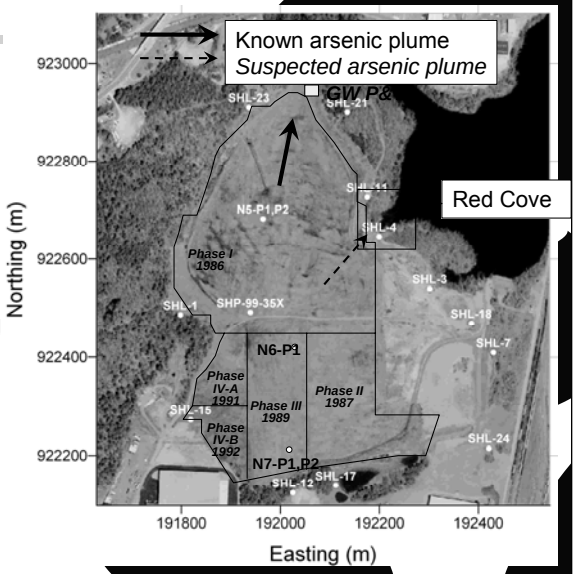
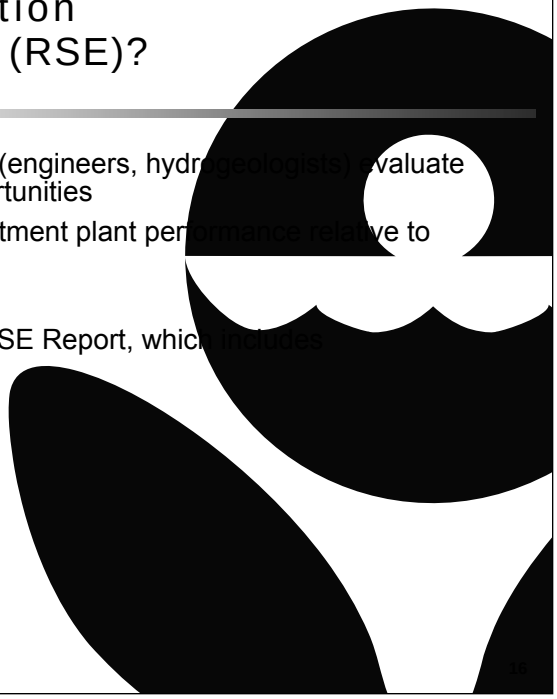
Background on Shepley's Hill Landfill

- 80 acre unlined landfill (OU1) at the Former Fort Devens
- operated 1917 – 1990s
- disposal of municipal waste, construction debris, incinerator ash, other?
- 1995 ROD remedy - geomembrane and soil capping system with a contingency for groundwater extraction
- groundwater P&T system began operation in 2005
- P&T operates at 50 gpm and removes arsenic



What is a Remediation System Evaluation (RSE)?

- Independent team of experts (engineers, hydrogeologists) evaluate remedy for optimization opportunities
- Evaluate subsurface and treatment plant performance relative to remedial goals
- Verify site exit strategy
- Analyze data and generate RSE Report, which includes recommendations related to:
  - » Protectiveness
  - » Cost-effectiveness
  - » Technical Improvement
  - » Site closure
  - » Sustainability



