



Case Study: Air Force Civil Engineer Center (AFCEC), Joint Base Cape Cod (JBCC, formerly the Massachusetts Military Reservation) Cape Cod, Mass, USA

<p>Site Overview</p>	<p>JBCC is a multi-use military and public facility with over 30 entities (see Attachment) that covers 22,000 acres on the Upper Cape Cod. As a result of military practices in the past, the site was listed on the National Priorities List in 1989. The AFCEC manages the Installation Restoration Program with 80 source areas (61 have been delisted) and 16 groundwater plumes in various stages of cleanup. AFCEC is currently treating approximately 12 million gallons of contaminated groundwater per day.</p>
<p>GSR Project Outcomes</p>	<p>The AFCEC and partners have minimized the use of new materials, the destruction of natural habitat and emissions from vehicles, pumps, and equipment. AFCEC’s three 1.5 MW wind turbines on JBCC power 100% of the groundwater cleanup, resulting in an annual credit of approximately \$1.2M towards AFCEC’s energy bills, and have decreased related air emissions by approximately 100% (Also see additional information section below.)</p>
<p>Background & Drivers</p>	<ul style="list-style-type: none"> • AFCEC is committed to a “better, cheaper and faster” approach that is intended to expedite the cleanup of groundwater and cleanup timeframes while reducing costs and minimizing its carbon footprint; • USAF wide goal to generate 1 GW of RE by 2020; • Executive Order 13514, <i>Federal Leadership in Environmental, Energy, and Economic Performance</i>; • <i>Defense Environmental Restoration Program (DERP) Management Manual (2012)</i> “Pursuant to E.O. 13514 the DoD Component shall, “where practicable based on economic and social benefits and costs, ensure green and sustainable remediation practices”; • JBCC goal to achieve energy security and become a net zero energy user.
<p>Site End Use</p>	<p>JBCC is home to several agencies including the United State Coast Guard (USCG), Air Force, Veterans Affairs (VA), Air National Guard (ANG), MA Army National Guard (MA ARNG) and numerous tenants. See Attachment for list of occupants.</p>
<p>Contaminants of Concern and Impacted Media</p>	<p>Primary chemicals of concern in groundwater:</p> <ul style="list-style-type: none"> • PCE, TCE • EDB • RDX
<p>Key Stakeholders in Project</p>	<ul style="list-style-type: none"> • Cleanup team: USEPA, AFCEC, and MassDEP • Cape Cod community property owners and residents • JBCC tenants and workers

<p>Cleanup Objectives</p>	<p>Risk-based objectives:</p> <ul style="list-style-type: none"> • Protect public against exposure to unsafe levels of contaminant sources and groundwater contamination; • Ensure that public or private water supplies are not affected.
<p>Remediation Strategy</p>	<ul style="list-style-type: none"> • Addressing groundwater plumes through extraction and treatment and monitored natural attenuation; • Replaced impacted drinking water supplies and connected over 1,100 homes in the area of groundwater plumes to municipal water; • Implemented land-use controls of private wells in plume areas; • Addressing source areas, those areas of contaminated soil or other materials through removal and treatment, or off-site disposal.
<p>GSR Strategy/Best Management Practices (BMPs)</p>	<p>BMPs used or planned to be used</p> <ul style="list-style-type: none"> • 3 1.5 MW wind turbines to power 100% of groundwater cleanup • biofuels in vehicles where possible • energy efficient pumps/motors (variable frequency drives) • energy-efficient lighting, heating and cooling • reusable mobile treatment units • beneficial reuse of treated water (i.e. irrigation of VA cemetery) • solar array on landfill • evaluating the use of alternative technologies such as in-situ bioremediation and ISCO • optimizing treatment system flow rates and monitoring networks • utilizing passive diffusion bags for sampling • owning/operating Geoprobe and well maintenance equipment to limit environmental impacts of transportation • testing carbon types for maximum adsorptive properties • participating in the demand response program; utilizing credit to install energy efficient windows and doors • home to a number of educational and training initiatives(see Attachment) • Senior AmeriCorps Program on Cape Cod assists various environmental projects at the JBCC and performs groundwater monitoring, well restoration and mosquito trapping/control projects.

