

Oregon ARNG Camp Withycombe

Environmental Restoration, Installation

INTRODUCTION

Camp Withycombe is an Oregon Military Department installation located near the southern slope of Mount Talbert in Clackamas, Ore. Camp Withycombe was established in 1909 as a 23-acre range and training area for the Oregon National Guard and expanded to 235 acres by 1919. Range use ended in the early 1990s, and all but approximately 77 acres have been transferred to the Oregon Department of Transportation (ODOT) for a highway development project. In preparation, the Oregon Army National Guard (ORARNG) remediated six former small arms firing ranges (SAFR). The implementation of innovative cleanup strategies and green remediation technologies made this project an extraordinary success.

Camp Withycombe is a depot-level maintenance facility for the ORARNG and the site of the Oregon Sustainment Maintenance Site, Readiness Sustainment Site, a Field Maintenance Shop, 41st Infantry Brigade Combat Team Headquarters and the Oregon State Defense Force Headquarters. Camp Withycombe also hosts maneuver exercises for troops and civilian law enforcement. The installation has a population of 40 civilians and 585 military personnel.

The former firing ranges are located in the north-central portion of the property. Much of the site is flat-lying land, except for the lower, southern slopes of Mount Talbert, which rise to a peak elevation of approximately 750 feet above sea level. The south sloping hillside, which was the backstop for the former ranges, is relatively undisturbed native forest which provides a high-quality ecological habitat for many species. The flat-lying portion, which is largely undisturbed grassland and low-quality habitat, is the future location of the highway's right-of-way.

JUDGING CRITERIA

-  Program Management
-  Orientation to Mission
-  Technical Merit
-  Transferability
-  Stakeholder Interaction

On this page: Camp Withycombe is the site of maneuver training exercises for troops and civilian law enforcement. (U.S. Army photo)

BACKGROUND & PROGRAM SUMMARY

Environmental restoration at Camp Withycombe is managed by the Environmental Restoration Program of the Oregon Military Department's Environmental Branch, located at the Joint Forces Headquarters of the Oregon National Guard in Salem, Ore.

The Restoration Program is responsible for matters related to environmental condition of property, environmental baseline studies, compliance-related cleanup, military range assessments and proposed/pending real estate actions for 12 installations and 44 fixed facilities in Oregon. The Restoration Program staff is committed to streamlining and fast-tracking cleanup processes, exemplifying environmental stewardship, reducing risks to human health and the environment and improving partnerships between the Department of Defense (DoD) and other agencies.

The Camp Withycombe cleanup project was executed by an experienced team of 24 technical experts and field personnel, comprised of scientists, engineers, contracting partners and equipment operators. The project was supported by other program managers in the Environmental Branch, which provided National Environmental Policy Act, cultural resources, natural resources and contract support. The Oregon Department of Environmental Quality (DEQ) regulatory personnel included a project manager and a hydrogeologist.

The ORARNG Restoration Manager worked in coordination with the Oregon DEQ, ODOT and other stakeholders to develop and execute an approach to remove lead-contaminated soil from the former SAFR and took the following actions to mitigate challenges:

- Managed the workflow and excavation sequence on a continuing basis to ensure the remedial action phase was completed prior to the rainy winter season. The team operated on a compressed schedule, July through September, to excavate and treat nearly 30,000 tons of soil located on 12 acres.
- Integrated technologies and logistics so remedial actions, equipment locations and truck routes would not adversely impact Camp Withycombe's maintenance operations and training missions.
- Ensured unexploded ordnance technicians were on site to reduce the risk posed by munitions potentially presenting an explosives hazard and coordinated notifications and actions with all related stakeholders.
- Designed an innovative soil treatment system which allows for variability of soil types and bullet density in the soil. The soil types encountered in the excavation area, located at the base of a volcanic hillside, included clay, sand, a mix of cobbles and organic matter. The types of bullets varied from range to range and included .22- to .50-caliber bullets.
- Conducted treatability studies to prove the efficacy of implementing the soil treatment system. Regulatory stakeholders were initially reluctant to support the technologies proposed, but studies were convincing, and given the project's success, regulatory stakeholders are now more receptive to green remediation solutions.

With highway construction set to begin in 2012, the ORARNG designed a sustainable cleanup for completion by 2011. Primary project milestones include: Remedial Investigation, 2008; Feasibility Study, 2008; Remedial Design, 2008; Decision Document–Record of Decision (ROD), 2008; Interim Remedial Action, 2008; Remedial Action, 2009; and Long-Term Monitoring, 2011. All milestones were completed on schedule, and long-term monitoring is on track for completion in 2011.