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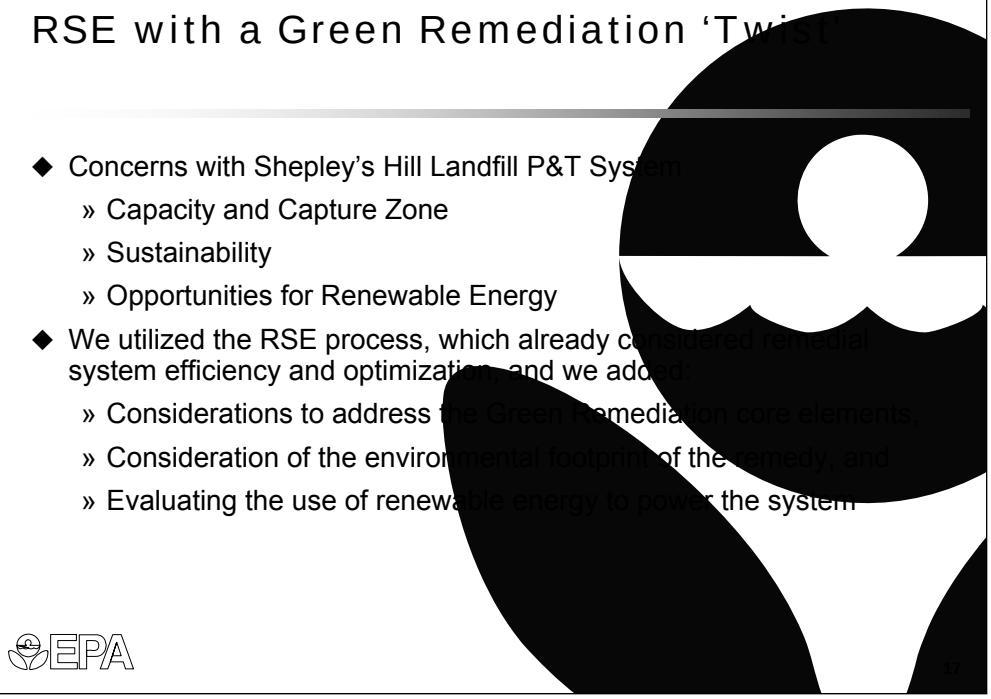
RSE with a Green Remediation 'Twist'

- Concerns with Shepley's Hill Landfill P&T System
  - » Capacity and Capture Zone
  - » Sustainability
  - » Opportunities for Renewable Energy
- We utilized the RSE process, which already considered remedial system efficiency and optimization, and we added:
  - » Considerations to address the Green Remediation core elements,
  - » Consideration of the environmental footprint of the remedy, and
  - » Evaluating the use of renewable energy to power the system



Background on the P&T System

- 2 extraction wells – each designed to provide 50 gpm, but operated together for a total 50 gpm flow
- Arsenic removal through precipitation with iron and microfiltration – process chemicals used are sodium chlorite and chlorine gas (As influent conc. = 3.2 mg/L, Fe influent conc. = 70 mg/L)
- Effluent discharged to Devens POTW (As effluent conc.< 10 ug/L (MCL))
- Lamella plate clarifier for solids thickening
- Solids dewatering with filter bottom container
- Sludge (~ 8% solids) transported off-site for disposal as non-hazardous to landfill in NH
- 40’ X 40’ steel building with electric heat

RSE & GR Evaluation Findings

- The next 6 slides present the findings and recommendations of the RSE/GR Evaluation
- The Report was finalized in August 2009 and has been shared with the Army and other site Stakeholders
- RSE/GR Evaluation conducted by GeoTrans, Inc.
- Thanks to Doug Sutton and Rob Greenwald, of GeoTrans, Inc.

P&T System – Major Costs

Item Description	Approximate Annual Cost
Project Management, Reporting, O&M Labor	Confidential
Electricity	$25,000
Chemicals	
◆Sodium chlorite	$40,000
◆Chlorine gas	$11,000
◆Other	$5,000
Waste Disposal	$74,000
Water Discharge	$81,000
Other	Confidential
Total Estimated Annual Cost	$500,000