<p>Use of GSR Metrics and/or Footprinting or tracking Tool(s)</p>	<ul style="list-style-type: none"> • Sustainable Remediation Tool • Metrix, a power use software tool that helps track energy use by account/building number and provides a diagnostic evaluation of reported energy. • .complex groundwater fate and transport models to assist in optimizing systems and explaining remediation timeframes to stakeholders
<p>Lessons Learned</p>	<p>Implementation of a robust optimization program and renewable energy technologies significantly reduced impacts to the environment while saving money and achieving cleanup timeframes.; gained public support and national recognition for JBCC</p>
<p>Project Contact</p>	<p>Rose H. Forbes, Remediation Program Manager 508-968-4670 x 5613 Rose.forbes@us.af.mil</p>
<p>Relevant Link</p>	<p>www.mmr.org</p>

Additional Information

Sustainable Reuse & Energy Security and Net Zero Energy progress report:

In addition to the 3 AFCEC 1.5 MW wind turbines the USCG has installed geothermal systems for heating and cooling of two of their aircraft hangars and has conducted a feasibility study funded by EPA to install a multi-megawatt (MW) solar array at the JBCC. The Air Force Space Command has installed two 1.68 MW wind turbines to offset the energy use at their PAVE PAWS radar facility on JBCC. Otis Air National Guard Base has released a request for proposals for a developer based power purchase agreement for installing a multi-MW solar array on a closed and capped landfill. The VA has installed a 50 kW wind turbine at their National Cemetery.

The JBCC agencies have all conducted energy audits at some if not all of their facilities and have implemented conservation initiatives such as installing more efficient lighting, occupancy sensors, thermostat controls, insulation, new windows and doors, and more efficient heating and cooling units. The Otis ANG Base is working with Cape Light Compact on a street lighting retrofit to install more efficient lighting. The USCG, AFCEC, and PAVE PAWS have all participated in the ISO-New England energy curtailment program to reduce energy loads during high grid use. In addition, MassDevelopment and the Otis ANG are working with AMBRI, an MIT-spinoff company based in Cambridge MA, on a feasibility study and prototype installation of an innovative liquid metal battery energy storage system. If the prototype is successful, plans will be made to scale up the energy storage technology to MW level and combine it with one of the renewable energy installations located on the JBCC.



MULTI-USE FACILITY

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- Veterans Administration National Cemetery
 - Barnstable County Sheriff's Office / Correctional Facility
 - 6th Space Warning Squadron PAVE PAWS
 - U.S. Department of Agriculture
 - Massachusetts Environmental & Readiness Center
 - U.S. Army Environmental Center Impact Area Groundwater Study Program
 - Air Force Civil Engineer Center Installation Restoration Program
 - 253rd Combat Communications Group
 - 267th Combat Communications Squadron
 - U.S. Coast Guard Air Station Cape Cod
 - Exchange/Commissary
 - Golf Course
 - MWR
 - Family Housing
 - Storage for ships in Boston
 - Massachusetts Army National Guard Army Aviation Support Facility #1
 - Massachusetts Army National Guard Regional Training Institute
 - Environmental Management Commission
 - Senior Environmental Corps
 - Massachusetts Disaster Preparedness Safe Haven Facility
 - US. Air Force Auxiliary (Civil Air Patrol)
 - Massachusetts Maritime Academy
 - Federal Aviation Administration, North Atlantic Region
 - Bourne School System
 - Coast Guard Communications Station, Boston
 - Coast Guard Electronic Systems Support Detachment
 - Coast Guard Marine Safety Field Office
 - Coast Guard Northeast Regional Fisheries Training Center
 - Coast Guard LANT Area Armory
 - Coast Guard Port Security Unit
 - Police Motorcycle & Canine Training Areas
 - Upper Cape Trash Transfer Station / Bay Colony Railroad
 - U.S. Geological Survey
 - Volpe Test Center
 - Buzzards Bay Project
 - FAA Cape Approach
 - Crane Wildlife Management Area