

# II International Conference on Subsurface Environment

## **Sustainable Remediation and Site Reuse**

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### **Abstract**

This presentation will provide an overview of the application of sustainable principles and tools to the cleanup and redevelopment of contaminated sites. This is an area of rapid development within the environmental profession, with new tools, business practices, and performance standards for identifying, evaluating, and managing the “collateral” impacts of cleanup and site development projects to the environment, economy and society coming from many organizations.

A series of case studies will be presented which include:

- Cleanup and redevelopment of a former refinery into a multi use wildlife refuge, kayak course, golf course and business park
- Reuse of a former landfill for a 4 mega watt solar energy facility
- Cleanup and reuse of a wood treating facility for an airport expansion
- Use of wetlands for site remediation and public space

### **Key words**

Sustainable remediation, site reuse, brownfields

### **CASE STUDIES**

#### **Refinery cleanup results in multiple community & environmental benefits**

AECOM helped the owner of a former refinery develop and negotiate a new site remediation strategy that included a risk-based remediation approach, innovative green remedies, and an integrated property reuse plan to establish attainable cleanup requirements, reduce cleanup costs, restore the property to productive use, and satisfy stakeholders.

The Remedy Agreement incorporated risk-based decisions and innovative approaches to define practical limits for soil/sediment excavation and disposal, LNAPL recovery and groundwater remediation. Green remediation measures included:

1. In-situ characterization efforts using geoprobes equipped w/hydrocarbon analyzers to limit the amount of investigation derived wastes
2. Characterization of NAPL mobility using innovative field and laboratory analytical methods led to a reduction in LNAPL recovery target areas from 150 to 50 acres.

3. Over 300, 000 tons of concrete were crushed and recycled on site as part of the site reuse features and 300 miles of underground piping were removed and recycled.
4. The groundwater remedy integrated monitored natural attenuation within the former refinery property, in combination with more aggressive engineered systems in off-site areas thereby limiting total resource consumption.
5. A new kayak course served as part of the groundwater gradient control thereby decreasing total energy used and creating a public amenity.
6. The 1,100-gpm water management system also saved \$10 million and reduced annual energy and water consumption by integrating a number of natural features. Following pre-treatment in a traditional oil/water separator, groundwater is treated in an engineered subsurface wetland, prior to reuse of the treated water.
7. Over 600 acres of wildlife habitat were created as part of the site cleanup efforts

### **Development of renewable energy on a closed landfill**

AECOM assisted Synergy Electric in developing a 1.4MWs photovoltaic (PV) facility on a closed landfill at the Camp Pendleton US Marine Corp base in California. . The project poses unique challenges as the landfill will continue to settle over the life of the project, and is covered by a specially designed evapotranspiration cover that cannot be altered.

AECOM has incorporated numerous design elements to address the unique challenges of the project including adjustable racking, non-penetrating self ballasted racks, and a cable and anchor system to prevent slippage or displacement as the landfill settles. Additionally, the modules are laid out in a manner to limit the sheeting of water which could cause erosion of the landfill cover. The PV system provides renewable energy for the base and a sustainable reuse for the closed landfill

### **Redevelopment of a wood treating site helps improve regional economy**

This active wood treating site in the southeast was encumbered by a long-term operating lease that guaranteed a financial loss for our client, the owner of the property. Further, the lease prevented reuse of the site as part of a regional airport expansion that was critical to the regional economy. That expansion provided a unique opportunity for project funding and for long-term resolution of site liabilities.

Our project team solved these problems and produced a substantial return for our client.

The operating lease was renegotiated, including acquisition of a new site, demolition of the plant, and funding of site relocation. Cleanup liabilities were allocated between buyer and the seller, providing an exit strategy for our client. A risk-based corrective action was developed with the cooperation of the regulatory agencies, and required cleanup actions were integrated with future property reuse. The final cleanup plan produced a prepared development surface for the buyer at a reduced cost. The final transaction captured a unique opportunity, and recovered substantial value from a non-producing asset. All parties to the transaction captured a portion of the project benefits, including the local community which benefited from the economic benefits and job creation resulting from the airport expansion.

### **Wetlands system provides sustainable remediation and public enhancements**

Bridal Veil Open Space is a Superfund site where soil, sediments, groundwater and surface water were contaminated with wood-preserving chemicals and wastes. Located in a heavily industrial area between Minneapolis and St. Paul, the area consisted of a stormwater pond, flowing stream and woodlands, and local residents used the site for recreation including fishing, swimming and nature walks. However, the contamination posed a health and ecological risk to humans and the environment, and use of the site was restricted because of these risks. The local community group wanted this area restored and maintained in a natural setting.

AECOM designed a “Green Sustainable Remediation” system to mitigate the environmental issues. An innovative design was completed in partnership with the Minnesota Pollution Control Agency (MPCA), the City of Minneapolis, and the local citizens’ organization. The design included conversion of a stormwater pond to a wetland while maintaining the required storage capacity, and construction of a treatment stream within the wetland to degrade pentachlorophenol (PCP) by photolysis and bioremediation. This unique design created flowing water, a wetland, and an oak savanna while reducing or eliminating human health risks. With this design, we were able to maintain the community’s small green oasis within a heavily industrial portion of Minneapolis.

There are several original and innovative applications and techniques used in this project. The objective of the project was to complete a “Green Sustainable Remediation” project that meets the needs of all the stakeholders.

- Use of Vegetation to mitigate human risk exposures – Open water creates an attraction to humans, and the potential for direct contact with PCP-contaminated surface water. However, the community sponsor insisted that water features be maintained on the site. The design uses wetland vegetation and wetland soils to minimize the potential exposure, as humans are less likely to contact water in a wetland than in an open water body.
- Wetland Stormwater Detention – The stormwater pond was the only detention structure on Bridal Veil Creek, and its retainage capacity had to be maintained. AECOM evaluated the Bridal Veil drainage basin, and designed a wetland basin with detention capacity equal to the existing pond.
- Photolysis / Bioremediation Treatment Stream – Groundwater contaminated with PCP provides the base stream flow for Bridal Veil Creek, and will continue to discharge to the creek since no groundwater remediation is planned for the site. In order to reduce PCP concentrations in the creek in a green, sustainable process, AECOM designed a rock-filled treatment stream that reduces the PCP concentrations with sunlight (photolysis) and bioremediation. The design was based on research sponsored by the USEPA. To our knowledge, it is the only application of this research in a real-world problem.
- Base Flow Diversion – Stormwater discharge required a 72 inch concrete arched pipe to meet design peak flow conditions. However, sediment removal and PCP treatment occurs during the first flush and base flow conditions. AECOM designed a diversion structure within the 72 inch pipe to direct the first flush and base flow through a sediment trap and to the treatment stream.

## SUMMARY

Key features of these projects include

1. Integrating cleanup and reuse requirements in a manner that reduced costs and accelerated the overall project schedule
2. Including environmental enhancements and public benefit features
3. Incorporating sustainable principles in the design that improved energy efficiency and minimized the environmental footprint of the projects

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