Chapter 3.1

Soils

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3.1 SOILS

3.1.1 INTRODUCTION

3.1.1.1 Overview

Soil is the unconsolidated mineral or organic material on the top layer of the Earth that serves as a natural medium for the growth of plants. Together with climate, soils largely determine the type of plants that can grow in an area. Proposed activities that could directly affect soils are limited to the land area of Naval Weapons Systems Training Facility (NWSTF) Boardman. Soils in areas adjacent to NWSTF Boardman could be indirectly affected by wind-transported soils. Therefore, the study area for soils includes NWSTF Boardman and adjacent areas that could be affected by wind-transported soils. The Boardman Northeast Military Operations Area proposed under Alternatives 1 and 2 would have no impact on soils because activities would be limited to aircraft overflights. Therefore, soils in this area are not discussed further. In addition to addressing soils, this section includes brief descriptions of geology and topography. Potential impacts on geology and topography would be negligible, and do not warrant detailed analysis. Nonetheless, general descriptive information is provided to support the overall description of the affected environment and the impact analysis for other resources.

3.1.1.2 Regulatory Framework and Navy Policy

3.1.1.2.1 Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) (42 United States Code [U.S.C.] §6901, et seq.) gives the United States Environmental Protection Agency (U.S. EPA) the authority to control hazardous waste from the "cradle-to-grave." This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also sets forth a framework for the management of non-hazardous solid wastes. The 1986 amendments to RCRA enabled the U.S. EPA to address environmental problems that could result from underground tanks storing petroleum and other hazardous substances.

3.1.1.2.2 Farmland Protection Policy Act

The Farmland Protection Policy Act (7 U.S.C. §4201, et seq.) is intended to minimize the impact federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. It assures that, to the extent possible, federal programs are administered to be compatible with state, local units of government, and private programs and policies to protect farmland. Projects are subject to Farmland Protection Policy Act requirements if they may irreversibly convert farmland (directly or indirectly) to nonagricultural use and are completed by a federal agency or with assistance from a federal agency (Natural Resources Conservation Service 2012).

For the purpose of the Farmland Protection Policy Act, farmland includes prime farmland, unique farmland, and land of statewide or local importance, which are defined based on soils. Farmland subject to Farmland Protection Policy Act requirements does not have to be currently used for cropland. It can be forest land, pastureland, cropland, or other land, but not water or urban built-up land (Natural Resources Conservation Service 2012).

Navy safety policies preclude the use of NWSTF Boardman for agricultural use; however, some of the soils on NWSTF Boardman are classified as prime farmland or farmland of statewide significance. Potential impacts to these soils are analyzed in this section in accordance with the Farmland Protection Policy Act.

3.1.1.2.3 Range Sustainability Environmental Program Assessment

A critical aspect in ensuring the long-term sustainability of military ranges is to understand the environmental conditions at each range and to conscientiously manage these resources in an environmentally sound manner. The Range Sustainability Environmental Program Assessment (RSEPA) process is the Navy's approach for assessing and addressing the environmental condition of land-based operational ranges where munitions are used or were used, excluding small arms ranges, within the United States and its territories. Range Sustainability Environmental Program Assessment complies with the environmental requirements of the U.S. Department of Defense (DoD) Directive 4715.11 *Environmental and Explosives Safety Management on Operational Ranges within the United States* and DoD Instruction 4715.14 *Operational Range Assessments*, which serves the following purposes:

- Determining whether there has been a release or substantial threat of a release of munitions constituents of potential concern from an operational range to an off-range area.
- Determining whether the release or substantial threat of a release of munitions constituents of potential concern from an operational range to an off-range area poses an unacceptable risk to human health or the environment.
- Enhancing the Navy's ability to prevent or respond to a release or substantial threat of a release of munitions constituents of potential concern from operational ranges or range complexes to off-range areas that could pose unacceptable risks to human health or the environment.
- Using data quality objectives and conceptual site models to develop sampling strategies, where necessary to fill data gaps and provide necessary information to confirm whether source-receptor interactions exist and whether or not unacceptable risks to human health or the environment exist.

Requirements, procedures, and protective measures necessary for implementing range assessments under RSEPA are provided in the Navy's RSEPA policy implementation manual (U.S. Department of the Navy 2006a). The process includes:

- **Range Condition Assessments** – The goal of the Range Condition Assessment (RCA) is to determine if further steps are necessary to maintain compliance and whether further analysis is required to assess risks of off-range releases of munitions constituents of potential concern beyond the range boundary. Range Condition Assessments are required every 5 years at each range regardless of whether a Comprehensive Range Evaluation (CRE) is conducted. This re-evaluation also is required whenever significant changes (e.g., changes in range operations, site conditions, applicable statutes, regulations, DoD issuances, or other policies) occur that affect determinations made during the previous assessment.
- **Comprehensive Range Evaluations** – A CRE will be conducted if necessary to assess the potential for the off-range release of munitions constituents of potential concern. The CRE includes two phases and two decision points. Protective measures may be implemented during either phase, if appropriate. If a CRE is performed, sampling and testing of appropriate environmental media will be conducted.
- **Sustainable Range Oversight** – The purpose of the Sustainable Range Oversight is to ensure range sustainability while addressing off-range releases of munitions constituents of potential concern through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. A Sustainable Range Oversight includes implementation of the CERCLA process to address confirmed off-range releases while implementing on-range protective measures to address munitions constituent migration.

3.1.1.2.4 Operational Range Clearance

Chief of Naval Operations Instruction 3571.4 *Operational Range Clearance Policy for Navy Ranges* establishes the policy and requirements for performing operational range clearance on Navy ranges in accordance with DoD Directive 4715.11. The purpose of the Operational Range Clearance Plan is to ensure the safety of aircrews, range operations, and maintenance personnel, range clearance personnel, and the public. The *NWSTF Boardman Operational Range Clearance Plan* was completed in July 2010 and is designated as Naval Air Station Whidbey Island Instruction 8027.3 (U.S. Department of the Navy 2010). The plan is updated every five years or sooner if training operations, operational tempo, or range characteristics change significantly. Clearance activities are accomplished to meet range-specific needs based on the following range clearance categories specified in Chief of Naval Operations Instruction 3571.4:

- **Laser Training Events** – All reflective surfaces (specular hazards) that are not specifically approved for use in the exercise, such as mirrors, bottles, windows, shiny metal, or other surfaces that have a high coefficient of specular reflection or the potential to adversely affect training, must be removed from laser ranges/targets to an appropriate distance at an appropriate frequency to ensure laser training events are not adversely affected.
- **Target Fidelity** – To ensure all targets resemble the objective of the mission and are distinguishable from their surroundings, all material potentially presenting an explosive hazard located on the surface and partially buried that are greater than 4 inches (in.) (10.2 centimeters [cm]) in any dimension, must be removed to an appropriate distance from the target and at an appropriate frequency. In addition, any significant unevenness of the ground surface (e.g., craters, holes, ruts, etc.) around each target must be removed.
- **Maintenance Personnel Safety** – To ensure the safety of maintenance personnel, operational range clearance requirements must address ingress/egress routes, run-in lines, maintenance roads, and sufficient area around each target to afford safe movement and operation of personnel and equipment. From these areas, all material potentially presenting an explosive hazard located on the surface or partially buried that is greater than 4 in. (10.2 cm) in any dimension must be removed to an appropriate distance at appropriate frequencies. Target areas affected by intrusive activity may be cleared to 1 foot (ft.) (0.3 meter [m]) below the anticipated intrusive depth.
- **Long-Term Range Sustainment** – Effective, efficient, and environmentally compliant management of ranges are key to ensuring range capabilities are available to meet current and future requirements. As such, operational range clearance requirements must address areas that may not be routinely accessed. Areas that support various range management activities as well as areas that pose a potential concern to human health or the environment shall undergo clearance activities. For these areas, all material potentially presenting an explosive hazard greater than 4 in. (10.2 cm) in any dimension located on the surface or partially buried must be removed at appropriate frequencies. Prescribed areas should be cleared until a density of less than or equal to 5 intact items per acre is encountered.

3.1.1.3 Determination of Significance

The impact analysis for soils considered possible changes in the physical and chemical characteristics of soils that could result from the Proposed Action. Such changes could arise from ground disturbing activities (e.g., construction and equipment use), incidental spills, or use of military munitions. Specific impacts might include soil erosion from wind or water, soil compaction, and soil contamination. Factors used in the determining whether impacts to soils would be significant relate to the extent to which their

physical or chemical characteristics are changed, other than in localized areas, such that (1) soils could no longer support important ecological functions (e.g., supporting native plant communities, providing burrowing habitat for wildlife, etc.) or (2) soils were contaminated to the extent that they would be considered a source of contamination that represents a substantial threat of a release to an off-range area that poses unacceptable risk to human health or the environment.