The multi-stage soil treatment process included a closed-loop water treatment system, allowing all process water to be reused.



All plans required by Army Regulation 200-1, ORARNGR 200-1, Oregon DEQ, Oregon Water Resources Department, Oregon Division of State Lands, Oregon Occupational Safety and Health Administration, Oregon State Historic Preservation Office, Clackamas County and the U.S. Fish and Wildlife Service were prepared and kept up-to-date.

The Camp Withycombe range restoration project effectively integrated all compliance and programmatic environmental Management Systems, as demonstrated by a “positive” Army External Compliance Audit System finding in November 2008. All Army compliance-related cleanup data calls, programming and execution requirements were completed on time and on schedule.

ACCOMPLISHMENTS

Accelerated Environmental Cleanup

The ORARNG used a combination of processes to remediate the contaminated soil: dry particle separation to segregate the size fraction containing the bullets, removing large stones and organic material and removing finer material; wet gravity separation to remove bullets and particulate lead and use of a phosphate amendment to prevent leaching of residual lead. The soil treatment process reduced the need for soil removal and transport to a hazardous waste disposal site using the traditional dig-and-haul approach. This process saved time, reduced fuel costs and eliminated emissions. As a result, the 12-acre restoration project was completed in less than six months, well in advance of ODOT timelines. Approximately 30,000 tons of contaminated soil were remediated, and only 130 tons required transport and disposal at a hazardous waste landfill.



“The ORARNG has successfully blended an efficient and innovative environmental restoration program with a concurrent emphasis on principles of sustainability, green remediation and mission support. The techniques used are of particular value to the Army and DoD environmental restoration programs in that they are simple in approach and directly transferable to other sites undergoing range cleanup of small arms ammunition.”

- Ray Fatz, President and CEO, Plexus Scientific Corp.

The restoration project accomplished all milestones by integrating green remediation technologies into project planning and incorporating regulatory stakeholders into the management system. This resulted in increased cooperation, streamlined regulatory reviews, shortened milestone timelines and saved more than \$5 million over traditional hazardous waste disposal-based remediation. This also ensured the restoration is fully compliant with environmental regulations and responds to every aspect of environmental stewardship and sustainability beyond the immediate remediation.

Innovative Technology Demonstration/Validation and Implementation

The Camp Withycombe range restoration project demonstrated readily available processing equipment from the gravel and rock mining, pulp and paper, and water treatment industries can be repurposed and engineered into a green remediation system capable of reducing the toxicity of lead-impacted soil sufficiently to render it non-hazardous. The approach is scalable to address varying project sizes and easily modified to address site-specific soil conditions and cleanup levels. As with this project, soil sampling and on-site testing can be used to track the percentage of contaminant reduction and validate the effectiveness of the soil treatment system so process adjustments can be made.



The gravity separation process shown here utilized recovered gold-placer mining equipment to remove the bullets.

The ORARNG Restoration Manager is actively transferring this knowledge through technical presentations at the 2008 and 2009 ARNG National Workshops, the Society of American Military Engineers, the ODOT 2009 Environmental Conference, the Northwest Environmental Business Council and the Portland State University Urban Ecology Research Consortium. He is also consulting with the Arizona ARNG and ODOT to modify these technologies for their projects. The manager also provided the Fort Lewis Department of Public Works with the Camp Withycombe range project ecological risk assessment details for evaluating risk associated with particulate lead in bullets, including the technical approach, relevant journal articles and supporting U.S. Environmental Protection Agency documents.



Partnerships Addressing Environmental Restoration Issues Between DoD and Other Entities

From the beginning, the ORARNG began engaging with the Oregon DEQ, ODOT, local government, the National Guard Bureau, the ORARNG tenants and the affected community to conduct advanced project planning, scoping and outreach.

The Restoration Manager provided regular updates to internal stakeholders, working closely with the garrison commander and updating him daily or weekly, as needed, regarding the restoration's progress. Weekly updates were also provided to the Environmental Program Manager, Funds Manager/U.S. Property and Fiscal Officer, Real Property Manager/Planner, Director of Installations and the ORARNG Adjutant General. Even now, personnel in the chain of command and the Army Compliance-Related Cleanup program are routinely updated on the long-term monitoring phase.