P&T System – Carbon Footprint

Item	Carbon Footprint (lbs CO_2e/yr)	Percent Contribution of Carbon Footprint	
		P&T Only	P&T + LFG
Energy			
Electricity	191400	52%	41%
Diesel	25168	7%	5%
Gasoline	5928	2%	1%
Energy Subtotal	**222,496**	**60%**	**48%**
Materials			
Sodium chlorite	32000	9%	7%
Chlorine gas	3712	1%	1%
Other chemicals	7500	2%	2%
Materials subtotal	**43,212**	**12%**	**9%**
Waste Disposal & Direct Emissions			
Non-hazardous landfill disposal	12852	3%	3%
POTW	45000	12%	10%
Methane from water	46200	12%	10%
Disposal subtotal	**104,052**	**28%**	**23%**
P&T System Subtotal	**369,760**	**100%**	**80%**
LFG Emissions**			
Carbon dioxide	0		
Methane	92400		20%
LFG emission subtotal	**92400**		**20%**
Total	**462,160**		**100%**

** More than 50% of the carbon footprint associated with diesel is associated with the transport of sodium chlorite and more than 30% of the diesel carbon footprint is associated with transport of waste for disposal.*

*** The provided landfill emissions rate assumes an average air flow rate of 1 cfm from the landfill. This flow rate has not been calculated. Values are presented so that the relative potential magnitude of the carbon footprint of the landfill could be compared with that of the P&T system. The carbon dioxide emitted from the landfill is not included because degradation of the waste to carbon dioxide would occur regardless of whether or not it was in a landfill.*

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Recommendations to Improve Effectiveness

- Concern with capture zone
  - » System designed for 50 gpm for capture at the north end of the landfill
  - » Due to system inefficiencies, system was running at around 35 gpm; improvements made by new operations contractor in 2008 has system operating at ~45 gpm – still not at 50 gpm
  - » Modeling results used were unreliable (unacceptable mass balance error)
  - » Model suggest groundwater along eastern side of landfill not captured
- Recommendations
  - » Revise groundwater flow model (to achieve convergence and acceptable mass balance error) and recalibrate
  - » Increase plume capture by reinjecting treated water downgradient of the P&T [Added Benefit – Avoid discharge to POTW at a cost of $80-90K per year]
  - » Increase system capacity (alternatives: large clarifier to replace microfiltration unit; filter press to improve dewatering)

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Recommendations to Reduce Costs

- Reinject treated water or surface water discharge
  - » Cost savings ~ $70K per year
- Alternative Chemical Usage
  - » Sodium chlorite (Atka Klor 25)
    - — Current annual cost = $40K per year
    - — Chemical comes from distant supplier and includes $0.20/lb freight
    - — Recommend looking at other 25% sodium chlorite solutions
  - » Chlorine Dioxide
    - — Current annual cost = $11K
    - — Sodium hypochlorite should be considered as replacement
    - — Added safety benefit
- Modified Solids Handling
  - » Cost comparison of current solids handling versus installation of filter press (cuts off-site disposal costs by 1/3)
  - » ~ 5 year pay back
  - » ~ 18K lbs per year reduction in CO_2 emissions

Recommendations for Improved Sustainability

- Use water source heat pump for building heat
  - » Current electrical heat cost $6,000 per year and generates ~47K lbs CO2 per year
  - » Reduction of 75% of electrical usage could be realized (saving $4,500 per year and reducing carbon footprint by ~35K lbs CO2 per year)
  - » ~ 3 year pay back
- Use solar spark flares to combust passive methane emissions
  - » Passive methane emissions from landfill account for ~20% of the carbon footprint
  - » Cost of flares = $5K (estimate that 8 would be needed for total cost of $40K)

Considerations for Renewable Energy

- Only evaluated renewable energy opportunities for providing energy for the P&T system
- Separate study ongoing by Army considering landfill as a site for larger-scale renewable energy system to power a new Armed Forces Reserve Center that us under construction at Devens
- Solar Analysis:
  - » 100 kW system to provide 90% system electricity
  - » Pay back with MA incentives = 15 years
- Wind Analysis
  - » 100 kW system to provide 80-90% system electricity
  - » Pay back with MA incentives = 12 years
- 100 kW size chosen to optimize size and financial payback
- Would need 3rd party partnership to benefit from 30% Federal Tax Credit (Pay back closer to 10 years for either)