3.1.2 AFFECTED ENVIRONMENT

3.1.2.1 Geology and Topography

The landform of NWSTF Boardman has been directly shaped by the Bretz floods of 12,000 years ago, plus the consequential development of a series of prehistoric lakes collectively called Lake Condon. The northern two-thirds of the facility gently rises in broad, flat alluvial terraces from approximately 400 ft. (122 m) at the northern boundary to about 700 ft. (213 m) (Figure 3.1-1). It largely represents an area scoured by the last Bretz floods that deposited in its wake sandy and gravelly alluvium. Most of the soil in this area is dominated by glaciofluvial sands deposited by the Bretz floods. In places, the sand forms extensive dune systems (U.S. Department of the Navy 2012).

The southern one-third of the facility is much hillier and ranges in elevation from 700 to 950 ft. (213 to 290 m); this is a buildup of lacustrine silt deposits from the old Lake Condon. The 150 ft. (46 m) deep Juniper Canyon is a prominent feature here, with slopes to 20 percent, although the upper reaches of Well Springs and Sixmile canyons also provide distinct topographical relief (U.S. Department of the Navy 2012).

The entire facility is underlain by Columbia River basalt deposited during the Miocene epoch to maximum depths of 4,000 ft. (1,219 m). These deposits are overlain by lacustrine silts deposited to depths of 1,000 ft. (305 m) during the Bretz floods and Lake Condon formation. Lacustrine deposits nearest the Columbia River were eventually washed away during sporadic flood events leaving behind sandy alluvium. This sandy material was eventually reworked by prevailing winds and redeposited over some of the lacustrine deposits farther south of the Columbia River, including the northern half of the facility. The southern half of the facility is also covered with loess re-deposits, mostly silty loams. Consequently, all surface soils on the facility are wind deposits with very high wind erosion potential (U.S. Department of the Navy 2012).

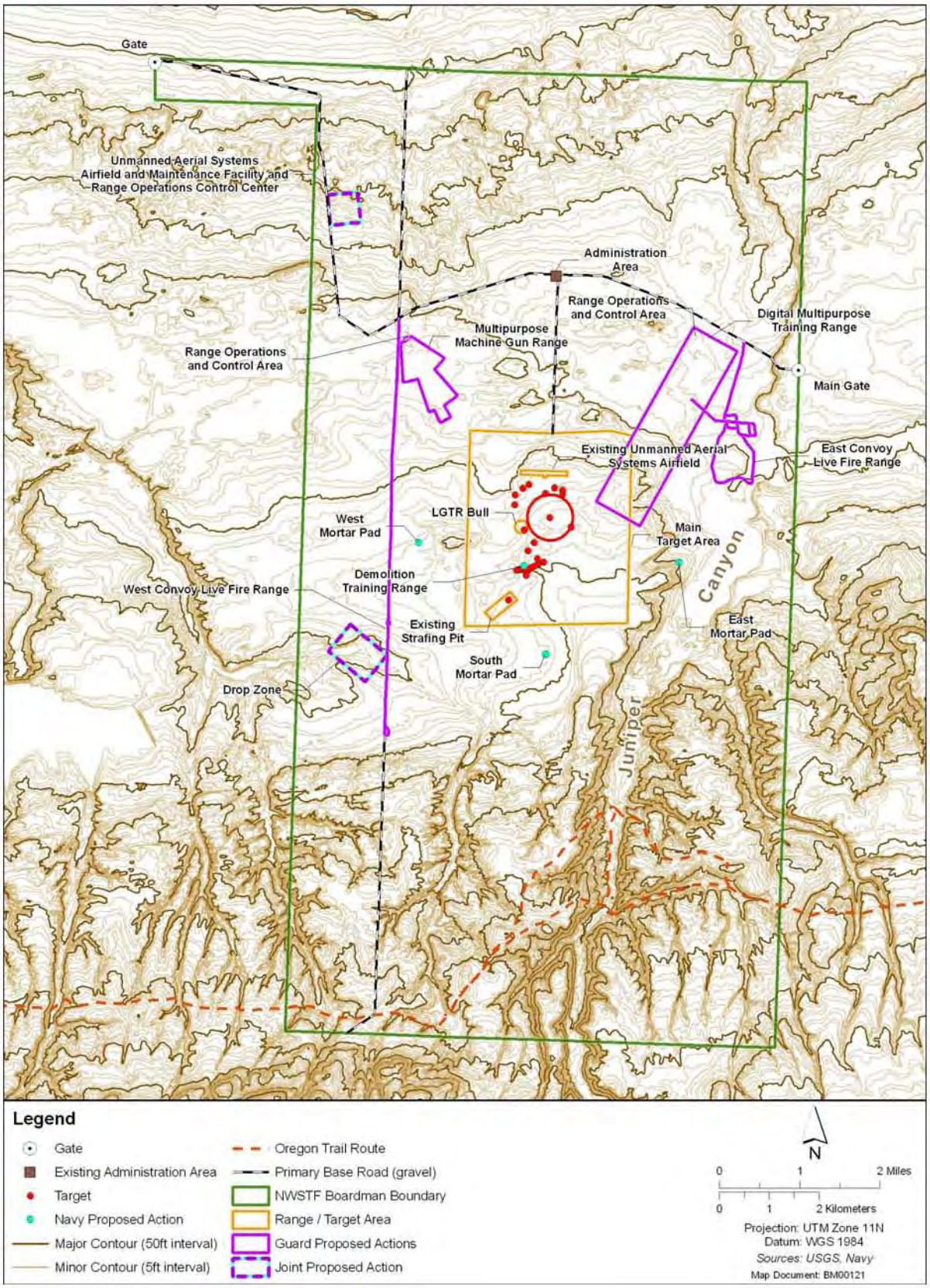

Figure 3.1-1: Topography at NWSTF Boardman

3.1.2.2 Soils

3.1.2.2.1 Soil Descriptions

Three major soil associations occur on the facility as shown in Figure 3.1-2: Quincy-Koehler, Sagehill-Taunton, and Warden (U.S. Department of Agriculture 1983). These major associations are represented by 34 soil mapping units, some of which are classified as prime farmland or farmland of statewide importance (Table 3.1-1 and Figure 3.1-3). The Quincy-Koehler association consists of soils on alluvial sand over alluvial gravel deposits on gently sloping terraces. On NWSTF Boardman, the association includes about 55 percent Quincy soil, 35 percent Koehler, and a combined 10 percent for Burbank, Hezel, Quinton, and Royal. These deep, loamy fine sand soils dominate the northern half of the facility.

Moving southward on the facility, the Quincy-Koehler association is replaced by the more sandy loam Sagehill-Taunton association. Soils in this association were formed on loess over lacustrine or a hardpan, and dominate the terrace front of the facility south end. Major soils include Sagehill (65 percent), Royal (20 percent), Taunton (10 percent), and Ellum (5 percent). These soils are very deep with a sandy loam or fine sandy loam surface.

The southern one-quarter of the facility is almost entirely Warden soils (90 percent). This is a very deep, well-drained soil with a silty loam surface. Warden soils developed in loess over lacustrine silt and form the terrace tops above Juniper Canyon and other canyons of the south end. Lesser (less than 10 percent) represented soils include Lickskillet and Xeric Torriorthents. Lickskillet soils are shallow stony soils composed of loess and basalt residuals. These soils are found on west and south-facing slopes of Juniper Canyon, and are punctuated with rock outcroppings. Xeric soils are deep wind and water lain accumulates in dry canyon bottoms. Because of high summer temperatures and excessive draining, these soils are unusually dry.

In some locations, wind and water processes have dramatically altered the surface layers of native soils presenting a much different appearance. These include areas where wind-borne sand has accumulated into dunes devoid of vegetation. Dunes are largely found on the north end of NWSTF Boardman and in the middle of Juniper Canyon. “Alkaline” soils, also bare of vegetation, can be found on the south end of NWSTF Boardman. These include areas near Tub Spring where the surface soil has eroded away revealing calcareous lacustrine silt under layers high in sodium and calcium. More classic alkaline soil is found at Well Springs where excessive evaporating of rain and spring water has allowed the accumulation of salts, especially sodium, on the surface horizon.

