



**Case Study:** Pharmacia and Upjohn Company LLC, North Haven, Connecticut

<p><b>Site Overview</b></p>	<p>The Pharmacia and Upjohn Company LLC site is in a mixed commercial and industrial area of North New Haven located along the Quinnipiac River. It initially was used as a clay mine and brick yard and then for chemical and electrical component manufacturing. Pfizer assumed responsibility for the Site in 2003 as a result of its acquisition of the Pharmacia Corporation. All former site buildings have been demolished. Pfizer maintains a groundwater treatment building on the site as remediation progress continues.</p>
<p><b>GSR and/or Triple Bottom Line Project Outcome</b></p>	<p>Pfizer integrated sustainable remediation concepts into the remedial design and implementation of a substantial cleanup project at the site. The project was then evaluated following the ASTM Greener Cleanup Standard Guide (E 2893-13), augmented to include the social and economic aspects of sustainable remediation. Based on the ASTM-styled evaluation, Pfizer determined that the project included 87 green BMPs, 9 social BMPs, and 8 economic BMPs. A notable aspect of the sustainable remediation was the extensive community outreach to engage local stakeholders in the selection of the remedy and the future use of the site.</p>
<p><b>Background &amp; Drivers</b></p>	<p>Pfizer’s management supported the use of sustainable remediation concepts as part of its Green Journey to integrate environmental sustainability into its business (see <a href="http://www.pfizer.com/responsibility/protecting_environment/green_journey">http://www.pfizer.com/responsibility/protecting_environment/green_journey</a>)</p>
<p><b>Regulatory Program</b></p>	<p>The investigation and cleanup are being performed under RCRA Corrective Action, which is administered by US EPA Region 1 in coordination with the Connecticut Department of Energy and Environmental Protection (CTDEEP).</p>
<p><b>Site End Use</b></p>	<p>The west side of the site will be as available for yet to be determined potential commercial or industrial purposes and the east side of the site maintained following ecological restoration.</p>
<p><b>Contaminants of Concern and Impacted Media</b></p>	<p>DNAPL Area - Volatile organic compounds (VOCs; predominately benzene, chlorobenzene, toluene, and tetrachloroethene [PCE]); semivolatile organic compounds (SVOCs; predominately, dichlorobenzenes, azobenzene, 2-chloroaniline, and 3,3’-dichlorobenzidine); and polychlorinated biphenyls (PCBs)</p> <p>Soil/wastewater treatment residuals - VOCs, SVOCs, PCBs, and metals</p> <p>Groundwater - VOCs, SVOCs, PCBs, and metals</p> <p>Sediment - Highest concentrations of key chemicals with bioaccumulation potential are 3,3-dichlorobenzidine, benzidine, and PCBs</p>



<p><b>Key Stakeholders in Project</b></p>	<p>In addition to Pfizer, EPA, and CTDEEP, the site has had active stakeholder participation by the following organizations: North Haven Citizens’ Advisory Panel, Quinnipiac River Watershed Association, North Haven Land Trust, Regional Growth Partnership, North Haven Trail Association, and North Haven Board of Selectmen.</p>
<p><b>Cleanup Objectives</b></p>	<p>Soil Cleanup Goals - The soil cleanup goals are based on the CTDEEP Remediation Standard Regulations (RSR) criteria for potential human health and ecological risks.</p> <p>Groundwater Cleanup Goals - The groundwater cleanup goals are based on the CTDEP RSR criteria for protection of groundwater, protection of surface water, and the potential risks to human health in future occupied buildings from volatilization of VOCs in groundwater.</p> <p>Sediment Cleanup Goals - The ecological preliminary media protection standards for sediment are based on potential ecological risks to estuarine wildlife.</p>
<p><b>Remediation Strategy</b></p>	<ul style="list-style-type: none"> <li>• In-situ thermal remediation to treat area impacted with DNAPL. Hydraulic control system for shallow groundwater consisting of a perimeter sub-grade, low-permeability vertical barrier along three sides of the site that intercept contaminated groundwater, thereby preventing impacts to the Quinnipiac River and abutting properties.</li> <li>• Groundwater treatment consisting of biological treatment, chemical coagulation, suspended solids removal, and UV light oxidation with hydrogen peroxide.</li> <li>• Low permeability cover systems in former soil pile and lagoon areas; remedy includes consolidating contaminated soils from other areas of the site under these covers.</li> <li>• Enhancement of ecological habitat, including creation of higher value uplands and wetlands habitat. The wetlands also offer stormwater management and treatment.</li> <li>• Long-term maintenance of the ecological restoration area, potential future commercial/industrial use of a specified area of the site, and the operation, monitoring, and maintenance (OM&amp;M) of remediation components and systems to verify continued protection of human health and the environment.</li> </ul>