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Status of the RSE/GR Pilot at Fort Devens

- Army and EPA considering recommendations
- Army preparing to conduct a supplemental investigation effort and complete a new FS to evaluate remedial alternatives to address issues with current remedy. The investigation and supplemental FS will consider the RSE/GR Recommendations to:
  - » Revise the groundwater flow model
  - » Reinject groundwater
  - » Increase system capacity (large clarifier and filter press)
- Army has also agreed to consider installation of a water source heat pump for building heat
- Army evaluated the proposed alternative chemical usage recommendations but was unable to implement those due to issues with area suppliers
- Army awaiting finalized plans on large-scale renewable energy system being considered for new Armed Forces Reserve Center
- EPA Region I will track changes implemented as a result of the RSE/GR effort and report these to EPA HQ

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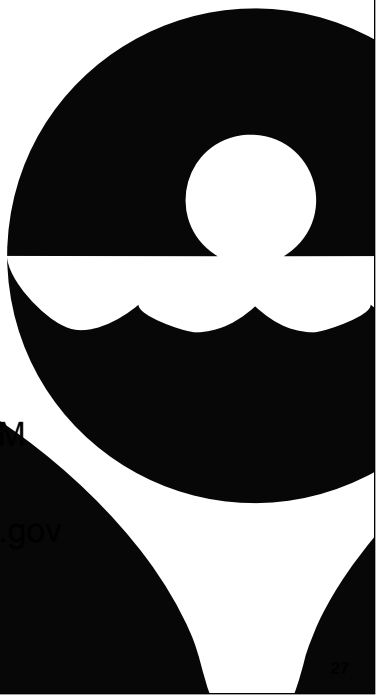
Questions?

Thank You!



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OII SUPERFUND SITE ALTERNATIVE ENERGY SYSTEM AND SOLAR POWER ADDITION

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OII Site Location

- 10 Miles East of Los Angeles in the City of Monterey Park, CA

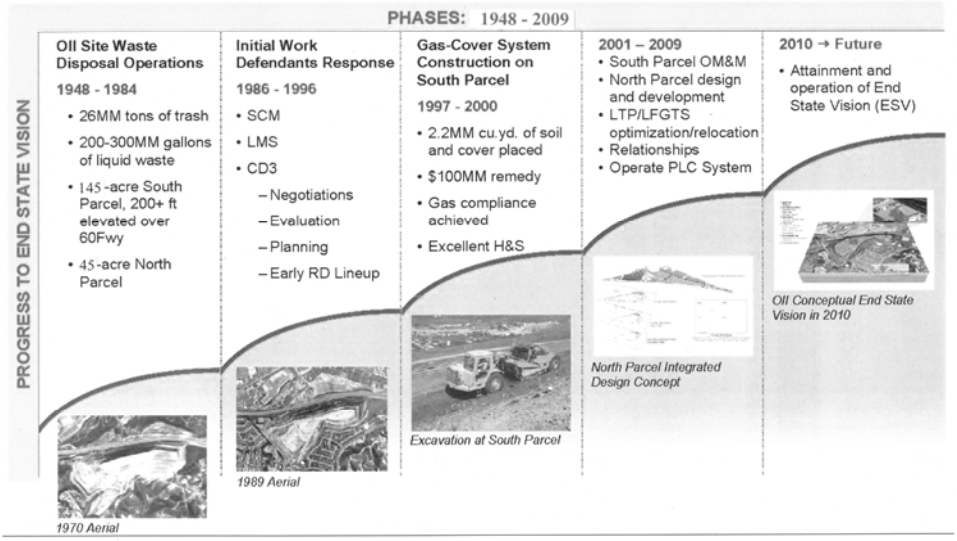
- 190 acres divided by California Highway 60 into two parcels

- South Parcel (145 Acres):
  - 275 feet high
  - Steep slopes (38 ^{o})

- North Parcel (45 Acres):
  - relatively flat
  - redevelopment planned

Aerial View of OII Site (South & North Parcels)