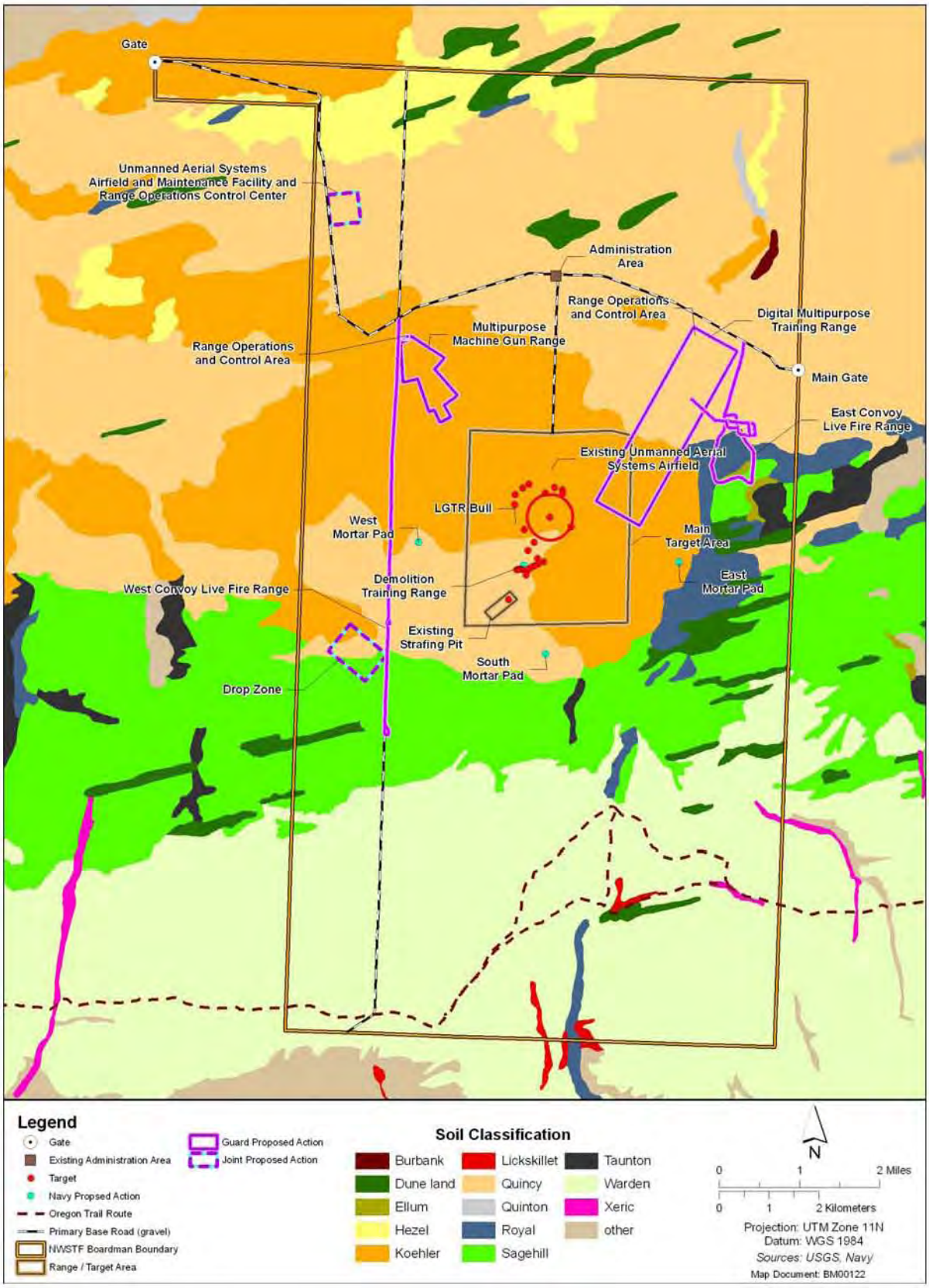

Figure 3.1-2: Soils at NWSTF Boardman

Table 3.1-1: Soil Map Units, Soil pH, and Farmland Classification of Soils at NWSTF Boardman

Soil Mapping Unit	pH	Farmland Classification
Burbank loamy fine sand, 2 to 5 percent slopes	7.2	Not prime farmland
Dune land	–	Not prime farmland
Ellum fine sandy loam, 5 to 12 percent slopes	7.6	Farmland of statewide importance
Hezel loamy fine sand, 2 to 5 percent slopes	8.4	Farmland of statewide importance
Hezel loamy fine sand, 5 to 12 percent slopes	8.4	Farmland of statewide importance
Koehler loamy fine sand, 2 to 5 percent slopes	7.9	Not prime farmland
Koehler loamy fine sand, 5 to 12 percent slopes	7.9	Not prime farmland
Lickskillet very stony loam, 7 to 40 percent slopes	6.7	Not prime farmland
Quincy loamy fine sand, 2 to 12 percent slopes	7.3	Not prime farmland
Quinton loamy fine sand, 2 to 5 percent slopes	7.8	Not prime farmland
Royal fine sandy loam, 2 to 5 percent slopes	7.2	Prime farmland if irrigated
Royal fine sandy loam, 5 to 12 percent slopes	7.2	Farmland of statewide importance
Royal loamy fine sand, 2 to 5 percent slopes	7.2	Not prime farmland
Royal silt loam, 0 to 3 percent slopes	7.2	Prime farmland if irrigated
Sagehill fine sandy loam, 2 to 5 percent slopes	7.5	Prime farmland if irrigated
Sagehill fine sandy loam, 5 to 12 percent slopes	7.5	Farmland of statewide importance
Sagehill fine sandy loam, 12 to 20 percent slopes	7.5	Farmland of statewide importance
Sagehill fine sandy loam, hummocky, 2 to 5 percent slopes	7.5	Farmland of statewide importance
Sagehill fine sandy loam, hummocky, 5 to 12 percent slopes	7.5	Farmland of statewide importance
Sagehill fine sandy loam, hummocky, 2 to 5 percent slopes	7.5	Farmland of statewide importance
Taunton fine sandy loam, 2 to 5 percent slopes	6.9	Prime farmland if irrigated
Taunton fine sandy loam, 5 to 12 percent slopes	6.9	Farmland of statewide importance
Warden very fine sandy loam, 2 to 5 percent slopes	7.2	Prime farmland if irrigated
Warden very fine sandy loam, 5 to 12 percent slopes	7.2	Farmland of statewide importance
Warden very fine sandy loam, 12 to 20 percent slopes	7.2	Farmland of statewide importance
Warden silt loam, 0 to 2 percent slopes	7.2	Prime farmland if irrigated
Warden silt loam, 2 to 5 percent slopes	7.2	Prime farmland if irrigated
Warden silt loam, 5 to 12 percent slopes	7.2	Farmland of statewide importance
Warden silt loam, 12 to 20 percent slopes	7.2	Farmland of statewide importance
Warden silt loam, 20 to 40 percent slopes	7.2	Farmland of statewide importance
Warden silt loam, 3 to 12 percent slopes, Eroded	7.2	Farmland of statewide importance
Warden silt loam, 12 to 20 percent slopes, eroded	7.2	Farmland of statewide importance
Xeric Torriorthents, nearly level	7.0	Farmland of statewide importance