The success of this restoration project built further equity for the ORARNG with state environmental agencies and community stakeholders. By supporting the ODOT highway project, coordinating with the DEQ and restoring this land to a natural state, the ORARNG cemented its reputation as a responsible steward of the land, a reputation which will support future training developments, conservation efforts and restoration projects. As just one example of outside acknowledgment, the project's sustainability

and stewardship success received national recognition by a speech delivered on the floor of Congress by U.S. Representative Earl Blumenauer on 10 June 2008.

Restoration Advisory Boards (RAB)

Although a formal RAB was not needed for this project, the extensive engagement with all stakeholders provided the same benefits. There was a Freeway Corridor Committee consisting of ODOT, Oregon DEQ, ORARNG personnel, local businesses and public representatives. The ORARNG and restoration staff provided regular updates to this group and distributed press releases for public information. Internal and external ORARNG project meetings and one open house were conducted to discuss breadth of lead impacts, future beneficial uses, appropriate cleanup levels and benefits of green remediation technologies. Encouraging open dialogue between stakeholders resulted in the identification of critical paths/schedules, focused and accelerated project studies, reduced regulatory review times and cost savings. The Corrective Action Program and ROD, for example, were achieved in only 30 days. As another example, open dialogue with internal stakeholders identified the future beneficial use of treated soil as structural fill in the Armed Forces Reserve Center Military Construction project, resulting in savings of \$378,400.



ORARNG Restoration Program and Public Affairs office staff hosted a public outreach event to demonstrate the soil treatment system. The event



ORARNG Restoration Manager Jim Arnold was interviewed by the local NBC affiliate during a media event.

resulted in live radio and television broadcasts and a special environmental feature on the local NBC affiliate's 24-hour news channel. Such open engagement demonstrates transparency and reinforces the ORARNG's reputation as an excellent environmental steward.

Opportunities for Small and Small Disadvantaged Businesses in Environmental Restoration

In an effort to increase opportunities for small and small disadvantaged businesses, ORARNG selected a technical partner for the project which has an active Small Business Contracting Plan and Small Business Program Policy. These programs and policies actively sought, identified and included small businesses in the Camp Withycombe range restoration project. As a result, 22 percent of the work on the project was performed by eight small businesses, accounting for \$1.54 million. Of the dozen people working on site for the duration of the project, five of those workers were small business contractors. These businesses performed earthwork, trucking, laboratory testing and the reforestation of the post-target impact areas at the conclusion of the remedial action phase.

Reducing Risk to Human Health and the Environment

Results from human and ecological risk assessments were used to develop site-specific cleanup levels. The soil treatment system was designed to reduce lead concentrations below 400 milligrams per kilogram (mg/kg) for reuse in public areas or below 800 mg/kg for reuse as construction backfill on the Camp Withycombe post. Removing soil with lead concentrations greater than 400 mg/kg from the former ranges eliminated human and ecological risks.



The project team employed various methods to reduce risk:

- Quiet pack generators reduced the noise from the soil treatment plant.
- Soil piles were kept damp by spray trucks and kept covered, and transport roads were sprayed with water to minimize dust.
- Low-sulfur fuels minimized atmospheric pollutants from heavy equipment.
- The use of passive energy technology, such as chemical stabilization for “finishing steps,” minimized soil and habitat disturbance.
- Hydroseeding with native grass species, applying biodegradable geotextile materials and irrigating with water recycled from the soil treatment system facilitated erosion control.
- Risk to the environment was reduced by avoiding transporting 30,000 tons of contaminated soil 120 miles through a National Scenic Area to a hazardous waste landfill.

Green Remediation

ORARNG implemented a strategy to integrate Army sustainability initiatives as a foundational component of the project. The goals included fostering a sustainability ethic, strengthening Army operations, meeting mission requirements, minimizing impacts and total ownership costs, driving innovation, enhancing well-being and facilitating



Mulch was applied to cleared lands to encourage revegetation.

the transferability of technology. The planning, development and execution of each project phase were compared to these goals to ensure their integration and implementation. Early communication with the project stakeholders fostered a collaborative effort which built a sense of ownership and equity in the project, allowing for leveraging of partnerships in later project phases and successful implementation of the sustainability goals.

Green remediation technologies implemented on this project set it apart from other traditional cleanup actions and saved more than \$5 million. Cost-saving efforts (as well as recycling revenue) made these funds available for Soldier readiness and training. Beyond that direct mission benefit, the Camp Withycombe project demonstrates green remediation technologies are effective, transferable and readily implemented. In addition, the project demonstrates Army leadership in environmental stewardship and sustainability.