Oll Superfund Site: The Site and the Remedial Response Evolution



Wastes Accepted At OII

- In 1954, permitted to accept:
  - Group 2 wastes (including household refuse, decomposable organic refuse and selected scrap metal) and
  - Group 3 wastes (including non-decomposable inert solids and certain types of liquids)
- Received all types of waste from many entities as a “city dump”
- Accumulated 38 million cubic yards of MSW
- Accepted 330 million gallons of liquid wastes (could be up to 1 billion gallons)
- Contains the entire range of hazardous materials

OII Site Chronology

1984 USEPA begins RI/FS
1987 Interim ROD for site control and monitoring
1987 Interim ROD for leachate management
1988 Landfill Gas Migration Control ROD
1990 Landfill Gas Migration Control ROD amendment
1992 Leachate Treatment Plant construction starts
1996 Final ROD (Groundwater) issued
1997 South Parcel Landfill cover work begins
1999 Landfill Gas Treatment System completed
2002 Micro-turbines installed
2008 Perimeter Liquids Control System (PLCS) installed
2008 North Parcel cap construction starts
2009 PLCS and NP cover compliance testing will start

OII Remedy Strategies

Landfill Gas

- Expand landfill gas collection system to control gas migration
- Construct a landfill gas treatment system

Leachate

- Install a leachate collection system to control migration and construct a leachate treatment plant
- Install a Perimeter Liquids Control System (PLCS) to control groundwater impacts and add additional groundwater monitoring wells to evaluate Monitored Natural Attenuation remedy

Cap

- Place landfill covers in the South and North Parcels to contain gas & prevent surface water infiltration and build stormwater retention ponds to control surface runoff

Site-wide Institutional Controls and Long-Term O&M

→ An estimated $600+ million in total remedial costs

Why Green Remediation considered at OII?

- It is environmental friendly resources reuse concept and reduces carbon footprint
- It will save site operation costs and/or provide additional financial support for the long term site remediation
- OII has high concentrations of methane resources
- OII has two units of thermal landfill gas treatment system
- OII has large open space for solar power farm
- OII has large quantity of treated liquids
- OII has high voltage power lines and a nearby power substation
- OII has potential nearby green products buyers

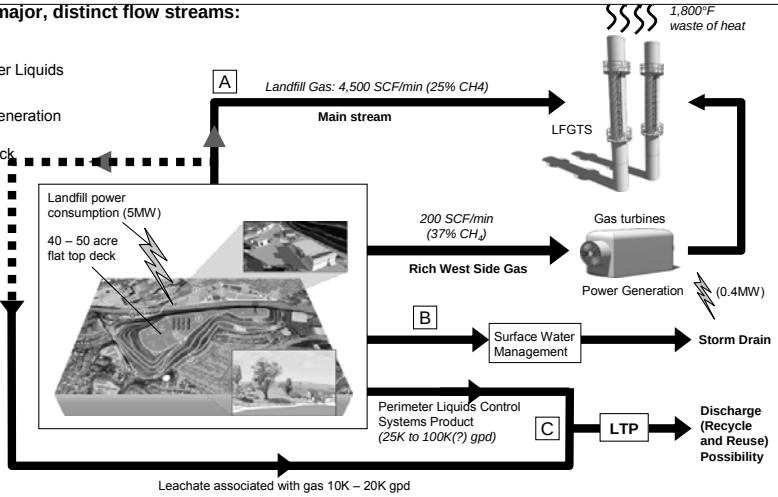
OII Landfill Superfund Site Process Flow Diagram: Energy and Resource Management Opportunities

OII Landfill has three major, distinct flow streams:

A. Landfill Gas
B. Surface Water
C. Leachate and Perimeter Liquids

Opportunities:

- LFGTS waste heat; cogeneration
- More gas to power
- Solar power from top deck
- Liquids reuse