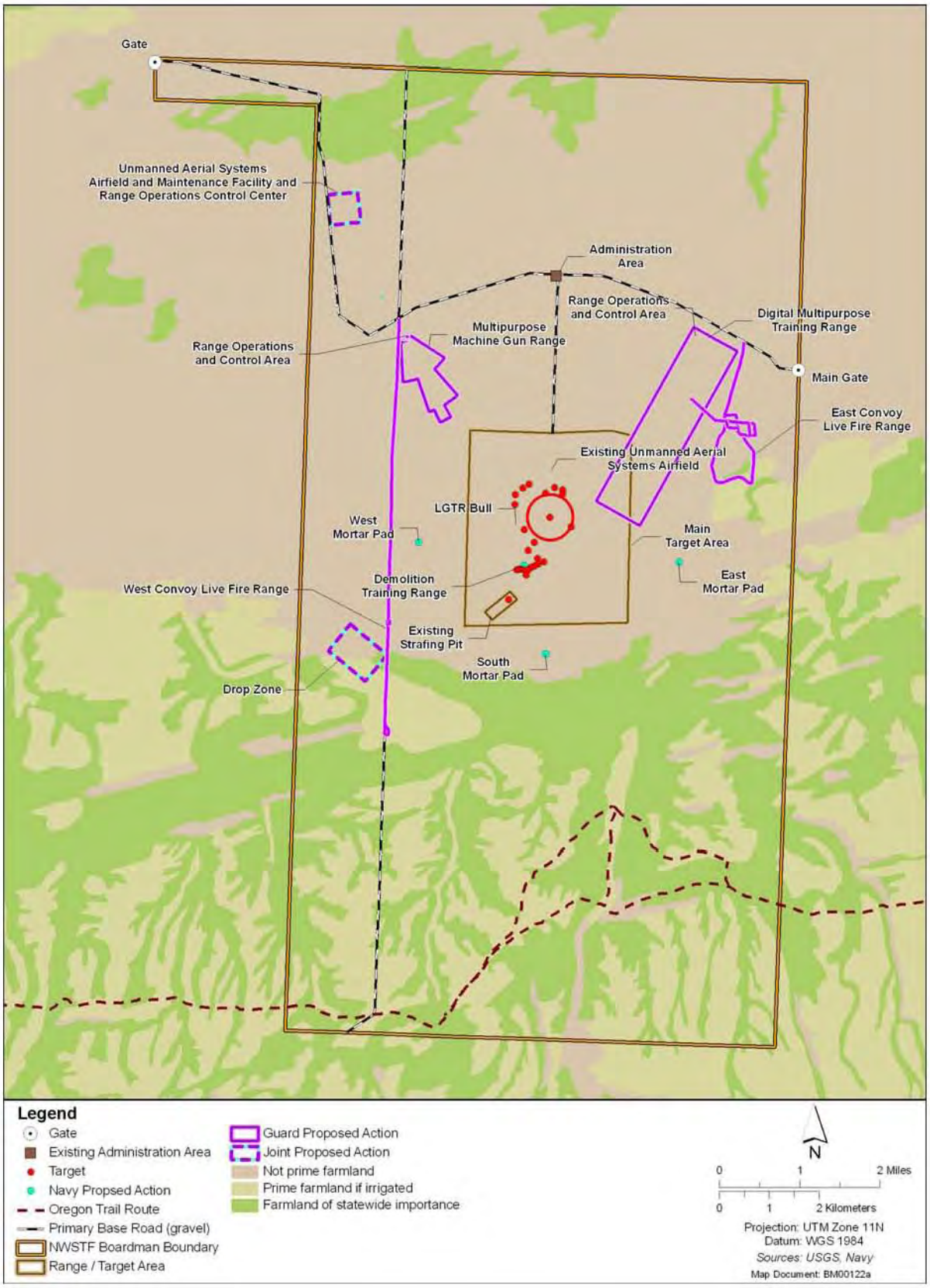

Figure 3.1-3: Prime Farmland Designations at NWSTF Boardman

3.1.2.2.2 Existing Soil Contamination

The potential for contamination of soils exists from historic use of NWSTF Boardman for military training and facility maintenance and support activities. Range Sustainability Environmental Program Assessment projects conducted at NWSTF Boardman identified areas where soil contamination might exist (Figure 3.1-4) (U.S. Department of the Navy 2004, 2006b, 2011a, 2011b).

During the 2005 Comprehensive Range Evaluation Phase I Field Investigation (U.S. Department of the Navy 2006b), a total of 15 soil samples were collected from three areas (Army Open Burn/Open Detonation Area, Demolition Crater Area, and West Bomb Crater Field) and analyzed for perchlorate, explosives, and nitrate-nitrite. Soil sampling results were compared to RSEPA target analyte screening values, which were based on U.S. Environmental Protection Agency Region 9 preliminary remediation goal tables, in accordance with RSEPA policy (U.S. Department of the Navy 2006a,b). Four surface soil samples from a single area, the Army Open Burn/Open Detonation Area, yielded detections of target compounds. The detections included octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) in four samples ranging from 0.068 to 1.40 milligram per kilogram (mg/kg). The residential soil screening level for HMX is 3,100 mg/kg and the industrial soil screening level is 31,000 mg/kg. All HMX detections were well below RSEPA residential soil screening levels. The compound 2,4,6-trinitrotoluene (TNT) was detected in two samples at 0.11 and 0.35 mg/kg, both below the RSEPA residential soil screening level of 16 mg/kg. Only Research Department Explosive (RDX) was detected at levels above the RSEPA screening levels, at 6 mg/kg in one sample and 18 mg/kg in another sample. The RDX screening levels for residential and industrial soil are 4 and 16 mg/kg, respectively. The detections that exceed the screening values are from the Army Open Burn/Open Detonation Area only. This area is interior to the site and does not have a direct soil transport pathway off-range (U.S. Department of the Navy 2006b).

In 2010, additional surface soil samples collected from the following locations were evaluated for perchlorate, explosives, and nitrate-nitrite (Figure 3.1-4) (U.S. Department of the Navy 2011b):

- A former range munitions and scrap consolidation area.
- A potential fuse demolition area, where visual evidence suggested past use of this area for open detonation of munitions, including fuse components.
- An area west of the current administrative compound that exhibited visual evidence consistent with past undocumented use of this area for open detonation of munitions (i.e., detonation craters and fragments of munitions items).
- The former North Target Area.

The analytical results are summarized in the following bullets (U.S. Department of the Navy 2011b):

- Perchlorate was not detected in surface soil at any of the locations.
- The RDX compounds hexahydro-1,3,5-trinitro-1,3,5-triazine and/or tetryl were detected in two soil samples. RDX was detected at a concentration of 0.041 mg/kg, which is well below the residential screening level of 5.5 mg/kg and the industrial screening level of 24 mg/kg. Tetryl was detected at concentrations of 1.40 mg/kg and 0.41 mg/kg, which are well below the residential screening level of 240 mg/kg and the industrial screening level of 2,500 mg/kg. The screening levels used in the 2010 evaluation were updated based on the May 2010 U.S. Environmental Protection Agency regional screening level table (U.S. Department of the Navy 2011b).