<p><b>GSR Strategy/Best Management Practices (BMPs)</b></p>	<p>Pfizer implemented environmental, social, and economic BMPs throughout the course of the project. A complete list of the BMPs is provided in the report posted on the ASTM website (<a href="http://www.astm.org/COMMIT/ASTM E2893-13e1_userdoc_reporting.pdf">http://www.astm.org/COMMIT/ASTM E2893-13e1_userdoc_reporting.pdf</a>). Examples of these BMPs are:</p> <ul style="list-style-type: none"> <li>• Consolidation of the majority of materials on-site under engineered caps; thereby, limiting the volume of materials transported off-site for treatment or disposal.</li> <li>• Construction of a subsurface low permeability barrier wall using a mixture of Portland cement and recycled ground granulated blast furnace slag.</li> <li>• Utilization of geotextile bags for dewatering during the dredging project.</li> <li>• Utilization of reusable in situ thermal treatment well and heater materials.</li> <li>• Operation of the groundwater extraction system in pulsed mode and adjusting of pumping as needed to match tidal elevation changes in the river.</li> <li>• Conducted a reuse assessment analysis to evaluate potential future land uses. This is updated periodically as cleanup nears completion.</li> <li>• Local buying commitment, including a web-based form that can be downloaded from the project website to enable local businesses to provide information on prospective services and products.</li> <li>• Creation of local jobs during the remediation and, potentially, as a result of the future land use integrated into the remedy.</li> <li>• Conducted community workshops and interviews to solicit and incorporate input into the remedial decision process.</li> <li>• Developed videos that assisted stakeholders visualize the remedy and restoration.</li> <li>• Involved town Selectmen in the remedial decision process to ensure local government supported the proposed remedy.</li> <li>• Restoring site surroundings so that they are visually attractive.</li> <li>• Completing ecological restoration on the east side of the property consisting of potential ecological habitat, nature trails and wetlands; retained a specialty consultant to provide expertise in community relations pertaining to environmental issues and identifying ecological enhancements to incorporate into the project.</li> </ul>
<p><b>GSR Metrics and/or Footprinting Tool(s)</b></p>	<p>Performed carbon footprint analysis as part of the remedy evaluation that quantifies equivalent carbon dioxide emissions associated with: (1) major on-site/off-site transportation components; (2) major energy use requirements from treatment/disposal activities associated with the construction of each site-wide Corrective Measures Alternative; and (3) long-term O&amp;M. Specific activities evaluated include the transportation of primary construction materials to the site, transportation of primary wastes from the site to disposal facilities, on-site treatment and off-site treatment, and operation of the groundwater treatment facility.</p>



<b>Lessons Learned</b>	When Pfizer acquired the site, little community outreach had been performed and there were stakeholders who were either not engaged in the project or displeased with the cleanup process. By developing a robust community outreach program to solicit input, and then working with the community on the remedy selection and site redevelopment plans, Pfizer fostered an environment where the community is integrated into the remediation process.
<b>GSR Project Contact</b>	Russell Downey, Pfizer Global Engineering Pfizer Corporation Peapack, New Jersey (908) 901-6079 <a href="mailto:russell.g.downey@pfizer.com">mailto:russell.g.downey@pfizer.com</a>
<b>Relevant Links</b>	North Haven Informational Website - <a href="http://www.upjohnnorthhaven.com">http://www.upjohnnorthhaven.com</a>  North Haven Osprey Cam - <a href="http://www.upjohnnorthhaven.com/osprey_cam.php">http://www.upjohnnorthhaven.com/osprey_cam.php</a>
<b>References</b>	ASTM Technical Summary Form for the site can be accessed at: <a href="http://www.astm.org/COMMIT/ASTM E2893-13e1_userdoc_reporting.pdf">http://www.astm.org/COMMIT/ASTM E2893-13e1_userdoc_reporting.pdf</a>