OII Microturbine Power Generation

Six Ingersoll-Rand Microturbines installed in 2002

- Methane Concentration > 30%
- Power Generation Capacity: 70 KW for each unit,
    - Total capacity: 420 KW
- Provide 60% - 70% site power
- Save $300,000 - $400,000 per year energy costs
- Planning to replace next generation of microturbines
    - Two units of 250 KW per unit capacity
    - Total capacity: 500 KW
- Energy grant is available from utility companies for Microturbine installation

Six Units of Microturbine at the OII Site

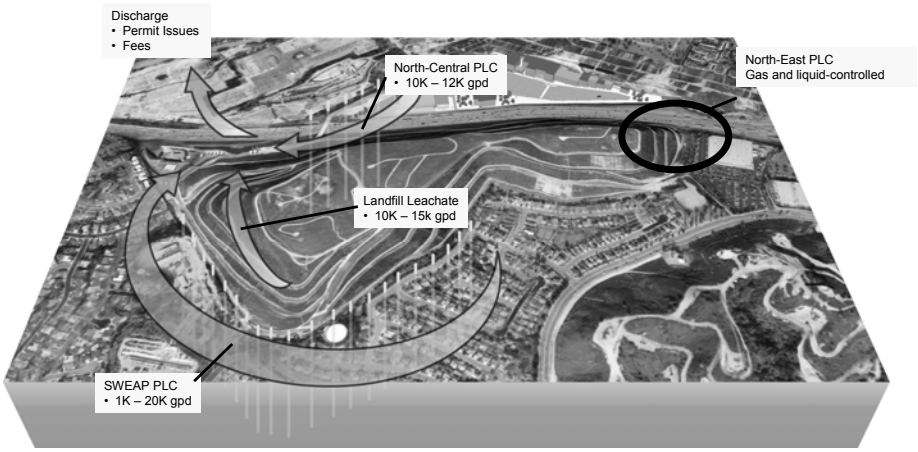
Thermal Recovery

Landfill Gas Treatment System (LFGTS)

- Located in the middle of North Parcel
- Thermal plumes released from LFGTS are 1800 Deg. Fahrenheit
- Total Thermal Recovery for reuse: 66MBTU/HR
- Produce 6000 SCFM Flow
- Retail market place will need heating resources
- Additional generated power can be sold to Southern California Edison

Landfill Gas Treatment System

Perimeter Liquids Control (PLC)



Note: Current LTP has a design capacity of 75K gpd, with a possible de-bottleneck capacity of 150K gpd

Reuse treated liquids collected and from the Perimeter Liquids Collection (PLC) System

- PLC has three liquids collection systems:

  South West Early Action Program (SWEAP)
  North Central (NC) Area
  North East (NE) Area

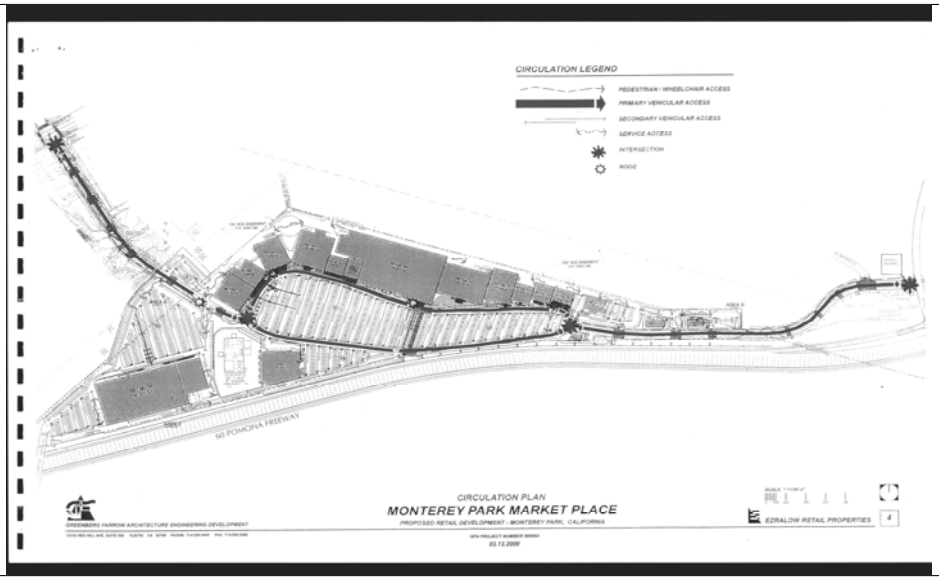
- The three systems include 458 gas extraction wells and 114 groundwater and liquid extraction wells