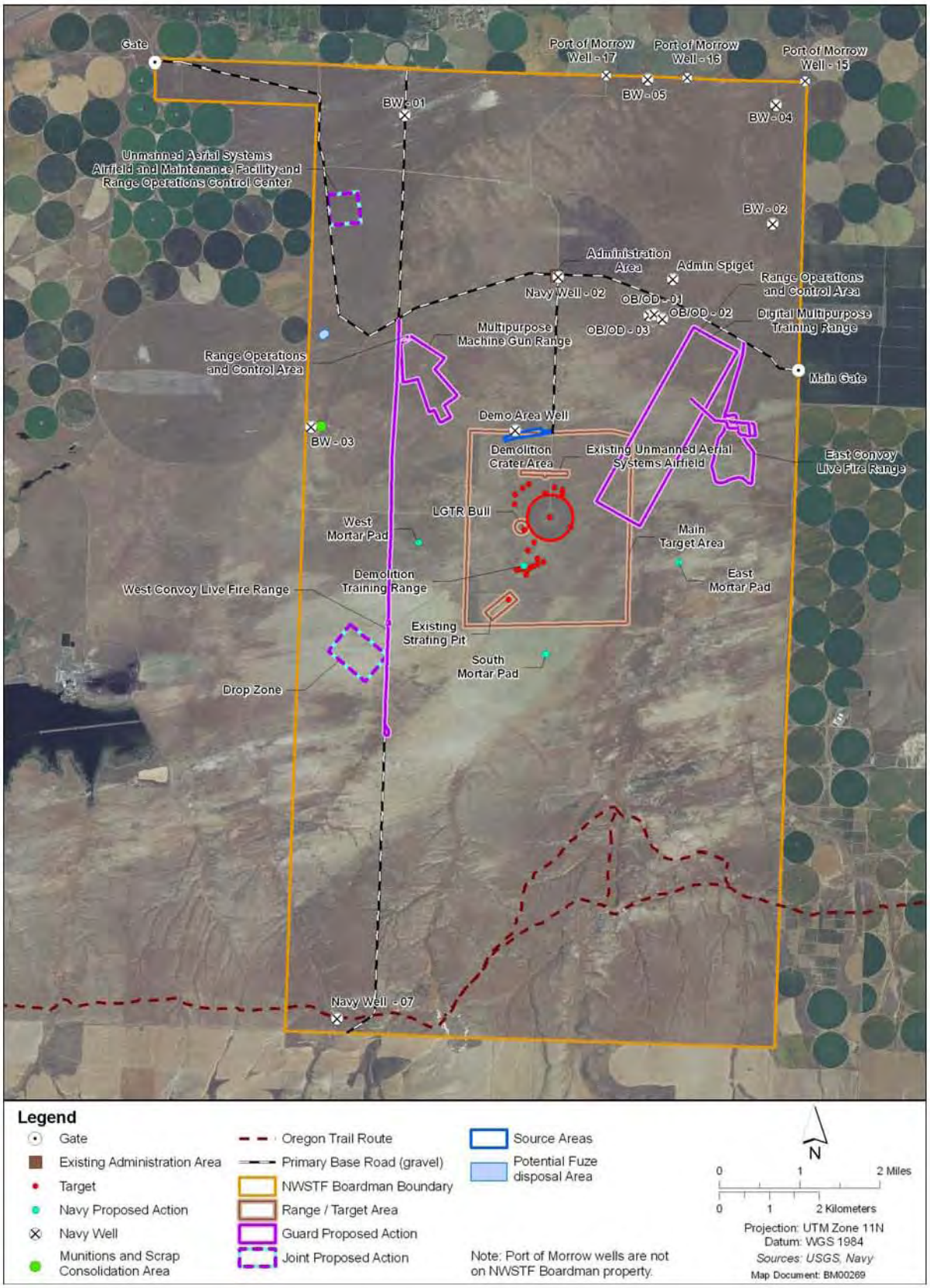

Figure 3.1-4: Range Condition Assessment Study Areas at NWSTF Boardman

- Nitrate-nitrite was detected at all four locations. Concentrations ranged from 2.8 mg/kg to 10.7 mg/kg, which are well below the screening levels for nitrate (130,000 mg/kg) and nitrite (7,800 mg/kg).

The Range Condition Assessments and Comprehensive Range Evaluations concluded that there is no potential for off-range releases at NWSTF Boardman at concentrations which exceed the RSEPA screening levels and that no additional soil sampling is necessary (U.S. Department of the Navy 2011a, 2011b). A five-year review of the Range Condition Assessment for NWSTF Boardman is scheduled in 2015-2016.

Metals are not typically evaluated as constituents of concern in the RSEPA program. Therefore, metal concentrations were not measured in soil samples during RSEPA analyses conducted at NWSTF Boardman. Metals were analyzed in soils collected in June 2004 during a preliminary assessment/site Investigation administered by the U.S. Environmental Protection Agency for the Boardman Air Force Range Formerly Used Defense Site (59,000 ac [23,877 ha] bordering NWSTF Boardman directly to the west). No metals were reported that significantly exceeded background concentrations (U.S. Department of the Navy 2006b).

In 2011, the U.S. Army Institute of Public Health conducted a Preconstruction Assessment for proposed locations of new ranges at NWSTF Boardman on behalf of the Oregon National Guard (ORNG) (U.S. Army Public Health Command 2011). This assessment was performed to collect information regarding the history and environmental condition of the proposed range locations and to develop an understanding of past site activities and disposal practices that might have resulted in contamination. The Preconstruction Assessment did not identify constraints associated with past site activities and disposal practices, with the exception of previously identified concerns associated with possible unexploded ordnance, which will be addressed during range design and construction.

3.1.2.3 Current Requirements and Management Practices

Following is a summary of current requirements and practices applicable to soils at NWSTF Boardman.

- Soils are managed from a natural resources perspective under the *Naval Weapons Systems Training Facility Boardman Integrated Natural Resources Management Plan* (U.S. Department of the Navy 2012). Actions focus on minimizing mechanical disturbance, restoration of native habitats to minimize soil erosion, and stabilizing soils following a wildfire to the extent practicable.
- Incidental spills that could contaminate soils are avoided and minimized through the *Hazardous Waste Management Plan* (U.S. Department of the Navy 2009). Navy personnel at NWSTF Boardman receive initial and periodic refresher training in the proper storage, handling, and management of hazardous materials.
- Incidental spills from ORNG activities are addressed in Oregon Army National Guard Regulation 420-47, *Hazardous Material, Waste, and Spill Management Plan*.
- Potential soil contamination is addressed in the Range Condition Assessment and subsequent five-year reviews, in accordance with the *Range Sustainability Environmental Program Assessment Policy Implementation Manual* (U.S. Department of the Navy 2006a).

3.1.3 ENVIRONMENTAL CONSEQUENCES

3.1.3.1 No Action Alternative

3.1.3.1.1 Ground Disturbing Activities

No construction would take place under the No Action Alternative. Ground disturbing activities would continue to include vehicle and equipment operation, non-explosive practice munitions impacts, target maintenance, and fire break maintenance.

Limited ground-based training would continue to take place at NWSTF Boardman under the No Action Alternative. None of this training involves large numbers of vehicles and vehicle use takes place on the road network, which primarily consists of primitive dirt roads. A few gravel roads are periodically maintained. Continued vehicle use on dirt roads would result in soil disturbance and compaction in previously disturbed areas.

The Main Target Area includes the main bull's eye, the strafe pit, the laser-guided training range bull's eye, and several single targets or grouped target sets (e.g., old vehicles, tanks, etc.). The vegetation in and around each of these targets must be maintained or removed for fire safety and to provide a viable visual cue to pilots. This is accomplished by mechanical disturbance (e.g., plowing or disking) with a tractor on an as-needed basis, typically one time per year. Approximately 23 ac. (9.3 ha) in the Main Target Area would be subjected to this maintenance under the No Action Alternative. Fire breaks throughout NWSTF Boardman are also maintained annually by mechanical disturbance (e.g., plowing or disking) with a tractor. Approximately 462 ac. (187 ha) of fire breaks are maintained. A total area of approximately 485 ac. (196 ha) would continue to be maintained by mechanical disturbance under the No Action Alternative. In addition, the existing unmanned aerial system runway is maintained as necessary by grading and compacting the dirt surface. Disturbed soils at NWSTF Boardman are susceptible to wind erosion based on their texture and because winds in excess of 25 miles per hour (40 kilometers per hour) are common from March to July. Water erosion is less of a concern because of the flat terrain and precipitation is only about 9 to 11 in. per year (23 to 28 cm). Disking and compaction of soils also alters the natural soil profile and structure, and makes them less suitable as burrowing habitat for wildlife such as the Washington ground squirrel, badger, and western burrowing owl.

Most non-explosive practice munitions would impact the ground in maintained areas where surface soils have been previously disturbed and would have little additional effect on soils. The Main Target Area and fire breaks have been subjected to similar maintenance and disturbance regimes for years. Therefore, ground disturbing activities under the No Action Alternative would not result in additional impacts on soils. The effects of ground disturbing activities on soils under the No Action Alternative would be long-term and minor in the form of increased potential for soil erosion, compaction, and alteration of natural soil profiles and structure. The direct effects would occur in previously disturbed areas along dirt roads, along firebreaks, and within the Main Target Area. Ground disturbing activities would not result in significant impacts on soils under the No Action Alternative.

3.1.3.1.2 Potential Soil Contamination

Potential sources of soil contamination would not change under the No Action Alternative and include incidental spills of fuel during equipment fueling and military expended materials. The potential for incidental spills that could contaminate soils is low based on the small quality of petroleum, oil, and lubricants used in the administrative area. A 1,000 gallon (3,785 liter) aboveground storage tank with built-in secondary containment is located in the administrative area. It contains diesel for fueling vehicles. Any spill would be contained and immediately responded to. Based on the limited volume of

material currently stored at NWSTF Boardman, a spill prevention, control, and countermeasures plan is not required. However, Navy personnel at NWSTF Boardman receive initial and periodic refresher training in the proper storage, handling, and management of hazardous materials. The limited amounts of hazardous waste generated at NWSTF Boardman are managed in with accordance the *Hazardous Waste Management Plan* (U.S. Department of the Navy 2009).

Military expended materials (e.g., non-explosive practice munitions) would continue to accumulate in soils within the Main Target Area. Non-explosive practice bombs and range scrap would be removed at regular intervals based on the *Operational Range Clearance Plan* (U.S. Department of the Navy 2010). Spent small- and medium-caliber rounds would not be removed at regular intervals, would accumulate in soils over time, and would alter soil composition through the presences of solid particles. Small- and medium-caliber rounds primarily consist of steel or a lead core with a copper jacket. A potential concern is the fate and transport of metals from bullets and bullet fragments accumulating in soil, with lead being the primary constituent of concern because of its toxicity and its ability to persist in the environment (U.S. Army Environmental Center 1998).