The ORARNG successfully applied and integrated green remediation technologies to the project objectives, as shown in the table at right.



Habitat reconstruction began during the restoration phase. Hydroseeding with native grass species, applying biodegradable geotextile materials, and irrigating with water recycled from the soil treatment system facilitated erosion control and laid the groundwork for this area's future use as hiking and biking trails.

Project Objectives	Green Remediation
Removal of soil containing bullets and lead presenting a risk	<ul style="list-style-type: none"> Approximately 30,000 tons of contaminated soil were excavated and remediated on site, eliminating the need for trucking and disposal as a hazardous waste at a cost savings of more than \$5 million. Soil sampling and on-site testing validated reduction in contaminants and allowed staff to immediately adjust the soil treatment system.
Demolition of buildings/concrete walls	<ul style="list-style-type: none"> More than 62 tons of scrap steel was recycled from the demolition of former range structures. All concrete was trucked to a concrete recycling facility near Camp Withycombe.
Clearing/grubbing of range areas (approximately 12 acres)	<ul style="list-style-type: none"> Trees removed from the project area were donated to the Oregon Department of Fish and Wildlife for a salmon bearing stream restoration project and to the Clackamas County School District for an outdoor education program.
On-site soil treatment and lead removal	<ul style="list-style-type: none"> The soil treatment process made the former range soil reusable, thereby avoiding the disposal of contaminated soil in a hazardous waste landfill. More than 1,480 truck trips through the Columbia River Gorge National Scenic Area to the landfill were eliminated, preventing 355,200 miles traveled and consumption of 83,000 gallons of diesel fuel, at a cost avoidance of approximately \$415,000. Particulate and greenhouse gas emissions were eliminated including 914 pounds of particulate matter, 1,859,200 pounds of carbon dioxide (CO₂), 141,605 pounds of carbon monoxide (CO), 36,543 pounds of nitrous oxide (N₂O) and 1,672 pounds of sulphur oxide (SO_x).
Dry particle separation, wet gravity separation, and stabilization	<ul style="list-style-type: none"> Combining soil treatment processes was an innovative approach, because the three processes are not commonly combined. Transferable and scalable, the ORARNG is actively briefing public and private sectors.
Recycling of lead bullets	<ul style="list-style-type: none"> Approximately 300 tons of bullets were recovered for recycling. Bullets were collected in reused, one-ton capacity sugar sacks.
Reuse of treated soil as construction fill	<ul style="list-style-type: none"> Remediation of 4,400 tons of soil for reuse as structural fill at a new Armed Forces Reserve Center project saved an estimated \$150,000.
Reuse of treated soil for regrading of excavation areas on affected Mount Talbert hill slope	<ul style="list-style-type: none"> Treatment of 6,700 tons of soil and other material to levels suitable for use in the reforestation phase resulted in savings of approximately \$228,400 for purchased fill and reduction of 335 truck trips for fill transport.
Planting of native vegetation and restoration of wetlands	<ul style="list-style-type: none"> Elimination of invasive species laid groundwork for habitat reconstruction. Reuse of more than 100 trees created native habitat during natural resources restoration. More than 60,000 gallons of system process water was treated and reused for irrigation and hydroseed application.

CONCLUSION

The ORARNG’s environmental restoration of the former SAFR at Camp Withycombe serves as an excellent example of innovative thinking, comprehensive planning, green remediation solutions and successful partnering with its stakeholders, to include regulatory agencies, ODOT, installation personnel and the community of Clackamas, Ore. The ORARNG restoration focused on the 12-acre post-target impact area and successfully remediated approximately 99.6 percent of the 30,000 tons of contaminated soil, at

a cost avoidance of more than \$5 million and well in advance of ODOT timelines. With measurable results, the Camp Withycombe project demonstrates sustainability can be integrated into remediation projects. The innovative solutions applied to this project are scalable and easily modified to address site-specific soil conditions and cleanup levels at other locations. The ORARNG is sharing this knowledge so that others can adapt and use these technologies – a further demonstration of its environmental stewardship.

“The ORARNG environmental restoration program is an excellent example of a cleanup that considered green technologies for virtually every aspect of the project to conserve and protect environmental resources.”

- Dennis Druck, U.S. Army Center for Health Promotion and Preventive Medicine



Nearly 300 tons of bullets were reclaimed for recycling and collected in reused, one-ton capacity sugar sacks.