- 10 Million gallons of annual treated liquids are available for reuse (e.g., nearby cemetery and nursery use)

Solar Panels Power Farm

- OII South Parcel has 40 – 50 acres of top flat deck
- Power transmission lines and substation are next to the site
- NCI (Work Defendant's contractor) has conducted preliminary study to confirm feasibility; however, it needs huge development (capital) costs
- Potential long term site lease – private and utility companies may be interested to lease the South Parcel (SP) for solar panels power production from OII
    - Long term site lease (20+ years)
    - SP site can produce up to 12 Megawatts of electricity to power 9000 homes

Proposed North Parcel Retail Market Place Redevelopment



OII North Parcel Redevelopment

To support redevelopment of Retail Shopping Center requires:

- Revised cap design to support building (e.g., enhanced waste processing, preloading the foundation)
- Possible relocation of treatment systems
- Negotiating an agreement with PRPs on reimbursable costs
- Oversight of redevelopment to ensure the site remedy is protective to human health and the environment

Advantages and Disadvantages of Applying Green Remediation before Site Remedy

Advantages:

- Integration will save the total remedy (including long-term O&M) and green remediation costs if the integration is done correctly
- Integration will maximize the opportunities for green Remediation
- Integration may save future regulatory agencies oversight costs

Disadvantages:

- Integration will take a lot of time and thus further delay the site remedy implementation
- Integration is hard to separate the site remedy costs and green remediation costs
- Integration may have significantly impacted to the remedy selections

Advantages and Disadvantages of Applying Green Remediation after Site Remedy

Advantages:

- It is easy to identify green remediation costs
- It will not cause delay of site remedy

Disadvantages:

- It may increase the green remediation costs because green remediation may disturb the site remediation
- It may increase the difficulty for regulatory agencies long-term O&M oversight especially for Fund-lead sites and Federal Facility
- It may limit green remediation opportunities after the remedial actions

Questions and Answers

RPM Contracting Toolkit: Contracting perspectives and allowances

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Contracting and Administrative Toolkit

- Developed for use by RPMs, OSCs, and procurement offices
- Identifies opportunities throughout ERRS, START, RAC, and RAC contracting stages
- Cites specific language already used in some regional contracts
- Opens doors for adding similar specs in administrative documents including RODs and RI/FSs
- Links to information on green incentives, financing, and decision-making tools plus related programs and administrative authorities
- Suggests “green building blocks” for innovative cleanup strategies

Highlights of the Contracting Approach

- ✦ Pre-award activities
- Include green specs in a new or revised SOW, at contract or task order/work assignment level
- Consider performance-based contracts that provide incentives while giving contractor flexibility
- Include technical evaluation criteria which relate to environmentally sustainable business operations
- Establish standard reporting requirements related to contractor's proposed green strategies

Highlights of the Contracting Approach

- ✦ During contract performance
- Request use of life cycle analysis to evaluate potential approaches, where appropriate
- Suggest that remedy screening include sustainability factors such as energy and water consumption, greenhouse gas emissions, and waste generation
- Ensure that the negotiated work plan documents all green agreements while preserving remedial objectives
- Include reuse planning requirements to ensure long-term protectiveness and sustainability