Several factors influence the fate and transport of lead on a training range, including soil type, soil pH, annual precipitation rate, and topographic slope (U.S. Environmental Protection Agency 2005). Lead oxidizes when exposed to air and dissolves when exposed to acidic water or soil, but is generally insoluble and immobile under neutral or basic pH conditions (U.S. Environmental Protection Agency 2005). The corrosion products of lead bullets in soil environments consist primarily of hydrocerussite, which is relatively insoluble (Chen and Daroub 2002). However, Dermatas et al. (2004) demonstrated that, in the case of a lead bullet with a copper jacket, the presence of copper increased the solubility of lead significantly, due to a galvanic corrosion reaction. Lead and copper concentrations were highly elevated in surface soils at two small arms ranges on Fort Irwin, California, but quickly decreased as a function of increasing depth from the ground surface. Despite the galvanic corrosion reaction, the mobility of both metals was significantly reduced within the first 10 to 20 in. (25.4 to 50.8 cm) below the surface. The limited mobility was attributed to the alkaline characteristics of the soils (pH 7.48 to 7.65 on one range and 8.03 to 8.30 on the other) and the formation of secondary minerals such as hydrocerussite (Dermatas et al. 2004).

Ideal soil pH for firing ranges is 6.5 to 8.5 because the lead precipitates out of solution and binds to the soil within this pH range (U.S. Environmental Protection Agency 2005). This binding effect prevents the lead from migrating to the subsurface. As shown in Figure 3.1-2, Koehler and Quincy soils are found within and around the Main Target Area. Lead would be expected to have limited mobility in these neutral to slightly alkaline soils (pH 7.3 to 7.9, Table 3.1-1).

Lead mobility would also be limited by the low annual precipitation rate at NWSTF Boardman (9 to 11 in. per year [23 to 28 cm]). Lead would weather slowly under these arid conditions because it would have limited contact with water. Low precipitation coupled with the flat terrain in and around the Main Target Area also makes it unlikely that lead would be transported outside the immediate target area by stormwater runoff (U.S. Environmental Protection Agency 2005).

Lead would be expected to be relatively immobile in soils at NWSTF Boardman based on soil pH, limited annual precipitation, and the flat terrain. Elevated concentrations would likely be limited to surface soils in the immediate area of projectile impact. Effects of contaminants on soils under the No Action Alternative would be long-term, but the effects would be localized. Elevated concentrations of lead in soils would not represent a substantial threat of a release to an off-range area that poses unacceptable

risk to human health or the environment. There would be no significant impacts on soils from possible contamination under the No Action Alternative.

3.1.3.2 Alternative 1

3.1.3.2.1 Ground Disturbing Activities

Construction Activities

Site excavation, grading, and equipment operations during construction of the proposed range enhancements for Alternative 1 would result in temporary disturbances to the ground surface. The area of disturbance for individual construction projects would range from 1 to 40 ac. (0.4 to 16 ha). The total area of disturbance would be about 92 ac. (37.2 ha), 13 ac. (5.3 ha) of which have been previously disturbed (Table 2-5). Koehler and Quincy soils would be the primary soil types affected (Figure 3.1-2). Approximately 79 ac. (32.01 ha) of previously undisturbed soils would be affected, about 50 ac. (20.2 ha) would be permanently converted to development, and about 30 ac. (12.1 ha) would be temporarily disturbed and revegetated. Soils in areas converted to development would permanently lose their ability to support native vegetation. However, the area affected is small relative to the total land area at NWSTF Boardman (about 0.1 percent). Temporarily disturbed areas would be restored in accordance with the proposed *Post-construction Habitat Restoration Plan* (Appendix F). Construction activities for the range enhancements would be spaced over a period of several years as funding becomes available (Table 2-6). Therefore, the area of disturbance at any given time during construction would be much less than the total 92 ac. (37.2 ha).

Portions of the drop zone and eastern Convoy Live Fire Range (CLFR) are the only Alternative 1 proposed range enhancements that would be sited on soils classified as prime farmland or farmland of statewide importance (Figure 3.1-2, Table 3.1-1). No construction or development would be required for the drop zone. Establishing the eastern CLFR would involve placement of gravel on existing dirt roads and establishment of temporary target emplacements. These activities would not irreversibly convert soils that are classified as prime farmland or farmland of statewide importance.

Disturbed soils would be susceptible to erosion. As discussed for the No Action Alternative, wind erosion is more of a concern than water erosion. Best management practices (BMPs) would be implemented during construction to avoid and minimize the potential for wind and water erosion in accordance with the Oregon Department of Environmental Quality *Erosion and Sediment Control Manual* (Oregon Department of Environmental Quality 2005). Implementation of BMPs and the proposed *Post-construction Habitat Restoration Plan* (Appendix F) would effectively minimize erosion over the long term.

Soils in the area of disturbance could also become compacted, which could limit their ability to support plant growth or burrowing habitat for species such as the Washington ground squirrel, badger, and western burrowing owl. Areas temporarily disturbed and restored are also likely to become less suitable burrowing habitat for at least several years following restoration.

Construction activities under Alternative 1 would result in long-term minor effects to soils in the form of erosion, compaction, and alteration of natural soil profiles and structure. The effects would be localized and the area affected would be small relative to the total land area at NWSTF Boardman (about 0.1 percent). There would be no significant impacts on soils from construction activities under Alternative 1.

Training Activities

Training activities that result in ground disturbance would increase under Alternative 1 compared to the No Action Alternative. Soils around targets on the new ranges would be disturbed by non-explosive practice munitions striking the ground and during placement or relocation of targets along the eastern CLFR. Some of the areas affected would coincide with areas temporarily disturbed during construction. Vehicle and equipment use would increase substantially under Alternative 1 during ground-based training events. However, vehicles, including tracked vehicles, would continue to use existing roads or new gravel roads constructed under Alternative 1. No maneuver training off of these roads is proposed. Disturbed areas would be susceptible to erosion. Ground disturbance from training activities under Alternative 1 would result in long-term minor effects to soils in the form of increased potential for erosion, compaction, and alteration of natural soil profiles and structure. The effects would be localized, but more widespread than the No Action Alternative. There would be no significant impacts on soils from training activities under Alternative 1.

Maintenance Activities

Maintenance activities around targets in the Main Target Area under Alternative 1 would be the same as those described for the No Action Alternative. Approximately 23 ac. (9.3 ha) would continue to be maintained by mechanical disturbance. However, as discussed in Section 3.12, Wildfire, the Draft Integrated Wildland Fire Management Plan (Appendix H) includes proposed modifications to the existing system of fire breaks. The width of some fire breaks would be reduced to the width of the adjacent road, some fire breaks that do not follow roads would be eliminated, and some new fire breaks would be created (Figure 3.12-2). The total area of fire breaks that would be maintained annually by mechanical disturbance (plowing or disking with a tractor) would decrease from 462 ac. (187 ha) to 243 ac. (98 ha). A long-term re-vegetation plan (Appendix F) would be implemented to restore the areas removed from mechanical maintenance. These areas would be re-vegetated with native bunchgrasses to provide a low-structure and low-fuel load area next to the road/fire break, and also provide some wildlife habitat value. Selective herbicide treatments or other appropriate management actions would be used to control invasive plants until these areas are completely restored. The proposed modifications to the fire break system would result in long-term benefits to soils at NWSFT Boardman by restoring approximately 219 ac (89 ha) of mechanically disturbed land to native plant communities, which would reduce the potential for soil erosion.

Indirect Effects of Increased Wildfire Risk

As discussed in Section 3.12, Wildfire, the proposed increases in training at NWSTF Boardman could increase the risk of wildfire. Soil erosion could occur indirectly from fire-caused decreases in vegetation cover and biological soil crust. However, the additional fire protection measures and resources that would be put in place under Alternative 1 would mitigate the increased fire risk (see Section 3.12) and avoid or minimize potential indirect effects to soils.

3.1.3.2.2 Potential Soil Contamination

The potential for incidental spills that could contaminate soils would increase under Alternative 1 because additional refueling would be necessary for some of the ORNG ground-vehicles. While ORNG wheeled vehicles would not be refueled at NWSTF Boardman, Abrams tanks and Bradley fighting vehicles would be refueled in the field using Heavy Expanded Mobility Tactical Trucks (i.e., HEMTT or tanker trucks) and portable secondary containment devices. Risk of a spill contaminating soils is considered negligible based on existing standard operating procedures, periodic spill response training, and use of secondary containment during refueling.