Highlights of the Contracting Approach

- ✦ Evaluating contractor performance (must be in place prior to award)
- Include discussions of contractor performance relative sustainable actions.
- Apply green rewards to successful contractors operating under performance-based contracts
- Consider successful use of green strategies when exercising any contract options
- Establish an annual “Contractors’ Green Cleanup Award” for exemplary success in green response/remediation strategies

Sample Contracting Language

- Monthly and Annual Report on Environmentally Preferable Practices (ERRS, Regions 4 & 6)

  The Contractor shall submit an annual report detailing the environmentally preferable activities accomplished or purchases made within the previous 12-month period and a monthly summary in the Monthly Progress Report….

- Clean Technologies (ERRS, Regions 9 & 10)

  The contractor will use clean technologies and/or fuels on all diesel equipment to the extent practicable and/or feasible….

- Clean and Green Policy (RAC, Region 2)

  The contractor shall explore and implement green remediation strategies and applications in the performance of the requirements of this work assignment to maximize sustainability, reduce energy and water usage, promote carbon neutrality, promote industrial materials reuse and recycling, and protect and preserve land resources.

Sample Contracting Language

- Professional Qualification and Management Ability (RAC II, ESS 4, Region 4)

  Ability to develop innovative management strategy to minimize costs and streamline schedules; effectiveness and accomplishments of firm's Quality Environmental Management System on overall reduction of greenhouse gas emissions.

- Renewable Energy (RAC II, Region 9)

  The contractor shall evaluate all reasonably feasible renewable energy sources when conducting work related to selecting a cleanup remedy, constructing a cleanup remedy, and when optimizing an existing cleanup remedy. Sources of renewable energy include solar, wind, and biomass and biogas.…

- Specialized Experience and Technical Competence (ROC III, Region 7)

  Experience in developing innovative technical approaches, tools, and technologies; experience in innovations and ideas relating to energy conservation, pollution prevention, waste reduction, and the use of recovered materials.

Sample Contracting Language

- Environmental Preferable Practices: (START, Region 7)

  The contractor shall, to the greatest extent practical, utilize environmentally preferable practices in their course of business. “Environmentally Preferable” is defined as products or services that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose….

- Environmentally Preferable Practices (ERRS and START, Region 6)

  The contractor shall provide a “green report” on reuse, recycling, waste streams reduction, and resource conservation as part of the monthly progress report.

Site	Period	Action	Volume	Estimated Cost Savings	Estimated Environmental Benefit	Comment or Cost Estimate
ABC Site	10/8	Salvaged metals	5,000 lbs	$300 income from sale	Reduced landfill burden	No additional cost

Sample Tools for Decision Making

- Waste Reduction Model (WARM) calculates GHG emissions of baseline and alternative waste management practices and energy savings
- Fan System Assessment Tool (FSAT) quantifies potential benefits of optimizing fan system configurations
- PVWatts calculates energy production and cost savings for hypothetical grid-connected PV systems
- EMFACT tracks materials and energy use, releases, and costs
- Water Evaluation and Planning (WEAP) explores demand and supply options within a given area
- RETScreen evaluates energy production/savings, costs, emission reductions, and financial risk for renewable energy and energy efficient technologies

Over 40 tools can be accessed at: http://www.cluin.org/greenremediation/subtab_b3.cfm

Points of Contact & Referral

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- Carlos Pachon, pachon.carlos@epa.gov

Many Thanks for Toolkit Contributions from:

Art Wing (R1), Deborah Butler, Nicoletta Di Forte (R2), Chris Corbett (R3), Julie Santiago-Ocasio (R4), Jo Ann Gee, Nancy Jones (R6) John Frey, (R7), Harry Ball, Sheila Rad (R9), and Sean Sheldrake (R10)

The complete ***Green Response and Remedial Action Contracting and Administrative Toolkit*** may be downloaded at: http://www.cluin.org/greenremediation/subtab_b2.cfm

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Links to Additional Resources

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