Military expended materials (e.g., non-explosive practice munitions) would continue to accumulate in soils within the Main Target Area, as well as on the new ranges. Non-explosive practice bombs and range scrap would be removed at regular intervals based on the *Operational Range Clearance Plan* (U.S. Department of the Navy 2010). Spent small- and medium-caliber rounds would not be removed at regular intervals, would accumulate in soils over time, and would alter soil composition through the presences of solid particles. The fate and transport of lead on firing ranges is a potential concern. However, as discussed for the No Action Alternative, lead would be expected to have limited mobility based on neutral to alkaline soil pH, limited precipitation, and flat terrain at NWSTF Boardman. As shown in Figure 3.1-2, the proposed Multi-Purpose Machine Gun Range (MPMGR) and Digital Multi-Purpose Training Range (DMPTR) would be constructed on Koehler and Quincy soils, with pH values in the range of 7.3 to 7.9 (Table 3.1-1). The eastern CLFR would be sited on Koehler, Quincy, Royal, Ellum, and Sagehill soils, with pH values in the range of 7.2 to 7.9. Lead precipitates out of solution and binds to the soil within these pH ranges, preventing or limiting migration to the subsurface (Dermatas et al. 2004, U.S. Environmental Protection Agency 2005). The flat terrain on the proposed ranges coupled with low precipitation also makes it unlikely that lead would be transported outside the immediate target area by stormwater runoff.

Once the MPMGR, DMPTR, and eastern CLFR are operational, ORNG would conduct assessments in accordance with the Army's Operational Range Assessment Program to fulfill requirements identified in DoD Directive 4715.11 *Environmental and Explosives Safety Management on Operational Ranges Within the United States* and DoD Instruction 4715.14 *Operational Range Assessments*. These assessments would first determine qualitatively if munitions constituents were leaving the operational range footprint and whether pathways existed for human or ecological receptors. A quantitative assessment would be conducted if the qualitative assessment were inconclusive. The assessments would be conducted on a 5-year review cycle, even if the initial qualitative assessment identified no issues. In addition, ORNG would proactively manage the new ranges using applicable strategies outlined in the *Army Small Arms Training Range Environmental Best Management Practices Manual* (U.S. Army Environmental Center 2005).

In summary, lead would be expected to be relatively immobile in soils at NWSTF Boardman based on soil pH, limited annual precipitation, and the flat terrain. Elevated concentrations would likely be limited to surface soils in the immediate area of projectile impact. Effects of contaminants on soils under Alternative 1 would be long-term. The effects would be localized to the range areas, but more widespread than the No Action Alternative. Elevated concentrations of lead in soils would not represent a substantial threat of a release to an off-range area that poses unacceptable risk to human health or the environment. The potential for a release to off-range areas would continue to be assessed every five years under the Army's Operational Range Assessment Program and applicable strategies outlined in the *Army Small Arms Training Range Environmental Best Management Practices Manual* (U.S. Army Environmental Center 2005) would be used to manage the new ranges. There would be no significant impacts on soils from possible contamination under Alternative 1.

3.1.3.3 Alternative 2

3.1.3.3.1 Ground Disturbing Activities

Construction Activities

As shown in Table 2-5 and Figure 2-3, the total area of disturbance associated with proposed range enhancements would increase from 92 ac. (37.2 ha) under Alternative 1 to 105.5 ac. (42.7 ha) under Alternative 2. This 13.5-ac. (5.5-ha) increase would be attributable to construction of the western CLFR

and, to a much lesser extent, the joint-use Range Operations Control Center. Construction of the western CLFR would include placement of additional gravel on about 12 ac. (4.9 ha) of existing gravel road, but previously undisturbed soils would not be affected. Similar to Alternative 1, approximately 79 ac. (32.01 ha) of previously undisturbed soils would be affected under Alternative 2. About 50 ac. (20.2 ha) would be permanently converted to development and about 30 ac. (12.1 ha) would be temporarily disturbed and revegetated. While the overall disturbance footprint is slightly larger for Alternative 2, impacts to previously undisturbed soils would be the same as Alternative 1. BMPs for Alternatives 1 and 2 would also be the same, and would include implementation of measures to avoid and minimize wind and water erosion in accordance with the Oregon Department of Environmental Quality *Erosion and Sediment Control Manual* (Oregon Department of Environmental Quality 2005) and implementation of the *Post-construction Habitat Restoration Plan* (Appendix F).

Portions of the drop zone, eastern CLFR, and western CLFR are the only Alternative 2 proposed range enhancements that would be sited on soils classified as prime farmland or farmland of statewide importance (Figure 3.1-2, Table 3.1-1). No construction or development would be required for the drop zone. Establishing the eastern CLFR and western CLFR would involve placement of gravel on existing dirt roads and establishment of temporary target emplacements. These activities would not irreversibly convert soils that are classified as prime farmland or farmland of statewide importance.

Construction activities under Alternative 2 would result in long-term minor effects to soils in the form of erosion, compaction, and alteration of natural soil profiles and structure. The effects would be localized and the area affected would be slightly more than Alternative 1 (0.5 ac. [0.2 ha]). The area affected would be small relative to the total land area at NWSTF Boardman (about 0.1 percent). There would be no significant impacts on soils from construction activities under Alternative 2.

Training Activities

Training activities that result in ground disturbance would increase under Alternative 2 compared to the No Action Alternative, but would be similar to Alternative 1. With respect to ground disturbance related to training, the main difference between Alternative 2 and Alternative 1 would be non-explosive practice munitions impacts and placement or relocation of targets along the western CLFR. Soils around targets on the new ranges would be disturbed by non-explosive practice munitions striking the ground. Some of the areas affected would coincide with areas temporarily disturbed during construction. Vehicle and equipment use would increase substantially under Alternative 2 compared to the No Action Alternative during ground-based training events. However, vehicles, including tracked vehicles, would continue to use existing roads or new gravel roads constructed under Alternative 2. No maneuver training off of these roads is proposed. Disturbed areas would be susceptible to erosion. Ground disturbance from training activities under Alternative 2 would result in long-term minor effects to soils in the form of increased potential for erosion, compaction, and alteration of natural soil profiles and structure. The effects would be localized, but more widespread than the No Action Alternative and Alternative 1. There would be no significant impacts on soils from training activities under Alternative 2.

Maintenance Activities

Maintenance activities around targets in the Main Target Area and fire break maintenance activities under Alternative 2 would be the same as those described for Alternative 1. Threfore, the analysis presented above for Alternative 1 also applies to Alternative 2. The proposed modifications to the fire break system (Figure 3.12-2) would result in long-term benefits to soils at NWSFT Boardman by restoring approximately 219 ac (89 ha) of mechanically disturbed land to native plant communities, which would reduce the potential for soil erosion.

Indirect Effects of Increased Wildfire Risk

As discussed in Section 3.12, Wildfire, the proposed increases in training at NWSTF Boardman could increase the risk of wildfire. Soil erosion could occur indirectly from fire-caused decreases in vegetation cover and biological soil crust. However, the additional fire protection measures and resources that would be put in place under Alternative 2 would mitigate the increased fire risk (see Section 3.12) and avoid or minimize potential indirect effects to soils.

3.1.3.3.2 Potential Soil Contamination

The potential for incidental spills that could contaminate soils would increase under Alternative 2 compared to the No Action Alternative because additional refueling would be necessary for some of the ORNG ground vehicles. Refueling requirements for Alternative 2 would be the same as Alternative 1. While ORNG wheeled vehicles would not be refueled at NWSTF Boardman, Abrams tanks and Bradley fighting vehicles would be refueled in the field using tanker trucks and portable secondary containment devices. Risk of a spill contaminating soils is considered negligible based on existing standard operating procedures, periodic spill response training, and use of secondary containment during refueling.

Potential impacts on soils from military expended materials (e.g., non-explosive practice munitions) under Alternative 2 would be the same as those described for Alternative 1 with two exceptions. First, approximately 6,000 non-explosive practice mortar rounds would be expended per year. These rounds would be recovered by the participating units for eventual reuse. Therefore, practice mortar rounds would not have a long-term impact on soils. Second, the western CLFR would be established and approximately 50 percent of the CLFR training events would shift from the eastern CLFR to the western CLFR. The total number of CLFR events and number of rounds expended would not change compared to Alternative 1, but the footprint of possible soil lead contamination would increase.

As discussed for the No Action Alternative and Alternative 1, lead would be expected to have limited mobility based on neutral to alkaline soil pH, limited precipitation, and flat terrain at NWSTF Boardman. As shown in Figure 3.1-2, the proposed western CLFR would be sited on Koehler, Quincy, and Sagehill soils, with pH values in the range of 7.3 to 7.9 (Table 3.1-1). Lead precipitates out of solution and binds to the soil within these pH ranges, preventing or limiting migration to the subsurface (Dermatas 2004, U.S. EPA 2005). The flat terrain on the proposed ranges coupled with low precipitation also makes it unlikely that lead would be transported outside the immediate target area by stormwater runoff.

Effects of contaminants on soils under Alternative 2 would be long-term and similar to those described for Alternative 1. The effects would be localized to the range areas, but more widespread than the No Action Alternative and Alternative 1 because the western CLFR would be used. Elevated concentrations of lead in soils would not represent a substantial threat of a release to an off-range area that poses unacceptable risk to human health or the environment. The potential for a release to off-range areas would continue to be assessed every five years under the Army's Operational Range Assessment Program and applicable strategies outlined in the *Army Small Arms Training Range Environmental Best Management Practices Manual* (U.S. Army Environmental Center 2005) would be used to manage the new ranges. There would be no significant impacts on soils from possible contamination under Alternative 2.

3.1.3.4 Proposed Management Practices, Monitoring, and Mitigation Measures

3.1.3.4.1 Proposed Best Management Practices

The current management practices listed in Section 3.1.2.3 would continue to be implemented under Alternatives 1 and 2, and existing programs and plans would be updated to reflect new conditions. The following BMPs would be implemented to avoid and minimize potential impacts to soils under Alternatives 1 and 2:

- Applicable erosion control measures would be implemented during construction to avoid and minimize the potential for wind and water erosion in accordance with the Oregon Department of Environmental Quality *Erosion and Sediment Control Manual* (Oregon Department of Environmental Quality 2005).
- A *Post-construction Habitat Restoration Plan* (Appendix F) would be implemented following construction to reduce soil erosion.
- An Integrated Wildland Fire Management Plan (Appendix H) would be implemented to avoid and minimize impacts associated with wildfire, including the indirect effects of soil erosion after a fire. In addition to other fire protection measures, the Plan includes proposed modifications to the existing system of fire breaks (Figure 3.12-2). The total area of fire breaks that would be maintained annually by mechanical disturbance (plowing or disking with a tractor) would decrease from 462 ac. (187 ha) to 243 ac. (98 ha). The proposed modifications to the fire break system (Figure 3.12-2) would result in long-term benefits to soils at NWSFT Boardman by restoring approximately 219 ac (89 ha) of mechanically disturbed land to native plant communities, which would reduce the potential for soil erosion.
- Incidental fuel spills would be avoided during construction and training by conducting all refueling activities in a secondary containment area.
- Drip pads would be placed under equipment when parked to avoid soil contamination from leaking fluids.
- A Spill Prevention, Control, and Countermeasures Plan would be developed if quantities of fuel and other petroleum products above the spill prevention, containment, and countermeasures quantity threshold were stored at NWSTF Boardman or a HEMTT or fuel tanker truck were parked on NWSTF Boardman. The Plan would help to ensure rapid and effective response to incidental spills and avoid contaminant migration to groundwater.
- Any spills would be managed and cleaned up in accordance with Oregon Army National Guard Regulation 420-47; a Spill Prevention, Control, and Countermeasures Plan, if deemed necessary; AR 200-1; and applicable state and federal regulatory requirements. If the ORNG is unable to contain a spill or the spill exceeded 42 gal. (158.9 L) of regulated material, the event would be immediately reported to the Oregon Emergency Response System.
- The NWSTF Boardman *Operational Range Clearance Plan* would be updated and implemented to address requirements for the new ranges.
- Range Condition Assessment Five-Year Reviews would continue to be conducted and appropriate steps would be taken, if necessary, to prevent or respond to a release or substantial threat of a release of munitions constituents of potential concern to off-range areas that could pose unacceptable risks to human health or the environment.
- Assessments would be conducted for the DMPTR, MPMGR, and both CLFRs in accordance with the Army's Operational Range Assessment Program. These assessments would first determine qualitatively if munitions constituents were leaving the operational range footprint and whether pathways existed for human or ecological receptors. A quantitative assessment would be conducted if the qualitative assessment were inconclusive. The assessments would be

conducted on a five-year review cycle, even if the initial qualitative assessment identified no issues. In addition, ORNG would proactively manage the new ranges using applicable strategies outlined in the *Army Small Arms Training Range Environmental Best Management Practices Manual*.

3.1.3.4.2 Proposed Monitoring

No specific monitoring needs where identified for soils. However, the need for soil sampling, analysis, or monitoring would continue to be considered during Range Condition Assessment Five-Year Reviews conducted under the Navy's RSEPA program and during Operational Range Assessments conducted by ORNG.

3.1.3.4.3 Proposed Mitigation Measures

No mitigation measures are warranted for soils based on the analysis presented in Section 3.1.3, implementation of current management practices, and implementation of proposed BMPs.

3.1.3.5 Summary of Effects and Conclusions

Table 3.1-2 lists each stressor analyzed for potential impacts on soils at NWSTF Boardman. None of the alternatives would result in significant impacts on soils.

Table 3.1-2: Summary of Impacts on Soils

Stressors		Summary of Effects and National Environmental Policy Act Impact Determination
Major Stressor Category	**Stressor Type**	
No Action Alternative		
Ground Disturbing Activities	Construction	Not applicable. No construction would occur.
	Training	Long-term minor effects in the form of soil erosion, compaction, and alteration of natural soil profiles and structure. Effects would be localized.
	Maintenance	Long-term effects from target and fire break maintenance in the form of soil erosion and alteration of natural soil profiles and structure.
	Increased wildfire risk	Not applicable. Wildfire risk would not increase.
Potential Soil Contamination		Long-term effects in the form of accumulation of military expended materials and metals in surface soils. Effects would be localized.
Impact Conclusion		The No Action Alternative would not result in significant impacts on soils.

STRESSORS		Summary of Effects and National Environmental Policy Act Impact Determination
Major Stressor Category	**Stressor Type**	
Alternative 1		
Ground Disturbing Activities	Construction	Long-term minor effects in the form of soil erosion, compaction, and alteration of natural soil profiles and structure. Effects would be localized. Soils classified as prime farmland or farmland of statewide importance would not be irreversibly converted.
	Training	Long-term minor effects in the form of soil erosion, compaction, and alteration of natural soil profiles and structure. Effects would be localized, but more widespread than the No Action Alternative.
	Maintenance	Proposed modifications to the fire break system would result in long-term benefits to soils at NWSFT Boardman by restoring approximately 219 ac (89 ha) of mechanically disturbed land to native plant communities, which would reduce the potential for soil erosion.
	Increased wildfire risk	Negligible indirect effects. Increased fire risk would be mitigated by additional fire protection measures and resources.
Potential Soil Contamination		Long-term effects in the form of accumulation of military expended materials and metals in surface soils. Effects would be localized, but more widespread than the No Action Alternative.
Impact Conclusion		Alternative 1 would not result in significant impacts on soils.
Alternative 2		
Ground Disturbing Activities	Construction	Long-term minor effects in the form of soil erosion, compaction, and alteration of natural soil profiles and structure. Effects would be localized, but a slightly larger area would be affected compared to Alternative 1. Soils classified as prime farmland or farmland of statewide importance would not be irreversibly converted.
	Training	Long-term minor effects in the form of soil erosion, compaction, and alteration of natural soil profiles and structure. Effects would be localized, but more widespread than the No Action Alternative and Alternative 1.
	Maintenance	Proposed modifications to the fire break system would result in long-term benefits to soils at NWSFT Boardman by restoring approximately 219 ac (89 ha) of mechanically disturbed land to native plant communities, which would reduce the potential for soil erosion.
	Increased wildfire risk	Negligible indirect effects. Increased fire risk would be mitigated by additional fire protection measures and resources.
Potential Soil Contamination		Long-term effects in the form of accumulation of military expended materials and metals in surface soils. Effects would be localized, but more widespread than the No Action Alternative and Alternative 1.
Impact Conclusion		Alternative 2 would not result in significant impacts on soils.